



Innovation Learning Geography with ArcGIS Online: The Impact to Skills Collaborative and Achievement Student School Upper Intermediate

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ABSTRACT

Purpose of the study: The aim of this research is to examine the influence of ArcGIS online learning media on collaborative skills and student learning outcomes at State Senior High School 1 Mojo, Kediri Regency.

Methodology: The research used a quasi-experimental method with a Post-test only control design. The tool used is ArcGIS online from ESRI. The research population was class 10 students at Mojo 1 High School, Kediri, academic year 2023/2024, with samples selected randomly for the experimental and control classes. Data was collected through observation of collaborative skills and post-test for learning outcomes. Observations were carried out with the help of three observers using a collaborative skills observation instrument based on a Likert scale. Data analysis was carried out using SPSS, including the ANOVA test for homogeneity, the Kolmogorov-Smirnov test for normality, and the T test to test significant differences between the experimental and control classes.

Main Findings: The use of ArcGIS online as a learning medium shows a significant increase in collaborative skills and student learning achievement compared to conventional learning media. Post-test and observation results show higher scores in the experimental class.

Novelty/Originality of this study: This research introduces the use of ArcGIS online as a geography learning medium, which has not been widely implemented in high schools. This study shows that the use of this technology can significantly improve students' collaborative skills and learning outcomes.

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1. INTRODUCTION

The development of technology, information and communication (ICT) has greatly influenced various fields, including education. This encourages changes in the implementation of the learning process, especially in the use of learning media [1-3]. The use of computers, laptops, cellphones, smartphones and other sophisticated electronic media has become an urgent need [4-6]. These technological advances greatly influence students' learning activities so that it cannot be denied that students use gadgets or the internet more often than textbooks to search for information [7-9]. As is the case in geography learning, it is necessary to utilize appropriate information technology in learning activities [10], [11]. This is because the field of geography has very broad material and some material is difficult to explain so real examples need to be given.

Geography subjects are one of the fields of science taught to high school students. The field of geography discusses the similarities and differences in geosphere phenomena from an environmental or spatial regional perspective [12-14]. Geography has a lot of material studies ranging from the distribution of animals and plants, the formation of the earth, natural disaster phenomena, layers of the earth, layers of the atmosphere, population, remote sensing, mapping, Geographic Information Systems (GIS) and many others [15-17]. Geography as a science that studies the earth's surface spatially, is of course very interested in the number of different natural phenomena in its environment. Making the surrounding environment as illustration material and as a place for the learning process.

In the learning process, students are emphasized on studying phenomena around them. Students are equipped to think spatially in general. Teachers in carrying out the geography learning process, especially in delivering material, still use the contextual learning model [18-20]. The contextual learning model is a learning model that has the concept of connecting lesson material with real world situations [21-23]. Apart from applying appropriate learning models in the geography learning process, learning will be optimal if accompanied by the use of learning media [24], [25]. Geography learning media that can be used are animations, videos, pictures, graphs and geographic maps [26], [27]. The geography learning material provided at high school level has many indicators that can be explained with the help of the media.

Geography basically discusses very interesting material, where the discussion of material in geography learning brings students to know the surrounding environment and other areas of the earth's surface. Teachers can use learning media to make students more interested in learning [28], [29]. This learning media is a supporting means to attract students' interest and attention [30], [31]. One of the studies on geography learning material for class X high school level is basic knowledge of mapping [32], [33]. The subject of geography related to basic knowledge of mapping is discussed in GIS material.

The results of initial observations carried out at Mojo 1 High School, Kediri Regency, revealed that in learning GIS material, geography teachers did not use learning media when delivering the material. Geography teachers still use PowerPoint as a medium to convey learning material. Some students are not yet motivated and challenged in listening to explanations of material presented by the teacher. Learning is still teacher-centered, so students just accept it and wait for an explanation from the teacher. Students only imitate and solve problems exactly as exemplified by the teacher, and are not challenged to be creative in solving problems using other solutions. Students still have difficulty developing their creative thinking skills because students' answers to questions are the same as the teacher's explanations, and there are no differences in other students' answers [34], [35]. These conditions affect student learning outcomes.

Delivering GIS material with direct practice using ArcGIS media, teachers can use the guided inquiry learning model. Guided inquiry learning is carried out by involving students during investigations, helping students identify concepts or methods, and encouraging students to find ways to solve the problems they are facing. The role of a teacher here is as a person who poses problems and guides problem solving activities. Stated that the guided inquiry learning model emphasizes the process of discovering a concept so that a scientific attitude emerges in students and a teacher can design its use according to the student's level of intellectual development [36], [37].

There are many types of GIS learning media, such as Google Earth, Google Map, Arcview, QGIS, and ArcGIS. ArcGIS media is a software package consisting of GIS software products developed by ESRI (Environmental Science & Research Institute). This software is used to create digital maps which are equipped with features to provide more detailed coloring, images and descriptions [38-40]. ArcGIS is a platform that consists of several software including Desktop GIS, Server GIS, Online GIS, ESRI Data, and Mobile GIS [41], [42]. ArcGIS can be operated by installing the application on a desktop or cellphone, apart from that, there is also ArcGIS which can be accessed online or on the web.

The large number of GIS software developed by ESRI can support and assist teachers in the geography learning process, so that teachers can use one of these applications as a learning medium. The ArcGIS application used as a learning medium will help teachers in carrying out the learning process and can help in achieving learning goals, however there are still many teachers who have not used the ArcGIS application as a mapping learning medium. This is because a lot of storage space is required to install the application. The same thing with the online ArcGIS website application which teachers can use as a medium for learning mapping material.

ArcGIS online Learning Media is cloud-based software (technology that can be accessed via the internet network) which is useful for creating and sharing maps in interactive web form [43]. ArcGIS online is a medium that can only be accessed if there is an internet connection. The features of ArcGIS online can be adjusted to suit GIS learning needs. ArcGIS online offers simple features that are easy to use, making it ideal for upper middle class users. When using ArcGIS online teachers and students can access datasets, including census data, elevation and slope, satellite imagery, geology, and flood risk areas. Most of the spatial data formats contained in ArcGIS online can be downloaded, then uploaded back to the account for use in web mapping applications. Teachers and students can also access ESRI's "Living Atlas," a collection of data sets and maps that can be easily added to web maps. In this way, researchers chose to use ArcGIS online media as a learning medium, because its use is more

practical and has many easy-to-use features. The existence of online ArcGIS learning media can maximize students' collaborative skills, which can be seen from the way students utilize online ArcGIS media technology.

Today's collaborative skills make cooperation an interaction structure designed to facilitate collective efforts to achieve common goals. Collaborative skills are social skills that students must have because these skills are very important in learning [44], [45]. Collaboration is an important skill to achieve effective results. Research from suggests that a teacher must work on students' academic abilities and collaboration skills, because it can be useful for improving group work and determining success in social relationships in society [46], [47]. Collaborative skills can be trained through educational channels, where education is not only carried out to develop knowledge based on core learning subjects but must also be oriented so that students have collaborative abilities [48], [49].

Creating collaboration skills in students makes it easier for students to achieve optimal learning outcomes. Learning outcomes are an assessment obtained by students while studying, so student success in learning can be seen from the student's learning results. According to Asim et al. [50], optimal learning outcomes are demonstrated by changes in behavior in the form of knowledge or understanding, skills and attitudes acquired by students during the learning process. Bloom in Ekpenyong et al. [51] explains that learning outcomes include cognitive, affective and psychomotor abilities. Using learning media can help teachers optimize student learning outcomes. This is supported by Yu et al. [52], that the use of learning media can help teachers see student learning outcomes during the learning process. Therefore, to produce quality learning, teachers need learning media that suits the needs in the classroom. The use of learning media can maximize student learning outcomes.

Previous research found that the use of GIS-based learning media influences student learning outcomes [53]. The research results showed that the experimental class that used the ArcGIS application had an average post-test score of 83.03 and the class that used the Quantum GIS application had an average post-test score of 77.50. Apart from that, previous research also shows that there is a significant influence of the use of Google Earth visual learning media on student learning outcomes [54]. This is based on the Independent sample test in the equal variances section, it is assumed, it can be seen that Sig. (2-tailed) is 0.001. This shows that there are differences in the learning outcomes of the two. Then, previous research based on triangulation of quantitative and qualitative data shows that GIS integrated teaching provides a significant positive impact compared to conventional teaching methods in increasing participants' intrinsic motivation [55]. However, there are several gaps that have not been explained in previous research which are the basis for conducting the current research. Previous research has focused on individual student learning outcomes, but there has been no research that specifically explores the impact of using GIS learning media on students' collaborative skills. Collaborative skills are an important aspect of modern education that supports cooperation, communication and joint problem solving.

Previous research has focused a lot on GIS-based learning media such as Google Earth, but there has been no in-depth research on the use of ArcGIS online in the learning context in secondary schools. ArcGIS online has different features and may offer different potential in improving student learning outcomes and skills. Previous research does not specifically highlight the application of GIS-based learning media at the high school level. Research needs to be conducted that focuses on high school students to understand how this learning media can be integrated effectively at that level of education. This research will provide novelty in the form of new contributions in the field of geography education by exploring the potential of ArcGIS online learning media in improving collaborative skills and learning outcomes of high school students. It is hoped that this research will provide deeper insight into the implementation of GIS technology in secondary education and its impact on various aspects of students' skills and knowledge.

The difference between this research and previous research lies in the research indicators. Where in previous research only used one indicator, this research uses 2 indicators, namely the influence of the use of learning media on collaboration skills and student learning outcomes. Another difference lies in the learning media used. Previous research used Google Earth media, while this research used ArcGIS online learning media. ArcGIS online learning media is an application that can be used to create maps with simple features provided in it.

Based on the description above, the learning process using ArcGIS online media is expected to influence students' collaborative skills, so that students become more active and responsive during the learning process. Students who have collaboration skills will find it easier to get high learning outcomes too. So researchers are interested in applying ArcGIS online media to class X high school students. The aim of the research is to examine the influence of ArcGIS online learning media on collaborative skills and student learning achievement at the Upper Middle School of Negeri 1 Mojo, Kediri Regency.

2. RESEARCH METHOD

2.1 Types of Research

The type of research used in this research is quasi-experimental research. Experimental research is a quantitative method where this research is used to conduct experiments to find the influence of independent variables on dependent variables under controlled conditions. Experimental research is a way to look for a causal

relationship between two factors that are deliberately caused by researchers by eliminating or reducing other disturbing factors.

This research design uses the Post-test Only Control Design method. Researchers used 2 classes or 2 groups, of which 1 class was used as the experimental class and the other 1 class was used as the control class. At the first meeting the experimental class was given treatment using ArcGIS online learning media. Meanwhile, the control class was treated using conventional media. After both classes have been given treatment, the next step is to carry out a post test or final test. This is to determine whether there is an influence from the treatment that has been applied.

2.2 Population and Sample

Population is a collection of data that includes objects or topics that have certain qualities and characteristics. The population in this study were all 10th grade students at Mojo 1 State High School, Kediri Regency, even semester 2023/2024 academic year, covering class X Social Sciences 1 to class X Social Sciences 6.

The research sample is a small part of the number and characteristics of the population. If the population is large, the researcher can use samples taken from that population. Two groups were selected for the research samples, each of which was an experimental class and a control class. Before taking samples, the researcher first carried out a homogeneity test on the research population by looking at the results of students' daily tests on the previous material. Population homogeneity testing was carried out using the SPSS for Windows application (one way ANOVA). If the sample was proven to be homogeneous then sampling used the simple random sampling method. After that, a draw was carried out to determine the experimental class and control class. If the homogeneity results are proven to be heterogeneous, then sampling uses a purposive sampling method, namely by selecting 2 classes based on the average daily test scores with the smallest difference and drawing lots to get 1 control class and an experimental class.

2.3 Data Collection Techniques

Researchers used observation and test data collection techniques. Researchers made direct observations in class X social sciences 1 Mojo, Kediri Regency. Researchers observed the students' condition during the learning process. Observations are carried out by observing in the classroom while learning is taking place. The researcher was assisted by 3 friends as observers. This data collection method requires an observational research instrument with certain criteria. The instrument grid in this research is presented in table 1 below.

Table 1. Instruments Skills collaborative

No	Indicator	Mark	Category
1	Contribute in a way active	> 80	Very Collaborative
2	Work in a way productive	> 60 – 80	Collaborative
3	Show flexibility and compromise	> 40 – 60	Enough Collaborative
4	Show not quite enough answer	> 60 – 40	Less Collaborative
5	Attitude value	≤ 20	Not Collaborative

Source : [56]

A test is an evaluation tool in written form to record or observe students who are aligned with the assessment target. In this research, test techniques were used to determine the learning outcomes of students in the experimental class after being given treatment using the ArcGIS online learning media. Students are given a posttest at the end of learning, this form of test is a multiple objective choice test with a choice of five answer choices totaling 20 multiple choice questions. The test questions are taken from questions whose validity has been tested, namely exam questions, student worksheets, and book packages. The test was given to the experimental class and control class groups to answer research hypotheses about GIS material.

2.4 Data Analysis Techniques

In this research, the data analysis technique used consists of several steps, namely processing data from observations of collaborative skills and student post-test results, as well as hypothesis testing using statistical tests. Data on students' collaborative skills was collected through observation sheets which were filled in by observers during the learning process. Each aspect of collaborative skills is assessed based on a Likert scale with a value range of 1-5. Calculate the average Collaborative Skills score for each student and each group. Conduct descriptive analysis to describe observation data on students' collaborative skills. This includes calculating the average value, standard deviation, and distribution frequency. Data on student learning outcomes was collected through a post-test which was carried out at the end of the lesson. Give a score to the student's post-test results.

Carry out descriptive analysis of students' post-test results to determine the distribution of scores, mean, median, mode and standard deviation. The normality test was carried out to find out whether the data from

observations of collaborative skills and students' post test results were normally distributed or not. The normality test was carried out using the Kolmogorov-Smirnov test. The homogeneity of variance test was carried out to find out whether the variance of the second group (experimental class and control class) was homogeneous or No. This test was carried out using Levene's Test with the help of the SPSS application.

To determine whether there was a significant difference between the experimental class that used ArcGIS online learning media and the control class that used conventional learning media, a T test was carried out. This test was used to test the hypothesis about the average difference in collaboration skills and student learning outcomes between the second group. If the significance value (Sig) < $\alpha = 0.05$, then H_1 is accepted and H_0 is rejected. If the significance value (Sig) > $\alpha = 0.05$, then H_1 is rejected and H_0 is accepted. H_0 : There is no significant difference between collaboration skills and student learning outcomes who use ArcGIS online learning media and conventional learning media. H_a : There is a significant difference between collaboration skills and student learning outcomes who use ArcGIS online learning media and conventional learning media.

3. RESULTS AND DISCUSSION

This research was conducted to determine the effect of using ArcGIS online learning media on the collaboration skills and learning outcomes of class X students at State Senior High School 1 Mojo, Kediri Regency. The research results are presented in two main parts, namely the results of observations of collaborative skills and the results of student post-test learning.

3.1. The Influence of ArcGIS online Learning Media on Skills Collaborative

Skills collaborative students on the material System Information Geography taken from instrument observations made at the end meeting after do classroom learning experiment using ArcGIS online learning media to create digital maps and classes control use method learning conventional or normal learning carried out by geography teachers with create a simple map. Indicators are assessed on skills collaborative includes : 1) Contribute in a way active , 2) Working in a way productive , 3) Show flexibility and compromise , 4) Demonstrate not quite enough answer , 5) Attitude value . Based on results observation Skills collaborative students , total value and average obtained student class experiments and classes control as following :

Table 2. Number of values and average skills collaborative

Class	Number of Values	Average
Experimental Class	2290	63.61
Control Class	1560	43.33

Evaluation Skills collaborative done with use method amount visible descriptor shared amount whole descriptor multiplied by 100. Meanwhile For calculation of the average value Skills collaborative done with method amount mark all over student shared amount all over student times 100.

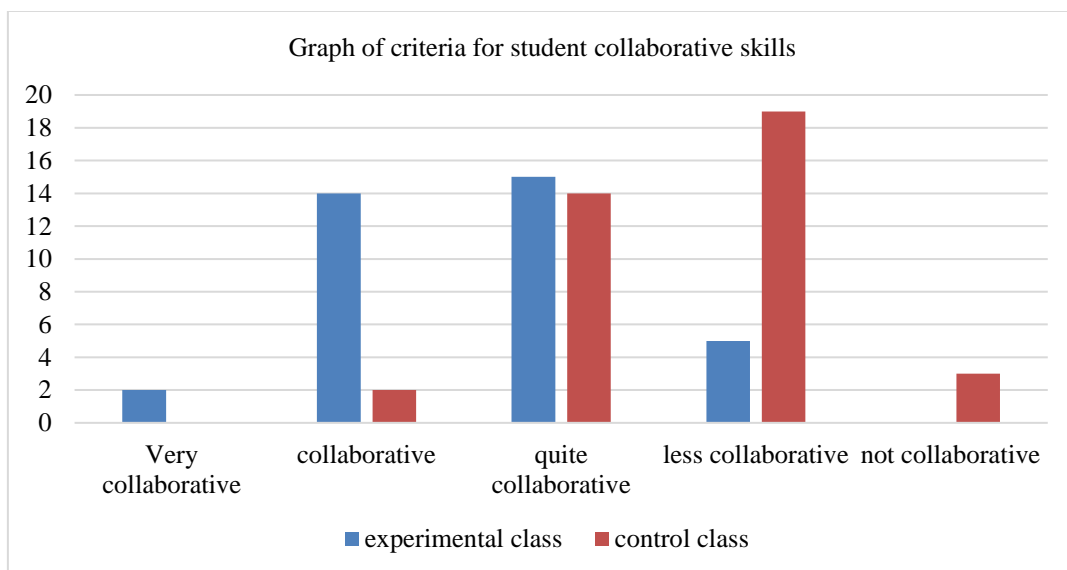


Figure 1. Graph criteria Skills collaborative student

Figure 1 shows amount criteria mark Skills collaborative student . In class experiment , criteria Skills collaborative student as following : 2 students detected very collaborative , 14 students detected collaborative , 15 students detected Enough collaborative , 5 students detected not enough collaborative , and 0 students detected No

collaborative . Meanwhile in class control , criteria Skills collaborative student as following : 0 students detected very collaborative , 2 students detected collaborative , 14 students detected Enough collaborative , 19 students detected not enough collaborative , and 3 students detected no collaborative .

Skill results collaborative can be tested for normality, homogeneity test using the Levene test , and the independent t-test for testing hypothesis with SPSS 26 assistance. Normality test was carried out useful For know distribution of data in groups the is normally distributed or no. Normality test use help SPSS 26 application , there are 2 points that are necessary seen namely Test Statistics and Exact Sig. (2-tailed). Test normality on skills collaborative student served in Table 3 below :

Table 3. Normality test skills collaborative experimental class and control class students with the one-sample kolmogorov-smirnov test

N	kolmogorov-smirnov test	
	Collaborative class control	Collaborative class experiment
Asymp . Sig. (2-tailed)	0.066	0.138

Kolmogorov- smirnov normality test results Skills collaborative data shows >0.05 . So from That results the can said results Skills collaborative student normally distributed . The next step carry out the Levene independent t- test for test homogeneity . Homogeneity test aim For know variance scores are measured on both sample own the same variance or no . Homogeneity test Skills collaborative student served in Table 4 below :

Table 4. Homogeneity test skills collaborative experimental class and control class students with the test of homogeneity of variances

df2	Collaborative class control	
	df2	Sig.
	70	0.077

Homogeneity test results levene independent t-test skills collaborative student data shows figure >0.05 . So from That results the can said that results Skills collaborative student have homogeneous variant . The next step is an independent t-test for testing hypothesis with SPSS help 26. Testing This works For know the influence of ArcGIS online learning media on Skills collaborative student . Hypothesis test independent t-test two sample pair mark Skills collaborative class experiments and classes control served as following :

Table 5. Skill T-Test hypothesis test results collaborative with independent samples test

Skill results collaborative	T-test value Sig (2-tailed)	
	T-test value	Sig (2-tailed)
		0,000

Based on the results of the t-test independent sample test, it shows the number $0.000 < 0.05$, therefore the null hypothesis (H_0) is rejected and the alternative hypothesis (H_a) is accepted. The test results can be confirmed that there is a significant influence on the use of ArcGIS online learning media on students' collaborative skills.

Learning carried out in the experimental class can operate and create maps digitally using ArcGIS online learning media. Digital map making is done in groups to see the collaborative skills each student has. The first meeting in the experimental class the teacher explained in general about geography and mapping. At this stage students are given the opportunity to ask questions about new discoveries that are not yet understood. In the second meeting, experimental class students were shown ArcGIS online media and introduced to the features and uses of the icons in ArcGIS online media. Students were given the opportunity to try entering the application and trying out the features in it.

At the third meeting, students were formed into several small groups to discuss making digital maps using ArcGIS online media. Students show a very enthusiastic and active attitude in learning using ArcGIS online media, students immediately open the application and follow the steps that have been explained. Learning in the control class is carried out using conventional learning or what is usually carried out by subject teachers. In the control class the learning material provided was the same as the material provided in the experimental class. Students in the control class held discussions in small groups to make simple maps using tracing paper, namely by tracing and coloring the map according to the example given.

In the control class, students did not show a collaborative attitude in discussions, this was because the teaching materials used did not attract students to learn and students were unable to complete assignments on time. This explanation is the same as Fadly, et al [57] who stated that in improving students' skills it was proven that learning using webGIS media was more effective than learning using conventional map methods or media. Based on the observation results, the average collaborative score for experimental class students was 63.61, which had a higher average score compared to the control class which had an average score of 43.33. The high average score in the experimental class is because learning in the experimental class using ArcGIS online media makes students

more interested in learning. Learning in the control class produces a lower average score because learning in the class uses conventional methods, so students feel bored and less interested in learning.

This explanation is the same as research that has been carried out by Ulhusna et al. [58] which shows that learning media can influence students' collaborative skills and the average score obtained in the experimental class is higher compared to the control class, because learning in the experimental class uses the help of Android-based ArcGIS online learning media which can foster student enthusiasm and motivation to learn the material. ArcGIS online media has special advantages, namely the application is easy to use, students can use the application wherever they are online, the application is in web form so that it minimizes the use of space on the cellphone, and map data is already available in the application.

ArcGIS online learning media can support student learning independently or in groups, and the use of this application can be operated using Android devices such as cellphones or tablets which many students currently own. Learning using ArcGIS online learning media allows experimental class students to be able to operate the ArcGIS online application using each student's gadget. Most of the students carried out discussions well and had grades above average. Students were able to make good use of ArcGIS online as a learning medium, especially in creating digital mapping.

The use of ArcGIS online media in learning can develop students' collaborative skills, demonstrated by students having responsibility; demonstrate an attitude of flexibility and compromise; work actively and productively; and can respect friends' opinions. Based on the results of research on students' collaborative skills, data was obtained that the majority of experimental class students had collaborative skills. The criteria for collaborative skills of experimental class students are explained in Figure 1, among the criteria for collaborative skills of experimental class students, namely 2 students are very collaborative, 14 students are collaborative, 15 students are quite collaborative and 5 students are detected as less collaborative. In contrast to the control class, there were 2 collaborative students, 14 students were quite collaborative, 19 students were less collaborative, and 3 students were detected as not collaborative.

Thus it can be concluded that the experimental class has higher collaborative skill criteria compared to the control class. Based on the results of observations of students' collaborative skills obtained by the researcher, the next step was to carry out a normality test, homogeneity test and t-test using the help of the SPSS 26 application. The normality test used the experimental class one sample Kolmogorov Smirnov test with the statistical test results producing a Sig number (2- tiled) produces a figure of 0.138, while in the control class the results of statistical tests produce a Sig (2-tiled) figure of 0.066. The results of this test can be said to be that the data obtained by researchers has been proven to be normal. Testing the normality of collaborative skills data with a normal distribution, then the researcher tested homogeneity using the Levene independent t test. The results of homogeneity testing using the Levene independent t-test produced a significant value of 0.077, it can be said that the results of students' collaborative skills have a homogeneous variance.

After it was proven that the results of students' collaborative skills were normally distributed and homogeneous, then the independent sample t-test was tested to determine whether the hypothesis drawn by the researcher was accepted or not. The data obtained from the t-test results shows a significance value of 0.000, which means that conclusions can be drawn, based on these results, there is a significant influence on ArcGIS online learning media on students' collaborative skills. Apart from being used as a learning medium and improving students' collaborative skills, ArcGIS online can also increase student activity. After discussing map making using ArcGIS Online, students presented the results of their discussion in front of the class. The use of ArcGIS online learning media, apart from being able to improve students' collaborative skills and activeness, can influence students' enthusiasm for participating in learning in the classroom, for example when the teacher asks students to log in to the ArcGIS online web application, almost all students follow the instructions and they also become very curious about How to use the application by trying various features and icons that are available in the application.

3.2. The Influence of ArcGIS online Learning Media on Learning Outcomes

Student learning outcomes in this research focus on the cognitive domain with the material "Geographic Information Systems". Student learning outcomes are taken from the posttest scores carried out at the end of the meeting after learning in the experimental class using ArcGIS online learning media and the control class using conventional learning models or learning models commonly used by subject teachers. Posttest implementation of student learning results is presented in the form of multiple choice 20 questions. Based on the posttest results of student learning outcomes, the following results were obtained:

Table 6. Average posttest scores for learning outcomes Student

Class	Number of Values	Average
Experimental Class	2210	61.38
Control Class	2125	59.72

Based on Table 6 it can be served in form chart results study student with highest value and lowest value from class experiments and classes control as following :

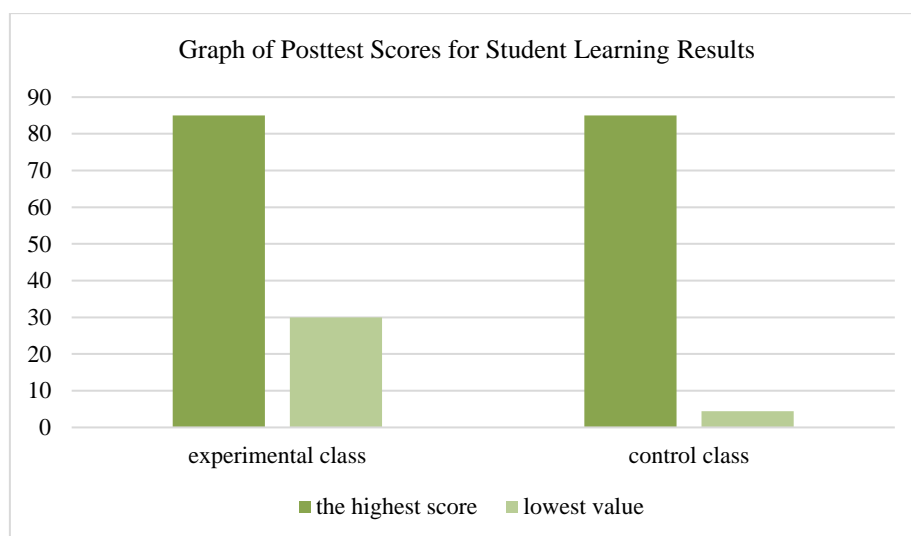


Figure 2. Graph of posttest learning result scores student

Table 6 and Figure 2 show the posttest results of student learning outcomes. The experimental class has the highest score of 85 and the lowest score of 30, for the total score obtained is 2210 with an average of 61.38. Meanwhile, the control class had the highest score of 85 and the lowest score of 25, the total score obtained was 2125 with an average of 59.72. Posttest results of student learning outcomes can be tested for normality, homogeneity test using the Levene test, and independent t-test for hypothesis testing with the help of SPSS 26. The normality test functions to determine whether the data distribution in the group is normally distributed or not. Test normality using the SPSS 26 application, what you need to see is the Sig value. (2-tailed). The normality test on student learning outcomes is presented in the following table:

Table 7. Normality test results study experimental class and control class students with the one-sample kolmogorov-smirnov test

	Collaborative class control	Collaborative class experiment
N	36	36
Asymp . Sig. (2-tailed)	0.303	0.085

The results of the Kolmogorov-Smirnov normality test of learning outcomes, the data shows a number >0.05 , so the data can be said that the Posttest data on student learning outcomes is normally distributed. The next step is to carry out the Levene independent t-test to test homogeneity. The homogeneity test aims to determine whether the variance of the scores measured in the two samples has the same variance or not. The homogeneity test of student learning outcomes is presented in Table 8 below:

Table 8. Homogeneity test of learning results experimental class and control class students with the test of homogeneity of variances

	Collaborative class control
df2	70
Sig.	0.544

The results of the levene homogeneity test of students' collaborative skills data show a figure of >0.05 . Therefore, these results can be said to mean that student learning outcomes have homogeneous variants. The next step is an independent t-test for hypothesis testing with the help of SPSS 26. This test functions to determine the effect of ArcGIS online learning media on student learning outcomes. Hypothesis Testing Independent t-test of two paired samples. The learning results of the experimental class and control class are presented as follows:

Table 9. T- test hypothesis test results learning results for experimental class and control class with independent samples test

	T-test value Sig (2-tailed)
Learning outcomes	0.001

Based on the results of the t-test independent sample test show the number $0.001 < 0.05$, then from That the null hypothesis (H_0) is rejected and hypothesis alternative (H_a) is accepted. The test results can confirmed that there is significant influence on the use of ArcGIS online learning media on results Study student .

Results of second data analysis that is results Study students, research This used For see the influence of ArcGIS online learning media on results Study student researcher use aspect cognitive and assessment taken from results posttest with total of 20 questions choice double. Based on results analysis of result data learning in Table 4.8 students obtained average posttest score of students class experiment that is of 61.38 and for class control own mark amounted to 59.72, of results the class average experiment more tall compared to class average control . Besides that amount mark whole class experimentation is also more tall compared to class control, where class experiment own amount mark overall 2465 and class control own amount mark a total of 2125. Figure 2 is also explained that mark highest obtained by students class experiment i.e. 85 and value the lowest is 30, meanwhile For class control mark highest student i.e. 85 and value lowest obtained student 25. Research results it's also the same with study revealed that average value of results Study student classes that use learning media more tall compared to with average value of results Study students who don't using learning media , differences from average value of classes that use learning media and those that don't using learning media by 11.

Classroom learning experiment using ArcGIS online media in progress with good and effective , because with students' ArcGIS online media can free export the icons contained within application so that can add insight and knowledge student. Using student ArcGIS online media with easy can create maps digitally and can create the map you created in accordance creation each of them. You can use ArcGIS online media produce positive energy and results in learning, namely interesting and fun learning can create active and enthusiastic students in study so that capable increase achievements results Study students and skills student.

Results data study results Study students in class experiments and classes control, processing moreover formerly For see is hypothesis researcher accepted or no . Stages passed namely normality test , homogeneity test using the Levene independent t-test, and if the data is complete normally distributed and homogeneous so can continue to hypothesis testing stage with the t-test all tests are assisted with use SPSS 26 application. Normality test results using the one sample Kolmogorov test smirnov on class experimental data t-statistics produce sig number (2- tailed) produce figure 0.303, while in class control t- statistical value produce sig number (2-tailed) yield figure 0.085. Results of normality test data results Study student stated normally distributed. Normality test results study already normally distributed , step furthermore that is carry out a homogeneity test using the Levene independent t-test. Levene test results data results Study student produce mark significance 0.544, of results the can decided that the result data study student own variance homogeneous. Data obtained from normality and homogeneity tests produces normal data and has variance homogeneous, step furthermore carry out hypothesis testing with the t-test. Generated data from the t-test shows mark significance 0.001, which can be withdrawn the conclusion that from results the stated that there is influence significant impact on ArcGIS online learning media towards results Study student .

A number of study about use of learning media that focuses on variables results Study student always produce good results , where student can utilize learning media the with Good. Use of appropriate media as ArcGIS online media can form good understanding for students, so student can study something problem in a way deep with so can increase results Study students [59], [60]. Use of ArcGIS online learning media implemented in class experiment taking place Enough effective, p the because students' ArcGIS online learning media can learn matter new about making digital maps and students role active and able find and analyze existing maps made in a way spatial. So from that's what influences it its height results Study student that is Because use of ArcGIS online learning media. Also stated that learning media function in a way general including; clarifying presentation message, resolve limitations time, power senses and space, enhance spirit learn, overcome attitude passive student moment learning takes place, and delivers possible stimuli equalize experience student to lesson .

Previously related research related to GIS technology had been carried out, which focused on analyzing soil characteristics, including physical and mechanical properties and spatial variability using geostatistical techniques and ArcGIS modeling [61]. Although the research provides in-depth insights into the correlation of soil properties and their use in geostatistical modeling, there are several unfilled gaps, especially regarding the application of GIS technology in educational contexts. The use of ArcGIS in previous research shows that this technology is effective in modeling and analyzing spatial data. This provides the basis for the use of ArcGIS online in educational contexts, where the technology can be used to create digital maps and increase student engagement in the learning process.

The novelty of this research is that it introduces a new approach by integrating ArcGIS online learning media into the 10th grade geography curriculum at Mojo 1 State High School, Kediri Regency. This study shows how digital mapping tools can significantly improve students' collaboration skills and learning outcomes compared to traditional mapping methods. By using ArcGIS Online, students experience a more interactive, hands-on learning experience that encourages active participation and higher levels of engagement [62], [63]. This research adds to the existing literature by providing empirical evidence that the use of web-based GIS tools can have a positive impact on student collaboration and cognitive learning outcomes in secondary schools.

The results of this study indicate that integrating digital tools such as ArcGIS online into the geography curriculum can significantly improve teamwork skills and overall learning performance. This has significant implications for educational practice and marks a shift from traditional teaching methods to more technologically integrated approaches. Schools and educators should consider investing in and integrating these digital tools to improve student engagement and learning outcomes. Additionally, this research highlights the importance of training teachers to use these tools effectively. This creates a more dynamic and interactive classroom and ultimately fosters a deeper understanding of geographic concepts among students. Although this research provides promising results, it is limited by the relatively small sample size and the specific circumstances of Negri 1 Mojo Senior High School in Kediri Regency, which may not be representative of other schools or regions. Additionally, the study did not account for potential confounding variables, such as students' familiarity with digital tools or innate interest in geography, that could have influenced the results. Researchers recommend that future research should consider larger and more diverse samples and control for these variables to generalize the results more widely. Additionally, the longitudinal study provides insight into the long-term impact of using ArcGIS online on student learning and collaboration skills.

4. CONCLUSION

Based on results and discussion described by researchers can withdrawn conclusion ArcGIS online learning media is influential significant to skills collaborative student. Data obtained show that results observation skills collaborative student show sig number 0.000 or not enough of 0.05, then can It is said that ArcGIS online learning media is capable influence skills collaborative student. Learning in the classroom with using ArcGIS online capable media interesting attention student become more spirit learn, want know, train discussion in group group small because the ArcGIS online media can influence Skills collaborative student. ArcGIS online Learning Media is influential significant to results study student. Data obtained show that results Study student show sig number 0.001 or not enough from 0.05. Learning with using ArcGIS online create media student more enterprising Again in study, because student sued for more independent in study. Student more like study using ArcGIS online learning media because student more interested and happy study using electronic media or a kind of gadget in comparison using print media. Researchers recommend that future research should consider larger and more diverse samples and control for these variables to generalize the results more widely. Additionally, the longitudinal study provides insight into the long-term impact of using ArcGIS online on student learning and collaboration skills.

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