Improving Critical Thinking Ability: Earthcomm Learning For Watershed Conservation Materials

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Abstrak

Earth Science System in the Community is a learning model relevant to the 2013 curriculum and can improve students' critical thinking ability. The research aims to determine the effect of EarthComm learning models assisted by Avenza Maps application on students critical thinking ability. This type of research is a quasi-experiment with a pretest-posttest control group design. The research was held at High School 2 Mojokerto in the even semester 2019/2020. Data analysis using Independent Sample T-Test with IBM SPSS Statistics 22 for Windows. The results showed there was quite a significant difference between the critical thinking ability of the experimental class and the control class, evidenced by the value gain a score of the experiment class (28.11) more significant than the control class (19.89). EarthComm learning model assisted by Avenza Maps application affecting the students critical thinking ability because the syntax of EarthComm invites students to observe directly in the field. Through direct observation, students can feel and understand what is happening in the field to improve students' critical thinking ability. Suggestions are given to (1) the teacher of Geography subjects, hopefully, able to implement EarthComm learning model assisted by Avanza Maps application about the Earth system material that demands critical thinking capabilities in it; (2) further researchers, it is advisable to replace or add other bonded variables.

Kata Kunci: EarthComm Learning Model; Critical Thinking Ability; Watershed Conservation

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INTRODUCTION

Learning is the core of education, and learning affects the process of receiving knowledge that teachers teach to students. The 2013 curriculum prepares students for critical thinking. It is evidenced by the many basic competencies with high cognitive level (Zlatkin-Troitschanskaia et al., 2015). The fact that happens, there are still many students who are lacking in the ability of critical thinking. Learning is still conceptual and has not been inquiry because the teacher is still using conventional models of lectures such as questions and answers. EarthComm is one of the relevant learning models and is capable of training students critical thinking ability.

The fact that happens, there are still many students lacking in the ability of critical thinking. Learning is still conceptual and has not been inquiry because the teacher is still using conventional lectures such as questions and answers. EarthComm is one of the relevant learning models and is capable of training students critical thinking ability.

EarthComm is a learning model that focuses on the environmental problems that exist on Earth. Problems include physical phenomena caused by Geosfer, Hydrosphere, Atmosphere, Criosfer, and Biosphere (Bellaubi & Lagunov, 2020; Putra et al., 2021). EarthComm has a learning step that is in line with the scientific approach, such as scenario (observing), think about it (to do it), reflecting on the activity and challenge (associating), digging deeper (collecting information), and applying what you have learned (communication). (Aliman et al., 2019). The scientific approach makes students more active in building their knowledge and skills, encouraging students to investigate and discovering facts from a phenomenon or incident. EarthComm is an inquiry learning that directs students to develop critical thinking ability through problem-solving and providing solutions to problems in the student's environment(Aliman et al., 2019). Through EarthComm, students are expected not only to know what it is but also to know how to do something, connect it with life in society, and apply what has been learned in community life (Amin et al., 2020).

Avenza Maps is an application with a system of work plotting areas, determining the point of coordinates, photographing conditions in the field, providing descriptions of what has been found, measuring distance and area, and importing and exporting placemarks (Merry & Bettinger, 2019). Avenza Maps has several advantages: (1) it has high accuracy when plotting; (2) it can be used to plotting based on the desired point; (3) it can be used with offline mode when in place of no signal. Through the Avenza Maps app, students can work more efficiently and effectively in collecting data in the field, assisting students in analyzing and answering questions on the EarthComm activity guide. Through problem-solving activities, students can develop critical thinking skills.

Critical thinking is a responsiveness ability regarding a matter or problem formulated in deep reasoning steps. Critical thinking forms individuals to have the ability to clarify, examine, assess a problem, conclude, integrate a good thing, and write or declare through good language and high sensitivity (Chesterman, 2014). The critical thinking ability needs to be developed due to information advancement, and global competition demands to think high levels of problem-solving (Kay & Greenhill, 2011).

METHOD

Research Plan

This research is a quasi experimental study with pretest posttest control group design. The details are shown in the following table.

Table 1. Pre-Test Post-Test Control Group Design

E	O_1	X	O_3
K	O_2	-	O_4

Based on table 1, X is EarthComm learning model assisted by Avenza Maps application and – is a STAD (Student Achievment Division) learning model. The O1 and O2 symbols define pretests the critical thinking skills of the experimental class and the control class. The O3 and O4 symbols define posttest critical thinking skills of experimental classes and controls.

Research Subject

The research subject is a grade X student of High School 2 Mojokerto. The subject determination is

based on the average student geographic value on previous material with almost the same value. Class X IPS 1 as an experimental class got EarthComm learning model assisted by Avenza Maps application, and class X IPS 2 as the control class got STAD learning model.

Research Instruments

The instrument used in the research is an essay test. The test is used to measure students critical thinking ability levels adapted to critical thinking indicators. Before being tested, an essay test must go through a prerequisite test to make the instrument valid and reliable so that the data obtained is correct and following reality.

Instrument testing includes validity and reliability. Validity is used to determine the feasibility level of each test instrument. The validity analysis uses the Pearson Bivariate statistical test. Based on the results of the validity test, it is known that each test instrument has a validity value with a range between 0,540-0,849, which is included in the criteria quite valid, valid, and very valid (Delgado Trujillo & de Justo Moscardó, 2018). This means that 15 test instruments are valid. Reliability is used to determine the level of consistency of an instrument as a data collection tool—reliability analysis using Cronbach's Alpha statistical tests. Based on the reliability test results, the value obtained is 0.901. The value of 0.901 is included in a very high-reliability classification with a correlation coefficient of 0.81-1.00 (Arikunto, 2019). This means that the test of critical thinking ability has a high consistency.

RESULTS AND DISCUSSION

The first step in processing data in assessing the student's answers according to the scoring table to get the test results. After assessing the student's answers, the next step is data analysis. The details can be seen in the following table.

Table 2. Frequency distribution of critical thinking skills beginning (Pretest) and end (Posttest) of control class

Value Interval	Criteria	Pretest		Posttest	
		Frequency	Percentage (%)	Frequency	Percentage (%)
91-100	Very Good	0	0	0	0
75-90	Good	0	0	10	28,57
60-74	Pretty Good	6	17,14	24	68,57
40-59	Less Good	29	82,86	1	2,86
< 40	Very Less	0	0	0	0
Total		35	100	35	100
Max Score		72		84	
Min Score		40		52	
Average		50,17		70,06	

Table 2. Shows the frequency distribution of students critical thinking ability control class. At the pretest, 29 students (82.86%) get value with more minor good criteria, and 6 students (17.14%) get value with pretty good criteria. The average value critical thinking ability of pretests students of the control class is 50.17, which is included in the less good criteria. At the posttest, 1 student (2.86%) get value with more minor good criteria, 24 students (68.57%) get value with pretty good criteria, and 10 students (28.57%) get value with good criteria. The average value critical thinking ability of posttest students of the control class is 70.06, which is included in the pretty good criteria.

Table 3. Frequency distribution of critical thinking skills beginning (Pretest) and end (Posttest) of experimental class

Value Interval	Criteria	Pretest		Posttest	
		Frequency	Percentage (%)	Frequency	Percentage (%)
91-100	Very Good	0	0	8	22,86
75-90	Good	0	0	24	68,57
60-74	Pretty Good	11	31,43	3	8,57
40-59	Less Good	24	68,57	0	0
< 40	Very Less	0	0	0	0
Total		35	100	35	100
Max Score		72		96	
Min Score		40		68	
Average		55,66		83,77	

Table 3. Shows the frequency distribution of student critical thinking ability of experimental class. At pretest, 24 students (68.57%) get value with less good criteria and 11 students (31.43%) get value with pretty good criteria. The average value critical thinking ability of pretests students of experimental class is 55.66 which is included in the less good criteria. At posttest, 3 students

(8.57%) get value with pretty good criteria, 24 students (68.57%) get value with good criteria, and 8 students (22.86%) get value with very good criteria. The average value critical thinking ability of posttest students of experimental class is 83,77 which is included in the good criteria.

Table 4 . Average Change in Pretest and Posttest Critical Thinking Ability

No.	Class	Pretest Average	Posttest Average	*Gain Score*	Percentage of Increase (%)
1	Control (X IPS 2)	50.17	70.06	19.89	39.64
2	Experiment (X IPS 1)	55.66	83.77	28.11	50.50

Table 4. shows that there was a change in the average value of critical thinking ability in the control class and the experimental class before and after treatment. The average of the control class pretest values is 50.17 and the average of the experimental class pretest values is 55.66. The value indicates that the experiment class has an average pretests value higher than the control class.

The average acquisition of the control class posttest value is 70.06 and the average of the experimental class posttest values is 83.77. The difference in value is quite far from the experimental class. It showed that there was a significant change in the experimental class after being given the EarthComm learning model assisted by Avenza Maps application compared to the control class that only used the STAD learning model as used by the teacher while teaching.

Data Analysis

Data analysis consists of two stages, a prerequisite test and a hypothesis test. A prerequisite test consists of normality test and homogeneity test. Normality test using Kolmogorof-Smirnov Z with significance value ($p \geq 0.05$). Homogeneity test using Levene's Test with significance value ($p \geq 0.05$). Hypothesis test using Independent Sample T-Test. Data analysis using IBM SPSS Statistic 22 for Windows. The details can be seen in the following table.

Table 7. Homogeneity Test Results

	Component	Sig.	Alpha 5%
Homogeneity Test Results	*Gain Score*	0.508	0.05

Table 7. shows the homogeneity test results have a significance value of 0.508. Significance value $0.508 \geq 0.05$ which means that the test data of critical thinking ability of the control class and the experimental class are homogeneous.

Table 8 . Independent Sample T-Test Results

Group	Average	Sig.	Alpha 5%	Condition
Experiment	19.89	0,000	0.05	Sig <Alpha
Control	28.11			

Table 8. shows the results of Independent Sample T-Test have a significance value of 0,000 or <0.05 and the average value of critical thinking ability of the experimental class 28.11 is greater than the average value of the critical thinking ability of the control class 19.89. This means that H0 rejected and H1 accepted, thus it can be concluded that there is an influence of EarthComm learning model assisted by Avenza Maps application on the students geography critical thinking ability.

Discussion

Using the EarthComm learning model assisted by Avenza Maps application on students critical thinking ability can occur because students are enthusiastic in carrying out learning using the EarthComm model. Student enthusiasm is influenced by the teacher that is the teachers' enthusiasm in doing it to stimulate students (Siegle et al., 2014). The implementation of the EarthComm learning model assisted by Avenza Maps application in the experimental class can train students to develop their critical thinking ability through the EarthComm steps to support the development of student mindset and reasoning. EarthComm steps encourage students to identify the issue evidenced at the chapter challenge stage (Park et al., 2005); reasoning on

the stage, think about it and applying what you have learned; solutive is evidenced in the digging deeper; creative attested at the chapter assessment stage; and observative is evidenced at the investigate stage.

EarthComm Learning models assisted by Avenza Maps application are performed using field performance and technical access. In its implementation, this model involves students learning in class and outside of class. Learning outside the class allows students to do activities in the field so that students more easily understand the problems in the surrounding environment, foster students concern for the environment, and students acquire new things by directly involving themselves to investigate a problem (Aliman et al., 2019; Amin et al., 2020; Sumarmi, 2015). In the Avenza Maps app, an "image and measure" feature assists students in the conjugation of their knowledge regarding the distance from the plant location to water pollution conditions in a river basin.

Based on the research results, it is known that experimental class students critical thinking ability is superior. This is because learning in the control class underemphasizes the ability of critical thinking in the steps of the lesson (Hu et al., 2016). Critical thinking is characterized by two main stages, namely, the process of logical thinking and decision making (Buckley et al., 2015; McPeck, 2016). Without both stages in the learning process in the control class, students are poorly trained to think critically. Critical thinking ability does not arise by itself but through learning and practice (Facione, 2011; Helyer, 2015; Nonis & Hudson, 2019)(Facione, 2011).

Students critical thinking skills can be observed from the characteristics of their attitudes and behaviour during learning that demonstrate some of the critical thinking aspects of clarifying (clarify), deciding (decide), and concluding (summarize). EarthComm learning assisted by Avenza Maps application more prioritize the learning process than the results achieved, so in the implementation of the students not only receive knowledge from the teacher, but students can build their knowledge by finding ideas and then applying them (Reiser, 2013).

The emphasis on critical thinking has a significant role in the learning process so that students always have a sense of curiosity and are not apathetic in learning so that learning is no longer centred on teachers unless students dig their knowledge and then apply it (Slavin, 2017). Students own essential critical thinking skills because critical thinking is needed in analyzing, synthesizing, and evaluating information that is used as the basis for arguments to make decisions. Students who have high critical thinking abilities will be able to explain global events either in opportunities or challenges.

According to the indicators used to measure students critical thinking ability: (1) identifying problems; (2) observe and assess the observation result; (3) explaining the conclusion; (4) znalyzing the arguments/assumptions; (5) making a decision (Paul & Elder, 2005). There are several findings in research related to the indicator. The first findings relating to the indicator identify the problem. The ability to identify problems is a fundamental thing that students have to develop their critical thinking ability. Critical thinking requires the ability to identify problems, find logical relationships between propositions, draw conclusions and generalization, construct patterns, and accurately research about certain things (Lai, 2011). Indicators of students who have critical thinking ability are well seen in some active class students experiments and are always looking for the truth about the information he receives, asking reasonable assumptions and consider them. Critical thinking and problem solving are one of the abilities that students must have in the 21st century (Lai, 2011; Putra et al., 2021). The following findings are related to decision making indicators. The decision in this case should be relevant to the options or problems previously identified. Students who have the ability of critical thinking are well able to make decisions that have certainly been considered well. Students who can make good decisions have fulfilled the criteria of critical thinking, but not all students can make good and relevant decisions. Some students are more likely to follow a learning flow to make decisions less precise than the scenarios they have made. In that case, the teacher must control each group especially those who are less concerned to stay in the proper EarthComm learning flow so that the expected goals can be achieved.

Students critical thinking ability can also be seen from students work during the learning process. The work is a research report and a poster. Through the preparation of student reports, the practice of answering questions correctly and integrating the observations and theories that have been studied well. Report drafting aims to train students ability to identify

problems, observe and assess observation results, determine solutions to a problem, and draw conclusions. Furthermore, making posters as one form of concrete efforts in tackling water pollution makes students creative. Poster making requires students to choose the right words and pictures so that the message from the poster can be conveyed to the reader. In this process, making students more skilled and developing their skills leads to critical thinking ability. The ability of critical thinking can not be obtained instantaneously but through learning and training. (Facione, 2011; Lai, 2011; Paul & Elder, 2005).

The results of this research are supported by the research conducted by Park (2005) that the use of EarthComm learning models affect student learning outcomes and the improvement of teacher professionalism. Based on the results of several studies that have been done previously showed that EarthComm learning models have an effect on the variables studied. In this study, EarthComm learning model assisted by Avenza Maps application affected students critical thinking ability.

CONCLUSION

Based on problem formulation and research results, it is known that there is an effect of the Earth Science System in the Community learning model assisted by Avenza Maps application for watershed conservation materials on students critical thinking ability.

Based on the conclusion, the proposed suggestion is as follows: (1) for Geography teachers is expected to implement the EarthComm learning model assisted by Avenza Maps application in relation to the Earth system material that demands critical thinking capabilities in it. What the teachers need to do, is to plan the learning implementation according to EarthComm learning model, teachers must understand the Avenza Maps application that will be used and can operate the computer so that the implementation of learning by using this application can be done; (2) for further researchers, it is advisable to replace or add other bonded variables such as analytical thinking skills, spatial thinking skills, motivation, activity, and learning interests.

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