



Collaborative Learning Model Based On Peer Tutoring Class Wide: Improving Students Critical Thinking In Biology Learning

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Abstract:

This research aimed to identify the effect of learning experiences through peer tutoring on students' critical thinking skills in biology learning. Then the specific target to be achieved from this study is a learning innovation that has a rapid effect on improving students' critical thinking skills in biology learning in high school students in Jambi City. The research method uses quasi-experimental research design. The procedure used was the pretest and posttest nonequivalent control group design experimental procedure. Hypothesis testing results that $T \text{ count} \geq T \text{ table}$ ($2.12 \geq 1.69$) with a significance level of 0.05. It can be concluded that H_0 was rejected and H_a was accepted. The achievement of critical thinking skills on experimental class was higher with a percentage of 58.78% compared to the control class with a percentage of 55.26%. The conclusion from this research is that there is a significant effect on implementation of collaborative learning models using the Class wide Peer Tutoring strategy toward students' critical thinking skills.

Keywords: Collaborative, peer tutoring, critical thinking, innovative

INTRODUCTION

Education in school must be able to foster critical thinking skills, be creative, be able to communicate and collaborate so that it can compete in the era of the industrial revolution 4.0. This is in accordance with the four competencies students

must have in this era, including critical thinking and problem solving, creative, communication skills, and the ability to work together. Nowadays, various kinds of information can be accessed very easily by students. Meanwhile, there is no guarantee that the information provided is all true. Information that is widely circulating on the internet at this time may be no longer relevant, out of date, incomplete, or invalid (Yudiyanto, 2019). In order to use data properly, each individual must have the ability to evaluate every information received. The ability to evaluate and decide to use the data is a critical thinking skill (Potter, 2010). Individual who has the ability to think critically will not immediately believe and receive information received without first trying to dig up information about the validity of the data obtained (Carolina, 2017). Ability to think critically, according to Facione (2011) is a very important ability to influence one's life later because individual who has the ability to think critically will be a good person in making decisions.

The ability to think critically is the ability to analyze situations based on data and facts in order to obtain a conclusion. Critical thinking is also the ability to explain and develop arguments based on data obtained so that it becomes a decision (Shriner, 2006). Agnafia (2019) states that critical thinking skills are skills in reflective thinking and have a strong foundation on what is believed. The ability to think critically is very important in determining success in the learning process. Sadikin (2019) demonstrates that critical thinking skills are an important basic capital for achieving success in the 21st century. In line with Bahr (2010), he stated that critical thinking skills are very important to be developed in order to achieve success after completing education. However, the current reality of students' critical thinking skills is still low.

Based on data from the Program for International Student Assessment (PISA) in 2015, critical thinking skills in Indonesia are still low. Indonesia occupies the 62nd position out of a total of 72 countries studied with a score of 397. Based on research in several places in Indonesia, it also shows data that critical thinking skills are still low, for example, research conducted by Liberna (2014) in Jakarta, Handriani (2015) in Mataram, and Hayudiyani (2017) in Madura. Seeing current conditions, it takes a conscious and earnest effort to prepare learning that can improve critical thinking skills.

Biology learning is a branch of science that includes theoretical facts, methods, legal facts, and principles resulting from scientific processes that require problem solving through critical thinking skills (Agnafia, 2019). This science skills can be developed through the ability to think critically and process in discovering new concepts from teaching and learning activities (Hakim, 2020).

In an effort to facilitate that students' critical thinking skills can develop properly, learning is needed that provides space for students to actively seek information, be free to think and question information obtained from teachers and their peers (Kazempour, 2013). One of the efforts that can be done in facilitating active learning is collaborative learning involving his own friend, commonly called Peer Mediated Instruction and Intervention (PMII). This learning model becomes an

alternative learning where students will easily understand the learning material delivered by their peers; students serving learning assistants for classes and or other students (Bowman, 2007).

The application of collaborative learning models in biology cannot be realized optimally because students' readiness in learning new material is not supported by a complete and adequate understanding of the relevant material knowledge prerequisites and different learning experiences in each learning activity. Therefore, an innovation in the collaborative learning model through a Class wide Peer Tutoring (CWPT) strategy is needed, which is one type of PMII (Hott, 2012). CWPT is a comprehensive teaching procedure or mutual-based teaching strategy by peers and reinforcement in which all class students are simultaneously preoccupied in the learning process and basic training of academic abilities in a systematic and fun way for students (Maheady, 2010).

The procedure for implementing the PMII learning model (CWPT type) includes all students in the class divided into two groups, then paired into tutors and tutees sitting close together. Tutors have completed the manuscript containing academic material according to the content to be taught. Next, the tutor teaches one part of the script and gives questions to the tutee within a certain time. Tutee responds orally to the part being taught. The tutor calculates points based on the answers given by tutee. Second, students switch roles when the allotted time is up. At each tutoring session, the teacher records the points earned by each student. Then, the teacher adds up all the points earned by each team. The team with the most points is announced as the winner and given an award (Greenwood, 2001).

The PMII learning model (CWPT type) has several advantages; 1) requires students to be active in learning, 2) develop their talents, 3) train students to think critically, 4) can solve the problems encountered (Nobel, 2005). Peer tutoring creates an opportunity for the students to utilize their knowledge and experience in a meaningful way. In this process, the tutors reinforce their own learning through reviewing, reformulating and finally evaluating their knowledge (Ali, 2015). These processes train students to think critically.

Hamsiah's research results (2014) show that PMII (CWPT type) learning model can improve critical thinking skills. Similar to Ciptaningtyas (2017) that argues the critical thinking skills of students who were taught using the PMII (CWPT type) learning model were higher than using conventional models. Likewise, research conducted by Munawaroh (2015) which states the CWPT learning model has a positive effect on critical thinking skills. The purpose of this research is to improve students' critical thinking skills in learning biology by applying the PMII (CWPT type) learning model.

MATERIALS AND METHODS

Research design

This study uses a quasi-experimental research design. The procedure is the pretest experimental procedure and posttest nonequivalent control group design. This study reveals a causal relationship between the independent variables applying the PMII (CWPT type) learning strategy to the dependent variable, namely critical thinking skills. The sample of this study is the students of SMA Negeri 1 Kota Jambi, Class XI-1, as an experimental group and Class XI-2 as a control group determined by the purposive sampling technique of a population of 350 students divided into 9 parallel classes. Both groups were given a pretest, then given treatment, and finally given a posttest.

Research Instruments

The research instrument used is a critical thinking ability test to measure 7 critical thinking skills adopted from Comfort (2014). The research data are obtained from the data collection of Pretest and Posttest results for the experimental group and the control group. Data collection is also done by observing student performance. There are two data analysis methods, namely, descriptive statistical techniques and inferential parametric statistical techniques. Descriptive statistical analysis techniques are used to test hypotheses. The hypothesis test used is inferential statistics from the covariance analysis unit (Anacova). Statistical analysis was assisted with SPSS 20 Software for Windows, performed at a significance level of 0.05 ($p < 0.05$).

RESULTS AND DISCUSSIONS

Posttest Value

After collaborative learning is implemented through the Class wide Peer Tutoring strategy, students are given a final test (posttest). Overall posttest scores in the cognitive domain can be seen in Table 1 below:

Table 1. Average posttest scores

No	Class	Number of Students	Average Value	Category
1	Experiment	30	72,58	High
2	Control	30	68,18	High

Based on Table 1, it can be seen that there are differences in the average post-test scores in the experimental class and the control class. The average value of the final test of the experimental students was higher at 73.87 while for the control class the average score was low at 69.32.

Data analysis

Normality test

Normality test is conducted to determine whether the learning outcomes obtained by students are normally distributed or not in both groups of research subjects. Normality test conducted in the experimental class and control class using

the Liliefors test. Obtained price L_{count} and L_{table} at the 95% confidence level or $\alpha = 0.05$ as shown in Table 2 below:

Table 2. Posttest Normality Test

No.	Class	Number of Students	L_{count}	L_{table}	Criteria
1	Experiment	30	0,38	16,9	Normal
2	Control	30	4,92	18,3	Normal

Based on Table 2, the results in the experimental class and the control class show that $L_{count} \leq L_{table}$, this means that the posttest results in the experimental class and control class are normally distributed.

Homogeneity Test

Homogeneity test or population variance similarity test in this study was conducted using Fisher's test, the research subjects were declared homogeneous if $F_{count} \leq F_{table}$ which is measured at a significant level of 0.05. Homogeneity test results for the posttest can be seen in the following Table 3:

Tabel 3. Uji Homogenitas Posttest

No.	Class	Number of Students	S^2	F_{count}	F_{table}
1	Experiment	30	26,72	1,12	2,03
2	Control	30	29,85		

From Table 3, it is obtained that $F_{count} \leq F_{table}$ ($1,12 \leq 2,03$) so it can be stressed that the posttest data results of the two classes have homogeneous variance.

Hypothesis test

If it is known that the sample is normally distributed with homogeneous variance, then hypothesis test was conducted. Hypothesis test is conducted on posttest data to find out whether there is a significant influence on the use of collaborative learning models using Class wide Peer Tutoring strategies on students' critical thinking. The results of the posttest hypothesis test of the experimental and control class can be seen in the following Table 4:

Table 4. The posttest hypothesis test

No	Class	Number of Students	S^2	T_{count}	T_{table}
1	Experiment	30	8,32	2,12	1,69
2	Control	30	7,75		

From Table 4, it is obtained that $T_{count} \geq T_{table}$ ($2,12 \geq 1,69$) with a significance level of 0.05. It can be concluded that H_0 was rejected and H_a was accepted. Thus, it can be said that there is a significant influence on the use of collaborative learning models using the Class wide Peer Tutoring strategy on students' critical thinking skills.

Indicators of Critical Thinking Ability

From the results of the posttest that have been done in the experimental class and the control class, it is obtained the achievement of each indicator of critical thinking. Achievement results on each indicator of critical thinking can be seen in the following Table 5.

Table 5, Percentage of indicators of students' critical thinking

No.	Indicators of Critical Thinking	Percentage of achievement (%)	
		Experiment	Control
1.	Provide a simple explanation	70,81	63,78
2.	Build basic skills	67,83	66,21
3.	Conclude	24,59	23,51
4.	Set strategy and tactics	71,89	67,56
Average achievement		58,78	55,26

From Table 5, it is known that the average achievement obtained by the experimental class is higher with a percentage of 58.78% compared to the control class with a percentage of 55.26%. The highest indicator in the experimental class, set strategy and tactics having a percentage of other indicators that is equal to 71.89%.

Observation

In addition to using test questions, an observation was also conducted in this study aimed to determine the implementation of student activities in learning by using a collaborative learning model, Class wide Peer Tutoring strategies for students' critical thinking. Observations were also made to find out the extent to which students' critical thinking processes in each class on each indicator. This is because the indicators on the essay test sheet are only 4 indicators to add observations to each indicator made with observations or observations. The results of observing students' critical thinking activities in learning can be seen in Figure 1.

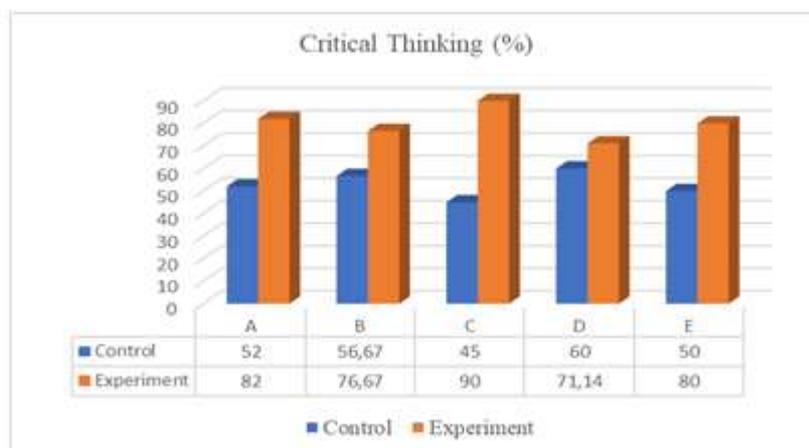


Figure 1: Critical thinking indicator (observation)

A: provide a simple explanation

B: build basic skills

C: conclude

D: provide further explanation
E: set the strategy and tactic

All indicators are shown in the diagram where the first indicator is to provide a simple explanation; the experimental class got a percentage of 82% while in the control class 52%. The second indicator is to build basic skills in which the experimental class gained 76.67% while in the control class 56.67%. The third indicator is to conclude where the percentage obtained in the experimental class as much as 90% while in the control class 45%. The fourth indicator is to provide further explanation where the experimental class gets a percentage of 77.14% while the control class gets a percentage of 60%. The last indicator is to set the strategy and tactics where the percentage obtained in the experimental class as much as 80% whereas in the control class as much as 50%.

From the calculation of each indicator on the test sheet and observation sheet the average is calculated so that the percentage of indicators obtained for the experimental and control classes can be seen in Table 6 below.

Table 6 Total Achievement of Each Indicator of Critical Thinking

Indicator	Essay Test (%)		Observation (%)		Overall average (%)		Information	
	Control	Experiment	Control	Experiment	Control	Experiment	Control	Experiment
A	63,78	70,81	52	82	57,89	76,41	Normal	High
B	66,21	67,83	56,67	76,67	61,44	72,25	High	High
C	23,51	24,59	45	90	34,25	57,29	Low	Normal
D	-	-	60	77,14	60	77,14	High	High
E	67,56	71,89	50	80	58,78	75,95	Normal	High

The results showed that the application of collaborative learning models using Class wide Peer Tutoring strategies had a positive effect on students' critical thinking skills. The results of posttest students showed the average value of posttest obtained by the experimental class and the control class were in the high category. From the posttest grade average value, it can be stressed that the critical thinking ability of the experimental class students has an average value that is higher than the control class. In observation, the highest percentage obtained in the experimental class is 90 while in the control class 45. Likewise, the percentage of students' critical thinking skills shows that the experimental class has a higher percentage than the control class for each indicator of critical thinking ability. This is due to the application of collaborative learning models using the Class wide Peer Tutoring strategy, students are always presented with interesting pictures and videos so that they can invite students to think critically and analyze the problems contained in learning.

The ability to think critically has 5 main indicators and consists of 12 sub indicators. In the essay sheet, this study used 4 indicators, namely providing simple explanations, building basic skills, managing strategies and tactics, and concluding. For other critical thinking indicators measured using observation sheets, they are indicators that provide simple explanations, build basic skills, conclude, build

advanced skills and manage strategies and tactics. This is due to the time required in the short essay test so that it is not possible to present all indicators in the form of questions; the lowest percentage is 34.79% obtained in the control class.

The indicators provide a simple explanation for the experimental class including the high category while the control class is the normal category. In the control class, the percentage obtained was lower than the experimental class because in the control class the activities to give explanations were very little done by students. In contrast to the experimental class which gives more explanation because there are pictures and videos that help students understand learning so that they can re-explain what they have learned. Indicators building basic skills for the experimental class and control class are high categories. Nevertheless, the experimental class has a higher percentage than the control class because in the experimental class the activities to build basic skills are more carried out than in the control class through giving challenging questions so that students will be provoked and build their thinking power. According to Fisher (2008), critical thinking is a skillful activity, which can be done better or vice versa, and good critical thinking will meet various intellectual standards such as clarity, relevance, adequacy, coherence, etc.

The indicators concluded in the experimental class is in the normal category while in the control class is in the low category. The experimental class has a higher percentage than the control class because in the experimental class students are invited to conclude after seeing pictures or videos. So that students in the experimental class are accustomed to concluding the subject being studied. According to (Colley, 2012) some abilities related to the concept of critical thinking are the ability to understand problems, select information that is important to solve problems, understand assumptions, formulate and select relevant hypotheses and draw conclusions. Based on these statements, it can be concluded that concluding is one of the elements that can measure a person's critical thinking power.

CONCLUSIONS AND RECOMMENDATIONS

Based on research finding researcher drawn a conclusion that there is a significant effect on implementation of collaborative learning models using the Class wide Peer Tutoring strategy toward students' critical thinking skills. It is recommended that class wide peer tutoring implemented during practical session on biology learning. This approach enhances student achievement and critical thinking skills development

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