Inquiries and Problem Based Learning (Pbl) Assistant Multimedia Learning Models in Improving Students' Critical Thinking Skills

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Abstrak: This study aims to determine the interaction between the multimedia-assisted inquiry learning model and the multimedia-assisted Problem Based Learning (PBL) model on critical thinking skills and to determine the differences in critical thinking skills between students using inquiry learning and PBL. This study used a quasi-experimental with static group pre-posttest design. The implementation of the learning involved students of class XI IPA who were studying the reproductive system, respectively 37 students for the inquiry class and 33 students for the PBL class. The instrument used was an essay question consisting of 10 questions, and a questionnaire to collect student and teacher responses. The results showed that the inquiry learning model and PBL were able to improve students' critical thinking skills, and overall, the PBL model is better than the inquiry learning model. Students and teachers gave a positive response to the inquiry learning model and PBL.

Keywords: *inquiry learning model, PBL, critical thinking skills.*

INTRODUCTION

Education is a conscious effort designed to achieve the goals set. The achievement of educational goals in schools is determined by the teaching and learning process. The purpose of science education is to prepare students to understand concepts and improve higher order thinking skills.

Critical thinking skills are high-level thinking that must be trained to students through science (Rubini, 2013). Critical thinking skills in learning are developed with the assumption that generally children can achieve critical thinking and skills in children are always developing. Based on these assumptions, teachers need to develop the learning process through the development of models or learning designs that are implemented in the learning process. The development of learning models aims to stimulate and motivate students and can open students' mindsets

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from remembering facts to being critical students' mindsets. Critical thinking skills can be taught through problem solving skills.

The reality in the field is that there are still many obstacles and difficulties experienced by students in studying biology. This is because in studying biology there are still many who do not understand the concept of biology subject matter, especially material that cannot be observed directly, so we need a learning media that can show objects and processes that occur in real terms. Another obstacle in learning biology is that students are bored and passive during the learning process. Motivation to learn and students' curiosity about biology, especially the material on the reproductive system is still low, so it is necessary to design a learning model that makes students active in learning and can improve students' critical thinking skills.

The learning model is a conceptual framework and describes a systematic procedure for organizing learning experiences (Jufri, 2003). Problem-based learning (PBL) and inquiry models are one solution to overcome boring and boring learning. PBL and inquiry models can help students to develop students' intellectual potential to think critically through the steps in the model.

The steps of the inquiry learning model invite students to be involved in asking questions, seeking information, and conducting investigations. Inquiry model learning involves student activity so that it can improve student achievement and student attitudes towards lessons (Fathurrohman, 2015).During carrying out learning through the application of inquiry, teachers can apply the following steps: 1) formulate problems, 2) develop hypotheses, 3) collect information (data), 4) analyze data, and 5) draw conclusions (Mudlofir, 2016). The process of formulating several questions in the inquiry learning model is the first step in finding answers and solving problems. Asking is a habit that can stimulate the creation of students' curiosity about the lesson (Jufri, 2003).

Problem based learning (PBL) model is a type of learning in which individuals are faced with problems that must be solved, both practical problems in life and theoretical in the field of science. The purpose of PBL is to guide students to develop basic knowledge, have problem solving skills, as well as self-direction in learning. One of the characteristics of PBL is the presentation of problem solving.

Students' critical thinking skills can be done through asking and questioning some of the phenomena being studied. In inquiry learning, learning is not just remembering a number of facts, but learning is a thinking process. Problem-based learning (PBL) models can also arouse student interest and can build intellectual abilities. Media is also very necessary in learning to increase student learning motivation. The learning model will be meaningful for students with the help of learning media. Media is a tool to convey the teacher's message

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to students (Mudlofir, 2016). According to Rubini (2013) the use of various media, including the use of video and power point, one of which can increase the intensity of interactive communication, creative dialogue, and active student participation.

Based on these problems, the authors conducted a study entitled the use of multimedia-assisted inquiry and PBL learning models in improving high school students' critical thinking skills with the aim of:

1. Knowing the difference in critical thinking skills between students who use the multimedia-assisted inquiry learning model and students who use the multimedia-assisted PBL model.
2. Knowing the interaction between the multimedia-assisted inquiry learning model and the multimedia-assisted PBL model on the critical thinking skills of high school students on reproductive system material.

METHODS

The research was conducted at SMA Negeri 1 Ciseeng Bogor in the even semester of the 2016/2017 academic year. The population in this study used class XI IPA. The sample used in this study was 70 students from two classes, namely class XI IPA 1 and class XI IPA 4.

The study consisted of one dependent variable (Y) namely students' critical thinking skills in reproductive system material, and two treatment variables (X) namely the inquiry learning model and the problem-based learning (PBL) model. This study uses a quasi-experimental quantitative method. The research design used was Static Group Pre-PostTest Design. The research design was carried out twice, namely pretest and posttest in each class that was given different treatment, then the %N-Gain value was calculated for each student.

The research data were then analyzed by normality test and homogeneity test before testing the hypothesis. After the data obtained were declared normal and homogeneous, then the hypothesis was tested. Hypothesis testing is done by analyzing the difference between the two averages of students' critical thinking skills using the t-test with the criteria if significant (2-tailed) > 0.05 then the null hypothesis (Ho) is accepted, which states that there is no difference in the critical thinking skills of students who study with using the Inquiry and PBL learning models. If significant (2-tailed) < 0.05 then the null hypothesis (Ho) is rejected, which states that there are differences in critical thinking skills between students who learn using the Inquiri and PBL learning models.

RESULTS AND DISCUSSION

Based on the results of the analysis of critical thinking skills can be described as follows:

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1. Inquiry Class Group Critical Thinking Skills

Based on the research that has been done, the results of the students' critical thinking skills using the inquiry model are listed in Table 1.

Table 1. Results of Inquiry Class Students' Critical Thinking Skills

Calculation of N-Gain
Maximum Value 67
Minimum Value 2
Average 33.30
Modua 22
median 31

Based on the results of the descriptive statistical calculation of N-Gain critical thinking skills, the minimum value of N-Gain 2 and the maximum value of N-Gain is 67. The average value of N-Gain is 33.30. The obtained mode value for N-Gain is 22. The median value for N-Gain is 31.

The results of the analysis of the pretest and posttest descriptions of 37 students (Table 2) show that 20 or 54.05% of students have increased critical thinking skills (KBK) in the medium category with %N-Gain values of 30-70, and 17 or 45.95 % of students have an increase in CBC in the low category with a value of %N-Gain <30. So it can be concluded that more than 50% of students have an increase in CBC in the medium category.

Table 2. Distribution of Inquiry Class N-Gain Level Category

Category Total Percentage
Height 0 0
Medium 20 54.05
Low 17 45.95
37 100

The N-Gain value shows the effectiveness of learning in the medium category of 54.05. These results indicate that there is an increase in students' critical thinking skills using the inquiry learning model

2. PBL Class Group Critical Thinking Skills

Based on the assessment that has been carried out, the results of the group's critical thinking skills using the PBL model are shown in Table 3.

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Table 3. Results of PBL Class Group Students' Critical Thinking Skills

Calculation of N-Gain
Maximum Value 76
Minimum Value 5
Average 41.27
Modua 36
median 40

Based on the assessment that has been carried out, the acquisition of the results of the critical thinking ability of the class group using the "Problem based Learning" model is calculated N-Gain and obtained a minimum score of 5 and a maximum score of 76. The average value of N-Gain is 41.27. Mode value gain on N-Gain 36.

The results of the analysis of the pretest and posttest descriptions of 33 students there are 1 student who has an increase in KBK in the high category with a value of %N-Gain > 70, 27 students who have an increase in KBK in the medium category, and 5 students who have an increase in KBK in the low category with %N-Gain value < 30 (Table 4).

Table 4. Distribution of PBL Class N-Gain Level Category

Category Total Percentage
Height 1 3.03
Medium 27 81.82
Low 5 15.15
33 100

The N-Gain value shows the effectiveness of learning in the medium category of 81.82%. These results indicate that there is an increase in students' critical thinking skills using the PBL learning model.

The assessment of students' critical thinking skills using the inquiry model and problem-based learning (PBL) was carried out in two stages, namely before (pretest) and after learning (posttest). The results of the pretest and posttest analysis on the indicators of students' critical thinking skills tested in the form of essay questions can be seen in Table 5.

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Table 5. Results of Pretest and Posttest Analysis on Students' Critical Thinking Skills (KBK)

	PBL Model Inquiry Model Implementation Data			
	Pre-test	Post-test	Pre-test	Post-test
Number of Students	37	37	33	33
Average KBK	45.81	64.09	51.79	71.70
Top Rated	60	81	74	88
Lowest Value	30	51	30	60
N-Gain	0.33		0.41	
% N-Gain	33		41	

For more details on improving students' critical thinking skills in classes using the inquiry learning model and PBL can be presented in Figure 1.

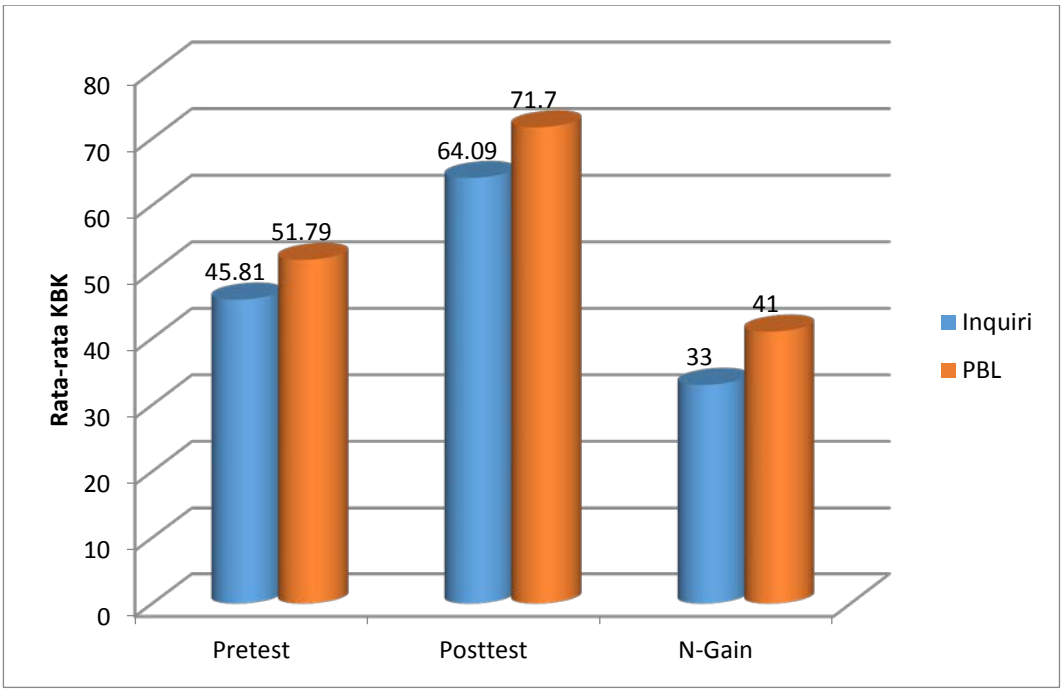

Figure 1. Diagram of Increasing Students' Critical Thinking Skills

Based on Figure 1, it can be seen that the average pretest score is 45.81 for the class that uses the inquiry learning model and 51.79 for the class that uses the PBL model, while the average posttest score is 64.09 for the class that uses the inquiry model and 71. .70 for the class using the PBL model. The average value of %N-Gain obtained is 33 for the class that uses the inquiry model and 41 for the class that uses the PBL model. The results showed that the average value of the class using the PBL model was higher than the inquiry model, so it can be

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concluded that the improvement in the critical skills of students using the PBL model was higher than the inquiry model. The average value of %N-Gain of the two models is in the medium category (30<%N-Gain<70).

3. Data Analysis Prerequisite Test

a. Normality test

Normality test is used to determine whether the resulting data is normally distributed or not. The results of the normality test of critical thinking skills can be presented in Table 6.

Table 6. Normality Test Results of Students' Critical Thinking Skills

Distribution of Treatment Groups	^{2}**calculate**	^{2}**Conclusion table**	
Inquiri	1.77	11.07	Normal Distribution
PBL	3.44	11.07	Normal Distribution

Based on Table 6, the calculation of the normality test using the chi-square technique can be concluded that^{2}count<χ^2table, so the data distribution is N-Gainstudents' critical thinking skillsclass*Inquiry*and PBL came from a normally distributed population.

b. Homogeneity Test

The homogeneity test of the variance of the N-Gain distribution of students' critical thinking skills in this study used Fisher's exact test. The results of the homogeneity test of students' critical thinking skills in the Inquiry and PBL classes can be seen in Table 7.

Table7.Result of Homogeneity of Variance Test of Students' Critical Thinking Ability

Class	N. Group	**S^2**	**Fcount**	**Ftable**	**Status**
Inquiry	37	289.98	0.64	1.78	Homogeneous
PBL	33	186.84	0.64	1.78	Homogeneous

Based on Table 7, the calculation of the homogeneity test of the variance of the N-Gain distribution of students' critical thinking skillsclass*Inquiry*and PBL, obtained the value of Fcount =0.64and Ftable=1.78at the significance level = 0.05. From the results of the homogeneity test calculation, it can be concluded that, Fcount < Ftable so that the variance of the N-Gain distribution of critical thinking abilities of Inquiry and PBL class students comes from a homogeneous population.

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4. Research Hypothesis Testing

Hypothesis testing is done by analyzing the difference between the two average students' critical thinking skills using the t-test. The results of the t-test of students' critical thinking skills can be seen in Table 8.

Table 8. Recapitulation of T-Test Calculation Results of Two Data

Class	N	mean	Sig (2-tailed)	□	Conclusion
Inquiry	37	33.30	0.000	0.05	Significantly different
PBL	33	41.27	0.000		

The results of hypothesis testing using the t test (Table 8) obtained a significance number of 0.000 which is smaller than (0.05), then the null hypothesis is rejected and the research hypothesis is accepted, meaning that there are differences in the results of critical thinking skills between students who learn to use the Inquiry learning model and PBL. The PBL learning model has a higher influence on the results of students' critical thinking skills compared to the Inquiry learning model. This can be seen from the %N-Gain value of the PBL group of 41 while the %N-Gain Inquiry value of 33 (Table 5).

1. Critical Thinking Skills

Based on the results of the research conducted, after testing the hypothesis, it showed that there was an influence of the multimedia-assisted inquiry learning model and the multimedia-assisted PBL model on students' critical thinking skills. From the results of hypothesis testing the results of critical thinking skills in the inquiry class and PBL groups with the t test, a significance number of 0.000 is obtained which is smaller than (0.05). This shows that there are differences in the results of students' critical thinking skills using the inquiry learning model and PBL. Students' critical thinking skills have increased from the initial state (pre-test) and final state (post-test) both in the classroom that uses the inquiry learning model and the class that uses the PBL model. The results of the pre-test and post-test analysis of students' critical thinking skills showed that the PBL model had a higher average score than the inquiry learning model as shown in Table 5.

The results of hypothesis testing using t-test showed that there were differences in the results of critical thinking skills between students who learned to use the inquiry learning model and PBL. The PBL learning model has a higher influence on the results of students' critical thinking skills compared to the inquiry learning model. This can be seen from the highest % N-Gain value from the PBL group of 41 while the % N-Gain Inquiry value is 33 (Table 5). This shows that there is a significant difference between the inquiry learning model and PBL in

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improving students' critical thinking skills on reproductive system material. The PBL model has a better effect on improving students' critical thinking skills.

Based on the results of the research that has been carried out, it turns out that there is an influence on the results of critical thinking skills for groups of students who carry out learning using the PBL learning model by obtaining higher critical thinking skills results compared to students using the Inquiry learning model. This is because in the classroom using the PBL model, to explore the material students are presented with examples of problems to be solved in groups after getting some information from the teacher. The problems that have been presented will provoke students' curiosity and raise the ability to solve and solve problems presented by the teacher. The problems presented are related to real life so that students can easily understand the subject matter

The results of this study are supported by the results of research conducted by Dwi Lestari (2014) which states that the PBL model has an effect on improving student learning outcomes and can develop student character including creative, critical, logical thinking, working carefully, honest and polite behavior and social skills. such as working together and respecting each other. The PBL model has also been shown to have an influence on students' ability to carry out higher-order thinking processes (Ayuningrum, 2015). According to research conducted by Nurun (2014) shows that the application of the PBL model can improve critical thinking skills and student learning outcomes. This is in accordance with research conducted by Kusumaningtias (2013) showing that PBL combined with NHT affects students' critical thinking skills.

Problem Based Learning learning model is able to provide a good response that can be seen from the aspect of student learning motivation because PBL is a learning model that uses problems as a first step in collecting and integrating new knowledge so that it can improve students' critical thinking skills. This is in accordance with research conducted by Ali (2014) which shows that there is an effect of the PBL learning model on critical thinking skills and student learning outcomes.

2. Student Response

Student responses to the inquiry learning model and PBL assisted by multimedia were very good. The percentage of student responses was 95% for the inquiry model and 98% for the PBL model. This shows that the student's response to these two models is very good, although the results of the implementation of improving critical thinking skills seen from the N-Gain score are in the medium category.

The results of the implementation of improving students' critical thinking skills have not been maximized due to various factors, for example inaccuracy in understanding questions and connecting with the material that has been studied and

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students are not accustomed to writing and conveying arguments about a problem. In this case, based on the results of interviews with students and classroom teachers, it was found that the inquiry and PBL learning models were rarely used due to time constraints.

Learning to think critically can be developed through learning biology because biology has a complete structure and study and is directly related to problems in everyday life (Ayuningrum, 2015). This skill also requires a habituation which in the process is done repeatedly. This is the basis why the inquiry and PBL models can be used to improve critical thinking skills, because in both models learning is directed to student activities.

CONCLUSION

Based on the results of research and data analysis that has been carried out, it can be concluded thatInquiry learning models and problem-based learning (PBL) models assisted by multimedia in the reproductive system can improve students' critical thinking skills. Overall, there are significant differences between the inquiry learning model and PBL in improving students' critical thinking skills. This is shown in the results of the N-Gain calculation, that the PBL learning model has a higher influence on the results of students' critical thinking skills compared to the inquiry learning model on reproductive system material.

Based on the discussion and conclusions obtained from the results of this study, the researcher recommends the application of multimedia-assisted inquiry learning models and multimedia-assisted PBL as alternative learning models in the classroom so that students can develop their potential and can improve students' critical thinking skills. For researchers, the results of this study can be used as a reference and reference for further research and are expected to be able to plan better research on the application of multimedia-assisted inquiry and PBL models with materials relevant to the content and learning model.

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