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The Influence of the Application of Inquiry and Problem Based Learning Models on the Critical Thinking Ability of Students in 5th Grade Elementary School

Mufti Arifandi*, Firosalia Kristin

Faculty of Teacher Training and Education, Universitas Kristen Satya Wacana, Salatiga, 50711, Indonesia

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ABSTRACT

The research aimed to find out the influence of the application of inquiry learning and problem-based learning and model toward students' critical thinking skills on the content of 5th-grade science lessons in elementary schools. Types of the research are a quasi-experiment with a nonequivalent control group design. The population of this research is the 5th-grade students of SDN 02 Salatiga as the experiment class and the 5th-grade students of SDN Ledok 07 Salatiga as the control class. The instrument used was an observation instrument and an instrument test. Research hypothesis test using independent sample t-test with a significance level of 5% ($\alpha - 0,05$). The results showed that the observation instrument obtained a significance value of 0,002 which means $0,002 < 0,05$ and the instrument test obtained a significance value of 0,000 which means $0,000 < 0,05$, then both of these data are H_0 =rejected and H_a =accepted. Thus, it can be concluded there is a significant difference between the critical thinking abilities of students who are given Inquiry learning models and students who are given a Problem-Based Learning model.

1. Introduction

Education is a very important thing for every individual human in running their lives. To realize better education, the Indonesian government has made various efforts to improve the quality of education. Improving the quality of education aims to improve the quality of Indonesian people including cognitive abilities, affective, and psychomotor. We should develop this ability early, especially at the level of primary education, to continue to the next level of education. Giving a basic understanding of excellent knowledge will produce a generation of qualified people. One of the government's efforts to make improvements or updates to the education curriculum is that in April 2013 a new curriculum was adopted, namely

* Corresponding author. Tel./Fax.: +62 823-1333-3673
E-mail: mufti.arifandi.ma@gmail.com

the 2013 curriculum to replace the KTSP curriculum. Things that are emphasized in the 2013 curriculum are active and innovative learning processes to stimulate higher-order thinking skills in students. Active and innovative learning processes expected to have an active interaction between students and teachers, learning is also student-centered. This is in line with the Republic of Indonesia's Minister of Education and Culture Regulation, one of the abilities or skills that students must master is the ability to think critically (Kemendikbud, 2016).

The demand for the development of a critical thinking ability of students in primary schools is becoming a concern, given that several studies that have been conducted related to the ability to think critically in students in Indonesia are still in poor condition (low) when reviewed from the aspect of critical thinking skills or indicators which is related to critical thinking skills because the learning process carried out so far mostly only teaches to improve student learning outcomes on the cognitive aspect only. Besides, that, research that has been conducted by Wijayanti et al., (2015) with the title Analysis of Critical Thinking Ability of 5th-grade Students in Learning in Elementary School No. 1, 2, and 3 Kaliuntu Cluster X Buleleng District, the research stated that the growth of students' critical thinking skills in preparing themselves to face life, the research that students' critical thinking skills are still low. Based on the overall results of the research, it was obtained that students' critical thinking ability scores in each aspect showed a percentage of less than 40%. These results prove that there is still a lack of critical thinking skills possessed by students.

The observations made by researchers in one of the elementary schools in the Salatiga City area, i.e. students tend to memorize the concepts given by the teacher without training the students' independent abilities and understanding the concepts, students still pay less attention to learning provided by the teacher, the teacher still does not provide opportunities for students to practice the ability to think critically and work collaboratively with friends, the underutilization of the surrounding environment and the lack of practice of students' critical thinking skills in solving problems, and the questions given by the teacher, practice more basic level skills and only a few questions that stimulate students' critical thinking abilities.

Responding that the weakness of students on critical thinking skills, then we need to improve critical thinking skills. One effort that can be done to address the low critical thinking skills and student achievement, is through the selection and application of a good and appropriate learning model to improve critical thinking skills. A learning model that is based on student needs so that students have challenges in the learning process that is inquiry learning models and problem based learning models. According to Ertikanto (2016), Inquiry learning requires students to look for a solution to a problem systematically, critically, and logically, which is then analyzed properly. The Inquiry model is learning that is delivered by presenting a problem, asking questions, investigating, and opening dialogue. While the problem-based learning model is learning, that allows students to solve problems related to the actual world (Sani, 2018). Based on the existing problems, there needs to be innovative solutions in learning to improve

the learning process that supports learning that is interesting, fun, and there need to be improvements in learning where the teacher as a facilitator and motivator. This research offers a solution by seeing better which affects the application of inquiry learning models and problem-based learning models on the critical thinking skills of 5th-grade students.

2. Methodology

This type of research was quasi-experimental research, which aims to determine the effect of inquiry learning models and problem based learning on critical thinking skills of 5th-grade elementary school students. While the research design used is the Nonequivalent control group. As a result, SDN Ledok 02 Salatiga was an experimental class with a total of 29 students and SDN Ledok 07 Salatiga was as control class with a total of 38 students. The experimental class was given with the inquiry learning model and the control class was given the problem-based learning model. Both classes were given two assessment instruments in this research, namely observation instruments and question instruments. This design is a research design that took two research samples chosen not randomly selected, then each sample was given different learning (Sugiyono, 2018). In this design, the experimental class and the control class were given a pretest and posttest.

To obtain valid data, the instrument must meet certain requirements. In this research, the requirements were validity and reliability tests. The method used for testing these requirements is to use the SPSS 25.0 program for windows with the provisions of a significance level of 5% (0.05). Validity test if the results of r count $>$ r table, then the instrument is declared valid. After that, the reliability test used the same provisions as the validity test, only the test is carried out on only valid instruments. Analysis of the research data needs to be done to test the truth of the hypothesis proposed in this research. The research data analysis technique used a Likert scale with intervals (1) not good, (2) good enough, (3) good, and (4) were very good according to Sugiyono (2018). The results that have been obtained are then grouped according to the criteria (Table 1) for the level of critical thinking skills that were very high, high, medium, low, and very low (Riduwan, 2013).

Tabel 1. Category Levels of Critical Thinking Ability

No	Percentage	Criteria / Categories
1	81-100	Very High
2	61-80	High
3	41-60	Medium
4	21-40	Low
5	0-20	Very Low

The data analysis test comprises descriptive analysis, normality test, homogeneity test, and hypothesis testing. We process descriptive analysis data using a

frequency table percentage calculation of the number of classes and class intervals with a formula according to Sugiyono (2010).

- a. Number of classes (K) = $1 + 3,3 \text{ Log } n$ (n amount of data)
b. Interval classes = $\frac{\text{Maximum score} - \text{Minimum score}}{K}$

Furthermore, the normality test was carried out to find out whether the research data is normal or not. We carried out homogeneity tests to ensure that the group being compared has various homogeneous variants. After we obtained all prerequisite test results to test the hypothesis, we performed the hypothesis test to know the hypotheses submitted in this research are accepted or rejected. The method used for independent sample t-test requirements is to use the SPSS 25.0 program for windows with the provisions of a significance level of 5% (0.05). Independent sample t-test if the results of r count < r table, then the instrument is declared there were differences. Hypothesis testing used an independent sample t-test to find out the different effects of the class given the inquiry learning model and the class was given the problem-based learning model of learning skills on the 5th-grade students' critical thinking.

3. Results and Discussion

Research results got from learning by using inquiry learning and problem-based learning models on critical thinking skills contain data obtained after researching 5th of SDN Ledok 02 Salatiga as an experimental class and 5th of SDN Ledok 07 Salatiga as a control class. The data obtained from the experimental class who got the inquiry model and the control class got the problem-based learning model which then analyzed the data based on indicators of critical thinking ability to find out the different effects of the two models.

Figure 1 showing the teacher and students used the tools and materials that applied in learning. The tools used were portable gas stoves, beaker cups, candles, large nails, water, and matches. All tools and materials that have been prepared to carry out heat transfer experiment practices.



Figure 1. The teacher shows the tools and materials used in learning.

After conducting research, we group the data obtained in the form of scores from observational instruments and instruments about critical thinking abilities with the category of critical thinking skills. The acquisition of critical thinking skills data in the experimental class using the inquiry model and in the control class using the problem-based learning model of the observed values are presented in the Table 2.

Table 2. Observation Result Data for Experiment Classes and Control Classes

Indicator	Experiment Class			Control Class		
	Median	%	Category	Median	%	Category
Indicator 1	87,1	87 %	Very High	84,9	85 %	Very high
Indicator 2	77,6	78 %	High	70,4	70 %	High
Indicator 3	78,4	78 %	High	80,9	81 %	Very High
Indicator 4	71,6	72 %	High	64,5	64 %	High
Indicator 5	69,8	70 %	High	63,8	64 %	High
Indicator 6	73,3	73 %	High	66,4	66 %	High
Indicator 7	68,1	68 %	High	63,2	63 %	High
Indicator 8	92,2	92 %	Very High	82,9	83 %	Very High
Average	77,0	77 %	High	72,4	72 %	High

Based on the data in table 2 there are 8 indicators of critical thinking ability, i.e. (1) focusing questions, (2) asking and answering questions that need an explanation, (3) observing and considering the results of observations, (4) doing deductions and testing the results of deductions, (5) doing induction (6) identifying terms and considering definitions, (7) identifying assumptions, (8) integrating with others. Getting data in the experimental class using the inquiry model and the control class using problem-based learning from the indicator (1) in the experimental class scored 87.1 and in the control, class getting 84.5 with a percentage of 87% and 85%, respectively including the very high category. In the indicator (2) the experimental class obtained a value of 77.6 and the control class got a value of 70.4 with a percentage of 78% and 70% respectively, both data included in the high category. In indicator (3) the experimental class scored 78.4 and the control class scored 80.9 with a percentage of 78% and 81% respectively. The acquisition value of the experimental class includes the high category, and the control class is very high. In indicator (4) the experimental class scored 71.6 and the control class gained 64.5 with a percentage of 72% and 64% respectively, both data are included in the high category. In indicator (5) the experimental class obtained a value of 69.8 and the control class gained 63.8 with a percentage of 70% and 64% respectively, both data included in the high category. In indicator (6) the experimental class obtained a value of 73.3 and the control class obtained 66.4 with a percentage of 73% and 66% respectively, both data included in the high category. In indicator (7) the experimental class scored 68.1 and the control class gained 63.1 with a percentage of 68% and 63% respectively, both included in the high category. In indicator (8) the experimental class scored 92.2 and the control class gained 82.9 with a percentage of 92% and 83% respectively, and we included both data in the very high category. With, overall average value of the indicator of critical thinking skills in the experimental class of 77 with a percentage of 77% and the control class obtained an average value of 72.4 with a

percentage of 72%. So the acquisition of the average value in the experimental class and control class by getting value in the high category.

After the result data from the observation instrument students' critical thinking skills in the experimental class and the control class was obtained, then the next thing to know the results of the critical thinking skills from the posttest question instruments. Instrument data about learning outcomes is needed to support and provide the accuracy of the outcome data in this research. Data on the results of the instrument about learning outcomes are presented in a descriptive analysis of frequency distribution tables with calculations from formulas according to Sugiyono (2010), which can be seen in the Table 3.

Table 3. Results of Posttest Questions for Experiment Class and Control Class

Interval	Experiment Class			Control Class		
	Frequency	%	Category	Frequency	%	Category
60 - 64	0	0 %	-	5	13 %	High
65 - 69	4	14 %	High	11	29 %	High
70 - 74	11	38 %	High	13	34 %	High
75 - 79	6	21 %	High	6	16 %	High
80 - 84	5	17 %	Very High	3	8 %	Very High
85 - 89	3	10 %	Very High	0	0 %	-
Total	29	100 %		38	100 %	

Based on the data in Table 3, shows that the value of the post-test results of learning outcomes in the experimental class, students who score at 60-64 value intervals are 0 or there are no students who score, at interval values of 65-69 there are 4 students with a percentage 14% included in the high category, at intervals of 70-74 there were 11 students with a percentage of 38% included in the high category, at intervals of 75-79 there were 6 students with a percentage of 17% including the high category, at intervals of 80-84 there were 5 students including the category very high, at intervals of 85-89 there were 3 students with a percentage of 10% including the very high category. So from the posttest questions the learning outcomes in the experimental class there were 21 with a percentage of 63% of students who received the category of critical thinking skills very high, and 8 students with a percentage of 27% received a high category.

The acquisition of table 3 data in the control class shows that the value of the posttest questions of learning outcomes in the control class, students who score at intervals of 60-64 there are 5 students with a percentage of 13%, at intervals of 65-69 there are 11 students with a percentage of 29% including the high category, at intervals of 70-74 there were 13 students with a percentage of 34% including the high category, at intervals of 75-79 there were 6 students with a percentage of 16% including the high category, at intervals of 80-84 there were 3 students including the very high category, at intervals of 85-89 there were no students who received these grades in the control class. So from the posttest questions the learning outcomes in the control class there are 3 students with a percentage of

8% who get the category of critical thinking skills very high, and 35 students with a percentage of 92% get a high category.

The results of the posttest question scores from the experimental class that used problem-based learning obtained an average value of 76.1 with a minimum of 67 and a maximum value of 89. While the control class that was given learning by using the inquiry model obtained an average value of 76.1 with a minimum value of 60 and a maximum value of 81. After the prerequisite data are obtained from the results of observations and tests in the experimental class and the control class, then to see the difference in the influence of the experimental class using the inquiry model and the control class using the problem-based learning model of students' critical thinking skills (Table 4).

Table 4. Independent Sample T-Test Observation and Test Results

Observation Results			Test Results		
<i>t-test for Equality of Means</i>	df	<i>Sig. (2-tailed)</i>	<i>t-test for Equality of Means</i>	df	<i>Sig. (2-tailed)</i>
Critical Thinking	65	0,002	Critical Thinking	65	0,000

Based on table 4 the hypothesis test used is the independent sample t-test. The results of the independent sample t-test on the experimental instruments of the experimental class and the control class obtained a significant result of 0.002 which means ($0.002 < 0.05$) so the t-test values showed significant differences in the t-test results of the observation instrument. This significant difference is also supported by the t-test results of the test instrument which got a significance value of 0,000 which means ($0,000 < 0.05$) which reinforces the results of the experimental class and the control class, that there are significant differences in the critical thinking abilities of students between classes taught using inquiry learning models and classes taught using the problem-based learning model.

Analyzed the discussion of the results of research on critical thinking indicators used in this research based on the acquisition of values from the student learning process. The average grade of the experimental class and the control class. In indicator (1) which focuses the question, with a ratio of 87:84 the value of the inquiry learning model is better than the problem-based learning model in critical thinking skills and obtains very high categories. This is related to the concept of inquiry learning model according to Hamnuri (2012) which states that inquiry learning is a series of learning activities that emphasize the process of thinking critically and asking analytical questions to find and find answers to a problem in question for themselves. So that student success is not seen from the extent of mastery of the material got by students, but how students process in finding something.

Indicator (2) the ability to think critically that is asking and answering questions that require explanation, with a ratio of 78:70 the acquisition values in the inquiry model is better than the problem-based learning model. This relates to the characteristics of inquiry encouraging students to be brave in making questions or

answers able to make for more critical, analytical and argumentative thinking. This can be seen when learning students express their opinions and answer questions in groups (Hendarwati, 2013).

Indicator (3) is observing and considering the results of observations, with a ratio of 78:81 which obtains a higher value the problem-based learning model compared to the inquiry model. According to research conducted by Anugraheni (2018) that model learning problem based learning in the learning process can motivate students in thinking, asking questions, and critical and reflective related problems that exist in the real world. In experiments conducted during learning, students do not immediately conclude but try to find things that underlie their opinions and be accompanied by evidence to support the reasons, so students not only express their opinions but also think about them.

Indicator (4) is to do deduction and assess the results of deduction, with a comparison of 72:64 results obtained better value of the inquiry model compared to the problem-based learning model. Based on research conducted by Nurmayani et al., (2018) this is because the focus of the inquiry learning model does not emphasize a definite answer from an inquiry into a problem or question. So that from a problem students have many solutions and sometimes conflicting, we encourage students to think and ask questions in search of answers with the guidance of the teacher to find a conclusion.

Indicator (5) is induction, with a ratio of 70:64, the acquisition value of the inquiry model is better than the problem-based learning model. According to research by Nur'Azizah et al., (2016) that one strategy in practicing to understand concepts in the inquiry learning model of students is required to express their opinions or decisions that need to be accompanied by clear and broad explanations that are general. The learning process carried out by experiments conducted by teachers and students, discussions together with groups can make students able to decide / conclusions based on the results of experiments conducted and communicate, so it can be understood.

Indicator (6), namely identifying terms and considering definitions, with a comparison of 73:66 the acquisition of the inquiry model value is better than the problem-based learning model. According to the research of Lestari et al., (2019) relating to the ability of students to accept opinions or statements from others, inquiry learning by encouraging more teachers to students in developing their knowledge to consider or think well in planning the core of a statement about something.

Indicator (7), which is identifying assumptions, with a ratio of 68:63, the acquisition of a higher value of the independent learning model is compared to the Inquiry model. According to research by Nur'Azizah et al., (2016) that the strengths of the student inquiry model are involved in the learning process by conducting experiments, students are active in giving guesses, investigating, collecting data to prove existing allegations by communicating evidence that is obtained from friends and teachers to get the right clarity.

In Indicator (8) which is integrated with others, with a ratio of 92:83 where the acquisition value from the inquiry model and the model problem-based learning is very high, but still a little better the inquiry model than the problem-based learning model. It emphasizes this on the concept of inquiry learning that teaches principles in working together in developing the potential of students to combine the goals they have with the goals of others so that the creation of an integrated whole. The data of each indicator of critical thinking ability shows that in the control class there are three very high indicators, compared to the experimental class where there are two indicators in the very high category, but the average value of the eight indicators shows that the experimental class gets an average value an average of 77.2 is higher than the control class which got an average value of 72.1.

Obtaining data from observations and tests can be one advantage in this research from several previous studies. Among the research conducted by Nurmayani et al., (2018) with the title "The Effect of Guided Inquiry Learning Models on Students' Critical Thinking Ability," the research only used test instruments to measure students' critical thinking skills. Research conducted by Diani et al., (2017) with the title "Comparison of Problem Based Learning and Guided Inquiry Models of Students' Critical Thinking Ability", the research only used test instruments to measure students' critical thinking skills. Research conducted by Farisi et al., (2017) with the title "The Effect of Problem Based Learning Models on Critical Thinking Ability in Improving Student Learning Outcomes on the Concept of Temperature and Heat", the research also used test instruments in the form of pretest and posttest to measure students' critical thinking skills. The results of observations and tests in this research are useful for getting non-subjective results and producing more accurate research data. The next advantage relates to the analysis of the data presented, that data analysis has been presented on each indicator which amounts to 8 indicators of critical thinking ability. Data analysis of each indicator results in critical thinking skills reviews the acquisition value and the things that are the reason for the results on each indicator used.

The critical thinking ability of students taught by using inquiry learning models shows higher results than students who are taught using problem-based learning models. This is also because it is related to the learning process of students directly conducting an experimental inquiry practice. The inquiry learning model challenges students in finding recent knowledge for students and provides opportunities for students to apply the knowledge they have in actual life events. In line with research conducted by Wulanningsih et al., (2012) with the title "The Effect of Inquiry Model on Science Skill Acknowledging from Student Academic Ability" that the inquiry learning model is very suitable in moisturizing processing skills with practical methods suitable for learning because the syntax of this model was developed with scientific methods that can train students' abilities. Besides, the advantages of the inquiry model according to Hamnuri (2012) are that the incur model provides opportunities for students to learn in their learning styles and emphasizes the development of cognitive, affective, and psychomotor aspects in a balanced way. Inquiry learning provides opportunities for students to learn to accord to their learning styles with the guidance of the teacher. So that in practice,

by conducting practical experiments directly, students can develop their critical thinking skills.

Different to problem-based learning, according to Sanjaya (2013) that the advantages of the PBL model are helping students understand real-world problems, increasing student activity, and can attract students' interest in critical thinking adjusts student knowledge. Although the advantages possessed can also help students in improving students' critical thinking skills, it should be noted that implementing this research is carried out with students in the process so that the inquiry learning model is superior in implementing this research. This is supported by research conducted by Sutama et al., (2014) with the title "The Effect of Inquiry Model on Critical Thinking Ability and Scientific Performance on Biology Class XI Science in SMA Negeri 2 Amlapura", the researchers concluded that the Inquiry learning model better at improving students' critical thinking skills.

Thus it can be concluded that students who are taught using Inquiry learning models can improve critical thinking skills better than students who are given the Problem Based Learning model. Nevertheless, both models have their advantages and disadvantages. The results of this research show that there are significant differences in the results of observations and tests used to measure students' critical thinking skills. Both data are used to strengthen the results of hypothesis testing, that the hypothesis test results received are H_a and H_o rejected. So that the overall results of this research there are differences in the influence of Inquiry Learning models and Problem Based Learning on critical thinking skills of 5th-grade students.

4. Conclusion

Based on the results of data analysis and discussion, it can be concluded that there is a significant difference between the critical thinking abilities of students who are given Inquiry learning models and students who are given the Problem-Based Learning model at SDN Ledok 02 Salatiga and SDN Ledok 07 Salatiga. Students who get Inquiry learning show the results of critical thinking skills better than students who obtain problem-based learning models. This is evidenced from the independent sample t-test which obtained under a significant value on the observation results and under a significant value on the student test results. The results conclusions both of these research data indicate that the inquiry learning model is better than the problem-based learning model in improving students' critical thinking skills.

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