Students' Critical Thinking Skills in Islamic Schools: The Effect of Problem-Based Learning (PBL) Model

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Abstract: Industrial Revolution 4.0 requires schools to produce graduates who are not only good in memorizing various materials, but also must have the skills to think critically. Problem-Based Learning (PBL) is one of the learning models that is deemed good in training students' critical thinking skills, including students in Islamic schools. The purpose of this research is to determine the effect of problem-based learning on students' critical thinking skills in Islamic schools. This type of research is a quasi-experimental with random sampling as the sampling technique. The research sample was 66 students. Data collection uses instruments in the form of description tests that are adjusted to the indicators of critical thinking skills. The research analysis technique used was the t-test to determine the effect of the problem-based learning model on students' critical thinking skills. The result of the research shows that the average score of the class where the critical thinking skills through PBL are applied is higher than the class that does not apply PBL. The result of the data analysis using the t-test obtained that the value of t_{count} bigger t_{table} is $4.119 > 1.997$ with a significance level of 5 %, so it is said that the PBL model influences students' critical thinking skills. It is suggested to make PBL learning becomes a mandatory choice to be applied in the learning process with the learning steps that have an impact on the students' thinking process.

INTRODUCTION

The world of education is currently facing the challenge of the fourth industrial revolution (Industrial Revolution 4.0) (C. Anwar, Saregar, Hasanah, & Widayanti, 2018; Ciffolilli & Muscio, 2018). To face this challenge, humans are required to compete with the development of modern science and technology (Gunawan, Harjono, Sahidu, & Gunada, 2019). In addition, competency in the 21st-century is a challenge for learners in focusing their skills and learning skills (Boholano, 2017; Siswanto, 2018).

Effective learning is one way to overcome the challenges of the Industrial Revolution 4.0 and the 21st-century (Hasmunarti, Bahri, & Idris, 2018; Yunitasari et al., 2019), especially in science learning that has its own knowledge building (Adawiyah, Lesmono, & Prastowo, 2018). In biology learning, it should no longer be teacher-centered but must be more student-oriented (Aini, Ramdani, & Raksun, 2018; Antika, 2018). One of the skills that need to be improved in biology learning is critical thinking skills (Gultom & Adam, 2018; Makhrus, Harjono, Syukur, Bahri, & Muntari, 2018). In fact, students still

regard biology as a difficult subject (Jamilah, Boleng, & Labulan, 2018). In the learning process, students tend to be passive and only act as learning objects (Ruli, Hala, & Syamsiah, 2018). So that students' critical thinking skills are still low (Permata, Hasnunidah, & Surbakti, 2019).

One effort to overcome this problem is through an effective and relevant learning process (Aristianti, Susanto, & Marwoto, 2018). Teachers as teachers must have the skills to choose a learning model that is in accordance with the characteristics of the learning material (Muis & Bahri, 2018; Suranti, Gunawan, & Sahidu, 2016). With an effective learning model, the skills to think in the learning process will be affected (Sudin, Duda, & Supiandi, 2018).

Some relevant learning models used in learning include; team assisted individualized learning model (Mardiani, Maasawet, & Hardoko, 2018), 7E cycle learning model (Balta, 2016), and Problem-Based Learning (PBL) model (Bakar & Panjaitan, 2018; Haruehansawasin & Kiattikomol, 2018). The syntax of the problem-based learning model is proven to be able to support the learning atmosphere so that it can improve various kinds of students' skills, such as understanding concepts (Tristanti, 2017), scientific literacy skills (Risqiana, N., Hidayat, A., Soepriyono, 2015), problem-solving (Yustianingsih, Syarifuddin, & Yerizon, 2017), creative thinking (Nuswowati, Susilaningsih, Ramlawati, & Kadarwati, 2017), and critical thinking (Azizah, Fatmaryanti, & Ngazizah, 2014; Fauziah, 2013; Herzon & Utomo, 2018). In this case, the researcher used Problem-Based Learning model to improve students' critical thinking skills.

In some studies on Problem-Based Learning (PBL) and critical thinking skills as revealed earlier, researchers generally find the research sample taken from public schools (Happy & Widjajanti, 2014; Hasan, Suyatna, & Suana, 2018; Mustofa, Susilo, & Muhdhar, 2016; Novianti, Fadilah Noor, & Hana Susanti, 2014; Susanawati, Diantoro, & Yuliati, 2013; Widayati, Suyono, & Rahayu, 2018; Widodo, 2016). Not many studies on PBL and critical thinking have been carried out in Islamic educational institutions. Even though Islamic schools in Indonesia have become a trend and are growing rapidly from year to year.

Lampung Province, in particular, Islamic schools have become the choice for parents who want to educate their children. Similar to the public schools, Islamic schools have levels from elementary school, junior high school, to senior high school (S. Anwar & Salim, 2018). However, based on the results of the initial research of critical thinking skills in biology to the tenth-grade students' of one of the favorite Islamic High Schools in Bandar Lampung, showed that 74.8 % of 235 students still scored below the score of 75. The interviews showed that it turned out the teachers did not implement many learning models and methods that can train students' critical thinking skills. Of course, this becomes a homework that must be addressed immediately, especially on biology subjects.

Therefore, the difference between this research and the previous one lies in the application of problem-based learning model by describing each step of the learning process to train students' critical thinking skills, especially in Islamic schools on biology subjects. For additional information, Islamic schools have different subjects and religious backgrounds compared to public schools. In Islamic schools, religious subjects tend to be more dominant compared to public schools. Another difference is the population and the sample used in which the students have the same religious preference, namely adherents of Islam, in contrast to relatively heterogeneous public schools.

METHOD

Quasi-experimental is the type of research used in this research with the Posttest Only Control Design (Arikunto, 2010). The research population was all students of Al-Kautsar Islamic High School in Bandar Lampung. The sampling technique used was random sampling techniques.

Table 1. Posttest Only Control Group Design

Class	Treatment	Posttest
Experimental	X_1	O_1
Control	X_2	O_2

The samples were two classes of the tenth-grade consisted of an experimental class and a control class. The experimental class was treated with Problem-based Learning (PBL) model while the control class was treated using conventional learning model. The numbers of samples were 66 students. The samples were divided into two classes with 36 students in the experimental class and 30 students in the control class.

The test of critical thinking skills was given after the treatment both in the experimental and control classes. The critical thinking skills test was in the form of a description test with the problem-based as the indicators on the subject of environmental pollution. There were 5 (five) indicators of critical thinking skills observed in this research. The five indicators are (1) provide a simple explanation, (2) build basic skills, (3) make inferences or conclusion, (4) provide further explanations, and (5) arrange strategies and tactics. From the 5 indicators, 15 instruments of critical thinking skills were developed. The validity and reliability of the instrument were tested before it was given to the students.

The data analysis technique used was t-test to see the effect of problem-based learning on students' critical thinking skills. The instrument was given to measure the extent of the application of PBL in training students' critical thinking skills. PBL learning itself has 5 learning steps. The five steps were re-translated in the form of teacher and students' activities so that they could train the critical thinking skills. The following is the learning framework of PBL associated with the activities and critical thinking processes of the students.

Table 2. The Problem-Based Learning Model on Students' Critical Thinking Skills

Learning Stages of PBL	Teachers and Students' Activities	Critical Thinking Indicators
Stage 1: Giving orientation to the students' problems.	The teacher provides problems or demonstrations in the form of phenomena that require problem-solving activities.	(1) Providing a simple explanation, (2) building basic skills.
Stage 2: Organizing students.	In groups, the students define and discuss the problems to be solved.	(3) Making inferences or conclusion, (5) regulating strategies and tactics.
Stage 3: Guiding individual and group investigations.	The teacher encourages students to gather needed information, carry out experiments and investigations to get explanations and problem-solving.	(3) Making inferences or conclusion, (4) providing further explanations, and (5) regulating strategies and tactics.
Stage 4: Developing and presenting the results.	The teacher assists students in planning and preparing reports, documentation, or models, and helps them to share tasks with others.	(2) Building basic skills, (3) making inferences or conclusion, (4) providing further explanations, and (5) regulating strategies and tactics.
Stage 5: Analyzing and evaluating the process and the results of problem-solving.	The teacher helps students to reflect or evaluate the process and results of the investigation they are doing.	(3) Making inferences or conclusion, (4) providing a further explanation.

RESULT AND DISCUSSION

Based on the results of the final test in the experimental class, the average score was better than the control class. 88.88 % of students got an average score above 75 while only 53.33 % of students in the control class who scored above 75. To prove that the application of PBL had an impact on critical thinking skills, a hypothesis was tested. Hypothesis testing used was t-test. Before the test was carried out, the data on the post-test of the critical thinking skills had to meet two prerequisite tests, namely the normality test and homogeneity test. Based on the results of the calculation, the data was proven as normal and homogeneous. Thus, the t-test requirements for this data was fulfilled.

After the prerequisite tests were done, the research hypothesis was tested using the t-test. The summary of the t-test calculation results is presented in Table 3.

Table 3. Calculation of t-Test

Class	Ave.	Var.	t_{table}	$t_{critical}$
Experimental	82.57	60.53	1,997	4,119
Control	72.19	46.67		

Based on the t-test calculation in Table 3, it can be seen that the value of $t_{critical} > t_{table}$. Based on the hypothesis proposed in this research, it can be concluded that there is an effect of problem-based learning on students' critical thinking skills in the material of environmental pollution in Al-Kautsar Islamic High School Bandar Lampung. The extent of the influence of PBL learning on each indicator of critical thinking skills can be seen in Table 4. Table 4 presents the results of tests of students' critical thinking skills in the experimental class and control class based on each indicator.

Table 4. Achievement Indicator of Critical Thinking Skills

Critical Thinking Skills Indicators	Achievement (%)	
	Experimental Class	Control Class
Providing a simple explanation	80.90	76.59
Building basic skills	86.83	72.29
Making inferences or conclusion	79.86	71.10
Providing further explanations	79, 86	70.31
Regulating strategies and tactics	83.55	70.32
Average	**82.20**	**72.19**

The percentage of achievement indicators based on the analysis of critical thinking skills in the experimental class is 82.20 %. This result is higher than the results of the average achievement indicators of critical thinking in the control class, which is 72.19 %. The high average score in the experimental class is caused by 88.88 % of students get an average test score above 75.

In order, the achievement of critical thinking skills in the experimental class from the highest to the lowest are building basic skills, regulating strategy and tactics, giving a simple explanation, making inference or conclusion, and finally giving further explanation.

The high achievement of critical thinking skills certainly cannot be separated from the steps of the PBL learning model. Each syntax of PBL can improve learning effectiveness so that it can improve students' critical thinking skills.

At the beginning of the learning, students orient themselves first. The orientation is done by giving problems that occur in real life. In this research, students were given a big problem with the theme "Plastic waste as a threat to the future of the earth". Through a short video presented by the teacher, students were presented with plastic waste as a problem that must be stopped immediately. They

were then asked to look for the causes, effects, and solutions to overcome the problems.

The students are challenged to formulate and identify the problems they face. The teacher also asks the students to associate solutions with Islam. At this stage, some critical thinking skills can be trained such as the skills to provide simple explanations and building basic skills, as well as the skills to provide advanced explanations.

After identifying the problem, students then worked in groups to discuss and research for material that can be used to solve the plastic waste problem and look for Islamic solutions to environmental problems. Students indirectly built their basic skills, making inferences, and regulating strategies and tactics so that their groups could get the best answers.

The next stage, the students conducted investigations, both individually and in groups. The investigation is intended to synchronize the opinions they discussed earlier with the information they get from other sources such as books, the internet, and the results of their investigations in the field. At this stage, students practice to make inferences and provide further explanations related to the arguments they are building.

After the students got the strongest argument related to the solution to the problem they were looking for, they then presented the results they got to other groups. At this stage, students are being trained to build their basic skills such as the skills to argue, defend opinions, provide further explanations, and regulate strategies and tactics.

The final steps of PBL are the analysis and evaluation of both the solutions they offer and those offered by other groups. In this case, the students conducted a process of further discussion and assimilation of different opinions and input from other groups.

Based on the description, all stages of PBL have succeeded in maximizing the five indicators of students' critical thinking skills, so it is natural that the average score in answering questions of critical thinking skills is high compared to classes that do not use PBL.

In general, it can be said that the problem-based learning process can activate the skills of students to be aware of problems, formulate them with questions, synthesize, and present their findings to others (Komalasari, 2013). PBL learning is an innovation in learning because it is full of skills to train students' critical thinking skills. The students' skills are truly optimized through a systematic process of group work or teams so that they can empower, sharpen, test, and develop their thinking skills on an ongoing basis (Rusman, 2012). The expected outcome of PBL is the growth of students' skills to think critically, analytically, systematically, and logically to find alternative solutions to problems through an empirical exploration of data in order to foster scientific attitudes (Sanjaya, 2006). PBL can be used as learning alternatives to overcome students' low critical thinking skills in Islamic schools. PBL model principally makes the problems that occur in the real world as a learning context for students to solve. Students are trained to think to solve problems and associated their knowledge with the concepts. In this case, the students are involved in investigations for problem-solving that integrate the skills and concepts they have. In line with the previous assessment that the PBL model is able to improve students' learning outcomes (Mairani & Simatupang, 2018), then able to improve students' achievement and motivation (De Witte & Rogge, 2016).

Based on the results obtained, students' critical thinking skills in Islamic

High School of Al-Kautsar Bandar Lampung are getting better through the use of PBL. This finding turned out to be no different from the research in public schools. Therefore, students in Islamic schools can also be said to be ready to produce qualified graduates who can compete in the industrial revolution era 4.0 and be able to face competencies in the 21st-century if PBL learning is made as a mandatory choice to be applied in the learning process with the learning steps that have an impact on each student's thinking process.

CONCLUSION

Based on the results of the research, it can be concluded that PBL, in general, can have an influence on improving students' critical thinking skills in Islamic schools. These results prove that students in Islamic schools have the same skills compared to public schools. This is shown through the hypothesis testing using the t-test. The value of $t_{critical} > t_{table}$ is 4.119 > 1.997 with a significance level of 5 %. Therefore, the results of this research provide recommendations to Islamic schools to start prioritizing PBL learning as a mandatory choice that must be applied by teachers in order to produce graduates who have critical thinking skills so that they are ready to face competition in the industrial revolution era 4.0.

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