



Problem Based Learning Model with Experiential Learning to Increase Creative Thinking and Critical Thinking Ability

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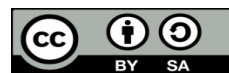
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ABSTRAK

Permasalahan kemampuan berpikir kreatif dan berpikir kritis siswa pada pembelajaran IPA masih rendah dan kurangnya guru dalam menerapkan model pembelajaran inovatif. Tujuan penelitian ini untuk menganalisis pengaruh model problem based learning berbantuan experiential learning dalam mengembangkan kemampuan berpikir abad 21 siswa yaitu berpikir kreatif dan berpikir kritis pada pembelajaran IPA. Jenis penelitian ini yaitu kualitatif. Metode penelitian yang digunakan dalam penelitian ini adalah kuantitatif yaitu eksperimen semu. Terdapat dua sampel penelitian sebagai kelas eksperimen dan kelas kontrol Metode pengumpulan data dilakukan dengan wawancara, observasi, tes dan dokumentasi. Teknik analisis yang digunakan adalah uji normalitas, homogenitas, uji T, dan Uji multivariate dengan MANOVA. Hasil penelitian menunjukkan terdapat peningkatan yang signifikan pada hasil posttest kemampuan berpikir kreatif dan berpikir kritis siswa setelah menerapkan model pembelajaran Problem based learning berbantuan Experiential learning. Hasil uji MANOVA menunjukkan bahwa pembelajaran pada kelas eksperimen dan kelas kontrol terdapat kenaikan nilai meskipun berbeda rata-ratanya. Disimpulkan bahwa model problem based learning berbantuan experiential learning dapat meningkatkan kemampuan berpikir abad 21 siswa yaitu berpikir kreatif dan berpikir kritis pada pembelajaran IPA.

ABSTRACT

The problem of students' creative thinking and critical thinking skills in science learning still needs to improve, and more teachers must apply innovative learning models. This study aimed to analyze the effect of the problem-based learning model assisted by experiential learning in developing students' 21st-century thinking skills, namely creative thinking and critical thinking in science learning. This type of research is qualitative. The research method used in this research is quantitative, namely quasi-experimental. There are two research samples experimental class and the control class. Data collection methods are done through interviews, observations, tests and documentation. The analysis technique used is a normality test, homogeneity, T-test, and multivariate test with MANOVA. The results showed a significant increase in the posttest results of student's creative thinking and critical thinking skills after applying the problem-based learning model assisted by experiential learning. The MANOVA test results show that learning in the experimental and control classes increases in value even though the average differs. It was concluded that the problem-based learning model assisted by experiential learning could improve students' 21st-century thinking skills, namely creative thinking and critical thinking in science learning.

1. INTRODUCTION

The 21st century human civilization is currently ushering the world in progress in all fields, including science, technology and telecommunications. With these advances, the skills needed are also increasing. 21st century skills are referred to as 4C namely 1) critical thinking, 2) communication, 3) collaboration, and 4) creativity (Ratama et al., 2021; Tang et al., 2020; Yu & Wan Mohammad, 2019). In facing the global competition in the 21st century, students are required to have 4c, namely critical thinking and problem solving, creativity and innovation, communication, and collaboration (Astuti et al., 2019; Khoiri et al., 2021; Rusdin, 2018). One of the difficult learning for students is science, science is an elementary school subject that requires students to organize ideas and concepts about nature obtained

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from experience through a series of scientific processes such as hiding, composing, and expressing ideas. This is what causes students to feel that science is difficult learning, because it requires understanding and higher-order thinking skills (Fatimah & Santiana, 2017; Ridwan et al., 2021). From the demands of the 4.0 industrial revolution, critical and creative thinking is a competency that must be achieved by students. Quality human resources come from a quality education process as well, where in the education process students are equipped with skills to solve problems, find alternative solutions to problem solving, and think reflectively and evaluative (Astuti et al., 2019; Devi et al., 2020; Supriyono, 2019).

Thinking skills are one of the life skills that need to be developed through the educational process. Thinking skills are very important to equip students to compete in a global world. The thinking skills that are generally developed in schools are critical and creative thinking skills which should not be considered as cognitive processes comparable to problem solving and decision making (Amran et al., 2019; Ferrer & Staley, 2016; Purawati et al., 2016). In general, the characteristics of a form of creativity are: 1) Creativity appears in the thought process when a person solves problems related to: a) Fluency in giving answers and or expressing opinions or ideas. b) Flexibility, namely the ability to express various choices in solving problems. c) Originality, namely the ability to issue various original ideas resulting from one's own thinking. d) Elaboration in the form of skills to broaden ideas and points of view that other people may not think of or can see. e) Tenacity and patience in encountering an unstable situation (Andarwati, 2019; Muhali, 2019; Yazar Soyadi, 2015). Critical thinking is part of several higher intellectual skills, which are related to analysis, conceptualization, information management, systemic thinking, critical thinking, research and metacognition. Several indicators in critical thinking skills, namely students are able to carry out basic clarifications, decision making, drawing conclusions, further clarifications and estimates (Abdullina et al., 2019; Schlegel et al., 2021).

One of the lessons that apply higher order thinking skills such as creative thinking skills is science learning. In science subjects which are included in one of the main subjects in the curriculum in Indonesian education. Science is a human effort to understand the universe through observations that are right on target, using procedures, and explained with reasoning so as to get a conclusion (Chung et al., 2019; Prijanto & Kock, 2021; Williams et al., 2009). Science is related to how to systematically find out about nature. Meanwhile, human survival is very dependent on nature. The position of science is very important for human life so that humans can maintain their lives (Laila Puspita, 2019; Rai & Khawas, 2020). IPA is not just a collection of knowledge in the form of facts, concepts or principles, but rather a search process, procedure or way of thinking and how to solve problems. The learning process in science emphasizes providing direct experience to students in order to gain a better understanding of the natural world around us through science lessons (Sadiqin et al., 2017; Shebastian et al., 2020; Takko et al., 2020). Based on the opinions of several experts above, it can be concluded that learning science requires learning that requires the ability to reason, understand, analyze and think creatively in order to be able to understand the concepts and principles of how to solve problems in the field of science related to nature so that it can be useful. in daily life.

The fact that occurs in schools at every level, including in elementary schools, in learning science students often experience difficulties in doing tenacity, elaboration, reasoning and problem solving which causes low science learning outcomes which are still below the KKM. This shows that students' creative thinking skills are still low. This can be seen from the results of interviews with students and teachers regarding students' science subjects at several elementary schools in the Karangnongko sub-district, Klaten Regency. after observing and interviewing teachers and students in science learning in the process of developing critical thinking skills they still use conventional learning models such as lectures and tend to focus on teacher center not student center.

This study also refers to previous research which examined the importance of creative thinking skills entitled The Influence of Scientific Approach Picture Story Books with the Discovery Method on Scientific Creativity and Curiosity of Class III Elementary School Students (Yulistia, 2019). The equation is the problem of the ability to think creatively in science learning. The difference is in the class level and the model used. Then the research entitled lift the flap story book based on child-friendliness has an effect on the ability to think creatively and self-actualization of fourth grade elementary school students in Pleret District, Bantul (Sartono & Irawati, 2020). The equation in this study is the problem of creative thinking skills. While the difference is in the use of models in this study using the media.

Based on the importance of having 21st century abilities such as critical thinking skills and creative thinking skills, while the facts on the ground there are still many students who experience difficulties in developing critical and creative thinking skills seen from the results of observations, interviews and also tests related to critical and creative thinking skills which are indicators in making questions based on the adoption of indicators of creative thinking skills. Researchers conducted research by looking at the results of the pretest before and after the posttest using a problem based learning model assisted by experiential

learning with the aim of seeing the effect of innovative models on 21st century abilities, especially students' creative thinking abilities and students' abilities. The novelty in this study contains. The effect of the problem based learning model assisted by Experiential Learning on the creative thinking skills and critical thinking skills of fifth grade elementary school students.

2. METHOD

This study uses a quantitative approach with a quasi-experimental research type. This type of quasi-experimental research involves the use of groups of subjects as a whole. The design used is nonequivalent comparison group design. The pretest and posttest are used as empirical evidence for the results of the comparison between the experimental class and the control class (Fox & Bayat, 2007; Purwanto, 2020). In this research, to ascertain the truth and find out the problems clearly in the field, it was carried out by analyzing and observing the science learning process in the fifth grade of elementary schools in the Karangnongko Sub-district, Klaten Regency. The population in this study were class V students in Karangnongko District, Klaten Regency. The samples used were class V students at SDN Gumul 2 and SDN Banyuaeng, Karangnongko District, Klaten Regency. The sampling technique used random sampling.

The data collection techniques used in this study were: interviews with teachers, interviews with students and observations during the science learning process. Interviews were conducted to find out the problems experienced by students and teachers in the science learning process, interviews were conducted to obtain data from informants, namely students and teachers. Observation, namely the activity of observing the ongoing learning process and to find problems and causes of low creative thinking abilities in science learning for class V elementary school students. The data collection technique used in this study is as follows: The test used in this study aims to obtain data on students' critical and creative thinking skills. It consists of an initial test (pretest) and a final test (posttest). The pretest is given before the treatment is carried out, while the posttest is given at the end of the lesson which aims to determine the level of students' critical and creative thinking skills after being given treatment.

The instruments used in this study related to indicators of critical and creative thinking skills according to experts are in the following table. The indicators of critical thinking are show in Table 1. The indicators of creative thinking describe indicators of creative thinking in detail through the Table 2.

Table 1. Critical Thinking Indicator

No.	Aspect	Indicator
1	Basic Clarification	Formulate questions Analyze arguments Ask and answer questions
2	Decision Making Assess	The credibility of sources assessing The results of observations
3	Conclusion Drawing	Conducting Induction Do an Evaluation
4	Further Clarification	Defining terms Defining Assumptions
5	Estimates and Integration	Estimates thinking Capability Integration

Table 2. Indicators Of Creative Thinking

No.	Aspect	Indicator
1	Fluency of thinking	Generate many ideas, many answer, problem solving and questions smoothly Give many ways or suggestions for doing things Thinking of more than one answer
2	Flexibility	Generate varied ideas, answers or questions Seeing a problem from different points of view Looking for many alternatives or different directions. Able to change the way of approach or way of thinking
3	Elaboration	Able to enrich and develop an idea or product Adding or detailing the details of an object, idea, or situation so that it becomes more interesting
4	Originality	Able to produce new and unique expressions Think of an unusual way Able to make unusual combinations of its parts

The data analysis technique using quantitative description analysis in this study went through three stages, namely the data description stage, the prerequisite test stage and the hypothesis testing stage. In the prerequisite test, the prerequisite test in this study used the equivalence test, homogeneity test and normality test. The first test to be performed was the equivalence test. This test was conducted to find out whether the data group came from a homogeneous population or not. This homogeneity test uses the Levene test. While the last prerequisite test is normality. This test was conducted to determine whether the data is normally distributed or not. The results of the normality test will determine the data analysis test used in the hypothesis. In the normality test, the technique used is the Kolmogorov-Smirnov test. Hypothesis testing in this study was carried out using the MANOVA test. The MANOVA test was carried out to see the effect of the Problem Based Learning model assisted by Experiential Learning on students' critical and creative thinking. The criteria for accepting and rejecting the hypothesis are if the significance value is less than 0.05, then the hypothesis is accepted. Hypothesis testing was carried out using SPSS 16.0.

3. RESULT AND DISCUSSION

Result

The normality test is a prerequisite test, the normality test is used to test whether the data obtained is normally distributed or not to. To facilitate data testing, the SPSS application is used to test the normality of a data. The results of the normality test in this study can be seen in [Table 3](#).

Table 3. Normality Test

Model	Group	Kolmogrof-Smirnova			Shapiro-Wilk		
		Statistics	df	Sig.	Statistics	df	Sig.
Pretest Creative Thinking	Experiment	0.155	10	0.200	0.954	10	0.717
	Control	0.190	15	0.153	0.945	15	0.452
Posttest Creative Thinking	Experiment	0.238	10	0.114	0.969	10	0.047
	Control	0.143	15	0.200	0.842	15	0.837
Pretest Critical Thinking	Experiment	0.238	10	0.114	0.842	10	0.047
	Control	0.190	15	0.149	0.906	15	0.119
Posttest Critical Thinking	Experiment	0.155	10	0.200	0.954	10	0.717
	Control	0.156	15	0.200	0.956	15	0.616

Followed the [Table 3](#), stated that the results of the normality test that had been carried out obtained pretest and posttest significance values for creative thinking ability and critical thinking ability > 0.05, meaning that the data was normally distributed. If the results of the data in the normality test are normally distributed, the data review is continued with the homogeneity test. The homogeneity test is used to investigate whether the homogeneity of the variance between groups is fulfilled or not. Based on data analysis, the results of the pretest and posttest of creative thinking ability and critical thinking ability in the two classes show that the significance value is >0.05, it can be concluded that the data is homogeneous. After the prerequisite test has been carried out, the next step is to test the hypothesis by testing the independent sample t-test. Next hypothesis test will be carried out to see the results of increasing learning outcomes in the experimental class. The following presents data on the results of hypothesis testing using the independent sample t-test as show in [Table 4](#).

Table 4. Hypothesis Test Results T-Test Creative Thinking Ability

Model	Means	Std. Deviation	Std. error means	Levene's test for equality of variances		T	df	
				F	Sig.			
Creative Thinking	Control Class	76.33	2.350	0.607	0.962	0.337	-5.467	23
	Experiment class	82.20	3.011	0.952			-5.196	16.0989

Based on the [Table 4](#), it shows that the Significance value (2-tailed) is 0.337>0.05, which means (Ho) is accepted and (Ha) is rejected. The conclusion from the creative thinking ability hypothesis test, the data shows that there is a significant difference between the learning outcomes of the class control and

experiment of creative thinking after implementing the model Problem based learning with Experiential learning. Hypothesis test results t-test critical thinking ability is show in [Table 5](#).

Table 5. Hypothesis Test Result t-test Critical Thinking Ability

Model	Means	Std. Deviation	Std. error means	Levene's test for equality of variances		T	df
				F	Sig.		
Critical Thinking	76.20	1.859	0.480	2.829	0.106	-6.092	23
Control Class	81.70	2.669	0.844			-5.665	14.773

Based on [Table 5](#), it shows that the Significance value (2-tailed) is $0.106 > 0.05$, which means (Ho) is accepted and (Ha) is rejected. The conclusion from the critical thinking ability hypothesis test, the data shows that there is a significant difference between the learning outcomes of the class control and experiment of critical thinking after implementing the model Problem based learning with Experiential learning. MANOVA hypothesis test results are show in [Table 6](#).

Table 6. MANOVA Hypothesis Test Results

Source	F	df1	df2	Sig.
Creative Thinking	0.962	1	23	0.337
Critical Thinking	2.829	1	23	0.106

Test results on [Table 6](#) shows the learning model a significance value of $0.337 > 0.05$, in the learning model and results a significance value of $0.106 > 0.05$. From these results it can be concluded that (Ha) is rejected an (Ho) is accepted. The conclusion from these data is that learning in the experimental class that implements the model problem based learning with experiential learning and the control class that implements model problem based learning can both improve students' creative thinking ability and critical thinking ability. However, in the learning outcomes the significance, this value interprets the existence of a real contrast in the posttest scores creative thinking ability and critical thinking ability between the experimental class and the control class. Based on the data analysis proves that the scores of both classes have increased, but the increase in the scores the experimental class is higher when compared to the control class. In the pretest-posttest creative thinking ability in the experimental class increased from 52,2 to 82,4. While in the control class it increased 46,1 to 76,3. This average proves that the experimental class increase in creative thinking ability scores was higher. The same thing happened to critical thinking ability where the average pretest-posttest score for the experimental class increased from 51,7 to 81,7. While in the control class it increased 47.1 to 76,2. This average proves that the experimental class increase in critical thinking ability scores was higher. The average in the experimental class is higher when compared to the control class.

Discussion

Based on the results of observations, interviews, test it can be said that there is a link between the low student learning outcomes in science, which requires students' creative thinking abilities and critical thinking abilities to study science related to the use of the learning model applied by the teacher in achieving learning objectives is increasing. This increase in value is certainly inseparable from the implementation of the model Problem based learning with Experiential learning. This can happen because the collaboration of the model Problem based learning with experiential learning is very feasible if used to overcome the students creative thinking abilities and critical thinking abilities. The increase in students' creative thinking skills and critical thinking skills can be seen from the results of the students' pretest and posttest where there is a change in Besides, the homogeneity test on the samples also came from homogeneous

The results of the studies that have been conducted are consistent with the previous study. So that learning science requires students' creative thinking skills which include tenacity, originality, fluency and student elaboration. In fulfilling the achievement of science learning objectives that require students' creative thinking abilities, innovative learning models are needed that keep up with the times such as problem based learning. Problem based learning is a learning model characterized by real problems and emphasizes students' high-level thinking skills in solving problems ([Erikasari et al., 2021](#); [Schlegel et al.,](#)

2021). There are several criteria for learning models that can achieve the expected learning objectives, namely valid and valid (Lestari, 2020; Retnowati et al., 2021).

Based on previous research it revealed the importance of using innovative learning models in learning mathematics which requires high-level critical thinking skills which are one of the 21st century abilities (Muhali, 2019). In addition, other research related to thinking skills in the 21st century using inquiry learning models in natural science learning is said to be effective because with innovative learning models learning becomes more meaningful and can influence learning outcomes and students' thinking abilities (Sumarno, 2019). Research from previous study states that one of the difficult learning in elementary schools is natural science because students' opinions regarding natural science learning are already considered difficult, so innovation is needed in learning to achieve learning goals (Karuniasih, 2022; Lewis, 2001).

The implications of this study indicate that the use of problem-based learning combined with experiential learning can improve students' creative thinking skills. This can have a positive impact on students' ability to generate innovative ideas and solutions in solving problems. This research also shows that the use of this learning model can improve students' critical thinking skills. Problem-based learning encourages students to analyze, evaluate, and interpret information more critically. Experiential learning provides opportunities for students to apply their knowledge in real contexts, which also contributes to the development of critical thinking skills. This research also has limitations. This research may not consider all the variables that can affect creative and critical thinking skills. There are many factors that can affect students' abilities, such as motivation, learning environment, teacher support, and individual student characteristics. Future research can consider these additional variables to gain a more comprehensive understanding of the factors that influence students' thinking skills.

4. CONCLUSION

In this study, the impact of implementing the Model Problem based learning model with Experiential learning on creative thinking abilities and critical thinking abilities is studied. Based on the results of studies that have been reviewed, It shows that the Model Problem based learning model with Experiential learning can be improve students' creative thinking abilities and critical thinking abilities. This can be seen from the results of the independent sample t-test for both creative thinking abilities and critical thinking abilities with significance value of $0.0 < 0.05$, meaning that (H_0) is accepted and (H_a) is a rejected. However, learning using Model Problem based learning model with Experiential learning is better than just used model problem based learning. Based on the MANOVA test that has been done, both of them are able to improve creative thinking abilities and critical thinking abilities

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