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Process-Oriented Guided-Inquiry Learning Model and Critical Thinking Ability of Elementary School Students

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Abstrak

Kemampuan berpikir kritis pada pembelajaran matematika masih kurang. Hal ini disebabkan dari beberapa faktor dan kesalahan yang dilakukan siswa dalam menyelesaikan soal-soal matematika. Penelitian ini bertujuan untuk menganalisis pengaruh model pembelajaran process oriented guided-inquiry learning terhadap kemampuan berpikir kritis siswa pada materi keliling dan luas segi empat. Jenis penelitian ini merupakan penelitian eksperimen dengan desain penelitian post-test only control group design. Populasi penelitian ini adalah siswa kelas IV yang terdiri dari 3 kelas. Melalui cluster random sampling terpilih dua sampel yakni kelas IVc dengan jumlah 24 siswa sebagai kelas eksperimen dan kelas IVb dengan jumlah 25 siswa sebagai kelas kontrol. Data penelitian ini diperoleh menggunakan metode tes. Instrumen yang digunakan adalah lembar tes. Teknik analisis data yang digunakan yaitu uji normalitas, uji homogenitas dan uji t. Dalam penelitian menggunakan bantuan program SPSS Versi 26. Hasil dari penelitian menunjukkan bahwa terdapat pengaruh pengaruh process oriented guided-inquiry learning terhadap kemampuan berpikir kritis siswa kelas IV pada materi keliling dan luas segi empat. Implikasi penelitian ini diharapkan penggunaan model process oriented guided-inquiry learning supaya memperbaiki kemampuan berpikir kritis.

Kata Kunci: *Process Oriented Guided-Inquiry Learning, Kemampuan Berpikir Kritis, Sekolah Dasar*

Abstract

The ability to think critically in learning mathematics still needs to be improved. It is caused by several factors and student errors in solving math problems. This study aims to determine the effect of the process-oriented guided-inquiry learning model on students' critical thinking skills on the circumference and area of a rectangle. This type of research is experimental with a post-test-only control group design. The population of this study was fourth-grade students consisting of 3 classes. Through random cluster sampling, two samples were selected: class IVc with 24 students as the experimental class and class IVb with 25 as the control class. The research data was obtained using the test method. The instrument used is a test sheet. The data analysis technique used is the normality test, homogeneity test, and t-test. The research used the help of the SPSS Version 26 program. The study results showed an effect of Process Oriented Guided-Inquiry Learning on the critical thinking skills of fourth-grade students on the perimeter and area of a rectangle. With these findings, the researcher recommends using the Process Oriented Guided-Inquiry Learning model to improve critical thinking skills.

Keywords: Process Oriented Guided-Inquiry Learning, Critical Thinking Skills, Elementary School

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1. INTRODUCTION

21st-century learning forms teachers and students with 21st-century skills and competencies. 21st-century learning requires students to master science, have metacognitive skills, think critically and creatively, and communicate effectively. This situation illustrates the harmony between expectations and reality (Damayanti et al., 2020; Mitra et al., 2019; Primasari et al., 2019). Many elementary schools have implemented 21st-century learning. Students are taught to study harder and respond more actively to every challenge (Jannah et al., 2022a; Pendy et al., 2021; Rahayu et al., 2022). Students not only memorize the material but better understand the concept of the material. By understanding the concept of material

and other information, students are expected to be able to solve problems well and become creative and innovative thinkers (Greenstein, 2012).

21st-century competencies include communication, collaboration, critical thinking, and creativity, requiring higher-order thinking skills or so-called HOTS (Higher Order Thinking Skills) (Ichsan et al., 2019; Kwangmuang et al., 2021; Phawani Vijayaratnam, 2012). To create an educated society that can face the challenges of an increasingly competitive era (Abidinsyah et al., 2019; Diah Rusmala Dewi, 2019). As explained, critical thinking is one of the 21st-century competencies that must be mastered. Critical thinking is related to cognitive growth and intellectual responsibility. The ability to self-correct is important to critical thinking (Anggraini et al., 2017; Ariani, 2020; Jannah et al., 2022b). Interest and trend factors have an important role in critical thinking. Basic skills such as reading, writing, arithmetic, and verbal communication play an important role in developing social skills but need to be improved for critical thinking (P. S. Devi et al., 2020; Setyawan et al., 2021). Critical thinking skills familiarize students with thinking rationally. Critical thinking contains rational (reasonable) and reflexive thinking focused on beliefs and decisions to be made (Budiarti et al., 2016; Leniati et al., 2021). In thinking activities, students must have thinking skills, originality of ideas, flexibility, and flexibility in finding solutions to problems. Having the ability to think critically, students can evaluate every truth, from solving the problem to getting the right solution (Nguyễn et al., 2017; Nurhikmayati et al., 2019).

Students' critical thinking skills are still relatively low. It can be seen from previous research, that Kartika & Rakhmawati (2022) said that students' critical thinking skills in mathematics were low. It was caused by several factors and mistakes made by students in solving math problems (Kartika et al., 2022; Wijiastuti et al., 2021). In carrying out the process of learning mathematics, it is not only listening and memorizing but also requires critical thinking skills. Mathematics relies on the ability to think critically so that students can solve problems in math problems. Critical thinking skills make it easier for students to analyze a problem found and obtain real information to make believed decisions (Kartika et al., 2022; Safitri et al., 2021). Carrying out mathematics learning with high-level critical thinking focuses more on discovering concepts and understanding the material taught appropriately. It is necessary to increase students' critical thinking skills (bambang sri anggoro, 2016; Fitriani et al., 2021). In learning, mathematics is always related to critical thinking. Critical thinking in learning mathematics can train students to participate actively to gain and experience meaningful experiences in the learning process (Sulistiani et al., 2016).

Efforts to improve student’s critical thinking skills by applying appropriate learning models. Based on these problems, one suitable learning model is the process-oriented guided-inquiry learning model. The process-oriented guided-inquiry learning model is one of the models or strategies used in teaching and learning (Anim et al., 2022; Wijaya et al., 2021). This model invites students to work in groups whose activities have been specifically arranged. Malik *et al*. (2017) said that the process-oriented guided-inquiry learning model is process-oriented and student-centered by applying the learning cycle in guided inquiry activities (Depiani et al., 2019; Malik et al., 2017; Sari et al., 2020). The advantage of applying the process-oriented guided-inquiry learning model is that it can help students find their knowledge (Muliani et al., 2019; Risky et al., 2018). This is in line with the statement put forward by Devi *et al.* (2019) that the learning model of process-oriented guided-inquiry learning makes learning active by developing knowledge, questions to improve critical and analytical thinking skills, problem-solving, metacognition, and individual responsibility (Fitriansyah et al., 2021; Syafaren et al., 2019).

Many studies implement the process-oriented guided-inquiry learning model as one of the variables. The process-oriented guided-inquiry learning model effectively improves

students' critical thinking skills on electrolyte and non-electrolyte solutions (Susana et al., 2018; Wilatika et al., 2022). The process-oriented guided-inquiry learning model has a positive and significant effect on the ability to think critically about heat material and its transfer (Wijaya et al., 2021). There are differences in student learning outcomes by applying the process-oriented guided-inquiry learning model (Fatkhul Arifin, Tri Anzani Ashari, 2021). Based on the findings of several studies, the process-oriented guided-inquiry learning model is an alternative learning model suitable to improve students' critical thinking skills. It is because Process Oriented Guided-Inquiry Learning seeks to make students actively involved in learning mathematics in class. By actively involving students in the learning process, students critical thinking skills are expected to increase. Therefore, this study aims to analyze the effect of process-oriented guided-inquiry learning on students' critical thinking skills on the perimeter and area of a rectangle.

2. METHODS

This research is experimental research conducted at SDN Dukuh Menanggal 1/424 Surabaya. The population of this study was all fourth-grade students at SDN Dukuh Menanggal 1/424 Surabaya, which consisted of three classes, namely class IV A to class IV C. Using the Random Cluster Sampling technique, two samples were selected, namely class IVc with a total of 24 students as the experimental class and the class IVb with a total of 25 students as the control class. Learning using the Process Oriented Guided-Inquiry Learning model is applied to mathematics subjects on the circumference and area of a rectangle in the even semester. Class IV B is the control class, and Class IV C is the experimental class. The research data was obtained using the test method. The instrument used is a test sheet. This experimental research design uses a Quasi-Experimental Design in the form of a post-test-only control design. This study uses the test method. The test method is used to obtain data on critical thinking skills. The instrument used is in the form of a critical thinking ability description test consisting of 2 items. The items are adjusted to the learning objectives of mathematics. Before the questions are given, experts validate the test, which is tried out in class IVa. The critical thinking test used is valid and reliable. The data analysis technique uses the t-test hypothesis test. Before testing the hypothesis, the researcher conducted a prerequisite test in the form of a normality test and a homogeneity test. Data analysis was assisted by the SPSS version 26 program.

3. RESULTS AND DISCUSSION

Result

This research was conducted in the even semester at SDN Dukuh Menanggal 1/424 Surabaya. Researchers apply the Process Oriented Guided-Inquiry Learning model by utilizing PowerPoint. Through PowerPoint, teachers can actively communicate in two directions with students. The PowerPoint contains basic ways to find the perimeter and area of a quadrilateral. Learning is carried out during one meeting with one test of critical thinking skills. In addition to using PowerPoint, the teacher also uses the Student Worksheets given to students. This Student Worksheet aims to help students find the perimeter and area of a quadrilateral on a basic basis. Display of PowerPoint and Student Worksheets in this study are shown in Figure 1, and Figure 2.

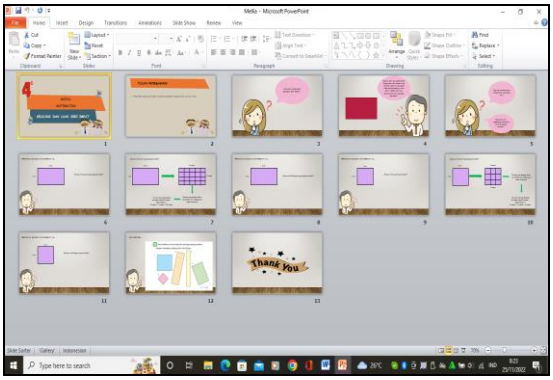

Figure 1. Powerpoint Display

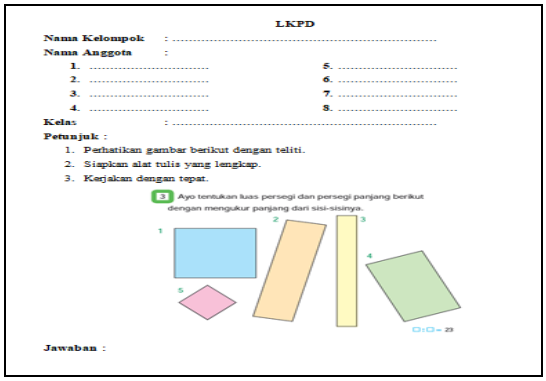

Figure 2. Display of Student Worksheets

The data was obtained in the study using hypothesis testing (t-test). Before conducting a hypothesis on the data obtained, there are stages as a condition or not for the data to carry out a hypothesis. Prerequisite testing before testing the hypothesis includes normality and homogeneity tests on data and experimental and control classes. The results of tests for students' critical thinking skills in grades IV B and IV C are described in Table 1.

Table 1. Descriptive Statistics on Critical Thinking Skills

Result	N	Mean	Minimum	Maximum	Std. Deviation
Control Class IV B	25	44.20	0	70	16.998
Experiment Class IV C	24	84.38	65	100	10.354
Valid N (listwise)	24				

Based on Table 1, the average for class IV B and IV C, respectively is 44.20 and 84.38. The minimum post-test scores for classes IV B and IV C are 0 and 65. The maximum post-test scores for classes IV B and IV C are 70 and 100, respectively. Before testing the hypothesis, the researcher conducted a prerequisite test in the form of a normality test using the Kolmogorov-Smirnov test. The results of the normality test data for students' critical thinking skills in grades IV B and IV C are described in Table 2.

Table 2. Tests of Normality

	Class	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Result	Control IV B	0.159	25	0.104	0.945	25	0.188
	Experiment IV C	0.151	24	0.168	0.937	24	0.140

Based on Table 2, the results of the data normality test show the Asymp value. Sig in class IV B and IV C obtained 0.104 and 0.168, so it can be concluded that the data came from a normally distributed population after carrying out the normality test. The researcher continued the next test, namely the homogeneity test with the Levene test.

The results of the data homogeneity test show the Asymp value. The class sig is 0.142, so it can be concluded that the data is distributed equally or homogeneously. So that the post-test value can be calculated using the Independent Sample T-Test. The results of hypothesis testing in this study are shown in Table 3.

Table 3. Independent Samples Test

		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Result	Equal variances assumed	2.227	0.142	9.941	47	0.000	40.175	4.041	32.045	48.305
	Equal variances are not assumed.			10.036	39.915	0.000	40.175	4.003	32.084	48.266

Based on Table 3, it can be concluded that the number of students as research respondents was 49, consisting of 24 students in the experimental class and 25 in the control class. Based on the results of the Independent Sample T-Test test in the table, the F value, which assumes that the two variants are the same, is 2,227 with t 9,941 with degrees of freedom (df) 47. Then Sig. (2-tailed) 0.000. Because of Sig. (2-tailed) 0.000 < 0.05. Thus, H0 is accepted, meaning that Process Oriented Guided-Inquiry Learning influences fourth-grade students' critical thinking skills in the material around the perimeter and area of a rectangle. The process-oriented guided-inquiry learning model has five stages: orientation, exploration, concept formation, application, and closing, presented in Figures 3, Figure 4, Figure 5, and Figure 6.

Figure 3. Opening Activity

Figure 4. Lighter Activity

Figure 5. Discussion Activities

Figure 6. Activities for Working on Critical Thinking Test Sheets

Discussions

This study's results indicate an effect of Process Oriented Guided-Inquiry Learning on the critical thinking skills of fourth-grade students on the perimeter and area of a rectangle. The process-oriented guided-inquiry learning model emphasizes a student-centered learning process by encouraging student participation in class. The process-oriented guided-inquiry learning model has five stages, namely the orientation stage, the exploration stage, the concept formation stage, the application stage, and the closing stage. Orientation stage, before learning begins, the teacher first invites students to prepare themselves for learning. The teacher performs routine morning activities such as singing the obligatory national anthem, reading Pancasila, and praying together. After the routine activities, the teacher informs students about the material and learning objectives that day. In the exploratory stage, the teacher continues the learning activity by asking students: What is a quadrilateral mean? What are the different types of quadrilaterals?

Furthermore, students gave various responses actively. Besides improving critical thinking skills, the process-oriented guided-inquiry learning model can also train students to express their opinions. Critical thinking skills make it easier for students to analyze a problem found and obtain real information to make believed decisions (Kartika et al., 2022; Safitri et al., 2021). Carrying out mathematics learning with high-level critical thinking focuses more on discovering concepts and understanding the material taught appropriately. Students' mathematical communication skills on quadrilateral material after being taught the Process-Oriented Guided Inquiry learning model are included in the high category (Anim et al., 2022).

In the concept formation stage, accompanied by the teacher, students discuss in groups to calculate a quadrilateral's perimeter and area. At this stage, the teacher provokes students to think critically to answer the questions properly. Each group faces how to decide on an action when answering questions. So that they can make the right and appropriate decisions to solve problems as a group. In the application stage, the new knowledge obtained from discovering the concept is applied to solve problems. Students are asked to answer questions on critical thinking test sheets individually. In the closing stage, the teacher evaluates the results of student performance. The indicators of critical thinking that are applied are making conclusions. Students provide conclusions obtained after learning. Then the teacher adds reinforcement of the conclusions obtained after learning to improve their abilities at the next meeting. Having the ability to think critically, students can evaluate every truth, from solving the problem to getting the right solution (Nguyễn et al., 2017; Nurhikmayati et al., 2019). It can happen because the process-oriented guided-inquiry learning model invites students to participate in group discussions, thus enabling students to understand facts and concepts. Active students in the learning process will create a sense of enthusiasm for learning, increasing student learning outcomes.

The learning process by applying the process-oriented guided-inquiry learning model allows students to improve critical thinking skills. This finding is reinforced by previous research findings that the Process-Oriented Guided Inquiry learning model effectively improves students' critical thinking skills (Susana et al., 2018). The Process-Oriented Guided Inquiry learning model can improve students' critical thinking skills on reaction rate material (Wijiastuti et al., 2021). Teachers who apply the Process-Oriented Guided Inquiry learning model positively and significantly influence students' critical thinking skills on heat and displacement material (Wijaya et al., 2021). The Process-Oriented Guided Inquiry learning model significantly improves student learning outcomes. There are significant differences in scientific learning outcomes between the Process-Oriented Guided Inquiry learning model and conventional learning models on natural science water cycle material (Leonard et al., 2018; Margunayasa et al., 2021). This researcher's findings imply that applying the process-oriented guided-inquiry learning model can positively and significantly influence critical thinking skills. The end of this research positively and significantly impacts students' critical thinking using the expected process-oriented guided-inquiry learning model. Teachers can apply this model so that participants are more active when the teaching and learning process occurs in group discussions and can make case decisions.

4. CONCLUSION

Based on the research results and discussion following the formulation of the problem, this study concludes that the process-oriented guided-inquiry learning model influences students' critical thinking skills on the material around the perimeter and area of a rectangle. It is recommended to improve their critical thinking skills in learning about the perimeter and area of a rectangle through a process-oriented guided-inquiry learning model.

The learning model is process-oriented guided-inquiry learning as an alternative to the mathematics learning process for students to improve critical thinking skills. Schools are expected to be able to apply the process-oriented guided-inquiry learning model to improve the quality of the learning process in particular and the quality of schools in general.

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