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Effectiveness of P3E Learning Model With Contextual Approach to Train Critical Thinking Skills of Elementary School Students on Science Lessons

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Abstract:- The P3E learning model (Organizing, Investigation, Presentation, and Evaluation) with a contextual approach isja science learning model designed to train students' critical thinking skills based on constructivism theory. The purpose of this study was to analyze the effectiveness of the P3E learning model with a contextual approach to learning Natural Sciences (IPA) to train the critical thinking skills of elementary school students. This research used *one group pre-test post-test design* for elementary school students in the fourth grade of the school year 2018-2019. Critical thinking skills in this study were measured using the indicators Facione (2004). The data analysis technique used was Paired test, n-gain, and Independent test. The results of the study prove that: (1) There is an increase in critical thinking skills of fourth grade students at = 5%. (2) Average n-gain of critical thinking skills in the high category; l (3) There is a significant difference between the natural science critical thinking skills in all classes, and (4) Students respond very positively. Therefore, the P3E learning model with a contextual approach has been shown to be effective on natural science learning has been proven to be effective to improve the critical thinking skills of primary school students.

***Keywords**: P3E, Contextual Approach, Critical Thinking.*

I. INTRODUCTION

The era of globalization as happened in the 21st century is now an era of intense free competition between countries in the world. In this era of competition, competency and quality are needed. Quality human beings are people who have critical thinking, scientific creativity, scientific collaborative skills, have scientific literacy in solving problems caused by the impact of developmental science and technology. In the 21st century, we cannot be separated from a problem, so that the ability in the 21st century, one of which is critical thinking skills, needs to be trained to students from an early age. Therefore, they are accustomed to and easy to deal with problems and solve problems critically related in the era of industrial revolution 4.0. By learning critical thinking skills, students will reach their maximum potential. In learning the achievement of critical understanding and thinking is far more important than learning achievement as measured by achieving student test scores (Brooks & Brooks, 1993). According by Cjoy, S.C, etjal. (2012) state that critical thinking skills must be taught to students, but many teachers do not understand how to teach effective critical thinking skills to students.

The 1999, 2003 and 2007 TIMSS (Trends in International Mathematics and Science Study) reports were 435, 420 and 427 respectively. In 1999, Indonesia was ranked 32nd out of 38 countries. In 2003, Indonesia was ranked 37th out of 46 countries. In 2007, Indonesia was ranked 35th out of 49 countries. The average score in Indonesia at TIMSS 2007 was below the average score of 500, and only reached Low International Benchmarks (TIMSS, 2007). Then in 2011 the score dropped to 406 to rank 40th in 42 countries. With these achievements, the average Indonesian student only recognizes basic facts but has not been able to communicate and associate various scientific topics, so that critical thinking patterns of students are not trained. This is same with the results of the study of Joseph (2006) states that students have problems in learning including critical thingking & problem solving by 70%.

This is also reinforced by observations at Muhammadiyah 4 Elementary School (Surabaya, Indonesia) which show that (1) on student activity sheets (LKPD) students have not been trained to formulate problems, make hypotheses, identify variables, define operational variables. Whereas with the implementation of this, the students become more focused and directed, including in analyzing data according to the experiments conducted. According to Luthan (2012), that in conducting experiments or research it is important to determine the main problems. When the main problems have been determined, the classification of the problems can be specified. Conducting experiments can help the students get technical skills such as observation, data collection, data analysis, problem solving, collaboration, and communication skills (Limniou et al. 2007). In evaluating learning, the questions given to students still have not applied the HOTS problem (Higher Order Of Thinking Skill). HOTS or high-level thinking ability is an ability to think that not only requires the ability to remember, but requires other higher abilities, such as the ability to think critically and creatively. The HOTS problem does not mean difficult questions, but the questions are arranged proportionally and systematically to measure indicators of competency achievement effectively and have the depth of material so that students are also aroused to answer questions well.

Achievement of student learning outcomes, especially in terms of critical thinking, requires a suitable learning model and can be improve critical thinking skills. Critical thinking skills are key in education to solve a problem in which there are indicators. Indicators of achieving critical thinking skills must be achieved through syntax in the learning model that will be applied. Facione (2004) explains that critical thinking as a cognitive skill, and in it contains indicators of interpretation, analysis, evaluation, inference, self regulation. From these indicators, one of the learning models suitable for practicing critical thinking skills is the P3E model. The application of the P3E model is able to improve students' critical thinking skills shown in the research conducted by Bahtiar (2016). The P3E model stands for 4 phases (organizing, investigation, presentation, and evaluation). The P3E learning model always pays attention to students' initial knowledge as a basis for further knowledge. The P3E model is suitable to be applied to elementary school students. In line with Piaget's learning theory, children aged 7 to 12 years enter in the concrete operational stage, which still requires concrete objects in the learning process. The P3E learning model invites students to interact directly with the environment and find concepts independently. This can be oriented with a contextual approach. According to Johnson (in Suyadi, 2013: 81) a contextual approach is a learning strategy that emphasizes the process of full student involvement to be able to find a relationship between the material being studied and the reality of real life (surrounding environment), thus encouraging students to apply it in daily life day. "The effectiveness of the P3E Learning Model with a Contextual Approach to Train Primary School Students' Critical Thinking Skills"

II. EXPERIMENTAL METHOD

A. General Background of Research

This research was conducted at Muhammadiyah 4 Primary School (Surabaya, Indonesia). The subject of this study was applied to classes IVC, IVD, and IV E in science subjects at second semester in the 2018/2019 school year. Each class consists of 30 students. The purpose of this study was to analyze the effectiveness of P3E learning models with a contextual approach to training students' critical thinking skills. The effectiveness of learning models is determined based on:

(1) Significant improvement in scores between pre-test and post-test of students' critical thinking skills;
(2) Obtain a minimum n-gain of medium category; and
(3) Student responses are at least quite positive.

B. Instruments and Procedures

Critical thinking skills of students in primary school were measured using critical thinking evaluation sheets compiled with indicators proposed by Facione (2004), including: (1) interpretation; (2) Analysis; (3) evaluation; (4) Inference; and (5) self regulation. The learning material used is the recognition of light, the properties of light, and the effect of light on eye health. This study uses a one group pre-test and post-test design, O1 X O2 (Sugiyono, 2016: 74). Before conducting learning using the P3E model with a contextual approach, the thing to do is to give a pre-test (O1). The pre-test aims to determine the initial abilities of students in critical thinking skills. After the pre-test (O1), the teacher applies the P3E learning model with a contextual approach and science learning instruments in class (X). The application of the P3E learning model with a contextual approach was carried out during three meetings. Learning using the P3E learning model has four syntaxes: (1) Organizing; (2) Investigation; (3) Presentation; and (4) Evaluation. Whereas in the contextual approach, it has seven components, including: (1) constructivism; (2) Inquiry; (3) questions; (4) Community Learning; (5) Modeling, (6) Reflection; (7) Authentic Assessment (Muslich, 2012: 44). The science learning instruments are the syllabus, lesson plans, student participant activity sheets, textbooks, critical thinking evaluation sheets and student response questionnaires (valid and reliable). After carrying out learning using the P3E model with a contextual approach, students are given a post-test (O2) to determine students' critical thinking skills after being given treatment.

C. Data Analysis

Critical thinking skills of elementary students are analyzed based on the assessment conducted before and after the application of P3E learning with a contextual approach to fourth grade natural science subjects. Pre-test, post-test, and n-gain of critical thinking skills were analyzed by using inferential statistics with the help of IBM SPSS software 21. The N-gain was determined using the equation:

$$N\text{-}Gain = \frac{S_{post} - S_{Pre}}{S_{max} - S_{Pre}}$$

(Hake; 1999) with criteria: (1) if n-gain ≥ 0,7 (high), (2) if 0,3 < n-gain > 7 (medium), and (3) if n-gain ≤ 0,3 (low). The inferential statistical test with the P3E learning model with the contextual approach used ANOVA test or the Kruskal-Walls test.

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III. RESULT AND DISCUSSION

The results of the study are presented in this table, which will be explained as follows:

No.	Nama	Pre-test	Post-test	N-gain	Category
1.	AO	32	82	0,74	High
2.	ALW	32	89	0,84	High
3.	AAS	29	79	0,70	Medium
4.	ABR	43	89	0,81	High
5.	ABRH	39	82	0,70	Medium
6.	AMA	43	79	0,63	Medium
7.	AAA	36	86	0,78	High
8.	AAH	43	82	0,68	Medium
9.	AAP	36	79	0,67	Medium
10	AAN	46	89	0,80	High
11.	CZPA	39	86	0,77	High
12.	CARA	39	82	0,70	Medium
13.	DHFK	32	89	0,84	High
14.	DAZ	39	79	0,66	Medium
15.	DR	32	86	0,79	High
16.	DAA	39	89	0,82	High
17.	FIAA	32	82	0,74	High
18.	FADG	46	86	0,74	High
19.	FHS	29	71	0,59	Medium
20.	HAAP	39	82	0,70	Medium
21.	IAWO	43	86	0,75	High
22.	KA	50	86	0,72	High
23.	KMN	46	89	0,80	High
24.	LRC	39	79	0,66	Medium
25.	MRR	32	82	0,74	High
26.	MS	39	86	0,77	High
27.	MAW	36	79	0,67	Medium
28.	MSA	43	93	0,88	High
29.	NAD	36	79	0,67	Medium
30.	NAA	50	93	0,86	High
Averages		**38,63**	**84,00**	**0,74**	**High**

Table 1:- Individual Completeness Result IV-C

Based on table 1 above, it can be seen that the average pre-test score for individual completeness of critical thinking skills of students in class IV-C is still low, obtaining a score of 38.63, while the average post-test score of individual completeness is critical thinking skills students increase with a score of 84.00. The average of N-Gain IV-C class is 0.74 with a high category. The results of the pre-test and post-test completeness of individual critical thinking skills of class IV-D students can be seen in table 2.

ISSN No:-2456-2165

No.	Nama	Pre-test	Post-test	N-gain	Kategori
1.	ARKR	29	79	0,70	Medium
2.	AZPP	32	82	0,74	High
3.	APR	32	79	0,69	Medium
4.	ADS	39	75	0,59	Medium
5.	ALP	36	79	0,67	Medium
6.	ASAS	32	86	0,79	High
7.	AIZ	36	82	0,72	High
8.	ASK	39	86	0,77	High
9.	AZN	36	79	0,67	Medium
10	ARZ	43	89	0,81	High
11.	AAA	29	75	0,65	Medium
12.	CSP	36	82	0,72	High
13.	DAQ	29	75	0,65	Medium
14.	DAN	39	79	0,66	Medium
15.	DZAP	29	86	0,80	High
16.	GHQ	36	82	0,72	High
17.	GAW	43	89	0,81	High
18.	ILP	43	89	0,81	High
19.	IAS	29	71	0,59	Medium
20.	JAC	46	86	0,74	High
21.	KAN	50	89	0,78	High
22.	MADR	46	93	0,87	High
23.	MAI	43	93	0,88	High
24.	MPW	39	79	0,66	Medium
25.	MAPW	50	82	0,64	Medium
26.	MRA	43	89	0,81	High
27.	MA	32	86	0,79	High
28.	MRF	43	89	0,81	High
29.	MRK	46	93	0,87	High
30.	NNA	36	75	0,61	Medium
Rata-Rata		**38,03**	**83,27**	**0,73**	**High**

Table 2:- Individual Completeness Result IV-D

Based on table 2 above, it can be seen that the average pre-test score for individual completeness of critical thinking skills of students in class IV-D is still low, obtaining a score of 38.03, while the average post-test score of individual completeness is critical thinking skills students increased with a score of 83.27. The average of N-Gain IV-D class is 0.73 with a high category. The results of the pre-test and post-test completeness of individual critical thinking skills of class IV-E students can be seen in table 3.

ISSN No:-2456-2165

No.	Nama	Pre-test	Post-test	N-gain	Category
1.	ARRP	46	93	0,87	High
2.	ANLH	43	82	0,68	Medium
3.	AES	36	86	0,78	High
4.	AF	39	75	0,59	Medium
5.	ALA	32	79	0,69	Medium
6.	AAL	39	82	0,70	Medium
7.	AAA	43	89	0,81	High
8.	ARE	36	79	0,67	Medium
9.	AQN	32	71	0,57	Medium
10	AHW	39	75	0,59	Medium
11.	BP	43	93	0,88	High
12.	BAS	39	89	0,82	High
13.	CMH	46	86	0,74	High
14.	DRF	29	79	0,70	Medium
15.	FFA	50	86	0,72	High
16.	FPF	32	82	0,74	High
17.	FRY	29	79	0,70	Medium
18.	INA	32	89	0,84	High
19.	KSAR	43	86	0,75	High
20.	KASP	32	79	0,69	Medium
21.	KDC	39	82	0,70	Medium
22.	KAN	29	68	0,55	Medium
23.	LKA	39	75	0,59	Medium
24.	MAA	50	89	0,78	High
25.	MDP	43	89	0,81	High
26.	MRBS	36	75	0,61	Medium
27.	MZR	36	82	0,72	High
28.	MFRA	36	79	0,67	Medium
29.	MBA	46	96	0,93	High
30.	MNR	36	86	0,78	High
Rata-Rata		**38,33**	**82,67**	**0,72**	**High**

Table 3:- Individual Completeness Result IV-E

Based on table 3 above, it can be seen that the average pre-test score of individual completeness of critical thinking skills of students in class IV-E is still low, obtaining a score of 38.33, while the average post-test score of individual completenessjis critical thinking skills students increased with a score of 82.67. The average of N-Gain IV-E class is 0.72 with a high category. The conclusions of the three classes can be seen in the table 4.

Group	The natural science critical thingking skills of primary school students'					
	Pre-test		Post-test		N-gain	
1 (Class IVC)	38.63	Low	84.00	High	0.74	High
2 (Class IVD)	38.03	Low	83.27	High	0.73	High
3.(Class IVE)	38.33	Low	82.67	High	0.72	High

Table 4:- The average pre-test, post-test and n-gain critical thingking skills

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Table 4. Describes the average pre-test, post-test, and n-gain of primary school critical thinking skills. Pre-test scores are low because students do not yet have critical thinking skills in science. According to Piaget, teachers must be able to create challenging learning for students so that the process of assimilation and accommodation can produce intellectual growth (Arensd, 2012; Hergenhahn & Olson, 2009). Assimilation is the process of obtaining information from outside, then combining it with prior knowledge and behavior. whereas accommodation is a process of changing (adapting) old schemes to process information and new objects around their environment (Ormond, 2008; Solso 2008). This happens when students adjust their schemes with new information and experiences (Ormorod, 2008; Santrock, 2011). When the adaptation process takes place, students 'interest in using the P3E model increases with a contextual approach, so that students' critical thinking skills can be improved, this can be known through n-gain from class IVC, Class IVD, and Class IVE which are included in the high category on increasing scores pre-test and post-test every class.

The results of this study are that the pre-test, post-test, and n-gain of students' critical thinking skills are homogeneous and normally distributed for the whole class. Therefore, the P3E learning model with a contextual approach to improve the critical skills of elementary school students for the whole class uses paired t-test. The results of paired t-tests are presented in Table 5.

Class	N	*Paired t-test*, α = 5%			
		Mean	t	df	p
Class IVC	30	-45.367	-45.341	29	.000
Class IVD	30	-45.233	-46.610	29	.000
Class IVE	30	-44.333	-43.718	29	.000

Table 5:- The results of Paired t-test of natural science critical thingking skills at all class

Based on table 5, it can be seen that the results of the IVC class are equal to -45,341, the results of the t-count IVD class are -46,610, and the results of the IVE class are -43,718 with alpha (α) of 5% and df = total data - 1 or 30-1 = 29, then the amount of table is 2.045. Based on the results of t_{count} and t_{table}, it can be concluded that the location of t_{count} is in rejection H_0. This means that there is a difference between the average score of the pre-test and post-test. Because t_{count} is negative, thejpost-test score is greater than the pre-test score.

In this process, students adapt to the P3E model with a contextual approach in several learning meetings until their learning interests emerge and can improve their critical thinking skills. According to Bruner, knowledge will be a compilation obtained from independent efforts obtained and seeking knowledge that supports it. In bruner theory, the teacher helps as facilitator and provides guidance to students in developing their knowledge independently. In the P3E learning model with a contextual approach, students also do active and symbolic process for example when they make direct observation or do research and do the interpretation of what is observed or make hypothesis.

	Class IVC			ClassjIVD			Class IVE		
The response of primaryj school students	Sample	Response	Category	Sample	Response	Category	Sample	Response	Category
	30	93.00%	Very Positive	30	93.00%	Very Positive	30	91.00%	Very Positive

Table 6:- The response of primary school students to the P3E learning model with contextual approach

Table 6. shows that IVC, IVD, and IVE students gave a positive response to the P3E learning model with contextual approach. The results of this research are empirical evidence of the effectiveness of the P3E model with contextual approach for improving critical thinking skills of fourth grade students in science subjects.

IV. CONCLUSION

The P3E learning model (organizing, investigating, presenting, and evaluating) with contextual ranking is an independent learning model designed to improve critical thinking skills based on constructivism theory. P3E learning model, students are guided to construct their own knowledge through practicum, trained to solve problems, and play an activejrole in the learning process. The results of the research prove that: (1)There is an increase in critical thinking skills of elementary school students at α = 5%; 2) The average of n-gain students' critical thinking skills in the high category; (3) There is no significant (consistent) difference in critical thinking skills towards science subjects in all classes; and (4) Students respond / respond very positive. Therefore, the P3E learning model with contextual approach to natural science subjects has proven effective for improving critical thinking skills of elementary school students.

SUGGESTION

Based on the results of the research described above, the suggestions given are: (1) Before applying the P3E model-based learning device with a contextual approach, the teacher should really understand and prepare well in advance so that it does not take too long to complete one learning. (2) Students must be accustomed to conducting an investigation activity, especially in science subjects, so that they are more confident in solving critical problems, including students can formulate a problem, put forward a hypothesis, identify variables, and define operational variables.

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