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RICOSRE: Improving Students' Scientific Literacy Abilities in Environmental Change Material

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Abstract. The aim of this research is to find out how the RICOSRE learning model can influence the scientific literacy abilities of class X students on environmental change material. The research method was carried out through a quasi-experiment with a nonequivalent control group design. This study involved class X students in one of the high schools in the metropolitan city of Bekasi as the population. The sample for this research is X MIPA 1 as an experimental group using the RICOSRE learning model and X MIPA 5 as a control group using a direct learning model. The data collected is in the form of pre-test scores and post-test scores. The research results based on the Wilcoxon Signed Rank hypothesis test show that (1) there is an influence of the RICOSRE learning model with $\alpha = 0.00 < 0.05$ (2) the average N-Gain value of the RICOSRE learning model is greater than the direct learning model, namely equal to 64.38% compared to the direct learning model of i57.82%. So it can be concluded that the RICOSRE learning model has the potential to improve the scientific literacy skills of class X students at SMAN 6 Tambun on the subject of environmental change.

INTRODUCTION

Technological developments in the 21st Century require students to have more freedom in the learning process, both in speaking, expressing opinions and so on [1]. Students can solve problems independently and in groups so that there is socialization between students didik [2]. Educational institutions require 4C skills, namely creative thinking (creative thinking), critical thinking and problem solving (critical thinking and problem solving, communication and collaboration) focus on teachers (teacher center) must change to focus on students (student center) [3].These skills can of course help students to deal with social problems, scientific problems, and problems in an practically effective efektif [4]. Problem solving ability is a series of actions to solve problems using steps to produce the expected solution [5]. Learning that has been carried out by previous educators, namely by using the direct model in the form of a lecture limits students' freedom in solving problems and expressing opinions.

A learning model is a plan or pattern created to become the basis for teaching staff to provide teaching in class according to what has been prepared to make it easier for teaching staff in providing explanations of teaching materials to students [6]. Limited and monotonous learning models or tools generally cause a reduction in students' interest in learning [7]. One learning model that can be used is the RICOSRE learning model. The RICORSE learning model was first developed by [4] which facilitates students to practice high-level thinking skills. The syntax of the RICORSE learning model is a development of the problem-solving-based learning model developed by several figures such as John Dewey (1933), Georga Polya (1988) and Stephen Krulick with Jesse Rudnick (1996) which consists of Reading, Identifying the Problem, Constructing the Solution, Solving the Problem, Reviewing the Problem Solving and Extending the Problem Solving. This change is based on the similarity of students' skills in working together, thinking at a higher level, having cultural literacy, being able to communicate, and being able to learn throughout life (long life learning).

Scientific literacy is defined as scientific knowledge and skills to identify questions, gain new knowledge, explain scientific phenomena, and draw conclusions based on facts. Developing scientific literacy for elementary school students is basically about attracting student involvement in the learning process and creating a pleasant learning atmosphere [8]. In categorizing students' abilities in scientific literacy, seven indicators are used to determine scientific literacy abilities. The seven indicators refer to indicators of scientific literacy abilities, namely (1) identifying valid scientific opinions (2) conducting effective literature searches (3) understanding the elements of research design and

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their impact on findings/conclusions (4) making appropriate graphs of data; (5) solve problems using quantitative skills, including basic statistics; (6) understand and interpret basic statistics; (7) make inferences, predictions and draw conclusions based on quantitative data [9].

There are many problems in the world of education, including the literacy of students who are still in the low category. Scientific literacy is one of the parameters in determining the human development index which is greatly influenced by the quality of education [10]. Scientific literacy encompasses many skills and can be described as the ability to critically transmit and understand scientific literature and apply this to a broader information context [11]. Based on data from PISA (International Student Assessment Program), students in Indonesia had a scientific literacy score in 2018 of 379 with a ranking of 71st. Indonesia's scientific literacy scores from 2000 to 2018 were 393, 395, 395 and 383, 379. [12]. Measurement of the level of scientific literacy is also carried out by TIMSS (Trend in International Mathematics Science Study) every four years with the aim of looking at the competition for achievements in Mathematics and Science among students in grades i4 and 8 in several countries that participated in the survey [13].

The results of pre-research on scientific literacy of students in one of the middle schools in a metropolitan city show that students' scientific literacy skills are still low, with indicators of understanding scientific phenomena 41.2%, finding scientific problems 47.3%, explaining phenomena scientifically 46.8 %, using scientific evidence 50%, and solving problems 52%. Meanwhile, student learning outcomes are still below the KKM. The KKM value is 76, while the average value is 61.12. Based on data from PISA and TIMSS as well as field observations, there is evidence that students are still in the very low category in scientific literacy and their learning outcomes [14]. The problem of low scientific literacy requires a creative and innovative learning model, namely the RICOSRE learning model [15].

The RICOSRE learning model can improve scientific literacy and cognitive learning outcomes [16]. There is an influence of the RICOSRE model on scientific literacy & students' self-esteem in Biology subjects [17]. Learning analytical skills [2] Problem solving skills in upper, middle and lower academic groups [18]. The lowest academic group achieved a remarkable increase in problem solving abilities (141.17%). In contrast to previous research, this research focused on measuring students' scientific literacy in environmental change material in high schools. Based on this background, researchers offer research entitled The Effect of the RICOSRE Learning Model to Improve the Scientific Literacy Abilities of Class X Participants on Environmental Change Material.

METHOD

The method in this research uses the one-equivalent control group design method, which is a quasi-experimental design that uses experimental groups and control groups [19]. In the experimental class the RICOSRE learning method will be given, while in the control class only Direct Instruction will be used. The population used was all students in class X MIPA 1 (experimental class) and X MIPA 5 (control class) totaling 77 people. Obtaining data to measure scientific literacy using the pre-test and post-test from the experimental class and control class which used a test instrument in the form of a description consisted of 15 questions. Data analysis uses analytical and descriptive statistics. The test results were processed using IBM SPSS Statistics 23 to measure the influence of the RICOSRE learning model in increasing the scientific literacy of class X students on environmental change material.

RESULT AND FINDINGS

The normality test is used to determine whether the data is normally distributed. In Table 1, it can be observed that the post-test group, experimental group, and pre-test control group showed sig results > 0.05, which means that the post-test scores for the experimental group and the pre-test control group had an abnormal distribution

TABLE 1. Normality Test

Group		Shapiro-Wilk		
		Statistic	**df**	**Sig.**
Pre-test	Experimental Group	.938	37	.041
	Control Group	.964	35	.307
Post-test	Experimental Group	.941	37	.055
	Control Group	.922	35	.016

Meanwhile, the significance of the Shapiro Wilk test in the experimental group pre-test and control group post-test showed sig < 0.05, which means that the data was not normally distributed. With data that is not normally

distributed, the analysis will be carried out using the Wilcoxon Signed Rank test method to test paired data that is not normally distributed.

TABLE 2. Uji Wilcoxon

		N	Mean Rank	Sum of Ranks
*Post-test*_XIPA1 - *Pre-test*_XIPA1	*Negative Ranks*	0[a]	.00	.00
	Positive Ranks	37[b]	19.00	703.00
	Ties	0[c]		
	Total	37		
*Post-test*_XMIPA5 - *Pre-test*_XIPA5	*Negative Ranks*	0[d]	.00	.00
	Positive Ranks	35[e]	18.00	630.00
	Ties	0[f]		
	Total	35		

Based on the Wilcoxon test in Table 2, it was found that at a significant level of 0.05, the asmyp value was found. Sig (2 tailed) = 0.000 < 0.05 in both classes, namely X IPA 1 as the experimental group and X IPA 5 as the control group, so it can be interpreted that there is a significant difference between the pre-test and post-test. Based on further observations, it can be observed that all class members in X IPA 1, namely the experimental group, and in class XIPA 5, which is the control group, have experienced an increase. This can be observed in the first table, namely the N positive rank or the increase in X IPA 1 by 37 and in X IPA 5 by 35.

TABLE 3. N-Gain Test

Group				Statistic	Std. Error
NGain	Experimental group	*Mean*		64.3887	3.82215
		95% Confidence Interval for Mean	*Lower Bound*	56.6370	
			Upper Bound	72.1404	
	Control Group	*Mean*		57.8248	3.64391
		95% Confidence Interval for Mean	*Lower Bound*	50.4195	
			Upper Bound	65.2302	

Based on the statistical values in Table 3, it was found that the n gain value in the experimental group, on average, was 64.3887%, which means that effectiveness was in the quite effective category, while in the control group it was also in the same category, namely in the quite effective category, namely an average of 57.8248%. When compared, it can be interpreted that the effectiveness of the experimental learning model is better than the effectiveness of the control group.

DISCUSSION

The research results show that there is a significant increase in scores on the post-test compared to the pre-test in the experimental class, so it can be interpreted that the RICOSRE learning model has an effect on increasing students' scientific literacy. In accordance with research conducted by _which states that the RICOSRE learning model is an efficient learning model in improving students' cognitive abilities, which in this research is directly proportional to the level of scientific literacy.

The reading syntax in this research is that students are motivated to think critically and creatively by constructing meaning from a text. Reading activities are very important and must be included in the core learning process [20].The syntax for identifying the problem is that students are trained to think critically by understanding the meaning of the problem and how to solve it. Formulating a problem not only involves finding the problem, but also conducting a thorough investigation to find out the reasons behind the problem [4]. The syntax of constructing the solution is that students are trained to think creatively by designing solution paths to solve problems [21]revealed that creative thinking is the main ability to find problems, make solutions in various dimensions flexible, and create new ideas. The problem solving syntax in this research trains students to think critically and creatively by implementing strategies to

solve problems. Problem solving can be interpreted as developing ideas or creativity in building new knowledge [5]. The syntax of reviewing the problem solving and extending the problem solving aims to train students to think critically by analyzing the effectiveness and efficiency of the solution they have chosen and apply these solutions to similar problems (Mahanal & Zubaidah, 2019).

Based on the N-gain value, it can be seen that the efficiency of the RICOSRE learning model was found to be an average of 64.3887%, while the average efficiency of the direct learning model was found to be 57.8248%. When compared, it can be observed that with the RICOSRE learning model, higher effectiveness was found, namely better improvement compared to classes taught with the direct learning model. Based on this comparison, it was found to be in accordance with research conducted by [22]. These findings state that the learning model has an influence on the science literacy abilities of students, with it being found that the increase in the RICOSRE learning model is also higher than the direct learning model.

The RICOSRE learning model compared to the direct learning model has several advantages. The advantages of this learning model include that it is applicative [18]. The RICOSRE learning model directly connects the knowledge being studied with life as well as experiments and case studies, stimulating students to be able to connect this knowledge with problems that may be encountered. Apart from that, another advantage of the RICOSRE learning model is that it stimulates students' ability to think [21]. This increase in creative thinking abilities comes from the syntax of constructing the solution and solving the problem. Based on the advantages discussed previously, namely the formation of a relationship between students' knowledge and the problems they may encounter, this will encourage students to think creatively in solving problems that they have never encountered before with limited knowledge. With this encouragement, it is hoped that students' ability to solve problems will increase considerably.

CONCLUSION

The data collected and the results found from this research show that in the RICOSRE learning model, as well as in the direct learning model, there is an influence on scientific literacy skills, namely by obtaining an asmyp.sig score of $0.00 < 0.05$. Then, in the results of comparing the N-Gain values between the two learning models, it was found that there was an increase in the RICOSRE learning model which was greater than the increase in the direct learning model, namely 64.388% compared to the direct learning model of 57.828%, so it can be concluded that the RICOSRE learning model is more effectively used than in the direct learning model.

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