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The Potential of RICOSRE's Learning Model in Improving Cognitive Learning Outcomes

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Abstract: Cognitive learning outcomes are learning outcomes that focus on intellectual knowledge. Some researches showed that the students learning outcomes of high school in Malang were still need improved. The study aims to determine the effect of the RICOSRE learning model in improving students' cognitive learning outcomes. This type of research is quasi experiment, using students of SMAN 1 Malang, SMAN 8 Malang, SMAN 1 Turen, and SMAN 1 Singosari as participants. Data analysis used covariance analysis then followed by post hoc test of LSD. The results of the analysis show that the RICOSRE learning model can improve students' cognitive learning outcomes compared to learning using *Problem Based Learning* and conventional learning.

Key Words: cognitive learning outcomes, RICOSRE learning model

Abstrak: Hasil belajar kognitif merupakan pencapaian belajar yang berada pada domain yang berfokus pada pengetahuan dan keahlian intelektual. Berbagai hasil penelitian menunjukkan bahwa secara umum hasil belajar siswa SMA di Malang masih perlu ditingkatkan. Penelitian bertujuan untuk mengetahui pengaruh model pembelajaran RICOSRE dalam meningkatkan hasil belajar kognitif siswa di Malang, Jawa Timur. Jenis penelitian adalah kuasi eksperimen, dengan menggunakan partisipan siswa di SMAN 1 Malang, SMAN 8 Malang SMAN 1 Turen, dan SMAN 1 Singosari. Analisis data menggunakan analisis kovarian kemudian dilanjutkan uji lanjut LSD. Hasil analisis data menunjukkan model pembelajaran RICOSRE dapat meningkatkan hasil belajar kognitif siswa dibandingkan pembelajaran menggunakan *Problem Based Learning* dan pembelajaran konvensional.

Kata kunci: hasil belajar kognitif, model pembelajaran RICOSRE

INTRODUCTION

Cognitive learning outcomes are learning out comes in a domain that focuses on intellectual knowledge and expertise (Eggen & Kauhack, 2012). Cognitive learning outcomes are sub-taxonomies about mental activities that are simpler that is remembering, increasing in problem solving skills that are more complicated to the highest level that is creating (Boyd & Vitzelio, 2010). Cognitive learning outcomes according to Bloom that have been revised by Anderson and Krathwohl can be divided into six levels, namely remembering, understanding, applying, analyzing, evaluating, evaluating, and creating Anderson & Krathwohl, 2001). Cognitive learning outcomes become a benchmark of success in the learning process of students (Sudjana, 2010).

Facts show that cognitive learning outcomes still need to be improved. The cognitive learning outcomes of Biology subjects at SMAN 1 Singosari showed 35% of students did not reach the Minimum Mastery Criteria (KKM) with an average value of 78.85 (Fajarwati, 2017). The results of other studies also showed the achievement of KKM as not in SMAN 6 Kota Malang (Yanuarta, 2017). Unsatisfactory cognitive learning results were also found in Malang 5 High Schools (Kusumaningtias, Zubaidah, & Indriwati, 2013), SMAN 6 Malang (Fauziyah, Corebima, & Zubaidah, 2013), Insan Cendekia Shalahudin Malang High School (Hasan, Zubaidah, & Mahanal, 2013) 2014), Surya Buana Malang High School (Prasmala, Zubaidah, & Mahanal, 2014), and several private high schools in Batu (Tendrita, Mahanal, & Zubaidah, 2017). Several other schools also showed similar re-

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sults (Insyasiska, 2013; Yunisa, Jalmo, & Maulina, 2015).

These facts are reinforced from the results of preliminary tests conducted in class XI of SMAN 1 Malang, SMAN 3 Malang, SMAN 4 Malang, SMAN 7 Malang, SMAN 8 Malang, SMAN 1 Singosari and SMAN 1 Turen. Preliminary tests using BC 3.4 Analyze the structure and replication, as well as the role of viruses in aspects of public health and 3.5 Analyze the structure and way of life of bacteria and their role in various aspects of community life. Cognitive learning outcomes seen include aspects of C3 for 6 questions, C4 for 7 questions, C5 for 3 questions, and C6 for 2 questions. The results show that students who did not reach KKM were 49%. Students' abilities are still limited to memorization and have difficulty with problems that require analysis and understanding. Various factors are suspected to be the cause of low cognitive learning outcomes. One of them is learning that is less interesting for students conducted in the classroom (Ramadan, Mahanal, & Zubaidah, 2017; Mahanal, Darmawan, Corebima, & Zubaidah, 2010). One alternative solution to overcome this is to apply a problem-based learning model, including RICOSRE. The RICOSRE learning model is a model developed by Mahanal and Zubaidah (2017). The syntax of the RICOSRE learning model was developed based on the problem solving learning model developed by John Dewey (Carson, 2007), Polya (1988), and Krulick and Rudnick (1996) as explained by Sari, Mahanal, and Zubaidah (2018). The syntax consists of reading, identifying problems, constructing solutions, solving problems, reviewing problem solutions, and extending problem solutions (Mahanal & Zubaidah, 2017). The RICOSRE learning model is expected to potentially improve cognitive learning outcomes. RICOSRE has been known to have the potential to develop critical thinking skills (Mahanal et al., 2019).

The purpose of this study was to determine the effect of the RICOSRE learning model in improving student cognitive learning outcomes. Besides RICOSRE, another problem based learning model is Problem Based Learning (PBL), therefore in this study PBL model is applied as positive control. The hypothesis proposed is: there are differences in cognitive learning outcomes between students who are taught using the RICOSRE, PBL, and conventional learning models.

METHOD

The study used a quasi-experimental design (quasi experimental design) with a pretest-posttest nonequivalent control group design. The learning experimental class uses the RICOSRE learning model, the learning control class uses the PBL learning model and the negative control class learns to use the conventional learning model (learning as usual without researcher intervention). Pretest questions are given before treatment to measure the initial ability of students in all classes, and to know differences in understanding related to the concepts of the three groups after the implementation of learning during the study conducted posttest.

The study was conducted in the odd semester of the 2018/2019 school year. The population in this study were all students of class X MIPA SMAN in Malang, East Java. The sample used in this study were students of class X MIPA SMA Negeri 1 Malang, SMA Negeri 8 Malang, SMA Negeri 1 Singosari and SMA Negeri 1 Turen. The determination of the sample is based on the results of the equivalence test using written test questions. The test results were tested with Anava, the results showed an equivalent class and some were not equal. Equivalent classes are then randomly selected for use in research.

Data collection after learning was done using essay tests to measure student cognitive learning outcomes. Cognitive learning outcomes include Biology class X material, namely Viruses and Monera. Cognitive learning outcomes refer to the revised Bloom's taxonomy of Anderson and Krathwohl namely applying (C3), analyzing (C4), evaluating (C5), and creating (C6). The results of the essay test on cognitive learning outcomes were analyzed with the rubric of cognitive learning outcomes. Before the test, essay questions are first validated in terms of content and construct validity. The essay question used has fulfilled empirical validity and reliability with $r_{count} = 0.822$ (> 0.700), meaning high reliability. A summary of the validity test results can be seen in Table 1 and a summary of the reliability results are presented in Table 2.

Table 2. Reliability Results

Cronbach's Alpha	N of items
0,822	16

Table 1. Validation Results

Items	R count	R table (5%)	Remark
1a	0,252	0,1614	Valid
1b	0,324	0,1614	Valid
2a	0,451	0,1614	Valid
2b	0,359	0,1614	Valid
3a	0,489	0,1614	Valid
3b	0,387	0,1614	Valid
4a	0,575	0,1614	Valid
4b	0,612	0,1614	Valid
5a	0,631	0,1614	Valid
5b	0,672	0,1614	Valid
6a	0,531	0,1614	Valid
6b	0,606	0,1614	Valid
7a	0,615	0,1614	Valid
7b	0,650	0,1614	Valid
8a	0,635	0,1614	Valid
8b	0,518	0,1614	Valid

Cognitive learning outcomes data were analyzed by analysis of covariance (Anakova) which was then continued with LSD (Least Significance Difference). All data that has been collected is tested prerequisites before testing the hypothesis through Anakova which includes the normality test and the homogeneity of variance tests. The normality test uses the Kolmogorov-Smirnov One-Sample test, while the homogeneity test uses the Levene's Test.

RESULTS

Description of Cognitive Learning Outcomes Average Score

The results showed that students who were taught with the RICOSRE model experienced the highest increase, followed by PBL and conventional learning. Data on average pretest and posttest scores of cognitive learning outcomes in conventional learning increased by 15,650%, PBL learning increased by 58.090% while RICOSRE learning increased by 64.578% is presented in Table 3.

Prerequisite Test Variables Bound Cognitive Learning Outcomes

The prerequisite test consisted of a normality test and a data homogeneity test before testing a hypothesis. Normality test was used to determine the distribution of data, while the homegeneity test to determine the variance of the data. A summary of the results of the normality and homogeneity tests on the pretest and posttest scores of cognitive learning outcomes is shown in Table 4 and Table 5.

Table 3. Pretest and Posttest Score of Cognitive Learning Outcomes

Model	*Pretest*	*Posttest*	Margin	Increase
Conventiona; (Control Negative)	27,168	31,420	4,252	15,650%
PBL (Control Positive)	25,042	39,589	14,547	58,090%
RICOSRE (Experimental)	28,257	46,505	18,248	64,578%

Table 4. Normality Testing Results

Variable	Significance (2-tailed)		Alpha
	Pretest	*Posttest*	
Learning outcomes	0,596	0,117	0,05

Table 5. Homogeneity Testing Results

Data	F	df	Sig.	Alpha
Pretest	22,908	323	0,120	0,05
Posttest	0,766	323	0,382	0,05

Table 4 shows that the significance value of each variable in the pretest and posttest is greater than the alpha value of 0.05 ($p > 0.05$) means that the pretest and posttest data on the variable of cognitive learning outcomes are normally distributed. Table 5 shows the results that the significance value of each variable both in the pretest and posttest is greater than the alpha value of 0.05 ($p > 0.05$) means that the pretest and posttest data on the cognitive learning outcome variable has a homogeneous variant. Therefore, the data analysis continued with the hypothesis test.

Hypothesis Test of Dependent Variables Cognitive Learning Outcomes

The results of the analysis using the Anacova test showed that the learning model obtained Fcount = 20.306 with p-value = 0.046. p-value < α (α = 0.05). Thus, the hypothesis is accepted. That is, there is an influence of learning models on the achievement of cognitive learning outcomes of students. A summary of the Anakova test on the effect of the learning model on cognitive learning outcomes can be seen in Table 6.

After the Anakova test, the analysis continued with the LSD test to find out the difference in mean corrected in each learning model. LSD test results of the influence of learning models on cognitive learning outcomes are presented in Table 7.

LSD further test results showed that the mean score corrected cognitive learning outcomes in the RICOSRE learning model were significantly different from PBL and conventional learning. Learning with PBL is also significantly different from conventional learning. The mean corrected score of cognitive learning outcomes in conventional learning was 31.320, PBL learning was 40.377, while RICOSRE learning was 45.722. The average percentage of corrected scores of the RICOSRE learning model was 13.23% higher than PBL learning, and 45.98% higher than conventional learning. This means that the RICOSRE learning model has more potential to improve student cognitive learning outcomes compared to PBL learning and conventional learning.

DISCUSSION

Based on Anakova test results, it is known that there is a significant influence of learning models on cognitive learning outcomes. The results of the LSD follow-up test showed that there were differences in mean corrected scores sequentially from lowest to highest obtained from the treatment using conventional learning, PBL learning and RICOSRE learning. Similar research results revealed that there was an increase in student learning outcomes after the application of the RICOSRE learning model (Sumiati, 2017). Other studies also report that problem-based learning can improve student cognitive learning outcomes (Ganina & Voolaid, 2002; Cheng, She, & Huang, 2018). These results are in line with various findings that reveal that learning models in the classroom can influence student cognitive learning outcomes (Micklich, 2011; Lashari, Alias, Akasah, & Kesot, 2012; Hermansyah et al., 2019).

The RICOSRE learning model is able to have a better impact on improving students' cognitive learning outcomes, allegedly because of the characteristics of the RICOSRE syntax which are indeed designed to empower several abilities. The RICOSRE model consists of reading syntax, identifying problems (Identifying the Problem), constructing solutions (Constructing the Solution), solving problems (Solving the Problem), reviewing problem solving (Reviewing the

Table 6. The Effect of Learning Models on Cognitive Learning Outcomes

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	8463,842	1	8463,842	173,923	,000
XHBK	2101,232	1	2101,232	44,877	,000
Model	11040,053	2	5520,074	20,306	,046
Error	549,190	321	271,845		
Total	22154,320	325			

Tabel 7. LSD Test Results of Cognitive Learning Outcomes

Model	*Pretest*	*Posttest*	Margin	Corrected mean	Notation
Conventional	27,168	31,420	4,252	31,320	a
PBL	25,042	39,589	14,547	40,377	b
RICOSRE	28,257	46,505	18,248	45,722	c

Problem Solving), extending problem solving (Extending the Problem) Problem Solving).

The first syntax of the RICOSRE learning model is reading. Reading in the learning model there are two kinds of activities, namely reading the material carried out at home, the results of the reading activities are outlined in the form of a resume. Reading is an activity encouraging students to assimilate knowledge or information that is in themselves, so students can construct knowledge or information related to the material being studied and students can understand the material being learned better (El-Koumy, 2006). In addition to involving seeking information, through reading activities are expected to be able to understand the meaning of what is read and compare thoughts with the writer's thoughts (Genlot & Grönlund, 2013). Direct reading activities undertaken by students can contribute to improving learning outcomes, especially in the aspects of remembering (C1) and understanding (C2).

The second syntax of the RICOSRE learning model is Indentifying the Problem. Identifying the problem of a problem process that is not clear, not structured and then the problem is identified by students (Mahanal & Zubaidah, 2017). The first stage in developing problem solving is to learn how to see each situation as an identifiable problem (Abazov, 2016). The syntax of the third RICOSRE learning model is Contructing the Solution. The phase of building solutions is a creative as well as practical step where students must develop the possibility of solutions or variations identified. In this step use the brainstorming process to produce as many solutions as possible (Mon-tesinos, 2010). Activities identifying problems and building solutions contribute to improving learning outcomes, especially in the aspects of applying (C3).

The syntax of the fourth RICOSRE learning mod-el is Solving the Problem. Problem solving as a process of several steps in which problem solvers (students) must find the relationship between the previous experience gained from the reading process and the problem provided and then determine the solution (Olaniyan et al., 2015). The process of solving this problem contributes to the improvement in analyzing aspects (C4).

The final syntax of the RICOSRE learning model is Reviewing the Problem Solving and Extending the Problem Solving. At this stage students review the advantages and disadvantages of the solutions offered, broaden the problem by looking for problems similar to the solutions offered, students communicate the results of the discussions carried out, and receive input in the class discussion process. In the activities of Extending the Problem Solving done to encourage students to apply new knowledge and skills from solving previous problems to new phenomena that have never been faced by students (Llewellyn, 2013). Reviewing solutions activities can contribute to the improvement in evaluating aspects (C5) and expanding the problem can improve in the creation aspects (C6)

RICOSRE learning that emphasizes reading activities, identifying problems, building solutions, solving problems, reviewing solutions and expanding solutions makes RICOSRE learning more potential in improving student cognitive learning outcomes than PBL learning and conventional learning. The syntax in PBL learning is that there are no structured reading activities, reviewing solutions, and expanding solutions, whereas in conventional learning that refers to a scientific approach there is also no scheduled reading activities, identifying problems, building solutions, reviewing solutions and extending solutions. The syntax in RICOSRE learning that has been explained is closely related to aspects of cognitive learning outcomes of the ability to remember (C1), understand (C2), apply (C3), analyze (C4), evaluate (C5), and create (C6). This is the reason for the increase in cognitive learning outcomes when students are empowered to use the RICOSRE learning model.

CONCLUSIONS

Based on the results of this study, it is concluded that the learning model affects the cognitive learning outcomes of students. The mean corrected score on cognitive learning outcomes in RICOSRE learning is higher compared to PBL learning and conventional learning. Thus, RICOSRE learning has the potential to be better in improving student cognitive learning outcomes.

RICOSRE learning can be used by teachers as classroom learning to improve student cognitive learning outcomes. The RICOSRE model can also be tried to determine its impact on various abilities related to 21st century skills that are the focus of empowerment.

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