The Influence of Reciprocal Teaching Model on Students' Critical Thinking Skills in Learning the Systems of Inequalities with Two Variables

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ABSTRACT

This study aims to determine the influence of the Reciprocal Teaching model on students' critical thinking skills in learning The Systems of Inequalities with Two Variables. This study used a pre-experimental design. The population of this study was 10th- grade students at SMAN 1 Campalagian, Polewali Mandar regency. The sample of this study was class X MIA 2 students at SMAN 1 Campalagian Kabupaten Polewali Mandar. Data collection was carried out using the test technique. The data were analyzed using descriptive statistics and inferential statistics. The results of descriptive statistical analysis show that (1) the average pretest score of students' critical thinking skills (39,79) is in the very uncritical category, (2) the average posttest score of students' critical thinking skills (84,15) is in the critical category, (3) N-gain score (0,74) is in the high category. The results of inferential statistical analysis show that the average score of the students after the experiment is greater than 80 (critical category) with df = 32, and the significance is less than the significance level (0,014 < 0,05), which means H0 is rejected. Based on the study results, it can be concluded that the Reciprocal Teaching model affects students' critical thinking skills in learning The Systems of Inequalities with Two Variables.

Keywords: Reciprocal Teaching model, Critical Thinking Skills, The Systems of Inequalities with Two Variables.

1. INTRODUCTION

National education aims to develop capabilities and shape the character and civilization of a dignified nation in the context of educating the nation's life so that students become human beings who believe and fear God Almighty, have a noble character, healthy, knowledgeable, capable, creative, independent, and democratic and responsible citizens.

The national education goals can be realized through curriculum development that is carried out in a directed manner and adjusts to the times. This is based on the definition of the curriculum contained in the Law of the Republic of Indonesia Number 20 of 2003 article 1 paragraph 19 concerning the National Education System, namely a set of plans and arrangements regarding the objectives, content, and learning materials, as well as the methods used as

guidelines for the implementation of learning activities for achieving educational goals. Based on the Joint Regulation of the Director-General of Basic Education and the Director-General of Secondary Education of the Ministry of Education and Culture article 2 paragraphs 1 and 3, the current curriculum in elementary and secondary education is the Curriculum 2006 and the Curriculum 2013, in which schools have implemented the Curriculum 2013 for a long time. Three semesters will continue to implement the curriculum. Schools that choose not to continue the 2013 Curriculum can implement the 2006 Curriculum by reporting to the Minister of Education and Culture through the provincial/district/city education office [1].

In the Curriculum 2013 and the Education Unit Level Curriculum, mathematics is one of the compulsory subjects in primary and secondary

education. This shows that mathematics is the main subject at school. Mathematics trains students to use and develop their thinking skills.

However, mathematics is a frightening subject for most students, and they think that mathematics problems are hard to be solved [2]. Most of the students have difficulties understanding the purpose of the problem, what is being asked, and material related to the problem. In addition, sometimes, students make mistakes in their calculations.

Mathematics is a discipline that trains students to think logically, rationally, critically, and carefully. The problem is that most students agree that mathematics is the most frightening and challenging subject. This perception must be eliminated since it will affect student learning success in mathematics. Everyone can learn critically because the human brain is constantly trying to make sense of experience.

The beauty of mathematics does not appear in the final result but in the process of achieving it. However, to achieve the final results, it is not enough to use ordinary thinking skills. High-order thinking skills are needed.

Higher-order thinking ability is a thinking ability that requires the ability to remember and other abilities such as critical thinking skills. Critical thinking is part of higher-order thinking. Critical thinking means thinking with logical reasons.

According to [3], critical thinking is a process that aims to make rational decisions directed at deciding whether to believe or do something. Critical thinking is an ongoing, active, and thorough process. A person's critical thinking ability can be recognized from the indicators/characteristics of his critical thinking ability [3].

To measure the critical thinking skills of students in learning mathematics, an essay test can be used since it has advantages to see how students develop their thinking skills, especially in the aspects of analysis, synthesis, and evaluation.

In learning mathematics, students need to show an active, creative, innovative, and responsible attitude. This is in accordance with Piaget's learning theory which states that learning should focus on children's thinking processes by involving children in the learning process facilitated by teachers.

Based on observations at SMA Negeri 1 Campalagian, Polewali Mandar Regency, students were still less active in learning mathematics in class. Student inactivity can be seen from students who did not dare to ask questions about the topic that was not understood at that time. In addition, teachers applied a conventional model, which was still teacher-centered. Students just listened and accepted the material presented by the teacher without any comments. As a result, students had difficulty in solving mathematical problems. It was difficult for students to understand the meaning and purpose of the questions. Students also had difficulty in determining the steps for solving the problems given. Students assumed that mathematics was a difficult subject.

Consequently, this assumption made students not enthusiastic about learning. In addition, students had no motivation to solve mathematics problems. Therefore, it can be concluded that students' critical thinking skills have not developed well.

According to Johnson's [4], critical thinking is a directed and clear process used in mental activities such as solving problems, making decisions, persuading, analyzing assumptions, scientific research. Critical thinking is an important key in learning mathematics.

When a teacher or instructor wants to teach something to his students well and successfully, the first thing to pay attention to is the learning model that will be used so that the expected goals can be achieved or carried out properly because by using the function model as a tool to achieve goals. Thus, if the knowledge of to use that model can be applied correctly, the goal will be achieved. In this case, the researcher tries to apply a student-centered mathematics learning model, namely the Reciprocal Teaching model.

According to Trianto [5], Reciprocal Teaching was mainly developed to help teachers use collaborative learning dialogues to teach reading comprehension independently in class. According to Trianto [6], the use of this model was chosen for several reasons, namely increasing activities that readers routinely use, increasing understanding, and giving readers the opportunity to monitor their own understanding, strongly supporting collaborative dialogue (discussion). As revealed by [6], the four phases that must be carried out in the Reciprocal Teaching model to understand the reading text are: summarizing, asking questions (questioning); to clarify (clarifying), and predicting.

In this Reciprocal Teaching-learning model, students are expected to be able to hone critical thinking skills. Reciprocal Teaching was chosen because it is a student-centered learning model; here, students are directly involved in finding solutions to a problem in mathematics. Students are required to be independent in learning to make students able to analyze, synthesize, solve and evaluate their problems.

Based on the problems described above, the researchers made the title The Influence of Reciprocal Teaching Model on Students' Critical Thinking Skills in Learning the Systems of Inequalities with Two Variables.

2. RESEARCH METHODS

This type of research is pre-experimental. In this type of research, there is no control variable. This research was conducted at SMA Negeri 1 Campalagian, Polewali Mandar Regency. The population in this study was all class X. The sample in this study was class X MIA 2.

The research design used in this study was a pre-experimental one-group pretest-posttest. This design involved one group being given a pretest (O), given treatment (X), and given a posttest. The success of the treatment was determined by comparing the pretest and posttest scores. In this pre-experimental one-group pretest-posttest research, the first step was to determine the research sample. The next stage was to give a pretest to measure students' critical thinking skills before being given treatment using the Reciprocal Teaching model. In the next stage, the sample was given treatment by applying the Reciprocal Teaching model. Then the last stage, the sample was given a posttest to measure students' critical thinking skills after being given the Reciprocal Teaching model treatment. The design model is as follows:

Table 1. Research Design Model

Kelas Eksperimen	O_1	X_1	O_2

Notes:

O_1 = The experimental class is given a pretest

O_2 = The experimental class is given a posttest

X_1 = Treatment by using the Reciprocal Teaching model

The instrument was in the form of description questions to measure students' critical thinking skills. Each question has an indicator of critical thinking ability. The test questions were given before (pretest) and after (posttest) treatment.

3. RESULT AND DISCUSSION

3.1 Result

The description of students' critical thinking skills before the application of the Reciprocal Teaching model is as follows:

Table 2. Statistics of Students' Critical Thinking Abilities before being given treatment (pretest)

Statistic	Statistic value
Number of samples	33
Ideal score	100
Maximum score	65
Minimum score	11
Score range	54
Average score	39,79
Standard deviation	15,01

The results of calculations using SPSS 25 version, the pretest in the experimental class obtained a valid sample of 33, an average score of 39.79, a minimum value of 11 and a maximum value of 65, a standard deviation of 15.01.

Furthermore, the category of critical thinking ability pretest in the experimental class using the Reciprocal Teaching model is presented in table 3.

Table 3. Frequency distribution and percentage of students' critical thinking ability before being given treatment (pretest)

Score interval	Category	Frequency	Percentage (%)
90 – 100	Very critical	0	0
80 – 89	Critical	0	0
65 – 79	Quite critical	1	3,03
55 – 64	Not critical	8	24,24

< 55	Very not critical	24	72,72
Total		33	100

Table 3 above shows that 100% of the 33 students still have not reached the category of critical thinking.

The following is descriptive of students' critical thinking skills after the application of the Reciprocal Teaching model.

Tabel 4. Statistics of Students' Critical Thinking Ability after being given treatment (posttest)

Statistics	Statistic value
Number of samples	33
Ideal score	100
Maximum score	100
Minimum score	56
Range score	44
Average score	84,15
Standard deviation	9,22

The results of calculations using SPSS 25 version, the posttest in the experimental class obtained a valid sample of 33, an average score of 84.15, a minimum value of 56, and a maximum value of 100, a standard deviation 9.22.

Furthermore, the categories of posttest critical thinking skills in the experimental class using the Reciprocal Teaching model are presented in table 5.

Tabel 5. Distribution of Frequency and Percentage of Students' Critical Thinking Ability after being given treatment (posttest)

Interval Score	Category	Frequency	Percentage (%)
90 – 100	Very critical	10	30,30
80 – 89	Critical	16	48,48
65 – 79	Quite critical	6	18,18
55 – 64	Not critical	1	3,03
< 55	Very not critical	0	0
Total		33	100

Table 5 above shows that students who get the critical category are 10 or 30.30% of the number of students, 16 are included in the critical category or 48.48% of the number of students, 6 or 18.18% of the number of students are categorized as quite critical. 1 person is included in the not critical category or 3.03% of the total number of students.

The descriptive N-gain after the application of the Reciprocal Teaching model is as follows.

Tabel 6. Statistics of *Gain* of critical thinking ability of students after giving the treatment (*posttest*)

Statistic	Statistic value
Number of samples	33
Ideal score	1,00
Maximum score	1,00
Minimum score	0,48
range N-Gain score	0,52
Average N-Gain score	0,74

Based on Table 6 above, it can be seen that the average score of students' critical thinking ability gain after the learning process by applying the Reciprocal Teaching model is 0.74 from the ideal score of 1.00. The gain scores achieved by these students ranged from the lowest score of 0.48 to the highest score of 1.00, with a score range of 0.52.

Furthermore, the data on the increase (gain) of students' critical thinking skills after applying the Reciprocal Teaching model is categorized based on students' critical thinking skills, which can be seen in the following table.

Tabel 7. Descriptive Improvement of Students' Critical Thinking Ability After Being Given Treatment (posttest)

Gain Value	Category	Frequency	Percentage (%)
$g \geq 0,7$	Tinggi	21	63,63
$0,3 \leq g < 0,7$	Sedang	12	36,36
$g < 0,3$	Rendah	0	0
Jumlah		33	100

Based on Table 7 above, it can be seen that there are 21 people or 63.63% of the number of students whose gain value is at a score of g 0.7, which means that the increase in students' critical thinking skills is in the high category. There are 12 students. or 36.36% of the number of students. The gain is at a score of 0.3 g 0.7, which means that the increase in students' critical thinking skills is in the medium category.

Suppose the students' average normalized gain of 0.74 is converted into the 3 categories above. In that case, the average normalized gain of students is in the interval g 0.7, which means an increase in students' critical thinking skills in class X MIA 2 SMA Negeri 1 Campalagian, Polewali Mandar Regency after applying the Reciprocal Teaching model is in the high category.

Based on the posttest t-test, it is known that the average result of the experimental class's critical thinking ability is 84.15. From the table, it is known that the significance is 0.014 with df = 32 at a significance level of 0.05. The significance value < significance level (0.014 < 0.05). It can be concluded that there is an effect on students' critical thinking skills using the Reciprocal Teaching model.

3.2 Discussion

In this study, the researcher used the Reciprocal Teaching model to the experimental class, namely class X MIA 2 SMA Negeri 1 Campalagian, Polewali Mandar Regency. In this study, students were given pretest and posttest questions to be given students' critical thinking skills. The questions are in the form of a description test with the material of the systems of inequalities with two variables. The results of the pretest and posttest were then analyzed descriptively and inferentially.

Based on the descriptive analysis of N-gain, the average N-gain score of students' critical thinking skills using the Reciprocal Teaching model of 0.74 is in the high category.

Based on the test hypothesis using the t-test, a significance value < significance level = 0.014 < 0.05, which means H0 is rejected, and H1 is accepted.

Based on the results of the descriptive and inferential analysis obtained, it can be concluded that the Reciprocal Teaching model influences students' critical thinking skills on the problem of the two-variable inequality system.

4. CONCLUSION

Based on the research and discussion results, it can be concluded that the Reciprocal Teaching model affects the critical thinking skills of students in class X MIA 2 SMA Negeri 1 Campalagian, Polewali Mandar Regency. This is indicated by the average posttest value of critical thinking skills in the experimental class of 84.15 and the average value of N-gain critical thinking skills in the experimental class of 0.74.

AUTHORS' CONTRIBUTIONS

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