

# The Application of Reciprocal Teaching on the Subject of Straight Line Equation in Second Grade of Junior High School

Darsono

Study program of mathematics education, University of Nusantara PGRI Ternate

## Abstract

Mathematics as an abstract science can be easily understood by a junior high school student when it is accompanied by concrete examples which is appropriate to the situation and conditions encountered. At the level of cognitive development, children actually very much based on the movements and actions. In this case, the children will learn at their best way if the initiative is based on the teaching and learning activities. In this way, the task a teacher is not giving knowledge, but preparing teaching situation that led children to ask questions, observe, predict, and find a concept of its own. One of the alternatives that can be done by the writer can be done by assessing the application of reciprocal teaching. This study is a quasi-experimental study that is preceded by the development of learning tools and research instruments. Symptoms which will be investigated in this study are first is the difference in learning outcomes of students who are taught mathematics reciprocal teaching with students who are taught by conventional teaching. While the symptoms of the two that will be investigated is an overview of some aspects related to the application of reciprocal teaching which covers; activities of teachers and students in learning, the teacher's response and the response of students towards learning, the management of teacher learning, mastery of learning. Based on the results of a descriptive and inferential analysis using Anacova, it is concluded that: (1) there is a difference between the learning outcomes of students who are taught using reciprocal teaching and learning outcomes of students who are taught using conventional learning; (2) the application of reciprocal teaching models turned on on the subject of straight-line equation in the second grade of Junior High school is effective; (3) the response after being taught by reciprocal teaching shows that most of the students want to attend classes with reciprocal teaching again and the teacher teaching using reciprocal teaching also respond positively. It is shown by teacher's statement saying that applying reciprocal teaching can help students to be able to communicate knowledge through discussion, ask questions, express opinions in front of other students, and to train students to be able to make a summary.

**Keywords:** reciprocal teaching

## Introduction

Nowadays the pattern of teaching is too much dominated by teachers, particularly in the transformation of knowledge to the students. Such learning pattern should be changed by pushing students looking for science itself. Thus, the teacher is only a facilitator, while the learners / students should find the concepts independently. The use of the learning model described previously may result in low involvement of the students during the learning activity and thus decrease their participation. In this case, the role of the student is no longer a subject of active and creative learning but rather as learning object. The responsibilities of the student in relation to learning are develop, discover, investigate, and disclose his knowledge to be reduced.

In the effort of anticipating the previously mentioned problems, teachers are required seek and find a way to motivate students to learn. This understanding implies that teachers are expected to develop a learning model that can improve the ability to develop, discover, investigate and express students' ideas thus teachers are expected to enhance the students' ability to solve problems, including problems in mathematics.

The developments of science and technology, especially information technology takes place more quickly so that all the information in it, including teaching materials can be obtained quickly and from a variety of media. With the development of information technology, it's no longer possible to teach all teachers teaching materials to students. If teachers insist on this attitude, then the only solution is done by cramming all the teaching materials to students. Thus, the teacher will act as the sole source of the most important information

Mathematics is a science having abstract object and thus it can be easily understood by junior high school students when it is accompanied by concrete examples which are appropriate to the situation and conditions encountered. At the level of cognitive development, children actually very much based on the movements and actions. In this case, the children will learn at their best way if the initiative is based on the teaching and learning activities. In this way, the task a teacher is not giving knowledge, but preparing teaching situation that led children to ask questions, observe, predict, and find a concept of its own.

Owen (1993) says that only about 30% of the number of students aged 15 years who are able to determine the gradient of a straight line, and none answer correctly when they are asked whether the two lines with gradients and parallel or not. In addition, a research by Armis (1995) done on second grade students of state Junior High School Tanah Datar, West Sumatra states that among 130 students, there is only 17.8% answers correctly in solving systems of linear equations with two variables using graphs

The above findings are worth to get the attention and thinking in order to fix it. One alternative that can be taken to overcome the weaknesses as previously described is to develop or implement a learning model which is suitable for the topic.

Ruseffendi (1979) states that teaching mathematics should be oriented to the question "why" and not the "how", meaning that students in solving a problem know the reason why doing it and they do not just know how to do it.

Weinstein and Meyer (in Arends, 1997) states that a good teaching includes teaching students how to learn, how to remember, how to think, and how to motivate themselves. This kind of teaching is thus commonly referred to as Learning Strategies. Teachers often require students to learn, but rarely give lessons to students about how students should learn. They also require students to solve problems, but they rarely give a lesson of how students should solve the problem.

The main purpose of learning strategies is to teach the learners (students) learn independently (self-regulated learner). Therefore, the students are expected to: (1) diagnose specific learning situation, (2) select learning strategies to deal with existing problems, (3) monitor the effectiveness of these strategies, (4) motivate themselves to be interested in learning situation stage. One of the approaches used in learning which aims to produce students who are self-learning is reciprocal teaching.

Based on the previous explanation, the purposes of this study are: (a) Knowing the differences in learning outcomes of students who are treated by using reciprocal teaching and learning outcomes of students who are treated by conventional learning in math; (b) Knowing the effectiveness of reciprocal teaching on the subject of straight line equation in second grade of junior high school; (c) Knowing the student's response after reciprocal teaching is done.

## 1. Reciprocal Teaching

According to Weinstein and Meyer (in Slavin: 1996) good teaching includes; teaching students how to learn, how to remember, how to think, and how to motivate themselves. And many educators agree on the opinion that to teach students about how to learn is something that is very important and it is a key to achieve educational goals

Learning strategies related to behavior and thought processes influence on what students learn, includes the process of remembering and meta-cognitive processes. Michael Pressley (in Arends, 1997) says that the process of remembering and metacognitive processes is a strategy used to solve the problem of learning in general. For example, in making a report, it requires a process of thinking and doing certain behavior like expressing ideas, summarizing, making notes to monitor a person's mind. Thus, to prepare the report students should use several strategies to learn

The main objective of the strategy is to teach students to learn independently. Some of the terms used to describe this type of learning is independent learner, strategic learner, self-regulated learner (self-learning). The term used here is self-regulated learner (self-learning).

In a self-learning (self-regulated learner), which is the preferred one or the most expected, student can do four important things, like (a) diagnose specific learning situation properly; (b) Select appropriate learning strategies for dealing with a given problem; (c) monitor the effectiveness of the strategy; (d) motivatesng themself to be interested in learning situation until it is complete.

Guided learning strategy that depends on the success requires many students to learn their own skills and to monitor their own learning. This leads to the importance of learning strategies given to students ranging from elementary school classrooms to the high school and college. This learning strategy initially focuses on reading, but subsequently has been successfully applied in the fields of physics, mathematics, and writing (Arends, 1997).

Activities of students who demonstrate self-regulated learner is a student who can summarize or ask when reading a passage from a book or listening to the teacher and student presentations are motivated to display and monitor the success of an operation. The usual approach is used to study the strategy of direct instruction (direct instruction) and reciprocal teaching. And in this study, the writer will discuss reciprocal teaching.

Reciprocal teaching is a learning designed to teach students about cognitive strategies and to help students understand the reading well (Arends, 1997). Reciprocal teaching refers to a set of conditions in which children learn, first undergo a certain set of cognitive activities and new slowly do its own function.

Reciprocal teaching who serve as a helper and a demonstrator and they serve as presenters in the learning process. According to Ann Brown (in Arends, 1997) the teacher teaches students cognitive skills that create learning experiences in which students mimic certain behaviors and then help students develop skills to motivate themselves.

In reciprocal teaching, students are taught four independent comprehension strategies, namely; summarizing, asking questions, explaining, and predicting. To implement these strategies, teachers and students to read the assigned readings in small groups, and four teachers demonstrate these skills is to summarize, ask

questions, explain difficult words, and predict the content of a reading material. During the ongoing learning activities, students take turns taking over the role of the teacher and act as a discussion leader for the group. Teachers provide motivation, feedback, and mediators during the implementation of the strategy and the students learn and help other students or they become "student teachers" (students who acted as a teacher) to teach other students.

The steps (phases) in reciprocal teaching are as follow: (1) Presenting the objectives of learning and motivate students; (2) presenting information; (3) Organizing students in groups and demonstrating the characteristics of reciprocal teaching (4) Training teachers students (students who serve as teachers); (5) Evaluating learning outcomes and skills expected

## **2. Relevant theories related to reciprocal teaching**

### **2.1. Piaget Theory**

According to Piaget (in Slavin, 1994), humans grow, adapt, and change through physical development, personality development, socioemotional development, cognitive development. Cognitive development is a process of genetic, meaning that a process which is based on biological mechanism is the development of the nervous system. With the ever increasing age of a person the more complex nerve cell structure the humans ability is also increasing (in Travers, 1976).

According to Piaget (in Suparno, 2001) cognitive development has three elements, namely; content, function and structure. The contents are what are known by a person, the content refers to the child's behavior is reflected in his response to a variety of problems or situations encountered. Function refers to the nature of intellectual activity (assimilation and accommodation) which are fixed and continuously developed throughout cognitive development. The function itself is made up of organizations and adaptation. While pointing to the nature of the organizational structure is formed (schemata) which is a high level of mental organization which is formed on the individual as he interacts with his environments.

Organization gives organisms the ability to organize or synchronize the physical processes and psychological processes to become regular and related systems. The second function is the underlying intellectual development of adaptation. All organisms are born with a tendency to adjust or adapt to their environment. The way to adapt will vary differently among organisms. Adaptation to the environment is done through two processes, namely assimilation and accommodation. In the process of assimilation someone uses or structures existing ability to respond to the problems encountered in the environment. While in the process of a person's property, it requires the modification of existing mental structures in organizing the response to environmental challenges.

Adaptation is a balance between assimilation and accommodation. If in the process of assimilation, a person cannot adapt, then there is an imbalance (dis-equilibrium). As a result of this imbalance occurs accommodation, and the existing structure changes or new structures arise, then the equilibrium occurs. After equilibration, a person is at a higher cognitive level than before and is able to adapt to the environment.

Utilization of Piaget's theory of learning can be seen in the following activities: (a) Focusing on the process of thinking or mental processes, and not just at the result. In addition to the correctness of students, teachers must understand the process used to arrive at the answer to a child's; (b) Give priority to the role of students in their own initiative and active involvement in learning activities. In the classroom, the presentation of knowledge so (ready made) is not emphasized, but children are encouraged to discover their own knowledge through spontaneous interaction with the environment; (c) tolerate the existence of individual differences in terms of development progress. Piaget's theory assumes that all students grow at the same developmental sequence, but the growth is taking place at different speeds (Slavin, 1994: 45).

In order to correlate Piaget's theory and reciprocal teaching thus (1) a person receives information or new experiences then this information will be modified to match the cognitive structures he has and this process is called assimilation, and if the cognitive structures must be adapted to the information received then a process of accommodation occurs. This is consistent with the phase-2 (at the time of presentation of the material); (2) a knowledge can be formed not only individually but socially, it is in accordance with the phase-3 (at the time of organizing students in groups and demonstrate the characteristics of reciprocal teaching); (3) Meanwhile, teaching is not to transfer knowledge from teacher to students, but to help a person in order to construct his own knowledge through the activities of the phenomenon and the object to be known. In this case the teacher is more active motivating and thought provoking, providing more opportunities for students to express critical ideas and concepts, which is in line with the 4th phase (when the students train students who will act as a teacher)

### **2.2. Vygotsky theory**

Vygotsky theory emphasizes the sociocultural nature of learning from. This theory also places emphasis on the learning. According to this theory, learning occurs when students work or learning to handle the tasks that have not been studied by the public and still be in range of students. The tasks that are in the zone of proximal deve-

lopment, which is at a level slightly above the level of development of the child's development in the present. Furthermore, Vygotsky believes that higher mental functions is generally comes up in conversation / collaboration among students before the higher mental functions are absorbed.

Another important idea is derived from Vygotsky Scaffolding. Scaffolding means providing large amounts of aid to students during the early stages of learning and then reduce the effort and provide the opportunity for students to take greater responsibility as soon as he can do it. The form of assistance in the form of tips, warnings, encouragement, decomposition solving steps, giving examples, or anything that may result in the studentst independence.

The relationship between Vygotsky's theory and reciprocal teaching is on phase-3 (at the time of organizing students in groups and demonstrating the characteristics of reciprocal teaching and 4th phase (during which the student teachers to train students who will act as a teacher). Students in completing each task discuss with other friends in the group. If a student can not complete the task correctly and finally be able to complete with the help of his friend, then these tasks are said to be right in the nearest development zone (zone of proximal development) students.

There are four learning skills that are expected in reciprocal teaching namely; summarizing, asking questions, explaining, and predicting, as well as the students who serve as teachers, teachers began to hire and train the students, then the students gradually to take the initiative themselves. This means that teachers do Vigotsky theory of scaffolding.

### 2.3. Ausubel Learning theory

Learning can be grouped into two dimensions, Ausubel (in Dahar, 1989: 110). First, learning is related to the way knowledge is presented to students through the admission or discovery. Second, learning is related to the way how students associate knowledge.

According to Ausubel (in Suparno, 1997; 54), meaningful learning occurs if students try to connect new knowledge with their knowledge. It happens when students learn concepts and changes in existing concepts. As a result, the structure of concepts / knowledge that students have changed. In addition, if the new knowledge is not related to the existing knowledge, the new knowledge that students will learn through rote learning. This is caused by the process of associating new knowledge with the existing knowledge.

The relationship between Ausubel's theory and reciprocal teaching occurs in phase-2 (at the time the information is presented), phase-3 (at the time of organizing students in groups and demonstrate the characteristics of reciprocal teaching), and phase-4 (at the time that the student teachers train students who will act as a teacher). And in these phases of students are trying to connect new knowledge to prior knowledge possessed.

### 3. Finding and discussion

The analysis of the data in this study is done using two data analysis techniques, namely the descriptive analysis and inferential analysis. Descriptive analysis is used to see the results of student learning, the teacher's ability to manage learning, teacher and student activities, student response to learning. While the inferential analysis used to answer the hypotheses in this study. The analysis used is analysis of covariance.

- a. Based on the results of inferential analysis using Anacova, it is obtained value of  $F^* = 0.2699 < F(0.95, 1, 74) = 3.959$ . This shows that there is no difference between the learning outcomes of students taught using reciprocal teaching and learning outcomes of students who are taught by using conventional learning. If the terms of the significance of the regression coefficients (the regression coefficient is not zero) then there is a significant relationship between the value of the initial test (pretest) on student learning outcomes (post-test), both for the experimental class students and students of control class. Based on the results of the regression linearity test, both experimental class and the control class it can be concluded that prior knowledge (pre-test) with student learning outcomes (post-test) is linearly related meaning that students who obtain high scores on the pretest will also get high marks on the posttest. And based on the analysis of the regression model homogeneity test both the experimental class and the control class it is obtained value of  $F^* = 2.7383$ , whereas the F table for  $\alpha = 0.05$  was obtained  $F(1 - \alpha, k-1, N-2k) = F(0.95, 1, 74) = 3.959$ . Since  $F^* < F(0.95, 1, 78)$ , then the coefficient of direction (gradien) regression model of experimental class and control class is the same homogeneous / parallel. In other words, the regression models of those two classes is same.
- b. Based on the description of the results of research on student learning outcomes using reciprocal teaching proves to be effective. The data obtained shows that the experimental class of 39 students who follow the teaching out that 30 students (76.92%) is said to complete their study. The average proportion of initial test scores and final test for the experimental class is 0.11 and 0.75, when it is considered in proportion to the average score of the final test in an increase of 0.64. While the average proportion of test scores for the beginning and the end of the test control classes respectively 0.16 and 0.71. When it is observed, the average

proportion of the final test score increased by 0.55. Difference in the proportion of initial test scores and final test for the experimental class is slightly larger than the difference in the proportion of test scores beginning and end of the test the control class. This indicates that reciprocal teaching can improve the achievement of learning outcomes of the conventional learning.

- c. Based on the description of the results of research on the achievement of specific learning objectives in reciprocal teaching, it is found out that from the data obtained; there are 6 out of 8 specific learning goals formulated is completed by students, or 74.68% of the specified learning objectives are successfully completed by the student. Because the percentage is less than 85% as determined by Department of Education and culture, it is then said that that the mastery learning in the classroom of reciprocal teaching is ineffective.
- d. Based on the description of the results of research about teachers' ability to manage turning learning is effective. The data obtained showed that the average value of the ability of teachers in the introduction is 3.03, giving a chance / appoint a teacher of students is 3, giving students the opportunity to read books and worksheets is 2.88, encourage students to ask is 3, and guiding students to make a summary as characterized by reciprocal teaching is 3. . the ability of teachers to close the lesson is 2.94, while the teacher's ability to manage the classroom atmosphere is 3.03. So it turns out that reciprocal teaching is easily socialized to teachers.
- e. Based on the description of the results of research on teacher activity in reciprocal teaching proves to be effective. The data obtained shows that during learning activities, reciprocal teaching proves to be able to increase student engagement and can reduce the dominance of the teacher in the learning activities in the classroom. Indicators related to the task of the teacher as a facilitator, mentor, and motivator show 3 and 6 to obtain an average value of 13.12%, for the indicator itself to come to the conclusion that material that has been discussed with the students is meant to obtain an average value of 11.67%. Thus many teachers provide time for students to actively construct or find the concept itself. Orientation refers to the teacher in learning how to learn (how students learn).
- f. Based on the description of the results of research about student activity in reciprocal teaching, it proves to be effective. The data obtained shows that during the activities of reciprocal teaching, a prominent student activities in student learning is reading a book, making a summary, as well as discussions among the students. The average percentage of student activity in peer discussion activities is 7.40%. According Vigotsky students will be smarter if he could explain to his friend and the higher mental functions generally comes up in conversation or cooperation of individuals before the higher mental functions are absorbed in these individuals (Slavin, 1997: 49). While the average percentage of students in reading activities and worksheets students is 18.54%, the activity of the students in presenting ideas on the board and as a teacher of students is 5.26%. This suggests that to obtain information, it is not enough to just simply listen to a lecture from the teacher, and the teacher is not the only source of information in the study.
- g. The data on student response during reciprocal teaching is as follows: 86% of students express delight as they are taught using reciprocal teaching, 84% of students say that reciprocal teaching is quite new concept, 90% of students state that learning devices used help them a lot, 85% of students claim to understand the language of the book students who made the researcher, and 90% are interested in appearance student book. It means that most of the students want to attend classes of reciprocal teaching and it affects students' motivation to learn.

#### **4. Conclusion and suggestion**

##### **4.1. Conclusion**

- a. Based on the results of inferential analysis using Anacova, it is concluded that there is a difference between the learning outcomes of students who are taught using reciprocal teaching and learning outcomes of students who are taught using conventional learning.
- b. Based on the results of the descriptive analysis, it is found that the application of reciprocal teaching on the subject of straight line equation in second grade junior high school is effective.
- c. Based on the results of the descriptive analysis, most of the students want to take lessons with reciprocal teaching, and it affects students' motivation to learn.

## 4.2. Suggestion

Based on the finding of the study, there are some suggestion as follow:

- a. In this study, there has been a process of implementing reciprocal teaching on the subject of straight line equation on second grade students of Junior high school. so there should be a trial in another class that will be able to perfect the devices that have been prepared
- b. Reciprocal teaching can be developed for other subjects in accordance with the characteristics of reciprocal teaching itself, so it can improve the student learning outcomes.
- c. From the results of this study, it indicates that reciprocal teaching has not been effective to be applied on the subject of straight line equation in terms of the achievement of learning objectives, so it is advisable to conduct in depth study and there should be more meetings..
- d. To disseminate the existence of reciprocal teaching, there should be workshops or other activities through working groups of teachers.

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