Effect of Reciprocal Teaching Model Toward Mathematics Learning Independence Reviewed from Gender and School Level Students Grade 8 MTsN Kampar

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Abstract—The aim of this research was to investigate and describe the influence of reciprocal teaching models toward students learning independence based on gender and school level. The research is a quasi-experimental study using the randomized control group only design. The population of the research was the students at grade VIII MTsN Kampar District in the Academic year 2019/2020. The sample was chosen randomly based on the school level determined from the results of the National Examination. Students learning independence is measured by giving a learning independence questionnaire at the end of the meeting. Research data were analyzed using parametric and non-parametric statistics. The results of the research show: 1) learning independence students who taught by reciprocal teaching model was better than students taught by conventional teaching at high, medium, and low school levels. 2) Learning independence of male students taught by reciprocal teaching was better than students taught by conventional teaching at high, medium, and low school levels. 3) Learning independence of female students taught by reciprocal teaching was better than students taught by conventional teaching at high, medium, and low school level. 4) There is no interaction between learning models and gender in influencing learning independence of students.

Index Terms— Gender, Reciprocal Teaching, Learning Independence, School Level

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1 INTRODUCTION

Learning activities can produce a change in students. The results can be knowledge or attitude and skills. Through learning activities, students can be trained in their ability to gain knowledge so that by learning cognitive aspects students can continue to develop.

Other than cognitive aspect, someone's success in gaining knowledge is also influenced by affective aspects. One of the affective aspects is learning independence. Students who have learning independencely can determine their own learning strategies and can learn without having to depend on the presence of a teacher or a friend. When given a problem, they will try to do it by themselves and when experiencing difficulties, they will ask for help from the teacher or his friends. But most of the students have not been able be independent to recognize, detail and arrange questions that are from a given problem. This happens because students only depend on the material presented by the teacher. They are given less opportunity to find their own understanding. Learning success is not obtained by relying only on face-to-face activities and assignments given by the teacher only. To absorb and understand the lesson requires an attitude to be independent, so that learning independence becomes a determining factor whether students are able to face

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challenges or not.

Learning does not mean separating from others. According to [1] learning independence is an effort to conduct learning activities itself or with the help of others based on their own motivation to master a certain competency. According to [2], learning independence has a characteristic that is the development the ability of students to be able to do the learning process independently, which does not depend on teacher, friends and other factors. The level of independence of student learning can be determined from how much initiative and responsibility of students to be able to make learning plans and can evaluate the learning. The greater the role of students in carrying out these activities, it means that the students have a high level of learning independence, where they will try with their own ability to be able to complete all the exercise or assignment given by teacher.

In the [3] concerning process standards, it was stated that the learning process in the education unit independent. Therefore, students who have high learning independence will be able to produce the expected abilities and learning outcomes, especially mathematical abilities. This is in line with [4] which states that to improve student mathematics learning achievement can be achieved through increased learning independence. This is also supported by [5], [6], [7], [8] and [9]. Thus, learning independence is an affective aspect that students must have, especially in learning mathematics.

But in fact, based on the results of the learning independence questionnaire that researchers gave during the observation, consisting of 30 statements to several MTsN students in Kampar District, the average achievement of students' learning independence was only 56.5 on a scale of 0-

100, so it was still far from expected. Based on the results of the student questionnaire answers, it can be concluded that most students only study while at school without any desire to also study independently at home. Most students assume that learning is only done at school with the teacher. This is certainly wrong because to study mathematics requires perseverance and practice which is certainly not only in school.

To overcome this, solutions need to be found in the learning process that will be applied. One solution that can be given is to apply a learning model that can encourage students to train them to have independence in learning mathematics, and to actively involve them in the learning process. One alternative that can be chosen is the Reciprocal Teaching learning model. Reciprocal teaching is one of the learning models implemented in order to achieve learning goals through the process of independent learning.

According to [10], by applying this model knowledge is not only given by the teacher to students, but these students are also given the opportunity to be able to find or apply their own ideas and teach them to be able to use their own strategies for learning so that the results obtained are maximum and long-lasting in students' memories. Based on this understanding, it is clear that this reciprocal teaching model can train students' independence in learning mathematics. According to [11], the Reciprocal Teaching model has four stages of learning, namely questioning, clarifying, predicting and summarizing. In this Reciprocal Teaching learning, students have the opportunity to communicate and interact with other students openly under the guidance of the teacher.

In addition, [12] also states that the Reciprocal Teaching model makes students more active in the learning process. Furthermore, the research conducted [13] also concluded that students who learn by using the Reciprocal Teaching model obtain better mathematics learning outcomes and students' learning independence also increases. This is also supported by [14] and [15].

Each student must have a learning independence that is not the same and many factors are the cause, including gender and school level. According to [16], gender is a grouping into the sexes, namely men and women. Grouping here is not only biologically, but rather the differences in abilities, roles, behaviors and traits formed by the community. Furthermore [17] also states that gender has a great influence on student learning outcomes due to differences in styles between male and female students, so that results in differences in learning outcomes between the two.

Some research results state that men have better mathematical achievements compared to women [18]. Furthermore [19] also said so and a large difference was found in geometry. Furthermore [20] also said that male students showed a higher ability in mathematics, but female students were superior in affective aspects such as diligent, thorough and careful. In the learning process, gender roles can be seen through learning that is applied in the classroom and by applying an appropriate learning model, the learning independence of both male and female students can be better than before.

In addition to gender factors, school level is also an important factor to be studied. Each level of school has different characteristics. For example, the high school level as we know it usually has a higher level of discipline and student ability compared to the two other school levels, as well as in terms of facilities and infrastructure and so on. Therefore, school level factors also need to be considered in this study.

Based on these problems, this study aimed to examine, compare and describe: (1) Differences in learning independence between students taught with the reciprocal teaching and conventional learning models at all three levels of the school; (2) Differences in learning independence between male students taught by the reciprocal teaching model and conventional learning at all three levels of the school; (3) Differences in learning independence between female students taught by the reciprocal teaching model and conventional learning at the three school levels; (4) Interaction between learning models and gender in influencing student learning independence at all three levels of the school.

2 METHOD

This type of research was a quasi-experimental study, because it cannot be controlled by all variables that influence the dependent variable. The design used was the randomized control group. The design was used to examine the effect of the implementation of reciprocal teaching and conventional models on learning independence based on gender and school level of students. This study used two sample classes, namely the experimental class learning with the reciprocal teaching model and the control class learning with conventional learning.

The population in this study were all eighth grade students of MTsN in Kampar District who were grouped according to school level. Samples were selected using random sampling techniques; from each school level was chosen for the high, medium and low school levels. School level grouping is done by calculating the average $(\bar{x})$ and standard deviation (sd) of the national exam results of students in the 2018/2019 academic year with the following criteria.

TABLE 1
SCHOOL LEVEL GROUPING CRITERIA

Score Interval	Interpretation
$\bar{x}_i \geq \bar{x} + 0,5\ sd$	High school level
$\bar{x} - 0,5\ sd \leq \bar{X}_i < \bar{x} + 0,5\ sd$	Medium school level
$\bar{x}_i < \bar{x} - 0,5\ sd$	Low school level

Based on these criteria, from each school level one experimental class and one control class were selected so that in this study there were 3 experimental classes and 3 control classes. The instrument used in this study was a learning independence questionnaire adopted from [21] which had tested its validity and reliability with quite good criteria, where the questionnaire consisted of 30 statements based on 9 indicators of learning independence according to [22]. The

research data were processed using the Mann Whitney U test, Independent Sample t-test and the two-way ANOVA test by first testing the normality and homogeneity of the data and analyzed with the help of SPSS 16 software at a significance level of 5 %.

3   RESULT AND DISCUSSION

After being given a questionnaire on all samples, the results were students' learning independence questionnaire. The learning independence questionnaire consisted of 30 statements which were divided into positive and negative statements which were compiled based on indicators of learning independence. The questionnaire was given to the sample, which was followed by 129 students, 65 students in the experimental class and 64 students in the control class. Descriptive data on the results of the study was done by calculating the average $(\bar{x})$, standard deviation (sd) and the number of students in each group (n) presented in table 2 below.

TABLE 2
DESCRIPTIVE STATISTICS OF STUDENT LEARNING INDEPENDENCE RESULTS BASED ON LEARNING MODELS, GENDER AND SCHOOL LEVEL

School level	Gender	Reciprocal Teaching			Konvensional		
		$\bar{x}$	Sd	N	$\bar{x}$	Sd	n
High	Man	80,38	12,88	8	66,14	9,19	7
	Woman	95,42	11,08	12	76,00	11,20	13
	Total	**89,40**	**13,76**	**20**	**72,55**	**11,36**	**20**
Medium	Man	82,08	14,58	12	66,08	10,63	13
	Woman	93,92	10,63	13	72,18	10,32	11
	Total	**88,32**	**13,88**	**25**	**68,88**	**10,42**	**24**
Low	Man	73,70	12,30	10	62,09	8,94	11
	Woman	76,60	6,70	10	60,33	12,08	9
	Total	**75,15**	**9,73**	**20**	**61,30**	**10,21**	**20**
Total	Man	78,83	13,47	30	64,68	9,36	31
	Woman	89,49	12,66	35	70,45	12,61	33
	Total	84,60	14,04	65	67,66	11,45	64

Based on Table 2, it can be seen that the average results of student learning independence with the reciprocal teaching model were higher than students with conventional learning at each school level. When it seen by gender, for male students the highest average score of learning independence is achieved by experimental class students at the medium school level, while the lowest average is obtained by control class students at the low school level as well as for female students, but the results highest learning independence is achieved by student in high school level. Based on this, it was concluded that the average achievement of learning independence of the experimental class students was higher than the control class. When it is seenby gender, the average learning independence of male and female students in the experimental class was higher than the control class and the highest achievement of learning independence was achieved

by female students of the experimental class at all three school levels.

Based on the results of the analysis requirements test, a hypothesis test was carried out using tests as mentioned in the method section. In testing the first hypothesis at the high school level the value of p (p value) = 0,000 was obtained so that the research hypothesis was accepted for α = 0.05. Furthermore, at the medium school level, p (p value) = 0,000 was obtained so that the research hypothesis was accepted for α = 0.05. At low level schools, the value of p (p value) = 0,000 was obtained so that the research hypothesis is accepted for α = 0.05. Thus, it was concluded that the learning independence of students taught by the reciprocal teaching model was higher than those taught by conventional learning at three school levels.

For testing the second hypothesis, at the high school level the value of p (p value) = 0.030 was obtained so that the research hypothesis is accepted for α = 0.05. Furthermore, at the medium school level, p (p value) = 0.004 was obtained so that the research hypothesis is accepted for α = 0.05. At low school level, the value of p (p value) = 0.038 was obtained so that the research hypothesis was accepted for α = 0.05. Based on this, it can be concluded that the learning independence of male students taught by the reciprocal teaching model is higher than those taught by conventional learning at three school levels.

For testing the third hypothesis, at the high school level the value of p (p value) = 0,000 was obtained so that the research hypothesis was accepted for α = 0.05. Furthermore, at the medium school level, p (p value) = 0,000 was obtained so that the research hypothesis is accepted for α = 0.05 and at the low school level p value (p value) = 0.002 was obtained so that the research hypothesis was accepted for α = 0.05. Thus, it can be concluded that the learning independence of female students taught by the reciprocal teaching model is higher than those taught by conventional learning at three school levels.

Then for the fourth hypothesis, two-way ANOVA test was used. Based on the interaction graph of the following picture.
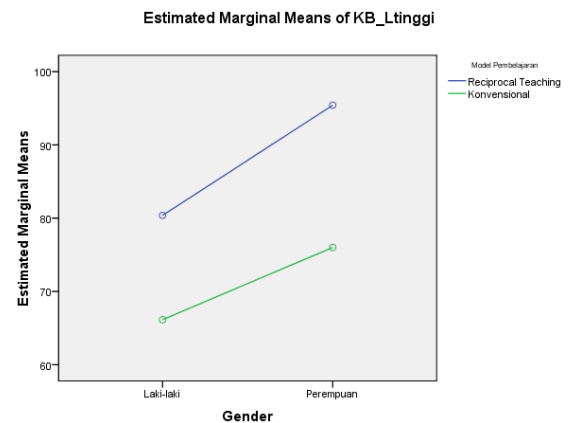

Fig. 1. Interaction Diagram between Learning Model and Gender Against Learning Independence at the High School Level
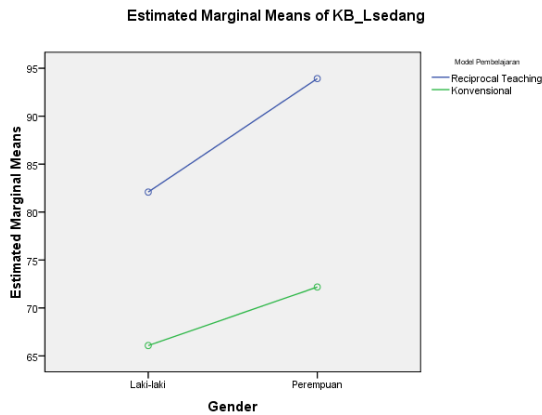
Fig. 2. Interaction Diagram between Learning Model and Gender Against Learning Independence at the Medium School Level
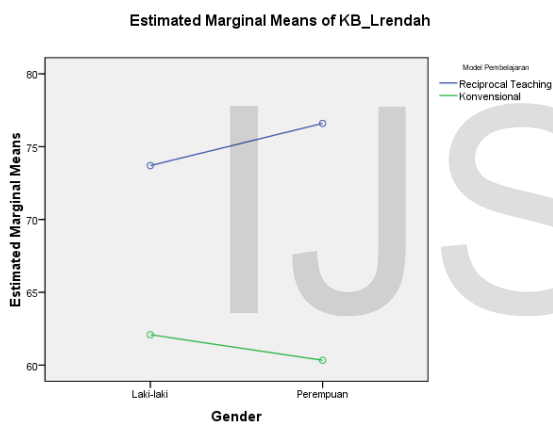

Fig. 3. Interaction Diagram between Learning Model and Gender Against Learning Independence at the Low School Level

Based on Figure 1, it can be seen that the effects of learning factors and the effects of gender factors on learning independence have non-intersecting lines, so H_0 was accepted and H_1 is rejected. Likewise in Figure 2 and 3 can be seen that the two lines are almost parallel and do not intersect. Thus, it can be concluded that there is no interaction between learning models and gender in influencing student learning independence, both at the high, medium and low school levels.

Discussion The results showed that the learning independence of students taught by the reciprocal teaching model was higher than those taught with conventional learning. This is because in the reciprocal teaching model students are actively involved in finding their own knowledge. From the reading material provided, students construct their own ideas and understandings and then discuss them with a group of friends so that students who do not understand at first can become more understanding after discussing with a group of friends. In applying this reciprocal teaching model, student discussion activities are maximized both in group discussions and discussions between groups and the teacher switches roles as facilitators in the learning process. This is in accordance with [23] which states that during the process of reciprocal teaching learning, students discuss their thoughts with their group members. Although there are also students who ask the teacher for help, but students must first discuss the matter with their friends.

After students discuss, a "student teacher" will be chosen from a group to present and explain their understanding of the material that has been read. With the application of reciprocal teaching model, students are more enthusiastic in learning mathematics. This can be seen from students who have understood the material to be studied before the reading material is given, because they have learned it first at home through learning resources they have, such as textbooks, the internet and worksheets. Based on this it can be concluded that by applying the reciprocal teaching model of learning independence students can be better trained and improved. This is in line with the results of research [6] and [24] which show that after the adoption of the reciprocal teaching model, student learning independence also increases.

When it is seen based terms of gender, the results show that the independence of learning of male students who are taught with reciprocal teaching is also higher than conventional learning at all three levels of school. In reciprocal teaching learning students are trained to be able to construct their understanding independently without having to rely on the explanation given by the teacher. Based on the reading material provided, students gain their own understanding which is then discussed with a group of friends. In the questioning stage, students write questions from what they do not understand based on the material. Then in the clarifying stage, students are trained to be able to explain material both verbally and in writing as teacher students based on what they have understood, so that from this activity the extent of student's understanding is based on what they understand themselves from reading material, without the aid of material explanation from the teacher.

Furthermore [25] states that independence is a condition where a person has a desire to compete to progress, so that students are more independent and enthusiastic in learning the right learning model needs to be applied. In the experimental class at three school levels, male students were enthusiastic in explaining their understanding. This is in line with [26] which states that these male students have a high enthusiasm in learning mathematics if given the right learning model. In the predicting stage, it can be seen that the male students of the experimental class have been implementing the reciprocal teaching model the longer they are trained in predicting the completion of the questions given, so without having to be asked by the teacher they have already worked on the problem and competing with female students to be able to solve the questions quickly and correctly, so that by applying this reciprocal teaching model

can train students' independence in learning mathematics. This is in line with [27] which states that male students are actually more interested in mathematics so that if the application of the model is right, it will spur him to study mathematics without coercion from anyone.

In contrast to male students in the experimental class, male students in their control class are passive in the learning process. The male students in the control class only listened to the teacher's explanation, some of them even did other assignments and did not pay attention to the teacher. Then when students are given the opportunity to ask questions, male students also just keep quiet and when given practice questions most of them only imitate the answers of their friends so it is natural that the independence of student learning taught by reciprocal teaching is better than students taught by conventional teaching. This is in line with [14] which states that the learning independence of students who learn with reciprocal teaching is always higher than students who learn with conventional learning.

In the application of the reciprocal teaching model, it was also seen that the independence of learning of female students at all three levels of school was higher than that taught by conventional learning, because at each meeting students were trained to be able to develop their independence in learning mathematics, so it was seen that the longer the reciprocal teaching model was applied these include students increasingly having the initiative in learning without coercion and being able to determine learning strategies in order to obtain knowledge and achieve learning outcomes in accordance with the desired target mathematics. This is in line with [28] which states that reciprocal teaching has a meaningful contribution in learning, one of which makes students more enthusiastic in gaining their own knowledge.

In addition, the female students of this experimental class when working on predictions, they did it individually, only a few students still looked left and right but because the other friends worked on their own over time he also used to do it himself. It is different from the control class female students who when given training they only wait for answers from their mathematician friends. Based on this, it can be seen that in these two classes there are differences where the female students of the experimental class are accustomed to being trained in their learning independence while learning with the reciprocal teaching model. This is in line with [13] which states that reciprocal teaching learning can improve student learning independence.

The results of the questionnaire also showed that the achievement of each indicator of learning independence of the experimental class students was higher than the control class students at three school levels and the percentage of achievement of learning independence at the low school level was not higher when compared to the two other school levels. This is in line with [14] which states that the learning independence of low school level students is lower than the medium school level, and the school level of learning independence is lower than the high school level.

4 CONCLUSION

In the application of the reciprocal teaching model, it was also seen that the independence of learning of female students at all three levels of school was higher than that taught by conventional learning, because at each meeting students were trained to be able to develop their independence in learning mathematics, so it was seen that the longer the reciprocal teaching model was applied these include students increasingly having the initiative in learning without coercion and being able to determine learning strategies in order to obtain knowledge and achieve learning outcomes in accordance with the desired target mathematics. This is in line with [28] which states that reciprocal teaching has a meaningful contribution in learning, one of which makes students more enthusiastic in gaining their own knowledge so that the knowledge will last long in their memories. In addition, the female students of this experimental class when working on predictions, they did it individually, only a few students still looked left and right but because the other friends worked on their own over time he also used to do it himself. It is different from the control class of female students who when given training they only wait for answers from their mathematician friends.

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