THE EFFECT OF COLLABORATIVE ASSESSMENT IMPLEMENTATION IN COOPERATIVE LEARNING TO IMPROVE THE STUDENTS' MATHEMATICAL DISPOSITION AND SELF REGULATED LEARNING

Kartono[1], Endang Retno Winarti[2], Masrukan[3]
[1,2,3]Mathematics Department of Mathematics and Natural Sciences Faculty, Semarang State University, Indonesia.

ABSTRACT

The implementation of a good learning assessment is not only regarded as teacher's activity but also as collaboration between teacher and students. This research aims to analyze the difference of students' mathematical disposition and self regulated learning as well as their effects toward the students' achievement. The population of this research was the students of mathematics department of mathematics and natural sciences faculty Semarang State University in the academic year 2012/2013 who took Calculus subject. We randomly selected three classes among five classes available. Two classes were treated as experiment classes while the other was the control class. The data was analyzed using two ways analysis of variance and multiple linear regressions. The result of testing the hypothesis 1, hypothesis 2, hypothesis 4, and hypothesis 5 were rejected, while the hypothesis 3 was accepted. The conclusion of this research was that the implementation of collaborative assessment in cooperative learning in order to improve the students' mathematical disposition and self regulated learning has not been effective yet.

Keywords: *collaborative assessment, mathematical disposition, self regulated learning.*

Introduction

The changing phenomenon of learning paradigm from teacher-centered learning to student-centered learning has been obviously emerged. It can be seen from the seminars, workshops, lesson study, classroom action research, and discussion about the innovation of learning models both in school level and higher education level. One of the applications of learning model which involves students more is that the cooperative learning type RT-STAD (Reciprocal Teaching- Student Teams Achievement Divisions), hereinafter called cooperative learning. The RT-STAD learning model could improve the learning quality and the students' achievement (Kartono, 2011, Kartono, 2010).

The fact shows that the students' involvement to join the learning was so high, but they have not been involved in the assessment activities. The assessment activity is still a single acivity conducted by teacher. Thus, the students' learning result still can be improved through the implementation of collaborative assessment within the learning.

The authentic assessment is an integrated assessment with the learning process in order to help students to improve the learning quality. If the assessment is the integral part of the learning, including the mathematics learning, then the assessment will contribute toward the students' learning. According to Herman (2001), a good assessment is the assessment which can improve the students' learning in various ways. Therefore, assessment should not only become the teacher's activity but also collaboration between tecther and students. Thus, assessment which can improve the students' learning is the assessment which involves students as learners. It means that the students are involved as subject of assessment, not only as object. They are involved in planning, designing, and implementing the assessment. The students' involvement in assessment process, according to Falchikov (2005), could increase the students' achievement.

One of the the principles of learning assessment is that the assessment should be done thoroughly, which means that the capabilities assessed should include cognitive, affective, and psychomotoric aspects. All of these capabilities should be part of the learning objectives at school which will be achieved through appropriate learning activities. The fact shows that the affective aspect of the students' capabilities is not considered as important by teachers since they have not implemented affective assessment. This is an irony when everyone now is thinking that the issues of affective abilities are important but the assessment has not been implemented appropriately. A psychologist named Binet and Simon said that in order to develop the cognitive learning result, the affective potential should be developed first (Chamberlin, 2010). It means that the achievement of the affective learning outcome is essential for the achievement of the other aspects of learning outcome.

The Indonesian Ministry of Education (2010) specifies that the affective aspects which are prominent in mathematics learning are careful or precision, perseverance, logical and systematical in problem solving. According to NCTN (1989), the affective components specified above are called disposition of mathematics. Specifically, Kilpatrick, Swafford, and Findel (2001), defines that the mathematical disposition is the tendency of looking at mathematics as something that can be understood, of feeling that mathematics is something useful, of believing that the diligent and tenacious efforts in the study of mathematics will be fruitful, and of acting as an effective learner. Polking (1998; as cited by Sumarmo, 2010) explicitely mentions the indicators of mathematical disposition including: (1) confidence in using mathematics, (2) flexibility in working with mathematics, (3) persistent and tenacious in doing mathematical tasks, (4) having curiosity in working with mathematics, (5) reflecting on the way of thinking, (6) appreciating the applications of mathematics, and (7) appreciating the role of mathematics.

Kilpatrick, Swafford, and Findel (2001) stated that the students' disposition of mathematics thrive when they learn other aspects of competence. For example, when the students build strategic competence in solving non-routine problems, attitudes and beliefs as a learner becomes more positive. The more concepts are being understood by the students, the more confident the students believe to master mathematics. On the contrary, when the students are rarely challenged to solve mathematical problems, they tend to memorize the process of problem solving that they have ever done rather than follow the appropriate ways of learning mathematics. It causes the students begin to lose their confidence when they fail to solve a new problem given by the teacher.

The other important affective aspect of learning outcomes is self-regulated learning. According to Kerlin (1992, as quoted in Sumarmo, 2002), self-regulated learning is the process of designing and monitoring individual himself or herself carefully towards the cognitive and affective abilities in solving an academic task. In this case, the self-regulated learning itself is not a particular mental ability or academic skill such as reading skill, but it is a self-direction process in transforming mental ability into certain academic ability.

There are three characteristics consisted in the self-regulated learning, such as: (1) designing their own learning in accordance with the purpose of learning; (2) selecting and implementing the learning design; (3) monitoring the progress of their own learning, evaluating the results of their learning, and comparing them with certain standards (Sumarmo, 2002). Thus, self-regulated learning is an individual activity to consciously and carefully design, implement, and evaluate his/her own learning. These three characteristics are used as the indicators of self-regulated learning in this study.

Individuals who learn mathematics can not be separated with the purpose of learning mathematics. One of the purposes of learning mathematics is to develop mathematics disposition. It means to develop high quality learning habit and attitude. The mathematics disposition reflects the characteristics of self-regulated learning, namely design the learning programs, select and implement the learning strategies, as well as monitor and evaluate their learning themselves. Thus, the development of self-regulated learning is needed by individuals who learn mathematics.

The need for the development of self-regulated learning in individuals who learn mathematics is also supported by the results of Hargis' research which suggests that individuals who have a high self-regulated learning tend to learn better, to be able to monitor, to evaluate, and to organize their learning effectively; they could be efficient in completing the task; regulate learning and time efficiently; and obtain a high score in science (Sumarmo, 2002).

According to Falchikov (2005), collaborative assessment is a term used to indicate that students and teacher share the responsibility to select the ktiteria of assessment. In the collaborative assessment, teacher and students discuss and negotiate issues related to the assessment which will be carried out. It is clear that within the collaborative assessment, the students are involved in the assessment process. The appropriate assessment techniques in a collaborative assessment are assessment which involves students in its implementation, namely self-assessment and peer assessment (Matsuko, 2009; Xin Ma, et al, 2008; Lindblom, et al, 2006, Falchikop & Goldfinch, 2000; Noonan & Duncan, 2005; Willey & Gardner, 2007; Willey & Gardner, 2008).

The question is how far the students' involvement in implementing collaborative assesment? There are 3 levels of students' involvement in collaborative assessment, i.e. level 1, level 2, and level 3 (Falchikov, 2005).

Level 1

Level 1 is the lowest level in which the students' involvement is limited to check the level of memory, performance, or skill of the answer model using the criteria given by the teacher; they are not involved in the process of constructing instrument.

Level 2

In the second level, the students' involvement is greater. The student has been involved in discussion and negotiation on the criteria or consideration of what constitutes a good answer before applying the standards of their own or each other's work.

Level 3

In the third level which is the highest level, the students' involvement is an important component in the assessment. The students are given authority to make important decision about themselves which include: selection criteria, weighting mark, and their own mark.

In this study, the students' involvement in collaborative assessment activities is categorized at Level 1. The students' involvement in the assessment instrument is limited only as user, they have not been involved in the construction of instrument.

Method

This research is an experiment research. The experiment and control groups were randomly assigned using a nonequivalent control group design (Sugiyono, 2010). The independent variable in this research is the collaborative group assessment technique in cooperative learning model. The dependent variables are cognitive and affective ability of the students namely cognitive ability (learning achievement), mathematics disposition, and self regulated learning.

The population in this study is all students of the Mathematics Department, Faculty of Mathematics and Natural Sciences, Semarang State University in the academic year 2012/2013 who took Calculus subject. We randomly selected three classes among five existing classes. Two classes were the experiment group and one class as a control group.

The data in this research are mathematical disposition, self regulated learning, and learning outcome. The data analysis was done based on hypothesis testing, namely used F test of two ways ANOVA and multiple linear regression (Sudjana, 2002).

Result and Discussion

Hypothesis 1: the mathematics disposition of the students engaged in collaborative assessment in cooperative learning is better than the ones who did not engage in it in terms of the students' ability.

Hypothesis 2: the mathematics disposition of the students engaged in collaborative assessment in conventional learning is better than the ones who did not engage in it in terms of the students' ability.

The first and second hypothesises were tested by using F statistic of two ways ANOVA. The testing criteria is that Ho is accepted if the value of F is less than the value of F table or the significance probability is more than 5%. The computation used SPSS program gives result as shown at Table 1 below.

Table 1. Result of F testing for mathematics disposition variable

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	147.662[a]	5	29.532	.870	.505
Intercept	271605.852	1	271605.852	8.004E3	.000
GROUP	69.271	2	34.635	1.021	.365
LEVEL	9.668	1	9.668	.285	.595
GROUP * LEVEL	22.175	2	11.087	.327	.722
Error	2477.150	73	33.934		
Total	426339.453	79			
Corrected Total	2624.812	78			

Based on Table 1, the value of the significance probability F in the group is 0.365> 5%, and the value of the probability significance level is 0.595> 5%. It means that Ho from hypothesis 1 and 2 are accepted.

Thus, the first hypothesis is rejected, there is no difference in the disposition of mathematics students engaged in collaborative assessment in cooperative learning model and those who were not involved in the collaborative assessment in cooperative learning model. Similarly, the second hypothesis is also rejected, meaning that there is no difference in the disposition of high-ability and normal ability students.

Hypothesis 3: the self regulated of the students engaged in collaborative assessment in cooperative learning is better than the ones who did not engage in it in terms of the students' ability.

Hypothesis 4: the self regulated of the students engaged in collaborative assessment in conventional learning is better than the ones who did not engage in it in terms of the students' ability.

The third and forth hypothesises were tested by using F statistic of two ways ANOVA. The testing criteria is that Ho is accepted if the value of F is less than the value of F table or the significance probability is more than 5%. The computation used SPSS program gives result as shown at Table 2 below.

Table 2. Result of F testing of self regulated learning variable

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	517.054[a]	5	103.411	3.150	.012
Intercept	264948.911	1	264948.911	8.071E3	.000
GROUP	359.294	2	179.647	5.472	.006
LEVEL	2.303	1	2.303	.070	.792
GROUP * LEVEL	65.553	2	32.776	.998	.373
Error	2396.415	73	32.828		
Total	419443.440	79			
Corrected Total	2913.468	78			

Based on the Table 2, the value of F for groups of significance probability is 0.006 <5%, there is a difference in student self regulated learning between the experiment and control groups. In the Table 2 also, the probability of significant value to the level of ability is F 0792> 5%, meaning there was no difference in self regulated learning between the high-ability and normal ability students. Furthermore, based on the advanced test result that there are differences in student self regulated learning involved in collaborative assessment in cooperative learning model and are not involved in the collaborative assessment in cooperative learning model. There is no difference in the student self regulated learning who were not involved in the collaborative assessment in cooperative learning model and the conventional learning model.

Hypothesis 5: There is an impact of mathematical disposition and self regulated learning towards the students' learning result. The hypotheses were tested using the F test through multiple linear regression analysis. The test criteria is that Ho is accepted if the value of F is less than F table or the value of the significance probability is greater than 5%.

The results of linear regression analysis shows that the probability of F significance value is 0.694 > 5%. Thus, the Ho is accepted, it means that the regression model used does not fit or is not supported by the data. In this case it can be said that there is no linear effect of the disposition of mathematics and self regulated learning towards the students' learning result.

It has been mentioned in the theoretical background that collaborative assessment is a term used to indicate that learners and teachers share on the responsibility for the selection of ctiteria of the assessment. In the collaborative assessment, they discuss and negotiate the assessment which is about to be carried out. Thus, in the collaborative assessment, the students are involved in the assessment. The appropriate assessment technique in a collaborative assessment is assessment which involves students in its implementation, for instance, self-assessment and peer assessment.

The effectiveness of collaborative group assessment to improve the affective learning outcomes highly depends on the students' involvement in conducting the assessment. In this study, the involvement of students in conducting collaborative asemen to the level of the lowest level of the three existing levels (Falchikov, 2005). At the level of student involvement was limited to check the level of memory, performance or skills against a model answer or using the criteria given by the teacher.

The students' self regulated learning can grow or increase through habituation or repetitive exercises in the process of learning activities. The growing of students' self regulated learning is largely determined by the role of teachers in implementing the learning process. The implementation of the learning process highly depends on the learning model used. In this study, the learning model used is a cooperative learning model such that the learning activity would be more student-centered. The learning activities have been integrated

with the assessment. Students are more engaged in learning activities, the syntax has accommodated activities that can bring the indicators of self regulated learning.

As an illustration, when the students take part in the pre-learning stage, they actually are trained to familiarize themselves for self-learning, reading, and doing tasks or learning material provided by the teacher. Furthermore, they interpret concepts learned, trying to make inquiries to examine their ability, and make summary of important concepts. All the activities are on their own initiative (group initiative) while the teacher acts as a facilitator. In this case, students are required to design a learning program, selecting, and implementing learning strategies chosen by themselves.

Furthermore, when students take part in the learning phase which has been inserted by the syntax which trigger activities supporting indicators of self regulated learning and equipped by collaborative assessment. They are directly involved in these activities. In this activity, self-reflection and feedback from peers and teachers really happen. Thus, monitoring and evaluating activities towards learning outcome have become their habits.

Thus, involving students in collaborative assessment in cooperative learning model can establish their self regulated learning. In other words, the hypothesis that the self regulated learning of students involved in a collaborative assessment in cooperative learning model is better than the self regulated learning of student that are not involved in the assessment collaborative learning model could be accepted.

In this study, the increased of the students' self regulated learning is not followed by the increasing of their mathematical disposition. This is reasonable, and is not an automation, although some indicators of students' mathematical disposition arise when they formed self regulated learning. There are still other indicators of mathematical disposition which accomplished not through activities that lead to self regulated learning, but through other activities.

For example, the indicator of having curiosity arises when students join pre-learning activities. They are required to formulate questions and answers about the concepts they have learned in the material. In this case, the student may not carry out seriously, especially when the task is a group task. Various possibilities can occur associated with a given task, for example, they do not have a high commitment or trailing their friend's group.

As another example, in a note summarizing the activities of things that are important to be able to cultivate the habit of pre-learning phase appreciate the application of mathematics and assessment activities that involve students in the learning phase cultivate the habit. How far the involvement of students in conducting collaborative assessment is? The student involvement in assessment instrument not only as users get involved in the making of the instrument, so that the student has not been a lot of demand in the activities that are expected to increase their affective learning outcomes. As an alternative to improve the disposition of mathematics students need to increase the level of their involvement in the assessment of collaborative group.

Furthermore, the habits of students to work with persistent, resilient, and flexible can be fostered through pre-learning activities, namely at stage of clarification and prediction. In those activities, there was a discussion at the group level, so that these habits are required. This habit becomes more intensified with the discussion at the level of the class when the students take part in the learning phase. In fact, based on the observations of classroom, discussion activities were less successful.

Through discussion during both the phase of pre-learning and phase of learning, the student can bring up a habit to appreciate the role of mathematics or opinions about mathematics. These habits will be nurtured by their habit of giving awards to outstanding group in the assessment. Finally, the habits which have been formed earlier internalized in the students attitude in every activity they do including learning mathematics. In other words, engaging students through collaborative assessment activities in cooperative learning model can trigger the formation of a mathematical disposition is not proven.

The results of this study support the previous research that says that the implementation of Knisley mathematics learning model has no effect on the increasing of students' mathematical disposition (Mulyana, 2007). It is on the contrary to the results of research by Kartono (2012), that the disposition of student mathematics learning can be enhanced through the provision of a learning task, Prabawanto (2009) that the disposition of mathematics students can be improved through a realistic mathematics learning approach.

Conclusion

Based on the results and discussion abobe, we can conclude that:

1. There is no difference of the mathematics disposition of the students engaged in the collaborative assessment in the cooperative learning and those who do not engaged in it without considering the level of students' ability.
2. There is no difference of the mathematics disposition of the students who do not engage in the collaborative assessment in cooperative learning and who do not engage in the collaborative assessmentin conventional learning without considering the level of students' ability.

3. The students' self regulated learning who engaged in collaborative assessment in cooperative learning is better than the students who do not engage in collaborative assessment in cooperative learning without considering the level of students' ability.
4. There is no difference of the students' self regulated learning of the students who do not engage in the collaborative assessment in cooperative learning and who do not engage in the collaborative assessmentin conventional learning without considering the level of students' ability..
5. There is no linear influence of the mathematics disposition and self regulated learning towards the students' cognitive ability in the implementation of collaborative assessment in cooperative learning model.

Based on the conclusion above, we recommend the following:

1. Though the effectiveness of the implementation of the collaborative assessment in the cooperative learning to improve the mathematics disposition and self regulated learning has not been proven yet, we recommend to implement the collaborative group assessment by increasing the level of involvement in the assessment as the alternative assessment.
2. The effectiveness of the implementation of the collaborative assessment in the cooperative learning to improve the mathematics disposition and self regulated learning can be optimized by further research and by increasing the level of involvement in the assessment activities.
3. The implementation of this collaborative assessment should insert the activities which can improve the achievement of mathematics disposition indicators such as: persistent, tenacious, and flexible.

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