B21 Comparative Learning Model of Student Teams Achievement Division

by Ali Mustadi

Comparative Learning Model of Student Teams Achievement Division (STAD) with Numbered Head Together (NHT) Toward Student Mathematics Learning Outcomes at University

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Abstract—This study aims to compare the learning model of Student Teams Achievement Division (STAD) with Numbered Head Together (NHT) toward the students' mathematics learning outcomes. In this study, the type of research is experimental research with randomized post test only comparison group design. Each group was treated and only compared to the final test. The population in this research was students of 3rd semester at PGMI UIN Sunan Kalijaga Yogyakarta. To determine the sample in this study, Purposive Random Sampling (sample purposed) was used with sample of class unit, randomly choosing 2 of 3 existing classes so that obtained sample of class IIIB students treated by cooperative model type Student Teams Achievement Division (STAD) and class IIIC were given the treatment of cooperative model type Numbered Head Together (NHT). The instrument used in this study was a test. The test used in this study is a written test in the form of a description. To find out whether there are differences in the influence of cooperative type model Student Teams Achievement Division (STAD) with cooperative model type Numbered Head Together (NHT) or not, data was analyzed by using t test. The results showed that there was a difference of influence between Student Teams Achievement Division (STAD) and Numbered Head Together (NHT) toward mathematics learning outcomes where the average of mathematics learning outcomes of students was higher using NHT type cooperative model than the average of student learning achievement which uses the STAD type cooperative model.

Keywords—Student Teams Achievement Division (STAD), Numbered Head Together (NHT), Learning Result.

I. INTRODUCTION

Mathematics is a science that trains someone to think efficient, clear, precise, and fast. Symbols and concepts in mathematics is a tool for saying opinions or ideas   quantitatively. In mathematics laid the foundation of how to develop ways of thinking and acting through rules of theorem and axiom [1].

Soedjadi [2] said that the purpose of teaching mathematics are as follow; (1) preparing the students so that students able to confront alteration situation and pattern of thinking in life and world always do the development, (2) preparing the students to use mathematics and pattern of thinking mathematics in daily life and in learning muchknowledge. Many obstacles in developing students' mathematical thinking ability, one of them is still a lot of lecturers who apply the learning system are monotonous, both about the material being taught and the way of teaching. Lecture process is dominated by models that do not activate the students, but there are many models that can actively activate the lecture process. Based on the observations in the B & C classroom the lectures process are still centered on the lecturers, where lecturers become the centers of classroom learning activities, the role is as planners, informers and as evaluators. Students are only placed as the object of learning, students are considered as a passive organism, so that in the course of college students just come, sit, take notes, the role of the student is only limited to the recipient of information. As an object of learning, students do not have the opportunity to develop skills in accordance with their talents and interest, even the learning according to the learning style becomes limited, because the learning process is set by the lecturer.

Based on observations made on October 6, 2016 in grade B third semester of UIN Sunan Kalijaga, learning style is auditory can be seen from students who focus on listening explanation submitted by lecturers. This auditory learning style is a learning style that relies on hearing to be able to understand and remember the lesson. While some learning styles are visual learning styles, visual learning style can be

seen from some students were sleepy because lecturers only use lecture method in the learning process, students were more interested to operate cell phone, discuss with their friend and read the material in the module. Then, the results of observations made on September 27 and September 29, 2016 in grade C is the same. The learning style with grade B was auditory and visual learning style because the symptoms shown by grade C is the same as grade B. Based on observations made in grade B and grade C can be concluded that the lecturer still could not use and put each structure properly, so in the course of the lecture, it was still less attention to the selection of strategies, methods, models, and learning approaches. In addition, lecturers tend to provide directional information where the role of lecturers was more dominant in the lecture process so that participation and activeness in learning less. The result will lead to a rigid and passive lecture process. This will affect the behavior of students who are less confident in asking questions, conveying ideas or in the process of problem solving faced. In addition, there is still a lack of stimulus to students' thinking ability, which ultimately affected to student learning outcomes obtained in less than optimal learning.

Students' mastery of learning materials, the ability to apply materials in different situations and the skills of students in using materials to solve the problems that arise are very important competences owned by students. To achieve the learning objectives, it is not enough if the students just follow the learning passively. Otherwise, it should actively undertake the activities necessary to understand and master the material learned by helping students define and organize learning tasks related to the problem.

The learning model chosen as an alternative to this problem is the type of *Student Teams Achievement Division* (STAD) in class B and the cooperative model of learning Numbered head Together (NHT) in class Joyce & Weil [3] states "*Model of teching are really models of learning. As we help students acquire information, ideas, skills, values, ways of thinking and means of expressing themselves, we are also teaching them how to learn* ". This means that the teaching model is actually a learning model\ because we help students to get or obtain information, ideas, skills, ways of thinking, and expressing their own ideas, we also teach how they learn. The importance of a learning model is expressed by Bell [4] as follows "*A teaching / learning model is a generalizing instructional process which may be used to many different topics in variety of subjects*". From that opinion, that the learning model is a generalization process of learning that may be used on different topics on various subjects.

Student Team Achievement Divisions (STAD) is one type of cooperative learning model by using small groups with the number of each member of each group of 4-5 people heterogeneously in which the students are placed in the study team consisting of 4-5 people which is a mixture according to the level of achievement, sex, and tribe. According to Slavin [5], cooperative learning type STAD comprises of five stages that include: (1) stage of material presentation, lecturers start by conveying the indicators to be achieved that day and motivate students' curiosity about the material to be studied. Followed by giving a perception with the aim of reminding students of the qualify material that has been studied, so that students can connect the material to be presented with the knowledge that has been owned, (2) stage of group work, students are given worksheet as material to be studied. In the group work the students share tasks, helping each other to provide a solution so that all group members can understand the material discussed, and one sheet collected as a result of group work at this stage lecturer's act as facilitators and motivators of each group's activities, (3) individual test phase, to know the extent to which the success of learning has been achieved, held individual tests on the material to be discussed. (4) The stage of calculating the score of individual development, calculation of individual score development is intended so that students are encouraged to obtain the best performance in accordance with its ability. The calculation of group scores is done by summing up individual score developments and the results are divided according to the number of group members, and (5) the group awarding stage, awarding is given based on the average score categorized as good group, great group and super group.

The advantages in using STAD type cooperative are as follows: (1) Develop and use critical thinking skills and group cooperation. (2) Fosters positive interpersonal relationships among students of different races. (3) Applying guidance by friends (4) Creating an environment that respect scientific values. While the disadvantages of using STAD type cooperative learning model are as follows: (1) A number of students may be confused because they are not familiar with this treatment. (2) The lecturer at the beginning will make mistakes in classroom management. However, sincere endeavors will be skilled at applying this model.

NHT (*Numbered Head Together*) or shared thinking together according to Trianto [6] is a type of cooperative learning designed to influence student interaction patterns and as an alternative to traditional class structures. *Numbered Head Together* (NHT) was first developed by Kagen (1993) to involve more students in reviewing the material covered in a lesson and checking their understanding of the content of the lesson. Learning by *Numbered Head Together* begins with Numbering. The learning steps of the NHT model according to Nurhadi, Yasin, and Senduk [7] are (1) the students are divided into small groups of 3 to 5 people and give them a number so that each student in the team has a different number. (2)

Submission of the Question: the lecturer asks a question to the students. (3) Thinking Together: The students think together to describe and make sure that everyone knows the answer. (4) Answer: the lecturer calls a number and the students from each group with the same number raise their hands and prepare the answers for the whole class. Based on that answer the lecturer can develop the answers then the lecturer can develop the discussion more deeply, so that the student can find the answer of the question as a whole knowledge.

Hamdani [8], said that the advantages of cooperative learning type Numbered Head Together (NHT) are as follows. (1) Every student becomes active. (2) Students can have a serious discussion. (3) Clever students can teach the students who are less clever. What are the disadvantages of the NHT model, ie. (1) the possibility of the number being called will be called again by the lecturer. (2) Not all group members can be called by lecturers. In line with Hamdayana [9] says that the advantages of the NHT model are (1) training students to work together and respect the opinions of others, (2) training students to become peer tutors, (3) fostering a sense of togetherness, and (4) making the students familiar with the differences. In addition to the advantages, NHT has some shortcomings to watch out for, this is done so that will not happen things that are not desirable in learning, including: (1) students who are accustomed to conventional way a little overwhelmed, (2) lecturers should be able to facilitate students, And (3) not all get turns. From the opinion, it can be synthesized that the NHT model has its advantages and disadvantages respectively but to overcome these shortcomings, lecturers can provide a pretension to know the ability of students and facilitate students, in the implementation of NHT, lecturers must provide facilities that support in terms of facilities and infrastructure that will used in the learning. For students who have not been called, lecturers can provide an opportunity at the next meeting to know the students' understanding of the material.

The meaning of learning outcomes according to Bettencourt [10] is the result of learning influenced by the experience of learners with the physical world and its environment, the outcome of one's learning depends on what the learners already know, concepts, goals, motivations that affect the interaction with the material being studied. Meanwhile, Bundu [11] learning outcomes is the level of mastery achieved by students in following the learning program in accordance with the established educational goals include cognitive, affective, and psychomotor aspects. so it can be synthesized that the learning outcomes are the interaction of learning and teaching that cause behavioral changes in the students. The results of this study can include three aspects of cognitive, affective, and psychomotor. This research is more take on the

cognitive ability. The assessment is often done by the lecturer to measure how much knowledge gained by students after the lecturers finished delivering learning materials. This cognitive result is also a benchmark by the lecturer in delivering the material whether the selected model is good or not.

Based on the above description, it is necessary to examine, know and understand more deeply whether there is a difference in the effect of learning with the model of *Student Team Achievement Division* (STAD) with *Numbered Head Together* (NHT) on student learning outcomes or not. To answer and solve the problem, a study titled: "Comparative Learning Model *Student Teams Achievement Division* (STAD) with *Numbered Head Together* (NHT) toward Student Mathematics Learning Outcomes third semester at PGMI UIN Sunan Kalijaga Yogyakarta.

II. RELATED WORK

The comparison of the NHT type cooperative model with the previous STAD has been investigated by Chayati [12] in SMA Negeri 1 Sukoharjo. The design used in the study was randomized pre test-post test comparison group design. Based on the results of this study it can be concluded that the use of NHT learning method gives better achievement results compared to the use of STAD learning method, both from cognitive and affective appraisal. The results are similar to the research conducted by Mulyati [13] at Techno Applied Makassar Technique. This study uses the non equivalent control group model, has also been successful to prove that there are significant differences in learning outcomes in the application of NHT and STAD learning model, the average student score using NHT model is higher than the average value of students using STAD model.

It can be seen from both researches that discuss about comparison of NHT type cooperative model with STAD type cooperative model to student learning result. The results of both studies show that the use of NHT type cooperative model gives higher results than the use of STAD type cooperative model. Equation of the research is research conducted on high school students.
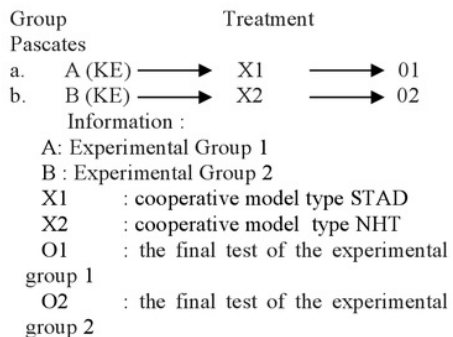
In this study, the comparison of NHT type cooperative model with STAD will be implemented on the 3rd semester students at the university. The problem of learning is closely related to the psychology problem of Mathematics lecture at Universitas Islam Negeri (UIN) Sunan Kalijaga. The problem of learning Mathematics according to Skemp [14] is *"Problems of learning and teaching are psychological problems and be able to make much improvement in the teaching of mathematics we need to know more about how is learnt"*. It means that learning and teaching problems are psychological problems, before we make many improvements in

teaching mathematics, first we need to know more about how mathematics is taught to learners. Therefore, this research will see how the influence of cooperative model type STAD with NHT to student's mathematics learning result. From the results of this study can be known which type of cooperative model is better applied for mathematics subject.

III. MATERIAL AND METHODOLOGY

A. Research Design

In this research, the research type is experimental research with comparative study which is aimed to compare the learning model of Student Teams Achievement Division (STAD) with Numbered Head Together (NHT). The research design used was randomized posttest-only comparison group design where each group is treated and only compared to the final test. The research design is as follows [15]:

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Group                Treatment
Pascates
a.    A (KE) ——→ X1 ——→ 01
b.    B (KE) ——→ X2 ——→ 02
      Information :
      A: Experimental Group 1
      B : Experimental Group 2
      X1      : cooperative model type STAD
      X2      : cooperative model  type NHT
      O1      : the final test of the experimental
group 1
      O2      : the final test of the experimental
group 2
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B. Techniques of Data Collection

Data collection techniques used in this study is a test technique. A test is a tool or procedure used to know or measure something in an atmosphere, in the manner and prescribed rules [16]. Type of tests used in this study is a written test that is test form description. The form test description is a form of test consisting of a question or an order that requires a relatively long answer [17]. The test is designed to measure learning outcomes where the elements needed to answer the questions are sought, created, and prepared by the taker themselves.

IV. RESULT AND DISCUSSION

A. Result

1) Data Description of Experiment Classroom 1

Data description of student learning outcomes in experiment group 1 can be seen in the following table.

TABLE I. DATA OF STUDENT LEARNING RESULT OF EXPERIMENTAL CLASS MATHEMATICS 1

Number of Students	The Highest Score	Lowest score	Mean (average)	Standard Deviation
53	100	60	78,63	8,95

To complete the description of the data presented the frequency distribution of student learning outcomes in the following table.

TABLE II. DISTRIBUTION OF EXPERIMENT CLASS FREQUENCY 1

Class Interval	Frequency (f)	Midpoint(x)
60-67	8	63,5
68-75	8	71,5
76-83	23	79,5
84-91	10	87,5
92-100	4	96
Σ	N=53	398

From the table above, it can be seen the student's value frequency. Students who scored 60 to 67 only 8 people, students who scored 68 to 75 as many as 8 people, students who scored 76 to 83 as many as 23 people, students who scored 84 to 91 as many as 10 people and students who scored 92 to 100 as many as 4 people.

2) Data Description of Experiment Classroom 2

Data description of mathematics learning result of student in experiment 2 group can be seen in following table.

TABLE III. DATA OF STUDENTS' EXPERIMENTAL MATHEMATICS LEARNING RESULT 2

Number of Students	The Highest Score	The Lowest score	Mean (average)	Standard Deviation
32	100	60	82,05	7,7

To complete the data description presented the frequency distribution of student learning outcomes in the following table.

TABLE IV.   DISTRIBUTION OF EXPERIMENT CLASS FREQUENCY 2

Class Interval	Frequency (f)	Midpoint(x)
60-67	1	63,5
68-75	5	71,5
76-83	12	79,5
84-91	11	87,5
92-100	3	96
Σ	N=32	398

From the table, it can be seen that the frequency of the students score of 60 to 67 is only 1 person, the students who score 68 to 75 are 5 students, the students who get the score 76 to 83 are 12 people, the students who get 84 to 91 are 11 people and students who scored 92 to 100 as many as 3 people.

Description of data of comparison of experiment group 1 and experiment 2 can be seen in the following table

TABLE V.   DATA OF EXPERIMENTAL CLASS COMPARISON 1 AND EXPERIMENT CLASS 2

Group	Number of Students	The Highest Score	The Lowest score	Mean (average)	Standard Deviation
Experiment 1	53	100	60	78,63	8,95
Experiment 2	32	100	60	82,05	7,7

Based on table 5, it is seen that experiment class 2 has higher average than experiment class 1. The second experiment class is a class given learning using NHT model, while experiment class 1 is a class given learning using STAD model. In other words, the learning NHT model is higher than the learning of STAD model in mathematics course.

B. Test Data Analysis

1) Test Data Normality

The next stage of research is the normality test in class B and class C. Normality test functions to determine whether the data to be analyzed to form a normal distribution or not. Testing the normality of data in this study using the Chi quadrate formula is [18].

$$\chi^2 = \sum \frac{(f_o - f_h)^2}{f_h}$$

$$(1)$$

By Criterion:

If $\chi^2{}_{count} < x^2$ in the table, normal data

If $\chi^2{}_{count} > x^2$ in the table, the data is not normal.

For the experimental group 1, results $\chi^2{}_{count}$ was compared with $\chi^2{}_{tabel}$ at a significant level of 5% and the degree for this test was k - 1 (5-1 = 4) where k was many intervals.

TABLE VI.   PRETEST NORMALITY TEST OF CLASS B AND CLASS C

	Grade B	Grade C
Number of Students	53	32
Average	78,63	8,95
Standard Deviation	8,95	7,7
χ^2	6,87	3,71

Based on the data analysis of experimental class 1 using STAD method, the calculation is known that class B with the number of students 53 people the average value is 78.63 and the standard deviation is 8.95 and after calculation of Chi quadrate calculate ($\chi^2{}_{count}$)= 6,87 while the value of Chi quadrate table ($\chi^2{}_{table}$) it can be seen that if dk = 5 and errors are set = 5%, then the price of Chi quadrate table ($\chi^2{}_{table}$)= 11,070 because $\chi^2{}_{count}$ smaller than $\chi^2{}_{table}$ (6,87<11,070), then the data obtained normal distribution. As for grade C which the number of students 32 people whose average value is 8.95 and the standard deviation is 7.7. After the calculation is known the value of Chi quadrate count ($\chi^2{}_{count}$)= 3,71, while the value of Chi quadrate can be known that if dk = 4 and errors in the set = 5%, then the price of Chi quadrate table ($\chi^2{}_{table}$)= 9,488. Because $\chi^2{}_{count}$ smaller than $\chi^2{}_{table}$ (3,71<9,488), so the data of mathematics learning with competence Understanding the way the presentation of data and simple statistics is normal distribution because $\chi^2{}_{count} < \chi^2{}_{table}$ (6,87<11,070) for the experimental group 1 and ((3,71 <9,488) for the experimental group 2. Thus, the mathematics learning outcome was eligible for analysis

2) Homogenity Test

The second stage is homogeneity test, in testing the homogeneity of this data testing is based on the assumption that if the variant owned by the samples concerned is not much different so the sample is quite homogeneous and then the sample can be generalized.

To prove homogeneous or not, data on student learning outcomes between the experimental group 1 and the experimental group 2 were calculated using

the F test formula (the largest variance versus the smallest variance). The F test technique formula is as follows [19].

$$F_{count} = \frac{\text{Biggest Variance}}{\text{Smallest Variance}} \quad (2)$$

After the calculation of Price F_{count} compared with F_{table}, with dk numerator = (32 - 1) and dk denominator = (53 - 1). Based on the numerator dk 31 and dk denominator 53, with error rate of 1%, then the price F_{table} = 2,10. (price between the numerator 30 and 40). It turned out to be the price F_{count} smaller than F_{table}, (1,74<2,10). This means homogeneous variants.

3) Hypothesis Test Technique

The hypothesis test that used post-test data of students learning result which is normal and homogeneous distributed is a comparative hypothesis test of two independent samples with the proposed hypothesis is as follows.

Ho : There is no difference of influence between the model of Student Teams Achievement Division (STAD) with the cooperative model of Numbered Head Together (NHT) type toward the students' mathematics learning outcomes of third Semester at PGMI UIN Sunan Kalijaga Yogyakarta Ho: $\mu1 = \mu2$

Ha : There is a difference of influence between model of Student *Teams Achievement Division* (STAD) with *Numbered Head Together* (NHT) toward student's mathematics learning outcomes of third Semester at PGMI UIN Sunan Kalijaga Yogyakarta.

Ha : μ_1 μ_2

Because this research is a research to test hypothesis using cooperative Student Teams Achievement Division (STAD) model with Numbered head together (NHT) toward student's mathematics learning result using t test analysis. The t-test formula used to test the comparative hypothesis of two independent samples is shown by the formula [20]

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{(n_1 - n_2)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \quad (3)$$

The next t_{count} price is compared with the t_{table} price with dk = (n + n2) = 2 = (32 + 53) - 2 = 83, at 5% significant level, then t_{table} = 1.66342, because the t_{table} is smaller than t_{count} (1, 66342 <9.77) then Ho that there is no difference of influence between cooperative model type of cooperative model type *Student Teams Achievement Division* (STAD) with *Numbered Head Together* (NHT) toward student

mathematics learning result third semester in PGMI UIN Sunan Kalijaga Yogyakarta is rejected, and Ha which reads that there is difference of influence between *Student Teams Achievement Division* (STAD) model with *Numbered Head Together* (NHT) toward student mathematics learning result of 3rd semester at PGMI UIN Sunan Kalijaga Yogyakarta is accepted

C. Discussion

Based on the result of the research the mean of *post test* value in experiment group 1 with cooperative model of *Student Team Achievement Division* (STAD) is 78,63, whereas post test average value in experiment group 2 using cooperative model *Numbered Head Together* (NHT) type is 8.95. Based on the average, it shows that the average class C shows higher than class B. Thus, the average class using cooperative model type *Numbered Head Together* (NHT) is higher than the class using cooperative model type Student *Team Achievement Division* (STAD) to the students' mathematics learning outcomes in the third semester at PGMI UIN Sunan Kalijaga Yogyakarta. This is because the cooperative model of NHT type has advantages when compared with the STAD type cooperative model that is the ability of each individual to work on the questions given by lecturers either in groups or individuals. The NHT type cooperative model requires active students both physically, mentally, emotionally, and intellectually in the learning process. From the observation during the learning process in the classroom using NHT type cooperative model is more conducive than the class using STAD type cooperative model. This is because in the class using the NHT type cooperative model focus with the discussion and preparation of each student if appointed to do the question in front of the class, while the STAD type cooperative model is only a few who are enthusiastic because each group there is one student who will be appointed to present the results of the group discussion in front of the class

Joyce & Weil [20] Using the appropriate learning model, not only in the form of positive social skills or creativity of students, but can improve students' learning ability. This is as it is stated as follows: *"We measure the effect of the objects to which they are directed (for example, solves, social skills, information, ideas, creativity), but also by how well they increase thy ability to learn, which is their fundamental purpose.* The meaning of the above statement that we measure the influence of various teaching models not only by some good criteria can achieve specific targets against which they are directed (self-esteem, social skills, information, creativity ideas) but through how well the models-learning model can improve learning ability. Interaction activities and learning activities deliberately engineered are interaction contexts that enable students to gain a learning experience in order

to rediscover their abilities (mental: intellectual, emotional, social, physical, cognitive, affective and psychomotor). This activity implied learning outcomes and learning process.

The results of this study are also supported by previous research conducted by Kusumawati [22] which says that learning treatment using the NHT model has an impact on different and higher learning outcomes than the STAD learning model. This research has also been conducted by Nurhalimah [23] where through the implementation of the NHT strategy, the participation shown by the students and group of presenters is very high, so that it can encourage students to learn to identify and complete their respective tasks on a particular discussion. In addition, the NHT strategy has one other advantage that STAD strategy does not have that students are actively involved in group and out-group discussions, develop student leadership attitudes, improve self-confidence and student curiosity, and develop skills for future students. It is also in line with the results of Nurhalimah's research [24] which found that the learning treatment with the NHT model had an impact on different and higher learning outcomes than the STAD model learning model.

V. CONCLUSION

Based on the purpose that will be achieved in this research is to know difference of influence between student learning model of *Student Teams Achievement Division* (STAD) with *Numbered head together* (NHT) toward student mathematics learning result at PGMI Universitas Islam Negeri (UIN) Sunan Kalijaga. Based on the data that has been collected and the analysis that has been done, the price of t_{count} is 9.77, while the price of t_{table} with dk = (n1 + n2) - 2 = (53 + 32) - 2 = 83, at 5% significant level, then t_{table} = 1.66342. Because t_{table} is smaller than t_{count} 1 (1.66342 <9.77),Ho is rejected and Ha is accepted. Thus, there is a difference in the effect of using STAD type cooperative model with NHT type cooperative model to the result of mathematics learning result of 3rd semester students at PGMI UIN Sunan Kalijaga Yogyakarta, where the average of mathematics learning outcomes of students is higher using NHT type cooperative model than the average result learning mathematics students using STAD type cooperative model.

Based on the conclusion of this study, the following suggestions are found. 1) Students, should be able to improve their ability to cooperate with friends, mathematical communication, problem solving and reasoning ability by enriching themselves by doing tasks, and discussions with colleagues. 2) The lecturer, an educator should be able to transfer the knowledge held to the student by model-a varied

or combined model so that students do not feel bored, saturated, hate math, or learn only to get high scores.

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FINAL GRADE

/100

GENERAL COMMENTS

Instructor