INFLUENCE OF CREATIVE PROBLEM SOLVING AIDED WITH INTERACTIVE COMPACT DISK TOWARDS MATHEMATICS LEARNING ACHIEVEMENT OF GRADE X STUDENTS

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ABSTRACT

This study aims to determine whether the activity of students in the Creative Problem Solving assisted interactive compact disk has positive effect on students achievement, and whether students' achievement in learning can meet the minimum criteria for completeness. This research is true experimental. Research variables consist of student activities (independent variable) and student achievement (dependent variable). Measuring instruments used in the form of student activity sheets observation and student achievement tests. Data analysis uses regression analysis and compare means one-sample t test. The results showed that students in learning activities with the model-assisted Creative Problem Solving aided with compact disk has positive effect on student achievement, and student achievement in this study have met the minimum criteria for completeness.

Keywords: Problem Solving, CPS, Interactive CD, Achievement, Creative

INTRODUCTION

Mathematics with its nature as a human activity through active, dynamic, and generative, as well as structured knowledge, develop critical thinking attitude, objective, open and become very important to make students facing the development of science and technology, as it continues to evolve. This calls for a strong mastery of mathematics from an early age, therefore mathematics courses should be offered to all students ranging from elementary school. It is intended to equip students with the competence to think logically, analytical, systematic, critical, and creative, as well as the ability to cooperate. Competence is needed so that learners can have the ability to acquire,

manage, and use information to survive in an ever-changing circumstances, is uncertain, and competitive (Depdiknas – Indonesian National Education Department, 2006).

In particular purpose, the teaching of mathematics at school, namely that students have the skills or mathematics skills such as: (1) understanding mathematical concepts, explains the relationship between concepts and apply concepts or algorithms flexibly, accurately, efficiently, and appropriately in problem solving; (2) using the pattern and nature of the reasoning, mathematical manipulation in making generalizations, compile evidence, or explain ideas and mathematical statement; (3) solving the problem which includes the ability to understand the problem, devised a mathematical model, solve the model and interpret the obtained solution; (4) communicate ideas with symbols, tables, diagrams, or other media to clarify the situation or problem; and (5) have respect for the usefulness of mathematics in life, which has a curiosity, attention, and interest in studying mathematics, as well as a tenacious attitude and confidence in problem solving (Depdiknas – Indonesian National Education Department, 2006).

The formulation of the above objectives implies the need to reform in mathematics learning paradigm, namely from the teacher's role as a conduit of information (transfer of knowledge) to the teacher's role as a driver of learning (stimulation of learning). In this latter role, teachers are required to provide opportunities for students to construct their own knowledge learned through activities. In the learning process, student activities is not enough to just listen and record, but the activity can produce a change in attitude or behavior of students. Learning activities include activities that are physically and mentally. Silver (1996) suggest that in learning, teachers should: (1) involve students in any mathematical tasks; (2) set the intellectual activity of students in the classroom as a discussion and communication; (3) help students understand mathematical ideas and monitor their comprehension.

In fact, up to now, according to Marpaung (2006) conventional learning is a learning model that is still dominant implemented in mathematics learning in school in Indonesia, and it did not succeed in making students understand very well what they are learning. Knowledge received passively by students is not meaningful to them. The understanding they have is only the instrumental understanding not relational understanding. Conventional learning model lead student not to provide an active response optimally, because students are forced to accept the knowledge of the teacher without knowing the meaning of the acquired knowledge. In the conventional learning model learning activity is mostly dominated by teachers. Most of the students are used to doing activities such as rote learning without accompanied the development of the ability to think and solve problems.

In line with the description Marpaung, Sobel and Maletsky (2001: 1-2) also illustrates that many mathematics teachers use class to discuss activities and tasks, give new lessons, and give the next task on the student. Learning as it is routinely conducted almost every day can be categorized as 3M, they are boring, dangerous and andanger the interests of students. If this still implemented as the basic learning competencies students can not be achieved to the maximum. This clearly was not conducive to the achievement of student in more maximum level.

These conditions were also contributes to lower mathematics skills of students in Indonesia in general, which according to the TIMSS (Trends in International Mathematics and Science Study)

and PISA (Program for International Student Assessment) since 1999, the results show that the performance of Indonesian's children are not encouraging. The results of the PISA research shows Indonesian's rank could only occupy the bottom 10 of the 65 countries, while the results of TIMSS Research shows Indonesian students are at a very low rank (Kemdikbud – Indonesian Education Ministry, 2013).

In an effort to "eradicate" the downturn related mathematical skills of students in Indonesia, the teacher's responsibility to devise and implement appropriate learning needs and packing learning process more meaningful, interesting, follow the development of science and technology, and can help students to improve mathematics and achieve a more optimal learning achievement. In meeting this requirement should be developed in case the application of the learning model based on problem solving. As stated by Wiederhold (in Suyitno, 2006) that the model of learning through problem solving is thought as a model of learning that can improve students' ability to think crittically. Problem solving in the learning process is possible to gain experience using the knowledge and skills that have been held to apply solving problems that are not routine. Through the activity aspects of mathematical skills such as application of the rules on non-routine problems, pattern discovery, generalization, mathematic communication can be developed better. It is expected to create more meaningful learning, so learning more fun and concepts that have been studied to be attached to the student a more permanent basis.

One of the learning models based on problem solving is a learning model Creative Problem Solving (CPS) aided interactive compact disk (CD). CPS learning model is a model of learning that focus on teaching and problem solving skills, followed by strengthening skills. When students faced questions, students they can perform problem-solving skills to select and develop a response, not only by rote without thinking, problem-solving skills broaden the thinking process. CPS is a natural process-dimensional representation, not a forced effort. CPS is a dynamic approach, students become more skilled, because students have a more structured internal procedures from scratch. With CPS, students can choose and develop ideas and thoughts, which is different from the rote use of thought.

CPS models comprising the step of clarifying the problem, brainstorming, evaluation and selection, and implementation (Pepkin, 2004: 2). By getting students creative measures to solve the problem it, is expected students improve their problem-solving ability and overcome difficulties in learning mathematics. This is consistent with the theory learned Jerome Bruner (in Hidayat, 2005: 11) states that learning is students learn through active engagement with the concepts and principles in solving the problem and the teacher serves as a motivator for students to gain experience that allows them find and solve problems. Similarly, David Ausabel meaningful learning theory (in Suparno, 1997: 53) which emphasizes the importance of students' associate experiences, phenomena and new facts in the sense that the system is already held, and in the process of student learning should be active.

CPS classroom setting learning is discussion groups (small discussion) with members of heterogeneous groups based on ability initially. In the discussion of activities that students can perform various activities such as inventory of required information, communicating opinions,

consider/accept the ideas of others, or taking a conclusion. The higher activity of the student associated with a material, is expected to enhance the students' mastery of the material.

This heterogeneous group division corresponding to the translation of the implications of Piaget's cognitive theory in education, among others understand their individual differences in terms of the progress of its development, then in learning teachers should make an effort to organize classroom activities consisting of individuals into shape small groups of learners (Hidayat, 2005: 7).

The division of a heterogeneous group will also encourage the establishment of a mutually supportive relationship between group members. Students who have difficulty can ask either to other students, or the teacher. So hopefully, it can improve students' problem solving skills and learning outcomes obtained more leverage. This is because the relationship can be mutually supportive between group members, to jointly obtain maximum learning results. Students who are smarter help students who are less intelligent, so the less capable students who have teachers from friends group. Thus the process of teaching by peers (peer teaching). This is in accordance with the opinion of Lie (2002: 43) states that the heterogeneous groups provide an opportunity to teach each other (peer tutoring) and mutual support. Students who are knowledgeable higher to be a teacher for other students, and students who lack knowledge of the teacher group of their friends, so expect student achievement at the bottom of the group can be increased. This is in accordance with the opinion of Lundgren (in Ibrahim, 2005: 17) states that the cooperative learning has a very positive impact on student learning outcomes are low. Similarly, students in the upper and middle groups, academic achievement can also be expected to increase, due to the presence of higher knowledgeable student becomes the teacher for another student, then high knowledgeable will be able to master the material provided by the teacher, this is in accordance with the opinion Lie (2002: 43) which says that by teaching what someone new to learn, he will be able to master or internalize new knowledge and skills. Similarly, Vigotsky theory (in Hidayat, 2005: 24) which emphasizes the socio-cultural nature of learning. According to social interaction, namely the individual interactions with others, are the most important factors that encourage or trigger a person's cognitive development.

The advantage of CPS model as well as the advantages of learning models based on problem solving in general, Sanjaya (2006: 220-221) mentions these advantages, among others, that the solution to the problem: a pretty good technique to understand the content of the lesson; can challenge the ability of the students and give satisfaction to find; can improve student learning activities; can help students how to transfer their knowledge to understand the problem in real life; can help students to develop new knowledge and is responsible for the learning they do, while also able to push yourself to do a good evaluation of the results and the learning process; can demonstrate to students that each subject (including mathematics) is basically a way of thinking and something that must be understood by the students, not just learn from the teacher or from books alone; considered to be more fun and likeable students; to develop students' ability to think critically and develop their ability to adapt to new knowledge; can provide opportunities for students to apply their knowledge in the real world; and may develop an interest to continuously learn even learn to formal education has ended.

On the other hand, the lack of progress in the field of computer technology with a variety of programs and animation, it is very appropriate if the computer is used as one component of learning resources. With the help of computer concepts and problems of learning materials that were previously only written and illustrated in the book can then be displayed in the form of impressions through audio media packaged in an interactive CD. Interactive CD is a designed learning resource (learning resources by design) and in it has installed a program that is prepared for specific learning objectives, and as the media leading edge computer-based learning that is believed to be able to create a more "live" and involves interactivity students (Arsyad 2006: 32). So, interactive CD can be used as an alternative to mathematical learning media selection is quite easy and effective to implement.

The purpose of this study was to determine whether the activity of students in mathematics learning with interactive CD-aided model of CPS positive effect on student achievement, and whether the learning achievement of students who take mathematics learning with interactive CD-aided model of CPS can meet the minimum criteria for completeness.

METHODS

This research is true experimental, with the entire population of the regular grade X SMA Negeri 1 Semarang. As a sample of students from two classes taken at random, one class as a class controls a given treatment in the form of conventional learning and one other class as a class experiment given treatment in the form of learning with interactive CD-aided model of CPS. Research variables consist of student activities (independent variable) and student achievement (dependent variable).

Measuring instrument used to measure the activity of the students in the form of student activity observation sheet that includes visual indicators activities, oral activities, listening activities, writing activities, drawing activities, the motor activities, mental activities, and emotional activities. To measure student achievement used tests of student achievement in the cognitive aspects related to the competency standards, basic competencies and indicators in accordance with the scope of the materials, in addition, it is also used questionnaires as a supporting instrument for obtaining data on the response and interest of students in learning. The scope of the material used is the material taught in class trigonometry X in semester 2. The data were analyzed using regression analysis and compare means one-sample t test.

RESULTS AND DISCUSSION

Based on data from observations of student activity sheet, results obtained the mean achievement scores of individual student activity is 58.58 or 83.69%, which shows that the activity of the students in learning with interactive CD-aided model of CPS is very high.

This condition is supported by the atmosphere of the learning model of CPS-assisted interactive CD that requires students to always be active during the learning takes place, which is active to find creative solutions to problems, also actively interact with other students through group discussions and class discussions and presentations in class. During the learning teacher acts as a facilitator and motivator, as well as provide facilities to student learning and student interaction with

learning resources that can facilitate their learning. So in learning with interactive CD-aided model of CPS, student activities dominate the learning process, or in other words a student-centered learning. This is consistent with the suggestion of Nasution (1995) that modern teaching students should prioritize activities. Similarly, Bruner learning theory, which states that learning is students study through active engagement with the concepts and principles in solving the problem, and the teacher serves as a motivator for students to gain experience that allows students to find and solve problems.

Based on the analysis of research data using regression analysis found that the activity of the students in learning with interactive CD-aided model of CPS positive effect on student achievement. The amount of influence or contribution of student activity on student achievement by 81.2%, while the influence of the relationship between students' activity with student achievement expressed by the regression equation $\hat{Y} = 4.932 + 0{,}901X$, $\hat{Y}$ is variable student achievement, student activities and X variables. The value 4.932 is a constant value which indicates that if a student does not have a student activity, the student achievement worth 4.932. While price is the regression coefficient of 0.901 which indicates that any increase in student activity score of 1, it will be accompanied by the increase in the value of student achievement at 0.901.

Obtaining the results of the above is possible because the CPS model-assisted learning interactive CD, students play an active role in the learning process and creatively trying to find solutions to the problems posed, interact with friends and teachers, exchanging ideas, so the insight and intellectual power develop. So in learning using interactive CD-aided model of CPS, students also do not just passively receive information that is transferred by the teacher, but the students play an active role in collecting information required in accordance with a predetermined-learning indicator.

The activities of students who appear during the learning process a positive contribution to the achievement of student achievement. For example, the emergence of student activities in the form of liveliness in asking the question, indicating that the student is having difficulty, but there is a willingness to master the material, so that students who want to ask if having difficulty, will have relatively fewer difficulties to the next matter, because the students' mastery of the material will affect the subsequent mastery of the material. This is because the nature of mathematical material that is generally arranged in a hierarchical manner, the material is a prerequisite of the subsequent material. Examples of other activities, in the form of active students respond to questions from other students and teachers, this indicates that the student has mastered the material. If this happens at every meeting means that the students master the many materials that have been targeted. This will obviously affect the acquisition of learning achievement.

It is relevant to the elaboration of the implications of Piaget's theory of cognitive among others stated that in learning focus on thinking or mental process of learners, prioritizing the role of learners in their own initiative and active involvement in learning activities (Hidayat, 2005: 7).

On the other hand with the use of multimedia learning and the use of interactive CD can increase student interest and assist students in understanding the material, it can be seen from the results of filling the questionnaire, which showed that 97.44% of the students were delighted with the use of interactive CDs, and 94, 87% of students stated that the use of the CD can help to

understand the material, even in general 100% of students stated pleased with the learning atmosphere trained by teachers, and 97.44% interest in participating in learning activities similar to the material further mathematics. Students response and positive interest towards learning as a whole, will help students to improve their academic achievement.

Furthermore, based on the calculation of the analysis of the compare means one sample t-test on the data results showed that the value of t = 8.715 with a significance value of 0.000 <5%, which means that Ho is rejected, the student achievement in the experimental class ≠ 68 is a standard of learning completeness, and from the table the average student achievement experimental class shows the average value of student achievement 82.51 well above 68, so the average achievement of learning achievement scores of students who take mathematics learning with interactive CD-aided model of CPS (experimental class) has meet learning completeness standard.

Obtaining the results is possible because the CPS model-assisted learning interactive CD, student activities dominate the learning process, students are not just passively receive information that is transferred by the teacher, but the students play an active role in collecting information required in accordance with a predetermined learning indicators.

The division of the group members heterogeneous capabilities, allowing each student has a different creativity in problem solving, so that each student can exchange ideas, each student is actively trying to find and express opinions. In addition, a heterogeneous group, allowing less capable students can ask other students are more capable when experiencing difficulties, so that the difficulties can be addressed immediately. Thus the process of teaching by peers (peer teaching).

The division of the group also raises the spirit of togetherness of the group members to be able to perform better than other groups. So that students are knowledgeable higher seeks to help other students who are less knowledgeable. Thus, students are knowledgeable higher to be a teacher for other students, and students who are less knowledgeable group of their friends got from the teacher, resulting in relationships that are mutually beneficial.

In addition, the presence of higher knowledgeable students become teachers for the other students, the higher will be more knowledgeable can master the material provided by the teacher.

Thus, learning using interactive CD-aided model of CPS can make students more knowledgeable can establish high academic achievement, and students who are less knowledgeable can be helped to improve their academic achievement. So overall this condition can increase the average achievement of student achievement value to at least be able to reach the standard of learning completeness.

CONCLUSION AND RECOMMENDATION

Based on the research results, we can conclude that:

1. Activity of students in mathematics learning with interactive CD-aided model of CPS has positive effect on student achievement. The magnitude of the effect of student activity on student achievement by 81.2%, while the influence of the relationship between students' activity with student achievement expressed by the regression equation: $\hat{Y} = 4.932 + 0{,}901X$, $\hat{Y}$ is the variable of student learning achievement and X is student activity variables.

2. The learning achievement of students who take mathematics learning with interactive CD-aided model of CPS has met learning completeness standard. Acquisition value of t = 8.715 with a significance value of 0.000 <5%, which means that student achievement in the experimental class ≠ 68 is a standard of learning completeness, and the average value for the learning achievement of students who take mathematics learning with interactive CD-aided model of CPS by 82.51 which means that more than 68.

From this study, it is suggested:

1. Model CPS-assisted learning interactive CD can be used as an alternative model of learning that can improve student achievement, therefore mathematics teachers are expected to implement this model in the study of mathematics, especially in the matter of trigonometry class X.
2. Teachers should enhance the learning activities of students in order to improve student achievement.
3. Teachers should provide learning opportunities to the students to solve problems in the form of problem solving.
4. The need for further research for materials and different classes and if it is possible, for other relevant subjects.

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