Analysis of the Effectiveness of Project Based Learning Model in Mathematics Learning: Viewed from LearningActivities

Syahrial

Universitas Negeri Yogyakarta, Jl. Colombo No 1. Yogyakarta, Indonesia
e-mail: syahrialsiregar09@gmail.com

Abstract

The purpose of this study to determine how the effectiveness of learning mathematics using a model project based learning: viewed from learning activities. The project based learning model is a model that encourages students to become more active in the classroom and able to apply the lessons learned so far in daily life. This research is a quantitative descriptive research, and its data collection is obtained by measurement using observation guide sheet. The sampling technique used is simple random sampling with the draw system and sampling size usingNomogram Harry King, with error rate of 6%. The result of the research shows that there are four domain: Listening Activities, Writing Activities, Drawing Activities, Mental Activities which have percentages above 80%. So the more students are active, the more effective the model of project based learning in learning mathematics. Benefits of this research is as an input model that is effective, appropriate and appropriate for use in learning and learning mathematics, insight in teaching, and as a reference material or reference especially to other authors who will examine the relevant issues.

Keywords:*project-based learning, mathematics learning, learning activities*

1. INTRODUCTION

In general, the purpose of teachers in teaching and learning activities in accordance with the curriculum is how to make the lesson material can be understood and mastered by the students completely. However, in the practice of learning, the students are less understood and less mastered the material presented by the teacher, it is indicated by the inability of students in completing the task of the teacher, and the lack of skills possessed students. This is due to many factors ranging from student factors as well as factors from learning models that are less varied and less effective. Less effective learning model will make students feel bored and saturated in learning.

In mathematics learning in addition to using lecture or conventional methods a teacher also needs to provide other supporting models to achieve an effective learning process. Effective learning is learning that can produce learning that is

useful and focused on the learner through the use of appropriate procedures.(Miarso, 2005: 536).

According to Eggen and Kauchak said that learning is effective when students are actively involved in organizing and determining information (knowledge). Students do not only passively receive the knowledge given by the teacher, and the students 'learning outcomes not only improve the understanding but also improve students' thinking skills, the learning completeness is greater, so the more effective the learning (Sinambela, in Mushlihuddin 2014).

According to Eggen and Kauchak (Bambang Triwarsita, 2008: 289) mentions the characteristics of effective learning as follows: (a) Learners become active reviewers of their learning environment through observation and comparison. (b) The teacher provides the material as the focus of thinking and interacting in the lesson. (c) The activities of the learners are entirely based on the assessment. (d) Teachers are actively

involved in providing direction and guidance to learners in analyzing information. (e) Orientation of learning, mastery of subject content and the development of thinking skills. (f) Teachers use instructional techniques that vary according to the purpose and style of learning.

In learning is very necessary activity, because in principle learn aadalah do (learning by doing). There is no learning if there is no activity. That's why activity is a principle or principle that is very important in the interaction of teaching and learning.

Based on the above description can be concluded that the effectiveness of learning can be seen from student activities during the learning progress, student responses to learning and mastery of student concepts.

In reality, in every teaching-learning process, the teacher will always dominate the activities. Students are too passive and all initiatives are coming from the teacher. It should be considered that learning activity is an activity that covers both physical and mental.

Piaget explains that a child thinks as long as he does, without the means that the child does not think. Therefore, for children to think alone then should be given the opportunity to do it yourselves. Thinking on the new ferb level will arise after the child thinks at the stage of deed (Sardiman, 2011). Therefore, it is clear that the activities in the broad sense both physical and mental, the links will both provide optimal learning activities. And teachers as facilitators can also use effective learning models and can increase student activity in learning.

In the previous research, the result shows that project based learning model can improve students' learning creativity (Lindawati, 2013 & Titu, 2015). In line with that, the research conducted by Handayani (2015) gave the result that increasing understanding of concepts and scientific attitudes was more influential by using project-based models rather than problem-based models.

The results of previous research indicated that the model of Project Based Learning is very effective, but not yet used to measure student learning activities, so this study will discuss and focus on learning activities.

The project based learning model is a learning model that makes students more active. With an active learning model, students will find it easier to understand difficult concepts if they work in a real project in their daily lives, and learning will be more effective. Therefore, one of the learning models that can be used by teachers is a project-based learning model

According to Thomas, project-based learning is an innovative learning model and emphasizes contextual learning through complex activities (Wena, 2011: 145).

Project-based learning model is a model that encourages students to become more active in the classroom and able to apply the lessons learned so far in everyday life. This model makes students productive because students will work in a project. The project provided is a real project in everyday life. This project will also generate motivation for students in learning because it is more interesting and more real (Istarani, 2011).

In learning, it should be noted that the involvement of students in organizing knowledge, whether they are active or passive. Fine types of activities that can be done by students during the learning. In this regard, Paul B. Diedrich classifies student activities in the following lessons (Sardiman: 2011): 1) Visual Activities (reading, taking notes, demonstrations, experiments, other people's work). 2) Oral Activities (stating, formulating, asking, and advising, issuing opinions, conducting interviews, discussions, interruptions). 3) Listening Activities (listening to conversations, conversations, discussions, music, and speeches). 4) Writing Activities (writing stories, essays, reports, questionnaires, copying). 5) Drawing Activities (drawing, graphs, maps, diagrams). 6) Motor Activities (experimenting, constructing, refit modeling, playing, gardening, raising). 7) Mental Activities (responding, remembering, solving problems,

analyzing, looking at relationships, making decisions). 8) Emotional Activities (interested, bored, happy, passionate, passionate, brave, calm, and nervous). Of the eight aspects above will be used as an indicator to measure the effectiveness seen from learning activities.

The formulation of the problem in this study is how the effectiveness of learning mathematics using model project based learning: viewed from the learning activities.Therefore, the purpose of this study is to determine how the effectiveness of learning mathematics using a model project based learning: viewed from learning activities.

2. METHOD

The Place of this research is in SMP (Junior high school) Negeri 35 Medan which is located at JL.Williem Iskandar Pasar V. Medan. The research was conducted in December until the end of February in the academic year of 2014/2015.

This research is a quantitative descriptive research, and its data collection is obtained by measurement using observation guide sheet. The sampling technique used is simple random sampling with the draw system and sampling sizenya using Nomogram Harry King, with error rate of 6%.So that obtained a sample of 38 students from a population of 48 students.

The technique of collecting the data used is observation. Here, the researcher collected observation sheets of students' activity during learning activity with project progress. The students' observation sheet is used to see student learning activity of mathematics by using project based learning model, observation that done is direct observation or participant observation, student observed during learning process using project based learning model. On the subject of the Two-Variable Linear Equation System (SPLDV). The obsevation sheet is made in the scoring column and has the criteria, and the observation is done in three meetings.

Instrument validity uses content validity. Content validity is the validity in the estimation through testing of the feasibility or relevance of test contents through rational analysis by a competent panel or through an expert judgment. Mardapi (2012: 39) states that the validity of the content can be obtained from an analysis of the relationship between the contents of the test with the constructs to be measured. The instrument being tested for validity is the observation guideline. The instrument is tested for its validity with the content validity approach. Content validity, which means that a measuring instrument is considered valid if it matches the domain and the specific purpose of using the measuring instrument (Surapranata, 2005: 50).

The data analysis used in this research is with descriptive statistics. To check the validity of the data in this study, researchers used triangulation technique. Triangulation is defined as a data collection technique that combines from various data collection techniques and data sources that already exist. Triangulation used in this research is triangulation technique. Triangulation technique means researchers use different data collection techniques to get data from the same data source. Researchers use participatory observation (Sugiyono, 2013: 241).

By using triangulation techniques in data collection, the data obtained will be more consistent, complete and certain. In addition, with triangulation will further increase the power of data, if in the observations made more than once. The assumption that the information obtained by researchers through observation would be more accurate when viewed from several meetings, by crossing the observations at the first meeting with observations at the second and third meetings, this would further strengthen the researcher compared with one only observation.

For scores and categories in this case use PAK (Assessment of Reference Criteria). Categories in determining score decisions obtained by students are:
Maximum score obtained by students are: 120

Minimum score obtained by students are :24

Then the interval of each category is adjusted to the normal curve of 3 to -3. And in this category to be made are four categories consisting of A (Very Good), B (Good), C (Simply Good) and D (Less Good). So we get the value of the category based on the criteria assessment as in Table 1:

Table 1. Normal Curve of Scale 4

-3	-1,5	0	1,5	3
24	48	72	96	120

After then that determined interval categories of students are:

Table 2. Category of Student Activity Score

No	Skor	Nilai	Kategori
1	x=>96	A	Very Good
2	72<=x<96	B	Good
3	48<=x<72	C	Simply Good
4	x<48	D	Less Good

3. RESULT AND DISCUSSIONS

The result of observation of student activity in this research is seen from three times meeting with same statement and indicator and observer (observer) same. This is done with the aim to strengthen the results of observations obtained, student activity can not be concluded if only done one time observation.

Data on each aspect/domain can be presented as in Table 3 below:

Table 3. Student Learning Activities

No	Domain	Percentage (%)
1	*Visual Activities*	67,54
2	*Oral Activities*	68,42
3	*Listening Activities*	84,21
4	*Writing Activities*	88,59
5	*Drawing Activities*	84,21
6	*Motor Activities*	76,32
7	*Mental Activities*	88,6
8	*Emotional Activities*	75,44

From the table can be seen that the domain visual activities. overall can be explained that active as many as 26 people, with percentage of 67.54% of the total students. This refers to the three statements that are part of visual activity indicators. This indicates that there are still some students who still kuranng active, it is seen from the still existence of students who drowsy and interfere with uneven friends do not listen to the explanations of other groups.

In the second domain is an active student Activities Oral overall total of 26 people, with persentasse 68.42% of the total number of students. This refers to the fourth, fifth and sixth statements that are part of the Oral Activities indicator. This shows that there are still some students who still kuranng active, it can be seen from there are still some students who do not care at all, so it can be analyzed that the students who are less active they are due for not being serious in learning that do not understand, and ignorant in learning .

In the third domain of Listening Activities students are active as a whole as many as 32 people, with a percentage of 84.21% of the total students. This refers to the seventh, eighth and ninth statements that are part of the Listening Activities indicator. This shows that almost all students are active but there are still some students who still kuranng active, can be analyzed that students who are less active is due to play and chat with friends.

In the fourth domain of Writing Activities students are active as a whole as many as 34 people, with percentage 88.59% of the total students. This refers to the tenth, eleventh and twelfth statements that are part of the Writing Activities id. This shows that almost all students are active but there are still some students who are still active, so it can be analyzed that the less active students are due to lazy in mensatat and some are still not understood in writing the project work.

In the fifth domain of Drawing Activities students are active as a whole as many as 32 people, with a percentage of 84.21% of the total students. This refers to

the thirteenth, fourteenth and fifteenth statements that are part of the Drawing Activities indicator. This indicates that almost all students are active but there are still some students who still kuranng active, so it can be analyzed that students who are less active is because the students are playing in making images / graphics and not serious.

In the sixth domain of Motor Activities, students are active as a whole as many as 29 people, with a percentage of 76.32% of the total number of students. This refers to the sixteenth, seventeenth and eighteenth statements which are part of the Motor Activities indicator. This indicates that almost all students are active but there are still some students who still kuranng active, so it can be analyzed that students who are less active is because the students are lazy in doing or do not understand how to create models and sketch drawing / graphics.

On the seventh domain that is Mental Activities students are active as a whole as many as 34 people, with percentage 88.60% of the total students. This refers to the nineteen, twentieth and twenty-first statements that are part of the Mental Activities indicator. This shows that almost all students are active but there are still some students who are still active, so it can be analyzed that the less active students are because the students prefer to memorize rather than understand, and there are also students who prefer silence and not daring or because students do not know what to respond to.

On the eighth domain of Emotional Activities students are active as a whole as 29 people, with a percentage of 75.44% of the total number of students. This refers to the twenty-second, twenty-third and twenty-fourth statements that are part of the Emotional Activities indicator. This shows that almost all students are active but there are still some students who still kuranng active, so it can be analyzed that students who are less active is because the students are not confident and afraid of the wrong and lack of enthusiasm and shyness.

This is supported by the observations of the three meetings that have been held, from the first meeting to the second meeting that the observed student activity has increased significantly, and from the second meeting to the third meeting can be seen a significant increase as well, although there are also students who still, this indicates that the increasing number of student activity days means the students are more active. And if we cross the results at the first meeting, the second meeting, and the third meeting, with the cumulative observation, the researcher finds the difficulty of the active students in learning. Data are cumulative from observations of three meetings on Tebel 4 and Figure 1:

Table 4. Frequency of Cumulative Score of Student Activity

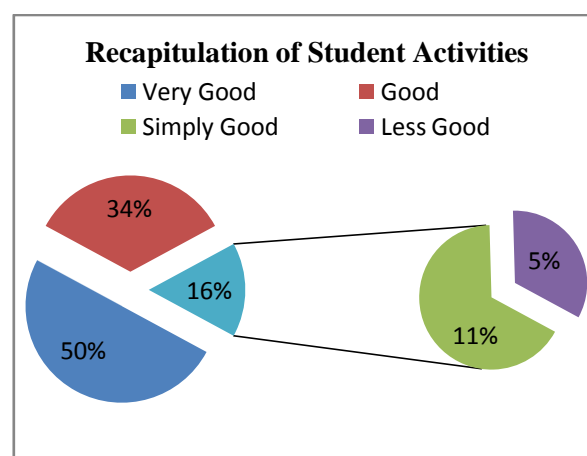| No	Value	Category	F
1	A	Very Good	19
2	B	Good	13
3	C	Simply Good	4
4	D	Less Good	2

Figure 1. Graph data of students' learning activity.

Based on the tables and figures above it can be explained that Based on the results of observation on the learning activities of students using the model based project learning, then obtained 84% of students can be categorized active because it is in good category and very good, sedangkat 16% other students are still less active because the

category scores obtained are pretty good and not good enough. So overall the active students are 84% of the total number of students. this is in accordance with the model used in the learning model of Project Based Learning. The project-based learning model is a model that encourages students to become more active in the classroom and able to apply the lessons learned so far in daily life.

4. CONCLUSIONS

Project-based learning will make students more active. This is consistent with the theory put forward by Eggen and Kauchak in which the lesson is said to be effective if the learners are actively involved in organizing and finding information (knowledge) as well as the linkage of information provided, learners are not only passively receiving the knowledge given by the teacher.

Therefore learning mathematics using the model of Project Based Learning can be declared effective, in accordance with the core of effective learning is the activity of students in learning.

5. RECOMENDATION

1) For students, it is expected to be more active in every learning, especially learning mathematics in order to obtain better and effective learning.
2) For teachers, especially teachers of mathematics is expected to use learning model using Project Based Learning in an effort to make students become more active in learning and have the skills and able to solve problems.
3) For the next researcher who has the same problem is expected to do research on different subject and location. And is expected in doing further research to further explore visual activities, student oral activities and emotional activities of students.

REFERENCES

[1] Handayani, I Dw A. Trisna. Karyasa, Wayan. Suardana, Nyoman. (2015). Komparasi Peningkatan Pemahaman Konsep dan Sikap Ilmiah Siswa SMA yang dibelajarkan dengan Model Pembelajaran Problem Based Learning dan Project Based Learning. *e-jurnal Program Pascasarjana Universitas Pendidikan Ganesha Program Studi Pendidikan IPA (Volume 5: 2015).*

[2] Istarani. (2011). *58 Model Pembelajaran Inovatif*. Medan: Media Persada

[3] Lindawati. Fatmariyanti, S.D. Maftukhin, A. (2013). Penerapan Model PembelajaranProject Based Learning untuk Meningkatkan Kreativitas Siswa MAN I Kebumen. *Radiasi. Vol.3.No.1.*

[4] Mardapi, Djemari. (2012). *Pengukuran Penilaian & Evaluasi Pendidikan*. Yogyakarta: Nuha Litera

[5] Miarso, Yusufhadi. (2005). *Menyemai Benih Teknologi Pendidikan.* Jakarta: Kencana

[6] Mushlihuddin, Rahmat. (2014). Keefektifan Model Pembelajaran Berbasis Masalah terhadap kemampuan pemecahan masalah peserta didik pada materi segitiga di kelas VII SMP N 9 Medan. *Jurnal Pendidikan Matematika EUREKA, Vol.6 No. 2: 2014.*

[7] Sardiman A.M. (2011). *Interaksi dan Motivasi Belajar Mengajar. rev.ed.* Jakarta: Raja Grafindo Persada./rajawali pers.

[8] Sugiyono. (2013). *Metode Penelitian Kuantitatif Kualitatif dan R & D.* Bandung: Alfabeta

[9] Surapranata, Sumarna. (2005). *Analisis, Validitas, Reliabilitas, dan Interpretasi Hasil Tes.* Bandung: PT Remaja Rosdakarya

[10] Titu,Maria Anita. (2015). Penerapan Model Pembelajaran Project Based Learning (PjBL) untuk Meningkatkan Kreativitas Siswa Pada Materi Konsep Masalah Ekonomi.*Prosiding Seminar Nasional. 9 Mei 2015.*

[11] Triwarsita, Bambang. (2008). *Cirri-ciri Pembelajaran yang Efektif.* Jakarta: Bumi Aksara

[12] Wena , Made . (2011). *Strategi Pembelajaran Inovatif Kontemporer: Suatu Tinjauan Konseptual Operasional.* Jakarta:Bumi Aksara