Effectiveness of Discovery Learning-Based Transformation Geometry Module

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Abstract. Development of transformation geometry module is conducted because the students got difficulties to understand the existing book. The purpose of the research was to find out the effectiveness of discovery learning-based transformation geometry module toward student’s activity. Model of the development was Plomp model consisting preliminary research, prototyping phase and assessment phase. The research was focused on assessment phase where it was to observe the designed product effectiveness. The instrument was observation sheet. The observed activities were visual activities, oral activities, listening activities, mental activities, emotional activities and motor activities. Based on the result of the research, it is found that visual activities, learning activities, writing activities, the student’s activity is in the criteria very effective. It can be concluded that the use of discovery learning-based transformation geometry module use can increase the positive student’s activity and decrease the negative activity.

1. Introduction

Teaching is one of activities used by teacher in order to make the students learn. In teaching and learning, the students become the subject or the doers of the activity of learning [1]. Using the activities has significant effect in teaching and learning because by doing so, the students can get their own experiences, build a good relationship, work based on the own interest and ability, develop understanding, think critically and develop personal aspects, so that the activities conducted become more enjoyable.

Learning is one of the changing to from a bad into better attitude and behavior, lack of knowledge into more knowledge, less understanding into more understanding. A student is considered into learning when there is a change into his or her own personality though it takes a long period to get it. The changes can be into skill, habit, understandable, achievement, interest, and self-adjustment [2]. It can be concluded that learning activity is a serial of learning activity conducted by students during teaching and learning. By having various activities in learning activity, it is expected that the students can build his/her own knowledge about the mathematical concepts towards the teacher’s guidance [3].

The result of the conducted observation shows that the student activities during the learning is far from the maximum result. It is caused by the conventional way of learning process, so that the students only listen the lecturer’s explanation. The student’s become passive, lack of participation and knowledge learned. Considering those problem, it is needed basic changes that can guide the students to find out the concept and involve the students to be active in learning process. This is supported
science 1981 when Moran made this statement, our lives have become increasingly more complex. Our ability to function in society is based part on our ability to learn without instruction. Interestingly, there is considerable as to the real value of discovery learning approaches [4]. Research of discovery-based learning tends to focus their research on specific domains such as math/numbers, computer skill, science, problem solving, and physical/motor skills [5]. One consistent finding is guided discovery learning is superior to pure discovery learning [6]. Further, upon review of research literature [5] found little evidence that pure discovery learning has any value. However, as Moran suggested in 1981, and with the constant introduction of new technologies, it seems pure discovery learning plays a significant role in our daily lives. In purchasing a new iPhone recently, it was a surprise to find no instruction booklet in the box.

One of the developed teaching material is a discovery learning-based module. This module can activate the student in learning. They will think and find out the findings. Then, there is a student self-satisfaction that can support the student to find out new concept learned, so that the student’s interest is increasing. Based on the curriculum direction, the curriculum must be based on the student centered. It means that the lecturer only becomes a facilitator and motivator. [7] stated that the importance steps taken in discovery learning-based module running effectively are the first define the problems given to the students with the adequate data and it must be clear, second from the data given by the teacher, students set, process, organize, and analyze, the data, third Students set the prediction and analysis conducted, fourth If necessary, the prediction made by the student is checked by the teacher, fifth if the certainty is possessed, the verbal prediction is handed to the student to be set, sixth after the student find what is researched, teacher should provide exercises or additions in order to check the result. Through this discovery learning, it is expected that it can increase the student’s activity in learning process.

Learning activity can increase the learning outcome [8]. Indicators of learning activity can be seen through visual, speaking, listening, writing, motoric, mental, and emotional activities [9]. Stated that learning Mathematics is not only learning to know, but it should be increased into learning to do, learning to be, learning to live together [10]. The activities observed on the research is Visual Activities that are student reads the module; Oral Activities are student gives question to lecturers and students; Listening Activities are student listen the explanation from the lecturers; Writing Activities is student fills the blank on the text on the module; Mental Activities are student responses, solves the problem, analyze, find out the relation, and concludes the learning; Emotional Activities are student feels interested and brave; Motor Activities are student conduct the irrelevant action into teaching and learning (for example: disturbing friends, daydreaming, or playing).

2. Method
The research model is a Plomp model that includes preliminary research, prototype phase and assessment phase. The research method used to parodelize the aparticular product, and test the effectiveness of the product [11]. This research is the assessment stage where to observe the effectiveness of designed products. Subjects in this study were 15 students. The instrument is an observation sheet for viewing activities in using module geometry of invention-based learning transformation at STKIP PGRI West Sumatra. The research procedure is a learning process using learning-based learning transformation learning module. Then, the analysis is done on student learning activities. Observational data derived from the calculation of student activity on the observation sheet. Then, the data were analyzed through the proposed percentage technique [12].

3. Result and Discussion
Effective or not a product, method, or learning model can be seen by the increase or changes in motivation, learning outcomes, behaviour, and so forth a better direction. In this papers will be seen, the effectiveness of the product in the form of guided discovery-based modules, the lectures geometry transformation in STKIP PGRI West Sumatra. The effectiveness highlighted here is on aspects of student learning activities using the modules present in the learning process. According to [13],
defining the effectiveness of student learning in mathematics being TIMMS or PISA assessment is determined by a number of factors [13]. The Indonesian education system is often said that the students' achievement in mathematics is a major factor for teacher [15]. One indicator of success in learning is good learning achievement by students after going through the learning process.

Results of three times meeting activity in teaching and learning process in student’s learning process by using discovery learning-based transformation geometry module can be seen as the following Table 1:

| Student Learning Activity | Meeting I | Meeting II | Meeting III | Mean | Level of Success |
|--------------------------|-----------|------------|-------------|------|------------------|
|                          | Quantity  | Quantity   | Quantity    |      |                  |
|                          | %         | %          | %           | %    |                  |
| 1                        | 15        | 100        | 15          | 100  | 100              | Very Successful |
| 2                        | 6         | 40         | 10          | 67   | 15               | It Worked       |
| 3                        | 15        | 100        | 15          | 100  | 100              | Very Successful |
| 4                        | 15        | 100        | 15          | 100  | 100              | Very Successful |
| 5                        | 8         | 53         | 12          | 80   | 15               | 77.6            | Very Successful |
| 6                        | 10        | 67         | 14          | 90   | 15               | 85.6            | Very Successful |
| 7                        | 4         | 37         | 0           | 13   | 0                | 16.6            | Not Successful  |

Table 1 show visual Activities is student reads the Module. Student’s activity on this level is very good. It can be seen from many students read the module given on each meeting. It happens because the given module by the teachers make the student read and pay attention. Oral Activities is Student Gives Question to the Lecturer and Students. Student’s activity on this level increases each meeting. It is because the activity on the module requires the student to find out the concept of materials. If there is no doubt or problem for finding the concept, students may question to the lecturer and students. Listening Activities is student Listens the Lecturer’s Explanation. Student’s activity on this level is very good. It happens because the student’s curiosity to the module given very high. The curiosity is growing because the content of module is started from the problems that guide the student to find out the concept. Writing Activities is student Fills the Blank Text and Exercise on Module. Student’s activity on this level is quite limited. It is because the students are not used to using the module in learning process. However, by having an explanation about how to fill the blank text on student’s activity module increase from each meeting. Students are able to fill the blank text and exercise on the module. Mental Activities is student Responds, Solves the Problem, Analyze, Find out the Relation, And Conclude the Learning. From the first meeting, the percentage of the activity is quite limited. It happens because the students are not able to analyze the existing problem on the module, so that the students get difficulties to solve the problem and could not relate to the concept of problem solved. However, on the following meeting, the student’s average score has been showing good activities. Emotional Activities is student Feels interested and Brave Activity of the student on this level has been very good. From the first meeting until the next meeting, the activity has been improving. They have been brave to express their ideas to their friends without having having doubt. It is because the students have already had their understanding to the materials given. Motor Activities is student Conducts Irrelevant Activities to the Teaching Learning Activities (Disturbing Friends, Daydreaming, and Playing). Student’s activity on this level for each meeting has been decreasing. It means that by using the module, it can grow the student’s positive activity so that the student can understand the concept of the materials given.

Learning by using discovery learning-based transformation geometry module supports the student to find out a concept from the materials and data provided by lecturers. This module is one of the learning media that helps the students to understand the materials. Learning media [16] is a media used to deliver the message or information from the lecturers or instructor to the learners. The use of the
module in learning process can increase the student’s activity so that the learning is no longer based on
the lecturer and decrease the activity disturbing the learning process. Investigation explained by the
National Science Education Standard [17] as a set of practice and science activity involving
observations, proposing questions, analyzing the information sources such as books in order to check
the understanding, involving the planning, investigation, reviewing the knowledge as the experimental
evidence, using needed tools to collect, analyze, and interpret the data, proposing the answers,
exploration, and prediction, communicating the results as well. Teaching investigation is frequently-
related to the concept of discovery teaching [11]. Investigation-based learning is a pedagogical method
developed as the response towards the forms of traditional instruction that is based on remembering
the information from the teaching materials [18].

Based on the results of the research can be concluded that the use of Guided Geometry module
based on discovery effectives improve student learning activities. This is supported by research
conducted by [19] there is substantial evidence that inquiry-based learning is effective. These
outcomes have included effect in a large urban district on state standardized assessments [20].
Moreover, this effect was cumulative (i.e., more inquiry units led to greater gains) and sustained. In a
study of a large and diverse school district, Lynch et al. [19] demonstrated that inquiry-based learning
environments fostered better engagement and mastery goal orientation when contrasted with a
comparison group that participated in traditional instruction. That effect was equally strong for his
torically disadvantaged groups as it was for non-disadvantaged groups. In a meta-analysis of teaching
strategies on science achievement. [21] Found that inquiry strategies were associated with a moderate
to large effect on student achievement.

4. Conclusion
Student activity during use of discovery learning-based transformation geometry module is concluded
to end to increase from the first meeting until the third meeting. It seems that the students are more
passionate and happy in the learning process, so that there is an increase in the activity of the student
reading the module, asking both lecturers and friends, listening to explanations, giving responses,
solving problems, analyzing and concluding lesson and reducing the activities negative direction as
disturbing friends during the learning process.

5. Acknowledgments
The writer expresses a great thank to DP2M Dikti, with the Agreement Letter of research Number:
025/E3/2017/ dated on January, 6th, 2017 as the research funder. Next, she also expresses her great
gratitude to President of STKIP PGRI West Sumatra for giving the research permit to conduct the
research.

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