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THE EFFORT OF INCREASING LEARNING MOTIVATION OF EIGHTH GRADE STUDENTS IN SMP MUHAMMADIYAH 3 YOGYAKARTA WITH APPLYING GEOMETRY LEARNING BASED ON VAN HIELE THEORY

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Abstract

The purpose of this research is to improve students' learning motivation through the application of geometry learning based on van Hiele theory. There are five stages in the learning of geometry based on the van Hiele theory: (1) Inquiry, (2) Directed Orientation, (3) Explication, (4) Free Orientation, (5) Integration. This research used a classroom action research. The subjects were 32 students of class VIII D in SMP Muhammadiyah 3 Yogyakarta. Instruments in this research were motivation questionnaire, test item description, and observation sheet of feasibilitylearning. Analysis of the data used is descriptive analysis. The results of this research were: (1) At the end of the first and second cycle, there were 65.63% and 87,5% of students who have learning motivation (minimum) in the medium category, (2) At the end of the first and second cycle, there are 70.94% and 84,16% of students who reached a value greater than or equal to 75, (3) The average percentage of learning feasibility at the first and second cycle was 85.33% and 81.81%. Thus, this research was considered successful because it reached target of this research: At least 75% of students who have a learning motivation (minimum) in the medium category and reached a value greater than or equal to 75, and the average percentage of learning feasibility was greater than or equal to 75%.

Keywords :learning motivation, geometry, van Hiele

INTRODUCTION

Based on the Regulation of the Minister of Education and Culture, Number 68, 2013 about Basic Framework and Curriculum Structure of Secondary School (Kemendikbud, 2014) explained that the competencies which are required of students in the learning of mathematics, including: (1) shows the logical attitude, critical, analytical, meticulous, and conscientious, responsible, responsive, and do not easily give in solving the problem, (2) have a curiosity, confidence, and interest in mathematics, (3) have a sense of trust in the power and usefulness of mathematics, which is formed through experiential learning, (4) have an open attitude, manners, objective in group interaction and daily activities, (5) the ability to communicate mathematical ideas clearly. These competences are needed so that learners can have the ability to acquire, manage, and use information to survive in an ever-changing circumstances, uncertain, and competitive.

Skemp (1971: 133) explained, "*Mathematics is a pleasureable and worthwhile activity in itself, regardless of any other goals which it may also serve. Way people should enjoy learn and practicing mathematics for its own sake is, however, far from obvious if we keep to our original hypothesis that any motivated behaviour satisfies some need*". Masykur&Fathani (2009: 75) explained that there are many students who still think that mathematics is a subject that is stressful, make a confused mind, spend time and tend to just tinkering with the formula that is not useful in life. Consequently, mathematics is seen as a science that does not need to be learned and can be ignored. Moreover, this condition is also supported by the learning process

in schools that still oriented to work practice questions only. Almost had never encountered mathematics learning process that directly linked to real life.

Based on observation in SMP Muhammadiyah 3 Yogyakarta, obtained information that 69.7% of students of class VIII D has not reached KKM (75). Especially for learning geometry, the students have difficulties in understanding geometry objects such as lines, two dimensional shapes, and three dimensional shapes. They were difficulty to visualize geometry objects. The students were given formulas to calculate the length, width, area, or volume of the geometry objects. They were rarely taught about the concept of the geometry objects, or invited to find a formula or patterns that associated with the concept of geometry. Applied learning was still conventional. As a result, in addition to lower educational achievement, student motivation was also low, because the students often feel bored and werenot interested in learning that followed.

Geometry is one of the subject areas of mathematics which is an applied science that is useful in almost all aspects of life. Geometry is important to learn because geometry is prominent in the deductive patterned structure and the techniques of geometry which is effective to solve the problem of the many branches of mathematics and to support the learning of other subjects. In-depth understanding of the geometry is useful in a variety of situations that related to the topics of mathematics and other subjects in school.Children meet many geometry objects in daily life, such as cube like boxes or blocks, toys in the form of a ball, cone-shaped hat, and etc. They are motivated to master the skills in understanding the shape and space so that they can develop a passion for learning geometry.

When the teacher dominated learning in the classroom, the student will be inactive. Another factor that makes learning becomes less significant is the limited medium of learning, especially learning geometry such as props (concrete objects). The props in geometry learning can help students to understand the concept of geometry itself. Supposedly geometry can be taught to students by using tools such as concrete objects, and adapted to the stage of development of students' thinking. Relationships between abstract geometry objects must be studied deductively as theoretical. Hopefully, it can help students in the process of abstract thinking about geometry.

Therefore, in the learning activities, especially learning geometry, a teacher must give a lesson in stages, adapted to the stage of development and the characteristics of the students. One of the many theories of learning geometry used by the experts in designing geometry learning activities is van Hiele theory. Teppo (1991: 210) explained that the van Hiele theory postulates a learning model that describes the different types of thinking that students pass through as they move from a global perception of geometric figures to, finally, an understanding of formal geometric proof. Van Hiele currently characterizes his model in terms of three rather than five levels of thought, which he labels as visual (level 1), descriptive (level 2), and theoretical (level 3) (Fuys, Geddes, and Tischler 1988; Geddes 1987, 1988; van Hiele 1986).

Teppo (1991: 210) explained that Van Hiele's model stresses the importance of the teaching-learning act. Students progress from one level to the next as the result of purposeful instruction organized into five phases of sequenced activities that empha size exploration, discussion, and integration. The van Hiele model postulates that these five phases of instruction are necessary to enable students in each learning period to develop a higher level of geometric thinking (van Hiele, 1986). The five phases of instruction are de scribed and illustrated by examples dealing with the concept of symmetry as treated during the first learning period. These activities are adapted from suggestions in Structure and Insight (van Hiele, 1986).

The first phase is information. In this phase, material related to the current level of study is presented to the students. The second phase is bound orientation. In this phase, the student explores the field of inquiry through carefully guided, structured activities.The third phase is explication. In this phase, the students and teacher engage in discussion about the objects of study. Language appropriate to the level is stressed (see the preceding activity). The fourth phase is free orientation. In this phase, the students engage in more open-ended activities that can be approached by several different types of solutions. The fifth phase is integration. In this

phase, the teacher helps the students to gain an overview of the field of study and to inte grate the subject matter investigated. At this stage rules may be composed and memorized(van Hiele, 1986).

Formulation of the problem in this study are: (1) How is the efforts of increasinglearning motivation of students with applying geometry learning based on van Hiele theory? (2) Is the geometry learning based on van Hieletheory can increasegeometry learning motivation of students?. The purpose of this study was to determine whether the geometry learning based on van Hiele theory can increase geometry learning motivation of students. The results of this study are expected to be useful: (1) Forteachers, the results of this study can be used as input to increase the learning process on the Pythagorean material of eighth grade students in SMP Muhammadiyah 3 Yogyakarta. (2) For other researchers, the results of this study can be used as a reference in conducting similar research. (3) For the principal, the results of this study can be used as a reference in making policy on increasing the quality of teaching in schools. (4) For students, this research is useful to increase students' motivation in learning geometry.

RESEARCH METHOD

This research used a classroom action research to monitoring the learning problems that faced by students and assist teachers in improving their teaching for teaching and learning take place. Classroom action research undertaken collaboratively, for the rational stability in the execution of tasks, and improve the conditions of their own teaching practice.The subjects were students of class VIII D SMP Muhammadiyah 3 Yogyakarta. Class divisions in SMP Muhammadiyah 3 Yogyakarta is heterogeneous, then the students in class VIII D consists of a heterogeneous student ability. The number of students in a class is 32 students, which consists of eight male students and 24 female students.

This study was conducted to follow the stages of classroom action research proposed by Kemmis and Mc Taggart, the action component is planning (planning), action (acting), observation (observing), and reflection (reflecting).Instruments in this study are: (1) Questionnaire to determine students' learning motivation at the beginning and end of the cycle, (2) Problem description test to determine student achievement at the beginning and end of the cycle, (3) The learning feasibility observation.

Analysis of the data used is descriptive analysis. Criteria mastery learning mathematics in SMP Muhammadiyah 3 Yogyakarta set with a score of 75 on a scale of 100. The action is successful if 75% of students have a minimal learning motivation at a moderate level, 75% of students reached a value greater than or equal to 75 (reach KKM), and the percentage average of learning feasibility lasting more than or equal to 75%.

RESULT OF THE RESEARCH AND DISCUSSION

The research was conducted in class VIII D SMP Muhammadiyah 3 Depok Yogyakarta on 27 October to 24 November 2014. This study was conducted in two cycles. The first meetings, namely on 3, 5, and 10 November 2014. The second cycle executed as many as 2 meetings, namely on 17 and 19 November 2014. The material taught in this study is the Pythagorean theorem material, with basis competence as follows: (3.8) Understanding the Pythagorean theorem through props and investigation of various patterns of numbers, (4.1) Using patterns and generalizations to solve real problems, (4.4) Using the Pythagorean theorem to solve various problems.

At the beginning of this research, students were given a pre-test which consists of learning motivation questionnaire and learning achievement tests. Pre-test is intended to determine the ability of the initial research subjects.Based on the data from pre-test, it is known that the level of students' learning motivation at the beginning of this study is on the criteria of "low", with an average score of 79.13. As for the initial knowledge of the Pythagorean theorem material, there was no research subjects that reached KKM. The average value of the subject of the study was 31.38. This indicates that the initial condition (before the study), research subjects have not

mastered the material so that the Pythagorean Theorem prior knowledge does not affect the results obtained after this research.

This research aims to increase students' learning motivation of the criteria of "low", becomes minimal criteria of "being". In general, target of this research was at least 70% of students are motivated by the criteria of "being". However, specifically researchers want to increase students' learning motivation for each criterion level as shown in the Picture 1.

At the end of the first cycle, the researchers provided the first post-test for students to know the results of their study. Based on the test result, there were only 53.13% of students with moderate learning motivation, and 12.5% of students who have high learning motivation. So that the number of students who have minimal motivation "being" is 65.63%. These results have not yet reached research target to be achieved at least 70% of students have motivation on the criteria of "being". When viewed by the value of learning achievement, only 40.63% of students who have reached KKM, with an average value of 70.94. It also shows that the research conducted until the end of the first cycle is not successful, although the learning process has been implemented 85.33%. Because this study has not been successful (yet to reach the desired target), this research is continued in Cycle II.

At the end of the second cycle, the researchers also providedthe second post-test for students to know the results of their study. Based on the test result, there were 65.62% of students with moderate learning motivation, and there were 21.88% of students who have high motivation. Thus, the target of increasing student motivation in this study have been met, 87.50% of the students are motivated to minimum criteria "moderate", with an average value of 84.16. In addition, the results of student achievement tests also showed an increase, there were 90.63% of students who have reached KKM, with an average value of 84.16. Although the percentageof learning feasibility in Cycle II was lower than the first cycle, which is 81.81%, but the percentage has exceeded the target, which is 75% done. Thus, this study was successful because it has met the research target to be achieved

Variabel	Interval	Kriteria	Kondisi Awal	Target	Akhir Siklus 1	Akhir Siklus 2
Afektif	120 < X	Sangat Tinggi	0%	0%	0%	.... %
	100 < X ≤ 120	Tinggi	6,25%	20%	12,5%	21,88%
	80 < X ≤ 100	Sedang	50%	70%	53,13%	65,62%
	60 < X ≤ 80	Rendah	25%	10%	31,25%	12,5%
	X ≤ 60	Sangat Rendah	18,75%	0%	3,12 %	0%
	Rata-rata		79,13	90	85,88	90,09
Kognitif/keterampilan	yang tuntas ≥ 75 %	**KKM Tercapai**	0%	75%	40,63%	90,63%
	Rata-rata		31,38	75	70,94	84,16
Proses Pembelajaran	terlaksana ≥ 75 %	**Pemb. Berhasil**		75%	85,33%	81,81%

Picture 1. Research Targets

Learning geometry based on van Hieletheory done quite well in Cycle I. Based on observation of practitioner teacher at the first until third meeting, the learning phase van Hiele quite an impact on students. Students really directed gradually in learning geometry. Practitioner teacherwas not only transfer information or materials, but also strive to provide meaningful learning to students, although the first cycle is not maximized. For example, students were directed to find the Pythagorean theorem through practice or testing directly with the help of props such as triangular and rectangular. Students can observe directly, then try (trial and error),

to discover new things. Such activities were directed by the practitioner teacher gradually, according to the van Hiele theory. The students were very enthusiastic and motivated during a trial (trial and error) with props. The students were also taught to communicate their opinions with others in discussion groups, and then presenedt the results of the discussion group. In this first cycle, activities that have not been visible was the studenst asked the teacher about anything they observe. When given the opportunity to submit questions, they were not willing to ask. In addition, they also have not been able to make conclusions on their own without the help of a teacher. Thus, teachers still often provide assistance in making conclusions or analyzing of learning. The average percentage of learning feasibility on this first cycle was 85.33%.

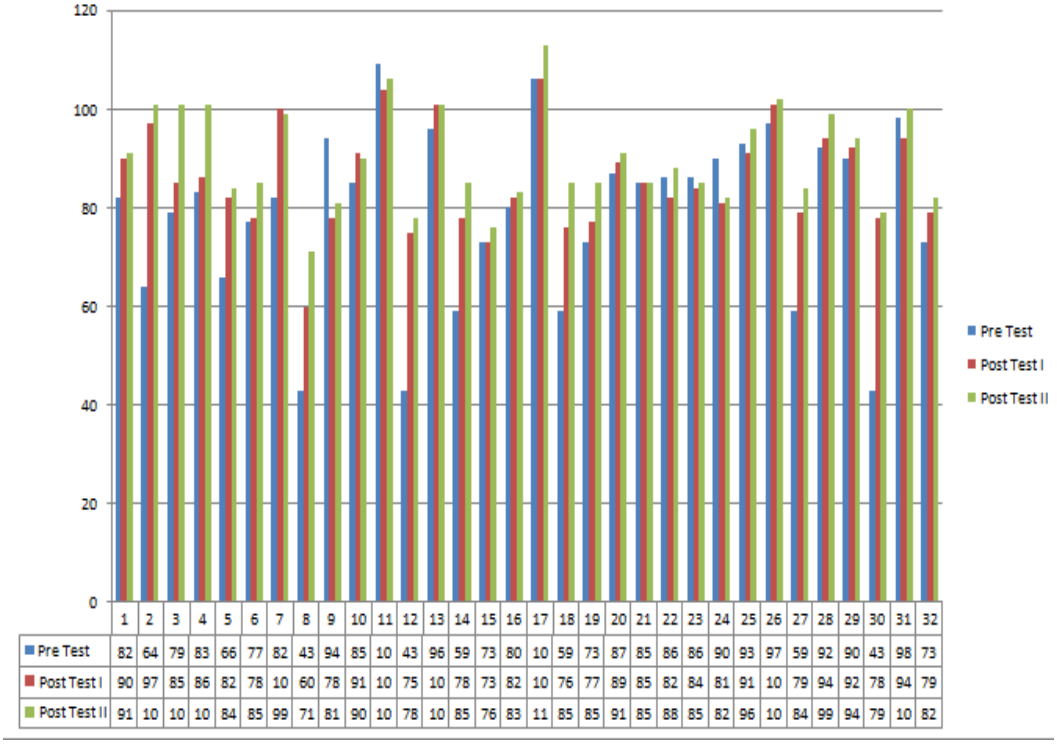
At the Cycle II, both at the first meeting and the second meeting, learning done well. The average percentage of learning feasibility amounted to 81.81%. Learning feasibility on the first cycle better than on the second cycle. This is because in the second cycle teachers did not use concrete props on learning activities, but replace it with power point slides. This is done because it adapts to the material being taught, namely resolve real problems with the Pythagorean Theorem. Although the percentage of learning feasibility on the second cycle was lower, but there was some progress in students. They have started to actively ask, even when not asked by the teacher. They eagerly solved the problems given by the teacher, discussed with their friends, and sometimes asked for help from the practitioner teacher to solve problems they have not understood.

Overall, learning geometry based on the van Hiele theory gave a good impact on students, particularly students' learning motivation. According to Elliot, et al (2000: 332), *"Motivation is difined as an internal state that arouse us to action, pushed us in particular direction, and keeps us engaged in certain activities. Learning and motivation are equally essential for performance. Learning enables us to acquire new knowledge and skills, and motivation provides the impetus for showing what we have learned"*. Students became more vibrant and active in learning activities.

In addition, the material that they received was not only the result of the transfer, but also the form of observations and experiments that they did, the process was experienced directly. Thus, they understood the material, not only a purely practical formulas, but also understood the concept. Learning feasibility at the first cycle and the second cycle has exceeded initial research target, which carried more than 75%.

At the end of the first cycle, the researchers gave the post-test in the form of learning motivation questionnaire. Based on the results of the questionnaire filling, data showed that there were 12.5% of students with high motivation, 53.13% of students with moderate motivation, 31.25% of students with low motivation, and 3.1% of students with very low motivation.These results did not meet research target to be achieved, because the percentage of students who have minimal motivation in the category of "moderate" only by 65.63%, whereas the minimum target reach 75% of students who have minimal motivation in the category of "moderate". In addition, there were students with very low motivation, that is equal to 3.12%. Although the average score of their learning motivation reached 85.88, which is categorized as moderate, but the number of students who achieve these categories have not reached the target.

At the end of the second cycle, the researchers returned to give the post-test in the form of motivation questionnaire. Based on the results of the questionnaire filling, data showed that there are 21.88% of students with high motivation, 65.62% of students with moderate motivation, 12.5% of students with low motivation, and 0% of students with very low motivation. These results have fulfilled research target to be achieved, because the percentage of students who have minimal motivation in the category of "moderate" has more than 75%. In addition, the average score of their learning motivation reached 90.09, which is categorized as moderate. Although the percentage of students who have low motivation in particular has not reached initial target, 12.5%, while only 10% target initially. Thus, learning geometry based on the van Hiele theory in this research proven to increase students' learning motivation.

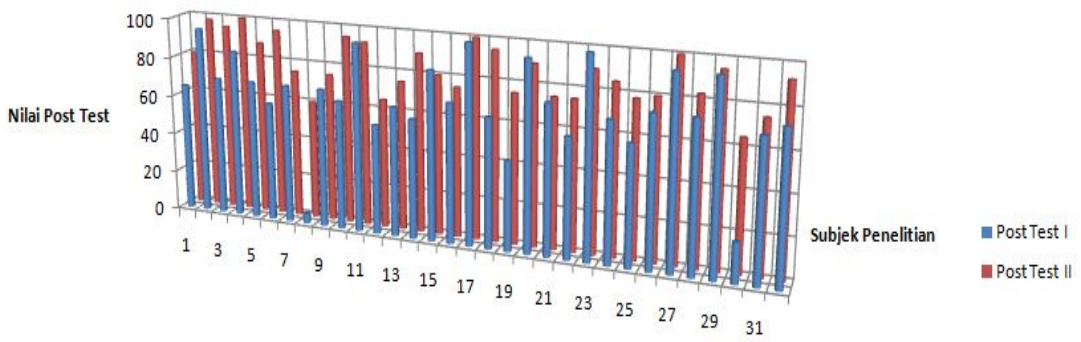


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Pre Test	82	64	79	83	66	77	82	43	94	85	10	43	96	59	73	80	10	59	73	87	85	86	86	90	93	97	59	92	90	43	98	73
Post Test I	90	97	85	86	82	78	10	60	78	91	10	75	10	78	73	82	10	76	77	89	85	82	84	81	91	10	79	94	92	78	94	79
Post Test II	91	10	10	10	84	85	99	71	81	90	10	78	10	85	76	83	11	85	85	91	85	88	85	82	96	10	84	99	94	79	10	82

Picture 2.Chart of Students' Learning Motivation Value

At the end of the first cycle, the researchers gave about the post-test as many as 6 essay to know the students' achievement. Rober& Chair (2009: 38) explained, *"achievement is that it is easier to estimate each student's expected outcomes when we have measures over time for each individual student. Student score are highly correlated over time"*. Based on the results of the first post-test, data showed that there were 40.63% of students who achieve the minimum completeness, invitation class average value of 70.94. There were 13 students who scored in the top 75, out of 32 students in the class. In fact, there were two students who succeeded in obtaining the value of 100. The lowest values were obtained by students at the post-test I was 5. Student achievement at the end of the first cycle has not reached the target,more than 75% of students achieve the KKM. Based on the analysis of students' answers, it turns out many students have difficulty in understanding the intent of questions, as well as simplifying the shape of the root.

At the end of the second cycle, the researchers gave about the post-test as many as 5 essay. Based on the results of the post-test II, data showed that there were 90.63% of students who achieve the minimum completeness, with class average value of 84.16. There were 29 students who scored in the top 75, out of 32 students in the class. In fact, there were 3 students who succeeded in obtaining the value of 100. The lowest values were obtained by students at the post-test II is 60. The achievement of student achievement at the end of the second cycle has reached the target, more than 75% of students achieve the KKM. Based on the analysis of students' answers, some students still have difficulty in simplifying the shape of the root.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Post Test I	65	95	70	85	70	60	70	5	70	65	95	55	65	60	85	70	10	65	45	95	75	60	10	70	60	75	95	75	95	20	70	75
Post Test II	80	98	95	10	88	95	75	60	75	95	93	65	75	90	80	75	10	95	75	90	75	75	90	85	78	80	10	83	95	65	75	93

Picture 3.Chart of Post-Test I and Post-Test II Value

The comparison test scores at the end of Cycle I and Cycle II, there was fluctuations in the value of the second cycle. Based on data of which are presented in the chart above, there were 4 students whose value has decreased from the first cycle to the second cycle, and there were 3 students whose value is fixed (same) between the first cycle and cycle 2, while 25 others have increased the value of the first cycle to second cycle. However, things are considered in this study is not the increase in the value of the first cycle to the second cycle, but the achievement of the research targets have been set at the beginning of the study, that there are at least 75% of students who scored above the KKM (75). Thus, at the end of the second cycle, this research has reached the target with 90.63% of students who scored in the top 75.

According to Burger & Shaughnessy (1986, 31), at the Level 3 (Deduction), the students reasons formally within the context of a mathematical system, complete with undefined terms, axioms, an underlying logical system, definitions, and theorems. So, the students there were in Level 3 (deduction) because the students knew about Pythagorean Theorm and they could proof it deductively.

CONCLUSION AND SUGGESTION

Based on the results of research and discussion in this study, it can be concluded that the study of this class action is considered successful because: (1) At the end of the first cycle, there were 65.63% of students who have a minimal learning motivation in the medium category, and at the end of the second cycle were 87.5% of students who have a minimal learning motivation in the medium category. Thus, the results of the learning motivation has reached research target, that there were at least 75% of students who have a minimal learning motivation in the medium category. (2) At the end of the first cycle, there were 70.94% of students who reached a value greater than or equal to 75 (reach KKM), and the end of the second cycle, there were 84.16% of students who reached a value greater than or equal to 75 (reach KKM). Thus, the results of the learning achievement has been reached research target, there were at least 75% of students who reached a value greater than or equal to 75 (reach KKM). (3) The average percentage of learning learning feasibility that takes place on the first cycle was 85.33%, while the second cycle was 81.81%. Thus, the percentage has been reached research target, which is the average percentage of learninglearning feasibility takes place more or equal to 75%.

Researchers suggest that teachers can apply geometry learning based on the van Hieletheory to increase students' learning motivation in learning activities other geometry. In addition, the

researchers suggested that teachers use teaching aids such as concrete object geometry in instilling the concept of geometry to students, especially those related to the material. Therefore, with the help of concrete objects, students will be more motivated to observe the geometry objects directly.

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