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Enhancement of Concentration and Mathematics Learning Outcomes Using Discovery Learning Method on Transformation Topic

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Abstract

This study aims to examine whether the actions of educators in using discovery learning models can improve concentration and mathematics learning outcomes in the material of transformation in class IX D of one of the junior high schools in Magelang. This research is a participant class action research. While the models used are the Stephen Kemmis and Robin McTaggart Model. The subjects of this study were students of class IX D of one of the junior high schools in Magelang in the academic year 2018/2019. This research consists of two cycles, namely cycle 1 and cycle 2. The material provided in this study is a transformation topic that includes translation, reflection, rotation, and dilation. Data on the concentration of mathematics learning are obtained using observation sheets. Data on mathematics learning outcomes were obtained using a theory test sheet. The data obtained were analyzed quantitatively and qualitatively. The results of the study show that: (1) learning using discovery learning models can increase student learning concentration; (2) learning using discovery learning models can improve student learning outcomes; and (3) learning using discovery learning models can increase the concentration of learning and the learning outcomes of IX D students of junior high school.

Keywords: discovery learning, learning concentration, mathematics learning outcomes, transformation.

INTRODUCTION

The education in Indonesia in 2018 has experienced significant development and improvement to generate quality educated people. The revised 2013 curriculum which is often referred to as the national curriculum shows that efforts to improve the education field continue to be done. The scientific approach used in the current curriculum is very precise, the stages carried out by educators are very clear and detailed so that the learning objectives are expected to be more achievable. The three domains of assessment include attitudes, knowledge, and skills that have begun to be applied in many schools slowly, but surely.

The mathematics lesson at one of the junior high schools in Magelang is still lacking in response because the level of difficulty remains high so that it influences the concentration in learning mathematics and the achievement of learning outcomes is very low. Meanwhile, mathematics is the basis of the lessons that need to be given to all students starting from elementary school to prepare them with the ability to think logically, analytically, systematically, critically, and creatively, and the ability to cooperate. In the mathematics learning model, it is expected that the students can develop their reasoning, think logically, analytically, critically and creatively because mathematics is one of the basic

sciences that has an important role in the development of science and technology.

The ability of the students of junior high schools in Magelang is quite diverse in paying attention to the teachers and they should concentrate or focus, and also they have many differences in solving mathematics problems due to some factors from themselves and the surrounding environment. Concentration means focusing the mind on one thing by putting aside others that are not related. The students who concentrate on learning can be observed from certain behaviors when the learning process takes place (Slameto, 2010).

According to Aunurrahman (2013), learning concentration is one of the psychological aspects that is often difficult to know by others other than the individual itself. This is because sometimes, what is seen through one's activities is not necessarily in line with what the individual is actually thinking.

Dimyati & Mudjiono (2013) stated that the concentration of learning is the ability to focus the attention on the lesson. Concentration is focused on the content of learning materials and the process of obtaining them. To strengthen the students' attention to the lesson, the teacher needs to use various teaching-learning strategies, calculate the study time and interlude breaks. Learning concentration is one of the factors that influence a person's learning achievement. The strength of one's focused attention during the learning will affect the learning achievement. While Nuryana & Purwanto (2010) stated that the concentration of learning is an activity to limit the scope of one's attention to an object or subject matter.

According to Makmun (2005), the concentration of a person's learning can be observed from his behaviors such as (1) focus of view: fixed on the teacher, blackboard, and media. (2) attention: paying attention to the source of information carefully. (3) verbal response: asking to find additional information. (4) answer: being able to answer positively if it is in accordance with the problem, and negatively if it is not based on the problem asked, and feeling doubt if the problem is uncertain; (5) giving statements to strengthen, approve, and refute with or without any reason, and (6) psychomotor remarks, shown by the behavior of taking notes/writing information and giving answers/work.

There needs to be a learning model that can motivate the students to be more enthusiastic in participating in mathematics learning. The educators must be more patient, creative and innovative in the application or delivery of the materials. Their attention is also very necessary to foster the concentration of learning mathematics in the classroom.

The use of the appropriate learning model will be able to motivate the students to be active and focused on following the learning activities and creative in solving problems faced. The learning model is one of the elements of the curriculum and is used in the learning process, and one of the models used in the learning process in the classroom is discovery learning.

Discovery learning is an inquiry process in which learner pose a question and seek answer-may be of use (Orlich, et. al., 2010). Mulyasa (2013) stated that discovery is a method that emphasizes more on direct experience. Learning using the discovery method prioritizes the process rather than the learning outcomes. Some experts refer to it as an inquiry learning.

Hamzah & Muhlisrarini (2014) suggested that the discovery learning method is a way to convey ideas/concepts through the finding process. The learners discover their mathematical patterns and structures through a series of past learning experiences.

Discovery learning is a series of learning activities that are expected to empower the students to become independent individuals who are able to develop their cognitive abilities and improve their ability to

communicate mathematics and social skills. The teaching and learning process is said to be successful if the learning objectives can be achieved. The learning objectives are the learning outcomes that have been determined both according to aspects of content and behavioral aspects. The achievement of these learning objectives requires the teaching and learning activities that involve the students, educators, subject matter, teaching models, curriculum and learning media that are appropriate to the needs of the students and are supported by the conducive learning-teaching environment.

Winkel (2007) suggested that learning achievement is evidence of the success that has been achieved by someone. Then, the learning achievement is the maximum result achieved by someone after carrying out his learning efforts.

According to Gagne (in Abidin, 2011), the mathematics learning outcomes are the abilities possessed by the students after they have received mathematics learning experience, or changes in the students' behavior, which are observed and measured in forms of changes in knowledge, behavior, attitudes, and skills after learning mathematics. These changes are interpreted as an increase and development in a better direction.

Mathematics learning is a process that is deliberately designed to create an atmosphere that enables the students to carry out mathematics learning activities, and the process is centered on the teacher teaching mathematics by involving the active participation of the students. The mathematics learning must be planned carefully so that the students' development of knowledge can be improved well (Hamzah & Muhlisrarini, 2014).

According to Turmudi (2009), learning mathematics requires the ability to use flexible knowledge and apply what is learned optimally. Mathematics will be easier to understand, remember and apply when the students associate new knowledge with their old ones in meaningful ways.

The transformation topic for class IX of one of the junior high schools in Magelang is a new material learned in the 2013 curriculum, so there are still many learning outcomes that have not yet reached the minimum standard criteria. The students still need much assistance and guidance in understanding it, but still, they must be the learning center, while educators act as facilitators who always provide scaffolding. Usually, the learning is done in the lecturing method, so there should be a learning model that can motivate and make the learning concentration of students is increasing. The discovery learning model is expected to increase concentration and improve the learning outcomes in learning the transformation topic. The application of the discovery learning model in this study is emphasized on the students' activeness in the process of discovery based on experience that has been obtained previously.

Discovery learning is a learning model that is student-centered and is expected to motivate the students to concentrate more on learning and create an active and creative learning process in solving mathematical problems faced. By using the discovery learning model, it is expected that the students are able to identify the influence of concentration thinking and the results of students' learning outcomes.

The formulation of the problems in this research are: (1) Is the application of the discovery learning model (discovery learning) can improve the learning concentration of the students in the transformation topic for class IX D of one of the junior high schools in Magelang? (2) Is the application of the discovery learning model able to improve the students' learning outcomes in the transformation topic for the students of class IX D of one of the junior high schools in Magelang? (3) Is the application of the discovery learning model able to increase the

concentration of learning as well as the learning outcomes in the transformation topic for the students of class IX D of one of the junior high schools in Magelang? The objectives to be achieved in this research are: (1) identifying the success rate of discovery learning model in increasing the concentration of learning in the transformation topic of the students of of class IX D of one of junior high schools in Magelang; (2) identifying the success rate of discovery learning model in improving the learning outcomes in the transformation topic in class IX D of one of junior high schools in Magelang; (3) identifying the success rate of discovery learning model in increasing the concentration and learning outcomes in the transformation topic in class IX D of one of junior high schools in Magelang.

RESEARCH METHODS

The classroom action research was conducted in September until December 2018 in the first semester of the academic year 2018/2019 at one of the junior high schools in Magelang which was located in Jalan Kyai Mojo 32 Magelang. This school had six classes for the grade IX, and each class consisted of 32 students.

The subjects in this study were the students of class IX D of one of the junior high schools in Magelang in the academic year 2018/2019. The reason for choosing research subjects was because more than 80% of class IX D students did not meet yet the minimum criteria in the initial treatment.

In this study, the objects of the research were: (a) concentration in learning mathematics; (b) learning outcomes in the form of understanding about transformation material.

The data sources in this study were IX D grade students of one of the junior high schools in Magelang in the first semester in the transformation topic in the academic year 2018/2019.

Data Collection Tools and Techniques

In the initial conditions, the data on the concentration of learning mathematics is collected using a document study technique. The documents about the concentration on mathematics learning that the educators already have been used as the data for the initial conditions. In cycle 1 and cycle 2, the data about the concentration on mathematics learning are collected through the non-test technique. This data collection technique is carried out through the observation made by the researcher when the teaching and learning process is taking place using an observation sheet. Meanwhile, the technique of collecting data about the mathematics learning outcomes on the transformation topic is done using written tests.

Data Analysis and Validation

The data from the results of this research from both in cycle 1 and 2 are processed using the validation process, namely: 1) collaboration; and 2) question grid.

The collaboration is done to validate the data on the concentration of learning mathematics and needs to be carried out along with the observations with the researcher's partners. Meanwhile, the making of the question grid aims to obtain data validation so that the question material is in accordance with the curriculum and evenly distributed. The questions made must involve several competencies that are indeed required in the transformation topic.

The data are then analyzed using the descriptive comparative method. The conditions of the concentration on mathematics learning and mathematics learning outcomes in the initial conditions are compared to cycle 1. The data about the concentration of mathematics learning and mathematics learning outcomes in cycle 1 are compared

with cycle 2. The data on the concentration of mathematics learning and mathematics learning outcomes in cycle 2 are compared with the initial conditions.

Performance Indicators Concentration on Mathematics Learning

The criteria for the students who have a strong concentration of learning from the classroom action research are classified as "Always", "Often" and "Sometimes" on the observation sheet of learning concentration. While those who have a low level of concentration of learning are those who are included as "Rarely" and "Never" on the observation sheet of learning concentration

The final condition of the concentration of learning is expected to be higher than the initial one. The initial condition of the concentration of study was 19 students having good learning concentration or 59.358% of the total students who were concentrated from a total of 32. Meanwhile, for this research, the number of students who can concentrate is targeted at 90% or 29 students. If the performance indicator is not achieved in cycle 1, this research is continued to the next cycle.

Learning Outcomes in The Form of Understanding The Transformation Topic

The final condition of the students' learning outcomes in the form of understanding the transformation topic is expected to be higher than the initial one. The initial condition of this learning outcome is that only 5 students have met the minimum criteria, or 15.625% of the total 32 students, whereas, in this study, it is targeted that the number of students meeting the criteria is 90% of 32 students or 29 students. If the performance indicators are not achieved in cycle 1, this research is continued in the next cycle until the performance indicators can be fully achieved.

Research Procedures

This study is divided into two cycles. Cycle 1 is a teaching and learning process that uses a discovery learning model without a mentoring process, while cycle 2 is a teaching and learning process that uses a guided discovery learning model with the mentoring process in discussion groups.

RESULTS AND DISCUSSIONS

Initial Conditions

The concentration in learning mathematics and the results of learning outcomes in the initial conditions, based on data taken through the study of documents on the quadratic function material in class IX D of one of junior high schools in Magelang in the semester of academic year 2018/2019 show that the students having strong concentration are 19 (59.375 %), while 13 students (40.625%) are classified as not fully concentrated. Meanwhile, from the initial conditions of mathematics learning outcomes, there are 5 students (84.375%) who have to meet standard criteria, while those who do not are 27 students (15.625%).

Cycle 1

From the results of the observation of the concentration of mathematics learning and the results of learning outcomes of class IX D students in the first semester, in the Translation and Reflection topic in cycle 1, there are 24 students (75%) who are able to concentrate well, while 8 students (25%) is grouped into not fully concentrate. The results of learning outcomes in this first cycle are the understanding of the transformation of translation and reflection in class IX D students in the first semester, and those who obtain scores above the minimum criteria is 18 students or 56.25%, while 14 others still have not yet reached the criteria or 43.75%.

Cycle 2

From the results of the observation of the concentration of mathematics learning and the results of the learning outcomes of class IX.D students in the first semester, there are 32 students (100%) who join in the Rotation and

Dilation Transformation topic. From the results of the mathematics learning outcomes in cycle 2, the students who obtain scores above the minimum criteria are 29 students, and 3 students have not yet reached the criteria. Therefore, there is 90.625% of the students who successfully reach the minimum criteria, while the number of students who have not yet reached the criteria is 9.375%.

In this initial condition, the learning media used are objects within the classroom which are supported by the lecturing method. This method is less supportive for enforcing the students' concentration.

The actions are carried out in cycle 1, by applying the discovery learning model where the students discuss within their groups to find ways or steps in translating and reflecting. The educators observe, monitor and provide scaffolding, and the rest of the students are looking for a solution. In cycle 2 the guided discovery learning model is applied and the educators begin to guide each discussion group in obtaining formulas and solving problems faced.

From the results of the concentration of learning mathematics in the initial conditions and cycle 1, it can be concluded that the number of students who have good concentrations in the initial conditions is 19. Meanwhile, 24 students have good concentration or focus on mathematics learning in cycle 1. This proves that there has been an increase in the number of students who have good concentration as many as 5 students, or 15.625%. Table 1 follows a comparison between the concentration of learning mathematics in the initial condition and cycle 1.

Table 1. Students' Concentration in Initial Condition and Cycle 1

Number	Cycle	Concentrated		Not Concentrated Yet	
		Amount	(%)	Amount	(%)
1	Initial condition	19	59,375	13	40,625
2	Cycle 1	24	75	8	25
Difference		5	15,625	5	15,625

The comparative graph between the students' concentration in learning mathematics in the initial condition and cycle 1 can be seen in Figure 1.

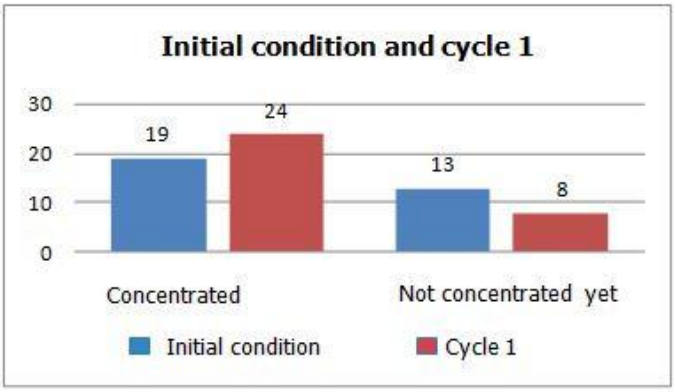

Figure 1. Students' Concentration in Learning Mathematics in Initial Condition and Cycle 1

Five students who meet the KKM (Minimum Completeness Criteria) or 15.625% of 32 students in the initial condition of mathematics learning

outcomes. In cycle 1, there are only 18 participants who have met the minimum criteria or 56.25%. On the performance indicators, it is targeted that the number of students who meet the criteria is 90%. The conclusion is that the performance indicators have not been achieved in cycle 1. This research needs to be continued in cycle 2. Table 2 shows a comparison between the results of mathematics learning outcomes in the initial condition and cycle 1.

Table 2. Comparison of The Results of Mathematics Learning Outcomes Between Initial Condition and Cycle 1

Number	Cycle	Minimum Completeness Criteria		Performance Target of The Number KKM Students	Result
		< KKM	> KKM		
1.	Initial Condition	27	5	-	15.625%
2.	Cycle 1	14	18	90%	56.25%

Note: KKM score = 71

The comparison graph of the results of mathematics learning outcomes between the initial condition and cycle 1 can be seen in Figure 2.

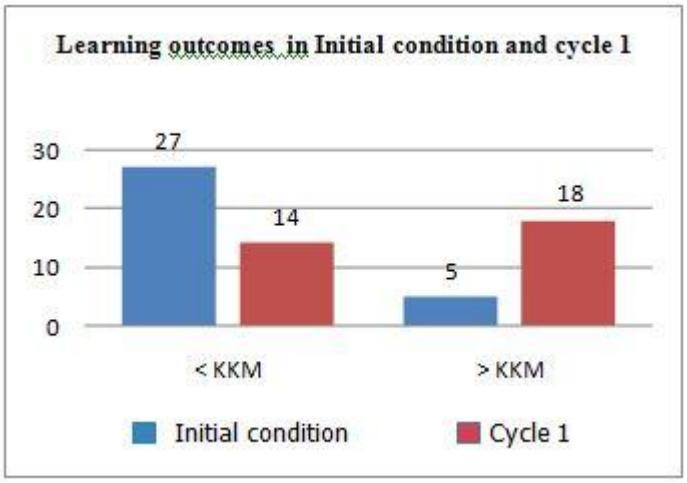

Figure 2. Comparison of The Results of Mathematics Learning Outcomes Between The Initial Condition and Cycle 1

The number of students who have good learning concentration cycle 1 is 24 students. While in cycle 2, all students have fully concentrated on learning mathematics in the classroom. This proves that there has been an increase in the number of students who have a good concentration in mathematics learning as many as 8 students or 25%. The comparison of the concentration in mathematics learning between cycle 1 and cycle 2 can be seen in Table 3.

Table 3. Comparison of The Concentration of Learning Mathematics Between Cycle 1 and Cycle 2

Number	Cycle	Concentrated		Not Concentrated Yet	
		Amount	(%)	Amount	(%)
1	Cycle 1	24	75%	8	25%
2	Cycle 2	32	100%	0	0%
Difference		8		8	

The comparison chart of the concentration of mathematics learning between the cycle 1 and cycle 2 can be seen in Figure 3.

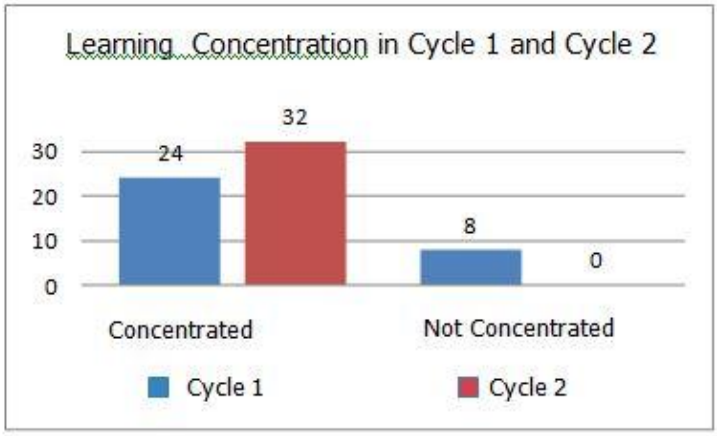

Figure 3. Comparison of The Concentration of Mathematics Learning Between Cycle 1 and Cycle 2

The results of the students' learning outcomes in the form of understanding reflection transformation and rotation dilation transformation in cycle 2 are expected to be higher than cycle 1. From cycle 1, 18 students who meet the criteria or 56.25% of 32 students. In cycle 2, the number of students who can meet the criteria is 29 students or 90.625%. On the performance indicators, it is targeted that the number of students who can completely understand the transformation material is 90%. It can be concluded that the performance indicators have been reached in cycle 2. This research does not need to be continued in cycle 3. The comparison between mathematics learning outcomes in cycle 1 and cycle 2 can be seen in Table 4.

Table 4. Comparison of Learning Outcomes Results Between Cycle 1 and Cycle 2

Cycle	Minimum Completeness Criteria		Performance Target of The Number KKM Students	Result
	< KKM	> KKM		
Cycle 1	14	18	90%	56,25%
Cycle 2	3	29	100%	90,625%

Note: KKM score = 71

The comparison chart of the results of mathematics learning outcomes between cycle 1 and cycle 2 can be seen in Figure 4.

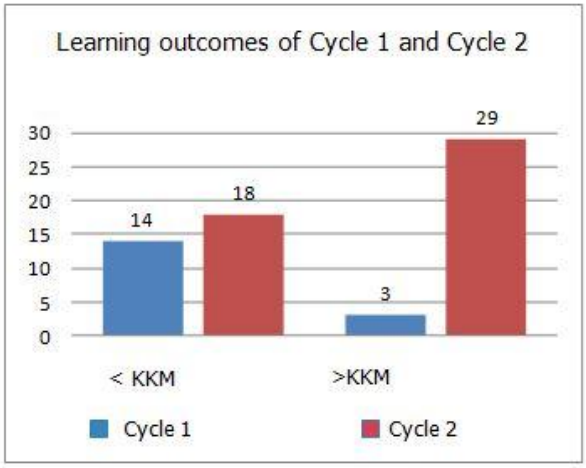

Figure 4. Comparison of The Results of Mathematics Learning Outcomes Between Cycle 1 and Cycle 2

The results of the students' concentration in learning in cycle 2 show that all students have a good concentration in learning, while initially, 19 students had the same level of concentration. This proves that the use of guided discovery learning model with the educators' mentoring is also able to increase the learning concentration. The comparison between the concentration of mathematics learning in the initial condition and cycle 2 can be seen in Table 5.

Table 5. Comparison of The Concentration of Learning Mathematics Between Initial Conditions and Cycle 2

Number	**Cycle**	**Concentrated**		**Not Concentrated**	
		Amount	(%)	Amount	(%)
1	Initial Condition	19	59,375	13	40,625
2	Cycle 2	32	100	0	0
Difference		13		13	

The comparison graph of the concentration of learning mathematics between the initial condition and cycle 2 can be seen in Figure 5.

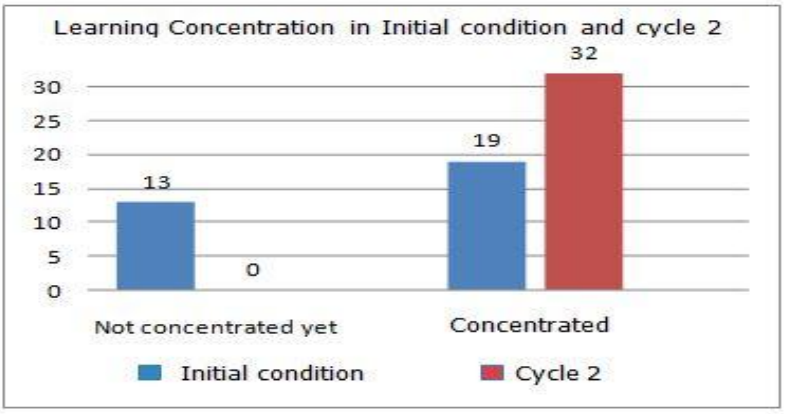

Figure 5. Comparison of The Concentration of Learning Mathematics Between The Initial Condition and Cycle 2

From the initial condition, only 5 students who were able to pass the minimum criteria score of 71. While in cycle 2, 29 students are able to meet the minimum criteria score, but 3 students are still less than the score. The total percentage of learning outcomes in this initial condition is 15.625%. In the cycle 2, the number of students who understand well the transformation topic is 90.625%, while the target on the performance indicators is 90% of 32 students who have been able to meet the criteria. This means that the overall results of cycle 2 reach the minimum criteria. The comparison between the results of mathematics learning outcomes in the initial condition and cycle 2 can be seen in Table 6.

Table 6. Comparison of The Results of Mathematics Learning Outcomes Between The Initial Condition and Cycle 2

Number	**Minimum Completeness Criteria**		**Performance Target of The Number KKM Students**	**Result**
	< KKM	> KKM		
Initial Condition	27	5	90%	15,625%
Cycle 2	3	29	90%	90,625%

Note: KKM score = 71

The comparison chart of the results of the mathematics learning outcomes between the initial condition and cycle 2 can be seen in Figure 6.

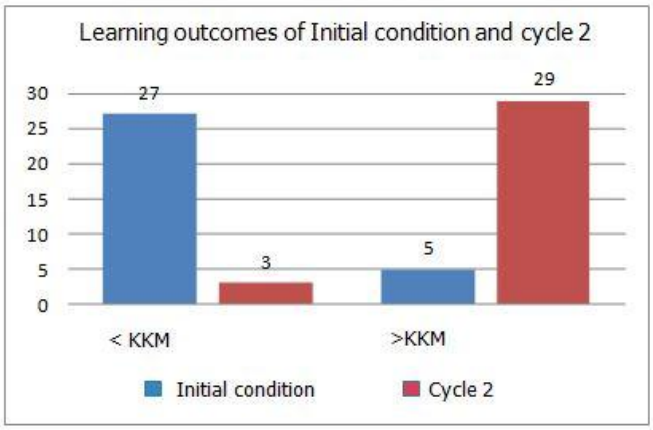

Figure 6. Comparison of The Results of Mathematics Learning Outcomes Between The Initial Condition and Cycle 2

The teaching and learning activities without using the proper learning model make students less concentrated, boring and do not create enthusiasm for learning, so the students are not interested and become lazy to learn and the results of their outcomes are less than optimal. The students who feel uncomfortable in the class cause them to be less enthusiastic to pay attention to the teachers well. This discomfort makes their learning concentration less focused and low. The extrinsic factor, in this case, the use of inappropriate learning models, plays a dominant role in the low concentration of the students‘ learning.

The mentoring process is the task of an educator so that learning objectives can be achieved optimally. In the initial condition, the learning process in this research was not carried out by the mentoring process, so that the learning outcomes could not be optimal. This can be seen from the number of students who can meet the minimum criteria score which was only 15.625%. While the students who were unable to meet the criteria were 84.375%. The low number of students who can successfully meet the standard is caused by the absence of the mentoring process by the educators. The low number of students who can meet the criteria is an impact of the use of inappropriate learning models that lead to boredom and a static atmosphere during the learning process. This kind of feeling causes the students' learning concentration to decrease. In this initial condition, the low number of students who fulfill the standard is due to the educators‘ mistake in choosing the learning model so that the interaction does not run optimally.

In cycle 1, the mentoring or guidance process is also not carried out by educators. The absence of this mentoring process or guidance has caused the outcomes targets cannot be achieved. This can be seen from the number of students who can meet the standrad criteria standard which only amount to 56.25%. While the number of students who did not meet the criteria amounted to 43,75%. The increasing number of students who can meet the criteria standard is more because the educators have used the right learning model for material understanding of the transformation topic so that they can raise the students‘ concentration to master the subject matter.

In cycle 2, the use of the learning model has been well implemented and the mentoring and directed guidance processes are carried out by educators. The combination of the use of a good learning model and mentoring and guidance during the learning causes the target of learning outcomes can be successfully grasped. This can be seen from the number of students who can meet the criteria standard which amounts to 90.625%. While the number of students who can not meet the standard amounted to 9.375%. The increasing number of students who can meet the criteria standard is because the educators have used a more appropriate learning model so that they can raise the students' concentration to master the subject matter. If during group discussions the students encounter difficulties, the mentoring process and guidance provided by educators can overcome them.

A good and right combination between the use of good learning model and mentoring and guidance by the educators when the students are having the learning process is an effective step to increase their learning concentration and mathematics learning outcomes of the students of class IX D of the first semester in the transformation topic in one of the junior high schools in Magelang in the academic year 2018/2019.

CONCLUSIONS

Some conclusions that can be drawn from the classroom action research using discovery learning model to improve the students' concentration and mathematics learning outcomes are: (1) the learning using discovery learning model can increase the students' concentration of learning for IX D students in the transformation topic in one of junior high schools in Magelang in the first semester of the academic year 2018/2019. This is shown by the increasing number of students who have good concentration, from the initial conditions of 19 students or 59.375% to 32 students or 100%; (2) the learning using the discovery learning model can improve the learning outcomes of IX D students in the transformation topic in one of junior high schools in Magelang in the first semester of the academic 2018/2019. This is evidenced by the increase in the students' learning outcomes that meet the criteria standard from the initial condition of 5 students or 15.625% to 29 students or 90.625%; (3) the learning by using the discovery learning model can increase the students' concentration in learning and at the same time the learning outcomes of the IX D students in the transformation topic in junior high schools in Magelang in the first semester 2018/2019. This is indicated by the increase in the number of students who have been able to fully concentrate from the initial condition of 19 students or 59.375% to 32 students or 100% and the increase in students' learning outcomes that meet the standard from the initial condition of 5 students or 15,625% to 29 students or 90,625%.

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