American Journal of Educational Research, 2018, Vol. 6, No. 12, 1646-1653
Available online at http://pubs.sciepub.com/education/6/12/9

DOI:10.12691/education-6-12-9

Development of Learning Devices Based on Discovery Learning Assisted Geogebra Models to Improve Self-regulated Learning of Students at SMP Negeri 1 Stabat

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Received November 05, 2018; Revised December 07, 2018; Accepted December 18, 2018

Abstract This study aims to: 1) find the learning device based models *discovery learning* that meet the criteria aided GeoGebra effective; 2) analyzing the increase in *self-regulated learning of* students using the learning tools developed. This research is a development research using a four-D model which carried out 4 stages, namely *define, design, develop,* and *dessiminate*. The subjects of this study were seventh grade of students at SMP Negeri 1 Stabat. Teaching materials generated from this study are: Learning Implementation Plans (RPP), teacher books (BG), student books (BS), and student worksheets (LKS). From the results of trial trials I and II obtained: 1) learning devices based on *discovery learning* effective geogebra-assisted models; 2) there is an increase in *self-regulated learning of* students by using approach based *discovery learning* geogebra-assistedon the first trial to obtain an average score of 69.56%, and an increase in the second trial with an average score of 80.18% .

Keywords: *development, learning tools, self-regulated learning, Discovery Learning Geogebra Assisted Model*

Cite This Article: Anggita Widyasari Leung, Hasratuddin, and Hermawan Syahputra, "Development of Learning Devices Based on Discovery Learning Assisted Geogebra Models to Improve Self-regulated Learning of Students at SMP Negeri 1 Stabat." *American Journal of Educational Research*, vol. 6, no. 12 (2018): 1646-1653. doi: 10.12691/education-6-12-9.

1. Introduction

Mathematical learning is one of the ways that can be taken to realize the 2013 curriculum goals. Because through learning mathematics can train self-confidence, discipline and develop mathematics in real-world life it is also undeniable, this is evidenced by the use of mathematics in all fields of science at various levels of education. This means that mathematics is very necessary in all areas of life.

According to Ashori [1] dividing independence in development into 4 levels, namely self-awareness, careful level, individualistic, and independent. In the process of teaching and learning students are often faced with a sense of confusion in accepting a material that gives rise to insecurity when answering questions so that students do not have one of the self-regulted learning indicators of self-concept that students are able to work on problems with strategies but unsure of the answers finally. According to Zimmerman [2] "*definition of SRL is a degree to which students are metacognitively, motivationally, and behaviorally active participants in their own learning process*" which concluded that learning independence is a level of metacognitive aspects, student motivation and behavior when actively participating in the learning process themselves. These students themselves begin their learning efforts directly to obtain the knowledge and expertise they want, without depending on the teacher, parents or other people.

Then Prue Salter's research [3] entitled "*Developing Self-Regulated Learners In Secondary Schools*" stated that the findings from online survey data from phase 1 were sent to 350 schools in grades 7-12 middle school in the Sydney area. In exploring how schools approach development SRL, it is necessary to have an understanding of how schools see their role in this process. This survey was completed by 54 schools and was designed to interrogate these views and examine the approaches taken by the school. Usually, Principals, Deputies or Learning Directors complete four open questions about their school approach. The main themes emerging from survey data are differences between schools in their perceptions of the role of schools, very different approaches taken to foster SRL skills in students, and a lack of overall school policies or approaches to SRL.

Then, researcher Boekaerts [4] with the title *"Self-regulated with Respect to Information Learning"*. Concludes that

children spend most of their time outside the formal classroom learning environment. Therefore, it is important to understand more about the process of self-regulation in informal learning settings. This applies not only because it is very important that this arrangement may exist in class learning, but also because the results of research can provide in-depth understanding for the implementation of new learning environments in the context of life long learning. Today, teachers, parents and educators are equally confident that to be effective, teaching methods must support the intrinsic desire to learn and must take into account the characteristics of young people's experiences outside the context of formal learning.

In addition, the success of a teacher can be seen in the final goal of learning such as researcher Arends [5] who states that the ultimate goal of teaching is to help students become self-regulated students. In line with this, according to Hastuti's research [6] states, students build a deep understanding of mathematical content when they can control their learning, by determining learning goals, monitoring their progress, assessing and reflecting their thinking processes, becoming more confident in their abilities, and being a curious and diligent person in the face of difficulties. But the fact that there are achievements or learning outcomes of mathematics still does not provide maximum results.

Balitbang Research and Development Agency [7] reported the results of a survey of the Mathematics And Science Study Trends In International (TIMSS) in 2003 showing the achievement of Indonesian junior high school students ranked 35th out of 46 countries. The average score obtained by students is 411. However, Indonesia is still below the average for the ASEAN region. TIMSS 2007's achievement was ranked 36th out of 49 countries with a score of 397, very concerning because student scores dropped and were far lower than the international average score of 500. Even worse, TIMSS 2011 was ranked 39th out of 43 countries. Besides TIMSS, the Program for International Students Of Assessment (PISA) also shows that the learning achievements of Indonesian children aged around 15 years are still low. The latest research conducted by PISA was in 2012 by including 510,000 students from 65 countries, including Indonesia. The average value of Indonesian students ranks second lowest from a total of 65 participating countries.

According to researcher Ramli A, [8] stated the results of interviews of researchers at Medan State Middle School, that the reality that happened was that students were very dependent on the teacher in learning mathematics. Such as not being able to control the time of study, unable to determine the purpose of learning, not confident in his abilities so that he is not willing and diligent in learning mathematics.

According to researcher Rizkyka [9] stated the results of interviews of researchers at Stabat Middle School 5, found that many students lacked independence in learning. This can be seen when the teaching and learning process takes place as students are still dependent on explanations from the teacher. Students are not confident about what they already know, so students more often cheat on friends who they think are smart in answering questions, rather than working on their own. Students also cannot answer questions without an explanation from the teacher first. In addition, the lack of initiative of students to learn by themselves along with their friends makes learning more dominated by teachers. So Related to the importance of students learning mathematics must be required to have a self-regulated learning attitude is a challenge for researchers to find new socialization.

This is in line with the research that will be conducted at Stabat 1 Public Middle School stating that students 'low self-regulated learning is reviewed by the results of student assignments that are very similar to the others, giving rise to students' lack of confidence in their own answers, as well as teacher habits. forming study groups without giving individual tasks. The following is an understanding of self regulated learning according to several researchers including;

According to Paul R. Pintrich and Elisabeth V. De Groot [10] entitled "Motivational and Self-Regulated Learning Components of Classroom Academic Performance". The results provide empirical ecological valid evidence for the importance of considering both motivation and learning components that are self-regulated in our model of academic class performance. Student involvement in self-regulated learning is strongly related to students' ability to believe in their ability to do class assignments and their belief that class assignments are interesting and worthy of learning. At the same time, this motivational belief is not enough for successful academic achievement.

So it needs steps to overcomelow *self-regulated learning* students'. Because of the importance *ofself-regulated learning* students'in learning, teachers must be able to prepare learning plans so that the mathematics material is able to be accepted by students. The learning process will run well if the teacher is able to design learning well, starting from planning learning devices, carrying out classroom learning, to evaluating it. In carrying out this main task alone, the teacher is still experiencing obstacles, such as in making learning tools, carrying out classroom learning, and evaluating learning relatively high. Making lesson plans is a must for a teacher, because in the lesson plan contains important aspects in the teaching and learning process. These aspects are for example competencies to be achieved, ways to achieve, material/subject matter, interaction models, evaluation models, and so forth.

According to Sumarmo [11] also stated the need to develop SRL in students who study mathematics is also supported by several findings of research results, among others, individuals who have high SRL tend to learn better, are able to evaluate and manage their learning effectively, save time in completing their tasks, manage learning and time efficiently and get high scores in science. According to Sulistyaningsih [12] in his research that learning devices provide convenience and can help teachers in preparing and carrying out teaching and learning activities in the classroom. So that with the right learning tools can make students easier in learning mathematics.

As a result of the difficulty of the teacher in developing learning tools that cause students to experience difficulties in understanding the material conveyed by the teacher, students consider mathematical material to be a burden that must be remembered and memorized, and lack of meaning in everyday life. As a result students in the class are unable to be more active in learning mathematics. Therefore, it is necessary to develop learning tools

that help to improve *self-regulated learning* student. Development of learning devices must be prepared based on the right learning model too. The use of learning models that are not in accordance with student development will have an impact on the stage of development of student learning. One learning model that can be used by teachers to improve *self-regulated learning* is bymodels *discovery learning*.

Hosnan [13] argues that *discovery learning* is a model for developing active learning methods by finding oneself, investigating on their own, then the results obtained will be loyal and long lasting in memory, will not be easily forgotten by students. By learning discovery, children can also learn analytical thinking and try to solve problems themselves so that these habits will be beneficial in community life.

Voluntary research according to Matondang AR [14] states that discovery-based learning models can improve disposition skills, including: confidence in using mathematics, diligent in doing mathematical tasks, having curiosity in mathematics, reflection on ways of thinking and performance in yourself in learning mathematics, and applying mathematics in everyday life. From the researchers' statement that discovery learning can improve student disposition.

The Hajar researcher [15] entitled "Learning Geometry through Discovery Learning Using a Scientific Approach" states that teacher activities during the implementation of geometry learning using Discovery Learning with a Scientific Approach are in line with valid learning designs. Teachers in this activity become more innovative and teaching abilities increase. Improvement is seen when the teacher prepares his learning activities both to achieve the learning objectives.

Besides learning techniques that can be used in Mathematics learning that provide opportunities for students to learn to improve *self-regulated learning* is by learning techniques using computer technology. According to S Siahaan [16] in the module "Utilization of Information and Communication Technology (ICT) in Learning". The potential of information and communication technology is as follows: ICTs can be used by teachers and students, among others, helping in finding information or learning material, bringing closer space and time in teacher-student interactions, learning efficiency and storing various data and information needed.

Syahputra [17] in his research stated that learning assisted by computers can improve students' disposition skills. According to Nur [18] Computer-assisted learning is very good for integration in learning mathematical concepts, such as geogebra software. Geogebra GeoGebra is a software that can visualize mathematical objects quickly, accurately, and efficiently. Geogebra can be used when starting to draw graphics and determine completion test points, and test the optimum function at these points.

Riani, Surya, and Syahputra [19] in their study stated that the average increase in student self-reliance given by problem-based learning was higher than the average increase in learning independence of students given conventional learning. Similarly, Juniati, Surya, and Syahputra [20] stated that student learning uses a better learning model to improve student learning independence.

Based on the description above, these problems have a profound effect on student learning outcomes, so to overcome these problems researchers conduct research namely the development of mathematical learning tools based on *discovery learning* -assisted *geogebramodels* to improve *self-regulated learning* of Stabat 1 Junior High School students.

2. Theoretical Framework

According to Jerome Bruner [21] discovery learning is a learning method that encourages students to ask questions and draw conclusions from general principles from examples of practical experience. What is the basis of Bruner's idea is a statement from Piaget which states that children must learn actively in learning in class.

According to Dewey Kuhlthau [22] explained: that education does not convey and convey, but an active and constructive process. Knowledge means working to try, find out, and learn more from various sources. Through reflection, directed ideas are formed which lead to questions for understanding. Dewey explained that facts, data, and information gave rise to ideas that made students able to draw conclusions from what he already knew which led to deeper understanding.

According to Hohenwerter and Mahmudi [23] Geogebra is a computer program (software) for learning mathematics especially geometry and algebra. According to Zimmerman [24] "the definition of SRL as a level where students are metacognitive, motivational, and behaving actively in their learning process" concludes learning independence is the level of metacognitive aspects, motivation and behavior of students when active. participate in their own learning process. These students themselves start their learning efforts directly to get the knowledge and expertise they want, without relying on teachers, parents or other people.

3. Research Methods

This study is a development research using the development model of Thiagarajan, Semmel and Semmel, namely 4-D models (*define*, *design*, *develop*, *disseminate*). This research was conducted to obtain the necessary teaching materials to be tested in class. So that the products to be developed in this study are learning devices (RPP, Teacher Books, Student Books, and LKS) based on *discovery learning* geogebra-assistedmodels to improve *self-regulated learning* student.

The subjects in this study were VII grade students of SMP Negeri 1 Stabat in the 2017/2018 school year. The object of this study is to see valid and effective learning devices that are developed based *discovery learning* on geogebra-assistedmodels on line and angle material.

The instrument or data collection tool in this study is a test. This test is used to measure *self-regulated learning* student. Furthermore, the effectiveness of learning devices is seen from the following criteria:

a. The classical value of student learning, which is analyzed by considering that students are said to complete if the value of individual students reaches 65%, while learning is said to have been achieved classically if there are 85% of students who have taken Hasratuddin [25]

b. Achievement of learning objectives, To see the achievement of learning objectives for each item in the test mathematical communication skills are used by

$$T = \frac{\text{Total student scores for points in the i item}}{\text{The maximum number of points in the i item}} x100\%.$$

The criteria are:
$0\% \leq T \leq 75\%$: Learning objectives have not been reached
$75\% \leq T \leq 100\%$: Learning objectives are achieved

c. Questionnaire student responses are analyzed by calculating the percentage of many students who respond positively to each category asked in the questionnaire using the formula the following [26]

$$PRS = \frac{A}{B} \times 100\%$$

Where:
PRS = Persentage of student responses
A = proportion of students who choose
B = number of students (respondents).

To determine the achievement of learning objectives in terms of student responses, if the number of students gives a positive response is greater or equal to 70% (positive) of the many subjects studied for each trial. If ≥ 70%, the learning device developed has met the requirements of effectiveness.

4. Research Results

4.1. Description of Stage of Development of Learning Devices Based on *Discovery Learning* Assisted Model *Geogebra*

Researchers conducted research on the development of learning devices with the 4-D development model (Four-D Model) by Thiagarajan, Semmel and Semmel. The first stage begins with determining, the second stage is design, the third stage is development and the last stage is spread. The results of the development of teaching materials can be described as follows:

4.1.1. Phase *Define*

4.1.1.1. Early Final Analysis

Based on observations in the teaching and learning process of teachers in Stabat 1 Junior High School, showing that the teacher still uses the learning method used is still teacher-centered, so students are less active in the teaching and learning process. With student inactivity in the learning process, this leads to a lack *of self-regulated learning* student. Not only that, teachers also lack training *in self-regulated learning* studentso students' *self-regulated learning* is lacking.

4.1.1.2. Student Analysis

The results of the analysis of the academic abilities of students in Stabat 1 Public Middle School are low. This can be seen from the results of the average math score of students in the first semester is 50, while the KKM for mathematics is 75. teachers only become the only source in delivering the subject matter, so what happens is learning is still teacher-centered, so cognitive abilities students are less developed and students become passive in learning because the teaching and learning process is teacher-centered. This results in students not being able to build their own knowledge so that learning is less meaningful. Learning devices that have been used so far have not paid attention to student analysis, therefore learning devices are developed that are tailored to the character of students in the hope that the quality of mathematics learning can increase.

4.1.1.3. Concept Analysis

The material in this study is the lines and angles for class VII SMP based on the 2013 curriculum.

4.1.1.4. Task Analysis

The results of the analysis of the tasks carried out were the assignments of students during learning using the developed learning tools, namely to analyze the definition of lines and angles, students can analyze the characteristics of a line, and describe line segments and line rays, students can determine the position of the line, the types of angles, and students can solve the problem of lines and angles by communicating mathematical ideas into written form.

4.1.1.5. Formulation of Learning Objectives

Learning objectives to be achieved by students are based on Competence Basic material lines and angles are:

3.10 Analyze relationships between angles as a result of two parallel lines cut by transverse lines.

4.10 Resolves problems related to relationships between angles as a result of twolines parallelcut by a transverse line.

Based on these basic competencies, the learning goals that must be achieved by students are:

1. Understand and explain the definition of a line with its own arguments.
2. Able to explain the characteristics of lines, as well as describing line segments and line rays.
3. Explain the position of the line (parallel, coincide, perpendicular, and intersect) through concrete objects.
4. Being able to divide the line into 3 equal parts.
5. Able to formulate a line segment comparison.
6. Can solve problems related to line segment comparison.
7. Understand and explain the meaning of angles with their own arguments.
8. Able to explain the formation of angles of two intersecting rays.
9. Able to explain different types of angles related to everyday life.
10. Able to solve the problem of different types of angles.

4.1.2. Stage Design

4.1.2.1. Results of Tests and Non-Test Preparation

The Tests used are self-regulated learning questionnaires student.

4.1.2.2. Media Selection Results The Media

Used in this study is computer media in the form of geogebra software.

4.1.2.3. Results of the Format Selection

The text book format refers to the rules of the BSNP (*National Education Standards Agency*). Text books and worksheets are colored so students will be interested and motivated to learn.

4.1.2.4. Preliminary Design Results

In the initial design phase, the initial draft learning device is in the form of Learning Implementation Plans (RPP), Textbooks, and LKS for 4 (four) meetings, *self-regulated learning questionnaires*, assessment guides, and answers. All the results of the design phase is here then referred to as draft 1.

4.1.3. Stage of Development (develop)

Resultsphase *define* and thephase *design* resulted in the initial design of a learning tool called the *draft* 1. After learning tool based on an open approach that is designed in the form of *draft* 1, test validity from expert review and field trials.

4.1.3.1. Validation Results

Before learning devices and research instruments were tested, the first learning devices and research instruments were validated by five validators including experts in the field. From the results of validation, the criteria for learning devices and research instruments were developed "valid" and could be used with minor revisions. Furthermore, questionnaires *self-regulated learningwere* studenttested in the outside class of the sample, then tested for validity and reliability.

TRY I

After the learning device developed has met valid criteria. Then the next learning device in the form of *draft* II was tested at the research site, which was a test that I did in class VII-B of SMP Negeri 1 Stabat. The results of the analysis of trial I data are devices that have not been effective, because there are still a number of indicators of effectiveness that have not been achieved, namely the results of classical values and analysis of achievement of learning objectives have not met the criteria reached in the first trial, can be seen in Table 1 and Table 2.

Table 1. Description Complete results of classical in test I

Description	Value
ValueHighest	90
Value lowest	50
average	77.00
percent Complete	76.67%

Based on Table 1 it can be seen that the average grade for the test in experiment 1 was 77.00 with the percentage of classical completeness students namely 76.67% of 30 students. This states that students have not fulfilled classical completeness because learning is said to have been achieved classically if there are 85% of students taking the test thoroughly. In addition, the analysis of the achievement of learning objectives in experiment I is explained briefly in Table 2.

Table 2. Achievement of Test Learning Objectives I

No	Learning Objectives	Test	
		% Achievement Learning Objectives	Information
1	Students are able to express the definition of lines and angles	67.65%	Not Achieved
2	Students are able to determine the difference in line position	85.83%	Achieved
3	Students are able to complete mathematical operations in daily life	87, 5%	Achieved
4	Students are able to analyze the properties of angles to solve questions	77.5%	Achieved
5	Students are able to solve problems between angles as a result of two parallel lines cut by the transverse line	66.67%	Not achieved

In accordance with the criteria forlearning objectives, said learning objectives are achieved by criteria of ≥ 75% of the score the maximum of each item, thus the achievement of learning objectives in the first trial, namely in theresults *posttest* skills mathematical communication have been achieved for questions number 2.3 and item number 4 while those that have not been reached are item number 1 and item number 5.

Based on the trial I that has been conducted in the field by providing learning using learning tools based on geogebra-assisted discovery learning models, several weaknesses of the learning devices developed were found. As on the achievement of learning objectives material lines and angles of 4 learning objectives, there is 1 learning goal that has not been achieved, namely: (1) students can interpret mathematical ideas into written forms. This is because students are not accustomed to expressing their opinions in writing, thus giving students less confidence in their answers and therefore need direction from the teacher to train students to interpret ideas into written forms. Then other weaknesses can be seen into two aspects, namely in the learning process and learning devices developed.

First, the learning process can be seen from the number of student learning groups in the class that is less effective, namely, the division of learning groups that are not heterogeneous but based on alphabetical names in class absences, at the time of trial I samples in class VII-B numbered 30 students, divided into 6 groups learning so that the study group consists of 5 students, this weakness is the researcher analyzes that when the LKS is given not all group members participate in completing it. Seen from students when trying to discuss, most of them only had a discussion together, leaving one student in each group who did not work to contribute mathematical ideas to the students' answers. So that special attention is needed to divide students into heterogeneous learning groups and the number of student members in their study groups.

Second, the learning devices developed have weaknesses that must be revised, (1) Learning Implementation Plans (RPP) need to be described in more detail the activities that will be carried out by the teacher and students at each step of learning and can maximize time. (2) Teacher's Book (BG) there are a number of things that must be revised, such as those that are not understood by students, orders of activities that are not clear, addition of examples or problems related to the characteristics of angles. less understood by students, less clear command of activities, addition of examples or problems related to the properties of angles so that the book can help students understand mathematical concepts. (4) the student activity sheet only relates to the use of language following improvements in the student book.

Based on the results of analysis and tests I, it is necessary to revise some components of the learning device developed in the hope that learning tools can improve *self-regulated learning* students'.

TRY II

After the revised *draft* II, further improvements were made to produce learning devices that met good effectiveness. The revised results in the first trial produced a *draft* III which will be tested on class VIII-C students of SMP Negeri 1 Stabat. This II trial was conducted four times according to the learning implementation plan (RPP) that had been developed. Trial II was conducted to measure the effectiveness of learning tools (*draft* III) which were developed based on *discovery learning*-assisted *geogebramodels* to improve *self-regulated learning* student. Overall, the rate of students in the classical completeness II trial can be seen in Table 3.

Table 3. Results Description Mastery Test II Classical On

Description	Value
Top Value	95
Value Lowest	65
Average	82.67
Percent Complete	90.00%

Based on Table 3 it can be seen that the class average for the test in experiment II was 82.67 with the percentage of classical completeness of student learning which is 90.00% of 30 students. It was stated that the classical completeness of students had been achieved.

Furthermore, the implementation of learning, student responses have been achieved and positive. Likewise, the achievement of learning objectives in trial II for posttest results in the achievement of learning objectives that have been achieved. Thus it can be concluded that learning devices developed based on *discovery learning* geogebra-assisted models have been said to be effective.

4.1.4. Dessiminate Stage (*Dessiminate)*

Learning Devices that are developed model on discovery learning approach with geogebra at the distribution stage are carried out in a limited way only at SMP Negri 1 Stabat. Learning devices developed were disseminated to be used in the following semester for line and angle material.

4.2. Increased Self-Regulated Learning Students Using Device-Based Learning Model On Discovery Learning Approach With Geogebra

Result analysis of increasing self-regulated learning of students in the test I and test II shows that the self-regulated learning of students on average on the results of the posttest trial I was 77, 00 increased to 87.67 in trial II. This is in accordance with the analysis of student ability data, namely an increase in self-regulated learning seen from the average results of the trial questionnaire I and II so that it is known that there is an increase in the average value of self-regulated learning studentis 10%.

Further more, the description of increasing self-regulated learning students using learning tools model on discovery learning approach with geogebra was developed in the first trial and trial II for each indicators self-regulated learning student'scan be seen in Table 4.

Table 4. Average Scores Self-Regulated Learning Students in Trial I and Trial II

No	Indicators	Percentage of Average per Indicator	
		Try I	Try II
1	self evaluating	65%	78%
2	organizing and transforming	74%	79%
3	goal setting and planning	67%	77%
4	seeking information	67%	79%
5	environmental structuring	87%	88%
6	rehearsing and memorizing	68%	82%
7	seeking peer, teacher, adult assistence	65%	77%
8	review test/work	64%	82%
Average Total All Indicator For Each Trial		70%	80%

Based on Table 4 above, it can be seen that the average questionnaire results self-regulated learning student increased from the results of trial I to trial II for each indicator. (1) Evaluation of task progress (self evaluating) increased by 13%; (2) Organizing material and transforming increases by 5%; (3) Making plans and learning(goalsgoal setting and planning) increases by 10%; (4) Finding information (seeking information) increases by 10%; (5) Environmental structuring increased by 1%; (6) Repeat and recall (rehearsing and memorizing) increased by 14%; (7) Asking for help from friends, teachers, adults (seeking peer, teacher, adult assistence) to increase 12%; (8) Repeating assignments / previous tests (review / work review) increased by 18%. For more details see Figure 1.

Based on Table 4 and Figure 1 it can be seen that the self-regulated learning of students from trial I to trial II was seen from the total average score and average score - orata each indicator has increased through learning tools based on discovery learning geogebra-assistedmodels. So, it can be said that learning devices developed model on discovery learning approach with geogebra have an impact on improving the ability ofattitudes in terms oftest results self-regulating, Self-regulated learning studentas well as individual indicators self-regulated learning.

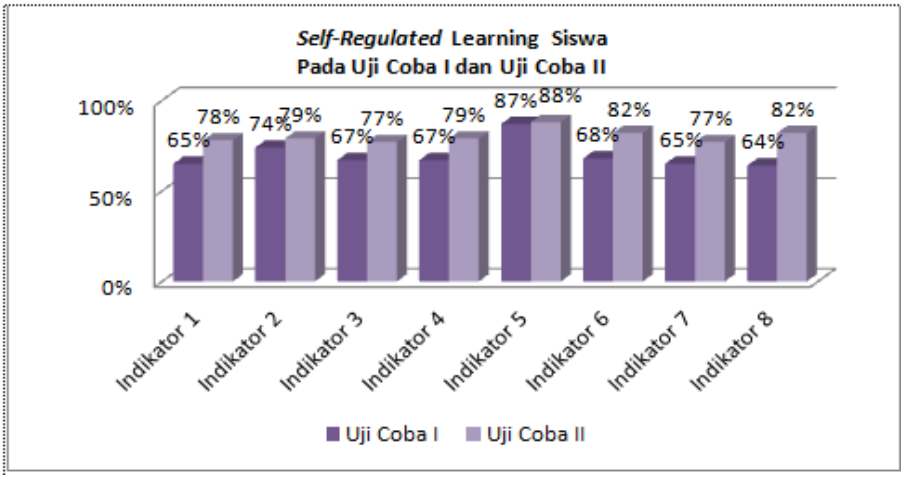

Figure 1. Average Self-Regulated Learning of Students in Each Indicator

5. Conclusion

Based on the results of data analysis and implementation of research, learning uses teaching materials based on an open approach with the help of signatures to improve self-regulated learning students'. The researcher draws the following the conclusions:

1. The validity of the learning device developed is included in the valid category.
2. Learning tools developed based on geogebra-assisted discovery learning approach have met effective criteria. Effective criteria viewed from: (1) completeness of student learning in a classical manner on the II trial has been achieved that is 90.00% complete (2) the achievement of learning objectives has also been fully achieved; and (3) positive student responses to the components of the learning device and learning activities developed.
3. By using learning tools based on geogebra-assisted discovery learning models self-regulated learning students increase from trial I to trial II.

6. Suggestion

Based on the above conclusions, it can be suggested that: The learning tool based on geogebra-assisted discovery learning model approach developed can be used as a reference to create learning devices with other materials to develop self-regulated learning for students both at the same and different educational unit levels.

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