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Resolution to Increase Capacity by using Math Students Learning Guided Discovery Learning (gdl)

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Abstract

This research is a classroom action research (PTK) aims to determine the increase problem-solving ability of students on the subject of flat in class VII SMP Hang Tuah 2 by using the method of learning Giuded Discovery Learning. The Instrument Data Collectors in this research is to test the problem solving and observation. This test consists of tests and test Cycle I Cycle II. From the results of the two cycles study, the data obtained in the cycle I of percentage completeness of problem solving ability of students by 44% and unfinished presentation 56% of 32 students who complete is 14 people and the unfinished is 18 people. In cycle II the percentage of problem solving ability is 87,5% and presentation is not complete 12,5% from 32 complete student is 28 people and the unfinished is 4 people.

Keywords: guided discovery learning (gdl); Plane; problem solving ability.

1. Introduction

Mathematics Education is part of education. So mathematics education is one aspect of life which is very important role in efforts to foster and support high-quality human. As revealed [1] about learning "In the modern developments, Mathematics plays an important role because with the help of all science mathematics perfect".

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In the learning process, the use of appropriate teaching methods will greatly affect the achievement of students' understanding. Of course all teaching methods had been applied so far has advantages and disadvantages.

Apart from all that, the teaching method often applied by our teachers today are inclined to only one side of the brain of the pupils. Because the human brain is essentially divided into two, the left brain and right brain.

One of the factors that affect the difficulty of learning mathematics in solving math problems is the ability reasoning. Lack of mathematical reasoning abilities due to learning in the classroom are still centered on the student *(student*center).

Master is still active and has not been offered an opportunity for students to construct his ideas, and the perception that mathematics be number one among other subjects, resulting in students' reasoning is becoming weaker. This is one of the factors that lead to mathematical reasoning to be low.

Can be seen from a few examples that illustrate mathematical problem solving problematic, then the need for an action to be able to train and develop students' ability of mathematical problem solving in order to increase in math.

Problem Solving is one of the main aspects of the mathematics curriculum that requires students to apply and integrate many of the concepts and math skills as well as making decisions [2].

Troubleshooting is also able to develop a creative approach to students. Experiments described is part of a longitudinal study that focuses on promoting a culture of problem-solving by students [3].

There are also problem solving is one of the most important elements in school mathematics can be defined as the process of finding the best way to resolve the problems encountered and require a series of measures pertaining to resolve the problems faced to achieve specific objectives [4].

There are many interpretations about problem solving in mathematics. Of whom there are many referred observers interpret mathematics and problem-solving as an attempt to find a way out of a difficulty in order to achieve a goal.

Can describe mathematical problems as a challenge when a solution requires creativity, understanding and genuine thought or imagination [5].

The importance of problem solving abilities by students in mathematics [6]:

1. The ability to solve problems is a common goal of teaching mathematics.
2. Solving problems includes methods, procedures and strategies are core processes and major in mathematics curriculum.
3. Problem solving is a basic ability to learn mathematics.

Problem Solving Ability indicators Broadly indicator troubleshooting capabilities [7] as in Table 1.

Table 1: Indicators Troubleshooting Capabilities By Polya Based Troubleshooting Steps

Number	Troubleshooting Steps	Indicators
1.	Understand Problems	Students should understand the condition of the existing problems or issues on the matter, such as: • data or information that can be seen on the matter? • What is the essence of the problem of the problem that needs solving? • Is there in terms of the formulas, images, charts, tables or special signs? • Are there essential prerequisites to be considered in the matter?
2.	Planning	• Students should be able to think about what steps are important and support each other in order to solve its problems • Students should look for concepts or theories that support each other and find the necessary formulas.
3.	Solving	• Students have been ready to do calculations with all kinds of necessary data including the concepts and formulas or equations corresponding • Students should be able to form a more standard problematic system • Students start to enter the data to lead to a solution of fleshly scheme • Students carry out steps plan
4.	Checking	Students should strive to double-check and re-examine carefully every step solution that does.

Discovery learning method is a teaching method that regulates teaching in such a way that the child acquires knowledge that he or she has not previously notified through notification, partially or wholly found alone. In learning discovery (discovery) activities or learning are designed in such a way that students can find the concepts and principles through its own mental processes. In discovering concepts, students make observations, classify, make guesses, explain, draw conclusions and so forth to find some concepts or principles [8].

Discovery is a mental process by which students are able to assimilate a concept or principle. The mental processes in question include: observing, digesting, understanding, classifying, making conjectures, explaining, measuring, making conclusions and so on. With this technique the students are left to find themselves or have

their own mental processes, the teacher only guides and gives instructions. Thus discovery learning is a learning that involves students in the process of mental activity through the exchange of opinions, with discussion, self-reading and self-test, so that children can learn alone.

Learning problems caused by the lack of participation and student achievement can be overcome with appropriate learning model. The learning model should be able to change the learning activities of students from passive to active to construct a concept that supports the balance of knowledge, skills, and attitudes [9]. One alternative learning model that can be applied to improve learning outcomes are less than optimal is the *Guided* Discovery Learning.

Discovery learning method is a method of teaching that focuses on the activities of students in learning. In the learning process with this method, the teacher only acts as a mentor and facilitator that directs students to find concepts, propositions, procedures, algorithms and the like. The three main characteristics of learning to discover are: (1) exploring and solving problems to create, combine and generalize knowledge; (2) student-centered; (3) activities to combine new knowledge and existing knowledge.

There are several specific purposes of learning with Guided Discovery Learning (discovery), which are as follows : [10]

a. In the present invention the students have the opportunity to be actively involved in learning. The fact shows that the participation of students in learning increases when the invention is used.
b. Through learning by discovery, students learn to find patterns in situations concrete and abstract, many students also foresee*(extrapolate)*the additional information provided
c. Students also learn to formulate strategy of questioning is not ambiguous and using frequently asked questions to obtain information useful in finding.
d. Discovery learning helps students form effective ways of working together, sharing information, and listening and using other people's ideas.
e. There are several facts that show that the skills, concepts and principles learned through more meaningful discovery.
f. The skills learned in a learning situation findings in some cases, more easily transferred to new activities and applied in new learning situations.

The Guided Discovery Learning Steps are as follows:

1. Stimulus (leave a question or encourage students to observe the images and read books on the material)
2. *Problem statement* (provide opportunities for students to identify as many issues relevant to teaching materials)
3. Data *collection* (providing opportunities students gather information)
4. Data *processing* (processing the data that has been acquired by the students)
5. Verification (conduct a careful examination to verify the validity of the hypothesis)
6. Generalization (holding conclusion)

2. Research Method

Subjects in this study were students of class VII-2 amounted to 32 people The SMP Hang Tuah 2 Terrain. The object of this research is the study of mathematics by using learning methods *Guided Discovery Learning* (GLD) to improve students' mathematical problem solving in the subject Bangun Datar in SMP Hang Tuah 2 Medan.

This type of research is classroom action research (PTK) that action research using learning methods *Guided Discovery Learning* (GDL), which aims to uncover the obstacles and difficulties experienced by students in resolving problems of mathematics square and a rectangle that can enhance problem solving abilities of students in completing math problems, especially in the material Plane.

In accordance with this type of research is classroom action research, this study has several phases that constitute a cycle. Each cycle is implemented in accordance with the changes that will be achieved. In this study, if the first cycle is not successful, the teaching-learning process did not go well so that students' mathematical problem solving ability is low then held the second cycle in the same class in a different time, to achieve the desired capability. Classroom action research conducted in the form of a repeating cycle in the cycle there are four main phases of activity, namely: (1) Planning *(planning),* (2) The *(acting),* (3) Observation *(obsevation),* (4) Reflection *(reflecting).*

3. Results and discussion

3.1 Results of the research

Testing of Research Instruments :

a. Validity of the item

Before the research instrument is given to the research sample, first tested in class VIII-2 SMP Hang Tuah 2 Medan who has studied the subject of Plane. The goal is to know the validity of each item, problem reliability, distinguishing power and difficulty level of the problem.

Table 2: Validity Problem Post Test I

Number	r_{count}	r_{table}	Description
1.	0.84926	0.349	Invalid
2.	0.66788	0.349	Valid
3.	0.78494	0.349	Valid
4.	0.80595	0.349	Invalid

Based on the calculation of the validity of Question 1 obtained r_{count} = 0.84926 and r_{table} = 0,349 on the real level α = 0.05 turns $r_{count} > r_{table}$ the problem number one is said to be valid. By the same token obtained validity of each question.

Table 3: Validity Problem Post Test II

Number	r_{count}	r_{table}	Description
1.	0.79587	0.349	Invalid
2.	0.74393	0.349	Valid
3.	0.67619	0.349	Valid
4.	0.62069	0.349	Invalid

b. Reliability of the item

Based on the calculation of the validity of Question 1 obtained r_{count} = 0.79587 and r_{table} = 0,349 on the real level α = 0.05 turns $r_{count} > r_{table,}$ so the problem number one is said to be valid. By the same token obtained validity of each question.

Table 4: Reliability Item Problem Cycle I

No.	r_{count}	r_{table}	Description
1.	0.82545	0,349	Reliable
2.	0.82545	0,349	Reliable
3.	0.82545	0,349	Reliable
4.	0.82545	0.349	Reliable

The reliability coefficient of the test is 0.82545 compared with the value of r_{table} critique of product moment for α = 0,05 and n = 32 that is $r_{table} = 0{,}349$, $r_{count} > r_{table}$ or 0,82545 > 0,349. So it can be concluded that the test used is reliable

Table 5: Reliability Item Problem Cycle II

Number	r_{count}	r_{table}	Description
1.	0.62926	0,349	Reliable
2.	0.62926	0,349	Reliable
3.	0.62926	0,349	Reliable
4.	0.62926	0.349	Reliable

The reliability coefficient of test 0,62926 compared with t_{table} critic value of product moment for α = 0,05 and $n = 32$ that is t_{table} = 0,349, $t_{count} > t_{table}$ or 0,62926> 0,349. So it can be concluded that the test used is reliable.

c. Power Beda Items

Table 6: Power Beda Post test I

Number	S_u^2	S_a^2	t_{count}	t_{table}	Description
1	0,32974	1,53405	12,69646	1,746	significant
2	0,65232	0,39426	14,66229	1,746	significant
3	1,03942	0,30824	6,89125	1,746	significant
4	0 , 77 419	0.52329	9.07169	1.746	significant

Based on calculationsdifferent power to question 1 on the post-test I obtained t_{table} = 1.746 and$_t$ t_{count} = 12.69646. It turned out that$_t$, $t_{count} > t_{table}$ is: 12.69646 > 1,746 so it is said in Question 1 significant. In the same way different power obtained each question.

Table 7: Power Beda Post test II

Number	S_u^2	S_a^2	t_{count}	t_{table}	Description
1	0,06452	0,37276	15,6265	1,746	significant
2	0,11469	1,17043	11,4604	1,746	significant
3	1,57706	0,63082	7,40294	1,746	significant
4	0 , 35 152	0.65233	7.32023	1.746	significant

Based on calculationsdifferent power to question 1 on the post-test I obtained t_{table} = 1.746 and t_{count} = 15.6265. It turned out that, $t_{count} > t_{table}$ is 15.6265> 1,746 sehungga said on Question 1 significant. In the same way different power obtained each question.

d. Level of difficulty Item

The calculation on post test level of cycle I and post test cycle II is as follows :

Table 8: Level of difficulty Grain Problem Post test cycle I

Number	ΣKA	ΣKB	ΣKA + ΣKB	Ni.S	TK	Description
1.	104	52	152	259.2	60.18%	Average
2.	94	49	143	259.2	55.16%	Average
3.	94	70	164	259.2	3.63.27%	Average
4.	99	68	167	259.2	64.42%	Average

Based on calculations about the number one difficulty level obtained by the level of difficulty was 60.18% categorized. In the same way the level of difficulty of each question is obtained.

Table 9: Level of difficulty Grain Problem Post test cycle II

Number	ΣKA	ΣKB	ΣKA + ΣKB	Ni.S	TK	Description
1	141	110	250	345,6	72.6273%	Easier
2	137	98	235	345,6	67.9977%	Medium
3	80	47	126	345,6	36.7477%	Average
4	143	121	264	345,6	76.3889%	easy

Based on the calculation level of difficulty about the number 1 obtained level of difficulty of 72.6273% easily categorized. In the same way, the problem of each problem is obtained.

Table 10: Description of Student Ability Level Test Problem-solving Mathematics Cycle I

Percentage of Mastery Level	Mastery Level	Many Students	Percentage of Number of Students
65% - 100%	Completed	14	44%
0% - 64%	Unfinished	18	56%

From the above results it can be obtained mastery learning classically only 44% has not reached the completeness of learning in the classical 80% of students from 32 people who achieve ≥ 65%. From the exposure of the data it is concluded that the criteria of classical completeness has not been reached then proceeded to the next cycle.

Table 11: Description of Student Ability Level Test Problem-solving Mathematics Cycle II

Percentage of Mastery Level	Mastery Level	Many Students	Percentage of Number of Students
65% - 100%	Completed	28	88%
0% - 64%	Unfinished	4	12%

From the above results it can be obtained learning completeness classically only 87.5% has not reached the completeness of learning in the classical 80% of students from 32 people who achieve ≥ 65%. From the exposure of the data then it is concluded that the criteria of classical completeness has been achieved.

3.2 Discussion

Before the research instrument is given to the students, first tested in class VIII-2 SMP Hang Tuah 2 Medan who has studied the subject of Plane. With the result of interview with teacher of class VII-2 SMP Hang Tuah 2 Medan before applied class action research in the form of learning using Guided Discovery Learning (GDL) method, it is found that students problem solving ability of categorized is still low. This can be seen in the problem solving ability of the low students especially in the subject of wake up flat. This is because students feel the material is difficult and students do not understand in choosing and trying strategies in solving problems, especially in making mathematical models. It is also caused by the teaching methods applied by teachers are monotonous and less varied. It is said to be less varied, because learning is teacher-centered and does not involve students actively. With such circumstances, it is necessary to apply Guided Discovery Learning (GDL) learning methods.

To know the problem solving ability of students before the research done, the researcher gives the initial test and the initial test score obtained by the students is used as a reference to know the improvement of problem solving ability of grade VII-2 students of SMP Hang Tuah 2 Medan after applying Guided Discovery Learning method (GDL).

Through the study of mathematics by using learning methods *Guided Discovery Learning* (GDL) improve students' mathematical problem solving ability and reduce the difficulty of students in mathematics. The difficulties experienced by students is:

1. Some students do not understand about a given problem so students often ask the teacher.
2. Some students are still less attention to procedure or step - step problem solving that has been taught by teacher.
3. Students are not active and shyly asked during the learning process takes place.

Thus, it can be concluded that there is an average increase persetase matemetika problem solving ability of students from the first cycle to the second cycle.

The use of this guided discovery method is reinforced by several learning theories that support the use of this method in the learning process, including Piaget's theory, viewing that learning is the process of cognitive development to build their own knowledge based on experiences gained through adaptation processes involving assimilation and accommodation. As stated by [11] that "assimilation is the process of joining the stimulus into the cognitive structure, while the accommodation is changing the understanding as a result of the new stimulus". In addition, each child develops his thinking ability based on regular stages.

The next theory is the theory of Ausubel that is about the theory of meaningful learning and the importance of repetition in a learning. "Learning to be meaningful according to Ausubel is the process of understanding the concepts/materials through various ways of development so that students understand" [11]. Ausubel distinguishes between learning to receive and discover, in learning to accept students only receive a material given by the teacher without any involvement of students to find out how the concept of the material obtained, while learning to find that students are invited by the teacher how to find the concept of learning is, so do not

accept Learning just like that, but students must go through the process of finding first in learning. In guided discovery learning is closely related to the finding process, this is in line with the theory put forward by Bruner. The basis of Bruner's theory is that students are actively involved during the learning process, while "the concept is to learn by discovering (discovery learning) that learning is essentially a finding process done by students or groups of students." [12]

Learning activities conducted with guided discovery method is packed with group learning. This group study is in accordance with Vigotsky's theory of social constructivism theory. Vygotsky believes that "children follow the examples given by adults and gradually develop their skills to perform certain tasks without the help or counsel of others [12]. So in carrying out the learning process of children need help from others.

4. Conclusions and Suggestions

4.1 Conclusions

Based on the research objectives to be achieved is to find out whether the problem solving ability of mathematics students can improve with learning Guided Discovery Learning method (GDL) in class VII SMP Hang Tuah 2 Medan academic year 2015/2016 and analysis of the data obtained are:

1. Math problem solving skills of the seventh grade students of SMP HANG TUAH 2 Medan of the academic year 2015/2016 on the subject of Plane using Guided Discovery Learning method improved from the initial test, cycle I and cycle II test. This can be seen from the average of critical thinking ability in cycle II that is 75,14 higher than with mean of critical thinking ability in cycle I that is 59.14 and preliminary test 34,58.
2. Completeness of learning ability of problem solving of student mathematics in class VII SMP HANG TUAH 2 Medan Year 2015/2016 academy on pocket discussion of flat wake with Guided Discovery Learning method also experience improvement from initial test, siklu I, and test cycle II. This is demonstrated by the classical completeness in cycle II is 87.5% higher than the classical completeness in the first cycle is 44% and the initial test 10%.

So it can be concluded that there is an improvement in learning by using Guided Discovery Learning (GDL) method to improve students' mathematical problem solving skills in Grade VII-2 SMP Hang Tuah 2 Medan of Plane.

4.2 Suggestions

Based on the research results that has been conducted by the researcher and the given conclusions, then the researcher’s suggestions are:

1. For the teachers, should use Guided Discovery Learning (GDL) as an alternative learning to improve students' mathematical problem solving skills and hopefully to make the best possible use of the time for the learning process to run well and guide the students to find their own solution problem..

2. For the students, it's suggested to be more active in learning process and to participate actively in every process, even if the teacher gives an opened problem. It will be useful for developing student skills..
3. For the headmaster, should often provide information/coaching to the teachers in the field of study in order to develop the way of teaching.
4. To the next researchers, it is expected to conduct more in-depth research on Guided Discovery Learning (GDL) learning methods to students' ability.

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