

CHAPTER I

INTRODUCTION

1.1 Background

Facing the current era of reform and advanced technology, the role of human resources is crucial. Only a nation that has quality human resources lives in the global competition that will take place. Education is one of the formation of the human soul that allows humans to grow and develop according to their potential and abilities. This is supported by the opinion of Jairo (2010: 58) which states that the educational process is a purposeful development process. The purpose of the development process is naturally maturity, because the most natural human potential is to grow towards maturity, maturity. Therefore, no one does not need education. Someone who has a good education will have the opportunity to achieve higher success than someone who has less education. As written in Law Number 20 of 2003 concerning Chapter I National Education System Article I:

Pendidikan adalah usaha sadar dan terencana untuk mewujudkan suasana belajar dan proses pembelajaran agar peserta didik secara aktif mengembangkan potensi dirinya untuk memiliki kekuatan spiritual keagamaan, pengendalian diri, kepribadian, kecerdasan, akhlak mulia, serta keterampilan yang diperlukan dirinya, masyarakat, bangsa dan negara.

With education, the human personality can be fostered and developed and can bring a positive impact towards the progress of a prosperous life. In the 1945 Constitution it is also explained that National education aims to develop capabilities and shape dignified national character and civilization in order to educate the nation's life to develop potential students to become human beings who are noble, healthy, knowledgeable, capable, creative, independent, and become citizens of a democratic and responsible state.

One field of study that has an important role in education is mathematics education. Mathematics is science whose purpose is to teach students to be able to

master concepts systematically and logically. As stated by Cornelius (Abdurrahman, 2018: 204) that:

Matematika merupakan sarana berpikir yang jelas dan logis, sarana untuk memecahkan masalah sehari-hari, sarana mengenal pola hubungan dan generalisasi pengalaman, sarana untuk mengembangkan kreativitas, serta sarana untuk menghasilkan kesadaran terhadap perkembangan budaya.

Whereas according to Hudojo (2016: 37), mathematics is not only related to numbers and operations, but also the element of space as its target. From this description it is clear that the object of mathematical study is not just a quantity, but rather emphasizes relationships, patterns, shapes and structures because in reality quantity targets do not have much meaning in mathematics.

Mathematics is one of the subjects taught in each education ranging from Elementary School (SD) to High School (SMA), even Universities. This shows the importance of mathematics in human life. In the development of science and technology, mathematics plays an important role because in mathematics learning is required to think critically and thoroughly to manage information, solve a problem / problem so that it is useful both in daily life and as a language or as a development of science and technology . Then mathematics needs to be understood and controlled by all levels of society.

There are many reasons for the need for students to study mathematics. Cockroft (Abdurrahman, 2018: 204) suggests that mathematics needs to be taught to students because: (1) is always used in all aspects of life; (2) all fields of study require appropriate mathematical skills; (3) is a means of communication that is strong, concise, and clear; (4) can be used to present information in various ways; (5) improve the ability of logical thinking, accuracy, and spatial awareness; (6) giving satisfaction to efforts to solve challenging problems.

Through this opinion, it was concluded that mathematics is a lesson that has an important role in education and is useful for improving the quality and quality of each individual. Mathematics lessons are also useful to improve human thinking, because by learning mathematics students can develop the ability to

think, reason, communicate ideas and can develop creative activities and problem solving.

Ironically, mathematics is one of the subjects that students don't like and sees mathematics as the most difficult, boring and frightening subject. For them math lessons tend to be seen as subjects that are less desirable and if possible avoided. This is in accordance with the opinion of Abdurrahman (2018: 202) which states that from the various fields of study taught in schools, mathematics is a field of study that is considered the most difficult by students, both those without learning difficulties and especially for students who have learning difficulties.

One of the things that causes students to dislike math and tends to view mathematics as a difficult lesson is a learning process that is not made to attract students' interest. The learning process that takes place in the classroom has not been able to make students become active and take on their role in learning. As expressed by Ernawati (2013: 3) that "students are always passive in learning while the teacher is active and all initiatives come from the teacher so that there is no reciprocal relationship between the teacher and students which has implications for the quality in the mathematics teaching and learning process". Because the learning process that does not make students active will result in students being poorly trained in constructing or compiling a problem presented in mathematics and unable to find a concept in solving mathematical solutions.

Every student has a different view of mathematics. For those who think mathematics is fun it will grow motivation in students to learn mathematics and be optimistic in solving challenging problems in mathematics. On the other hand, for those who consider mathematics to be a difficult subject, the students will be pessimistic in solving mathematical problems and lacking in mathematics, which has an impact on the achievement of learning objectives. Learning objectives will be achieved if the planning and methods used can affect the potential and abilities

of students and the success will be achieved if students are involved in the thought process (Witri Lestari, 2017: 77).

Because the initial ability of mathematics is crucial in learning a new mathematics subject matter because mathematics is hierarchical. The better the students' initial mathematical abilities, the better the students' ability to learn mathematical material to be studied. In addition, students' initial mathematical abilities are also used as a foothold in choosing the optimal learning strategy. Because, by knowing the initial mathematical abilities of each student, the teacher will be easier in determining the method or strategy that is suitable for use in the classroom so that the learning carried out will be more effective and efficient. Each student's initial ability varies in level of mastery (high, medium, and low) so that this is used as a guide in designing the form of learning.

Another factor that affects the low level of students' mathematical abilities is the less effective way of teaching teachers. Teachers need to consider individual student differences because not all students are the same. Each student has differences in various aspects, such as intelligence, talent, interests, needs, learning readiness, learning styles and so forth. Teachers must re-examine traditional teaching methods that are often incompatible with students' learning styles and skills in how teacher teaching needs to be improved by presenting math lessons in various ways so that teachers can provide greater opportunities to meet the diverse needs of their students (Ade, 2016: 13).

Factors of students' initial abilities considered to be the most influential are important factors in the learning process of mathematics. There are factors that are entirely dependent on students, such as intelligence, readiness and talent of children. Every individual has different abilities. The initial ability of students is the ability that has been possessed by students before he follows the learning that will be given. This initial ability describes the readiness of students to receive lessons to be delivered by the teacher (Gais, 2017: 256).

The initial ability of students is a determining factor in the success of mathematics learning. Every individual has different learning abilities. The initial ability of students is the ability that has been possessed by students before he follows the learning that will be given. This initial ability describes the readiness of students in accepting lessons to be delivered by the teacher. The success of students in a lesson or education also depends on the child's readiness. This child's readiness has two kinds, his mental development is ready and his prerequisite knowledge has been possessed. Students cannot understand counting if they have not been able to understand the immutable law (mental development is not ready) and he will not understand quadratic equations if he does not yet understand linear equations (prerequisite knowledge does not yet exist).

Based on the results of the study show that there is a positive relationship between the students' initial abilities and their learning outcomes. With the assumption that students who are the subjects of the study are students who have IQs above the average, so that they have no difficulty in receiving the next lesson. Thus the teacher's attention can be directed to the students' initial abilities, before the subject matter is delivered. The initial ability of students is important to know the teacher before he begins with learning, because it can be known: a) whether students already have or knowledge that is a prerequisite for participating in learning; b) the extent to which students know what material will be presented. By knowing these two things, the teacher will be able to design learning better, because if students are given material that is already known they will feel bored quickly.

Teachers who do not interact with students in a familiar way, causing the teaching and learning process to run smoothly, students feel far from the teacher so they are reluctant to actively participate in learning. This is confirmed by the opinion of Arend (Trianto, 2016: 10) which states that in teaching teachers always require students to learn and rarely give lessons on how students to learn, teachers also require students to solve problems, but rarely teach students how solve the problem.

In curriculum design there are stages of evaluation. Assessment is part of evaluating the achievement of students and teachers in teaching. One form of instrument in known cognitive assessment is a test. skills needed by student learning. For example, if the test made will have a HOT (Higher Ordering Test) character, then the test item must have a character that involves a high level of thinking, complex problems, and involves various cognitive levels. The structure of a test item with HOT characteristics consists of a case presentation, choice questions, and request for reason selection (Bambang Subali & PujatiSuyata 2012). Assessment will be better if it is equipped with a portfolio so that the assessment will be more intact.

Based on a comprehensive evaluation of the curriculum, rather than what happened from our curriculum products, according to Wright (Eko Prasetyo, et al., 2008), modern education in general has now experienced reason reduction to become "rationality without reason", where processes and graduates educational institutions tend to be "cheerful robots"; has a ratio without reason so that it loses its creative power, experiences alienation from the reality of the self and the reality of the educational community, thus losing its vital role as an institution that produces civilized human beings, full of respect and respect for fellow humans, as he respects and respects himself therefore changes in the changes in the education system (teaching and learning process) in schools should not be limited to mere administrative technical mechanisms or procedures, but simultaneously education can optimally give birth to humans who are in balance and reason. With the balance ratio and reason then students will be open to various skills to live in the future.

This situation is further strengthened by the results of the Program for International Student Assessment (PISA) and Trends in the International Match and Science Survey (TIMSS) survey. Since its participation from 1999, the ranking of Indonesian students has not been able to occupy the top position looks like the following table (Arifin, 2018: 11).

Table 1.1 PISA Ranking and TIMSS for Indonesian Students

PISA			TIMSS		
Year	Rating	Total Country	Year	Rating	Total Country
2000	38	41	1999	32	38
2003	38	40	2003	37	46
2006	50	57	2007	35	49
2009	60	65	2011	40	42
2012	71	72	2015	45	48
2015	64	72	-	-	-

Both surveys show that the majority of students are still at the level of Lower Order Thinking Skills. This indicates that students' scientific literacy is still low. The process, content, and applications of science and mathematics are still not as expected. There are still many memorizing material that is buried and is in the realm of short term memory. The ability to think is still just tends to remember (recall), restate, or refer without doing processing (recite).

Related to the issue of the development of education at the international level, the 2013 curriculum was designed with improvements. Assessment models in the 2013 curriculum adapt international standard assessment models that are expected to help students to improve their high-order thinking skills (High Order Thinking). But in reality this has not been done well. On monitoring the supervision and Guidance of Post-High School Learning Evaluation (EHB) conducted by the Directorate of High School Development, most of the target high school teachers in compiling items tend to only measure Low Order Thinking. (High Order Thinking Skills Preparation Module, 2015: 1). Based on

the opinions of Anderson & Krathwohl (in the Directorate of High School Development, 2015: 4) the domain of cognitive processes that are included in the ability to think higher (High Order Thinking) is the analysis domain (analyze), evaluation (evaluate) and create (create).

Education in Indonesia has always undergone improvements which ultimately result in a quality product or education quality. Various efforts have been made in order to improve the quality and quality of existing education, so as to be able to create a reliable next generation capable of facing various life challenges. These improvements and improvements include improvements in the education system or things directly related to learning practices. The 2013 Curriculum Policy announced by the Indonesian government through Permen No. 22 of 2016 concerning process standards, it is clear that as a curriculum improvement plan it is expected that students can develop themselves in thinking. Students are required not only to have low-level thinking skills or LOTS (Lower Order Thinking Skill), but also to high-level thinking skills or HOT & (Higher Order Thinking Skill). According to Krathwohl, & Anderson (2001), states that indicators for measuring HOTS include analyzing (C4), evaluating (C5), and creating (C6).

In 2018, the Ministry of Education and Culture began to apply questions that require high-level thinking skills or "High Order Thinking skill or HOTS on 2018 National Exams (NE). The HOTS system will continue to be used because it aims to develop students' reasoning power. Regarding the difficulty of Mathematics in the National Examination in 2018. According to him, the use of HOTS in NE questions was applied to encourage students' critical thinking skills.

The factors of student's initial abilities were considered the most influential, as revealed by Karso, et al. (1993: 217) students are an important factor in the teaching and learning process of mathematics. There are factors that are entirely dependent on students, such as intelligence, readiness and talent of children. Every individual has different abilities. According to Yusuf (2011)

Students' initial abilities are abilities that have been owned by students before he attended the learning that will be given This initial ability describes the readiness of students to receive lessons to be delivered by the teacher."

Based on this, the researcher conducted observations to find out the learning process in Perbaungan 1 High School. Through observations made, it shows that students are active in the learning process, but it seems that the students are still bored and bored. This is because the learning model that is applied does not attract the attention of students to take part in the teaching and learning process.

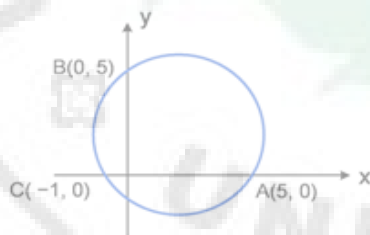
Based on the "Program pengalaman Lapangan (PPL)" of researchers on the questions previously given by teachers at Perbaungan 1 Public High School, there are only questions that measure analysis and evaluation skills, but there are no questions that measure the ability to create. Whereas in the XI grade students' mathematics books students who apply the 2013 curriculum dominating questions are questions that invite students to think analysis, evaluation and creating. Based on the results, interviews and preliminary observations of researchers during learning with math teacher class XI IPA 1 SMA N 1 Perbaungan obtained information as follows:

1. From the results of the final semester assessment found that students have diverse values and indirectly can show differences in the ability to solve math problems.
2. Regarding HOTS questions the teacher said that there was still a lack of time and references for making HOTS math questions. The questions given by the teacher are limited to the questions in the student handbook. HOTS are questions that have a high degree of difficulty solving questions especially HOTS math questions.
3. Students are not familiar with HOTS questions and assume HOTS questions are questions that have a high degree of difficulty.
4. The teacher does not yet know the extent of the students' ability to solve questions, especially HOTS math problems.

The teacher has not tried to find out the causes of the difficulties experienced by students, then choose the right solution for the problems experienced. One way that can be used to find out the cause of the difficulty is done by analyzing the response (answer) given by the student from giving the test. Meanwhile to determine the quality of responses (answers) students in answering questions can be analyzed.

This can be seen when the researcher gave a question to 36 students of class XI MIA 2 in SMA 1 Perbaungan regarding the material of the circle equation which was still being studied and had just entered the 3rd meeting. Here are the questions given by the researcher:

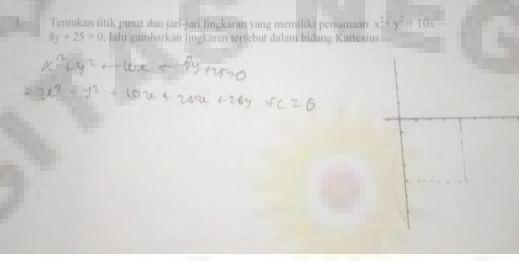
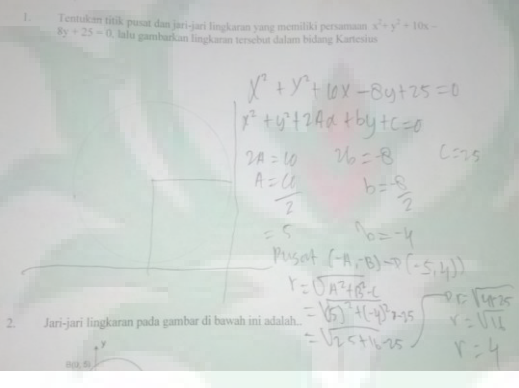
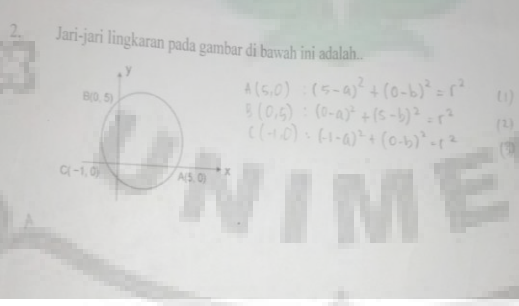
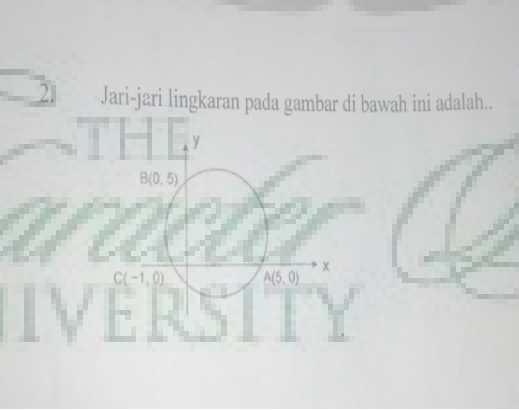
1. Determine the center and radius of the circle that has the equation $x^2 + y^2 + 10x - 8y + 25 = 0$, then draw the circle in the Cartesian field!
2. The radius of the circle in the image below!



Here are the results of the work of several students in solving the above description questions, seen in the following table:

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Table 1.2. Student Answers In Solving Questions On Circle Material

Nu	Student Work Results	Description
A	 <p>Tentukan titik pusat dan jari-jari lingkaran yang memiliki persamaan $x^2 + y^2 + 10x - 8y + 25 = 0$, lalu gambarkan lingkaran tersebut dalam bidang Kartesius</p> $x^2 + y^2 + 10x - 8y + 25 = 0$ $x^2 + y^2 + 10x - 8y + 25 = 0$	Students are unable to plan problem solving.
B	 <p>1. Tentukan titik pusat dan jari-jari lingkaran yang memiliki persamaan $x^2 + y^2 + 10x - 8y + 25 = 0$, lalu gambarkan lingkaran tersebut dalam bidang Kartesius</p> $x^2 + y^2 + 10x - 8y + 25 = 0$ $x^2 + y^2 + 2Ax + 2By + C = 0$ $2A = 10 \quad 2B = -8 \quad C = 25$ $A = 5 \quad B = -4 \quad C = 25$ <p>Pusat $(-A, -B) = (-5, 4)$</p> $r = \sqrt{A^2 + B^2 - C}$ $r = \sqrt{5^2 + (-4)^2 - 25}$ $r = \sqrt{25 + 16 - 25}$ $r = \sqrt{16}$ $r = 4$ <p>2. Jari-jari lingkaran pada gambar di bawah ini adalah..</p>	Students are able to understand the problem in writing what is known and what is asked on the question but cannot describe it into the Cartesian field
C	 <p>2. Jari-jari lingkaran pada gambar di bawah ini adalah..</p> $A(5, 0) : (5 - a)^2 + (0 - b)^2 = r^2 \quad (1)$ $B(0, 5) : (0 - a)^2 + (5 - b)^2 = r^2 \quad (2)$ $C(-1, 0) : (-1 - a)^2 + (0 - b)^2 = r^2 \quad (3)$	Students are not able to solve problems, where students only write is known.
D	 <p>2. Jari-jari lingkaran pada gambar di bawah ini adalah..</p>	Students are not able to understand the problem in writing what is known and what is asked on the question.

From the table above it can be seen that some students still have difficulty in solving problems related to the equation of the circle. This could be because they have not fully understood because they have just started the material study of the circle equation. The results of these tests indicate that students' thinking abilities are classified as low, medium and high. Some students still have difficulty understanding the meaning of the questions given, identifying the elements that are known and the elements asked from the questions, planning the problem solving that is not directed and the calculation process that causes the solution or the answers made by students is incorrect.

Based on the background described above, researchers are interested in conducting a study entitled "**Analysis of Student's Ability to Solve High Order Thinking Skills (HOTS) Problems in Terms of Students Mathematical Initial Abilities On The Circle Topic in Class XI MIA 1 in SMA N 1 Perbaungan A.Y 2018/2019**". It is important to know the ability of students to solve math problems especially HOTS type questions, because it can help determine the next step in order to improve student learning outcomes.

1.2 Problem Identification

Based on the description of the background of the above problems, identification of the problem is as follows:

1. Lack of mathematical questions of the type of High Order Thinking Skills (HOTS), whereas education in Indonesia requires strengthening of High Order Thinking Skills (HOTS),
2. HOTS questions are still not fully applied by the teacher.
3. Students are not familiar with HOTS questions and assume HOTS questions are questions that have a high degree of difficulty.
4. So far the teacher sees the students' ability to solve questions based only on quantitative values, whereas it is more important to know the difficulties experienced by students as seen from how students respond.

5. The process of answering students in solving problems is still incomplete / has not followed the steps of a good and correct solution.

1.3 Problem Limitation

Based on the background and identification of the problems described, it is necessary to limit the problem to be more focused and directed. The limitation of the problem in this study lies in the analysis of students' abilities in terms of the initial mathematical abilities of class XI students of SMA 1 Perbaungan. Math in this study is limited to the subject of Geometry Circles and a math problem composed with respect to the level of about HOTS based on Bloom's taxonomy and curriculum revision 2013.

1.4 Problem Formulation

Based on the above problem definition, the formulation of the problem in this study is whether

1. How the Mathematical Initial Ability of students' on the execution of High Order Thinking questions in terms of aspects of the analysis, aspects of evaluation and aspects of the matter of creation?
2. What factors are students' problems in solving High Order Thinking questions?

1.5 Research Objective

In line with the formulation of the problem, the purpose of this study is

1. To know out the Mathematical Initial Ability of students' on the work of High Order Thinking questions in terms of aspects of the analysis, aspects of evaluation questions and aspects of creating questions.
2. To find out what factors cause students to be mistaken in solving high order thinking questions.

1.6 Research Benefits

With the implementation of the objectives of this study, the benefits can be expected as follows:

1. For students
 - a. Students get the opportunity to know to what extent students are able to solve problems.
 - b. This research can provide experience in solving math problems that can measure high-level thinking skills.
2. For prospective mathematics teachers / teachers.
 - c. The teacher can use HOTS type questions as one of the alternative assessment tools in the learning process.
 - d. The teacher can know the level of understanding of material possessed by students after learning circle material.
 - e. The teacher can also know the ability of students to solve HOTS type questions.
 - f. The teacher can find out where the weaknesses or difficulties of students in working on HOTS type questions are given related to the material Circle.
 - g. As a consideration in expanding students' knowledge and in order to improve students' high level thinking skills.
3. For schools
 - a. As an effort to improve students' initial mathematical abilities.
 - b. Helps increase the knowledge of the importance of habituating HOTS type questions so that students have 21st century abilities.
 - c. As a consideration in developing and refining mathematics teaching programs in schools.
4. For researchers
 - a. Researchers can know the level of student responses in solving HOTS type questions given in the Circle material.

- b. Researchers can find out what stage students understand in learning the material Circle.
- c. Researchers can introduce HOTS type questions as an alternative research tool that can be used in the assessment process in the classroom.

1.7 Operational Definition

The operational definitions in this study are:

1. Analysis of the Ability to Complete Mathematical Questions. According to the Big Indonesian Dictionary (2008), analysis is the investigation of an event to find out the real situation. The ability to solve mathematical questions is understood by the problem meaningfully in solving problems used in solving mathematical problems. So this study is an investigation of the understanding of the same class XI IPA students 1 Perbaungan 2018/2019 school year in solving HOTS questions in circle material seen from student work.
2. HOTS type questions are questions that require the ability to use reasoning and logic to make decisions (C4), predict & reflect (C5), and the ability to develop new strategies (C6) to solve non-routine questions.
3. The circle of sets of all points on a flat plane which is equidistant from a fixed point in the field.
4. High Order Thinking Skills (HOTS) the ability to think that is not just remembering, restating, and sulking without doing processing, but the ability to think to analyze information critically, creatively, creatively and able to solve problems.
5. Early mathematics ability is a determining factor in the success of mathematics learning. Every individual has different learning abilities. The initial ability of students is the ability that has been possessed by students before he follows the learning that will be given.