

# CHAPTER I

## INTRODUCTION

### 1.1 Background of The Study

Education is the process of changing the attitudes of a person or group of people in an effort to maturity through teaching and training efforts (*Kamus Besar Bahasa Indonesia*, 1991:232). Education is guidance or assistance provided by educators to the development of learners to reach maturity with the aim that children are capable enough to carry out their own life tasks not with the help of others (Purnomo, 2019). Education can happen under the guidance of others but it can also happen self-taught. The role of education is to ensure the survival of a nation, because through good education it will create smart and well-acted learners, who are ready with the development of an era full of challenges.

Mathematics is one of the lessons taught in the world of education and is one of the important parts to improve the quality of education. According to Hasratuddin (2014:30) Mathematics is a way to find answers to problems faced by humans; a way of using information, using knowledge of shapes and sizes, using knowledge of counting, and most importantly thinking in man himself in seeing and using relationships. Mathematics lessons are lessons that always relate to a concept, the concept itself is an abstract idea that by associating a concept we can group objects into examples. Concepts in mathematics itself have a connection with each other, because this proves the importance of understanding the concept of mathematics itself. Therefore, students have not been able to understand a material if they do not understand the concept of the previous material.

The world is currently hit by COVID-19 (Corona Virus Disease 2019) including Indonesia. COVID-19 is a type of virus that started in Wuhan City, China at the end of 2019. The transmission of the virus originated from animal to human which occurred in a market located in Wuhan, Hubei Province of China. The World Health Organization (WHO) named the virus Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) and the name of the disease as Corona Virus Disease

2019 (COVID-19). Based on data released by WHO and reported on the Kompas.com website, a total of 101,561,219 people were confirmed positive and at least 2,196,944 people died as of January 31, 2021 worldwide. In Indonesia, there are 1,078,314 people confirmed positive and at least 29,998 people died as of January 31, 2021.

To reduce the number of people infected with this virus, the government prohibits all Indonesians from crowding, *doing social distancing*, wearing masks, always washing their hands and having to implement other health protocols. Government rules that prohibit people from crowding and keeping distance certainly have an impact on various fields, one of which is the field of education. Therefore, through the Ministry of Education and Culture the government has banned universities from carrying out face-to-face (conventional) lectures and ordered to hold lectures or online learning (Kemendikbud Dikti No. 1 Year 2020). Universities are led to be able to conduct online learning (Firman & Rahayu, 2020). Because of the change in learning methods, it is certainly a challenge for every element in the world of education, namely for students and teachers.

Students do not have readiness in terms of self-learning motivation without direct teachers, and control from parents who are less likely to always accompany their children to study online, parents have been delivering their children to school, because parents are busy working to meet the needs of the family. The success of online learning can be achieved if the three components synergize each other, namely schools, students, parents / parents.

There are many difficulties experienced by teachers, from the unfamiliar use of the internet as the main component in teaching. Social distancing and physical distancing policies to minimize the spread of covid-19 encourage all elements of education to activate classes even if the school is closed. School closures are the most effective mitigation measures to minimize the spread of outbreaks in children. The solution provided is to implement home learning by utilizing various supporting facilities.

One of the obstacles of online learning is in mathematics subjects. The problem today is that there are still many students who consider Mathematics to be a difficult lesson. Mathematics requires representation in simplifying and solving

mathematical problems because mathematics is abstract. Students need access to mathematical ideas and that can only be done through representing these ideas (Nada, 2020:2).

According to the Curriculum Center the general purpose of school mathematics learning is (1) to train ways of thinking and reasoning in drawing conclusions, for example through research, exploration, experimentation, showing similarities, differences, consistency, (2) developing creative activities involving imagination, intuition and discovery by developing divergent, original, curiosity, making predictions and guesses, and experimenting, (3) developing problem solving skills, and (4) develop the ability to convey information or communicate ideas among others through oral conversations, notes, graphs, maps, diagrams, and explaining ideas.

Calculus mathematics at the high school level began to be taught to students. Calculus is one of the important materials that must be studied because it is the basic material of the development of other sciences. For example, technology, programming and more. One of the calculus materials taught is the limit of algebraic function. Calculus is a study of limits, so a clear understanding of the concept of limit is a useful goal (Kulsum, 2020:286). There are two parts of understanding in mathematics about function limits, namely limit in non-reaches and function limits at one point.

The function limit in calculus is the starting gate to proceed to the next material which is derivative and integral. Not only that the importance of studying the limits of algebraic function due to the benefits in its application in daily life. The concept of limit is widely used in the field of engineering, natural sciences, economics and business to take into account deviations in measurement.

In everyday life, various problems that we face can give birth to various mathematical concepts. Based on the general mathematical concept obtained from the problem, we are able to solve similar problems again. For example, we make observations on the response of the body that is allergic to a substance with a dose level of antibiotic drugs. From the data we obtained, we can model the dose limit of antibiotic use. Thus, similar allergy problems can be solved if they occur again.

Our experiment is a concept approach to solving the problem. So, the concept can be obtained by observing, analyzing data and drawing conclusions.

The concept of limit is also used in various fields in daily life. For example, the maximum production of a machine of a factory, can be said to be the limit for the achievement of results. In practice, the achievement is not appropriate, but it is close to close. In everyday life, people never realize that everything we do is related to mathematics. For example, such as the process of buying and selling and so forth that are closely related to calculations. Thus the limit of function, unconsciously used in the field of medicine. A person with shortsightedness will wear concave lens glasses in order to see normally. In the field of chemistry, the function limit is useful to calculate the strength of iron that rubs with salt water and calculate its resistance in the face of grinding. Making the expiration date of food. And the function limit is also used by the government in determining the taxes to be paid by the public. In economics, function limits are also often used in calculating average costs and interest. Therefore, the material limit algebraic function needs to be mastered.

But in reality students still have difficulty in mastering the material. Students still find it difficult at the stage of determining alternative problem solving, and also the application of problem solving that has been selected. This is driven by a lack of understanding of concepts and also the principle of material limit functions. As for the type of difficulty in learning the material limit algebra function (Dewi, 2020:136) :

1. Conceptual difficulties are difficulties experienced by students because they do not understand the definition of limits or the conditions for a function to have a limit and errors in determining the compound roots of a function in the form of roots.
2. Principle difficulty is difficulty in relating some facts or concepts. The principal error indicators include: 1) students do not understand the concept of factoring, 2) students do not understand the properties in operations, and 3) students do not master other prerequisite materials used in determining the limit value of a function.

3. Procedural difficulties are difficulties in arithmetic, algebraic, and other mathematical work. The indicators are as follows: 1) students are wrong in performing operations, 2) students are wrong in writing, 3) students are wrong in substitution, and 4) the steps are not hierarchical in determining the limit value of the function.

The results of learning learners on algebraic function limit materials are less than maximum because students find it difficult to learn the material limit function this is because students do not understand the concept of algebraic function limit. In fact, in studying mathematics, understanding concepts is important. To understand a subject of mathematics of course learners must first master mathematical concepts. In addition, understanding the concept is also a goal in mathematics learning, this is stated in Permendiknas no. 22 of 2006 which explains that one of the objectives of mathematics learning is that students can understand mathematical concepts, explain interconcepts and apply concepts or algorithms, in a flexible, accurate, efficient, and precise, problem solving. That is, learning solutions are needed so that students can understand the concept of algebraic function limits, thus the learning outcomes of learners can be improved.

Therefore, it is necessary to analyze the mistakes of students in solving the problem of algebraic function limits. Useful as a bridge to get a solution so that the next mistake does not happen. Because as we already know that mathematical concepts are arranged hierarchically, structured, logical, and systematic ranging from the simplest concepts to the most complex concepts, which means that if an error is not corrected, it will accumulate other errors in the next material.

Related to the students' suboptimal learning outcomes, there are problems in math learning activities that must be improved. There are various factors that cause this problem, whether it comes from internal or external factors of learners. Judging from the internal factors of learners from the beginning already have a mindset that mathematics is difficult so that students are lazy to learn and repeat the lesson. From external factors one of the causes is the use of mathematical learning models that are less attractive to learners in learning, thus causing the learning of mathematics is less meaningful for learners. This is felt by teachers during the learning process where learning is still done centered on teachers and students play a passive role in

the classroom. In fact, teachers have an important role in the learning process and the learning model used by teachers during the learning process is also an important factor in making students understand and master the lesson materials delivered so as to influence the results of students' math learning.

The difficulties in Mathematics lessons require teachers to express their creativity to develop their learning methods. Effective online learning methods are urgently needed today. A learning model is a plan or pattern that can be used to form a curriculum (long-term learning plan), design learning materials in the classroom or something else. (Rusman, 2019). The more precise the method used by teachers in teaching, it is expected that the more effective the achievement of learning objectives (Nasution, 2017:9).

According to Putri (2019 : 709-710) learning strategy used by teachers will be depend on the approach used while how to run the strategy can use some learning methods . The choosing methods, strategies, models or approaches should pay attention to the learning goals. So that, the learning goals can be achieved. Problem-Based learning model made the students think divergently. Problem can forced students to develop their mind in solving the problem itself. Besides that, one of the purpose why students trained to solve problem using the problem solving is improving students' spatial ability. Problem-Based learning steps used in learning process can be divided to some phases: 1) Orientation phase, oriented students to the real problem; 2) Engagement phase, students are taking part in problem solving; 3) Inquiry and Investigation, students do research and investigation in order to solve the problem; 4) Debriefing, students discuss about the problem solving done

One of the learning models that can be used is the Problem Based Learning Model (PBL). In Problem Based Learning, a problem presented to students must be able to awaken students' understanding of the problem, an awareness of gaps, knowledge, the desire to solve problems and the perception that they are able to solve the problem (Rusman, 2019). Based on this belief, learning should always be associated with students' daily lives because this natural context provides something that students can do, not something to learn, so this will naturally require students to think and get natural learning outcomes as well.



Teachers should use a learning process that will move students toward independence, a wider life, and lifelong learning. The learning environment that teachers build should encourage reflective thinking, critical evaluation and a usable way of thinking. Teachers in Problem Based Learning (PBL) are different from the role of teachers in the classroom. Teachers organize learning environments to encourage the unification and involvement of students in problems. Teachers also play an active role in facilitating collaborative inquiry and student learning processes (Rusman, 2019). Based on some of the above understandings, the PBL model is a learning model that provides an authentic experience that encourages students to actively learn, construct knowledge, and integrate the context of learning in school and learning in real life naturally.

Some of the advantages of the PBL model are (1) Problem solving is a pretty good technique to better understand the content of the lesson; (2) Problem solving can challenge students' abilities and provide satisfaction to discover new knowledge for students; (3) Problem solving can improve student learning activities; (4) Problem solving can help students how to transfer their knowledge to understand problems in real life; (5) Problem solving can help students to develop new knowledge and be responsible for the learning they do; (6) Problem solving can show students that every subject is basically a way of thinking, and something that students must understand, not just learning from the teacher or from books; (7) Problem solving is considered more fun and liked by students; (8) Problem solving can develop students' ability to think critically and develop their ability to adapt to new knowledge; (9) Problem solving can provide opportunities for students to apply the knowledge they have in the real world; (10) Problem solving can develop students' interest in continuously learning even though studying in formal education has ended (Sutirman, 2013).

From some of the advantages presented by some of the above experts, it can be concluded that this PBL model is very good to develop high student confidence and able to learn independently so that researchers use this model in the process of Teaching and Learning Activities.

Due to the online learning situation during the COVID-19 pandemic, teachers should apply appropriate learning methods for effective teaching and learning

activities. One of them is to change the learning media used. The learning media is everything that can be used to convey a message or information in the teaching and learning process so as to stimulate students' attention and interest in learning. (Arsyad, 2017). Online learning from home prevents teachers from paying attention to what students are doing. Therefore, teachers should be able to create learning media that can make students focus on the lessons and materials explained by the teacher.

According to the results of my interview with one of the math teachers at SMA Negeri 16 Medan, limit lessons are one of the materials that students can not understand the material. Therefore, researchers are interested in researching and appreciating problem-based learning methods online in Limit lesson materials by teachers at SMA Negeri 16 Medan by taking the title "Analysis of Online Learning Methods Based on Problem Based Learning on Limit Subject Matter During The COVID-19 Pandemic".

### **1.1 Problem Identification**

Based on the background of study, the problem can be identified that

1. There has been a COVID-19 pandemic that requires schools to carry out online school learning.
2. Online learning that is carried out makes it more difficult for students to understand Mathematics lessons.
3. One of the materials that are considered difficult is limit material.
4. Effectiveness of online learning in Mathematics lessons during the COVID-19 pandemic.

### **1.2 Scope of Study**

Based on the problem identification, it can be determined the scope in this research is the school environment that is the learners which use online learning methods.



### 1.3 Research Question

Based on the problem identification, researcher formulated the research question that

1. How was the effectiveness of online learning discussion methods based on Problem Based Learning on Limit subject matter during the COVID-19 Pandemic?
2. Was the online learning discussion methods based on Problem Based Learning able to help students in understanding limit material?

### 1.4 Scope of Problem

Based on the research questions, researcher scope the problems studied, which is more focused on the percentage effectiveness of online learning discussion methods based on Problem Based Learning in mathematics lessons in limit materials reviewed from the results of learning implementation and student learning outcomes.

### 1.5 Study Objective

Based on research questions, the objectives of this research :

1. Knowing the effectiveness of online learning discussion methods based on Problem Based Learning on Limit subject matter during the COVID-19 Pandemic
2. Finding out if the online learning discussion methods based on Problem Based Learning was able to help learners in understanding limit materials.

### 1.6 Research Purposes

The results of this study are expected to provide benefits. The benefits of this research are as follows:

1. Theoretical Benefits

Theoretically, this research provides readers with broad insights into online learning methods in math lessons during the COVID-19 pandemic situation.

## 2. Practical Benefits

In practical terms, this research can provide information on learning methods and learning media that can be used during online learning in math lessons during the COVID-19 pandemic situation.



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