CHAPTER I
INTRODUCTION

1.1 Background

Education is a process to assist humans in developing their potential and to increase human dignity so that humans can deal with any changes that occur in a better direction. Education can be pursued in various ways, and one of them is studying at school, from several subjects studied by students, mathematics is one of the essential subjects in the world of education. Mathematics will continue to be reviewed until the highest level of education. This is supported by Ruseffendi (2006) opinion that mathematics is the queen of science that does not depend on other fields of study. By studying mathematics, students are expected to be able to connect and understand the relationship between one mathematical concept and another mathematical concept to solve problems in everyday life.

For some materials, mathematics is presented in real-life-oriented daily problems. It aims to make mathematical material easier to understand. Students are required to be able to solve real-life-oriented math problems. Problem solving ability is the ability used when solving a math problem. Lencher (Malaiziar, 2019) defines mathematical problem solving as the process of applying previously acquired mathematical knowledge to new unfamiliar situations. Problem solving ability is closely related to students' ability to read and understand story problems, present in mathematical models, plan calculations from mathematical models, and complete counts from non-routine questions. This is reinforced by the opinion of Dewey (Rusmono, 2014), who says that schools are laboratories for solving real-life problems because every student needs to investigate the environment and build knowledge personally.

However, in reality students' mathematical problem solving abilities are still low. This can be seen from the Trends in International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment (PISA) results. Based on Indonesia's participation in TIMSS and PISA, the following data were obtained:

Table 1. 1 Indonesian TIMSS Results Data

No	Year	Rating	Number of participants	Score	Average Score
1	1999	34	38	403	487
2	2003	35	46	411	467
3	2007	36	49	397	500
4	2011	38	42	386	500
5	2015	44	49	397	500

(Syamsul Hadi, 2019)

Table 1. 2 Indonesian PISA Results Data

No	Year	Rating	Number of participants	Score	Average Score
1	2000	39	41	367	500
2	2003	38	39	360	500
3	2006	50	57	391	500
4	2009	61	65	371	496
5	2012	64	65	375	494
6	2015	63	70	386	490
7	2018	72	78	379	489

(Syamsul Hadi, 2019)

There are several factors associated with low mathematical problem solving ability. According to Susanto (2013: 191) explains that:

> "Factors such as the classic problem of applying mathematics learning methods are still centered on the teacher, while students tend to be passive. Another classic factor is the application of conventional learning models, namely lectures, questions and answers, and giving assignments or homework."

Such a learning system causes students not to participate in learning activities, so students do not take lessons and tend to be less interested in learning mathematics. The use of inappropriate methods in learning mathematics causes students to find it difficult to accept the material presented by the teacher. So that when students are given a problem students cannot solve the problem.

In addition to the above factors, based on observations made in class IX-3 of SMP Negeri 1 Galang, it shows that conventional learning methods with lectures and question and answer activities (teacher-centered approaches) are dominantly used in learning mathematics. This learning pattern is more about the activeness of educators compared to students. In addition, educators assume that learning in class is only to complete the material in the book. Students are seen as objects, not as learning subjects, so students are less active in exploring knowledge. The problems obtained from the observations are:

1. In the learning process, students are less enthusiastic about receiving mathematics lessons.
2. Student learning activities tend to be passive. This condition causes students to be less interested in learning.
3. The teacher does not give real-live (daily) problems to solve.
4. Learning interactions between students, students and teachers are not going well.
5. Conventional learning methods/ lectures dominate.
6. The teacher does not apply effective learning strategies in the learning process.

The following results were obtained based on interviews with the Mathematics teacher of class IX-3 SMP Negeri 1 Galang.

1. The obstacle experienced by the teacher lies in the students. Students tend to be less active in asking and answering during the learning process.
2. Teachers use lectures, questions and answers, discussions, and assignments in learning.
3. Most students still find it difficult to understand the subject matter, primarily material that is not easy to learn.
4. The ability of students to solve real-live (daily) problems is still in low category because students find it difficult to interpret story questions such as which statements and which questions are in the question.
5. In addition, online learning also impacts the decline in student's abilities from various aspects, such as problem solving skills and concept understanding abilities.

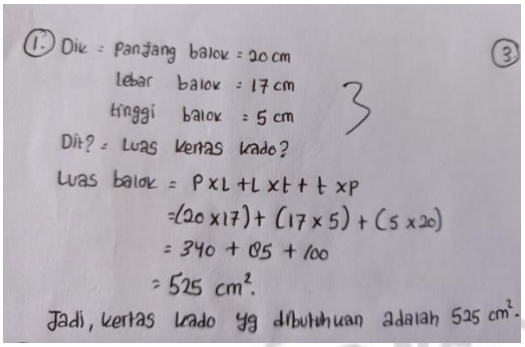
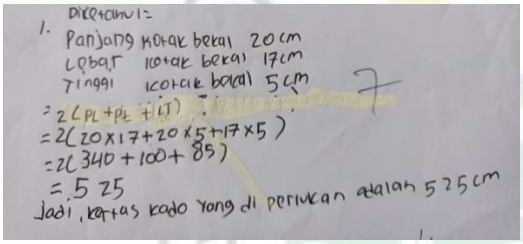
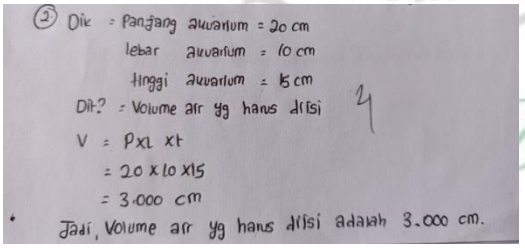
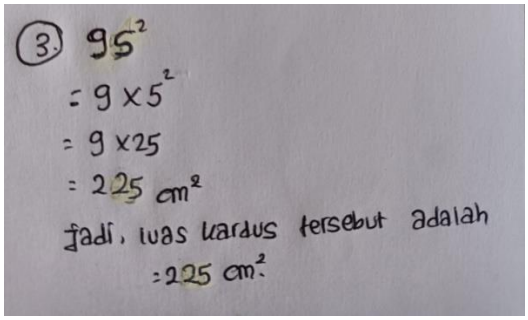
To obtain more suitable data from student that relate to their problem solving skill the researcher use diagnostic test to measure their skill. This diagnostic test was given to students when the researcher made observations in class XII-3 of SMPN 1 Galang. Diagnostic questions used by researchers can be seen in Table 1.3.

Table 1. 3 Diagnostic Test Questions

No	Question
1	Ando bought a lunch box as a birthday present for his sister. To make it look attractive, he want to wrap the gift with wrapping paper. The lunch box is in the form of a block with a length of 20 cm, a width of 17 cm and a height of 5 cm. Then the wrapping paper needed to wrap the gift is… cm^2.
2	Dina recently bought a rectangular aquarium. The aquarium has a length of 20 cm, a width of 10 cm and a height of 15 cm. If the aquarium water cannot exceed a height of 10 cm, then what volume of water must Dina fill so that the water level does not exceed 10 cm?
3	A toy company will make a large number of Rubik's cubes. The Rubik that will be made is a 3×3 Rubik. The Rubik's Cube has a side of 5.5 cm. The company wants to make a cardboard box that can fit 8 Rubik's cubes in it. Then the size of the cardboard that can contain 8 Rubik's is...

The test results given to students are also not satisfactory. Of the three questions given, none of the students answered correctly. For question number 1, students could identify the known elements, which were asked, but they were wrong in connecting the known and asked elements and stated them in the form of a mathematical model. Then for question number 2, students were fooled by questions that incorrectly identified the element being asked. Furthermore, for question number 3, none of the students could identify the known factors requested, so the answers they made deviated far from the correct answers.

Table 1. 4 Student Errors in Diagnostic Tests

No	Student Answers	Description of Student Answers
1		• Students are wrong in stating the elements that are known and asked into the form of a mathematical model.
		• Students have chosen a solution strategy but are wrong in carrying out calculations or completing mathematical models.
2		• Students are able to identify the elements that are known, but students are fooled by the questions so that they are wrong in identifying the elements being asked
3		• None of the students were able to identify the known elements, which were asked so that the answers they made deviated far from the correct answers .

Based on the results of observations, interviews, and the results of diagnostic tests conducted in class IX-3 of SMP Negeri 1 Galang, it can be seen that the results obtained by students are still low. This is in line with the results of a Trends in International Mathematics and Science Study (TIMSS) survey and the Program for International Student Assessment (PISA) that the problom solving skill Indonesian students are still bellow avarage. Problem solving ability is the potential possessed by a person or student in solving story problems, solving problems that are not routine, applying mathematics in everyday life to find solutions or solve problems contained in mathematics. (Andayani & Lathifah, 2019).

The correct action to improve students' problem solving skills is to create a better learning process based on constructivism principles, social interaction, and real-life contexts. One of the learning models that adhere to the principles of constructivism is the Problem Based Learning (PBL) Model. According to Duch (Shoimin, 2014: 130), said that:

> "Problem Based Learning (PBL) is a teaching model characterized by the existence of real problems as a context for students to learn critical thinking and problem solving skills and gain knowledge."

In line with that, Arends (Eka and Ridwan, 2015:42), also defines:

> "Problem Based Learning (PBL) as a learning model in which students are faced with authentic (real) problems are expected to be able to construct their own knowledge, develop inquiry and high-level skills, make students independent and increase their confidence."

Prior to this research, there have been several studies or writings that have been carried out by several researchers who use research related to the application of Problem Based Learning models to improve students' problem solving abilities. The supporting studies are described as follows:

Arrahim (2021) in his research entitled "Application of Problem Based Learning Models to Improve Mathematics Problem Solving Ability of Elementary School Students in Fpb and Kpk Materials" concluded that the application of PBL learning models succeeded in increasing problem solving abilities and motivation in class XI MIPA 1 SMA Negeri 1 in the 2019/2020 academic year.

Ilmi Nahdliyatin (2021) in his research entitled "Application of Blended Learning in Mathematics Lessons with Live Worksheets Media to Improve Student Learning Outcomes for Class V Data Processing Materials at Mim 14 Pambon" concluded that the application of mathematics learning using live worksheet media can improve learning outcomes students in cycle I and cycle II showed very good results.

The 2013 curriculum adheres to the fundamental view that knowledge cannot be transferred from teachers to students. Learners are subjects who can actively gain by process, construct, and use knowledge. In Problem Based Learning, the learning center is student-centered. At the same time, the teacher acts as a facilitator who facilitates students to actively solve problems and build their knowledge in pairs or groups (collaboration between students). This model trains students to solve problems with the knowledge they have. This process will trigger the construction of new knowledge that is more meaningful for students. So it can be concluded that Problem Based Learning (PBL) is a learning model involving students in solving real problems to develop higher-order thinking and problem-solving skills and acquire new knowledge related to them.

Some of the advantages of learning problem based learning are as follows (Johnson 1984: 23): (1) improve problem solving abilities. Problem based learning emphasizes students being involved in problem solving tasks and the need for special learning on how to find and solve problems. Problem based learning makes students more active and succeeds in solving complex problems; (2) improves collaborative skills. Learning Problem based learning supports students in teamwork. In this teamwork, they discover the skills of planning, organizing, negotiating and making consensus on task issues, assigning individual teams, gathering information, and presenting. This collaborative problem solving skill of teamwork will be used later when working; (3) to improve resource management skills. Problem based learning provides students with learning and practice in project organization, time allocation, and other resources for task completion.

Education at this time is more developed than in previous education. This is due to the urgency of the Covid-19 pandemic, which demands that education must utilize existing technology for sustainability at every level. Many things can be done

with the help of technology, one of which is as a learning medium. Learning media is one of the essential things in the current education process. Mathematics learning media can help present abstract concepts into simple ones by integrating images, videos, sounds, and animations (Musfiqon, 2012). In its development, a lot of software can be used to create a mathematics learning media, for example, Live Worksheets. The use of relevant Live Worksheets software is used in learning in the 2013 Curriculum, which focuses on implementing learning with a scientific approach, which consists of 5M, namely: (1) Observing, (2) Questioning, (3) Gathering Information, (4) Associating, (5) Communicate.

One of the uses of ICT (Information and Communication Technology) in education is using live worksheet media to improve student learning outcomes (Hidayatullah, 2019). The use of live worksheet media is in accordance with the results of research conducted by Novi Andriyani (2020) media live worksheet is an application provided free by the Google search engine with keywords liveworksheet.com. This application allows teachers to convert traditional printable worksheets (documents, pdf, jpg, or PNG) into interactive online exercises as well as automatically proofread. Students can work on the worksheet online then the answer is sent to the teacher also online.

The advantages of this application are good for students because it is interactive and motivating, for teachers this application saves time and saves paper (Andriyani, 2020). The advantages of worksheets for use in learning are, "live worksheet media can present words, numbers, notations, two-dimensional images, and diagrams so that they are easy to use anywhere and anytime, can develop students' abilities to learn about facts and explore principles accompanied by arguments (Iffah, 2021).

Prastowo (2013) explains that there are at least four important points that are the objectives of the preparation of the students worksheet, namely, 1) presenting teaching materials that can make it easier for students to interact with the material presented, 2) presenting various tasks that can improve students' mastery of the material students, 3) make it easier for teachers to give assignments to students and 4) train students to learn independently. In addition, Arsyad (2011) explains that the benefits of using students worksheet in learning are, 1) provoke students to actively

participate in the learning process, 2) assist students in developing concepts, 3) train students to find and develop process skills, 4) train students in problem solving critical thinking, 5) save teaching time.

Based on the background above, the researcher is interested in conducting research entitled **"The Application Of Problem Based Learning By Using Live Worksheets Website To Improve Problem Solving Skills In Learning Quadratic Equation In Class IX-3 Students Of SMPN 1 Galang"**

1.2 Identification of Problems

Based on the background of the problem above, it can be stated several identification problems as follows:

1. The problem solving skill of class VIII-3 SMPN 1 Galang students still bellow the avarage.
2. Mathematics learning still use teacher-centered, so that students are not actively involved in the learning process.
3. Students are not used to solving non-routine (real-live problem) questions.
4. Information and communication technology has not been fully utilized.

1.3 Scope of Problem

Based on the identification of the problem, there is a board scope of problems, so the researcher defines the problem so that this research is clearer and more focused. Scope of the problem in this study is:

1. The problem solving ability of class I X -3 SMPN 1 Galang students is still low.
2. The learning model used in this research is Problem Based Learning using the Live Worksheet website in class I X -3 SMPN 1 Galang.
3. Train students to work on non-routine questions and familiarize students with following the correct process in solving problems.

1.4 Problem Formulation

Seeing the problem limits that have been simplified into a smaller scope, the formulation of the problem for this research is:

1. Can applying the Problem Based Learning model using the Live Worksheet website improve student's problem-solving ability in the class IX-3 SMPN 1 Galang?
2. How is the students answering process after applying the Problem Based Learning model using the Live Worksheet website in class I X -3 SMPN 1 Galang?

1.5 Research Purposes

Accordance to the formulation of the problem, the main purpose of this research is to find out the level of students' mathematical problem solving abilities after applying the Problem Based Learning learning model using the Live Worksheet website in class I X-3 SMPN 1 Galang.

1.6 Benefits of Research

This research is expected to provide benefits to the development of the world of education. These benefits include the following:

1. For researchers, they can gain direct experience in applying the Problem Based Learning learning model by using the Live Worksheet website in improving students' mathematical problem solving abilities and as a provision for researchers as prospective mathematics teachers in carrying out real teaching practice.
2. For teachers, it is a consideration for innovating mathematics learning to improve math problem solving skills in schools.
3. For students, the learning model developed is expected to be able to improve students' mathematical problem solving abilities in learning mathematics.
4. For schools, as input material in the context of improving learning that occurs in schools
5. For other researchers, as a reference and reference material for conducting further research.

1.7 Operational Definition

In order to avoid differences in interpretation of the terms contained in the problem formulation determined by the researcher, the researcher put forward the operational definition as follows:

1. Problem solving ability is the ability to solve a mathematical problem using previously acquired knowledge with indicators: understanding the problem, planning a solution, carrying out problem solving and checking again.
2. Problem Based Learning learning model is a learning model that adheres to constructivism/constructivistic understanding where students are involved in participating in building mathematical concepts and principles through problem solving with learning steps as follows: (1) Problem orientation, (2) Organizing, (3) Guiding experience , (4) Develop and present, (5) Analyze and evaluate.
3. The process of student answers in solving mathematical problems is a series of stages of completion that are made by students in more detail and correctly based on problem solving indicators, namely: (1) writing down what is known and asked and the adequacy of the data correctly; (2) write down the strategic plan of completion correctly; (3) perform calculation operations correctly, and are able to; (4) re-check the results obtained from the calculation results correctly.