

CHAPTER I

INTRODUCTION

1.1. Background of Study

Education is the fundamental basis that plays a vital part in the development of students. Students, as the central element in education, need to be equipped with logical, critical, systematic, analytical, and creative thinking skills to endure the challenges of the future. These attitudes and thinking skills can be nurtured through the learning of mathematics. Mathematics is a subject not only related to numbers and calculations but also helps sharpen our thinking skills. This adjusts with James's definition that arithmetic is the science of rationale concerning shapes, courses of action, amounts, and different related concepts, partitioned into three areas, variable based math, investigation, and geometry.

Students as the center component in education ought to be prepared with the capacity to think consistently, basically, systematically, analytically, and inventively so that they can survive within the confront of conditions that happen within the future. These attitudes and thinking skills can be developed through learning mathematics. Mathematics is a subject that not only deals with numbers and calculations, but also helps us hone our thinking skills. This is in line with the definition of mathematics according to James, specifically Mathematical is the science of rationale around shape, structure, size and other relationship concepts that are various and separated into three areas, specifically polynomial math, investigation and geometry. Based on its sort, Mathematical skills can be clarified in five fundamental competencies, to be specific: 1) Mathematics understanding; 2) Mathematics problem solving; 3) Mathematics communication; 4) Mathematics association; 5) Mathematics reasoning. One of the main competencies in learning mathematics is problem solving (Laia, et al., 2021: 465).

The National Council of Teachers of Mathematics (NCTM) states that problem solving is an indispensably portion of learning mathematics that cannot be isolated. Problem solving skills are expected not only in solving math problems but also other problems. According to the opinion of Effendi (in Septiani & Nurhayati,

2019: 169), problem solving skills must had by students to plan them to both problems in mathematics, to get used overseeing different problems, problems that arise in several disciplines and increasingly complex difficulties faced in everyday life. Mastery of mathematical concepts also aims to improve problem solving skills.

Problem-solving skills is the learner's capacity to solve unpredictable and non-routine problems. Students can comprehend the problem and then develop procedures to handle it, determining the goals of complex and non-routine problems. As expressed by Polya in Agustami et al. (2021: 224), handling problems involves several stages that students can take, namely: (1) understanding the problems; (2) planning problem-solving solutions; (3) implementing problem-solving solutions, and (4) reviewing the obtained solution. Thus, someone can be considered to have good problem-solving skills under the assumption that the person understands the data used to develop a problem-solving procedure to overcome the problem.

Based on the results of observations conducted by the author in November 2023 and interviews with one of the math teacher at SMK Negeri 1 Kisaran, information was obtained that teaching and learning activities where students only tend to listen and there is rarely interaction in class which results in students becoming more passive when teaching and learning activities take place. The low skills of students in problem solving results in unsatisfactory student studying outcomes in the material taught. This is indicated by the results of students' tests which are still low. In addition, teachers only use Power-Point as learning media in providing certain materials, while in geometry materials, teachers still use blackboard media and rulers in drawing, but schools have adequate facilities to implement learning media and teachers have participated as participants in learning media training.

Another picture of the low problem solving skills of students is supported by several studies that have been conducted previously, one of which states that the results of students problem-solving skills are in three categories, namely 26.7% of students at the high category, 13.3% of students at the medium category and 60% of students at the low category (Adhyan & Sutirna, 2022: 451). Based on the results of the study, it proves that the problem solving skills of students is still relatively

low, which means that there are several indicators of problem-solving skills that have not been fulfilled optimally. In addition, the low mathematics problem solving skills can also be seen in the results of the Program for International Student Assessment (PISA) test, particularly on mathematics competence, which states that in 2018 Indonesia was positioned 63 out of 80 nations with a score of 379 while the OECD average was 489 (Syaputra, et al., 2022: 3).

Based on the results of observations, information was also obtained that SMKN 1 Asahan has five different majors, namely Accounting, Office, Marketing, Fashion and Culinary, consisting of 30 classes and 1236 students in total. For Class XI consists of 10 classes consisting of 3 Accounting classes, 2 Office classes, 2 Marketing classes, 1 Fashion class and 2 Culinary classes. In learning mathematics, some students consider that mathematics is a very difficult subject, because in learning mathematics there are many formulas and calculations that can be used as a method to solve problems and mathematics is a boring subject because it can only find numbers, formulas, graphs and images. This makes students lose interest and feel bored in learning math, especially in the material of the circle equation.

The circle equation is a basic material that introduces algebraic and geometric connections simultaneously. Good mastery of this material will make it easier for students to learn similar concepts, at the next level, such as quadratic equations, circles and tangents. This circle equation material will usually be related to culinary majors, especially in making culinary food. Based on the criteria for achieving learning objectives, students are expected to be able to make desserts, process traditional Indonesian cakes, make pastry and bakery products that are in accordance with industry needs and standards.

This is in line with Saputri's research (2021: 28) in her research entitled "Ethnomathematics: Exploration of Geometry Values or Concepts of Class X High School in Malay Riau Specialties" states that the mathematical values or concepts found in Malay Riau specialties are points, lines, angles, triangles, semicircles, circles, quadrilaterals, rectangles, regular octagons, rhombuses, tubes, beams, quadrilaterals and kesebangunan. Some mathematical values or concepts contained in typical Malay Riau food can be used to introduce and understand mathematical

concepts in lessons that contain geometry concepts. Based on this explanation, it can be concluded that math subject matter and culinary majors can be interrelated.

In learning mathematics, some students consider that mathematics is a very difficult subject, this is because in learning mathematics there are many formulas and calculations that can be used as methods to solve problems. Math is also considered a boring subject because it can only find numbers, formulas, graphs and images. Therefore, it is necessary to have a learning tool, namely learning media. Learning media is a learning resource that can offer assistance teachers enrich students experiences, with different sorts of learning media by teachers can be material in providing knowledge or information to students. This aims to help make it easier for students to more easily understand math lessons. One of the computer programs (software) that can be used as a medium for learning mathematics (especially geometry and algebra) is GeoGebra.

GeoGebra is a learning media that can be used to meet the criteria in stimulating students' understanding through visualization of objects or a mathematical concept. The development of GeoGebra software is expected to improve students' concept interpretation. The use of GeoGebra media is able to train students in constructing knowledge independently so that they can get out of the problems they face. This statement is relevant to the results of Sari's research (2019: 331) which explains that GeoGebra-assisted learning has a strong impact on improving students' mathematical problem solving skills.

According to Muliani et al. (2021: 330), their research shows differences in mathematical problem-solving skills and learning interest between students using GeoGebra-assisted learning and those using conventional methods. Furthermore, Ratuni and Feninlambir (2022: 1105) state in their research titled "Utilization of GeoGebra Program on the Circle Material Using Discovery Learning Models to Improve Learning Results for Students of Class VIII SMP Negeri 1 Tanimbar Utara" that utilizing GeoGebra software can improve learning outcomes for eighth-grade students, particularly in circle-related topics, with good categorization.

Some advantages of GeoGebra in mathematics education include: (a) Compared to using pencils, rulers, and compasses, GeoGebra can quickly and accurately generate geometric and algebraic figures. (b) The program offers

animation functions and interactive movement (dragging), providing a clearer visual experience for students and aiding in understanding geometry and algebra concepts. (c) It can be used as feedback or evaluation to ensure that completed figures are correct. (d) It facilitates teachers or students in studying or demonstrating attributes applicable to algebra courses.

According to Ratuanik and Feninlambir (2022: 1107), GeoGebra software can be used by teachers to evaluate or compare students' work, because in GeoGebra software there are tools to calculate the length of line segments or the area of a circle. Therefore, a solution that can help students in the learning process related to geometry concepts, especially circular material, is to implement learning with geoalgebra software.

To address the aforementioned issues, a new innovation is needed, namely the use of digital-based learning media, specifically software. The hope is that the assistance of GeoGebra software can help students become more active during learning, visualize abstract concepts more concretely, and thereby enhance their problem-solving skills in mathematics, leading to more satisfactory learning outcomes.

According to the description above, the author will conduct research with the title **“The Impact of The GeoGebra Media Application on Mathematical Problem-Solving Skills in Circle Subject for Grade XI at SMK Negeri 1 Kisaran”**.

1.2. Problem Identification

Based on the background issues mentioned above, the identified problems in SMK Negeri 1 Kisaran in mathematics learning are as follows:

1. Students have difficulty when doing math practice problems.
2. Lack of students' math problem solving skills which causes the math teaching and learning process to not achieve the expected learning outcomes.
3. Learning media used by teachers in learning has not been able to improve students problem solving skills in geometry.

4. Teachers lack IT mastery.
5. Teachers have never used and developed GeoGebra learning media.
6. Students have never learned by using GeoGebra media.

1.3. Scope of Study

To provide a clear scope in the discussion, it is necessary to establish limitations within this research. The limitations set for this study are as follows:

1. The research parameter to be measured is the mathematical problem-solving skills of the students.
2. The instructional media applied to assist in assessing the parameters is the GeoGebra application.
3. The GeoGebra application is utilized in the experimental class, while conventional teaching methods are applied in the control class.
4. The research subjects are limited to students in grade XI at SMK Negeri 1 Kisaran.

1.4. Research Questions

Based on the identification of the problem and the limitations of the problem, the problem formulation in the research is:

1. How well the mathematical problem-solving skills of students taught using GeoGebra application based learning in Grade XI at SMK Negeri 1 Kisaran?
2. Is there a difference in the mathematical problem-solving skills of students in the circle material, taught using GeoGebra application-based learning and conventional learning in Grade XI at SMK Negeri 1 Kisaran?

1.5. Research Purposes

Based on the formulated problems above, the objectives of this research are as follows:

1. To unveil the mathematical problem-solving skills in circle-related topics among students who receive instruction using the GeoGebra application in Grade XI at SMK Negeri 1 Kisaran.

2. To identify any differences in the mathematical problem-solving skills in circle-related topics between students who receive instruction using the GeoGebra application and those who receive conventional instruction in Grade XI at SMK Negeri 1 Kisaran.

1.6. Research Benefits

The expected benefits of this research are outlined as follows:

1. For Students

Students can experience enjoyable, effective, and efficient learning of circle-related topics using the GeoGebra learning application. Additionally, students will be able to easily comprehend and embrace circle-related material, develop an interest in learning about circles, and become active students, thereby understanding circle concepts.

2. For Teachers

The GeoGebra learning application can serve as an alternative instructional medium that facilitates students in understanding and enhancing problem-solving skills related to circle concepts.

3. For Other Researchers

The discoveries of this research can be used as a reference for other researchers interested in exploring further aspects related to the utilize of the GeoGebra learning application in circle-related learning activities.