

CHAPTER I

INTRODUCTION

1.1. Background

Developments in information and communication technology are currently growing rapidly. The use of technology in the world of education is also increasingly being intensified. Utilization of information technology in the world of education, among others, can help in the learning process. For example, teaching materials can be displayed in various formats and forms that are more attractive and interactive so that students are more interested and motivated to participate in learning. The presence of technology can also assist in the presentation of data/information better, facilitate the interpretation of data and in obtaining information. And can be used by teachers in preparing lesson plans.

Indrianto (in Akhyak, 2021:7) stated that this was related to the program "Merdeka Belajar Kampus Merdeka" which was initiated by Nadiem Makarim as the Minister of Education and Culture. School digitization is a necessity and a must as a solution to the challenges and developments of the times. Thus, the use of technology is something that cannot be avoided in this day and age. Digitizing schools will encourage collaboration between teachers and students. Not only that, learning becomes more interactive because students are involved in the activities of the teaching and learning process. Students can also access material and exchange information quickly. So, teachers must continue to improve their competence. Teachers not only play a role in transferring knowledge but also must be able to facilitate the needs and improve the competence of students optimally so that they are able to face future challenges. Teachers are required to be able to become a liaison for learning resources or a absorption linker which requires teachers to master relevant learning resources to be accessed by students anytime and anywhere.

However, teachers still experience problems in utilizing technology in learning. Constraints experienced by teachers in utilizing technology in learning

include the lack of teacher knowledge about IT, lack of IT facilities available in schools, abnormal electric currents in schools, the internet cannot reach all classes, and there is no obligation on the part of the school so that teachers who teaching must use IT (Sahelatua et al, 2018: 131).

According Listyaningsih et al. (2020) Critical thinking is one of the important aspects that can be formed through education to prepare Indonesia's golden generation in 2045. According Diharjo et al. (2017) critical thinking is an important thing that must be possessed in building student knowledge. critical thinking skills will stimulate students' cognitive reasoning in acquiring knowledge. Students' critical thinking is needed, because during the learning process students develop ideas for the problems contained in learning.

However, to remain skilled in the current situation requires the ability to acquire, select, process information, think critically, logically and creatively. These abilities can be developed through learning Mathematics (Rasiman, 2013).

Mathematics is a branch of science that has an important role in the development of science and technology, both as a tool in the application of other fields of science and in the development of mathematics itself. Mastery of mathematics material by students is a necessity that cannot be negotiable in the arrangement of reasoning and decision making in the era of increasing competitive competition at this time.

The ability to think critically is an ability that is needed by a person in order to be able to face various problems faced in social and personal life. Glaser (in Puspita and Dewi, 2021) explains critical thinking as an skills to think deeply about problems and apply them in methods of examination and logical reasoning.

To determine students' mathematical critical thinking skills, the researchers conducted a diagnostic test. The diagnostic test was given to students of class VIII-4 of SMP Negeri 1 Babalan. The diagnostic test questions for students' mathematical thinking abilities can be seen in Table 1.1.

Table 1.1. Diagnostic test questions for students' mathematical critical thinking skills in class VIII-4 of SMP Negeri 1 Babalan.

	Question	Indicators an measured
A.	Terdapat susunan balok berbentuk seperti replika piramida. Pada barisan pertama terdapat 1 balok, pada barisan kedua terdapat 3 balok, pada barisan ketiga terdapat 6 balok, pada barisan keempat terdapat 10 balok, dan pada baris kelima terdapat 15 balok. Tentukan banyak balok yang digunakan disetiap barisnya hingga ke barisan 10 !	
	a. Dari permasalahan di atas, tuliskan apa yang diketahui dan ditanya !	Interpretation
	b. Gunakan tabel untuk mengelompokkan balok di setiap barisnya !	Analysis
	c. Selesaikanlah permasalahan diatas !	Evaluation
	d. Menurut pendapatmu berdasarkan pola susunan balok tersebut, pola susunan balok tersebut merupakan pola barisan? berikan alasanmu !	Inference
B.	Pada pembukaan perdana toko roti, pemilik toko memberikan diskon 50% kepada 20 pembeli pertama. Pada pukul 09.00 sudah ada 5 pembeli. Pukul 9.20 bertambah menjadi 8 pembeli. Pukul 9.40 bertambah lagi menjadi 11 pembeli. Jika pola seperti ini berlanjut terus, pada pukul berapa 20 pembeli akan memasuki toko ?	
	a. Tuliskan yang diketahui dan ditanya dari permasalahan yang diberikan	Interpretation
	b. Gunakan tabel untuk mengelompokkan informasi yang diberikan dari permasalahan di atas.	Analysis
	c. Gunakan strategimu untuk menyelesaikan permasalahan tersebut !	Evaluation
	d. Buatlah kesimpulan yang kamu peroleh jika dilihat dari pola bertambahnya pembeli disetiap waktunya !	Inference

A diagnostic test for mathematical critical thinking skills was given to 31 students in class VIII-4. The results of the diagnostic test of students' mathematical critical thinking skills were measured based on the scoring guidelines for the critical thinking ability test according to Facione. The results of the diagnostic test of students' mathematical critical thinking skills can be seen in table 1.2.

Table 1.2. The results of the diagnostic test of students' mathematical critical thinking skills

No	Indicator	Percentage	Category
1	interpretation	83,46 %	High
2	Analysis	77,41 %	Medium
3	Evaluation	57,25 %	Low
4	Inference	46,77 %	Very low

Based on the results of the diagnostic tests, there is one indicator in the high category, namely interpretation, there is 1 indicator in the medium category, namely analysis, and there are two indicators that are still in the low category, namely evaluation and inference indicators. The errors made by students on the diagnostic test of thinking skills given can be seen in table 1.3.

Table 1.3. Snippets of answers and analysis of students' answers

Snippets of answers	Analysis						
<p>a. Tuliskan yang diketahui dan ditanya dari permasalahan yang diberikan</p> <ul style="list-style-type: none"> Diketahui : jam 09.00 lima kumbang jam 9.20 kumbang jam 9.40 15 kumbang pada pukul berati Lombok jam 10.10 Ditanya : 	<p>At the interpretation stage, students are asked to write down what is known and asked about the questions. However, some students are not able to write correctly.</p>						
<p>b. Gunakan tabel untuk mengelompokkan informasi yang diberikan dari permasalahan di atas.</p> <table border="1"> <tbody> <tr> <td>09.00</td> <td>9.20</td> <td>9.40 9.60</td> </tr> <tr> <td>Pem Beli 5</td> <td>8 Angul rumpai</td> <td>54 Perabeli</td> </tr> </tbody> </table>	09.00	9.20	9.40 9.60	Pem Beli 5	8 Angul rumpai	54 Perabeli	<p>Students have problems when grouping the information obtained from the questions into tables</p>
09.00	9.20	9.40 9.60					
Pem Beli 5	8 Angul rumpai	54 Perabeli					

<p>c. Gunakan strategimu untuk menyelesaikan permasalahan tersebut!</p> <p>5, 8, 11, 14 $1 + 2 + 3 + 4 + 5 = 15$</p> <p>09.00 = 5 Pembeli 09.20 = 8 Pembeli 09.40 = 11 Pembeli 10.00 = 14 Pembeli</p> <p>Jadi pada pukul 10.00 bertambah 14 Pembeli</p>	<p>Students are not careful when reading the questions.</p> <p>Students use appropriate strategies to solve problems.</p> <p>However, the students did not fulfill the orders in the questions.</p>
<p>d. Menurut pendapatmu berdasarkan pola susunan balok tersebut, pola susunan balok tersebut merupakan pola barisan? berikan alasanmu!</p> <p>SEPERTI REPRIKA PRAMIJA</p>	<p>In the inference section, students are asked to conclude based on the results they get. However, students cannot conclude correctly.</p>

Based on the results of interviews with students, the dominant factor that causes low indicators of students' thinking ability test results is that students have difficulty understanding questions and students have difficulty determining strategies to solve problems. it can be said that students' mathematical critical thinking skills are still in the low category.

Zulfah (2017:3) one of the determinants of the success of the learning process and success in achieving the objectives of learning mathematics is learning tools. Learning tools are a set of tools or components used in the learning process consisting of a syllabus, lesson plans (RPP), teaching materials, and learning outcomes tests. One of the printed teaching materials used in the learning process in schools is the Student Worksheet or abbreviated as LKPD.

According to Putri (2018) critical thinking can be improved by using a variety of learning models and teachers often provide problem-based questions. Sofyan, H and Komariah, K. (2016: 263) Problem-based learning (PBL) is an active learning strategy that is highly recommended in the implementation of the

2013 Curriculum. This learning strategy aims to improve students to learn independently, using real-world problems as a context for students to learn with critical thinking and life problem-solving skills. So that LKPD with problems based on *Problem Based Learning* (PBL) is very appropriate to improve students' critical thinking skills

According Utari et al. (2019) suggest that one of the obstacles faced by students when learning mathematics is an abstract object. In addition, to make it easier for students to understand abstract mathematical objects, teachers need a media that can visualize abstract objects into other, more concrete representations for students.

Mathematics has abstract objects, therefore not all students can understand mathematics quickly. So we need a visual media that can be used by teachers to make it easier for students to understand mathematical abstract objects in Ishartono et al. (2019: 79).

One technology that can be used to help mathematics lessons is desmos. "Desmos is an online graphing utility that requires no downloads or special hardware. It works on any computer, tablet, or phone" (Ebert in Ishartono et al. 2019: 79), or in other words Desmos is a tool for drawing graphics that can be accessed online which can be used on a computer, tablet, or smartphone. Therefore, Desmos can be an alternative learning media that can be used by mathematics teachers in teaching materials related to graphics or images, and which require a high level of abstraction.

One of the materials in mathematics that requires supporting media in its learning is Cartesian coordinates. The learning process in Cartesian coordinates requires students to be able to read pictures from the location of the coordinates correctly. In studying Cartesian coordinates, it is very necessary to have a learning media that is able to describe objects in Cartesian coordinates. Therefore, one solution that can be implemented to concretize something that looks abstract is to provide visualization (Wulandari and Asmar, 2021: 250).

Incorporating technology into the LKPD, it can overcome students' problems in visualizing abstract mathematical objects. Therefore, teachers need to

develop teaching materials that utilize technology such as Electronic Student Worksheets (E-LKPD) (Rahayu, et all, 2021).

Electronic Student Worksheet (E-LKPD) is a student worksheet in which there are questions, material summaries and instructions for working on assignments that are packaged into multimedia. The use of the E-LKPD is a means for teachers and students to be proficient in technology and helps students understand material that requires a high level of abstraction. By using Desmos as an E-LKPD, it is hoped that it can help students understand the Cartesian coordinate material.

Based on the description above, the researchers are interested in conducting research with the title " **Development Of Desmos Electronic Students' Activities Sheet (E-LKPD) Based On The Problem Based Learning To Improve Students' Mathematical Critical Thinking Skills** ".

1.2. Problems Identification

1. Teachers experience obstacles in utilizing technology in learning
2. Critical thinking ability which is an important aspect to build the 2045 golden generation is still low.
3. Problem-based questions should be given frequently to improve students' critical thinking skills
4. Abstract objects in mathematics become obstacles for students
5. Students need media to visualize abstract mathematical objects
6. Students experience problems in understanding the problem with Cartesian coordinates
7. Teaching materials that utilize technology such as E-LKPD is never used.

1.3. Problems Limitation

The limitation of problem in this research are:

1. This research is centered on the development of Electronic Student Worksheets (E-LKPD).

2. The specific mathematics technology used in the development of E-LKPD is desmos.
3. The questions used in the E-LKPD use a Problem Based Learning (PBL) model.
4. E-LKPD which was developed to improve students' critical thinking skills.
5. The material used is a Cartesian coordinates.

1.4. Scope of Research

The scope of the problem in this research is to develop the Desmos Electronic Worksheet (E-LKPD) based on Problem Based Learning to improve students' critical thinking skills.

1.5. Research Questions

The research questions of the problem raised in this research are:

1. How is the validity of the Electronic Student Worksheet (E-LKPD) based on Problem Based Learning to improve students' critical thinking skills that are developed?
2. How do students respond to the Electronic Student Worksheet Based on Problem Based Learning (E-LKPD) which was developed on Cartesian Coordinates material in class VIII-4 SMP Negeri 1 Babalan.
3. How effective and practicality is the Desmos Electronic Student Worksheet (E-LKPD) Based on Problem Based Learning in improve students' critical thinking skills?

1.6. Research Purposes

Based on the description that has been stated, the purpose of this research were to:

1. Produce Electronic Student Worksheets (E-LKPD) based on Desmos Problem Based Learning to improve proper students' critical thinking skills.

2. To find out student responses to the Electronic Student Worksheet (E-LKPD) based on Problem Based Learning which was developed on Cartesian Coordinates material in class VIII-4 SMP Negeri 1 Babalan.
3. To find out the effectiveness and practicality of the Desmos Electronic Student Worksheet (E-LKPD) based on Problem Based Learning in improve students' critical thinking skills.

1.7. Benefits of Research

Benefits The expected benefits from the results of this research are as follows:

1. It is hoped that it can contribute to developing knowledge and enriching research results regarding the development of previous E-LKPD.
2. Attract students' interest and activity in Mathematics so that they can improve students' critical thinking skills.
3. The results of the research are expected to be input for teachers regarding the use of learning devices by utilizing technology in mathematics subjects.
4. E-LKPD desmos based on Problem Based Learning to improve students' critical thinking skills that are developed can be used for teachers and students in active learning activities.