

CHAPTER I

PRELIMINARY

1.1. Background of The Study

The development of science and technology makes it easy for various parties to obtain abundant, easy, and fast information from various sources in the world, so mastery of learning materials such as mathematics is a necessity that can not be negotiated by students in organizing reasoning and decision-making in this era (Fuadi, et al., 2016). Teacher's tasks also increased in providing information to students as a guide, so that students are able to acquire, sort, process, and construct knowledge and information independently in learning activities. Through learning mathematics, thinking abilities like this can be developed. Mathematics as one of the basic sciences, both in applied aspects and in reasoning aspects, plays an important role in efforts to master science and technology. Therefore, school mathematics must be used as a means of growth and development in shaping the intelligence, abilities, and personalities of students.

Based on the Regulation of the Minister of National Education Number 22 of 2006 that one of the objectives of learning mathematics in junior high schools is for students to understand mathematical concepts, explain the relationship between concepts, and apply concepts or algorithms flexibly, accurately, efficiently, and precisely in problem solving. This is in line with the formulation of National Council of Teacher of Mathematics (NCTM) (2000) that the understanding concept plays an important role for students in solving mathematical problems in everyday life (Rahmatia, et al., 2018). In addition, based on the results of the study Trends in International Mathematics and Science Study (TIMSS) in 2015 showed that the mathematics learning outcomes of Indonesian students were ranked 45th out of 50 participating countries. Then on the results of the study Programme International for Student Assesment (PISA) In 2015, Indonesia's ranking for mathematics was 64 out of 70 countries. Based on the results of both studies, it showed that the ability of Indonesian students in mastering concepts is still relatively low (Diana, et al., 2020).

Mathematical ability is the cognitive ability of students in understanding mathematical material that is summarized into ideas and information and being able to convey back information obtained using their own language in the learning process to complete it in accordance with the rules based on the concept of understanding. The urgency of understanding mathematical concepts is seen in the first goal of learning mathematics, namely the 2013 Curriculum, which states that in learning mathematics, students must have a set of competencies, one of which is understanding concepts. In addition, the importance of mastering concepts is that understanding concepts is the root of mastering higher mathematical concepts and being able to support the ability between connections and concepts (Fauziah, 2021). However, the facts on the reality show that there are still students who have difficulty in gathering information from a statement due to a lack of understanding of students' concepts in processing information, such that students find it difficult to solve mathematical problems and have an impact on student learning outcomes.

Based on the results of the researcher's observation in the initial observations in class of VIII UPT SMP Negeri 27 Medan in learning mathematics with the curriculum applied is the Curriculum 2013 shows that 61% of students still do not master the concept of understanding so that they have difficulty in solving math problems for class VII. The results of this observation are supported by 26% of the 31 students achieving the KKM (Minimum Completeness Criteria) score of 70. The following is a sample of the initial test and the results of student work from the observations of the researcher.

Question: Look at the following picture!

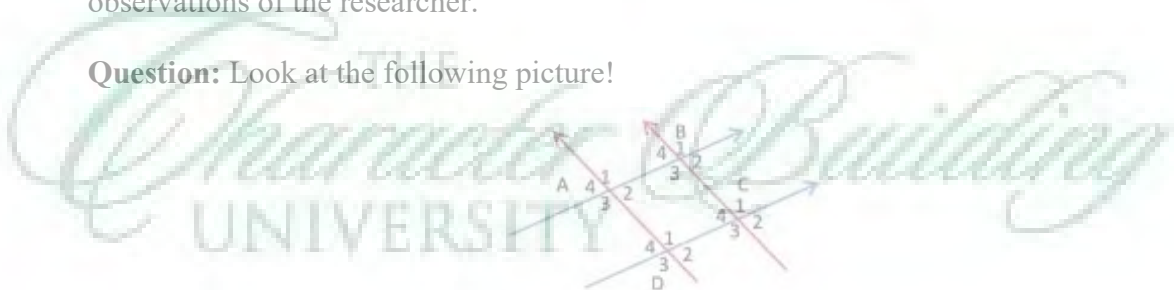
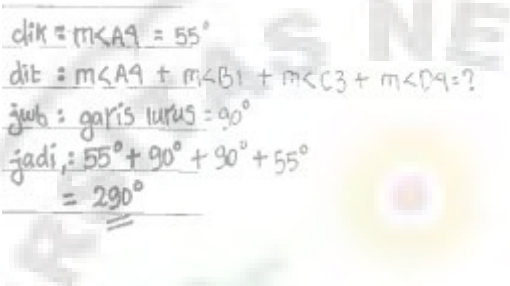
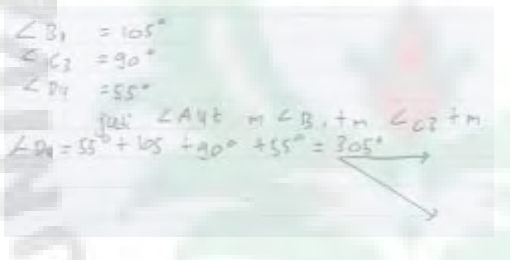
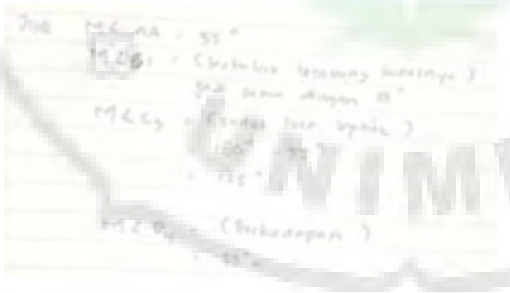

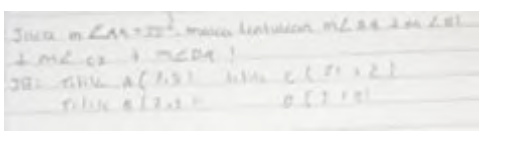


Figure 1.1. Example of Mathematics Question Class VII

If $m\angle A4 = 55^\circ$, then determine $m\angle A4 + m\angle B1 + m\angle C3 + m\angle D4$!

Here are some examples of student's answer sheets for solving the problem above.

Table 1.1. Examples of Student Answer Sheets

No	Student Answer Sheets	Students' Concept Error
1		<p>Student has not mastered the concept of the problem presented, namely those about lines and angles. In addition, students are also unable to describe the information obtained related to where the angle is obtained completely, so they misrepresent information related to concepts that have been studied previously.</p>
2		<p>Student is still wrong in determining the size of the angle $m\angle B1$ dan $m\angle C3$. This is because students are not able to describe the information obtained related to where the angle is obtained in full, so the final results obtained are still inaccurate.</p>
3		<p>Student has not completed the questions provided as a whole. However, in terms of elaboration according to the existing concept, it can be said to be good compared to the previous student's answer.</p>
4		<p>Student has been able to complete the questions provided to the end. However, in terms of elaborating the information obtained related to where the angle was obtained, it is still incomplete.</p>
5		<p>The solution described by the student is not in accordance with the directions requested by the question. This happens because student still do not understand the concept of the problem provided.</p>

Based on the results of student's work above, there are 23 students who are not right in solving the problem in this question. This means that 74% of the 31 students showed a lack of conceptual understanding abilities. Students' errors in solving the problem presented by the researcher are not only in the questions above, but also in the following problem:

Question: Look at the picture below!

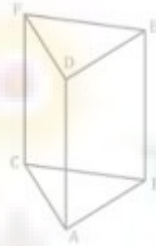
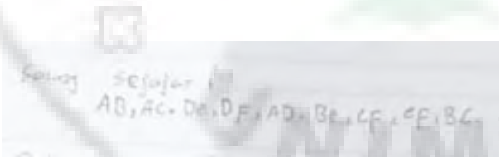
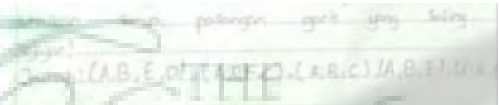
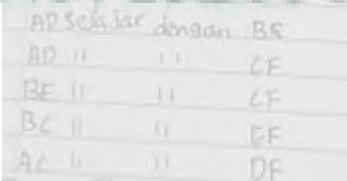

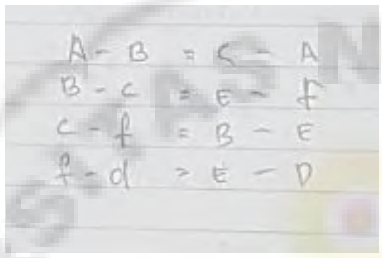


Figure 1.2. Example of Mathematics Question Class VII

Describe all parallel line pairs!

Table 1.2. Examples of Student Answer Sheets

No	Student Answer Sheets	Students' Concept Error
1		Student has not mastered the concept of the problem presented, namely lines and angles. In addition, student is not able to symbolize parallel lines and pair pairs of parallel lines that are still incorrect.
2		Student is not right in writing pairs of parallel lines on the given problem. Then not all pairs of parallel lines are described by students.
3		Student is not correct in symbolizing parallel lines. The symbols written by students have other meanings in mathematics, namely seconds.

4	 <p>Written: a dan b, a dan c, b dan c, a dan d, b dan e, c dan f, d dan e.</p>	The solution described by student is not appropriate for the problem presented. Students actually describe pairs of points in the presented space.
5		Student is still not right in their writing lines in mathematics, so they can provide inaccurate information to readers. In addition, there are still errors in pairing pairs of parallel lines, namely at $A - B = C - A$ dan $F - D = E - D$

Based on the results of student work above, there are 21 students who are not right in solving the problem of this question. This means that 68% of the 31 students showed a lack of ability to understand other students' concepts, so that it had an impact on the low learning outcomes of students. Therefore, based on the observations of researchers, there are several problem in learning mathematics in the classroom, including: (1) Students still memorize material without being accompanied by understanding; (2) Lack of students' conceptual understanding ability; (3) Low students' learning outcomes.

Quality learning process in class is one of the main factors in achieving success in understanding every subject matter. The process needs to be reviewed and corrective actions taken to improve the quality of learning in order to achieve learning goals according to the target (Kairuddin, et al., 2020). The conventional learning process in mathematics teaching and learning activities in teacher-centered classrooms is still less effective in achieving indicators of understanding concepts in students. This is because teacher still use learning methods in the form of lectures and questions and answers. In addition, teachers are also less innovative in teaching and learning mathematics so that students are involved during learning. The teacher should act as a central aspect in achieving the goal of understanding student concepts, so that in the context of teaching and learning mathematics in this era, the teacher must be of the view that mathematics material is not rote material but understandable concepts based on the material provided. Therefore, teachers are expected to be able to develop appropriate, creative, and innovative strategies

according to student needs and related to real problems, so that students are able to achieve learning goals.

Learning activities in the classroom must be centered on student activities so that students are more active in learning and developing their potential. Teaching materials are one of the learning tools that play a role in the smooth teaching and learning activities in the classroom. Students will more easily understand the concepts given by the teacher if they use appropriate, creative, and innovative teaching materials. Teaching materials can be in the form of print, audio, or visual. One of the teaching materials in teaching and learning activities is a module. Module is teaching materials that can be made by teachers, so they can be designed with friendly language, the latest materials, as well as the appearance and application of materials in everyday life that are interesting. Learning with a module approach allows students to explore as much knowledge as possible based on their own abilities, enabling them to learn more independently in the shortest possible time, so that students are able to understand the concepts of the material provided.

The modules are designed according to the syllabus, which contains competency standards and basic competencies, so that they can achieve learning objectives. Students can learn independently more easily to understand abstract mathematical material through modules. Therefore, it is necessary to develop a module in the form of a digital module so that students can easily understand the concepts of mathematics learning materials such as flat-sided geometry. Researcher innovate to make teaching materials in the form of digital module that not only show pictures and imagine the subject matter, but also present audio-visuals in the module, making it easier for students to understand the concept of building a flat side geometry. Digital module innovation will be combined with ELPSA learning design (Experiences, Language, Pictures, Symbols, and Application). Therefore, researcher conducted research on the feasibility of digital modules with the title Development Of Digital Module Using ELPSA Learning Design to Improve Understanding Concept of Class VIII UPT SMP Negeri 27 Medan.

1.2. Problem Identification

Identify the problem in this research as follows:

1. The learning method used by the teacher is still in the form of lectures also questions and answers.
2. The teaching material used by the teacher are only in the form of printed books.
3. The ability of understanding students' concepts is still low.
4. Students' mathematics learning outcomes tend to be low.

1.3. Scope of Problem

The limitations of this research problem are:

1. Subject in this study is limited to students of class VIII UPT SMP Negeri 27 Medan T.P. 2021/2022.
2. Development of teaching material in the form of digital mathematics module for class VIII semester II students to improve students' conceptual understanding skills.
3. The using of ELPSA learning design in developing digital modules on flat-sided geometry material, namely cube and cuboid.
4. Development of digital module is limited to module feasibility based on the results of filling out questionnaires by validators and users.

1.4. Problem Formulation

The formulations of problem in this research is:

1. How valid is the digital mathematics module in improving students' conceptual understanding for class VIII semester II at UPT SMP Negeri 27 Medan T.P. 2021/2022?
2. How practical is the digital mathematics module in improving students' conceptual understanding for class VIII semester II at UPT SMP Negeri 27 Medan T.P. 2021/2022?
3. How effective is the digital mathematics module in improving students' conceptual understanding for class VIII semester II at UPT SMP Negeri 27 Medan T.P. 2021/2022?

1.5. Objectives of Research

The objectives of this research are:

1. Produce digital mathematics module that validly used as teaching material to improve students' conceptual understanding ability for class VIII semester II at UPT SMP Negeri 27 Medan T.P. 2021/2022.
2. Produce digital mathematics module that practicality used as teaching material to improve students' conceptual understanding ability for class VIII semester II at UPT SMP Negeri 27 Medan T.P. 2021/2022.
3. Produce digital mathematics module that effectively used as teaching material to improve students' conceptual understanding ability for class VIII semester II at UPT SMP Negeri 27 Medan T.P. 2021/2022.

1.6. Benefit of Research

The expected benefits of this research results are:

1. For researcher, knowledge and experience gained during research can increase self capacity in achieving goals as a professional teacher.
2. For teachers, assisting teachers in finding and developing the implementation of creative and innovative mathematics teaching and learning activities on flat-sided geometry materials to improve students' understanding.
3. For students, improve the ability to understand concepts and student learning outcomes in mathematics teaching and learning activities in the classroom.
4. For school, encourage schools to make continuous improvements and innovations in teaching and learning activities to improve the quality of education in schools.
5. For readers, can be a reference for further research.

1.7. Operational Definitions

In obtaining a common understanding of the terms used in research, operational definitions of research are:

1. The digital module referred to in this research is a modification of the conventional module by combining the use of information technology and a learning desain, so that the digital module is more interesting, interactive and

can be a source of learning in the form of teaching materials that can be accessed through digital devices.

2. The ELPSA learning design (Experiences, Language, Pictures, Symbols, and Applications) is developed based on constructivist and social learning theories. This model views learning as an active process where students build their own ways of understanding things through individual thought processes and social interaction with others.
3. The ability to understand mathematical concepts is the cognitive ability of students to understand mathematical material which is summarized into ideas, information, and the ability to convey back information obtained using their own language in the learning process to solve problems in accordance with the rules based on the concept.



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