

# Profile of Difficulty of Class XI MIA Students of SMA Negeri 2 Enrekang in Solving Mathematics Induction Problems in View of Learning Styles

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## ABSTRACT

This study aims to determine the profile of students' difficulties in class XI MIA 2 SMA Negeri 2 Enrekang in solving math induction problems in terms of visual, auditory, and kinesthetic learning styles. This research is descriptive research with a qualitative approach. The processed data are learning style data and student difficulty data in solving mathematical induction problems. Based on the data analysis, it was found that students with visual learning styles had difficulty in transferring knowledge and lack of mathematical language skills, students with auditory learning styles had difficulties with weakness in counting and lack of mathematical language skills, and students with kinesthetic learning styles did not get difficulty in doing the problem. The most dominant difficulty is the lack of mathematical language skills.

**Keywords:** *Difficulty, Learning style, Mathematics.*

## 1. INTRODUCTION

Education is one of the needs that all individuals must meet. Education is a conscious effort to prepare students through guidance, teaching, and training activities to fulfill their role in the future. According to the Big Indonesian Dictionary (KBBI), education is a learning process for individuals who aim to achieve higher knowledge and understanding of particular objects.

The process of learning must be considered and should not be ignored by students in the world of education. Students are said to have learned if there is a change in their behavior. The behavior referred to here is related to changes in Cognitive (Knowledge) and Psychomotor (Skills) and in the form of attitudes. This is in line with the opinion of W.S. Winkel, who states that learning is a mental or psychic activity that takes place in active interaction with the environment that results in changes in knowledge, understanding, skills, and values of attitudes [1].

Mathematics is one of the subjects taught to students. Each subject taught to students has its

characteristics. Likewise with mathematics, one of the characteristics of mathematics, according to Soedjadi, is having an abstract object. As a basic science, mathematics also plays a very important role in all other areas of learning. Therefore, it is appropriate to learn mathematics should give special treatment so that students can understand well the concepts and principles of mathematics itself.

Mathematics learning in schools is intended to achieve the following objectives: (a) understand mathematical concepts, (b) use reasoning, (c) problem-solving skills, (d) communicate ideas with symbols, and (e) have an attitude of appreciating the usefulness of mathematics in life [2]. But in reality, there are still many students who have difficulty learning, so achieving what is intended by mathematics education is impossible if it is not solved as soon as possible.

One of the materials in mathematics learning that is difficult for students to learn is mathematical induction; mathematical induction is a branch of science about proving a statement in mathematics. This material was first introduced to students when students were in class XI high school. Understanding the material requires high reasoning from students,

mastering algebraic manipulation, and the basics of mathematics such as calculations, properties of operations, etc. From the discussion above, we can conclude that when students cannot master the previous materials related to the material, students will have difficulty in learning mathematical induction material. According to Hamalik, learning difficulties are things or disorders that fail or at least become a disorder that can hinder learning progress; in this study, the researchers took the difficulties raised by Martini [3] as follows (1) weakness in numeracy, (2) difficulty in transferring knowledge, (3) poor understanding of mathematical language and (4) difficulty in visual perception

Based on observations at SMA Negeri 2 Enrekang, it is known that most students have difficulties in learning mathematics. According to the results of interviews with teachers, it is known that students began to have difficulty learning mathematics while still in elementary school because students did not master the basics of mathematics, which resulted in students having difficulty in learning the next material. Students often experience difficulties when working on questions because they cannot understand the meaning of the questions and confusion when determining which arithmetic operations will be used. In addition, students often make mistakes when calculating, let alone calculating multiplication and division operations, in a long way. Furthermore, the teacher said that every student has difficulties working on different questions; this is due to the different learning styles of students in capturing learners.

According to Gunawan, the learning style is the preferred way of thinking, processing, and understanding information [4]. Meanwhile, according to Deporter & Henacky, learning styles are divided into three types: visual, auditory, and kinesthetic learning styles. The three types of learning styles are distinguished based on their tendency to understand and capture information more easily using sight, hearing, or doing it themselves. Visual learning style is learning style by seeing, auditory learning style is learning style by listening, and kinesthetic learning style is learning style by moving.

In working on math problems, the three learning styles have different difficulties because the three learning styles have different focal points than what a teacher must know. In line with this, according to Bobbi de Potter, understanding these different learning styles has helped teachers everywhere to approach all or almost all students just by conveying information in different styles [5]. This is what prompted the author to conduct research related to the profile of students'

difficulties in working on mathematical induction questions in terms of their learning styles. By carrying out this research, students can find out where their difficulties are in working on questions so that in the future, the same thing does not happen, and the teacher concerned can also determine how to overcome this

## **2. METHODS**

This research is descriptive qualitative research that aims to describe students' difficulties in solving mathematical induction problems in terms of student learning styles. The subjects in this study were 2 students from each learning style in class XI MIA 2 SMA Negeri 2 Enrekang who had various difficulties and could communicate well. The data collection technique in this research is the Explanatory Sequential Design.

This method determines students' difficulties in solving mathematical induction problems in terms of learning styles. Data on learning styles were obtained from a learning style questionnaire, and data in the form of students' difficulties in working on induction questions were received from learning outcomes tests and interviews. The learning style questionnaire was made based on the theory of Deporter & Henacky. According to Martini, the learning outcome test was created by paying attention to the indicators of learning difficulties. The interview used was an unstructured interview, where the researcher did not use questions that had been arranged systematically before.

Then from the data collected, the researcher analyzed as follows (1) student learning styles were determined from the most dominant results in the learning style questionnaire, (2) learning outcomes tests were analyzed using difficulty according to Martini, and (3) Interviews were analyzed in stages. As follows: data reduction, data presentation, and conclusion drawing. The indicators of learning difficulties, according to Martini, can be seen in Table 1.

## **3. RESULT AND DISCUSSION**

The following are the results of research in class XI MIA 2 SMA Negeri 2 Enrekang. This study started from giving a learning style questionnaire to identify or classify students according to their learning style, then continued with a learning outcome test to determine students' difficulties in solving math problems with mathematical induction materials and the final stage of the researcher conducted interviews

**Table 1** Learning difficulty indicators

Difficulty of learning	Indicator of learning difficulties
Learning difficulties Weaknesses in numeracy Error in adding two numbers example:	<ol style="list-style-type: none"> <li>1. <math>2k^3 + 3k^2 + k + 6k^2 + 12k + 6 = \dots</math></li> <li>2. Error in multiplying two different numbers example: <math>n(n + 1)(n + 2) = \dots</math></li> <li>3. Error in squaring a number example: <math>(k + 1)^2 = \dots</math></li> </ol>
Difficulty in transferring knowledge	<ol style="list-style-type: none"> <li>1. Students do not answer the questions determined by the interview.</li> <li>2. Error in using formula.</li> <li>3. Error in understanding the meaning of the question.</li> <li>4. Error in substituting what is known about the problem in the formula, for example: substituting <math>n=k</math> into the statement <math>n=k+1</math></li> </ol>
Poor comprehension of mathematical language	<ol style="list-style-type: none"> <li>1. Students do not answer the questions determined by the interview.</li> <li>2. Error in determining what is known by the question.</li> <li>3. Mistakes in determining what the question is asking about.</li> <li>4. Error in making statement <math>n = k+1</math>.</li> </ol>
Difficulty in visual perception	<ol style="list-style-type: none"> <li>1. Reading errors.</li> <li>2. Students' inability to reason, determined by interview.</li> </ol>

with 2 students from different learning styles with varying styles of learning. Several considerations, namely (1) the student is a representative of each group that has the most difficulty in working on the problem (2) the student can communicate well, after considering this, Several students are selected, namely S5, S17, S20, S22, S27, and S32.

**3.1. Learning Style Questionnaire Analysis**

Based on the results of the learning style questionnaire in class XI MIA 2 SMA Negeri 2 Enrekang, it is known that the number of subjects who have an auditory learning style in that class is 14 then 12 subjects have a visual learning style, and 10 subjects have a kinesthetic learning style.

**3.2. Difficulties of Students with Visual Learning Style**

Based on the analysis of the difficulties of 2 students with visual learning styles, it is known that these students have difficulty in transferring knowledge and lack mathematical language skills. The researcher said the visual subject had difficulty transferring knowledge because the student could not substitute a value into the equation. The researcher said the visual subject had difficulty lacking language skills because the 2 visual subjects could not formulate the formula  $n=k+1$ .

Furthermore, related to the difficulty in counting weaknesses, visual subjects did not experience it even though the visual subject learning outcomes test showed this. Still, after conducting interviews related to this, it was concluded that the visual subject's error in counting was due to the haste in solving problems and the visual subject's lack of focus. Then related to difficulties in visual perception, from the results of the analysis of visual subjects that did not experience it, it was proven that the visual subjects could read the questions well and knew some prerequisite materials from mathematical induction.

**3.3. Difficulties of Students with Auditory Learning Style**

Based on the difficulty analysis, the two auditory subjects had difficulty counting weakness and lacked mathematical language skills. The researcher said that auditory subjects had difficulty counting weakness due to the inability of auditory subjects to operate a number with other numbers. From test results and interviews, it was clear that auditory subjects could not operate 2 numbers when containing variables. Then the researcher said that the auditory subject had difficulty lacking mathematical language weaknesses because both the auditory subject's test results were unable to formulate the  $n = k + 1$  formula. In interviews, when the researcher allowed the subject to formulate it, the subject still could not.

Furthermore, the researcher concluded that the auditory subject did not experience this even though the test results of the auditory subject showed these difficulties. Still, when the researcher confirmed this in the interview session, it was seen that the auditory subject did not appear to have difficulty in transferring knowledge. Then related to the difficulties in visual perception, the researcher concluded that the auditory subjects did not experience these difficulties because the auditory subjects could read the questions well and knew some prerequisite materials related to mathematical induction.

### **3.4. Difficulties of Students with Kinesthetic Learning Style**

Based on the analysis of the two kinesthetic subjects, it is known that the kinesthetic subject does not tend to have learning difficulties. The S20 subject has difficulty numeracy and lacks mathematical language skills, while the S5 subject has difficulty transferring knowledge. From the data obtained by the researcher, it can be seen that S20 has no difficulty in transferring knowledge even though in the test sheet, the subject of S20 shows these difficulties in question number 2 regarding the substitution of a statement into an equation. Still, when confirmed through interviews, it appears that the subject knows the indicators contained in the test. Then from the data obtained from S5, it is known that the subject has no difficulty in counting weakness. This is evidenced in the interview session, and the subject can solve the questions given during the interview session related to operations.

## **4. CONCLUSION**

Based on the results of research and discussion related to the difficulty profile of XI MIA 2 students at SMA Negeri 2 Enrekang, it can be concluded as follows: (1) Visual learning style students have difficulty solving problems, namely difficulties in transferring knowledge and understanding of mathematical language. (2) Students with auditory learning style have difficulty in solving problems, namely weakness in counting and lack of understanding of mathematical language, and (3) students with kinesthetic learning style have difficulty in counting weakness, difficulty in transferring knowledge, and poor understanding of mathematical language, it means that students with kinesthetic learning style do not tend to have difficulty in solving problems.

## **REFERENCES**

- [1] Kritanti. (2017). Analisis kesulitan dan kemampuan siswa dalam menyelesaikan soal matematika materi kubus dan balok pada siswa kelas VIII A SMP institut indonesia tahun ajaran 2016/2017. *Jurnal Pendidikan Matematika*, (Online). (<https://repository.usd.ac.id/>, diakses 06 Desember 2018 pada pukul 13.20).
- [2] Depdiknas. (2006). Permendiknas Nomor 22 Tahun 2006 tentang standar isi sekolah menengah pertama. Jakarta: Depdiknas.
- [3] Martini, J. (2013). *Kesulitan belajar: Perseptif, asesmen, dan penanggulangannya*. Bogor: Ghalia Indonesia.
- [4] Afif, dkk. (2017). Analisis kemampuan penalaran matematis ditinjau dari gaya belajar siswa dalam Problem Based Learning (PBL). *Seminar Nasional Matematika X Universitas Negeri Semarang* (Online). (<https://journal.unnes.ac.id/>, diakses 06 Desember 2018 pada pukul 13.49).
- [5] Yudha, dkk. 2017. Identifikasi gaya belajar matematika siswa kelas VII di SMP Negeri 14 Malang. (Skripsi). *Open access*: <http://jurnal-online.um.ac.id/>, diakses 09Februari 2019 pada pukul 21.55.