

ANALYSIS OF STUDENTS LOGICAL THINKING ABILITY BASED ON CONCEPTUAL COGNITIVE STYLE OF MATHEMATICAL LOGIC MATERIAL FOR CLASS X SMK PERDANA 1 SURABAYA

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ABSTRACT

This study aims to explore and describe students' logical thinking skills in terms of tempo conceptual cognitive style on mathematical logic material for class X SMK Perdana 1 Surabaya. This research approach is a qualitative research with a descriptive type of research. The subjects in this study were four students of class X OTKP-2 SMK Perdana 1 who were selected based on the results of the MFFT test with two students representing the impulsive cognitive style group and two students representing the reflective cognitive style group. The instruments used are the MFFT test and the mathematical logic test. Data analysis techniques are carried out by reducing data, presenting data and drawing conclusions. The validity of the data using the triangulation method. There are three indicators of logical thinking ability, namely: sequential thinking, ability to reason and drawing conclusions. The results showed that: students with impulsive cognitive style only met 0-2 indicators, including: logical thinking and argumentation skills, thinking and drawing conclusions, ability to argue and drawing conclusions, logical thinking only, ability to argue only, drawing conclusions only, or does not even meet all of these indicators. Meanwhile, students with reflective cognitive style are able to fulfill 2-3 indicators of logical thinking ability, including: logical thinking and argumentation skills, thinking and drawing conclusions, ability to argue and drawing conclusions, and some who meet all of these indicators.

Keywords: Logical Thinking Ability, Tempo Conceptual Cognitive Style, Mathematical Logic

1. Introduction

One of the skills or reasoning abilities related to solving mathematical problems is the ability to think logically. Logical thinking is the ability to think correctly, logically, based on certain patterns, rules or logic (Melatul, et al, 2019). There are three characteristics of logical thinking according to (Noviani, et al., 2020), namely: a) the continuity of thinking or thinking systematically, b) the ability to argue, and c) drawing conclusions. Based on these logical thinking indicators, there are many factors that can change students' understanding of concepts, one of which is the student's cognitive style.

In particular, students' cognitive style refers to every process that students do in building their knowledge by recognizing and processing the information they receive. Cognitive style relates to the individual personality of each student in processing information during learning activities (Hidajat, et al., 2018). The way each student consistently uses cognitive processes is the understanding of cognitive style (Risma and Iva, 2017). Education experts according to Rahman in (Soemantri, 2018) have divided cognitive style into 3 parts, namely: 1) Cognitive style based on psychology, consisting of: field dependent cognitive style and independent field cognitive style. 2) Cognitive style based on conceptual tempo, which consists of: impulsive cognitive style and reflective cognitive style; 3) Cognitive style based on the way of thinking, consisting of: intuitive-inductive cognitive style and deductive cognitive style.

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In this study, researchers are interested in exploring and describing the tempo conceptual cognitive style proposed in 1958 by Jerome Kagan in (Soemantri, 2018). Tempo conceptual cognitive style is a cognitive style based on the speed and accuracy or accuracy of students when drawing conclusions or decisions.

Impulsive cognitive style is indicated by the personality of students, who solve problems quickly but not completely or answers tend to be inaccurate, while reflective cognitive style is characterized by the personality of students who are but in solving problems more carefully and answers tend to be correct (Ahmad, et al., 2017).

One of the materials in mathematics related to the ability to think logically is Mathematical Logic. Mathematical logic is the material given at the SMA/SMK grades X, XI and XII. Mathematical logic is one of the important materials, because it provides direction to students to think logically. Mathematical logic is a lesson that explores rules or rules when making decisions and places more emphasis on the reasoning process (Lia, et al., 2018).

Based on the background described above, researchers are interested in conducting research at SMK Perdana 1 Surabaya, because according to the mathematics teacher at the school that students lack mastery of mathematical logic material due to several reasons, including: 1) when the teacher gives the material, students are less enthusiastic in following it due to the lack of student interest in mathematics, especially mathematical logic material, 2) the weakness of students' logical thinking skills, and 3) the lack of creative ideas from students makes mathematical logic material considered difficult by most students in the class. This makes students score less than the KKM when viewed from the value of daily assignments and scores from exams, both mid and end of the semester. Based on the above background, the researcher wants to examine the research with the title: "Analysis of Students' Logical Thinking Ability Based on Conceptual Cognitive Style Tempo Mathematical Logic Material for Class X SMK Perdana 1 Surabaya".

2. Research Methods

In this study, researchers used qualitative research methods. The type of research used in this research is descriptive qualitative research. The subjects of this study were four students of class X OTKP-2 SMK Perdana 1 who were selected based on the results of the MFFT test with two students

representing the impulsive cognitive style group and two students representing the reflective cognitive style group. The instruments used are the MFFT test and the mathematical logic test. Data analysis techniques are carried out by reducing data, presenting data and drawing conclusions. The validity of the data using the triangulation method.

3. Results and Discussion

The researcher gave the MFFT test on Tuesday, March 1, 2022 which was attended by 13 students from 24 students of class X OTKP-2 SMK Perdana 1 Surabaya, where at the time of giving the MFFT test there were 11 students who did not enter because at that time it was raining quite heavily and there are some students who are sick based on information from students in the class. This MFFT test was given to students of class X OTKP-2 SMK Perdana 1 Surabaya to find out which students have a reflective and impulsive tempo conceptual cognitive style. Based on the results of the MFFT test that has been given, the results are presented in the following table:

Table 1 MFFT Test Results for Class X OTKP-2 SMK Perdana 1 Surabaya

No	Initials Name	Correct Answer	Wrong Answer	Time (Minutes)
1.	AF	6	6	7:03
2.	RL	1	11	7:12
3.	AAN	2	10	7:44
4.	LSA	4	8	8:02
5.	SPA	8	4	8:25
6.	PYS	4	8	8:49
7.	LS	0	12	9:15
8.	AKN	1	11	9:28
9.	MAAK	2	10	9:58
10.	MAP	6	6	10:10
11.	OSM	3	9	10:13
12.	MR	5	7	10:36
13.	MFM	6	6	10:52

Based on the results in table 3.1 above, it can be seen that of the 13 students who took the MFFT test, they can be classified into four parts according to the division of tempo conceptual cognitive style according to (Risma and Iva, 2020) including:

- Fast but imprecise (impulsive) students are colored yellow
- Fast-accurate students are colored orange
- Slow but precise (reflective) students are colored blue

- Slow-inaccurate students are colored purple

From the 4 categories that have been described above, the researcher wants to conduct research with tempo conceptual cognitive style based on impulsive and reflective categories. From the results of the MFFT test conducted by students of class X OTKP-2 SMK Perdana 1 Surabaya, 4 student will be selected, including 2 students with an impulsive cognitive style and 2 students with a reflective cognitive style. Students who were selected as research subjects reviewed based on the tempo conceptual cognitive style can be seen in table 3.2 below:

Tabel 2 Research Subject

Initials Name	Cognitive Style	Wrong	Correct	Time
AF	Impulsif	6	6	7:03
SPA	Impulsif	8	4	8:25
LS	Reflekti	0	12	9:15
AKN	Reflektif	1	11	9:28
Researched Subject		4 People		

From the selection of students above, the four students will be given a second test, namely a mathematical logic material test to determine students' logical thinking abilities. The place to carry out this test is at the school and the student's home depending on the agreement with the student. The data on the results of the students' logical thinking skills on the material of mathematical logic for class X OTKP-2 SMK Perdana 1 Surabaya are as follows:

Tabel 3 Tabel Kemampuan Berpikir Logis Subjek Impulsif dan Reflektif

Indicator	Impulsive Subject	Reflective Subject
Thought Confusion	• In question number 1, subjects I1 and I2 are quite able to think coherently.	• In question number 1, subjects R1 and R2 are able to think coherently.
	• In question number 2, subject I1 is able to think coherently, while subject I2 is quite able to think coherently.	• In question number 2, subjects R1 and R2 are able to think coherently.
	• In question number 3, subjects I1 and I2 are quite able to think coherently.	• In question number 3, subject R1 is able to think coherently, while subject R2 is quite able to think coherently.
	• In question number 4, subject I1 is able to think coherently, while subject I2 is quite able to think coherently.	• In question number 4, subjects R1 and R2 are able to think coherently.
	• In question number 5, subject I1 has not been able to think coherently, while subject I2 is quite able to think logically coherent.	• In question number 5, subjects R1 and R2 are able to think coherently.

Arguing Ability	• In question number 1, subject I1 is able to argue, while subject I2 is not yet able to argue.	• In question number 1, subjects R1 and R2 are able to argue.
	• In question number 2, subject I1 is able to argue, while subject I2 is quite capable of arguing.	• In question number 2, subjects R1 and R2 are able to argue.
	• In question number 3, subject I1 is quite able to argue, while subject I2 is not yet able.	• In question number 3, subjects R1 and R2 are able to argue.
	• In question number 4, subject I1 is able to argue, while subject I2 is not able to argue.	• In question number 4, subjects R1 and R2 are able to argue.
	• In question number 5, subjects I1 and I2 have not been able to.	• In question number 5, subjects R1 and R2 have not been able to argue.
Conclusion Drawing	• In question number 1, subject I1 is able to draw conclusions, while subject I2 has not been able to draw conclusions.	• In question number 1, subjects R1 and R2 are able to draw conclusions.
	• In question number 2, subjects I1 and I2 are quite capable of drawing conclusions.	• In question number 2, subject R1 is able to draw conclusions, while subject R2 is quite capable of drawing conclusions.
	• In question number 3, subject I1 is able to draw conclusions, while subject I2 has not been able to draw conclusions.	• In question number 3, subjects R1 and R2 are able to draw conclusions.
	• In question number 4, subject R1 is quite capable of drawing conclusions, while subject I2 has not been able to draw conclusions.	• In question number 4, subjects R1 and R2 are able to draw conclusions.
	• In question number 5, subjects I1 and I2 have not been able to draw a conclusion.	• In question number 5, subjects R1 and R2 have not been able to draw conclusions.

4. Conclusions

The conclusions in this study are as follows:

1. Students who have a reflective cognitive style are able to fulfill 2-3 indicators of the indicators of logistical thinking skills. These indicators include: indicators of thinking continuity and ability to argue, indicators of thinking and drawing conclusions, indicators of ability to argue and drawing conclusions, and some that meet all of these indicators.

2. Students who have an impulsive cognitive style are only able to fulfill 0-2 indicators of logistical thinking ability indicators. These indicators include: indicators of thinking continuity and ability to argue, indicators of thinking and drawing conclusions, indicators of ability to argue and drawing conclusions, indicators of thinking consistency only, indicators of ability to argue only, indicators of drawing conclusions only, or even not fulfilling all of these indicators.

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