Understanding Mathematical Concept: The Effect Of SAVI Learning Model With Probing-Prompting Techniques Viewed From Self-Concept

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Abstract. This research aims to discover the effect of SAVI learning models with the Probing-prompting technique in terms of self-concepts on students' mathematical conceptual understanding. The method used in this research was the quasi-experimental design. The experimental design used in this study was the post-test only design with a 3x3 factorial research design. The population in this study were 153 students. The sampling technique used was random. The normality test, homogeneity test, two way ANOVA test and Scheffe' method were used as data analysis techniques. The results showed that there is an influence of the SAVI learning model with probing-prompting techniques in terms of students' self-concepts on the ability to understand mathematical concepts compared to conventional learning models applied by teachers at school.

Keywords: Concept Understanding Ability; Probing-prompting; SAVI; Self-Concept

1. Introduction
Mathematics is one of the useful lessons and plays an important role for one self and others. Mathematics is the study of how to count and measure things with numbers and symbols [1]. In the 21st-century, understanding concepts is an important part of mathematics learning. The understanding of the concept is one of the important objectives of learning mathematics [2]. Understanding mathematical concepts are to understand correctly about mathematical concepts [3–5]. Understand means that the students can translate, interpret, conclude a mathematical concept based on one's knowledge [6].

Students are still having difficulty understanding mathematical concepts [5,6]. Students are still fixated on memorizing formulas and examples. Students are also still unable to conclude the learning. There is a lack of students' confidence in solving problems with their knowledge [9]. Not only that but students also still have not been able to apply a concept related to the real world and everyday life.

The students' success in understanding mathematical concepts might be caused by learning models that contribute to influence students' understanding of mathematical concepts. Not only learning models that play a role, but psychological aspects also play a role in students' success in understanding the learning. The psychological aspect is self-concept. Self-concept is not a factor that is brought from birth but is formed through individual experiences in dealing with others [8,9].

Students' self-concept is lacking in terms of knowledge, expectations, and judgment. Students'interest in mathematics, students' confidence in their abilities, and their perspective in seeing
the benefits of mathematics are still relatively low [12, 13]. This occurs because of the lack of new ideas that make students more interested and more confident in learning mathematics which directly related to the ability to understand mathematical concepts.

Based on previous research, the Somatic, Auditory, Visual, Intellectual (SAVI) learning model has a good influence on the effectiveness of mathematics learning [11,12]. SAVI learning models are better than learning with expository methods. SAVI learning model is learning that emphasizes that all senses possessed by students must be used when learning [16]. SAVI has a basic principle which is a learning in which involves the whole mind and activities of the body. It is learning where a person creates rather than consumes and working together in helping the learning process [14,15].

Besides the right learning model, an appropriate technique in learning should be chosen to see students' ability to understand the learning. Based on previous research, probing-prompting techniques can improve the ability to understand mathematics [19]. Probing-prompting is learning where the teacher presents a series of questions that are investigative [20] so that a thought process occurs that links students' knowledge and experience with the knowledge being learned. In this technique, the question and answer process is done by randomly pointing students so that each student must automatically participate actively [17,18].

Based on research that has been done before, this research has a renewal that lays in the variable of the research that combines the probing-prompting techniques and the students' self-concepts. Thus, the purpose of this study is to see the effect SAVI learning model with the probing-prompting technique on the ability to understand mathematical concepts viewed from self-concept.

2. Research Method

This study uses a quasi-experimental design. The design used in this study is a post-test only design. The population in this study were 153 students of SMP Negeri (State Junior High School) 1 Jati Agung. The sampling technique used was the random sampling technique that resulted in 92 students. The experimental class 1 uses the SAVI learning model, the experimental class 2 uses the SAVI learning model with probing-prompting technique and the control class uses the conventional learning model.

The data collection technique used was written test of concepts understanding ability and questionnaire of self-concept. The concept of understanding ability test refers to the following scoring guideline:

| No | Indicator                                                                 | Description                                                                 | Score |
|----|---------------------------------------------------------------------------|----------------------------------------------------------------------------|-------|
| 1  | Restate a concept                                                         | No answer.                                                                  | 0     |
|    |                                                                           | Incorrect answers but using the method.                                    | 1     |
|    |                                                                           | Correct answers without reasons.                                           | 2     |
|    |                                                                           | Provide answers but not all are correct.                                   | 3     |
|    |                                                                           | Provide answers and reasons that can be understood and correct.           | 4     |
| 2  | The ability to classify objects according to certain properties related to the concept. | No answer.                                                                  | 0     |
|    |                                                                           | Incorrect answers but using the method.                                    | 1     |
|    |                                                                           | Correct answers without reasons.                                           | 2     |
|    |                                                                           | Provide answers but not all are correct.                                   | 3     |
|    |                                                                           | Provide answers and reasons that can be understood and correct.           | 4     |
| 3  | The ability to provide                                                   | No answer.                                                                  | 0     |
| No | Indicator                                                                 | Description                                           | Score |
|----|---------------------------------------------------------------------------|-------------------------------------------------------|-------|
| 3  | examples and not examples                                                 | Incorrect answers but using the method.               | 1     |
|    |                                                                           | Correct answers without reasons.                      | 2     |
|    |                                                                           | Provide answers but not all are correct.              | 3     |
|    |                                                                           | Provide answers and reasons that can be understood   | 4     |
| 4  | The ability to present concepts in various forms of mathematical          | No answer.                                            | 0     |
|    | representation.                                                           | Incorrect answers but using the method.               | 1     |
|    |                                                                           | Correct answers without reasons.                      | 2     |
|    |                                                                           | Provide answers but not all are correct.              | 3     |
|    |                                                                           | Provide answers and reasons that can be understood   | 4     |
| 5  | The ability to develop the necessary and sufficient conditions of a       | No answer.                                            | 0     |
|    | concept.                                                                 | Incorrect answers but using the method.               | 1     |
|    |                                                                           | Correct answers without reasons.                      | 2     |
|    |                                                                           | Provide answers but not all are correct.              | 3     |
|    |                                                                           | Provide answers and reasons that can be understood   | 4     |
| 6  | The ability to use and utilize and choose certain procedures.             | No answer.                                            | 0     |
|    |                                                                           | Incorrect answers but using the method.               | 1     |
|    |                                                                           | Correct answers without reasons.                      | 2     |
|    |                                                                           | Provide answers but not all are correct.              | 3     |
|    |                                                                           | Provide answers and reasons that can be understood   | 4     |
| 7  | The ability to classify concepts or algorithms into problem-solving.      | No answer.                                            | 0     |
|    |                                                                           | Incorrect answers but using the method.               | 1     |
|    |                                                                           | Correct answers without reasons.                      | 2     |
|    |                                                                           | Provide answers but not all are correct.              | 3     |
|    |                                                                           | Provide answers and reasons that can be understood   | 4     |

The following is the categorized scale of the self-concept questionnaire:

![Figure 1. Dimension of Self-concept](image-url)
The steps of SAVI learning model with probing-prompting technique:

The data analysis technique used in this research was two way ANOVA. However, before the data was analyzed, the prerequisite tests in the form of normality tests and homogeneity tests were conducted.

3. Results And Discussion
Based on the results of research, the data on the ability to understand mathematical concepts was obtained which consisted of the average score ($\bar{x}$), the highest score ($x_{\text{max}}$), modus (MODE), median (MEDIAN), and the lowest score ($x_{\text{min}}$) in the control class, experimental class 1, and experimental class 2. The results of the data analysis of the mathematical concept understanding of experimental class 1, experimental class 2, and control class can be seen in the following table.

| Group          | $x_{\text{max}}$ | $x_{\text{min}}$ | Central Tendency |
|----------------|------------------|------------------|------------------|
|                |                  |                  | $\bar{x}$ | MODE | MEDIAN |
| Experimental 2 | 100              | 52.30            | 76.780 | 70.50 | 75.00  |
| Experimental 1 | 95.40            | 50.00            | 74.997 | 75.00 | 75.00  |
| Control        | 91.00            | 50.00            | 68.165 | 63.60 | 65.90  |

Based on table 2, it is known that the average score obtained from the experimental class 2 and the experimental class 1 is better than the control class which was given the conventional learning model as the treatment. The highest average score of mathematical concepts understanding test was obtained by experimental class 2 through the SAVI learning model with probing-prompting technique as the
treatment. The lowest average score of the mathematical concept understanding test was obtained by the control class.

The data analysis used was two-way ANOVA. However, before the test was conducted, prerequisite tests in the form of normality test by using the Liliefors formula and homogeneity test by using the Bartlet formula were conducted.

| Treatments                      | L<sub>observed</sub> | L<sub>critical</sub> | Result          |
|--------------------------------|----------------------|----------------------|-----------------|
| Experimental class 2 (A2)      | 0.142                | 0.159                | H<sub>0</sub> is accepted |
| Experimental class 1 (A1)      | 0.124                | 0.161                | H<sub>0</sub> is accepted |
| Control class (A3)             | 0.155                | 0.159                | H<sub>0</sub> is accepted |
| Self-concept (B1)              | 0.103                | 0.133                | H<sub>0</sub> is accepted |
| Self-concept (B2)              | 0.156                | 0.159                | H<sub>0</sub> is accepted |
| Self-concept (B3)              | 0.142                | 0.206                | H<sub>0</sub> is accepted |

| Treatments                      | X<sup>2</sup><sub>observed</sub> | X<sup>2</sup><sub>critical</sub> | Result          |
|--------------------------------|----------------------------------|----------------------------------|-----------------|
| A<sub>1</sub>, A<sub>2</sub>, and A<sub>3</sub> | 3,377                           | 5,991                            | H<sub>0</sub> is accepted |
| B<sub>1</sub>, B<sub>2</sub>, and B<sub>3</sub> | 1,672                           | 5,991                            | H<sub>0</sub> is accepted |

Based on tables 3 and 4, it is known that the data were normally distributed and had homogeneous variance. The prerequisite test results had met the criteria to be continued by the two-way ANOVA.

| Source                          | JK    | Dk    | KT    | F<sub>observed</sub> | F<sub>critical</sub> |
|---------------------------------|-------|-------|-------|-----------------------|----------------------|
| Learning Model (A)              | 1017,674 | 2     | 508,837 | 4,728                 | 3,106                |
| Self-concept (B)                | 3230,006 | 2     | 1615,003 | 15,006                | 3,106                |
| Interaction (AB)                | 686,907 | 4     | 171,726 | 1,595                 | 2,481                |
| Error                           | 8932,72  | 83    | 107,623 |                        |                      |
| Total                           | 13867,31 | 91    |        |                        |                      |

Based on Table 5, it can be concluded that there is a difference between the SAVI learning model with probing-prompting technique and the conventional learning model on the ability to understand mathematical concepts because SAVI learning model with probing-prompting technique made the students more active and more accustomed to relying on their existing senses such as hearing, vision, gestures, and active thinking.

This is relevant to the previous research that explained that students who were taught using the SAVI learning model were better than students with conventional learning [22]. Likewise, with the use of probing-prompting techniques where the teacher presents questions that explore students’ thinking processes and knowledge that has been learned [23]. The two studies conclude that the SAVI learning model and the probing-prompting technique provide positive results. Likewise, the research that has been carried out by researchers in which combining the SAVI learning model and probing-prompting techniques provides the same good results as the previously conducted research by Prida NLTaneo and Yuriska Mandasari [24, 25]
Also, there is an effect of self-concept on the ability to understand mathematical concepts [26]. Students' self-concept can help them understand that there are so many benefits and uses of mathematics in daily life and motivate them to better understand their characters. Self-concept is a way of looking at oneself in terms of interests, abilities, and everything that he thinks is good or not. This is in line with previous research which states that self-concept is the perspective of someone in assessing all the strengths and weaknesses that they have [13].

Furthermore, there is an interaction between the learning model with self-concept on the ability to understand mathematical concepts. Based on the results of the two-way analysis of variance, it is concluded that there is no interaction between the SAVI learning model with the probing-prompting technique on self-concept. The SAVI learning model with the probing-prompting technique during the learning process made students more active in searching for answers so that Self-concept is not fully utilized.

4. Conclusions and Suggestions
From the results of data analysis and discussion, it is concluded that there is an influence of SAVI learning models with the probing-prompting technique viewed from students' self-concept on the ability to understand mathematical concepts.

The researcher suggests that some important things must be considered concerning the application of the SAVI learning model with the probing-prompting technique, namely time management, group management in the learning discussion process, and further maximizing each of the steps of the learning model.

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