



## **THE INFLUENCE OF STUDENTS' LEARNING STYLE TOWARDS STUDENTS' MATHEMATICS KNOWLEDGE**

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### **Abstrak**

Penelitian ini bertujuan untuk mengetahui adanya pengaruh gaya belajar terhadap kemampuan pemahaman matematis siswa. Sampel dalam penelitian ini adalah 140 siswa kelas XI SMK Bina Am-Mak'mur Kabupaten Tangerang tahun ajaran 2019/2020 yang diklasifikasikan menjadi tiga kelompok gaya belajar, yaitu gaya belajar visual yang terdiri dari 32 siswa, auditorial terdiri dari 23 siswa, dan kinestetik terdiri dari 85 siswa. Metode dalam penelitian ini adalah *ex post facto* untuk mengetahui secara jelas pengaruh gaya belajar siswa terhadap kemampuan pemahaman matematis siswa. Data yang diperoleh, sebelumnya dilakukan uji normalitas dan uji homogenitas dan selanjutnya dianalisis dengan *One Way Anova* untuk menguji hipotesis ada pengaruh gaya belajar siswa terhadap kemampuan pemahaman matematis siswa. Setelah dilakukan pengujian dapat disimpulkan bahwa, terdapat pengaruh gaya belajar terhadap kemampuan pemahaman matematis siswa yang signifikan.

**Kata kunci:** gaya belajar; pemahaman matematis; pendidikan.

### **Abstract**

This paper aimed to determine the effect of learning styles to students' mathematical understanding abilities. The sample in this paper was 140 students of XI grade Bina Am-Mak'mur Vocational School at Tangerang 2019/2020 academic year which were classified into three learning style groups, visual learning style that consist of 32 students, auditory learning style 23 students, and kinesthetic learning styles 85 students. The method in this paper is *ex post facto* to know the effect of student learning styles to students' mathematical understanding abilities clearly. The data obtained were previously tested for normality and homogeneity tests and subsequently analyzed by *Anova One Way* to test the hypothesis that there is an influence of learning styles on students' mathematic understanding ability. After testing, we can conclude that there is a significant effect of learning styles to students' mathematic understanding abilities.

**Keywords:** education; learning style; mathematical understanding.

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## INTRODUCTION

Education is an activity or process of changing people's behavior and ability to move towards progress and improvement. Changing someone mindset to innovate and improve self-quality could be obtained with education. According to Indonesian Constitution book number 20 on the National Education System in 2003, "education is a conscious thinking and plan based effort to create learning atmosphere and the process for students develop their potential actively to have spiritual, religious, self-control, personality, intelligence and noble character, and the skills needed by themselves, society, nation and country ". The purpose of education is a benchmark from the success of the implementation of education, which is corresponding with the education purpose, because the implementation of education is not separatable from the educational goals to be achieved. Demands of development and the growth of the Indonesian Nation such that educational purposes are dynamically adjusted to the objectives of national education (Dini, M., Muraeni, & Anita, 2018).

Mathematics in the education context is related to complex calculations. Students are required to understand abstract objects. The abstract trait causes students to have difficulty in solving them. In the *Program for International Student Assessment (PISA)* in 2018, Indonesia was ranked 73 out of 78 countries, with a 379 score while the country's average score according to PISA for mathematics ability was 489. The score decreased if we compare with the results in 2015, which is 386. Most of PISA problems are questions with decent mathematical thinking (OECD, 2019). The aspects assessed in PISA are understanding ability, problem solving, logical ability, and communication skill. Based on the data from the *Indonesian Family Life Survey (IFLS)* in 2000, 2007 and 2014, represent 83% of the population of Indonesian children, had an average low competency score in understanding mathematics (*Mathematical Understanding of Indonesian Children Only Rises 11 Percent in 14 Years, n.d.*).

The complete research by Kurniawan tahun 2017 mention that students are having difficulty in understanding the problem caused by: 1) Low residual comprehension ability; 2) Chased by time or want to save it; and 3) Students do not

writing down/make a note everything they know. This is match with the results of the observations from Ms. Yulia Olivianti as a mathematics teacher at the Bina Am-Ma'mur Vocational High School, Tangerang, where students demonstrate that the ability to understand mathematical problems by her students was not all good. Some students are having difficulty in understanding problems both in the learning process and answering math questions, and when the learning process, they pay less attention that result students are making mistakes in solving the problems and problems given.

Students' mathematical understanding is affected by many factors, one of them is an internal factor that comes within the student, learning styles. The internal factors referred to physiological factors, including the healthy five senses that not experiencing defect/deform, illness or even down syndrome. as for psychological factors include intellectual, interests, talents, potential, and achievements; Other internal factors are physical or psychological maturation factors (Safitri, 2018). As revealed by Utami (2016) that one of the factors effecting learning styles comes from students (internal), each student has a different learning style depends on how they can receive, process and conclude the obtained information.

According to Argarini (2018) learning style is an outlook that reveals how someone processing the data begin from the process of storing data to analyze them. Learning style is also an approach that explains how individual learn or the ways each person takes to concentrate on the process and mastering difficult and new information through the perception of different styles (Umrana, 2019). Based on these definitions it can be concluded that individuals in learning has a variety of learning ways, that is by listening, or by finding in a learning process.

Learning styles are divided into three types: visual, auditory, and kinesthetic (Wulan, 2017). This is parallel with (Daryanto & Rachmawati, 2015) states that there are 3 modalities (types) in learning styles: visual, auditory, and kinesthetic. Visual learns through what they see, auditory learns by listening and learning kinesthetic through motion and touching. Students with a visual learning style in the process focus more on the sharpness of the look sense. Students with a visual learning style are characterized by having a high need to see and capture

information visually before they understand it. In this category students are easier to capture the subject through pictures, are more sensitive to changes in color around them, students with visual learning style sometimes find it difficult to when it comes to verbally learning and often to misinterpretation. Students with an auditory learning style in receiving and understanding information, need to more focus on hearing. To be able to understand and remembering them, the student has to listen it first. Students in this category are having weaknesses in absorbing written information directly, also in reading and writing. **Students** with kinesthetic learning styles has to touch something that provides certain information so they can remember it. This learning style usually using several characters in learning activities. The first character is using the hand as the main tool of receiving information that he can always remember it. Only by holding it, students are able to absorb information without having to read the explanation. The next character is that students is sick if they have to sit quietly for too long listening the information. Students with kinesthetic learning style able to learn by physical activities. The advantage of this learning style is that students are able to coordinate a team besides the ability to control gestures. Usually, people with a kinesthetic learning style find it easier to absorb information by copying images or words for saying it later or understand facts (Waskitonigtyas, 2017). In research conducted by Hamsar in 2017 said that by knowing students' learning style, the teacher could apply learning methods that are appropriate to the character or conditions of student learning. The teacher's role is very important in determining the success of the teaching and learning process. So the teacher needs to identify student learning styles so that the learning process runs well, especially on students' mathematical understanding. Besides that, basically mathematical understanding is an attempt to find a way out of a difficulty to achieve goals that cannot be achieved immediately (Polya, 1973).

The importance of mathematical understanding ability gained by students is a prerequisite for someone to have mathematical understanding ability as an aspect of knowing the extent to which students have high thinking power. According to Sariningsih (2014), which states that important to have mathematical understanding for students because it is needed to solve mathematical problems.

Problems in other discipline, and the daily life, which are the vision of the development of mathematics learning to meet the goals of the present. In developing mathematical abilities, specially mathematical understanding abilities, a student must have an attitude of confidence and trust in his own abilities that can avoid anxiety and doubt. This attitude can be interpreted as a person's fighting spirit in solving problems being faced (Dini, M., Wijaya, T. T., & Sugandi, 2018).

Developing mathematic knowledge of students in learning maths is needed to deal with the both of mathematical problems and in real life which is the ability of mathematical knowledge. On how to deal with and solve these problems can be overcome by knowing their own learning styles or methods. Students will be able to learn well and good learning outcomes, if he understand his learning style (Umrana, 2019). Facts in the TIMSS report (*The Trends of Mathematical and Science Studies*) in 1999, 2003, and 2007 show that the ability of mathematical understanding of Indonesian students is included in low category (Dini, M., Muraeni, & Anita, 2018). As well as the latest results in 2015 which stated that Indonesia was ranked 44 out of 49 countries (Hadi & Novaliyosi, 2019), this means students need to be trained in understanding mathematical abilities in the learning process.

Therefore to find out the learning style of students that support in acquiring good and maximum mathematical understanding ability. From problems above it can be concluded that the formulation of the problem to be discussed in this paper is “The Effect of Learning Style Towards Students' Mathematics Knowledge”

## **METHOD**

This paper uses a comparative causal research method (*Ex Post Facto*), in line with opinion (Sumartiningsih, D., & Sari, 2019) that the research is a systematically planned and conducted investigation in the tangible form of the dependent and independent variables. In this paper, the method aims to obtain data on the effect of student learning styles on mathematical understanding abilities. *The Ex Post Facto* research design is the same as the experimental research design. The difference is that *Ex Post Facto* research has independent variables that are

explained or described and not manipulated, whereas in experimental research the independent variables are manipulated (Widiyanti, 2011). In conducting research, researchers are directly involved in collecting data, processing and drawing conclusions from the data obtained.

The population in this paper were 400 students of Bina Am-Ma'mur Tangerang Vocational School. The location is in Tangerang Regency. The sampling method in this paper is using a random sampling technique. The number of samples taken was 140 students of XI Grade Bina Am-Ma'mur Tangerang Vocational School who took mathematics subjects. Furthermore, students are given a learning style test to classify them into three groups of learning styles: visual, auditory, and kinesthetic learning styles.

Data collection in this paper are using test and questionnaire method. We were using a written test taken from questions commonly given by teacher of Vocational High School Bina Am-Ma'mur Tangerang for the tests. Because in this form, it will measure how far the students' understanding of the subjects that has been given in the learning process in class. Therefore the test aimed to obtain data on students' mathematical understanding abilities. While the questionnaire method are using a questionnaire with two alternative answers offered to respondents, "Yes" or "No". The purpose of distributing it is to obtain data on student learning styles which are grouped into three: visual, auditory, and kinesthetic learning styles.

After the data has been collected, processing it become the next step with a statistic test to determine the average of the three types of learning styles; after that, normality test using (*One-Sample Kolmogorov-Smirnov Test*) to find out whether the data is normal or abnormal; and furthermore, conduct data analysis using inferential analysis with One Way Anova analysis.

## **RESULTS AND DISCUSSION**

Based on the results of conducted research at Bina Am-Ma'mur Vocational High School in Tangerang, we obtain data distribution information of three learning styles and data on students' mathematical understanding abilities that can be seen in Table 1.

**Table 1. Statistics of Mathematical Understanding Ability**

Statistics	Learning Style		
	Visual	Auditory	Kinesthetic
N	32	23	85
$\bar{X}$	88.59	81.52	83.38
Standard Deviation	9.6	9.09	9.46
Median	90	80	80
Mode	100	80	75
Minimum	75	70	70
Maximum	100	100	100

According to Table 1, the average value of students with an auditory learning style has a smaller amount than the visual and kinesthetic, with constant differences of 7.07 and 1.86. This means students' understanding of auditory and kinesthetic is lower than visual. After that we are doing normality and homogeneity tests to find out more the effect of learning styles on students' mathematical understanding. First, a normality test is performed with the goal of finding out whether the data collected is normal or abnormal. The technique test are using *Lilliefors* test. The results of the normality test can be seen in Table 2.

**Table 2. Test the Normality of Students Have Visual, Auditory, and Kinesthetic Learning Styles**

<i>One-Sample Kolmogorov-Smirnov Test</i>				
		Visual	Auditory	Kinesthetic
N		32	23	85
Normal Parameters <sup>a,b</sup>	Mean	88.59	81.52	83.39
	Std. Deviation	9.608	9.100	9.467
Most Extreme Differences	Absolute	.226	.219	.169
	Positive	.158	.219	.169
	Negative	-.226	-.129	-.137
Test Statistic		.226	.219	.169
Asymp. Sig. (2-tailed)		.000 <sup>c</sup>	.006 <sup>c</sup>	.000 <sup>c</sup>

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

Based on Table 2, it can be seen that absolute values in visual, auditory, and kinesthetic learning styles are 0.226, 0.219, and 0.169, respectively, which means that the three data are normally distributed with the critical value taken for the

*Liliefors* test is  $> 0.05$ . If the data is normally distributed, then the homogeneity test is performed using the One Way Anova method in Table 3.

**Table 3. Anova One Way**

ANOVA						
	<i>JK</i>	<i>df</i>	<i>RJK</i>	<i>F<sub>count</sub></i>	<i>F<sub>table</sub></i>	<i>Sig.</i>
Between	838.040	2	419.020	4.701	3.062	.011
In	12211.646	137	89.136			
Total	13049.686	139				

Homogeneity test for the mathematical understanding ability data results in Table 3 shows the three groups of learning styles, namely that  $F_{count} = 4.701 > F_{table} = 3.062$ , at the significance level  $\alpha = 0.05$ , with the *df* numerator is *df* inter = 2, and *df* inner = 137. To determine how big the effect of learning styles to students' mathematical understanding can be calculate using a determination coefficient that is equal to 0.039, which means that the effect of learning styles is just 3.9% to the results of mathematical understanding abilities.

From the calculation above, it can be compare that visual, auditory, and kinesthetic learning styles resulting that the average student who has a visual learning style has a very high mathematical understanding ability than the auditory and kinesthetic. The average value of the ability of mathematical understanding in visual is 88.59, while the auditory and kinesthetic are 81.59 and 83.38, respectively.

Based on the normality and homogeneity test, there is a significant effect of learning styles to students' mathematical understanding abilities. This is consistent with the facts that occur in the field, because the higher or lower the level of learning styles will affect the ability of students to understand mathematical problems. Things that affect the learning style of mathematical understanding ability: visual learning style, students are able to pay attention to an object, read a book or a picture that is presented in the learning process well; auditory learning style, students are able to listen and remember the material delivered by the teacher, and are able to listen well in a paper group; and kinesthetic learning styles, students are able to learn through hands-on practice and are able to understand each mathematical formula which is then practiced by working on mathematical problems.



If seen from the average mathematical understanding ability in the previous research, the visual is higher than the and kinesthetic learning style. This paper also indicate that visual learning styles has a better effect to students' mathematical understanding. Visual learning style is supported by the theory of behaviorism, which is information given through pictures or diagrams in the learning process can provide a stimulus in response to the receipt of information that will be the student's learning achievement (Bire, A. L., Geradus, U., & Bire, 2014).

In previous study conducted by Widiyanti in year 2011 on the students of 1 Junior High School State in Surade, Sukabumi, was telling about the effect of learning styles on the ability to solve mathematics in 2011 found that the most dominant learning style used was kinesthetic with a frequency of 70 students, and the effect of learning style solving problems by 3.62%. While on this paper, out of 140 students classified as 32 students with visual learning styles, 23 students with auditory learning styles, and 85 students with kinesthetic learning styles. This is consistent with the results of survey that there are 23% of visual people, 16% of auditory people, and 61% of kinesthetic people. The determination coefficient from the effect of independent variables to the dependent variable is equal to 0.039 which means the dependent variable students' mathematical understanding ability by learning styles is 3.9%.

## **CONCLUSION**

There is significant effect of learning styles to students' mathematical understanding ability. In accordance with the facts that occur because the higher or lower the level of learning styles will affect the ability of students' understanding in understanding mathematical problems. In this paper the more dominant learning style is a visual learning style that is better than the auditory and the kinesthetic learning style on students' mathematical understanding abilities. This can be seen from the average result of mathematical understanding ability tests of students with visual learning styles higher than students with auditory and kinesthetic learning styles.

We suggest that students are expected to be able find their learning style, and the teacher should understand in each learning process, specially on students' mathematical understanding abilities.

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