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Abstract: This research aims to analyze and describe the ability of students of SMA Al Islam Krian to Understanding Mathematical Concepts in Terms of Student Learning Styles for the 2022/2023 academic year on the material of circle equations in terms of learning styles using include auditory, visual, and kinesthetic learning styles with a qualitative descriptive approach. The data collection techniques used were tests and interviews, with research instruments in the form of learning-style questionnaires, test questions, and interviews. The results of the study, it was found that from the visual learning style students with high abilities were able to understand mathematical concepts, whereas students with low abilities were not yet able to understand mathematical concepts. Meanwhile, from the auditory learning style, students with high and low abilities are less able to understand mathematical concepts. If from the kinesthetic learning style students with high abilities are less able to understand mathematical concepts, while students with low abilities are not yet able to understand mathematical concepts.

Keywords: Learning Styles, Circle Equation, Qualitative Descriptive

INTRODUCTION

Along with the times, humans experience changes in mindset to become more modern. In the past, humans had a fairly narrow mindset about education which resulted in difficulties for humans in carrying out their daily lives. Currently, humans are starting to improve their mindset and begin to understand the importance of education in living life. Therefore, education is given early on to increase the quality of human resources.

Education is an important aspect in the progress of a nation, one of which is the Indonesian nation. Indonesia is trying to increase the quality of education, this is based on Law Number 20 of 2003 about the National Education System. That law seeks to increase student activity in an effective learning process (suraji, 2018). The learning process occurs due to the interaction of teachers and students in creating a comfortable learning environment with the methods that have been applied, one of which is in the process of learning mathematics. In this process, teachers must be able to improve students' mindsets by involving everyday life problems associated with theories to analyze information.

Each student has a different style of analyzing information. The differences arise from students' ways of thinking, student characteristics, and student learning styles (Khoirunnisa and Soro 2021). Different characters will lead to different learning styles in students and result in different ways of thinking. Based on learning modalities, there are three learning styles namely: The visual learning style is more dominant using the sense of sight, meaning that students must first witness factual evidence so that it is easier to understand the material and imagine what is being discussed (Deporter & Hernacki, 2016).

The sense of hearing is more dominantly used in the auditory learning style. It means that students must listen first so that it is easier to remember and understand information. The kinesthetic learning style prioritizes the senses of taste and physical movement in obtaining information, meaning that learning focuses on the senses of taste and physical movement so that students can easily receive material by doing activities.

If the teacher can pay attention to student learning styles, it is hoped that students can absorb the material to the maximum (Karunia 2016). Students who understand the material well will be able to understand the concept of the material being taught, especially mathematics material. Mathematics is a scientific discipline, which requires high reasoning and conceptual understanding skills. Understanding mathematical concepts is an ability to acquire mathematical knowledge and perform meaningful calculations while learning mathematics (Karim and Nurrahmah 2018). Therefore, understanding mathematical concepts is a student's ability to master the material in mathematics. One of the materials that require the ability to understand mathematical concepts is the circle equation material.

One of the mathematics learning materials that must be mastered by class XI students is the equation of a circle. By understanding the mathematical concepts in learning the equation of a circle, students are expected to be able to solve problems in everyday life. If students can understand mathematical concepts, students can solve these problems properly.

Based on the results of observations in the field, it shows that some students do not understand the circle equation material. This means that it can be said that some students still have difficulty solving questions related to the circle equation material, the problems given in the problem are related to how students determine the circle equation centered at $O(0,0)$, the circle equation centered on $P(a,b)$, and the position of the line concerning the circle. The other research with the same study was also conducted by (Alan and Afriansyah 2017; Apriliani 2020; Bonatua, Mulyono, and Febriandi 2021; Hidayati and Darmuki 2021; Karunia 2016; Kendal 2015; Sarniah, Anwar, and Putra 2019; Smp et al. 2019; Zulherman, Arifudin, and Pratiwi 2020)

Based on the above analysis, this study discusses how students' ability to understand mathematical concepts in the circle equation material in terms of learning styles. In addition, with the information regarding students' ability to understand mathematical concepts in this circle equation material, teachers can more easily determine learning strategies to improve students' understanding of mathematical concepts.

METHOD

This research is a qualitative descriptive type that used to describe or present an overview of the ability to understand mathematical concepts in the circle equation in terms of student learning styles. This research was conducted at Al Islam Krian High School in the 2022/2023 academic year. The selection of research subjects was carried out using a purposive sampling technique or a sample that aims as a way of taking the subject as a data source. The purposive sampling technique is a technique for determining several data sources with certain considerations. The subjects chosen by the researcher were three students of class XI MIPA II at SMA Al Islam Krian, each of whom had visual, auditory, and kinesthetic learning styles.

In this study, the data were obtained from a questionnaire on student learning styles and test questions for understanding the mathematical concept of the circle equation material according to the indicators. Previously the learning style questionnaire, test questions, and interview guidelines were tested for validity first. Next, give a learning style questionnaire and test the ability to understand concepts to class XI MIPA II students at SMA Al Islam Krian, then choose subjects from each learning style, and conduct interviews with the selected subjects. After that, the results of the data were analyzed by reducing data,

presenting data, and drawing conclusions. In data reduction stage, students are grouped into three types of learning styles, such as visual, auditory, and kinesthetic learning styles. Next, the data is presented in the form of a description of the ability to understand the concept of the circle equation in terms of student learning styles, then conclusions are drawn according to the results of the data analysis that has been described. In this study, the triangulation method was used to check the validity of data.

RESULT AND DISCUSSION

In this case, the results of the student learning style questionnaire and the test of the ability to understand mathematical concepts in the circle equation material that has been carried out, one subject is taken from each learning style. The test scores obtained from each learning style subject can be seen in the following table:

Table 1. Subject Test Result Scores

Subject	Learning Style	Test Score
FSA	Visual	92
ABU	Auditory	90
RRN	Kinesthetic	81

1. Subject With Visual Learning Style

FSA subjects are subjects who have a visual learning style. The results of tests and interviews of FSA subjects on were able to fulfill all indicators of understanding mathematical concepts. The results of FSA's answers in solving question no 1 on the indicator re-explain a concept and present the concept in various mathematical representation concepts, namely the FSA can determine the position of the line to the circle, namely the FSA states that it is possible that people who are walking are not infected. By first determining the equation of the circle and the equation of the line, then substituting the equation of the line into the equation of the circle to produce a quadratic equation and looking for the discriminant value so that the result is that the line does not cut the circle, meaning that the person walking is not infected with the patient's disease. Figure 1 shows the results of the FSA subject's work on the first question.

Figure 1. FSA Test Results at No. 1

Based on the interview results, information was obtained that FSA subjects could determine the position of the line to the circle and could also explain the steps in solving the problems in the problem.

2. Subject With Auditory Learning Style

ABU subjects are subjects who have an auditory learning style. ABU subjects have difficulty understanding the concept in number 3 there is an indicator of grouping objects and applying concepts or algorithms in problems solving. Based on the results of the ABU subject's answers to number 3, they were able to determine the position of the line to the

circle, but the ABU subject did not write down the equation of the line and was not precise in writing conclusions. The ABU subject stated that the two patients were not infected, which should be the conclusion from question number 3, that is, a person who is walking has no potential to be infected by one of these patients. Figure 2 shows the results of the ABU subject's work on the third question.

Figure 2. ABU Test Results at No. 3

Based on the results of the interviews, information was obtained that the ABU subject was able to explain and determine the position of the line to the circle, but was not quite right in drawing concluding. The following is an interview with ABU regarding question number 3.

Table 2. Results of the ABU Interview Question No. 3

Code	Interview Description
P3-W1	Pay attention to question number 3, what did you find in the question?
ABU3-W1	The area of patient A $x^2 + y^2 - 4x - 6y + 12 = 0$ and patient B $x^2 + y^2 + 4x - 4y + 7 = 0$, and the equation of a person walking $x - y = 1$
P3-W2	Please explain how you solve the problem.
ABU3-W2	Enter the formula into the regional equation A which results in $2y^2 - 8y + 9 = 0$ then enter it into the ddiscriminantformulaand get a value of $-8 < 0$ meaning the person has no potential
	Then to the region B equation, the result is $2y^2 + 2y + 12 = 0$ then enter the discriminant formula ,a nd the value $-92 < 0$ means no potential
P3-W3	What results/conclusions did you get?
ABU3-W3	Because the discriminant result is less than 0, the two patients are not potential

3. Subject With Kinesthetic Learning Style

RRN subjects are subjects who have a kinesthetic learning style. The RRN subject had difficulty understanding questions no. 1 and 2. Based on the results of answers to no. 1, the RRN subject was able to determine the position of the line to the circle, namely the RRN subject stated that people who were walking were unlikely to be infected. Figure 3 shows the results of the RRN subject's work on the first question.
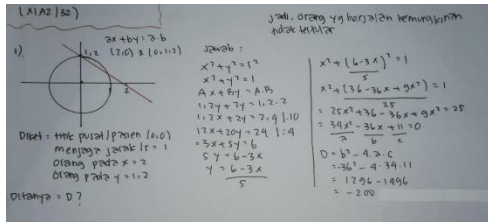
Figure 3. RRN Test Results in Problem No. 1

Based on the interview results, information was explained that the RRN subject had not been able to explain the position of the line to the circle properly, but the test results were correct. The following is an interview results with RRN regarding question number 1.

Table 3. RRN Interview Results Question No. 1

Code	Interview Description
P1	Solve/explain this problem using the shape of the position of the line that you know.
RRN1	I don't understand is, anyway this will be entered into this formula $x^2 + y^2 r^2$ and the result will be y =ed into the circ,l e equation and then look for the ddiscriminanttheresult is $D = -200$

In question no 2, the RRN subject can determine the general equation of a circle and can use the formula for the equation of a circle in (a, b). Figure 4 shows the results of the RRN subject's work on the second question.
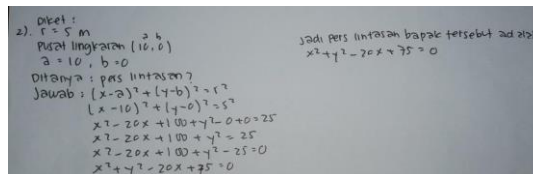

Figure 4. RRN Test Results in Problem No. 2

Based on the interview results, information was explained that the RRN subject was able to determine the general equation formula for a circle, but did not understand how to do it. The following is an interview results with RRN regarding question number 2.

Table 4. RRN Interview Results Question No. 2

Code	Interview Description
P2-W1	What did you find in this problem?
RRN2-W1	The father's track distance to the center of the pool is 5 meters, the child's distance to the center of the pool is 10 meters, and the center of the circle (10,0)
P2-W2	Can you understand the problem contained in the problem?
RRN2-W2	I understand, but I'm confused about how to do it, sis
P2-W3	How do you get the general equation of the circle?
RRN2-W3	anyway, according to the formula $(x - a)^2 + (y - b)^2 = r^2$ the formula is to find the path equation and you will find it $x^2 + y^2 - 20x + 75 = 0$

Based on the results of data, the following is a discussion of the ability to understand mathematical concepts in terms of student learning styles. Meanwhile, for the results of written tests and interviews with FSA subjects, subjects with a visual learning style are said to be able to meet the indicators of understanding the concept. The results of research conducted by researchers have similarities with the results of research conducted (Khoirunnisa and Soro 2021), namely the visual learning style that best fulfills all indicators of understanding the concept.

Subjects who have an auditory learning style, based on the results of written tests and interviews with ABU subjects, have difficulty understanding the concept in number 3, there are indicators of classifying objects and applying concepts or algorithms in solving problems. The results of research conducted by researchers indicate that ABU subjects can distinguish examples and non-examples of a concept and have not been able to classify objects according to the concept and apply the concept in solving problems, which is different from the results of research conducted by (Khoirunnisa and Soro 2021)shows that the subject is still unable to distinguish examples and non-examples of a concept.

Subjects who have a kinesthetic learning style, based on the results of written tests and interviews with RRN subjects, have difficulty understanding questions no. 1 and 2. The results of research conducted by (Khoirunnisa and Soro 2021) show that students with a kinesthetic learning style are still unable to distinguish between examples and non-examples. from a concept, and have not been able to apply algorithms using procedures and concepts in solving problems. The results of the research conducted by the researcher have similarities with the results of research conducted (Khoirunnisa and Soro 2021), namely that the subject is still unable to distinguish between examples and non-examples of a concept. In addition, the two studies have differences in that the results of research conducted by RRN subject researchers were able to apply algorithms using procedures and concepts in solving problems, while the results of research conducted by (Khoirunnisa and Soro 2021) showed that subjects were still unable to apply algorithms using procedures and concepts in solving problems.

CONCLUSION

Based on the results and discussion, it can be concluded that based on achievement indicators of understanding mathematical concepts, students who have a visual learning style can understand mathematical concepts well. Meanwhile, students with an auditory learning style are still unable to understand mathematical concepts, this is based on the achievement of indicators of understanding mathematical concepts because achievement indicators of understanding mathematical concepts do not approach the indicators, for example in restating and presenting concepts with mathematical representations, giving examples and non-examples of concepts, using and select a specific operation.

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