

# Analysis of Learning Difficulties of Mathematics for Vocational School Students in the 3T Area

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**Abstract.** This study aims to describe the mathematics learning difficulties of vocational high school students in the frontier, outermost and disadvantaged (3T) areas, especially in North Maluku Province, West Halmahera Regency. This type of qualitative descriptive research uses the results of questionnaires, observations, and interviews. The population in this study were students of class X TKJ, X Nautika Perkapalan, and X Asisten Keperawatan SMKS Fomarimoi for the academic year 2022/2023 as many as 19 students and 2 teachers. The results showed that the difficulties in learning mathematics for SMK students in 3T areas West Halmahera, were: (1) difficulties in understanding concepts; (2) difficulty in arithmetic operations; (3) difficulty in solving problems; (4) lack of self-awareness to learn mathematics; (5) low motivation to learn mathematics; (6) less able to determine the formula to be used; (7) facilities and infrastructure are still inadequate; (8) the ability of educators is still low; and (9) limited coverage of learning in 3T areas.

**Keywords:** Analysis, Math Learning Difficulties, 3T Area

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## INTRODUCTION

National education has the main goal of educating the life of the nation as stated in the opening of the 1945 Constitution. On the other hand, quality education must be equal in all regions in Indonesia (Putra et al, 2019). In a book written by Handoko (in Syafii, 2018) it is stated that underdeveloped areas are defined based on social, economic, cultural, and regional conditions (inter and intra-spatial functions both in natural aspects, human aspects, and population infrastructure). Determining lagging areas uses criteria based on 6 approaches, namely the community's economy, human resources, infrastructure, local financial capacity (fiscal), accessibility, and regional characteristics. West Halmahera Regency is one of the regions in Indonesia which is in North Maluku Province which is classified as the foremost, outermost and underdeveloped (3T) area.

Education in West Halmahera Regency is still a fundamental issue that needs to be considered, especially since the central government hopes for equal distribution of education in both urban and rural areas. The West Halmahera Regency area is considered to still have poor facilities and infrastructure, human resource (HR) skills, especially educator skills, are still low, and also the scope of learning is very limited. Local teaching methods without applying other models and methods make it increasingly difficult to align education with education in urban areas.

Mathematics is a field of exact science that is more concerned with student understanding than memorization. Mathematics plays a major role in preparing human resources (HR) to be able to face the challenges of the globalization era (Simbolon and Harahap, 2021). Mathematics is a very important field of science. According to Sitepu (2022), the purpose of learning mathematics is to improve students' abilities to develop, starting from understanding abilities to reasoning abilities. Almost all students from beginner to advanced levels, from elementary school, high school to college level, study mathematics. One of the secondary levels that study mathematics is a vocational high school (SMK).

So far, students have assumed that SMK is practice/implementation, not theory/concept. This triggers the formation of SMK thinking with low motivation for subjects that are not related to implementation. Vocational High School students are very enthusiastic when it comes to practical subjects because their minds have already been formed where Vocational students are oriented to the world of work. As a result, many vocational students ignore theorizing subjects. However, without them realizing it, the basis of all practice is theory and mathematics is the basis of all knowledge. But in fact, many think that mathematics is the most difficult subject for students to understand so far. This is what makes vocational students increasingly unmotivated in learning mathematics.

Learning difficulties are circumstances in which individuals cannot learn well. This individual disability is caused by disability which can come from within a person (internal) or from outside (external). This factor in a person is limited by intelligence, health, talents, interests, and motivation of a person. The external factors come from the person's environment such as the school environment, family environment, and community environment. This is supported by the opinion of Van Steenbrugge (in Pramesti and Prasetya, 2021) which states that learning difficulties can be divided into

two types, namely learning disabilities which lie in the cognitive development of the students themselves and learning difficulties caused by factors outside the students or problems other.

Students' learning difficulties in mathematics are associated with imperfect learning abilities. These deficiencies can be revealed from solving mathematical problems that are not complete or complete but wrong. This incompleteness can be suspected due to errors in the use of concepts and principles in solving the required mathematical problems (Laili and Puspasari, 2019). Students' learning difficulties will have an impact on student learning achievement because to obtain good achievements can be obtained from the treatment of learning at school and outside of school and on the conditions and efforts of students in (Jamal, 2014). In learning mathematics this also happens so it is important for teachers to understand students' difficulties in learning mathematics in order to improve the teaching and learning process in the classroom.

From the results of observations by researchers at a SMK in West Halmahera which is classified as a 3T area, where the math scores of class X students, especially TKJ, X Nautika Shipping, and X Nursing Assistants, are still lacking. Researchers got this information from the results of student report cards shown by the teacher. The researcher then conducted interviews with the teacher and the information that the researcher obtained was that students at the school had low awareness of learning mathematics and students needed to be constantly reminded and motivated by the teacher to learn. In addition, students are still unable to link new knowledge with old knowledge, causing misunderstandings and ambiguity related to what they learn. Students are also slow in doing calculations and many students do not understand how to use formulas in math practice exercises.

Based on the background above, it is necessary to know the mathematics learning difficulties of SMK students, especially in the outermost, outermost and disadvantaged (3T) areas, especially in West Halmahera Regency and how efforts are made to overcome these learning difficulties.

## **RESEARCH METHOD**

The type of research conducted by researchers is descriptive qualitative research, which aims to describe the difficulties of learning mathematics for Vocational High School students in the 3T area. Qualitative research is research that intends to understand phenomena about what is experienced by research subjects, for example behavior, perceptions, motivations, actions, etc., holistically and by means of descriptions in the form of words and language in a special natural context by utilizing various scientific methods (Utari et al, 2019).

This research was conducted at Fomarimoi Vocational School, West Halmahera Regency. The data collection technique used in this study was distributing questionnaires to students, observing, and then conducting direct interviews with teachers and students of class X TKJ, X Nautika and X Nursing Assistants at SMKS Fomarimoi. The population in this study were students in class X TKJ, X Nautika and X Nursing Assistants for the 2022/2023 school year with a total of 19 students and 2 teachers.

The questionnaire was made to see the form of learning difficulties in mathematics based on the scope of mathematics studies proposed by Jemaris (in Cahirati et al, 2020) that mathematics should include three elements, namely concepts, skills and problem solving. Observations of students were made to measure the level of students' difficulty in learning mathematics. Meanwhile, interviews were made to examine more deeply the forms of students' learning difficulties in mathematics in the learning steps along with the causal factors. In this study, data analysis from questionnaires, observations, and student interviews was carried out using steps according to Miles and Huberman (in Cahirati et al, 2020), namely data reduction, data presentation, and drawing conclusions.

## RESULT AND DISCUSSION

### Difficulties in Learning Mathematics for Students

Respondents were asked to choose one of the four alternative choices in the statement regarding students' learning difficulties in mathematics which were reviewed from internal factors as well as from external environmental factors as shown in Table 1 below.

Table 1. Indicators of Students' Learning Difficulty in Mathematics

No	Indicator	Respondents			
		TA	A	D	TD
1	Mathematics is not a difficult subject for me	-	9	8	2
2	Math is so boring	2	6	6	5
3	The atmosphere in the class supports the process of learning mathematics	3	11	5	-
4	I feel less able to learn mathematics	3	7	7	2
5	Mathematics has many formulas that make math lessons difficult	4	9	5	1

TA= Totally Agree; A= Agree; D= Disagree; TD= Totally Disagree

Based on Table 1 above, there are 5 indicators of students' learning difficulties in mathematics in the 3T area. As many as 13 students (68.3%) considered learning difficulties in mathematics because mathematics has many formulas. This is shown by 9 respondents (47.3%) who agreed and 4 respondents (21%) who strongly agreed with statement number 5. In addition, as many as 10 students (52.5%) stated that they were less able to learn mathematics. This is shown by 7 respondents (36.8%) who agree and 3 respondents (15.7%) strongly agree with statement number 4. Furthermore, as many as 10 students (52.5%) think that mathematics is a difficult subjects. This is shown by 8 respondents (42%) who disagreed and 2 respondents (10.5%) who strongly disagreed with point 1.

From the results of observations in the classroom, the cause of students' learning difficulties in mathematics is also due to their low knowledge of the arithmetic operations of addition, subtraction, multiplication, and division. In addition, many students do not understand how to enter formulas in math exercises. Difficulties in arithmetic operations can occur because students make mistakes in operating numbers incorrectly. From the results of interviews with teachers, the

information that researchers received was that students in this school still had low awareness of learning mathematics and students needed to be constantly reminded and motivated by teachers to learn. Furthermore, students are unable to link new knowledge with old knowledge, causing misunderstandings and ambiguity regarding what they learn.

#### Student's Motivation to Study

Further analysis provides details regarding student motivation in the 3T areas of North Maluku province, West Halmahera Regency as shown in Table 2 below.

Table 2. Student's Motivation to Study (n=19)

No	Indicator	Respondents			
		TA	A	D	TD
1	Mathematics is a subject that I like	6	4	6	3
2	Mathematics is an important subject	9	9	-	1
3	By studying mathematics I feel that I will become a successful person	5	10	3	1
4	I am always excited when studying mathematics at school	5	6	5	3
5	I feel math is very useful for me	9	8	1	1
6	I need a study buddy when studying math	5	9	3	2
7	I feel I can understand math material faster than my friends	4	5	8	2
8	I often read math books while studying at home	1	7	5	6

TA= Totally Agree; A= Agree; D= Disagree; TD= Totally Disagree

From Table 2 above there are 8 indicators related to motivation to learn mathematics in which the level of students' motivation to learn mathematics will have a significant influence on students' learning difficulties in mathematics. As many as 14 (76.3%) students will have difficulty learning mathematics if they are not accompanied by cool friends. This is shown by 5 respondents (26.3%) who strongly agreed and 9 respondents (47.3%) who agreed with statement number 6.

On the other hand, students' lack of digital mathematics literacy also shows a lack of motivation to learn mathematics and interest in mathematics. This can be seen from 11 (57.8%) students who read less math books while at home with details of 5 respondents (26.3%) who disagreed and 6 respondents (31.5%) who strongly disagreed with statement number 8.

From the results of observations, the researchers also found that the low awareness of students in learning mathematics can be seen from environmental factors such as when the teacher is not in class, many students skip classes, they do not take the initiative to learn on their own.

### The Learning Process of Vocational High School Students in 3T Regions

Further analysis provides details regarding the learning process of SMK students in the 3T area of North Maluku province, West Halmahera Regency as shown in Table 3 d below.

Table 3. The learning process in the classroom (n=19)

No	Indicator	Respondents			
		TA	A	D	TD
1	I always pay attention to the math teacher who is explaining in front of the class	8	6	3	2
2	I rarely pay attention to the teacher when giving material during the lesson	-	8	8	3
3	In order to make mathematics learning more interesting, other learning media besides books are needed	5	10	4	-
4	Schools and teachers provide additional learning facilities when there is material that I don't understand	3	12	2	2
5	I don't understand the teacher's explanation in class during the material	1	9	9	-
6	I do the assignments given by the teacher	10	3	3	3

TA= Totally Agree; A= Agree; D= Disagree; TD= Totally Disagree

From Table 3 above, it is found that the greatest difficulty for students in the mathematics learning process is that students still have difficulty with the teacher's explanation regarding the material being taught. This can be seen from as many as 10 (52.5%) students who did not understand the teacher's explanation with the details of a respondent (5.2%) who strongly agreed and 9 respondents (47.3%) who agreed with point 5's statement. The second thing that becomes a difficulty for students in the process of learning mathematics is that some students still pay less attention to the teacher when learning takes place. This is shown from 8 students (42.1%) who agree with the statement in point 2.

From the results of observations, researchers found that one of the causes of students' learning difficulties in mathematics was that there were still many teachers who used lecture models and methods in learning mathematics. The selection of learning models and methods must, of course, be in accordance with the peculiarities of mathematics learning material so that students can understand the material well explained. From the results of student interviews it was also found that the cause of students' learning difficulties in mathematics was the lack of learning media used by the teacher when teaching so that students had difficulty understanding the material.

## Discussion

### 1. Difficulties in Learning Mathematics for Students

Learning difficulties are not experienced only by students with below average abilities but can be experienced by students with any level of ability from any group or group. The levels and types of sources of difficulty vary (Putra, 2019). Concept learning difficulties experienced by students can be due to various factors. Another factor that influences the development of students' skills is the location of education in the 3T areas (frontier, outermost, and lagging). According to Husamah (in Azhimuh et al, 2021) the factors that cause learning difficulties include difficulties in focusing attention, difficulties in remembering, and difficulties in perception.

Vocational High School in West Halmahera in class X TKJ, X Nautika and X Nursing Assistant, has 19 students and almost all students have difficulties in learning mathematics. Difficulties in learning mathematics experienced were difficulties in understanding concepts, difficulties in arithmetic operations (addition, subtraction, multiplication and division), and difficulties in solving problems. From the results of the study it was also obtained that students' learning difficulties were caused by self-learning difficulties, namely a lack of self-awareness to learn mathematics because they considered that mathematics was very difficult.

Students' learning difficulties in arithmetic operations occur because students make mistakes in operating numbers correctly. This difficulty was obtained from the results of researchers' observations when learning the material of linear equations of two variables. Also from the interview results, students revealed that the difficulties faced by students in arithmetic were caused by a lack of numeracy skills. Students admit that they often experience difficulties in counting, especially when it comes to negative numbers and fractions. According to Jemaris (in Cahirati et al, 2020) one of the difficulties in learning mathematics is a weakness in arithmetic caused by misreading symbols and operating numbers incorrectly. To minimize errors due to not being careful, the way that can be done is to increase practice.

Students' learning difficulties in mathematics are also caused by students not being able to apply existing formulas. From the results of the interviews, students revealed that they were confused by the many formulas that they forgot and even had difficulties in determining which formula to use. Forgetting a formula can be interpreted as not understanding the material. From the data obtained it is known that students who have difficulty applying the formula are students with low abilities. This is in line with the results of Apriliawan's research (in Pramesti and Prasetya, 2021) which states that students with low mathematical abilities tend to make mistakes in solving problems. Errors made can come from errors in calculations, determining relevant data, or applying the appropriate formula.

Based on this description, it can be obtained that the difficulties in learning mathematics for vocational students in the 3T area, especially in West Halmahera Regency, are caused by several factors, both internal and environmental factors. Another factor is the development of students' skills in the 3T areas, namely inadequate facilities and infrastructure, low teacher skills, and limited learning coverage.

## **2. Student's Motivation to Study**

From the results of the study it was found that the learning motivation of students in the 3T area in West Halmahera Regency was still lacking which resulted in low student learning outcomes as well. Motivation is a desire and an important thing for a person to be able to carry out a certain activity so that enthusiasm for work or study increases and can also be interpreted as a driving force in students so that they are able to bring up learning activities (Nurfallah and Pradipta, 2021).

From the results of the questionnaire, it was found that most of the SMK students in West Halmahera did not like mathematics and were not enthusiastic about learning mathematics. This is due to the students' views of mathematics who think that mathematics is difficult. From the results of the study it was also found that the lack of students' mathematical literacy resulted in lower motivation to learn mathematics. Furthermore, based on interviews with students, it was found that students thought that the teacher focused more on writing on the blackboard without using the right media or visual aids so that learning was not conveyed properly which resulted in students not understanding what was explained.

Someone who has a high intensity of learning motivation, the learning outcomes obtained will also be higher, while someone who has less intensity of learning motivation, the learning outcomes obtained are also not good (Sholihah and Kurniawan, 2016). From the results of the interviews it was also found that the low awareness of students in learning mathematics resulted in minimal student motivation and would certainly affect student learning outcomes.

Based on this research, it can be obtained that the motivation to learn mathematics for Vocational High School students in the 3T area, especially in West Halmahera Regency, is still low, so it needs to be increased again so that difficulties in learning mathematics can be minimized and students' learning outcomes will increase.

## **3. The Learning Process of Vocational High School Students in 3T Regions**

In the learning process, motivation can be said to be one of the dynamic aspects which is so important because motivation is able to direct each individual in making a decision so that the desired goals can be achieved (Nurfallah and Pradipta, 2021). Students' mathematical abilities are still low because they consider mathematics to be a complicated subject. Many students do not play an active role in learning mathematics so that the process of learning mathematics fails to develop their creativity which results in poor student learning outcomes in mathematics.

From the results of the questionnaire, it was found that the learning process for SMK students in West Halmahera was still not going well because most students still did not understand the teacher's explanations caused by the model and learning method that used the lecture method. From the results of the study it was also found that students still paid less attention when the teacher explained and the lack of learning media used. Facilities and infrastructure at SMKs in 3T areas are also lacking so that the learning process does not run optimally.

Based on this research, it was found that the learning process of SMK students in the 3T area, especially in West Halmahera Regency, had not gone well due to



students not paying enough attention when the teacher explained and the way the teacher explained was not well understood. In addition, adequate facilities and infrastructure still need to be improved.

#### **4. Efforts to Overcome Learning Difficulties for Vocational High School Students in 3T Regions**

After identifying the difficulties faced by students and the factors that cause them, then we will discuss ways to overcome learning difficulties for vocational students in the 3T area, especially in West Halmahera Regency. Analysis of how to overcome learning difficulties for SMK students in the 3T area is carried out by describing the results of interviews on the research topic. Efforts that can be made to overcome the learning difficulties of SMK students are as follows.

- a. Increase student learning motivation  
Providing student motivation is very important in learning mathematics because with encouragement from within themselves, teachers, and parents, students want to learn and will have a high awareness to continue learning mathematics.
- b. Increasing the number of practice questions  
It is better for the teacher to provide more practice questions for students who have difficulty learning mathematics because through practice students will understand better. The additional practice questions that are given do not have to be completed in class and can be given as homework to determine the level of development of students' skills.
- c. Apply appropriate learning models and methods  
Teachers need to apply appropriate learning models and methods according to the characteristics of the material being taught through creative, effective, useful, and fun collaborative learning for students so that students are able to understand the material better.
- d. Cooperate with parents.  
Parents have an important role in motivating students. Students who are well cared for in the family are more motivated to study at school. For this reason, parents should always keep an eye on how their child's learning is progressing. Accompanying children studying at home is a form of parental concern for their children because if children have learning difficulties, parents can guide children so that children understand the problem.
- e. Using the right media.  
The use of appropriate media is very important in learning mathematics so that the delivery of teaching materials to students can be maximized.

#### **CONCLUSION**

Based on the analysis of the results of questionnaires, observations, and interviews, it was concluded that the difficulty of learning mathematics for Vocational High School students in the 3T area was still relatively high. The results showed that the difficulties students experienced in learning mathematics were difficulties in understanding concepts, difficulties in arithmetic operations, and difficulties in solving problems. As for student learning difficulties caused by self-difficulty factors,

namely a lack of self-awareness to learn mathematics because they think that mathematics is very difficult, low motivation of students in learning mathematics, and students are less able to determine the formula to be used. Student learning difficulties are also viewed from environmental factors such as family environment, school environment, and community environment. Another factor that affects the development of students' skills is the location of education in the 3T areas (frontier, outermost and disadvantaged) where facilities and infrastructure are still inadequate, the ability of teaching staff is still low, and also limited learning coverage.

Efforts made to overcome these learning difficulties are 1) increasing student motivation; 2) multiply practice questions; 3) apply creative, effective and fun learning models and methods; 4) cooperate with parents of students; and 5) using props that are easy to understand. This study provides an overview of the difficulties in learning mathematics for SMK students in the 3T area which provides valuable information to further improve the learning process in West Halmahera Regency.

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