The analysis of dyscalculia that referred to the learning style of fleming and mills theory on matrix materials of MAN 1 Metro students

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Abstract. This study aims to: (1) Investigate the learning problems from students, (2) To know the learning styles of students, (3) To identifies the dyscalculia experienced by students on matrix based on their learning styles of Flaming and Mills Theory. The subject of research are students of MIA 6 MAN 1 Metro grade XI, in the 2018-19 Academic Year. The research uses descriptive qualitative method. The results of this research are: (1) the students of class XI MIA 6 had four difficulties of learning mathematics such as (a) spatial disruption: not describing the steps of operating on the answers done, (b) the difficulty of understanding the concept: not making the problem answer correctly, (c) the difficulty of understanding the formulas or symbols: the incomplete of writing formulas the use of false step and the use of wrong formulas and symbols, and (d) the difficulty in calculation: the lack of students accuracy during the operation of the work; (2) students of class XI MIA 6 have four styles (VARK) they are Visual (V): 8 students, Audiotori (A): 13 students, Read-Write (R): 7 students, and Kinesthetic (K): 8 Students, and found students who have combined learning styles of Audiotori and Read-Write (AR): 2 students, Audiotori, Read-Write and Kinestetik (ARK): 1 student, and Visual, Audiotori, Read-Write and Kinestetik (VARK): 1 student; (3) The difficulties of learning mathematics experienced by students are also attributed to their V-A-R-K learning style; Visual students (V): spatial disruption and difficulty of understanding formulas or symbols. Audiotori Students (A): spatial disruption, the difficulty of understanding concepts, and calculations. Read-Write student (R): spatial disruption and the difficulty of understanding formulas or symbols. And Kinestetich students (K): spatial disruption, the difficulty of understanding concepts, formulas or symbols and calculations.

1. Introduction

Mathematics is a school subject which had been considered not as a counting and working with the formula or numbers for the most people. The students complaint that mathematics is difficult, scary and boring. The scary title of mathematics, makes concern for students' mathematics learning achievement. Related to the regulation of the Minister of National Education No. 22 of 2006 regarding Standard Content, students as objects of education must be able to have five (5) abilities in
understanding mathematics such as: (1) to understand mathematical concepts; (2) to use reasoning on patterns and traits; (3) to solve problems that include the ability to understand the problems; (4) to communicate ideas with symbols, tables, diagrams, or other media to clarify the situation or problem; and (5) have an attitude of appreciating the usefulness of mathematics in life [3]. With the five (5) capabilities the students as objects of education and the symbol of the success of a learning required to be able to succeed the problem of success in learning mathematics.

The fact, shows that the problem of success in learning mathematics cannot be solved by students. This is based on the results of the pre-survey interview conducted to one of the MAN 1 Metro math teacher Dra. Srimulyani the data obtained from the odd semester midterm mathematics test results in XI MIA class (Mathematics and Natural Sciences) 6 MAN 1 Metro 2018-19 academic year with Minimal Completeness Criterion which is set in MAN 1 Metro for class XI Mathematics subjects is ≥ 76. Here is the results of the odd midterm mathematics test for class XI MIA 6 MAN 1 Metro students in 2018-19 academic year listed on the Table 1.

| No | Value | Information       | Frequency | Percentage (%) |
|----|-------|-------------------|-----------|----------------|
| 1  | ≥ 76  | Complete          | 5         | 12.5%          |
| 2  | < 76  | Not finished yet | 35        | 87.5%          |
|    |       | Amount            | 40        | 100%           |

The table shows that only 5 students completed or by 12.5% and unfinished there are 35 students or 87.5%. From the results of the odd midterm math test students of class XI MIA 6 MAN 1 Metro 2018-19 Academic Year there are so many students who haven't finished. Based on the results of the interview with class XI MIA 6 students, that matter due to the occurrence of learning difficulties in students especially in understanding mathematics. Difficulties in learning mathematics that are being experienced by these students called dyscalculia. Department for Education and Skills London, the definition of dyscalculia to include difficulties with the concept of numbers, or with the rote mechanism of learning maths, such as number rules and facts [5]. Based on the statement, learning difficulties mathematics includes difficulties with the concept of numbers, or with memorization techniques in learning mathematics, like the number rule and the facts. Undecidable, the problems of learning comes due to the miss understanding of the students. Basically learning difficulties according to the result of mathematics teacher at MAN 1 Metro The results of the pre-survey interview stated that: Most students generally have difficulty learning mathematics in applying concepts or the formula in the given problem, even more when the teacher gives a slightly different problem with examples of questions that have been given or already in the book, and the most often is the lack of accuracy of students when calculating problem solving operations.

But the learning difficulties according to students of class XI MIA 6 MAN 1 Metro based on results of the pre-survey interview stated that "generally students have difficulty in applying existing material concepts, and students often do not understand the purpose of the questions given and what formula should be used in solving the problem ". It shows that the results of the midterm mathematics test results in odd semester XI MIA 6 MAN 1 Metro students in 2018-19 Academic Year the level of mastery of students in mathematics is still low or completeness has not been reached yet. Based on the results of the interview and observation on students after being given an odd midterm math test, it appears that material that is difficult for students is the matrix. This material is taught to students at MAN 1 Metro class XI odd semester. This matrix material includes: matrix operations, find a determinant of the matrix, look for inverse matrix and determine matrix transforms with order more than 2 x 2. In study each student has a different learning style. Learning style is a combination from how
one absorbs, ability to regulate and manage information [7]. One learning style theory that becomes a concern to the education field is the Flaming and Mills theory learning style, which this theory categorizes learning styles into 4 categories namely: visual learning styles, auditory, read-write, kinesthetic known by the abbreviation V-A-R-K.

Related to the learning styles of a person has, entitled journal Student Performance Evaluation Based on Smartphone Technology Using the Modified TASK-TECNOLOGY FIT Method, VARK Learning Styles is a concept that understands the characteristics of student learning styles consisting of Visual (vision), Aural / Auditory (hearing), Read / Write (read / write), Kinesthetic (direct practice). Each student has their own learning style in understanding the material obtained. Based on the data characteristics of a person's learning style will be aligned with the use of technology in completing tasks to have a positive effect on improving performance [2]. Based on the journal above shows that A person's learning style can be categorized into four abbreviated with V-A-R-K learning style (Visual, Aural / Auditory, Read / Write, and Kinesthetic). Differences in student learning styles can be understood from the process of teaching and learning activities in the classroom. From the results of the pre-survey observations class XI MIA 6 students with a total of 40 students and 3 (three) observers, obtained learning activity data or Student learning styles in class are presented in the following Table 2.

| Table 2. Student observation result data for class XI MIA 6 MAN 1 Metro. |
|-----------------------------|-----------------------------|
| Student activities in class | The number of students |
| During the learning process in class students prefer to do activities that lead to bad things and disrupt the process of ongoing learning activities such as; chatting, disturbing other friends who are next to him, sleep, leaving class too often, and eating and drinking in class. | 15 students |
| Students during the learning process in class more active and pay more attention to the teacher when the learning process when the teacher makes an illustration or a description of the material being studied on the board. | 7 students |
| During the learning process in class student pay more attention to the teacher when teaching by conveying it verbally they listen to be able to understand it. | 3 students |
| During the learning process in class students often write what they have read from the teacher's writing on the board and from books into written form and pictures that they have understood by themselves. | 10 students |
| During the learning process in class students prefers to form small groups to discuss when the learning process takes place so they exchanged information or questions concerning the lesson. | 5 students |

According to the data in the table the results of observations of class XI MIA 6 MAN 1 Metro students above, seems clear that there are a variety of student learning styles in the class, even though they go to school or even sitting in the same class. One's ability to understand and absorbing lessons has certainly different levels. Therefore they have to take different ways to be able to understand information or same lesson.

The research problem formula is: (1) What are students the learning problems?, (2) What is the student learning style?, (3) What learning difficulties do students experience on the matrix material with their learning style?. The aims of the study are: (1) Investigate the learning problems from students, (2) To know the learning styles of student, (3) To identifies the dyscalculia experienced by students on matrix based on their learning styles of Flaming and Mills Theory.
2. Method
The approach used in this study is a qualitative approach to the type of descriptive qualitative research, this study uses 2 instruments namely main instruments and assistive instruments. In this research, the researcher becomes the main instrument of the study. It becaused the researchers use qualitative research, so in collecting research data, the researchers directly to the field and tasked with finding accurate data about learning difficulties of students learning styles observed of class XI MIA 6 MAN 1 Metro on the matrix material. So researchers must attend in the series looking for data in the field. While assistive instruments in this study were questionnaire sheets, test questions, and in-depth interviews.

The data in this study are test results and results of in-depth interviews obtained from the informants and respondents surveyed, in the form of student learning difficulties found by their learning styles they have. Sources of qualitative research data are subjects from which obtained data [1]. As for the subjects of this study were students of class XI MIA 6 MAN 1 Metro. In taking data sources in this study, The technique used is purposive sampling. Purposive sampling is a data source sampling technique with certain considerations [6]. So population of this study were all students of class XI MIA 6 MAN 1 Metro, totaling 40 students. Then from this population the researchers determined 12 students as samples in the study taken based on the classification of V-A-R-K learning styles. Each type of learning style is represented by 3 students with a single learning style.

Activities of qualitative data analysis are carried out interactively and continues until the end, so the data is already finished. The stages in data analysis include data reduction, data display, and conclusion drawing / verification [6]. In this research, the stages in the data analysis process are: (1) data reduction; to do summarizing activities, to choose the main things, to focus on the things that are important and to discard unnecessary data that has been obtained. So that researchers will get a clearer picture and make it easy to do further data collection. In this research The data reduced is the result of the acquisition of a student learning style questionnaire that has more than one learning style and test results and the students interview whichs not problem reseach. (2) data display; in this qualitative study the presentation of data in a descriptive form, so that it will be easier to understand. In this case The researcher will present a description of the results of the analysis of students' learning difficulties such as: 1) Spatial disruption, 2) The difficulties of understanding concepts, 3) The difficulties of understanding formulas or symbols, and 4) The difficulties in calculations, class XI MIA 6 MAN 1 Metro matrix material in the V-A-R-K learning style category. And (3) conclusion drawing / verification; research results obtained from the entire analysis process then concluded in a comparative descriptive manner by looking at the data found. Initially unclear conclusions will increase to be more detail. "Final" conclusions will arise depending on the size of the collection of field notes, the coding, storage, and the search method used, and research skills, but these conclusions have often been formulated beforehand.

3. Research Result and Discussion
Before seeing the learning difficulties experienced by students, The researcher used the VARK Questionnaire Version (7.8) Learning Style questionnaire for Younger People to find out the most dominant category of student learning styles to be used as a subject in research [4]. Learning Style Questionnaire The VARK Questionnaire Version (7.8) for Younger People was distributed to 40 students of class XI MIA 6.

The results of students' learning style category data obtained from 40 class XI MIA 6 students were obtained by distributing a questionnaire consisting of 16 multiple choice questions with 4 answer choices. Each part of the answer to each question questionnaire contains categories of learning styles that are randomly placed and different between one problem with another problem. The following table presents the results of the analysis of the V-A-R-K learning style category for class XI MIA 6 MAN 1 Metro students:
Table 3. Analysis of V-A-R-K learning style category students in class XI MIA 6 MAN 1 Metro

| No | Types of Learning Style Categories | The number of students |
|----|-----------------------------------|-----------------------|
| 1  | V                                 | 8 students            |
| 2  | A                                 | 13 students           |
| 3  | R                                 | 7 students            |
| 4  | K                                 | 8 students            |
| 5  | VA                                | 0 student             |
| 6  | VR                                | 0 student             |
| 7  | VK                                | 0 student             |
| 8  | AR                                | 2 students            |
| 9  | AK                                | 0 student             |
| 10 | RK                                | 0 student             |
| 11 | VAR                               | 0 student             |
| 12 | VAK                               | 0 student             |
| 13 | VRK                               | 0 student             |
| 14 | ARK                               | 1 student             |
| 15 | VARK                              | 1 student             |

Total Number of Students 40 students

Description Type Category Learning Style:
V: Visual, A: Auditory, R: Read-Write, K: Kinesthetic, VA: Visual dan Auditory, VR: Visual dan Read-Write, VK: Visual dan Kinesthetic, AR: Auditory dan Read-Write, AK: Auditory dan Kinesthetic, VAR: Visual, Auditory dan Read-Write, VAK: Visual, Auditory dan Kinesthetic, VRK: Visual, Read-Write dan Kinesthetic, ARK: Auditory, Read-Write dan Kinesthetic.

Based on the results of research, shows that students in class XI MIA 6 MAN 1 Metro 2018-19 Academic Year have four styles (VARK) they are Visual (V): 8 students, Auditory (A): 13 students, Read-Write (R): 7 students, and Kinesthetic (K): 8 Students, and found students who have combined learning styles of Auditory and Read-Write (AR): 2 students, Auditory, Read-Write and Kinesthetic (ARK): 1 student, and Visual, Auditory, Read-Write and Kinesthetic (VARK): 1 student.

Based on results of the types of learning styles for each student in class XI MIA 6, Furthermore, researchers selected 12 students randomly as subjects in the study, each type of V-A-R-K learning style is represented by 3 students. In this research, The researcher did two subjects. Taking the first subject is done to 12 students who have low levels of mathematics learning achievement in the classroom, and taking the second subject is done to 12 students who have a level of learning achievement in mathematics in the classroom. Based on research data, the selected students as subjects in this study are the students with learning styles V-A-R-K, each learning style represented by 3 students namely V4, V5, V6, A4, A5, A6, R4, R5, R6, K4, K5, and K6.

The students learning difficulties data of class XI MIA 6 were obtained by teacher-made tests and in-depth interviews with 12 research subjects, consisting of 3 students with a dominant visual learning style (V), 3 students with auditory dominant learning style (A), 3 students with a dominant read-write learning style (R), and 3 students with dominant kinesthetic learning style (K). Students who have learning difficulties can also be identified by an analysis of incorrect answers and the questions that were not answered by students on the mathematics test matrix material which amounted to 3 essay questions. Based on test data obtained by researchers, The researcher used question number 2 and question number 3 to be used as data to be discussed in this study. The use of question number 2 and
number 3 used as a discussion data because questions number 2 and problem number 3 are questions that are done by all students the tested with a variety of difficulties they experienced.

The difficulty of learning mathematics itself in this study can be categorized into 4 groups. The category of learning difficulties includes spatial disruption, the difficulties of understanding concepts, the difficulties of understanding formulas or symbols, and the difficulties in calculations. Based on the results of research that has been done, shows that students in class XI MIA 6 MAN 1 Metro 2018-19 Academic Year in general experiencing four difficulties learning mathematics which include; 1) spatial disruption: not describing the steps of operating on the answers done, 2) the difficulty of understanding the concept: not making the problem answer correctly, 3) the difficulty of understanding the formulas or symbols: the incomplete of writing formulas the use of false step and the use of wrong formulas and symbols, and 4) the difficulty in calculation: the lack of students accuracy during the operation of the work.

This is due to the lack of ability in students so students feel hampered in working on problems that result in various kinds of learning difficulties. The learning difficulties in mathematics are most often experienced by students in class XI MIA 6 MAN 1 Metro 2018-19 Academic Year is spatial disruption. This is caused by a lack of student understanding with the intention of the matter and not describing the steps of operating on the answers done. Difficulties in learning metamorphism experienced by students of class XI MIA 6 MAN 1 Metro 2018-19 Academic Year also occur because of errors made by researchers when making orders about tests, so the purpose of the questions made by the researcher cannot be understood by students when working on the test questions.

The specifically learning difficulties experienced by students with the learning styles they have are:

**Students with a Visual Learning Style (V)**

This learning style is generally called as an observational learning style. This observation style relies heavily on the sense of sight (eye) in the learning process [7]. From the data of V4, V5, and V6 students described above, it can be concluded that students with Visual learning styles (V) has two difficulties learning mathematics in the form of; 1) spatial disruption spatial because of the three students V4, V5, and V6 in working on the problem does not describe in full the operating steps that are done on the answers written, and 2) the difficulty of understanding the formulas or symbols That is because the three students are V4, V5, and V6 in working on the problem, do not write the inverse matrix formula and its solution clearly and incorrectly give a negative symbol (-) the answer to the problem that should be positive (+). Whereas the difficulty of understanding the concept and calculation were only experienced by V4 students and not experienced by students V5 and V6 so that students in the Visual learning style (V) are considered to have no difficulty because it is only experienced by one student.

**Students with Auditory Learning Styles (A)**

Auditory learning styles are usually referred to as auditory learning styles. Children who have this learning style generally maximize the use of the sense of hearing (ears) in the process of capturing and absorbing information [7]. From the A4, A5 and A6 student data described above, it can be concluded that students with Auditory learning styles (A) have three difficulties in learning mathematics; 1) spatial disruption spatial it is because the three students A4, A5, and A6 in working on the problem does not describe in full the operating steps that are done on the answers written, 2) the difficulty of understanding the formulas or symbols That is because the three students are A4, A5, and A6 in doing the problem do not write the inverse matrix formula and multiplication formula and addition to the problem being worked on, besides that students also incorrectly give a negative symbol (-) the answer to a problem that should be positive (+), and 3) the difficulty in calculation caused by the lack of accuracy of students at the time of operation of the questions done. As for difficulties understanding the concept only experienced by A4 students and not experienced by A5 and A6 students so the
Audiotori learning style students (A) are considered not to experience these difficulties because they are only experienced by one person.

**Students with Read-Write Learning Styles (R)**

In addition to learning styles that emphasize aspects of listening, there is also a learning style that has more aspects to reading and writing. For someone who has a Read-Write learning style like this he will more easily understand learning material by reading or writing [2]. From the R4, R5 and R6 student data described above, it can be concluded that students with Read-Write (R) learning styles have two difficulties in learning mathematics; 1) spatial disruption it is because of the three students R4, R5, and R6 in working on the problem does not describe in full the operating steps that are done on the answers written and in working on the problem there are answers that are not written by students, and 2) the difficulty of understanding the formulas or symbols That is because the three students are R4, R5, and R6 in working on the problem do not write the answer to the calculation of the multiplication formula (X) on the answer made on the problem and student error in writing negative symbol (-) in the answer in operation. Whereas the difficulties of understanding concepts are only experienced by R5 students and are not experienced by R4 and R6 students so that students are in the style of Read-Write learning (R) considered not experiencing these difficulties because only experienced by one person. And for difficulties in calculating the three students R4, R5, and R6 did not experience it so for students in the style of Read-Write (R) learning did not experience these difficulties.

**Students with Kinesthetic Learning Styles (K)**

Kinestetsi learning styles are usually also referred to as movers learning styles. This is because children with this learning style always use and utilize limbs in the learning process or in an effort to understand something [7]. Students with kinesthetic learning styles in class XI MIA 6 MAN 1 Metro have the most difficulty learning mathematics, that is due to the lack of classroom learning activities that involve students in practicing directly in understanding the material being studied. From the K4, K5 and K6 student data described above, it can be concluded that students with Kinesthetic learning styles (K) have four difficulties in learning mathematics; 1) spatial disruption it is caused of the three students K4, K5, and K6 in working on the problem does not describe in full the operating steps that are done on the answers written, 2) the difficulty of understanding the concept it is caused by students not making the correct answer to the problem because they do not understand the operation steps of the problem being worked on, 3) the difficulty in understanding the formula or symbol is caused by the three students K4, K5, and K6 in working on the problem do not write the inverse matrix formula and solve it clearly and the multiplication formula and the sum of the questions being worked on, besides that students also incorrectly give negative symbols (-) answers to questions that should be positive (+), and 4) difficulty in calculation due to the lack of accuracy of students at the time of operation of questions about lack of accuracy of students at time of operation of questions and pengoprasian problems that are not appropriate in doing.

4. **Conclusion and Suggestion**

Based on the results of the study can be concluded as follows:

a. The students of class XI MIA 6 had four difficulties of learning mathematics such as (1) spatial disruption: not describing the steps of operating on the answers done, (2) the difficulty of understanding the concept: not making the problem answer correctly, (3) the difficulty of understanding the formulas or symbols: the incomplete of writing formulas the use of false step and the use of wrong formulas and symbols, and (4) the difficulty in calculation: the lack of students accuracy during the operation of the work.

b. Students of class XI MIA 6 have four styles (VARK) they are Visual (V): 8 students, Audiotori (A): 13 students, Read-Write (R): 7 students, and Kinesthetic (K): 8 Students, and found students
who have combined learning styles of Audiotori and Read-Write (AR): 2 students, Audiotori, Read-Write and Kinestetik (ARK): 1 student, and Visual, Audiotori, Read-Write and Kinestetik (VARK): 1 student.

c. The difficulties of learning mathematics experienced by students are also attributed to their V-A-R-K learning style;

1) Visual students (V): spatial disruption and difficulty of understanding formulas or symbols.
2) Audiotori Students (A): spatial disruption, the difficulty of understanding concepts, and calculations.
3) Read-Write student (R): spatial disruption and the difficulty of understanding formulas or symbols.
4) Kinesthetic students (K): spatial disruption, the difficulty of understanding concepts, formulas or symbols and calculations.

The suggestions in this study are: (1) the teachers should be able to implement learning strategies using methods that are able to facilitate the four V-A-R-K learning styles; (2) the schools should be able to provide learning media that is suitable for each student's V-A-R-K learning style, so the teacher can implement a variety of appropriate learning strategies; and (3) visual students can learn by doing more practice questions, have a complete notebook, and always try to be present in learning activities. Auditory students must ask more questions, discuss, and study in groups with friends to have better understanding the lesson. For students who read-write should learn more to have textbooks, reading textbooks, and has a complete notebook. And kinesthetic students should learn by doing practice directly so that it is easier to receive information (subject matter) delivered by the teacher.

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