DIFFERENCES IN MATHEMATICS LEARNING OUTCOMES OF STUDENTS WITH HIGH SCHOOL LEVEL VISUAL, AUDITORIAL AND KINESTHETIC LEARNING STYLES

Yulia Utami
Informatics techniques, STMIK Pelita Nusantara, Medan, Indonesia,
E-mail: yuliautami@gmail.com

ABSTRACT
This study aims to determine differences in mathematics learning achievement of students who have visual, auditory, and kinesthetic learning styles. The type of research used is Causal-Comparative and ex-post-facto. The population of this study was students of the private high school local government of Langkat Bahorok which consisted of 6 classes. The sample of this research was students of class X, XI, and XII, each consisting of 25 people so that the total sample was 75 students. Based on the results of the study, it was found that students' learning styles for visual learning styles were 30 people, auditory 25 people, and kinesthetic 20 people. The average mathematics learning achievement for students who have a visual style is 6.4 with a standard deviation of 0.768; The average auditory learning style was 7.34 with a standard deviation of 0.914 and the average kinesthetic learning style was 5.825 with a standard deviation of 0.912. To test the hypothesis, the F test was used and obtained Fcount > Ftable = (17.466 > 3.13) so that it was concluded that the average mathematics learning achievement of students who had visual, auditory, and kinesthetic learning styles was significantly different.

1. INTRODUCTION
Improving the quality of human resources is a must for the Indonesian nation, especially in the era of globalization which demands the readiness of each nation to compete freely. In the era of globalization, only nations with high quality can compete or be competent in the free market. Education has a very important role in producing complete Indonesian human resources, both individually and as a society. The development of the times always raises new challenges, some of which are often unpredictable. As a logical consequence, education is always expected to be responsive to these new problems. Therefore, it is appropriate that the development of the education sector is a top priority that must be done by the government. Many efforts have been made by the government to improve the quality of the results of this field. Efforts made by the government include increasing the level of teacher education to a higher level, updating the curriculum, improving educational facilities and infrastructure, upgrading teachers, using methods, teaching approaches, carrying out research, and increasing the quality and quantity of textbooks. [1]–[5]

Many factors can affect the low student achievement. Among other things, in the learning process that uses inappropriate methods, lack of understanding and mastery of subject matter, inaccurate way of presenting lessons, lack of attention to student learning styles (modalities), and individual differences in the teaching and learning process. As stated by Hutagaol (1992): "The factors that cause low student learning include: (1) The teaching system is less effective, less efficient, and less arousing student
learning which results in low student achievement. (2) The quality of the teaching design that does not attract students' interest in learning can lead to low student achievement. [6], [7]

Meanwhile, according to DePorter "One of the causes of low student achievement is the mismatch between student learning styles and teacher teaching styles". Education in Indonesia uses a class system where each class requires a teacher. So in a teaching and learning situation, the factors that can affect student achievement need to be known by the teacher. One of them is that the teacher must pay attention to the different ways of learning students. Following that stated by[8]. that "Every human being has a different way of learning. Some people may find it easier to remember what they read. While some others may find it easier to remember what they heard. "While Siddidjaja stated:" Teachers must also adapt their teaching styles to the learning styles of the majority of their students, even though each child has their learning style. Some like to listen to a lot of material in the form of theory, some prefer practicum and not a few who like physical activity. Some understand faster, some are slower. [9], [10] The teacher then has to evaluate the progress of their students every time to monitor whether the more applied methods are effective or not. Less effective presentation of material can make students unable to accept and understand the subject matter. Because basically everyone learns in different ways. It has been stated above that one of the factors that are thought to cause low student achievement is the student learning modality (style) factor. [11]–[14]

2. METHOD

1) Research Population
The population in this study were 241 high school students with this study sample of 75 people drawn from each class consisting of 3 classes, each of which numbered 25 people.

2) Type of Research
This type of research is Causal-Comparative, and is ex-post facto. This means that in this study, researchers collected data after all events took place.

3) Research Design
In this study, the samples that have been determined are divided into three groups. Group A are students who have a visual learning style, group B are students who have an auditory learning style and group C are students who have a kinesthetic learning style. The research design is presented in the following table:

<table>
<thead>
<tr>
<th>NO</th>
<th>LEARNING STYLE</th>
<th>ACHIEVEMENT</th>
<th>TREATMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Visual</td>
<td>K₁</td>
<td>P₁</td>
</tr>
<tr>
<td>2</td>
<td>Auditory</td>
<td>K₂</td>
<td>P₂</td>
</tr>
<tr>
<td>3</td>
<td>KINESTHETICS</td>
<td>K₃</td>
<td>P₃</td>
</tr>
</tbody>
</table>

4) Data Collection Tools
The instruments used to collect data needed in this study were questionnaires and tests. Questionnaire is an instrument to determine student learning styles. This questionnaire consists of 12 questions for each learning style, so the total number of questions is 36 questions taken from the book (Genius Learning by Adi Gunawan) and tested, so there is no need to look for validity anymore because it is considered to meet the validity of the content. Each question is given a score of 1 for those who answered "yes" and a value of 0 for those who answered "no". To determine students' mathematics learning achievement, tests were used. The test used is a multiple-choice test, totaling 25 questions which are expected to represent the entire material to be measured. The material being tested is class VII material consisting of factorization of algebraic terms, functions, and graphs of functions, straight-line equations, two-variable system of linear equations, and Pythagoras' argument. Before the test questions were given to the research sample, they were tested for validity and reliability.
3. RESULTS AND DISCUSSION

3.1 Results

Testing the validity and reliability of the test was carried out on grade VII students at high school. After testing 25 mathematics questions, it turned out that 20 items were declared valid, 5 items were declared invalid and the test was reliable (complete calculation according to provision 4). Thus valid items were used as research instruments to collect data on mathematics achievement in high school students.

1. Description of Student Learning Style
The research sample was given a student learning style questionnaire to determine the style of each student. It turns out that from the results of the questionnaire it was found that there were no students who were absolute on one learning style. But generally, students have all three learning styles (visual, auditory, and kinesthetic), it's just that students tend to one learning style. A summary of the results of the calculation of high school students' learning styles is presented in Table 2 below:

<table>
<thead>
<tr>
<th>NO</th>
<th>STUDENT LEARNING STYLES</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Visual</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Auditory</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>Kinestetik</td>
<td>20</td>
</tr>
<tr>
<td>JUMLAH</td>
<td></td>
<td>75</td>
</tr>
</tbody>
</table>

Based on Table 2, the most dominant learning style in high school is the visual learning style, which is 30 people, the second is the auditory learning style, which is 25 people and the least learning style is the kinesthetic learning style, which is 20 people consisting of 75 people.

2. Description of Student Learning Achievement

After the data on student mathematics learning achievement is tabulated based on the learning style of each student, it can be seen that the lowest score, the highest score, the average and the standard deviation of the students' mathematics learning achievement. This data can be seen in the table below:

<table>
<thead>
<tr>
<th>NO</th>
<th>LEARNING STYLES</th>
<th>FREQUENCY</th>
<th>AVERAGE</th>
<th>MIN VALUE</th>
<th>MAKS VALUE</th>
<th>STANDARD DEVIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Visual</td>
<td>30</td>
<td>6.4</td>
<td>5.0</td>
<td>8.0</td>
<td>0.768</td>
</tr>
<tr>
<td>2</td>
<td>Auditory</td>
<td>25</td>
<td>7.34</td>
<td>6.0</td>
<td>9.0</td>
<td>0.914</td>
</tr>
<tr>
<td>3</td>
<td>KINESTETIK</td>
<td>20</td>
<td>5.825</td>
<td>4.5</td>
<td>8.0</td>
<td>0.912</td>
</tr>
</tbody>
</table>

Based on Table 3, the highest average student mathematics learning achievement is students who have an auditory learning style of 7.34 with a standard deviation of 0.914 then followed by students who have a visual learning style with an average of 6.4 with a standard deviation of 0.768 and The lowest average learning achievement is students who have a kinesthetic learning style of 5.825 with a standard deviation of 0.912.

3. Data tab for ANAVA

The summary of the calculation results is presented in Table 5 below:

<table>
<thead>
<tr>
<th>NO</th>
<th>STATISTICAL UNIT</th>
<th>VISUAL LEARNING STYLES</th>
<th>AUDITIORIAL LEARNING STYLES</th>
<th>KINESTHETIC LEARNING STYLES</th>
</tr>
</thead>
</table>

Jurnal Science is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0)
Based on table 5, the average mathematics learning achievement of students who have a visual learning style is 6.4 with 30 students, total student scores = 192, total student squares = 1246.50, and standard deviation = 0.768 and the variance = 0.5898. The average mathematics achievement for students who have an auditory learning style is 7.34 with 25 students, total scores = 183.5, total squares of student scores = 1367.75 and standard deviation = 0.914 and variance = 0.8354. The average for students’ mathematics learning achievement who have a kinesthetic learning style of 5.825 with 20 students, the total student score = 116.5 the total number of squares of student scores = 695.25 and the standard deviation = 0.912 and the variance = 0.8317.

3.2 Discussion

Based on the results of the study, it was found that the dominant learning style of high school students for the whole was a visual learning style of 30 people, then followed by an auditory learning style of 25 people and the last one was a kinesthetic learning style of 20 people. The good mathematics learning achievement of students are students who have an auditory learning style with an average of 7.34, then followed by students who have a visual learning style with an average of 6.4 and the lowest are students who have an average kinesthetic learning style. 5.825.

4. CONCLUSION

The most dominant learning style in SMA is the visual learning style of 30 people, the second is the auditory learning style, which is 25 people and the least learning style is the kinesthetic learning style, which is 20 people. The best mathematics learning achievement is students who have an auditory learning style with an average of 7.34, the second is the average student who has a visual learning style of 6.4 and the lowest are students who have a kinesthetic learning style with an average of 5.825. The average mathematics learning achievement of students who have visual, auditory, and kinesthetic learning styles differ significantly.

REFERENCE


