THE INFLUENCE OF LEARNING STYLE ON MATHEMATICS LEARNING ACHIEVEMENT AMONG 10TH GRADE STUDENTS OF MAN 4 CENTRAL MALUKU, INDONESIA

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ABSTRACT
This study examined the influence of learning styles on mathematics learning achievement of 10th grade students in MAN 4, Central Maluku. Learning styles included visual learning style, auditory learning style, and kinesthetic learning style. This ex-post facto study was conducted using a quantitative approach, which data were analyzed using multiple linear regression analysis. This study was conducted from April 2 to April 9 2018 in MAN 4, Central Maluku. The population in this study amounted to 57 students consisting of 2 classes, namely class X MIA and X IIS. Samples were selected from the whole population. Questionnaires and documentation were used as data collection instruments. The results of the data analysis showed a positive relationship between learning styles on learning achievement, with a value of 0.060 and an effect of 0.4%. Even though the influence was weak, learning styles still influence students' mathematics learning achievement. Since the significance value was set at >0.05, H0 was accepted and H1 was rejected. Therefore, learning styles had no significant influence on the mathematics learning achievement of 10th grade students in MAN 4 Central Maluku.

KEYWORDS
Learning Styles, Learning Achievement, Visual, Auditory, Kinesthetic

INTRODUCTION
There are many factors influencing learning achievement which are worth studying. Learning style is one’s by birth attribution. Hence, teachers need to consider students’ internal factors as they can influence the learning process. In general, learning style can be categorized into 3 namely, visual, auditory and kinesthetic learning styles. This study was conducted to determine the effect of different learning styles on student achievement. The results of this study can be used as insights to design proper teaching methods that can accommodate different learning styles.

Madrasah Aliyah Negeri 4 Central Maluku is an Islamic state-owned school. The school is located in Rajawali Village, Banda District, Central Maluku Regency, and this school is the only state-owned Islamic high school in the area. Based on observations and researchers’ teaching experiences in schools, especially in MAN 4 Central Maluku, some students had difficulties in catching up with the lessons, which ultimately impacted their learning outcomes. Students also often found it difficult to adjust their learning methods with the teaching methods used in the school. Whilst at home, students sometimes were forced to learn based on parents' learning rules at home. This phenomena intrigued the researchers to investigate how influential learning styles on one’s learning achievement. Despite no scientifically-valid evidence available, learning
styles theoretically plays an important role in relation to learning outcomes. As explained by Bobbi DePorter and Mike Hernacki in his book entitled Quantum Learning, "Learning styles are the key to developing performance in work, school, and in interpersonal situations.” Thus, learning styles will affect ones’ capability in receiving and processing information which eventually affect their achievements.

LITERATURE REVIEW

Learning Styles
As defined by Sugihartono et al. (2007: 53), learning styles are a collection of personal characteristics that make learning effective for some people and ineffective for others. Furthermore Depoter (2015: 110) stated in several elementary and secondary schools in America that teachers actually notice that everyone has an optimal way and different learning styles. Knowledge about different learning styles helps teachers to successfully approach all or almost all students only by conveying information in different styles.

Deporter & Hernacki (2015: 110) said in some elementary and secondary schools in America said that teachers notice different learning styles. They understand that some students need to be taught other ways than standard teaching methods. If these students are taught using standard methods, they are less likely to understand the materials. Knowing these different learning styles helps teachers everywhere to approach all or almost all students only by conveying information in different ways.

In addition, Deporter (2005) categorized learning styles into three, namely visual, kinaesthetic, and auditory learning styles.

Visual Learning Style
Visual learning style emphasizes visual activities. Students with this learning style need to see concrete evidence first before they are able to understand certain material. Visual learners have strong needs to see and capture information visually before they understands it. They learn through pictorial material. In addition, they are sensitive to color, besides having a sufficient understanding of artistic issues. On the other hand, they find it difficult to understand dialogue directly as they are not good at understanding verbal suggestions and often misinterpret words. Bobi Deporter & Mike Hernacki (2015: 116) mentioned some characteristics of visual learners as follows.

a. Always neat and orderly
b. Talk fast
c. Have good long-term management and plans
d. Attention to details
e. Attention to look, both in terms of outfit or presentation
f. Good speller and are able to see words in their mind
g. Tend to remember what is seen better than what is heard
h. Memorizing through visual association
i. Not easily distracted by noises
j. Having difficulties in remembering verbal instruction, unless it is written. They often ask for others help to repeat it.
k. Fast and keen reader
l. Prefer reading to being read
m. Like to write doodles when they are talking or listening
n. Rather use short answers such as yes or no to questions
o. Prefer demonstrating to talking
p. Prefer arts to music
q. Often know what should be said, but are not good at selecting words
r. Often lose concentration when they want to pay attention
s. Visuals help them memorize things better

Teachers are encouraged to adjust their teaching methods to visual learners by:
   a. Using symbols in explaining concepts
   b. Encouraging students to strengthen their conceptual comprehension using symbols/colors
   c. Providing them with key words to be later defined in their own language
   d. Using colors, graphs, tables as learning media

**Kinesthetic Learning Style**
Kinesthetic learning style is characterized by activities of moving, working and touching. This type of learner is unique as they fond of moving around, sensory activities, and touching. These learners find it difficult to sit still for hours because their desire for activity and exploration is very strong. Deporter & Hernacki (2015: 118-119) mentioned the characteristics kinesthetic learners including;
   a. Talk slowly
   b. Attention to physical motion
   c. Easily distracted by noise
   d. Touching others to attract their attention
   e. Always being physic-oriented and move a lot
   f. Have strong muscles
   g. Learning through manipulation and practices
   h. Memorizing well while walking and seeing
   i. Using fingers as pointers while reading
   j. Using a lot of gestures
   k. Finding it hard to sit still for long time
   l. Always want to do lots of stuffs
   m. Love busy games

Teachers can adjust their teaching methods to fit kinesthetic learners by:
   a. Using attractive learning media to grow their curiosity
   b. Sitting or standing beside them when providing personal assistance
   c. Determining clear rules regarding movements in the classroom
   d. Giving clear demonstration of concepts for students to gradually understand the concepts
e. Talking to each student personally in the class
f. Using drama/simulations

**Auditory Learning Style**
Auditory learners have the ability to absorb audio information. Appropriate learning methods for these learners is related to the need for attention to learners’ physical conditions. Auditory learners learn faster from verbal discussion and listening to teachers’ explanation. Deporter & Hernacki (2015: 118) mentioned the characteristics of auditory learners as follows.

a. Easily distracted by noises
b. Self-talking while working
c. Making lips movement and say the written text in the book while reading
d. Fond of reading out loud and listening
e. Good ability to recall words and imitating tones
f. Having difficulties in writing, yet good at story telling
g. Talking in patterned tones
h. Usually are fluent speakers
i. Prefer music over art
j. Learning by listening and memorizing what is discussed instead of what is seen.
k. Talk active, love discussions and explaining things thoroughly
l. Better at reading out loud than writing things down
m. Prefer spoken humor than reading comics

Teachers can adapt their methods to fit auditory learners by:

a. Using varied intonation in giving explanation including different tones, volumes or rate of speech.
b. Using repetitions to explain concepts
c. Providing/being peer-partner
d. Putting the concepts into songs
e. Using music as intermezzo

**Learning Achievement**
Suyono & Hariyanto (2014) associated learning achievement as the level engagement in the teaching and learning process as a result of evaluations conducted by the teacher or the abilities of students after experiencing certain learning experience. According to Nasution (1996, in Yasa, 2008), learning achievement is the perfection achieved from thinking, feeling and doing. Learning achievement is considered perfect if it fulfills three aspects namely: cognitive, affective, and psychomotor. On the other hand, achievement is less satisfying if targets within these three criteria are not achieved.

In general, factors affecting learning can be categorized into three as follows.

a. Internal factors which refer to students’ physical and mental conditions.
b. External factors, referring to factors around students.
c. Approach to learning which deals with learning efforts including learning strategies and methods used in learning (Qomariah: 2010).

**RESEARCH METHOD**
This study is an ex-post facto study which involved 10th grade students amounting to 57 students of MAN 4 Central Maluku as population and samples at the same time. The variables of this study consisted of the independent variable (X), namely learning style and the dependent variable (Y), namely student achievement. Multiple linear regression dummy variables, namely variable $X_1$, variable $X_2$, while learning achievement (Y) is the dependent variable. The multiple linear regression formula used is shown as follows.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2$$

Note:
- $Y$ = dependent variable (learning achievement)
- $\beta_0$ = constants
- $\beta_1, \beta_2$ = regression coefficient
- $X_1 = \begin{cases} 0, \text{visual style} \\ 1, \text{others} \end{cases}$
- $X_2 = \begin{cases} 0, \text{auditory style} \\ 1, \text{others} \end{cases}$

Questionnaires were used to identify students’ learning styles, while academic rapports were the source of data regarding learning achievement. Statistical hypotheses proposed in this study are as follows.

1. $H_0 = \beta_1 = 0$
   There is no significant influence of visual learning style and other learning style on learning achievement.
   $H_1 = \beta_1 \neq 0$
   There is a significant influence of visual learning style and other learning style on learning achievement.

2. $H_0 = \beta_2 = 0$
   There is no significant influence of auditory learning style and other learning style on learning achievement.
   $H_1 = \beta_2 \neq 0$
   There is a significant influence of auditory learning style and other learning style on learning achievement.

$H_0$ is accepted at sig $> 0.05$.

**RESEARCH RESULTS AND DISCUSSIONS**

**The Learning Styles of 10th Grade Students of MAN 4 Central Maluku**

There were three learning styles found in this study including visual, auditory, and kinesthetic learning styles. Learning style data were obtained from questionnaires distributed to all 10th grade students of X MAN 4 Central Maluku in two classes, namely class X MIA and class X IIS with a total number of students of 57 students. The data interpreted from questionnaires are presented Table 1.

<table>
<thead>
<tr>
<th>Number</th>
<th>Learning Style</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Visual</td>
<td>23</td>
</tr>
</tbody>
</table>

Table 1. Identification of Students’ Learning Styles
Learning style is cognitive, affective and psychomotor behavior traits which is a stable indicator for learners to feel interconnected and react to the learning environment (NASSP in Ardhana and Willis, 1989: 4). Learning style is a born trait that cannot be changed. Therefore, it is important to be aware of ones’ self-modality from how they absorb and process information.

The results of this study showed that out 57 students, 23 students were identified as visual learners, 13 students were auditory learners and 21 kinesthetic learners. This data show that the majority of students had visual learning style.

### Learning Achievement of 10th Grade Students of MAN 4 Maluku Tengah

Data of students’ learning achievement were obtained from the odd semester academic rapports for mathematics. All students obtained good grades based on the assessment criteria. The learning achievement of the students is presented in the frequency distribution table as shown in Table 2.

<table>
<thead>
<tr>
<th>Results</th>
<th>Xi</th>
<th>Fi</th>
<th>Xi fi</th>
<th>Σfi</th>
<th>Lower Limit</th>
<th>Upper Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>71 – 72</td>
<td>71.5</td>
<td>20</td>
<td>1430</td>
<td>20</td>
<td>70.5</td>
<td>72.5</td>
</tr>
<tr>
<td>73 – 74</td>
<td>73.5</td>
<td>1</td>
<td>73.5</td>
<td>21</td>
<td>72.5</td>
<td>74.5</td>
</tr>
<tr>
<td>75 – 76</td>
<td>75.5</td>
<td>1</td>
<td>75.5</td>
<td>22</td>
<td>74.5</td>
<td>76.5</td>
</tr>
<tr>
<td>77 – 78</td>
<td>77.5</td>
<td>24</td>
<td>1860</td>
<td>46</td>
<td>76.5</td>
<td>78.5</td>
</tr>
<tr>
<td>79 – 80</td>
<td>79.5</td>
<td>9</td>
<td>715.5</td>
<td>55</td>
<td>78.5</td>
<td>80.5</td>
</tr>
<tr>
<td>81 – 82</td>
<td>81.5</td>
<td>2</td>
<td>163</td>
<td>57</td>
<td>80.5</td>
<td>82.5</td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
<td></td>
<td>4317.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Values of mean, median, and modus were then calculated from the above data, which results are shown as follows.

- Mean = 75.74
- Median = 76.8
- Modus = 77.7

In this study, students’ learning achievement was assessed based on the reference assessment or *penilaian acuan patokan* (PAP) proposed by Arikunto (2010) as follows.

<table>
<thead>
<tr>
<th>Score</th>
<th>Criteria</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>81 – 100</td>
<td>Very Good</td>
<td>2 students</td>
</tr>
<tr>
<td>61 – 80</td>
<td>Good</td>
<td>55 students</td>
</tr>
<tr>
<td>41-60</td>
<td>Fair</td>
<td>-</td>
</tr>
<tr>
<td>21 - 40</td>
<td>Poor</td>
<td>-</td>
</tr>
<tr>
<td>0 – 20</td>
<td>Very Poor</td>
<td>-</td>
</tr>
</tbody>
</table>
Learning achievement is one’s outcome after learning, both inside and outside of school. Student achievement data in this study were obtained from students’ score on mathematics for 2019/2020 school year. After being analyzed, it can be concluded that the learning achievement of MAN 4 Central Maluku students is categorized very good and good. There were 2 students obtained scores which were categorized very good, and the rest 55 students had good scores.

The data obtained in this study indicated that the learning achievement of 10th grade students of MAN 4 Central Maluku is categorized good. Whilst, the descriptive statistics of the group data based on the Benchmark Reference Assessment (PAP) according to Arikunto (2010) showed mean score of 75.74 (good), median score of 77 (good) and mode score of 78 (good). It can be seen that students’ learning achievement varied based on their knowledge and comprehension.

The Correlation between Students’ Learning Style and Learning Achievement
There were three learning styles found among students which attributed to different learning achievement in students.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Visual</th>
<th>Auditory</th>
<th>Kinesthetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Good</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Good</td>
<td>22</td>
<td>13</td>
<td>20</td>
</tr>
<tr>
<td>Fair</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Poor</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Very Poor</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23</strong></td>
<td><strong>13</strong></td>
<td><strong>21</strong></td>
</tr>
</tbody>
</table>

There are 23 visual learners, one of which obtained very good score, while the rest obtained good scores. All 13 students who were identified as auditory learners obtained good scores. Whereas, out of 21 students identified as kinesthetic learners, 1 student obtained very good score, while the other 20 had good scores. The visual learner student and kinesthetic learner student both obtained scores of 82.

Hypotheses Testing
The hypothesis of this study was proposed as “there is a significant influence of learning style on mathematics learning achievement of 10th grade students of MAN 4 Central Maluku”. This hypothesis was then tested using SPSS version 16.0 application.

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.060a</td>
<td>.004</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), X2, X1
As shown in Table 5, there is a relationship between learning style and mathematics learning achievement with R value of 0.060. R value ≠ 0 shows a positive yet insignificant influence. The determination value of learning styles on learning achievement indicates an influence equal to 0.004 x 100% = 0.4%, even though the influence is very small. The determination value can be seen in the R Square column in the Model Summary table.

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>T</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Constant) 76.493 1.355</td>
<td>Beta -0.063 -0.417 -0.311</td>
<td>56.465</td>
<td>.000</td>
</tr>
<tr>
<td>X1</td>
<td>-.416 .998</td>
<td>-.417</td>
<td>678</td>
<td></td>
</tr>
<tr>
<td>X2</td>
<td>-.363 1.166</td>
<td>-.311</td>
<td>757</td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: LEARNING ACHIEVEMENT

For the estimated regression line $Y = 76.493 - 0.416 X_1 - 0.363 X_2$ where $X_1$ value is 0 for visual learning style and 1 for other learning styles means auditory and kinesthetic learning styles while for $X_2$ is 0 for auditory learning styles and 1 for auditory learning styles and 1 for learning styles learning other means for visual and kinesthetic.

The significant coefficient for $X_1$ is 0.678 and 0.757 for $X_2$ is (shown in the sig column in the Coefficientsa table. The significance values for $X_1$ and $X_2$ which are greater than 0.05 accept the H0, while H1 is rejected. Therefore, there is no significant influence between learning style on student learning achievement.

This study indicates an influence between learning style and learning achievements because the class consisted of students with different learning styles. Hence, it is assumed that when a teacher gives explanation based on only one learning style or focuses on one learning style, the teaching would only fit certain students, allowing these students to learn better. As explained by previous researchers, there is a significant influence between learning styles on achievement. On the contrary, other researchers found a positive and strong relationship between learning styles and learning achievement with sig. 0.060.

For inferential statistics on multiple linear regression analysis $Y = 76.493 -0.416 X_1 - 0.363 X_2$, the estimated regression line with $X_1$ coefficient of -0.416 indicates that the visual learning style is better than the other learning styles. The $X_2$ coefficient of -0.336 shows that auditory learning style is better than other learning styles.

For $X_1$, the first two values are 0 for visual learning styles and 1 for auditory learning styles and kinesthetic learning styles.

If $X_1 = -0.416 \times 0 = 0$ for visual learning style

Then $\beta_0 = 76.493 - 0 = 0$
If $X_1 = -0.416 \times 1 = -0.416$  
for auditory and kinesthetic styles

Then $\beta_0 = 76.493 - 0.416 = 76.077$

$X_2$ have two scores, 0 for the auditory learning style and 1 for visual and kinesthetic learning styles.

If $X_2 = -0.363 \times 0 = 0$  
for auditory learning style

Then $\beta_0 = 76.493 - 0 = 76.077$

If $X_2 = -0.363 \times 1 = -0.363$  
for visual and kinesthetic styles

Then $\beta_0 = 76.493 - 0.363 = 76.13$

Based on the explanation above, the researcher can conclude that by comparing the two coefficients $X_1$ and $X_2$, visual learning style is better than the other learning styles. Because auditory learning styles is more attractive than visual learning style.

It can be concluded that there is an influence of learning styles on students' mathematics learning achievement yet the influence is insignificant because the significance value $> 0.05$. Therefore, $H_0$ is accepted and $H_1$ is rejected, implying that learning styles do not have general effect on the mathematics learning achievement of 10th grade students of MAN 4 Central Maluku because the influence is very small at 0.4%.

**CONCLUSION**

Regarding the research questions and hypotheses as well as the results of the data analysis, conclusions are drawn as follows.

1. Out of 57 students, 23 students had visual learning style, 13 students had auditory learning style, and 21 students had kinesthetic learning style.
2. The learning achievements of students involved in this study were categorized into two: very good and good. Based on these two categories, 2 students were in the very good category and 55 students were in the good category. Based on these results, students' achievement is regarded good.
3. Based on the results and discussions, there is an influence of learning style on students' mathematics learning achievement but at insignificant rate as the influence is only 0.04%. This means that the learning styles do not affect the students' mathematics learning achievement. Therefore, $H_0$ is accepted and $H_1$ is rejected.
Suggestions
Suggestions were proposed based on the findings of this study as follows.
1. By seeing the very small influence of learning styles on student achievement, found in this study requires teachers to pay more attention to other factors that might affect students’ learning achievement in order to improve the education quality of MAN 4 Central Maluku.
2. Considering that this research is only a regression study, it is challenging to investigate further whether learning styles will indeed affect student achievement. Therefore it is necessary to conduct experimental study on this matter. Thus, educators will be ensured about the contribution of learning styles and other factors to students’ learning achievement.

REFERENCES