

## **Relationship between learning styles and learning achievement in mathematics based on genders**

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**ABSTRACT:** This study was a descriptive study using cross sectional design. The aims of this research were to examine the relationship between learning styles and learning outcomes by gender. The population in this study were all students in 1st year of SMAN 1 Galesong Selatan, Indonesia, in the 2014/2015 academic year. The instruments used in this research was the test of modalities learning styles (TMLS), to determine whether the students' learning styles are visual, auditory and kinaesthetic (VAK), and documentation. The relationship between learning styles and learning outcomes were analysed with the chi-square test and two-way ANOVA. The results of this study showed that 1) the learning styles of visual and auditory learning styles is dominated by women; and 2) there is no relationship between the variables of learning styles, genders and interaction of learning styles with genders to learning achievement.

### INTRODUCTION

It is important to support the future with education in the current era. A good future will be secured if someone has a good education and skills. To reach a higher standard of education, students need many adaptations before mastering an advance cognitive skill [1].

In the process of learning, each person has specific learning characteristics. The characteristics of each person are different. One of the distinct characteristics is learning style. Learning styles are associated with the ability to absorb and process the results of learning acquired by a student. Learning style is an important factor for determining the outcome of student learning. Learning style is the way the nature of the individual is involved in them acquiring and absorbing information in their environment. Learning styles affect the students' learning process so that it can be used as a consideration in designing learning [2].

Learning style is an important modality in the learning process. Modalities are often associated with learning styles. The modalities are usually associated with how students use their senses in the learning process. In general, there are three types of modalities; namely, visual, auditory and kinaesthetic [3][4]. Important polemic discussions have been aware of gender differences in cognitive mapping that reflects the ability to reproduce the spatial environment and objects [5]. Gender differences in mathematics is somewhat controversial, but there is considerable evidence that shows that men often outperform women on tests of mathematics achievement, particularly at high school and among the university population [6-10].

### LITERATURE REVIEW

#### Learning Styles

The development of one's personality usually depends on learning styles and is often influenced by environmental, emotional, social influence and individual feelings. How to learn is different for each person. Some learners need to see more; some need to hear, and some have to do something to the body using a series of activities. Rahman et al stated that in general, the learning style of each person consists of three types of visual style, auditory style and kinaesthetic style [2]. The types are as follows:

Visual learning style. Rahman et al said that the visual learning style is a learning style through which people learn best when they see images of what they are learning; they are oriented to printed text and can learn through reading [2]. Visual learners think in pictures and learn best through visual images. Individuals who have a visual learning style are well marked with behavioural characteristics as follows:

- neat and tidy;
- speaking quickly;
- planner and regulator of long-term is good;
- meticulous to detail;
- concerned with the appearance, both in terms of clothing and presentation;
- good speller and can see the actual words in their minds;
- given what is seen rather than what is heard [11].

Auditory learning style. Rahman et al said that auditory learning style is a learning style in which people learn better when they hear what they are learning [2]. Individuals who have an auditory learning style are well marked with behavioural characteristics as follows:

- talking to yourself at work;
- easily distracted by a commotion;
- they move their lips and read out loud when reading;
- glad to read aloud and listen;
- can repeat back and mimicked the tone, rhythm and timbre;
- find it difficult to write, but great storytelling;
- speaking in a patterned rhythm [11].

Kinaesthetic learning style. Kinaesthetic learning style is a style of learning by engaging, moving, experiencing and experimenting [12]. Individuals who have a kinaesthetic learning style are well marked with behavioural characteristics as follows:

- speak slowly;
- responding to physical attention;
- touching people to get their attention;
- stand close when talking to people;
- always physically oriented and a lot of moves;
- has the early development of large muscles;
- learning through manipulating and practices [11].

## METHOD

This study was a descriptive study using cross sectional design. The population in this study were all students in 1st Year of SMAN 1 Galesong Selatan, Indonesia, in the 2014/2015 academic year. The random sampling method was used in this study, and there were 34 students in the sample. Instruments used in this research were the test of modalities learning styles (TLMS) to determine whether the students' learning styles are visual, auditory and kinaesthetic (VAK), and documentation. The relationship between learning styles and learning outcomes was analysed with the chi-square test and two-way ANOVA.

## RESULT AND DISCUSSION

Based on results of the test of modalities learning styles, the student's learning style can be seen in Table 1 and Figure 1.

Table 1: Result of results of the test of modalities learning styles.

Style	Male		Female		Total	
	N	Pearson	N	Pearson	n	Pearson
Visual	7.00	41.18	3.00	17.65	10.00	29.41
Auditory	10.00	58.82	7.00	41.18	17.00	50.00
Kinaesthetic	4.00	23.53	3.00	17.65	7.00	20.59
Total					34.00	100.00

From the test results (Table 1 and Figure 1), it can be seen that from the 34 students who did the test, ten students (29.41%) have a visual learning style, seven students (20.59%) have an auditory learning style, and 17 students (50%) have a kinaesthetic learning style. From the results of this test it also seems that the visual and auditory learning styles are dominated by women, in the sense that female students are more likely to like learning from graphs, charts, flow diagrams, speech and hearing.

This is in agreement with the results of research conducted by Kharb et al [13] and also Csapo and Hayen [14]. Kharb et al said that a significantly higher number of female students prefer auditory learning styles compared to male

students [13]. Furthermore, Csapo and Hayen said that female students scored higher in the strength of visual and auditory learning styles over male students [14].

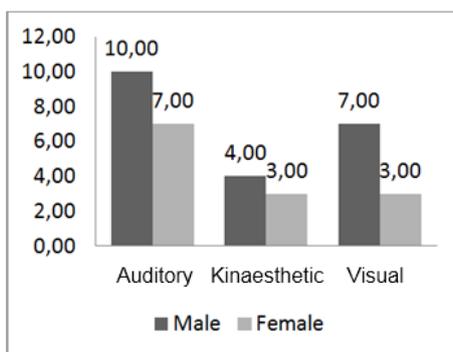


Figure 1: Histogram of results of the test of modalities learning styles.

Table 2: Chi-square tests of learning styles and learning achievement of mathematics.

Chi-square tests			
	Value	df	Asymp. sig. (2-sided)
Pearson chi-square	42.629 <sup>a</sup>	38	0.279
Likelihood ratio	47.988	38	0.129
Linear-by-linear association	0.864	1	0.353
N of valid cases	34		

Note: 60 cells (100,0%) have expected count less than 5. The minimum expected count is 0.21

The results of the analysis using the chi-square test show that the value of sig. (2-sided):  $0.279 > \alpha = 0.05$  which means that there is no significant relationship between learning styles and learning achievement in 1st year of SMAN 1 Galesong Selatan, Indonesia. This is in agreement with the opinion Ahmad et al [15] and Yilmaz-Soylu and Akkoyunlu [16]. Ahmad et al [15] said that there was no significant relationship among students with different learning styles with respect to achievement in mathematics, and Yilmaz-Soylu and Akkoyunlu [16] said that the type of the learning style was not significantly effective on students' achievement in different learning environments.

Table 3: Levene's test of equality of error variances.

Dependent variable: score			
F	df1	df2	Sig.
1.478	5	28	0.228

Note: Tests the null hypothesis that the error variance of the dependent variable is equal across groups  
Design: Intercept + style + sex + style \* sex

It can be seen from Table 3 that the value of sig.:  $0.527 > \alpha = 0.05$ , so, one can say that the variance of cross-group is significantly different.

Table 4: Tests of between-subjects effects. Result of two-way ANOVA.

Dependent variable: score					
Source	Type III sum of squares	df	Mean square	F	Sig.
Corrected model	541.540*	5	108.308	1.233	0.320
Intercept	180427.140	1	180427.140	2054.314	0.000
Style	174.910	2	87.455	0.996	0.382
Gender	64.318	1	64.318	0.732	0.399
Style * gender	345,644	2	172.822	1.968	0.159
Error	2459.195	28	87.828		
Total	226561.000	34			
Corrected total	3000.735	33			

Note: \* R squared = 0.180 (adjusted r squared = 0.034)

The results in Table 4 show the value of sig. in the corrected model:  $0.320 > \alpha = 0.05$ . This means that there is no relationship between the independent variables (learning styles, genders and interaction of learning styles with genders) with learning achievement in 1st year of SMAN 1 Galesong Selatan, Indonesia.

In this table, it is also shown that the value of sig. in variables of learning styles, genders, interaction of learning styles with genders is greater than  $\alpha = 0.05$ . This means that learning styles have no influence over learning achievement, and gender has no influence on learning achievement, and there is no influence of interaction of learning styles and genders to learning achievement in 1st year of SMAN 1 Galesong Selatan, Indonesia.

## CONCLUSIONS

The results of this study showed that 1) the learning styles of visual and auditory learning styles is dominated by female students; and 2) there is no relationship between learning styles, genders and interaction of learning styles with genders to learning achievement.

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