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A Study of Students' Learning Styles and Mathematics Anxiety Amongst Form Four Students In Kerian Perak

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Abstract. This study aims to identify the relationship between students' learning styles and mathematics anxiety amongst Form Four students in Kerian, Perak. The study involves 175 Form Four students as respondents. The instrument which is used to assess the students' learning styles and mathematic anxiety is adapted from the Grasha's Learning Styles Inventory and the Mathematics Anxiety Scale (MAS) respectively. The types of learning styles used are independent, avoidant, collaborative, dependent, competitive and participant. The collected data is processed by SPSS (Statistical Packages for Social Sciences 16.0). The data is analysed by using descriptive statistics and inferential statistics that include t-test and Pearson correlation. The results show that majority of the students adopt collaborative learning style and the students have moderate level of mathematics anxiety. Moreover, it is found that there is significant difference between learning style avoidant, collaborative, dependent and participant based on gender. Amongst all students' learning style, there exists a weak but significant correlation between avoidant, independent and participant learning style and mathematics anxiety. It is very important for the teachers need to be concerned about the effects of learning styles on mathematics anxiety. Therefore, the teachers should understand mathematics anxiety and implement suitable learning strategies in order for the students to overcome their mathematics anxiety.

Keywords Mathematics, Mathematics anxiety, Learning styles

INTRODUCTION

According to Badzis (2008), children from 0 to 4 years old should be teaching about mathematics knowledge and logical thinking. However, mathematics learning which is provided since pre-school to tertiary education is still not enough for students to score in Program for International Student Assessment (PISA) 2012. The TIMSS 2011 reported a significant drop in the performances of mathematics where the rank fell from 16th (1999) to 26th (2011) (Mulliss et al., 2012). Malaysia's disappointing performance in both international ranking should be a wake-up call to everyone that something must be done to identify the cause of this problem.

Lately, many researchers try to relate the level of mathematics anxiety with mathematics achievement where the students with high level mathematics anxiety are predicted to have lower mathematics achievement (Zakaria et al., 2012; Mohamed and Tarmizi, 2010). The results of these studies provide evidence that mathematics anxiety have negative effect in mathematics education. Aarnos & Perkkila (2012) defined mathematics anxiety as negative effect in individuals when dealing with numbers and questions that involve mathematics. Woodard (2004) states that mathematics anxiety exist due to environmental factors, internal intellectual or cognitive ability such as learning styles, persistence, self- doubt, and dyslexia and personality factors such as low level of self-confidence, shame, and intimidation.

In Malaysia, mathematics anxiety is found among students in tertiary education (Usop et al, 2012), matriculation students (Zakaria & Nordin, 2008) and secondary school students (Zakaria et. al, 2012). This psychology problem can happen in every level of society from primary education to higher education. Although, student's learning styles can cause mathematics anxiety (Tatar, 2012) but this factor can also reduce the level of mathematics anxiety by choosing suitable learning style. According to Mohd et al. (2013), every student has their own different style of learning. By learning about suitable learning style, students can study effectively and help them lower the nervous, scared and uncomfortable around mathematics. Thus, researcher wants to know which student's learning style give most effect on mathematics anxiety among students while taking into account their demographic factor based on gender.

The objective of this study was to determine the type of students' learning style, to identify the level of mathematics anxiety among form four students, to determine difference in students' learning styles between male and female students and the relationship between students learning style and mathematics anxiety

RESEARCH METHODOLOGY

The study used quantitative method to collect data. The number of sample of this study is 175 students (85 males and 90 females) of all form four students in three different schools in Kerian district. The data is obtained from a set of questionnaire consisting of three sections i.e: section A, section B and section C. Data in section B and C are collected by using questionnaire that used five points of likert-scale that is "1-Strongly disagree, 2- disagree, 3-not sure, 4- agree, and 5- Strongly agree". Table 1 shows the detail of the questionnaire.

TABLE 1. Section in questionnaire

Section	Question	Item	Variable
Section A	Background Information	4	Independent
Section B	Students' learning styles	30	dependent
Section C	Mathematics anxiety	12	dependent
	Total	46	

Section B is based on Learning Style Inventory developed by Grasha and Riechmann (Grasha & Riechmann, 1996) which has six types of learning styles namely independent, avoidant, collaborative, dependent, competitive, and participant. 60 questions in Grasha-Riechmann learning Styles Inventory were modified to 30 items and each learning styles is measured by five items to make them easy and simple for the respondents to answer. Grasha and Riechmann recognized six types of learning styles with different characteristics (Table 2).

TABLE 2. Characteristics of Grasha-Riechmann learning styles model (1996)

Type of learning style	Characteristics
Independent	• like to think for themselves
Avoidant	• Uninterested, non-participant
Collaborative	• Share ideas with others
dependent	• Seek authority figures.
Competitive	• Compete with other students
Participant	• Eager to participate

In section C, mathematics Anxiety is measured by using instrument adapted from Mathematics Anxiety Scale (MAS) by Fennema & Sherman (1976). MAS consist of twelve items with six positive items and six negative items. The negative items are reversed for scoring. The total of the scale points signify the degree of mathematics anxiety for each student. The range for the total scale points is between 12 and 60. Higher points indicate higher mathematics anxiety and lower points indicate lower level of mathematics anxiety.

PILOT STUDY

In order to determine the reliability of the questionnaire, a pilot study was done on 23 students in different school other than samples. Cronbach's alpha for all items in the questionnaire is calculated to be at 0.86 and this value is acceptable values of alpha (Nunnally & Bernstein, 1994).

RESULTS

Based on the data obtained by Grasha-Riechmann Learning Style Inventory, it is seen that that majority of the students adopt collaborative learning style (mean=4.28), followed by participant learning style (mean=3.98), dependent learning style (mean=3.97), competitive learning style (mean= 3.62) and independent learning style (mean=3.18). The lowest learning style is avoidant learning with mean=2.32. Table 3 shows the means and standard deviations of students' learning styles.

TABLE 3. Means and standard deviations of students' learning styles

Learning Style	Mean	SD
Collaborative	4.28	0.509
Participant	3.98	0.547
Dependent	3.97	0.432
Competitive	3.62	0.574
Independent	3.18	0.577
Avoidant	2.32	0.717
Total Mean	**3.56**	**0.559**

Students' mathematics anxiety among Form four students in Kerian district was at moderate level (mean=2.85, SD= 0.658). Table 4 shows analysis descriptive of mathematics anxiety.

TABLE 4. Analysis descriptive of mathematics anxiety

Item	Mean	Standard deviation
Mathematics anxiety	2.85	0.658

A t-test was conducted to determine the difference of learning styles based on gender. Results in the table (table 4) indicates that there was a significant difference between males and females in avoidant (t= 3.069, p=0.002), collaborative (t=-2.070, p= 0.040), dependent (t=-2.587, p=0.010) and participant (t=-2.654, p=0.009) learning styles while there was no significance difference in independent (t= -1.541, p=0.125) and competitive (-1.573, 0.117). Overall, the finding indicates, there is significant difference of learning styles based on gender (t=-2.05, p= 0.042). Thus, null hypothesis can be rejected.

TABLE 5. Result of the t-Test for gender based on Grasha-Riechmann learning style

Learning style	Gender	Frequency	Mean	SD	t	P
Independent	Male	85	3.11	0.623	-1.541	0.125
	female	90	3.24	0.526		
Avoidant	male	85	2.49	0.736	3.069	0.002
	Female	90	2.16	0.664		
Collaborative	male	85	4.20	0.519	-2.070	0.040
	female	90	4.36	0.491		
Dependent	male	85	3.88	0.469	-2.587	0.010
	female	90	4.05	0.380		
Competitive	Male	85	3.55	0.622	-1.573	0.117
	Female	90	3.69	0.519		
Participant	Male	85	3.87	0.530	-2.654	0.009
	Female	90	4.09	0.546		
Overall	Male	85	3.52	0.263	-2.05	0.042
	Female	90	3.60	0.258		

Based on the correlation test, it is found that independent, participant and avoidant learning style were significantly related with mathematics anxiety. Avoidant learning style show weak but positive correlation (r=0.171, $p = 0.024 \leq 0.05$) which means that students which have high avoidant scores tend to have higher level of mathematics anxiety. The other styles which are significant to mathematics anxiety were the independent ($r = -0.187, p = 0.013 \leq 0.05$) and participant ($r = -0.192, p = 0.011 \leq 0.05$) learning style. There were a weak but statistically significant negative correlation between both learning style and mathematics anxiety which means that students who used independent or participant learning style exhibit low mathematics anxiety scores. According to Cohen (1988), correlation coefficient between 0.1 and 0.3 can be indicated as weak correlation.

TABLE 6. Pearson correlation between mathematics anxiety and learning styles

Learning style	Level of Mathematics Anxiety	
	P value	Pearson correlation
Independent	0.013	-0.187
Avoidant	0.024	0.171
Collaborative	0.653	0.034
Dependent	0.506	-0.051
Competitive	0.933	-0.006
Participant	0.011	-0.192

$* p \leq 0.05$

DISCUSSION

Based on the analysis, majority of students use collaborative learning style (mean= 4.28) and participant learning style (mean= 3.98) during mathematics class sessions. It is seen that students preferred collaborative learning style to share their ideas through discussion with other students (Uzuntiryaki, Bilgin & Geban, 2004).

Students' mathematics anxiety among Form 4 students in Kerian, perak was at moderate level which the results showed that the overall mean was M=2.85. This study was consistent with the findings of Zakaria et al. (2012) and Puteh & Khalin (2016). Although the students will not face national examination that year, their teacher always gives monthly tests (Zakaria et al, 2012).

A t-test was conducted and expressed that there was significant difference in learning styles between males and females students. Results also show that p-value for avoidant, collaborative, dependent and participant learning styles was found significant. However, independent and competitive learning styles are not significant at 0.05. This study was also supported by Akhtar (2011) which she stated that there is significance difference in learning styles of male and female students. However, out of six Grasha learning styles, she found only avoidant learning style is not significant between gender.

The result obtained appears that there is significant relationship between independent, avoidant, and participant learning style with mathematics anxiety. Avoidant learning style showed low but positive correlation with mathematics anxiety which means that students that have higher avoidant scores tend to have higher level of mathematics anxiety. This study was consistent with the findings of Tatar (2012). There was a low but negative correlation between independent learning style and mathematics anxiety. The same result also applied to participant learning styles. As the independent or participant learning style scores increased, the mathematics anxiety scores decreased. However, the results obtained were different for Tatar (2012) which found that independent and participant learning style do not have significant relationship with mathematics anxiety and there was significant negative correlation between mathematics anxiety and collaborative learning style.

CONCLUSION

Mathematics anxiety does exist among students in these three different schools. Therefore, teachers should have more knowledge on mathematics anxiety, implement variety of teaching styles to meet the students' preferential learning styles and by telling which learning style is suitable for them so that students can overcome their anxiety to improve students' achievement in mathematics. As the variable affecting mathematics anxiety in this study are learning styles which adapted from Grasha- Riechman (1996), we suggest that further research should explore different types of learning styles using different models and theories of learning styles.

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