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The Learning Styles and Academic Achievements among Arts and Science Streams Student

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Abstract

This study aims to verify the statement that learning styles influence the academic achievements of students' in the arts and science streams. The main objectives of the study are 1) to seek if students' academic achievement has any significant relationship with their learning styles, 2) to determine the types of learning styles that have significant relationship with students' academic achievement in both the arts and science streams and 3) to determine the demographic factors that have significant relationship to the learning styles among Form 4 and 5 students of both the Arts and Science streams in one of the schools in the northern part of West Malaysia. To measure learning styles, six dimensions from the GRLSS (Grasha-Riechmann Learning Styles Scale) that are free style, avoidance, cooperation, dependent, competition, and participation will be used as the factors. a total of 100 responses were collected through the questionnaire distributed and received one at random which represent 100% response. The data analysis was conducted using SPSS v.19. the data was analysed and interpreted using descriptive and inferential statistics. Findings from the data analysis show that respondents prefer the dependent learning style followed by cooperation in all the variables namely gender, class, ethnic, family income and students' academic achievement. However, there can be a bit of a difference in terms of students who come from the home income of RM 2000, where they prefer cooperation followed by dependency. The Pearson Correlation analysis showed no significant relationship between learning styles as a whole with academic achievements, except for avoidance. The main findings also showed no significant relationship between learning

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styles and academic achievements. The discussion to findings, implications and suggestions for future researchers will also be presented in this study.

Keywords: Learning styles, academic achievement, arts and science stream, high school students, and school management

1.0 Introduction

Although basically there are other factors that can influence students' academic achievement, this study specifically seek to discover the students' learning styles in both arts and sciences streams. The information is vital in helping teachers, students and parents to employ these learning styles effectively (Dunn, 1984).

2.0 Learning

It is natural for individuals to want to learn something new. an individual learn to develop his/her intellectuality and to gain new knowledge, individual learn not only in structured environment such as schools but also in environments which are not structured or formally planned such as knowledge, skills and attitude (Reay,1994).

2.1 Academic achievement

In an examination result, every student's achievement is different due to different learning styles (Yahaya & Abdul Karim, 2003). Examination is used to gauge how far and how much the learning objectives have been achieved. In Malaysia, public examination such as Sijil Peperiksaan Malaysia (SPM) is very important because it acts as a benchmark to qualify students to enter university or apply work either in the public sector or private firms. In this study, students' academic achievement is based upon the Final Year Examination result sat in 2011 by the Form Five students and the Monthly Test result sat in 2012 by the Form Four students. The SPM grade scales set by the Malaysian Examination Syndicate are as follows:-

Table 1: SPM Grade Scales

Grade	Marks	Achievement
A+	90 - 100	
A	80 - 89	Excellent
A-	70 - 79	
B+	65 - 69	
B	60 - 64	
C+	55 - 59	
	Average	
C	50 - 54	
D	45 - 49	
E	40 - 44	
F	0 - 39	
Weak		

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2.2 Learning Styles

Learning styles refers to the style or how one prefers to do his/her learning. it also a specific way used by a learner or an individual to get information or knowledge which can be obtained in various ways that are deemed as suitable (Ciccarelli & Mayer, 2006; Slavin,2006). In this study, Grasha-Riechmann's Learning Styles Scale(GRLSS) will be used.

2.3 Grasha-Riechmann's Learning Styles Scale(GRLSS)

Grasha-Riechmann's Learning Styles Scale(GRLSS) is used because this concept focuses towards learners' attitude towards learning, class activities, teachers, and peers. It also looks at the relationship between methodology, students' learning styles and achievement. The GRLSS instrument is used because it is one of the various instruments that are built specifically for students in secondary, college and university (Hruska-Riechmann & Grasha, 1982). Besides that, this scale is also relevant and suitable because it focuses on how students interact with instructors, peers and with learning in general. GRLSS bases the understanding of learning styles in a very wide context through six categories, different from other instruments, namely free style, avoidance, cooperation, dependent, competitive, and participation. Sriphai et al. (2011) said that Grasha-Reichmann fixed six learning styles that are:

Table 2: Six Grasha-Reichmann's Learning Styles (1970)

Styles	Explanation	Sample statement
Free style	Students prefer to work alone and need only brief instruction from the teacher	Most of the knowledge I acquire, I learn it myself
avoidance	students prefer to be in the lowest grade scale. absenteeism very high, fail to complete work and not responsible towards own learning	I have problems paying attention in class
cooperation	students enjoy working together with peers	Ideas from other students help me to understand the content
dependent	generally, students become frustrated facing new challenges and students project their frustrations in class	teachers who allow students to do as they please are not doing their jobs well

competition	students always want to compete against their peers to get acknowledgment	I like it if other students know that I have done well in my task
participation	students acknowledge that they need to learn on their own and interact with their peers	I try to participate as much as possible in this course

Education is a continuing process to develop an individual's potential towards academic achievement with various skills that are holistic and integrated. Students' academic achievement acts as a gauge to measure what have been learnt in a specific duration of time. Each student is unique and different in all aspects (Chan, 2001). The learning styles of each individual are also different. These differences are seen as the factors or variables that influence students' academic achievement (Wang et al., 2008).

Therefore, employing the correct learning styles is very important in improving academic results. Similar findings were found by Baharin Abu (2007) where students' performance have increased when learning and teaching done suits their learning styles. If students' learning styles suit the course they are taking, it will be a positive effect towards their academic achievement (Yahaya & Abdul Karm, 2003). Thus, students who employ effective learning styles usually obtain excellent academic achievement and are able to secure a place in higher institutions or a position in the work sector.

The findings by Mohamad Jafre et al. (2011) posited that the importance of knowing one's learning styles is essential for every student. Teachers' teaching styles also need to be adjusted to the students' learning styles so as to build conducive learning and teaching environment. Teachers' teaching styles too need to be suited to the students' learning styles so that a conducive learning and teaching environment can be developed. Thus, it is vital that students' learning styles be known and used as a guide or reference for teachers to be more sensitive of their students' learning needs (Fedler and Spurlin, 2005).

Several recent researches showed that students' academic achievement is influenced by their learning styles (Rasimah & Zurina, 2008). In relation to that, it is very important to understand students' learning styles so as to increase students' performance in academic (Brown et al., 2006; Graf and Kinshuk, 2007). Based on the study done by Sriphai, Damrongpanit and Sakulku, (2011) the effectiveness of learning styles is seen also as a factor towards success in the learning process besides effort and hard work. Learning problem is not only because of the level of difficulty of the subject but more to the learning styles and learning process that are

needed in order to study (Keefe & Ferrell, 1990). Subsequently, this study seeks to understand the learning styles as a factor towards students' academic achievement.

Consequently, the objective of this study is to determine whether students' academic achievement has any significant relationship with the students' achievement for both the Arts and Science streams and to determine whether students' demographic aspects have any significant relationship to students' learning styles.

3.0 Methodology

Respondents

To get the data for this study, a questionnaire was distributed and collected from 100 students of a school in the Northern area of West Malaysia using random sampling which covered most of the Form 4 and Form 5 (aged 16 and 17 respectively) students in that school. The sample is based on Krejcie Morgan's (1970) sampling table.

Instrument of Study

The independent variables of this study are factors that influence the learning styles by measuring the implication towards the academic achievement based on the five independent variables namely gender, ethnic, age, social economy background and the six learning styles by Grasha-Riechmann's Learning Styles Scale (GRLSS) that are free style, dependent, competition, cooperation, participation and avoidance as have been mentioned in the Literature review. The dependent variable in this study is the students' academic achievement. This GRSLSS model is conduced by Anthony Grasha and Sheryl Reichmann in 1974. This model focuses on the students' attitude towards learning, the activities in class, teachers and peers.

The method of data collection was through questionnaire as primary data and other printed materials as secondary. This study uses Grasha-Reichmann's instrument, which was translated to Bahasa Malaysia, was found in the study by Tadzilah Jib (2011). The questionnaire is divided into two sections; section A for the respondents' demography profile with four questions that included gender, age, ethnic and social economy background while section B consists of ninety items comprising 15 items for each of the six learning styles. For definition and sample question, please refer to Table 2).

All the ninety items were constructed using the Likert scale. The scales are "1 – strongly disagree", "2 – Do not agree", "3 – Neutral", "4 – Almost agree" and "5 – Strongly agree". (Sample questions can be found in Table 1). The respondents were instructed to respond based on the scales provided. Due to the fact that the questionnaire has been used previously in another study, the validity and reliability are considered as have been tested.

Procedure

The questionnaire was completed by the respondents themselves without the presence of the researcher. They were given four days to complete it. The completed questionnaires were

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collected by the teacher. This procedure was to endure the validity and reliability of the study is maintained.

The data analysis will be done using Statistical Package for the Social Sciences Version 19.0 (SPSS 19.0). The data is analysed and interpreted using descriptive and inferential statistics. According to Ary, Jacobs and Razavieh, (2002), the reliability value which can be accepted for the learning styles variables is less than 0.5. Inferential statistic is used to find the mean difference and also to determine the relationship between the variables in the study. To find the relationship between students' achievement and learning styles and the relationship between learning styles and students' achievement in both the Arts and Science streams, t-test is used. ANOVA is also performed to determine whether the demography factors show significant relationship towards learning styles.

4.0 Findings

Respondents' Analysis

The demographic details for 100 respondents are as follows:-

Table 3: Respondents' Analysis (n=100)

Demographic details		Number	Percentage (%)
Gender:	Male	37	37.0
	Female	63	63.0
Class:	Art stream	50	50.0
	Science stream	50	50.0
Ethnic:	Malay	61	61.0
	Chinese	19	19.0
	Indian	20	20.0
Family Income:	Less than RM 1000	60	60.0
	RM 1000 – RM 2000	29	29.0
	More than RM 2000	11	11.0
Exam Result	Excellent	8	8.0
	Average	73	73.0
	Weak	19	19.0

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The t-test showed that there is a difference in respondents' learning styles based on gender and class. ANOVA result showed that there is a difference in respondents' learning styles based on ethnic and family income. The correlation result is used to determine the difference in examination result and learning styles. In Tables 4 to 4.9, the mean value and SD for each group are also presented besides the t values and level of significance.

Table 4 : Mean and SD for gender and learning styles

		Dependent	Competition	Cooperation	Free	Avoidance	Participation
Male							
	Mean	3.95	3.41	3.86	3.23	3.12	3.47
	SD	0.36	0.45	0.28	0.38	0.39	0.35
Female							
	Mean	4.01	3.52	3.84	3.33	3.10	3.48
	SD	0.48	0.396	0.29	0.41	0.45	0.447

Based on the mean for learning styles related to class, respondents from both streams prefer to be dependent followed by cooperation.

Table 4.1: Mean and SD for class and learning styles

		Dependent	Competition	Cooperation	Free	Avoidance	Participation
Science							
	Mean	4.03	3.46	3.85	3.32	3.00	3.53
	SD	0.407	0.458	0.287		0.409	0.415	0.379
Arts							
	Mean	3.94	3.49	3.84	3.26	3.21	3.42
	SD	0.467	0.376	0.287		0.391	0.413	0.437

Based on the mean for learning styles related to ethnic, there is a similarity of learning styles in all the ethnic groups. Learning styles for all the ethnic groups studied showed preference towards dependent followed by cooperation.

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Table 4.2 : Mean and SD for ethnic and learning styles

Participation		Dependent	Competition		Cooperation	Free	Avoidance
Malay							
	Mean	3.96	3.50	3.85	3.24	3.17	3.44
	SD	0.427	0.401	0.287	0.378	0.412	0.396
Chinese							
	Mean	3.89	3.41	3.76	3.29	3.18	3.37
	SD	0.577	0.411	0.263	0.473	0.485	0.536
Indian							
	Mean	4.14	3.45	3.89	3.44	2.82	3.67
	SD	0.271	0.479	0.298	0.369	0.276	0.229

Based on the mean for learning styles related to family income, it is shown that the group of family income below RM 1000, and between RM 1000 and RM 2000, preferred to be dependent followed by cooperation whereas the group of family income more than RM 2000 preferred cooperation followed by dependent.

Table 4.3: Mean and SD for family income and learning styles

Participation		Dependent	Competition		Cooperation	Free	Avoidance
< RM 1000							
	Mean	3.94	3.48	3.80	3.27	3.15	3.42
	SD	0.444	0.426	0.294	0.437	0.466	0.442
RM 1000 – RM 2000							
	Mean	4.11	3.46	3.88	3.35	2.97	3.59
	SD	0.434	0.408	0.259	0.358	0.357	0.330
>RM 2000							
	Mean	3.95	3.52	3.99	3.21	3.16	3.42
	SD	0.381	0.421	0.265	0.276	0.272	0.391

Based on the mean for learning styles related to examination result, it is found that dependent is more preferred by the respondents who achieved excellent, average and weak results. This is followed by cooperation which showed very strong relationship with the learning styles.

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Table 4.4: Mean and SD for examination result and learning styles

Participation		Dependent		Competition		Cooperation		Free		Avoidance
Excellent										
	Mean	4.28		3.12		3.93	3.14	2.98	3.68	
	SD		0.340	0.568	0.321		0.403	0.488	0.243	
Average										
	Mean	3.98		3.51		3.842		3.31	3.06	3.46
	SD		0.450	0.393	0.282		0.407	0.422	0.427	
Weak										
	Mean	3.89		3.52		3.838		3.27	3.30	3.46
	SD		0.395	0.384	0.296		0.372	0.362	0.389	

Based on the findings in this study, it is shown that respondents prefer dependent followed by cooperation in all the variables that are gender, class, ethnic, family income and students' academic performance. However, there is a slight difference in terms of family income for group more than RM 2000, where they prefer cooperation as their number one choice followed by dependent.

Table 4.5: t-test: Difference in learning styles based on gender

Learning Styles	Gender	N	t	df	Sig. (2-tailed)
Free style	Male	37	-1.25	98	0.22
	Female	63			
Avoidance	Male	37	0.17	98	0.87
	Female	63			
Cooperation	Male	37	0.35	98	0.72
	Female	63			
Dependent	Male	37	-0.72	98	0.47
	Female	63			
Competition	Male	37	-1.26	98	0.21
	Female	63			
Participation	Male	37	-0.16	98	0.97
	Female	63			

Based on the table above, it is shown that there is a no significant difference in all the learning styles related to gender.

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Table 4.6: ANOVA result between ethnic and learning styles (n=100)

Learning styles	Variance	Average sq	df	Mean sq	F	Sig. (p)
Free style	Inter group	.614	2	.307	1.957	.147
	Intra group	15.207	97	.157		
	Total	15.820	99			
Avoidance	Inter group	1.952	2	.976	5.951	.004
	Intra group	15.907	97	.164		
	Total	17.859	99			
Cooperation	Inter group	.197	2	.099	1.211	.302
	Intra group	7.901	97	.081		
	Total	8.098	99			
Dependent	Inter group	.695	2	.348	1.837	.165
	Intra group	18.351	97	.189		
	Total	19.046	99			
Competition	Inter group	.158	2	.079	.449	.639
	Intra group	17.075	97	.176		
	Total	17.233	99			
Participation	Inter group	1.084	2	.542	3.363	.039
	Intra group	15.624	97	.161		
	Total	16.708	99			

Based on the table above, there is no significance difference to the learning styles free, cooperation, dependent and competition. So, ANOVA result showed that there is significant difference in learning styles related to ethnic for avoidance $F(2,97)=5.95$, $P < 0.05$ and participation $F(2,97)= 3.363$, $P < 0.05$. Tukey post test also found significantly difference between the ethnics groups for this two groups Malay has higher means than Chinese and Indian students.

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Table 4.7: ANOVA result between family income and learning styles

Learning styles	Variance	Average sq	df	Mean sq	F	Sig. (p)
Free style	Inter group	.188	2	.094	.582`	.560
	Intra group	15.633	97	.161		
	Total	15.820	99			
Avoidance	Inter group	.705	2	.353	1.994	.142
	Intra group	17.153	97	.177		
	Total	17.859	99			
Cooperation	Inter group	.394	2	.197	2.479	.089
	Intra group	7.705	97	.079		
	Total	8.098	99			
Dependent	Inter group	.619	2	.309	1.629	.201
	Intra group	18.427	97	.190		
	Total	19.046	99			
Competition	Inter group	.028	2	.014	.079	.924
	Intra group	17.205	97	.177		
	Total	17.233	99			
Participation	Inter group	.567	2	.283	1.703	.188
	Intra group	16.141	97	.166		
	Total	16.708	99			

Based on the table above, it is found that there is no significant difference between learning styles and family income.

Table 4.8: t-test result between class and learning styles

Learning styles	Class	N	t	df	Sig. (2-tailed)
Free style	Science stream	50	-0.73	98	0.47
	Arts stream	50			
Avoidance	Science stream	50	2.46	98	0.02*
	Arts stream	50			
Cooperation	Science stream	50	-0.14	98	0.89
	Arts stream	50			
Dependent	Science stream	50	-1.02	98	0.31
	Arts stream	50			
Competition	Science stream	50	0.27	98	0.79
	Arts stream	50			
Participation	Science stream	50	-1.25	98	0.21
	Arts stream	50			

* P < 0.05

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Based on the table above, it is found that there is no significant difference towards learning styles in terms of free style, cooperation, dependent, competition and participation. The t-test result is significant for avoidance t (98)= 2.46, $p < 0.05$. This shows that there is a difference in for both streams in terms of avoidance.

Table 4.9: Pearson Correlation between academic achievement and learning styles

Learning styles	Pearson Correlation	academic achievement sig.(2-tailed)	N
Free style	0.05	0.65	100
Avoidance	0.22’	0.03	100
Cooperation	- 0.06	0.59	100
Dependent	0.18	0.07	100
Competition	0.17	0.09	100
Participation	-0.09	0.37	100
Overall Learning Styles	0.04	0.68	100

From the Pearson Correlation analysis, it is found that there is no significant relationship between overall learning styles with academic achievement (r=.04, p>.05). This can also be seen from the findings: free style (r=0.05, p>.05),), cooperation (r= -0.06, p>.05), dependent (r=0.18, p>.05), competition (r=0.17, p>.05), participation (r=-0.09, p>.05). However, only avoidance (r=0.22, p<0.05) has a significant relationship. Nevertheless, the overall result showed that there is no significant relationship between learning styles and academic achievement.

4.1 Discussion

The objective of this chapter is to discuss the findings and data analysis. This chapter will also relate the findings with findings from recent researches. In addition, there will be suggestions after the implications have been discussed.

The main objective of this study is to explore the factors that influence the relationship between learning styles and academic achievement of Form 4 and 5 students (aged 16 and 17 respectively) in both the arts and science streams of a school in the northern region of West Malaysia. Hence, learning styles which have been used for this study is the Grasha-Reichmann’s Learning Styles Scale (GRLSS) the GRLSS is used as the main referent to construct the research questions and for the survey items. Below are the discussion for the findings of this study which will be a associated with the objective of this study and findings of recent researches.

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Objective 1: To seek if students' academic achievement has significant relationship with learning styles.

Findings from the Pearson Correlation showed there is no significant relationship between academic achievement of students in both the arts and science streams with learning styles. Except for avoidance, the other five characteristic (i.e., free style, cooperation, dependent, competition, and participation) of learning styles are not significantly difference. Looking at the data analysis, avoidance is dominant and has significant relationship with academic achievement for this sample of population. Perhaps, this is due to the almost 92% of the selected student were from low (19%) and average achievers (73%). Thus, they seem to avoid not ready their own learning. Overall, the finding is contradictory. Findings from Dunn, Beaudry and Klavas (1989) showed that students who of average standard and who managed to get a pass in their academic increased their academic performance when they are taught using the suitable learning styles. Therefore, it can be seen that through the t-test, where the researcher seek to find the relationship between learning styles preferred by both arts and science students, the type dependent followed by cooperation are the preferred ones by these students. Hence, teachers in that school should be aware of the dependent characteristics in their students. Students may get frustrated when they are faced with new challenges but they do not show their frustrations in class. Therefore, teachers in that school have to employ learning styles that will inculcate positive learning styles such as competition and collaborative (Grasha, 1996). The finding from this study can be associated with the idea discussed by Goodwin (1995) where the number of students who excel will increase significantly if there is suitable teaching and learning styles. Thus, teachers have to identify factors that affect the learning styles of their students so that their teaching will suit their students' needs and to help increase their academic achievement.

Objective 2: To determine the types of learning styles that have significant relationship with students academic achievement in both streams.

The significant learning style for both the arts and science stream students have chosen is dependent followed by cooperation. This answered the second research question for this study. The students are too dependent. Naturally they will get frustrated when facing with new challenges but they will not portray his in class (Grasha, 1996). Based on the findings of a research done on engineer and science students in Aalborg University, Kolmos and Holgaard (2008) said that the students were more active, more visual and sensitive towards the teaching and learning sessions. Teachers have to increase their students' motivation and level of their teaching skills. According to Armbruster, Patel, Johnson, and Weiss (2009) active learning such as student-centered pedagogy with free style participation and cooperation are improving student performance and attitudes for learning Introduction Biology. So, the teachers in this school have to improve their students' academic achievement by improving their teaching styles to the ones that suit the students' learning styles.

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Objective 3: To identify the demographic factors that have significant relationship to learning styles.

The demographic factors tested in this study are gender, ethnic group and socio economic background (family income). Based on the responses, there are certain factors that have significant relationship o learning styles.

i. Is gender a factor that influences learning styles?

Based on the findings in this study, there is similarity between male and female students who showed preference to being dependent as their learning styles. For the type competition, the mean for female is higher than the mean for male. Female students prefer free style while male students prefer avoidance. Therefore, gender has no significant relationship with students' learning styles. This can also be proven in a study by Ross and Powell (1990) where it showed that female students have a motivation score that is significant than the male students in learning and they prefer active learning compared to males. Female students also spend more time preparing for class presentation and completing their assignments. This supports that female students are more inclined towards the type free style in their learning styles compared to male students who prefer avoidance. Therefore, besides determining or identifying the students' learning styles, according to Linn and Hyde (1989), in ensuring that students both male and female achieve the same teaching and learning experience, education programs and teachers' role are also considered as essential so that students are given the same opportunity to learn.

ii. Is socio economy a factor that influences learning styles?

Socio economy is another factor that is tested in this study. Based on the findings, it is found that the group of students with family income of below RM 1000 and between RM 1000 to RM 2000 showed inclination towards dependent followed by cooperation as their learning styles. The group with family income of more than RM 2000 showed preference for cooperation followed by dependent as their learning styles. Based on findings of the study done by Mintjelungan (2011) on students studying technical electronic education in Unima Indonesia, there is positive relationship between social economy status and students' academic performance. Thus, it is proven that students with higher social income are more dominant towards cooperation as their learning styles compared to students from the lower income group who prefer dependent and are less active. Therefore, this is equivalent to Vygotsky (1978) who said that one has to know one's values and knowledge about one's culture in order to understand the development of one's higher mental function. Clearly educationists have to seek information with regards to students' background in order to help them in choosing the more productive and effective learning styles and therefore can help increase their academic performance.

iii. Is ethnic a factor that influence learning styles?

Based on the findings, all the different ethnic groups that are studied showed the same preference to dependent followed by cooperation as their learning styles. Therefore, it can be seen that there is no significant difference for ethnics related to learning styles. Although, Nuby and Oxford (1996) identified that there is a difference in learning styles among African-

American students compared to native Americans, but in this study, there is no significant difference in learning styles among students from different ethnic groups. This is also an indicator that in constructing or planning a curriculum and learning and teaching methods or approaches, culture and ethnic groups should also be taken into consideration.

4.2 Implication for school management and education system

From the findings, there is no significant relationship that can be seen between students' learning styles and their academic achievement. However, we cannot deny Grasha's (1996) claim that students' learning styles influence their academic achievement. Therefore, teachers and those who are responsible in planning the curriculum for secondary schools have to bear in mind that students learn in various ways and dimensions (Wratcher, Morrison, Riley & Scheirton, 1997). Teachers should be aware that students who of different backgrounds or social economy status have different preference towards two or more learning styles. This statement corresponds with the findings in this study that students prefer the dependent style of learning. This type of learning style is not commendable if the students are going to face the challenge in this 21st century where learning should be active and students cooperate actively in discussion and activities that involve synthesis analysis and evaluation towards increasing their skills, values and attitude (Sivan, Leung, Woon, & Kember, 2000).

Thus, the learning styles that have been identified in GRLLS can at as a guideline for teachers in ensuring that their teaching and learning sessions are suitable for their students. Ambruster et al., (2009) stressed that teachers have to continuously become dynamic and flexible in their teaching styles by employing various methods and approaches in their teaching and learning sessions which suit their students.

Suggestion for future research

From the findings, there should be research done with the following focus:-

i. this study has been done in a normal government funded school. Therefore, it is suggested that further research be done in other types of schools such as cluster schools, boarding schools or schools where the academic achievements are excellent. Thus, comparison can then be made among schools with high academic achievement. With this suggested study, teachers can see clearly which learning styles they can employ for their students in their schools.

ii. compare the learning styles between high achievers and low achievers.

iii. compare learning styles based on age. In this study, age (16 & 17) was not tested as a factor that influence learning styles.

iv. learning styles that are effective for arts and science streams students by focusing at only certain specific subjects. This may help teachers who are teaching Chemistry, for example, to know the suitable learning styles that are dominant among the students which in turn can help teachers to use the suitable teaching styles or methods.

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