Academic Achievement of Students with Different Learning Styles

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Abstract

The present study investigated the impact of learning styles on the academic achievement of secondary school students in Iran. The Kolb Learning Style Inventory (1999) was administered in eight public schools in Tehran. The mean of test scores in five subjects, namely English, science, mathematics, history and geography, was calculated for each student and used as a measure of academic achievement. A total of 285 Grade 10 students were randomly selected as sample of this study. The results of the analyses of variance show that there is a statistically significant difference in the academic achievement of the Iranian students that correspond to the four learning styles [$F(3, 285) = 9.52$, $p < .05$]; in particular, the mean scores for the converging and assimilating groups are significantly higher than for the diverging and accommodating groups.

Keywords: Academic achievement in Iran, Learning styles, Converging and assimilating

1. Introduction

Individual differences play an important role in academic achievement of students. There have been many attempts to address the problem of low academic achievement and some factors have been identified in explaining academic achievement. Among the numerous variables researched, demographic status (Casanova, García-Linares, de la Torre, and de la Villa Carpi, 2005; Ray, 2010; O'Sullivan, 2009), intelligence (Deary, Strand, Smith and Fernandes, 2007), behavioral characteristics (Ergul, 2004; Lane, Barton-Arwoo, Nelsonz, and Wehby, 2008), and psychological factors, namely, attitudes (Erdogan, Bayram, and Deniz, 2008; Olatunde, 2009), self esteem (Bankston and Zhou, 2002; Lockett and Harrell, 2003; Schmidt and Padilla, 2003; Reasoner, 2005), self efficacy (Ferla, Valcke, and Cai, 2009; Onyeizugbo, 2010) and self concept (Reynolds, 1988; Holliday, 2009), have been used to explain academic achievement. Besides differences in ability, which are not easy to

control, students have specific learning styles that may influence their academic achievement. Sternberg (1997) proposed that styles are at least in part socialized, suggesting that they can, to some extent, be modified. Thus, being aware of learning styles and their roles in academic achievement is of a great importance for educational psychologists, teachers and researchers.

Although it has been found that students' learning styles do significantly influence their academic achievement, these findings are based on research conducted in other countries and vary depending on the country. A country never stops to explore and develop its own methods of learning in order to respond to the demands particular to its environments (Yamazaki, 2005). For instance, Bennett (1993) summarizes that the learning styles of African Americans may be inconsistent with the teaching approaches applied in most schools. Hence it is pertinent that these factors should be looked into based on an Iranian perspective. Additionally, a compatible learning style with the teaching style of a course instructor enables the students to retain the information much longer, apply it more efficiently and effectively, and have more positive post-course attitudes toward the subject than their counterparts who experience learning/teaching styles mismatches (Felder, 1993). In other words, since there are individual differences in learning style, adapting academic materials to these differences will facilitate learning and thus help increase learning benefits "especially for low and moderate achieving students" (Zin, Zaman & Noah, 2002). Therefore understanding students' learning styles and their impact on their academic achievement is important for teachers for it is the first step in ensuring students' achievement.

The Kolb model is one of the theoretical perspectives that have been applied to the investigation of learning styles. The model has been widely used throughout the field of educational psychology. The Kolb's Learning Styles Inventory (LSI) has been the most widely documented test to assess learning styles (Cano-Garcia and Hughes, 2000). Kolb suggests that experience, and the analysis of it, can assist in the formation of concepts. Then the concept, after being assimilated and organized, may be applied to new experiences. In this model, learning is conceived as a process through which the transformation of experience creates knowledge. In Kolb's model, the person is required to employ each of the four key learning abilities: concrete experience (CE), abstract conceptualization (AC), reflective observation (RO), and active experimentation (AE) (Kolb, 1984). The form of learning styles is a combination of four learning abilities: CE, AC, RO, and AE (Kolb, 2005).

According to Kolb, there are four fundamental learning styles. The diverging learning style specializes in the two learning abilities of CE and RO. In contrast, the converging learning style specializes in the two abilities of AC and AE. The assimilating learning style specializes in the two abilities of AC and RO. In contrast, finally, the accommodating learning style specializes in the two abilities of CE and AE. Notably, both converging and assimilating learning styles have a higher score in abstract conceptualization (AC) and lower score in concrete experience (CE). Abstract conceptualization which actualized in adolescence is conceived to be a higher level ability rather than concrete experience (CE).

Research on learning style demonstrates that individuals differ in their learning style and that no single delivery system is optimal for all students (Paul, Bojanczy & Lanphear, 1994). It seems current instruction and assessment techniques favor certain learning styles of students in different cultures. Some studies show a positive relationship between academic achievement and the converging learning style (Rutz 2003, Boyatzis and Mainemelis 2000), some show academic performance privileges for converging and assimilating learning styles (Malcom, 2009; Lynch, Woelfl, Steele, and Hanssen, 1998; Newland and Woelfl, 1992; Kolb, 1984) and Oughton and Reed (2000) found that assimilating and diverging learners were the most productive on concept mapping. Taken together, reviewing the previous studies suggest that researchers need to take caution in evaluating performance based on a single outcome measure, as each learning style has its strength in specific tasks. Therefore, different subjects were used to measure student overall performance. In the study, academic achievement was measured using the result of the secondary examination in grade nine in five main subjects namely, English, mathematics, science, history and geography.

Cognitive styles have been investigated in many countries, such as in the United States (e.g., Grigorenko & Sternberg, 1997), Spain (e.g., Cano-Garcia & Hughes, 2000), the Philippines (e.g., Bernardo, Zhang, & Callueng, 2002), Hong Kong (e.g., Zhang & Sternberg, 2002), mainland China (Zhang, 2004), and more recently in Korea (e.g., Park, Park, & Choe, 2005), Norway (e.g., Fjell & Walhovd, 2004), and Malaysia (e.g., Jilardi Damavandi, 2011). However, the scarcity of studies manifests itself in the area of learning styles and academic achievement in Iran. As it was indicated, it is important for educational psychologists to know how learning styles influence pupils' academic achievement in different countries, and from there to design possible means of intervention for promoting effective learning and academic achievement.

2. Method

2.1 Participants

Two hundred eighty five Grade 10 students (average age = 16; 56.5% male & 43.5% female) from eight governmental schools in Tehran were selected as the participants of this study. The reason these students were chosen was because the ability to think about the cognitive process of mind and to report these introspections, which are necessary to answer learning style inventory, normally actualizes at the adolescence stage. The majority of the fathers (39.2%) in Iran were self-employed and the majority of the mothers (75.2%) were housewives. While most of the fathers (40.2%) had from secondary school diploma to bachelor degree (12 to 16 years of education), the majority of mothers had 12 years of education. Although, missing data regarding parents' income was quite high, majority of parents were earning equal to US$ 700 to US$ 1400 per month.

2.2 Measures

2.2.1 Dependent Variable

The present study uses concrete and consequential outcomes of students' academic achievement, using the national standardized examinations' results. In the study, academic achievement is operationalized as the result of the secondary examination in grade nine in five main subjects namely, English, mathematics, science, history and geography. The mean for the five subjects was calculated as academic achievement of the students.

2.2.2 Independent Variables

The Kolb Learning Style Inventory (1999), which contains 12 sentences with four statements each, was used to evaluate the students' learning preference. The LSI has been found to possess adequate validity and reliability (Barmeyer, 2004). The Kolb LSI was chosen because the inventory is relatively simple to administer and score and it has demonstrated a high degree of reliability (Willcoxson & Prosser, 1996). This instrument was translated to the national language of Iran (Persian). A team of lecturers confirmed the validity of the translated instrument using back translation (translating to Persian and then translating back to English and finally comparing the main instrument and the back-translated). The obtained standardized Item Alpha for the translated instrument was acceptable and was as follows; CE: 0.70, AC: 0.64, AE: 0.65 and RO: 0.62.

2.3 Data Analyses

The aim of the study is to investigate the impact of thinking and learning styles on the academic achievement of secondary school students in Iran. An analysis of variance (ANOVA) was conducted to explore the impact of different learning styles on the academic achievement of the students. Since the four learning styles are independent and there is only one continuous dependent variable, a between-groups one-way ANOVA was conducted (Pallant, 2007). Before performing the ANOVA, the homogeneity of variance was verified using Levene's test (Coakes & Steed, 2003). Effect sizes were calculated and the impact of different learning styles on academic achievement was investigated. In the next part the results of the study is presented.

3. Results

Subjects were divided into four groups according to their learning styles (Group 1: Diverging; Group 2: Converging; Group 3: Accommodating; Group 4: Assimilating). Among the learning styles, converging (35.4%) styles was the most chosen followed by accommodating (23.4%), assimilating (22.4%) and diverging style (18.8%). The converger's dominant learning abilities are in abstract conceptualization (AC) and active experimentation (AE). The converger's greatest strength is in the practical application of ideas (Kolb, 1985; Malcom, 2009). Students' performance based on their learning styles was tested with the null hypothesis being that there is no significant difference in academic achievement of students with converging, diverging, accommodating and assimilating learning styles (Table1).

As it is indicated, there is a statistically significant difference at the p<.05 level in academic achievement scores for the four learning styles [$F(3, 285) = 9.52$, $p < .05$]. The effect size, calculated using eta squared, was 0.09. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for the converging group (M = 85.27, SD = 11.17) is significantly higher than that of the diverging group (M = 76.46, SD = 14.14) and the accommodating group (M = 77.30, SD = 12.49). Meanwhile, the mean score for the assimilating learning style (M = 84.39, SD = 13.04) is significantly higher than that of the diverging group (M=76.46, SD=14.14) and the accommodating group (M = 77.30, SD = 12.49).

4. Conclusion

A one-way between-groups analysis of variance (ANOVA) was conducted to explore the impact of different learning styles on the academic achievement of the students. As predicted, the null hypothesis that there is no

significant difference in the academic achievement of students with converging, diverging, accommodating and assimilating learning styles was rejected. Post-hoc comparisons support that the mean scores for converging and assimilating groups are significantly higher than diverging and accommodating groups. This result was in accordance with those of some other scholars (Malcom, 2009; Lynch, Woelfl, Steele, and Hanssen, 1998; Newland and Woelfl, 1992; Kolb, 1984), as they found that accommodators and divergers were slightly less successful students than convergers and assimilators.

The converger's dominant learning abilities are in abstract conceptualization (AC) and active experimentation (AE). The converger's greatest strength is in the practical application of ideas. The assimilator's abilities are abstract conceptualization (AC) and reflective observation (RO) with the greatest strength in the ability to create theoretical models (Kolb, 2005). Notably, both converging and assimilating learning styles have a higher score in abstract conceptualization (AC) and lower score in concrete experience (CE). Therefore, students with average age of 16 in Iran are expected and academically rewarded for being more abstract and less concrete. This is consistent with Piaget's theory that students develop abstract thinking during adolescence, possibly as a result of environmental (educational) demands. Meanwhile, there is another possible explanation, that is, greater learning occurs when the teaching style matches the students' learning styles than when they are mismatched (Allinson & Hayes, 1996; Felder & Brent, 2005). Thus, it is possible that teachers in the chosen sample have converging and assimilating teaching style. In other words, the higher academic achievement can be the result of the match between teachers' teaching style and the students' learning styles.

Several implications emerge from these results. First of all, in order to assess Iranian students' learning styles, the translated learning styles inventory (Kolb, 1999) can be used. LSI was translated into Persian and then the questionnaire was verified by a panel of lecturers to check the format, arrangement, appropriateness of the content and the language used in the instruments.

Second, the findings of this study extends knowledge in the field of learning styles to the Iranian context, as most of the investigations have been carried out in western culture. After identifying the learning styles of the students, teachers can be encouraged to teach their students accordingly. As stated by Sternberg (1997), teachers must take into account that they teach according to a specific styles. However, they should design a way of teaching which takes into account the diversity of learning styles. This must be done to enrich and at the same time favor all the students. As we know, a compatible learning style with the teaching style of a course instructor enables the students to retain the information much longer, apply it more efficiently and effectively and have more positive post-course attitudes toward the subject than their counterparts who experience learning/teaching styles mismatches (Felder, 1993).

The next implication is that educational psychologists need to develop insights into the specific learning styles which are favored by the educational system. If students can be enabled to be more aware of themselves and the ways in which they are likely to achieve better, they can be encouraged to develop more effective and more flexible learning styles. On the other hand, two major strategies have been proposed for enhancing students' achievement. One is through providing learning environments that match students' learning styles (refer to Adderley, 1987; Grout, 1991; Kagan, 1965). The second strategy is through teaching for a balanced use of styles or flexibility (Saracho & Spodek, 1986; Sternberg, 1997; Zhang 2005). In this regard, the basic principle is that, in order for students to benefit maximally from instruction and assessment, at least some of each should match their learning styles.   Therefore, flexibility is crucial for students as well as for teachers.

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Table 1. ANOVA results for the learning styles and academic achievement in Iran

Forms	N	Mean	Std. Deviation	F	Sig-F	Sig-Levene
Diverging	52	76.46	14.14			
Converging	104	85.27	11.17			
Accommodating	63	77.30	12.49	9.52	.001*	.169
Assimilating	66	84.39	13.04			
Total	285	81.70	13.03			

Table 2. Tukey HSD multiple comparisons

(I) LSI	(J) LSI	Mean Difference	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Diverging	Converging	-8.81*	2.12	.000	-14.29	-3.33
	Accommodating	-.84	2.33	.984	-6.88	5.20
	Assimilating	-7.93*	2.31	.004	-13.91	-1.94
Converging	Diverging	8.81*	2.12	.000	3.33	14.29
	Accommodating	7.97*	1.99	.000	2.82	13.12
	Assimilating	.88	1.96	.970	-4.19	5.96
Accommodating	Diverging	.84	2.33	.984	-5.20	6.88
	Converging	-7.97*	1.99	.000	-13.12	-2.82
	Assimilating	-7.09*	2.19	.008	-12.77	-1.40
Assimilating	Diverging	7.93*	2.31	.004	1.94	13.91
	Converging	-.88	1.96	.970	-5.96	4.19
	Accommodating	7.09*	2.19	.008	1.40	12.77