

The Relationship Between Learning Style Preferences and Academic Achievement of the Hashemite University Students

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Abstract

The purpose of this study was to estimate the relationship between the learning style preferences measured by Kolb's Learning style inventory and academic achievement measured by grade point average (GPA) for 221 undergraduate students at the Hashemite University. The results indicated that subjects were predominantly assimilators. Furthermore, ANOVA test indicated that students with assimilator learning styles had the highest GPAs compared to other learning styles. Based on chi-square tests, differences in learning styles were not found due to gender, educational level, and specialty area. Finally, implications for practice are provided for university faculty members.

العلاقة بين أسلوب التعلم المفضل والتحصيل الأكاديمي لدى طلبة الجامعة الهاشمية

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الملخص

هدفت هذه الدراسة والتي تكونت عينتها من (٢٢١) طالباً وطالبة من مختلف كليات الجامعة الهاشمية إلى التعرف على طبيعة العلاقة بين نمط التعلم المفضل لدى طلبة الجامعة وتحصيلهم الأكاديمي مقاسة بقائمة كولب (Kolb, 1985) لقياس نمط التعلم ومعدل الطلبة التراكمي. وقد أشارت نتائج الدراسة إلى أن الطلبة كانوا في أغلبهم من ذوي النمط التمثلي، وأن الطلبة من ذوي هذا النمط التعليمي كانوا الأعلى في المعدل التراكمي مقارنة بزملائهم من ذوي الأنماط التعليمية الأخرى. كما دلت نتائج اختبار كاي تربيع على عدم وجود فروق ذات دلالة إحصائية تعزى لكل من الجنس، والمستوى الدراسي، ومجال التخصص. وتمخضت الدراسة عن عدد من التوصيات التي تفيد في توجيه الممارسات التدريبية في الجامعة.

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Introduction

Efforts to improve the quality of higher education have been increasing due to technological advancements, competition, and new approaches to teaching and learning (Tagg, 2003). Institutions of higher education are now held accountable to a number of stakeholders including students, parents, legislators, and private and public organizations. As a result, faculty members are now expected to transform methods of teaching which take into account the individual needs of their students (Schoem, 2002).

Colleges and universities have recently recognized that there are different learning styles among students (Malinen, 2000). A learning style is the general tendency toward a particular approach of perceiving and processing information displayed by an individual (Robotham, 1999). Each student's learning style is unique and may not be identical to any other learning style (Fritz, 2002). According to Mathew (1995), learning style is extremely important to consider in improving curricula and instruction in higher education. By allowing students to learn in an environment that corresponds with their learning style, students tend to exhibit better academic achievement (Malinen, 2000; Rosenfield & Rosenfield, 2003). An individual's learning style may play a critical role in predicting academic achievement more than traditional measures such as personality, attitudes, and ability (Tallmadge & Shearer, 1971). Thus, it is the responsibility of the educational system to present facts, concepts, and information in a variety of ways so that all students can have the opportunity to maximize their learning potential (Serasin, 1999).

Research on learning styles in the classroom can help faculty members

to gain insight about students learning preferences and how these preferences influence academic achievement (Silver & Hanson, 1995). This issue has raised concerns in higher education that there is a need to increase research on learning styles of university students and how it contributes to their academic achievement (Plater, 1995). Kolb's (1985) model of learning styles is recognized as one of the prominent and widely used tool for assessing students' learning preferences. The model assumes four learning styles among people in a given learning situation. These styles are divergers, assimilators, convergers, and accommodators.

Divergers perceive information concretely and process it reflectively. They are called imaginative learners because they integrate experiences with the self and need to be personally engaged in the learning process. Assimilators perceive information abstractly and process it actively. They prefer working with ideas than working with people and are strong in situations call for the development of theoretical models. Convergers perceive information abstractly and process it reflectively. They focus on the practical application of ideas and tend to be unemotional, have narrow interests and prefer things over people. Finally, accommodators perceive information concretely and process it actively. They are innovative learners who like to take risks, work through trial and error, and have the ability to adapt to change.

In examining previous research, Elfant (2002) contended that the majority of research conducted on learning styles related to Kolb's model has been focused primarily on elementary and secondary education students. Only few studies examined students' learning styles and academic achievement in higher education settings. Moreover, these studies had contradictory results. For example, Garvey, Bootman, McGhan and Meredith (1984) reported that convergers were more likely to achieve academic success in pharmacy than were students with other learning styles. Jones, Green, Mahan, and Slate (1997) study showed significant differences in GPAs across Kolb's four learning styles, with convergers having the highest GPAs followed by accommodators while divergers and assimilators having the lowest GPAs. The mean GPA for all learning styles, however, was fairly high, ranging from 2.84 to 3.11. Geiger (1991) reported the opposite results where assimilators had the highest GPA's and accommodators with the lowest GPA's. On the other hand, Fox (1984) and Davis (1988) found no relationship between Kolb's learning styles and GPA's. Sparks (1990), however, found the correlation between

Kolb's learning styles and achievement among optometry students to be not strong enough for predictive use.

On the basis of the above argument, the following remarks were observed:

1. Research on the relationship between learning styles and academic achievement remains highly contradictory.
2. Research on the relationship between learning styles and academic achievement is outdated.
3. There has been a little research on learning styles in higher education (Boyer, 2001; Malinen, 2000).
4. There is a dearth of research on the relationship between learning styles and academic achievement (GPA) utilizing Kolb's learning style inventory in higher education settings (Solomon, 1998; Tinto, 1999).

Therefore, there is a need for additional research on the relationship between learning style preferences and academic achievement of students from higher education settings utilizing Kolb's learning style inventory.

Purpose of the Study

The primary purpose of this study was to extend previous research by assessing the relationship between students' learning styles and academic achievement of the Hashemite University students.

Questions of the Study

The following research questions were formulated for the study.

Research Question 1: What are the learning style preferences of the Hashemite University students?

Research Question 2: Do learning styles of the Hashemite University students vary based on differences in gender?

Research Question 3: Do learning styles of the Hashemite University students vary based on differences in educational level (freshman, sophomore, junior, and senior)?

Research Question 4: Do learning styles of the Hashemite University students vary based on differences in specialty area (Humanities and Social Science Colleges vs. the Scientific Colleges)?

Research Question 5: What is the relationship between learning styles of the Hashemite University students and their academic achievement as measured by their overall GPA?

Significance of the Study

Colleges and universities are always looking for new ways to improve their teaching and learning practices. Teaching has always served as an important role to achieve institutional goals of efficiency, effectiveness, and improved students' learning and performance. However, students learn in different ways and are influenced by individual preferences for certain styles or approaches of perceiving and processing information. The benefits from understanding students' learning styles may offer help to meet the diverse needs of students.

Results of this study have important implications for faculty members. By understanding their students learning preferences, faculty members can use such information to design effective teaching strategies. With faculties knowing their students' learning styles, they will be better prepared to help students achieve success. Therefore, this study may help in seeking feasible approaches to help faculties and students find the most effective ways of teaching and learning.

The result of this study will also help fill in the gap in the literature related to the lack of research in higher education and the contradictory results regarding the relationship between learning styles and academic achievement.

Methodology

Study Site

This study took place at the Hashemite University, the fifth state university in Jordan. Teaching began at the Hashemite University, in the academic year 1995/1996. Presently there are more than 15,000 students enrolled in eight colleges. The faculty of educational sciences offers the educational culture course, which is a university elective for undergraduate students as part of their degree program. For the purpose of this study, undergraduate students enrolled in the educational culture class were chosen as the population of the study. For the first term of 2004/2005 there were 12 sections of the class with a total number of 986 registered students representing a variety of academic majors.

Population and Sample

The population for this study was all the Hashemite University undergraduate students who are enrolled in the educational culture class offered by the faculty of educational sciences for the first term of 2004/2005. A

random sample of 300 students was chosen for the study. A total of 221 students completed the survey with a response rate of 74%. Based on their majors, students were classified into two faculties: The Humanities and Social Science Colleges (HSSC) ($n = 101$ or 45.7%) and the Scientific Colleges ($n = 120$ or 54.3%). The resulting sample included 81 males (36.7%) and 140 females (63.3%). There were 87 freshman (39.4%), 58 sophomore (26.2%), 46 juniors (20.8%), and 30 seniors (13.6%). The mean age of the sample was 19.5 years ($SD = 1.03$; range = 18 to 21), and the mean GPA was 2.98 ($SD = .38$; range = 1.87 to 3.87).

Instrumentation

Instrument Description

The Kolb's Learning Style Inventory (LSI) (Kolb, 1985) was used to assess students' learning preferences. The LSI is a self-report measure containing 12 items in which respondents describe their learning style preferences. Each item asked participants to rank order four sentence endings that correspond to a four learning modes: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE). Respondents were asked to rank these sentences on the following scale: 1 (least like you), 2 (third most like you), 3 (second most like you), 4 (most like you). The LSI is scored by adding up the scores in each of the four columns to produce the scores for each of the learning modes (CE, RO, AC, and AE). Therefore, raw scores for each mode range from 12 to 48. The four raw scores are then combined to form the two learning dimensions: perception (AC-CE) and processing (AE-RO). These two dimensional scores are then placed on a learning style grid. Depending on the magnitude of the scores, the individual is categorized within one of the four quadrants that represent an individual's preferred learning style as diverger, assimilator, converger or accommodator. In the present study, the researchers manually categorized and classified each respondent learning style based on their scores and the Grid chart. An SPSS coding of 1 was given to the diverger learning style, a code of 2 was given to the assimilator learning style, a coding of 3 was given to the converger learning style, and a code of 4 was given to the accommodator learning style.

Instrument Validity and Reliability

The reliability and validity of the LSI (Kolb, 1985) is well-document-

ed in the literature. In a study by Marshall and Merritt (1985) the LSI was administered to 543 college students from randomly selected classes at two universities and thirty-seven different majors were represented. The internal consistency reliabilities based on alpha coefficient ranged from .78 to .88. In similar study by Geiger, Boyle, and Pinto (1993), reliabilities ranged from .85 to .88. Finally, Willcoxson and Prosser (1996) investigated 187 Arts and Science students in an Australian university using the responses to the Kolb's (1985) Learning Style Inventory. The results obtained in this study of the reliability and validity of Kolb's (1985) LSI indicate a high degree of reliability, with coefficient alpha reliabilities ranging from .81 to .87 and a high degree of validity which demonstrate different discipline-based learning preferences parallel to those found for the Kolb LSI. Therefore, it is well-documented that the LSI is a valid and reliable instrument for research purposes.

Instrument Translation Process

To ensure equivalence of meaning of the items and constructs between the Arabic and English versions of the LSI, a rigorous translation process was used that included forward and backward translation, subjective evaluations of the translated items, and pilot testing. The goal of the translation process was to produce an Arabic version of the LSI with items that were equivalent in meaning to the original English version (Lomi, 1992; Sperber, Devellis, & Boehlecke, 1994).

One translator (faculty member) bilingual in English and Arabic translated the English version of the LSI into Arabic (forward translation). This translator was instructed to retain both the form (language) and the meaning of the items as close to the original as possible but to give priority to meaning equivalence. When the Arabic translation was finalized, the instrument was then back-translated (from Arabic to English) by another faculty member, bilingual in English and Arabic.

The back-translated items were then evaluated by a group of three faculties to ensure that the item meanings were equivalent in both the original English versions and the back-translated version. If differences in meaning were found between items, those items were put through the forward and back-translation process again until the faculties were satisfied there was substantial meaning equivalence. The Arabic version of the LSI was then pilot tested with a group of 12 students and 10 faculties to collect feedback about instrument content and usage. The feedback from the

students did not lead to any substantive changes. The feedback from the faculties emphasized that the instrument has both face and content validity.

Instrument Standardization

The Arabic version of the LSI was tested with a sample of 45 students different than that of the study but withdrawn from the same population (the Hashemite University students). Cronbach's alpha for the four learning modes was calculated to be as follows: concrete experience (.78), reflective observation (.85), abstract conceptualization (.81), and active experimentation (.79). These reliability estimates seemed consistent with previous research (Gorsuch, 1997). Based on the translation process and the reliability estimates, the Arabic-translated version of the LSI seemed to be valid and reliable measure for use with a Jordanian population.

Data Collection

With the permission of the instructor, the translated LSI was administered to students during regular class periods toward the end of the first semester of 2004/2005. The students received written instructions that specified the purpose of the study and explained the procedures to be followed in responding to the items. They were told that there were no right or wrong responses but only statements with which they can identify themselves. Students were asked to return the survey to the class instructor who in turn returned it to the researchers. The questionnaire included a brief demographic sheet that asked students to provide basic demographic information (e.g., gender, age, educational level, and department) and their GPA which is used as indices of college achievement. Previous research has demonstrated that self-reported GPAs are highly accurate indicators of actual GPAs (Fetters, Stowe, & Owings, 1984). The questionnaire took approximately 12 minutes to complete.

Results

Research Question 1: Learning Style Preferences

Descriptive statistics were used to profile the overall learning preferences of the Hashemite University students. Table 1 indicated that the dominant learning styles that emerged in the entire population were the assimilator followed by the converger. The least frequent style was that of accommodator.

Table 1
Distribution of learning styles

Learning Styles	N	%
Assimilators	78	35.3
Convergers	68	30.8
Divergers	48	21.7
Accommodators	27	12.2
Total	221	100.0

Research Question 2: Learning Styles and Gender

A chi-square test of independence was used to compare if there were differences in learning styles among students based on differences in gender. The chi-square statistic was 2.83 with a significance level of .42. Thus, we failed to reject the null hypothesis and conclude that there were no significant differences between students' learning styles based on differences in gender (Table 2 and 3). In other words, there is insufficient evidence to conclude that there is any evidence that there is a relationship between the learning styles of students and gender.

Table 2
Distribution of learning styles by gender cross tabulation

Learning Styles	Male		Female	
	N	%	N	%
Assimilators	28	34.6	50	35.7
Convergers	30	37.0	38	27.1
Divergers	15	18.5	33	23.6
Accommodators	8	9.9	19	13.6
Total	81	100.0	140	100.0

Table 3
Chi-square tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.828	3	.419
Likelihood Ratio	2.822	3	.420
Linear-by-Linear Association	.324	1	.569
N of Valid Cases	221		

Note. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.90

Research Question 3: Learning Styles and Educational Level

A chi-square test of independence was performed to compare students' learning styles based on differences in educational level. The significance level (0.08) of the chi-square statistic (55.86) was less than the stated alpha. Therefore, we failed to reject the null hypothesis and conclude that there is no significant difference between students' learning styles based on differences in educational level (Table 4 and 5).

Table 4
Distribution of learning styles by educational level cross tabulation

Learning Styles	Freshman		Sophomore		Junior		Senior		Total	
	N	%	N	%	N	%	N	%	N	%
Assimilators	33	37.9	24	41.4	16	34.8	5	16.7	78	35.3
Convergers	29	33.3	20	34.5	16	34.8	3	10.0	68	30.8
Divergers	12	13.8	7	12.1	7	15.2	22	73.3	48	21.7
Accommodators	13	14.9	7	12.1	7	15.2	0	0.0	27	12.2

Table 5
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	55.855	9	.08
Likelihood Ratio	48.375	9	.08
Linear-by-Linear Association	18.199	1	.08
N of Valid Cases	221		

Note. 1 cells (6.3%) have expected count less than 5. The minimum expected count is 3.67

Research Question 4: Learning Styles and Specialty Area

A chi-square test of independence was used to compare differences in learning styles among students based on differences in speciality area. The chi-square statistic was 1.33 with a significance level of .72 resulting in no significant association between specialty area and learning styles of students. Thus, we failed to reject the null hypothesis (Table 6 and 7).

Table 6
Learning styles analyzed by speciality area cross tabulation

Learning Styles	Social Science & Humanities		Science	
	N	%	N	%
Assimilators	38	37.6	40	33.3
Convergers	28	27.7	40	33.3
Divergers	21	20.8	27	22.5
Accommodators	14	13.9	13	10.8
Total	101	100.0	120	100.0

Table 7
Chi-square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.332	3	.721
Likelihood Ratio	1.334	3	.721
Linear-by-Linear Association	.028	1	.867
N of Valid Cases	221		

Note. 0 cells (.0%) have expected count less than 5. The minimum expected count is 12.34

Research Question 5: Learning Styles and Academic Achievement

A one-way analysis of variance (ANOVA) was used to answer for the fifth research question. The test statistic indicated a significant difference in GPAs across learning styles, $F(3, 217) = 8.54$, $p < .05$. The results are presented in Table 8. Multiple comparisons using the Tukey HSD procedure revealed that assimilators had higher GPAs than did accommodators and divergers, who did not differ from each other (see table 9).

Table 8
Results of ANOVA for Differences in GPAs based on learning styles

	Sum of squares	df	Mean Square	F	p
Between Groups	3.34	3	1.11	8.54	.00**
Within Groups	28.29	217	.13		
Total	31.63	220			

Table 9

Results of Tukey's HSD for pair-wise comparison of differences in learning styles by GPAs

	Mean	Mean difference	Sig.
Assimilator vs. Diverger	3.12/2.81	.30*	.001
Converger vs. Diverger	3.00/2.81	.19*	.03
Assimilator vs. Accommodator	3.12/2.83	.28*	.003

Note: * The mean difference is significant at the .05 level.

Discussion and Conclusions

The primary purpose of this study was to investigate the relationship between learning style preferences and academic achievement of the Hashemite University students. The study also investigated differences in learning styles based on gender, educational level, and speciality area. Overall results indicated that more respondents belong to the assimilator and converger learning styles. This implies that students at the Hashemite University enjoy traditional classrooms and prefer learning through lectures that involve abstract ideas, concepts, and theories. By the same token, students also prefer the application of those concepts and theories to real life or practical problems as they may be encountered in educational settings. These results are justified given the nature of the educational system in Jordan. There is more emphasis on abstract ideas and the application of those ideas in a given learning situation. However, the integration of previous experience with self (diverging) and the encouragement of higher levels of innovation (accommodating) are still not largely emphasized.

Results showed no significant differences between males and females in how they learn. Moreover, students from different speciality areas and educational levels did not differ in their learning preferences. A further look at the data presented that more convergers came from the science colleges and more assimilators came from the HSSC. This trend may be due to a difference in the nature of the two departments. The HSSC are characterized by emphasizing abstract ideas and theories more than the science departments which emphasize learning by doing and active participation in the learning experience. Therefore, it is expected to find more assimilators in the HSSC and more convergers in the science departments. With regard to the educational level of students, seniors seemed to be inclined toward the diverging learning style (73%). At this level, sen-

iors have accumulated a reservoir of experience which can be used to integrate with the self in a given learning situation.

With regard to the relationship between learning styles and academic achievement, significant differences in GPAs were found across Kolb's four learning styles. Assimilators had the highest GPAs while accommodators and divergers had the lowest GPAs. The mean GPA for all learning styles, however, was fairly high, ranging from 2.81 to 3.12. These results are not consistent with those reported by Jones et al., (1997) who found convergers having the highest GPA's and assimilators with the lowest GPA's. However, the results mirror those reported by Geiger (1991) who found assimilators to have the highest GPA's and accommodators with the lowest GPA's. These results may be due to the fact that the teaching system in Jordan has always been concerned with abstract knowledge, concepts, and theories over immediate application, imagination, and innovation. This study can be used as a gateway for more research in Arabic cultures to confirm the outcome of this study. In sum, this study adds up to the growing field of literature on the relationship between learning styles and academic achievement. Therefore, the following theoretical and practical implications are suggested:

Theoretical Implications

1. More research is needed with a larger sample from higher education settings to confirm that indeed assimilators have higher GPA's than other learning styles.
2. More research is needed to investigate the relationship between learning styles and academic achievement among all majors in the university not just speciality areas.
3. There is a need to explore the relationship between learning styles and academic achievements between private and public institutions with different teaching systems. For example, we need to choose an institution that encourages the application of ideas and compare it with an institution that favors abstract knowledge and theory.
4. A mixed method research design of both quantitative and qualitative research should be used to gain a deeper understanding of individual, institutional, and environmental factors that may influence students' orientation toward a particular learning style.

Practical Implications

1. Administrators of higher education institutions should move toward changing existing teaching and learning methods to accommodate students' learning styles. Students should have the opportunity not only to learn the material but also to practice it, innovate it, and integrate it with self.
2. Colleges and universities should encourage faculty members to utilize available learning style instruments to assess their students' learning styles. This assessment can then be used for help in class preparation, designing class delivery methods, choosing educational technologies, and developing sensitivity to differing student learning preferences.
3. Administrators of higher education institutions should establish a university-based center which educates students of their learning styles and the weaknesses and strengths associated with their style. The center can also be used to help students choose the right major and future career based on their personality needs.

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