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LEARNING STYLES RELATIONSHIP FOR POST-GRADUATE STUDENTS IN PAKISTANI UNIVERSITIES USING CORRELATION MATRIX

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Abstract- The current study was conducted to know the relationship of learning styles used by the students of University of Management & Technology and University of Lahore, based upon their disciplines (Science, Humanities and Engineering). This is a quantitative study. Unfortunately, Pakistan is lacking such studies at this level; hence, this is an effort to fill this gap vis-à-vis to enhance the ability of university teachers. The data was collected from 300 gender balanced students through a survey designed by Oxford, and analysed through SPSS. The researcher used independent sample t test, ANOVA and bivariate correlation. The study conducted by using three major variables: gender, affiliations (UMT and UOL) and discipline (Science, Humanities, and Engineering). It was concluded that male and female students have insignificant difference in using learning styles in which male students are favouring visual, and interpersonal learning styles; whereas female students are more prone towards intrapersonal and aural styles.Verbal and physical styles of learning have no significant difference gender wise. One way ANOVA was applied to know the discipline wise difference, which rendered that only the significant difference was found in choosing interpersonal and intrapersonal learning styles by the students of different discipline. The university wise difference rendered the results that there is significant difference in using all learning styles except intrapersonal style in which students of UMT are more visual learners; whereas UOL students are more aural. For other learning styles there is significant difference though a slight tilt towards some learning styles can be seen in the tables except for intrapersonal learning style where there is no significant difference found. It was concluded from correlation matrix that all learning styles are interdependent on one or the other style of learning except interpersonal which is not correlated with other styles. Besides that science and humanities students mostly favoured the same styles. Intrapersonal and aural styles of learning are not favoured by humanities students and aural style is also not liked by science students. The study recommends including those activities which support the particular learning styles based upon the choices of discipline to further the results of university students.

Keywords: Learning Style, Graduate learners, Correlation, ANOVA, UMT and UOL

I. INTRODUCTION

Oxford (1990) worked on the learning styles used by the students and separated six different types of learning styles. Those learning styles are affective, cognitive, metacognitive, memory related, compensatory, and social. Rubin conducted studies to find the factors which are responsible for selection of different learning styles like gender, age, proficiency, stage of learning, cultural differences, aptitude and experience of learning (Rubin, 1975, et al., cited by Lee, 2010). Actually language learners are interested to enhance their learning capacity and also wanted to learn in super quick speed; for which they consciously or unconsciously choose the learning styles which can enhance their learning speed and experience.

For the students, learning style is the most important thing to be decided so that they must know that how they can learn a language or some other subject in a better way because it is related with their learning experience. There are multiple learning style typologies being used in the world in different sectors but for the current study the researcher has chosen VAK/VARK model as it is suitable to be used for this study to know about choices of learning styles by the students of University of Management and Technology (UMT)

and University of Lahore (UOL). Other models in the domain of learning styles are useful for professional style and also useful for those who are thinking to choose their profession. This knowledge can be beneficial for those people who are in search of the field with which they can be attached to.

In SLA studies it is shown that different cultures have different choices in choosing the learning styles (Oxford, 1996). The purpose of this study is to find out the learning styles chosen by the university students learning at UMT and UOL at Lahore. It is also an effort to analyse whether there is any interdependence of learning styles so that the teaching methodology could be improved through the inclusion those activities which are based upon some particular learning styles. The samples belong to three different disciplinesavailable in private universities at Lahore i.e. Science (Sc.), Humanities (Hum.) and Engineering (Engg.).

Problem Statement

Students in Pakistan use various learning styles for leaning academic and non-academic contents. They are not properly trained to explore their learning styles; hence, they are sometimes unable to select and properly use them to extend their learning experience. The current study not only determine the learning styles of university students in Lahore but also try to find out the relationship of one learning style to the other so that the students could properly be trained to use different styles to enhance their learning experience.

Research Objectives

- To explore the learning styles used by private university students in Lahore
- To use correlation matrix for analysing the relationship among different learning styles of private university students in Lahore

Research Questions

- What are the learning styles used by university students studying in private universities of Lahore?
  - What are the gender-based different learning styles by the private university students at Lahore?
  - What are the differences in using learning styles by the university students studying at different universities in Lahore?
- How the learning styles used by learners are related to each other?

II. Literature Review

Unfortunately, modern teaching methods are not in action in Pakistani context; hence, the education system is not producing the proper results. A large proportion of students are failed and teaching community is at odds to decide about which teaching method can work better for the best results (Umar & Siddique, 2013). At college level, teachers are using either modern teaching methods with some innovative techniques and the traditional teachings styles which are based on chalk/talk system and using cramming to learn something. Our examination system adds fuel to fire by focussing on who remembers the most can get best marks. This rat race of marks is day by day escalating and students are no more interested to learn the application of the concepts they are going through in the educational institutions. Modern teaching methods being used elsewhere in the world have a focus on the learning of student by creating interest of students to seek the unknown; for which the teachers use various activities to refine their conceptual knowledge and its application too (Khurshid & Ansari, 2012).

Boud&Feletti, (1997) argued that the methods, which force the students to use their inner abilities to explore things at their own and tried their best to apply that knowledge support towards success in the future endeavours of the students. It is no denying the fact that comprehension is enhanced through the techniques used in modern methods. Besides that it helps the students to step ahead to solve their real life issues. If we compare the modern teaching styles with the traditional one, we can have a clear difference in the approach of the students who are being taught with modern methods of teaching; whereas, in the traditional style of teaching the only target is to complete the syllabus and achieve good marks and there is no focus on enhancing the perceptibility of students regarding not only the subject but also for real life too. The main point of difference between modern and traditional teaching methods is using activities which cater different learning styles by the teachers of modern methods. The use of activities which support multiple learning styles are good for the perception and learning of the students (Sajjad, 2009; Doyle, 1993)

Cernal&Pavliushchenko (2015) opined that it is strange that the students of same class have different marks. Some failed, some get good results, howsoever, they are taught by same teaching method and by same

teacher too but there is a vast difference in the final grades. There should be a way to either end this differentiation or at least minimize this gap. There should be a way which could help each student to perform equally well in the examination (2015). One reason is opting out different study habits by different students that produce difference in the quality and quantity of marks. So, their process of study should be continued in an effective manner (Moghadam&Cheraghian, 2009). The problem is that institutes are not paying due attention to exercise those factors which could benefit the students. Though individually the students are working very hard to achieve good results in their academics but due to no help from the institution their efforts are not giving them good results (Baquiran, 2011).

The habits developed by each student to use those activities which can bore fruit and can help him/her to gain comprehension in the concerned subject (Nagaraju, 2004). Students' practices of learning are called study habits. The study habits should be a mixture of theoretical and practical activities and related to the academic field (Kohli, 1977). A study conducted to check the relationship between positive study habits and performance for the success of in the subject of economics provide strong results and proved that there is a strong association, which can guarantee the success (Okpala, Okpaka, & Ellis, 2000).

Crede&Kuncel (2008) recommended that attitudes, habits and skills can positively effect on the students' grades. Blake (1954) pointed that if the students are trained to use their sills, it can be substantial for them to adopt good study habits, which can make them successful. Relating to these, there was another study, which was conducted on secondary level students. The study provided ample proof that study habits and academic success are strongly connected to each other. In an experimental study in a medical college proved that medical students' success and their adoption of learning style is strongly related (Danish & Awan, 2008).

There is no study available to investigate the adoption of learning styles by the university students. So there is a need to discover this finite treasure for the benefit of university students. So that the students could adopt good study habits and the teachers could include those activities which are good for their students' success. The study is conducted to know the study habits of the university students and their relationship to each other so that the learners could augment their study experience.

III. Research Methodology

The study is descriptive in its nature as only the opinions are required regarding learning styles used by university students studying at UMT and UOL in the three disciplines: Science, Humanities, and Engineering. Quantitative approach is used as the data is collected in numbers and frequencies are to be drawn.

Sampling

300 gender-balanced as well as discipline balanced graduate students from two private universities (UMT and UOL) of Lahore.

Tool

The researcher adapted a closed ended questionnaire from learning style battery by Oxford (1996). Before final collection of data, a thorough pilot testing was conducted and after correcting the comprehension problems the tool was used for final collection of data.

Analysis

Table 1.1

Statistics

Gender		Affiliation		Discipline			Visual	Aural	Verbal	Physical	Inter-personal	Intra-personal
M	F	UMT	UOL	Sc.	Hum.	Engg.						
150	150	150	150	101	89	110	300	300	300	300	300	300

As per the above table, it is clear that total sample was 300 out of which 150 male and 150 female were considered. Besides that the samples were equally distributed between two universities UMT and UOL.The samples were also divided into three disciplines, out of which 101 belong to Science, 89 from Humanities, and 110 from engineering departments. Moreover, it is also clear that all 300 samples gave their opinion regarding all six learning styles.

Table 1.2

Descriptive of using leaning style

	N	Minimum	Maximum	Mean	Std. Deviation
Visual learning style	300	4.20	16.80	13.7773	3.55648

Aural learning style	300	4.20	17.00	9.8127	3.65264
Verbal learning style	300	4.20	16.80	11.4873	2.84667
Physical learning style	300	4.40	16.80	10.7660	2.64088
Interpersonal learning style	300	4.20	16.80	11.7513	4.56359
Intrapersonal learning style	300	4.20	16.80	9.3440	4.08810
Valid N (listwise)	300				

The above table clarifies that for all six learning styles the ratio at the minimum level was same i.e. 4.20 but the maximum was changed only for aural learning styles i.e. 17 otherwise the maximum level is same i.e. 16.80. The mean score shows that most of the students' favourite style of learning is visual (13.44) then interpersonal (11.75) and at 3rd is verbal learning style (11.49). Physical learning style comes at 4th position with themeans score of 10.77. Aural and intrapersonal learning styles have almost the same mean score i.e. 9.81 and 9.34 respectively; hence, the less favoured learning styles among university students.

Table 1.3

Gender wise difference in using learning styles

Learning Style	Gender	N	Mean	Std. Deviation	T Value	Sig. (2-tailed)
Visual	Male	150	14.1720	3.05036	1.931	.055
	Female	150	13.3827	3.97036		
Aural	Male	150	9.4760	3.43083	-1.601	.111
	Female	150	10.1493	3.84374		
Verbal	Male	150	11.7467	2.92434	1.582	.115
	Female	150	11.2280	2.75213		
Physical	Male	150	10.8200	2.57043	.354	.724
	Female	150	10.7120	2.71703		
Interpersonal	Male	150	12.0333	4.37101	1.071	.285
	Female	150	11.4693	4.74623		
Intrapersonal	Male	150	9.0893	3.78726	-1.079	.281
	Female	150	9.5987	4.36616		

Male and female are not significantly different in any of the learning styles that might be due to the environment and age factor. The sig. (2-tailed) values are more than the cut value of .05, only the visual style has a minute difference of having .055 otherwise .111 for aural, .115 for verbal, .724 for physical, .285 for interpersonal and .281 for intrapersonal. If we look at the mean values, it seems that male students are most widely choosing visual and interpersonal styles; whereas, female are most prominent in choosing aural style of learning. In all the other styles of learning the difference is almost touching the bottom line.So the dominant choice for male students is visual style and for female students is aural style of learning.

Table 1.4

University wise difference in using Visual learning styles

Categories		N	Mean	Std. Deviation	T Value	Sig. (2-tailed)
Visual	UMT	150	14.5333	3.19233	3.762	.001
	UOL	150	13.0213	3.74705		

The students of UMT are more prone towards using visual style of learning as per the results shown in above table which shows that there is a significant difference in the approaches of UMT and UOL students in their uses of styles of learning as the cut value is .001 with t value of 3.762, which is less than the standard p value

of .05. The mean difference is also showing the difference as the mean value for UOL students is 13.02 whereas the same for UMT students is 14.53.

Table 1.5

University wise difference in using Aural learning styles

Categories		N	Mean	Std. Deviation	T Value	Sig. (2-tailed)
Aural	UMT	150	9.2387	3.22995	-2.752	.006
	UOL	150	10.3867	3.95944		

An independent sample t test was applied on the data gathered from UMT and UOL students about their using of aural style of learning in their day to day learning activities. The result shows that there is a significant difference in their using of aural style as the cut value is .006 which is less than the standard p value which is .05. The mean score for the UOL students is 10.39 whereas the same for UMT students is 9.24 which show that UOL students are using aural style more than the students of UMT.

Table 1.6

University wise difference in using Verbal learning styles

Categories		N	Mean	Std. Deviation	T Value	Sig. (2-tailed)
Verbal	UMT	150	11.9467	2.89129	2.827	.005
	UOL	150	11.0280	2.73442		

The students of UMT and UOL have significant difference in using verbal style of leaning as their sig. (2-tailed) value is .005 which is less than the standard .05 value. The mean difference is also very less which is only 0.92 in which a slight tilting of UMT students towards using verbal leaning style is shown.

Table 1.7

University wise difference in using Physical learning styles

Categories		N	Mean	Std. Deviation	T Value	Sig. (2-tailed)
Physical	UMT	150	11.1693	2.64405	2.672	.008
	UOL	150	10.3627	2.58393		

The mean difference of UMT and UOL students in using physical learning style is 0.81 shows that the students from UMT favour physical learning a little more than the students of UOL, which means they have significant difference in their choices as the 2-tailed value is .008. it is less than the standard p value of .05.

Table 1.8

University wise difference in using Interpersonal learning styles

Categories		N	Mean	Std. Deviation	T Value	Sig. (2-tailed)
Inter-	UMT	150	12.2933	4.71842	2.068	.039
personal	UOL	150	11.2093	4.35174		

There is a significant difference in using interpersonal leaning style by the students of UMT and UOL as the p score is .039 which is less than the standard p value of .05. the t value of 2.068 is also showing the tilt towards UMT students. The mean difference is 1.09, which is showing the favourite style of leaning for the students of UMT is interpersonal and they are more inclined towards it than the students of UOL.

Table 1.9

University wise difference in using Intrapersonal learning styles

Categories		N	Mean	Std. Deviation	T Value	Sig. (2-tailed)
Intra-	UMT	150	9.0253	4.34680	-1.352	.177
personal	UOL	150	9.6627	3.79976		

As per the results of independent sample t test to differentiate the use of intrapersonal leaning style by students of UMT and UOL, there is no significant difference between the students from both universities as the cut value is $t_{-1.352}$=.177 which is far greater than the standard value of .05. Their mean difference .63 is also less than the significant as the mean value for UMT students is 9.03 and for UOL students it is 9.66. It means that the students from both sectors are equally proficient in using intrapersonal style of learning.

Table No 1.10

Correlations matrix of interdependence of learning styles

Learning styles		Visual	Aural	Verbal	Physical	Inter-Personal	Intra-Personal
Visual	P Correlation	1	-.576**	.237**	.003	.100	-.191**
	Sig. (2-tailed)		.000	.000	.962	.084	.001

	N	300	300	300	300	300	300
	P Correlation	-.576**	1	-.494**	-.105	.014	.160**
Aural	Sig. (2-tailed)	.000		.000	.069	.805	.005
	N	300	300	300	300	300	300
	P Correlation	.237**	-.494**	1	.490**	.067	-.053
Verbal	Sig. (2-tailed)	.000	.000		.000	.245	.357
	N	300	300	300	300	300	300
	P Correlation	.003	-.105	.490**	1	-.073	.166**
Physical	Sig. (2-tailed)	.962	.069	.000		.207	.004
	N	300	300	300	300	300	300
	P Correlation	.100	.014	.067	-.073	1	-.807**
Inter-Personal	Sig. (2-tailed)	.084	.805	.245	.207		.000
	N	300	300	300	300	300	300
	P Correlation	-.191**	.160**	-.053	.166**	-.807**	1
Intra-Personal	Sig. (2-tailed)	.001	.005	.357	.004	.000	
	N	300	300	300	300	300	300

**. Correlation is significant at the 0.01 level (2-tailed).

Correlation matrix was applied on using learning styles by the university students of UMT and UOL to analyse the interdependence of learning styles which rendered the above shown table. The table shows that visual learning style is strongly correlated with all other learning styles except physical and interpersonal styles. It is negatively correlated with aural and intrapersonal, which means that these are inversely proportioned with visual style; whereas there is no significant difference in the correlation of physical and interpersonal learning styles, which means visual is not interdependent on them. The magnitude of association is small for intrapersonal, medium for verbal and large for aural, but with the moderate association between visual and verbal shows that visual student should be verbal as well. Aural leaning style is also strongly negatively correlated with visual and verbal learning styles but positively with intrapersonal except physical and interpersonal where there is no association weak or strong is shown. The strength of the association is strong with visual, moderate with verbal and weak with intrapersonal. Verbal style is strongly positively correlated with visual, and physical but negatively correlated with aural. Verbal has no correlation with interpersonal and intrapersonal both. The magnitude of relationship is weak with visual, and medium with aural and physical both. Physical learning style is positively correlated with intrapersonal and verbal and for verbal it is moderate; whereas for intrapersonal it is weak as it has .166 r value. Interpersonal is only correlated with intrapersonal but in negative linear direction, but the magnitude of association is very strong having r value of -.807.The last learning style in the table is intrapersonal and it is correlated with every learning style but positively with aural and physical and negatively with visual and interpersonal. It means that a visual or interpersonal learner cannot be intrapersonal and with the help of adding physical or aural styles of learning can enhance the ability of intrapersonal student.

Table 1.11

One Way ANOVA Test for adoption of learning styles by graduate students

Group Statistics (Descriptive)

		N	Mean	Levene Stat. Sig.
Visual	Sc.	100	14.6673	.650
	Hum	100	13.7843	
	Engg	100	11.8720	
Aural	Sc.	100	9.4990	1.617
	Hum	100	9.6360	
	Engg	100	10.2436	
Verbal	Sc.	100	11.8277	.014

ANOVA Main

	Sum of Squares	Eta Square	df	F	Sig.
BetweenGps	2.228	.09	2	.088	.523
Within Gps	3779.698		297		
Total	3781.926		299		
Between Gps	33.146	.09	2	1.244	.200
Within Gps	3956.045		297		
Total	3989.192		299		
Between	18.528	.08	2	1.144	.986

					Gps					
	Hum	100	11.3888		Within Gps	2404.424		297		
	Engg	100	11.2545		Total	2422.952		299		
Physical	Sc.	100	11.3400	2.298	Between Gps	11.534	.02	2	.826	.102
	Hum	100	11.1240		Within Gps	2073.759		297		
	Engg	100	10.1320		Total	2085.293		299		
Inter-personal	Sc.	100	13.2080	6.291	Between Gps	101.350	.05	2	2.457	.002
	Hum	100	13.4120		Within Gps	6125.740		297		
	Engg	100	10.6320		Total	6227.089		299		
Intra-personal	Sc.	100	10.5680	6.732	Between Gps	102.781	.04	2	3.119	.001
	Hum	100	7.4160		Within Gps	4894.278		297		
	Engg	100	9.5160		Total	4997.059		299		

0.01 = small, 0.06 = medium, 0.13 = large (Cohen, 1987 effect size for eta squared calculation)

A one-way between groups analysis of variance was conducted to explore the impact of discipline on adopting from six different learning styles. Participants were taken from three different disciplines (Science, Humanities, andEngg.). There was a statistically significant difference for selecting interpersonal and intrapersonal learning styles F (2, 297) = 2.46, p > .002 for interpersonal; F=(2, 297)=3.12, p > .001 for intrapersonal In these two learning styles, the actual difference in mean scores between groups was quite small but effect size calculated using eta squared is medium i.e. between .05 and .04. Post-hoc comparisons using the descriptive indicated that the insignificant difference are in the visual, aural, physical, interpersonal and intrapersonal, whose mean score are: for visual Sc.(M=14.67), Hum.(M=13.78) and Engg.(M=11.87) with Lavene statistics of .650; for aural Sc.(M=9.50), Hum.(M=9.64) and Engg(M=10.24) with Lavene significant score of 1.617; for physical Sc.(M=11.34), Hum.(M=11.12) and Engg(M=10.13) with Lavene significant score of 2.298; for interpersonal Sc.(M=13.21), Hum.(M=13.41) and Engg(M=10.63) with Lavene significant score of 6.29; for intrapersonal Sc.(M=10.57), Hum.(M=7.42) and Engg.(M=9.52) with Lavene significant score 6.732. The learning style with significant difference is for verbal Sc.(M=11.83), Hum.(M=11.39) and Engg(M=11.25) with Lavene significant score of .014. The mean difference between groups was quite small and the effect size calculated by eta squared is also medium for every learning style which ranged from .02 to .09.

IV. Discussion and Findings:

The research found out the followings:

1. Male graduate students are more favoring visual, and interpersonal learning styles
2. Female students are in favor of aural and intrapersonal learning styles.
3. There was no significant gender-based difference in using other learning styles.
4. There was also significant difference in using all learning styles by the students from UMT and UOL except for intrapersonal learning style.
5. Visual and verbal learning styles have strong positive correlation and interdependence.
6. Interpersonal learning style has no interdependence or correlation except intrapersonal learning style.
7. Results also show that interpersonal and intrapersonal learning styles have strong magnitude but in negative linear direction.
8. Science and Humanities students have almost same choice for learning styles, but Engineering students have difference choices except in choosing verbal where the choice is same with science and humanities students.
9. Intrapersonal and aural learning styles are mostly not favored by humanities students and intrapersonal is almost at the lower ebb in selection.
10. Aural style is not liked by science students.

The current study is conducted to know the choices of learning styles by the students of UMT and UOL based upon their disciplines. Moreover, it was also tried to find whether learning styles are interdependent or not

so that this knowledge could work for the teachers and syllabus designers to include activities in consonance with other to augment the learning experience of university students. The results established that interpersonal learning style students have no connection with other learning styles, neither positive or negative which means they are not dependent on any style. The question of dependence for other styles resulted that they are interdependent positively with some styles and negatively with some others.

V. CONCLUSION

The study was started with the objectives of having any discern for selection of learning styles by the university students learning at UMT or UOL, and whether any interdependence is available among different learning styles. The questionnaire used by Rebecca Oxford was adopted and adapted based upon cultural norms. It was results university environment has a strong effect on the choices of learning styles but gender has no effect at university level.Actually, in university gender differences have been minimised with strong ties between both genders and those ties have reduced the effect of gender on selecting the learning style for augmenting the experience of learning. It was also concluded that Science and Humanities students have almost same choices for different learning styles but Engineering students are different in their point of views as in most of the cases their choices were different than their counterparts studying in science or humanities.

VI. RECOMMENDATION

The study recommends that:

1. The university teachers should encompass activities based upon students favored learning styles so that their learning could be improved.
2. The students should adopt these learning styles to learn in a better way.
3. If the heads of department might conduct a kind of workshop of how to adopt such kind of activities in the classes by their respective teachers the results could be improved a lot.
4. The teaching methodology at university level at Lahore should be improved through the inclusion of respective activities for the concerned disciplines.
5. The textbook selected should have exercises at the ends of chapters based upon the activities having the favored learning styles by the students of different disciplines.

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