Gender-Based Analysis of Learning Styles among University Students in Pakistan: A Comprehensive Study

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Abstract

Considering the learning style of learners is as significant as the course content being taught in educational institutions. Education based on student-preferred learning styles strives to provide learning methods as well as educational content appropriate for the students. Focusing on preferred learning styles in curriculum designing and academic activities can enhance its effectiveness. The purpose of the current research was to explore the preferences of university students concerning general preferences of learning styles, gender, and discipline differences. The sample consisted of 495 students (44% were females and 55% were male students) of age range 18 to 26 years enrolled under five major faculties from different universities in Pakistan. Felder-Soloman Index of Learning Styles (ILS), a 44-item scale was administered for this purpose. This study addressed three key purposes: The first purpose was the investigation of the general profiles of university students regarding learning style. The second purpose was the exploration of the learning style differences regarding gender while the third purpose was the examination of differences in students' learning styles regarding various disciplines. The statistical practices of average, t-test, ANOVA along with Tukey tests were employed for analyzing data. The preferred learning style of more than half of the students in the present study were sensing, verbal, global, and active learners. Students Learning Styles if grouped according to gender shows higher frequency of male students in Visual-verbal, Active-Reflective, Sequential-Global learning styles. Frequency of female students was higher compared to male in Sensing-Intuitive learning style. Overall result revealed significant differences among university students regarding gender. Results also indicated that the students scored differently in learning styles concerning disciplines in the four ILS scales. This study highlights significant differences in learning styles among university students based on gender and academic discipline. Educators should consider these differences when designing instructional strategies to ensure they are inclusive and effective for all students. Future research should explore these learning style variations in different educational contexts and investigate additional factors influencing learning preferences.

Keywords: Learning style; e-learning; gender differences; discipline differences, university students

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Introduction

Educators for many years have considered learning styles as a significant component of the educational process. Therefore, the recognition of learning style preferences contributes a valuable addition to the body of knowledge relating to the field of educational psychology, pedagogy, and cognitive research. The notion of "learning style" was initially introduced by Rita Dunn in the 1970s and gained huge popularity over the past few decades (Pashler, McDaniel, Rohrer, & Bjork, 2008). Learning style has been defined in several ways, it is also stated as a learner's habitual, natural way of processing information and absorbing innovative skills.

Theoretically, learning styles are defined as a gateway into learners' learning processes (Van Waes, van Weijen, & Leijten, 2014; Moser & Zumbach, 2018). As mentioned by Kolb (1984), learning styles are learner-preferred ways of how to receive and process information. Apart from the differences in expressions, what is similar in given definitions are: (1) learning style emphasis on "individuals" who are different from one another, and (2) learning styles are based internally. Thus, research based on learning styles with an emphasis on psychological attributes of learners including traits, personalities, and characteristics. It is therefore, determined that recognizing the learning style of learners and designing instruction as per learners' needs could improve their level of satisfaction (Popescu, 2010), lessen the time required to learn (Kuo, Chu, & Huang, 2015), and finally enhance their academic performance (Felder & Spurlin, 2005).

Though researchers have investigated learning styles in a multitude of studies from various perspectives under diverse conditions and varied samples (Al-Othman, 2004; Andreou, Andreou, & Vlachos, 2008; Castro & Peck, 2005; Isemonger & Sheppard, 2003; Mulalic, Shah & Ahmad, 2009; Tight, 2010; Wu, 2010; Yong, 2010). However, the underlying construct has not been rigorously investigated especially in the context of Pakistan where the largest number of university students all over the world is housed. Therefore, it is a dire need to focus on learning environments that meet definite learners' characteristics. Educational researchers, in this context should require to develop ways of addressing diverse learning styles of students especially in e-learning environments, so that, e-learners will find ways to become successful in their respective domains. Though numerous studies have investigated the learning styles based on demographic characteristics among university students in Pakistan with many related concepts but there is a scarcity of research studies focusing on gender-based analysis of e-learners learning styles. This study, therefore, intends to provide preliminary research to encourage

the importance of individual differences in learning styles of e-learners in order to achieve their academic performance. As it has been suggested by Litzinger, Lee, Wise and Felder (2007), to provide individualized instruction is not the ultimate goal of teaching and learning; rather to identify factors of balanced instruction. The findings of this research will help us not only to examine, investigate and address learners' individual differences but benefit us to develop student-centered classrooms in order to maximize their learning at the end. The present study is an effort to address this gap by investigating university students' learning style preferences for general patterns, gender, and discipline differences.

Literature Review

The present study relies on the models and theories that have the following two grounds (1) internally based and (2) psychological and cognitive basis. In this regard, Perceptual Learning Style (PLS) was one of the significant models proposed by Reid (1987) which presented the following learning style preferences: visual, auditory, kinesthetic, tactile, group, and individual. Based on this model, Reis devised the Perceptual Learning Style Preference Questionnaire (PLSPQ) to assess these six types of learning styles. The PLSQ has already been utilized in multiple research studies (Isemonger & Sheppard, 2003; Mulalic, Shah & Ahmad, 2009; Tight, 2010; Wu, 2010; Yong, 2010). In one study, Reid (1987) explored that learner with science majors preferred tactile learning style as compared to the liberal arts students whereas regarding gender and cultural background significant difference was not found.

On the other hand, numerous studies have revealed somewhat different findings about the gender differences in the learning styles of university students (Keri, 2002; Sim & Sim, 1995; Philbin, Meier, Huffman, & Boverie, 1995). One study, for instance, indicated that females are more absorbent, prefer to study in groups, and would like to arrange their course content and lecture handouts in an organized manner while males are better at grasping abstract concepts (Chou & Liu, 2005). Similarly, Isemonger & Sheppard (2003) have explored significant gender differences regarding learning styles in a sample of 710 Korean university ESL (English as a Second Language) learners.

The emphasis of previous researches conducted in Pakistan related to learning styles has been broadly on traditional classrooms since they relate to academic performance (Nasir, Mughal & Rind, 2021; Razzak et al. 2019; Yasmin, Akbar, & Yan, 2016). However, empirical data related to learning style of e-learners is scare and scanty (Diaz & Cartnal, 1999). Though, the focus has been rapidly changing to e-learners' learning styles in last two decades. Very few researches have been

conducted in Pakistan to study the learning styles of e-learners (Siddiquei & Khalid, 2022; Siddiquei & Khalid, 2017) while some researches have examined the notion of learning style and e-learning (Cassidy and Eachus, 2002). To enlighten the present facts regarding learning style of e-learners, therefore, one cannot oversee the empirical findings done to date. Similarly, the extensive review of literature has been done to incorporate the researches regarding both constructs: e-learning and learning styles.

Additionally, Zahra, Ali, Naveed, Fatima, Butt & Waseem (2023) conducted a study to explore learning style preferences of undergraduate medical students in Pakistan. They explored that statistically no significant relationships exist between learning style and gender, clinical year, schooling background, or institute type. However, they found significant relationships between age, academic performance, and preferred teaching methodology. Furthermore, Siddiquei & Khalid (2022) explored the preferred learning styles and explore the relationship between learning styles and academic achievement of e-learners in Pakistan. They revealed that all learning styles were positively related to academic achievement (GPA). Also, Yong (2010) observed that cultural background has been closely connected to learning styles. Whereas most of the studies have been conducted in the Western context about learning styles, mainly in the United States of America. Very limited empirical studies have been done in Asian countries, particularly Pakistan.

Researchers (e.g., De Vita, 2001) stated that the construct of learning style requires to be measured using an available, valid, and reliable index. Based on the last two decades, it has been pointed to an increase in the development of instruments measuring learning styles to identify, assess, and classify individual learning styles and learning preferences, still, researchers came to become dissatisfied with available measuring instruments (Isemonger & Sheppard, 2003; Manolis, Burns, Assudani & Chinta, 2013; Siddiquei & Khalid R, 2021). For example, all the available valid and reliable scales that measure learning styles are lengthy, which might cause tediousness, boredom, lack of interest, and exhaustion amongst participants (Romanelli, Bird & Ryan, 2009), and complicated statistical analyses (Manolis et al., 2013). Similarly, the psychometric properties of the existing learning style measures of a shorter form are not sound (Mupinga et al., 2006).

Consequently, more learning style inventories have been devised: the Felder-Soloman Index of Learning Styles (ILS) (Felder & Soloman, 2001), the three-factor survey (Isemonger & Sheppard, 2003), the Style Analysis Survey (Psaltou-Joycey & Kantaridou, 2009). Among them the most used inventory is the Felder-Soloman Index of Learning Styles (ILS) which was used to identify four different dimensions: Visual-Verbal,

Sequential-Global, Sensing-Intuitive, and Active-Reflective. The scale consisting of 44 questions with two possible answers has been adopted in many empirical studies due to its adequate reliability and validity (Felder & Spurlin, 2005). In one such study, Tuan's (2011) reported that older students are more reflective as compared to young students who are more active learners whereas majority of students prefer visual learning style in the Visual-Verbal scale. On the other hand, Middleton (2013) examined gender and racial differences in their study of American university students of science and engineering. They have found significant racial and gender differences. Researchers such as Siddiquei & Khalid (2022) showed that the preferred learning style of e-learners was visual. While they have found auditory style as a second and kinesthetic learning style as the third preferred style.

Literature review discussed above have concluded that the existing empirical data predominantly emphasis on: (a) learning styles impact on learning outcomes (b) how factors including gender and discipline impacts learning styles. The review of literature has also explored that there is a paucity of researches on learning styles particularly within the context of Pakistan where the largest number of students enrolled in different universities from all over the world (Wu, 2010; Wang & Jin, 2008). Additionally, it is also acknowledged that students differ in terms of gender and discipline, but there is a dearth of research has been observed regarding students enrolled in different universities in Pakistan (Reid, 1987; Felder & Spurlin, 2005). In most of the studies discussed above the grouping of disciplines is somewhat rough, students are grouped into science, engineering, and liberal arts irrespective of more specific disciplines, for example, medicine, business, and management sciences. The current study was designed keeping in mind these reasons, to investigate the learning style preferences of university students regarding general patterns, gender differences, and discipline differences. Based on the literature review, the following research questions were of particular interest:

1. What are the general profiles of learning styles of university students?
2. What is the difference between male and female university students regarding learning styles?
3. What is the difference in learning styles among university students for different disciplines?

Methodology
Sample

The sample of the current study comprised 495 students (206 male and 289 female) based on a non-probability convenient sampling technique. The sample was taken from different universities in Pakistan. Of the sample, 44% were females and 55% were male students. The age range of participants was 18 to 26 years. whereas the educational level of students varies from bachelors to master's programs of different courses and different semesters as well. The sample was chosen majorly from five disciplines: management sciences, social sciences, engineering, arts and humanities, biological sciences.

Instrumentation

In the current study following two instruments were used

Demographic Information Sheet

Demographic sheet was used to acquire the information from the study participants. The researcher asked the demographic characteristics by the study participant to collect the background information. The information includes age, gender, semester, and discipline.

Felder-Soloman Index of Learning Styles

The Felder-Soloman Index of Learning Styles (Felder & Soloman, 2001) was used as the main instrument for the present study. The ILS is devised to gauge how students interpret their learning style comprising 44 statements. The Felder-Soloman Index of Learning Styles has four subscales including Sensing-Intuitive, Visual-Verbal, Sequential-Global, and Active-Reflective, whereas eleven items for each scale. Each item of ILS contains two alternatives, a value of 1 allocated to alternative and 0 allocated to alternative. Hence, a higher mean score on each scale indicates the learners are more visual, sensing, sequential, and active respectively. The Cronbach's alpha for ILS was considered good with 0.74 (Fedler, 1996).

Procedure

The study participants were approached and contacted. The booklet comprising of demographic profile and Felder-Soloman Index of Learning Style (ILS) was distributed among 510 participants enrolled in several degree programs. The estimated time to complete the questionnaire was 20-25 minutes. 495 questionnaires were finally collected from the

participants. The response rate indicates 95% on the basics of total questionnaires. Few questionnaires were excluded because of missing and incomplete questionnaires. The informed consent was taken from the participant before administering the questionnaire. They were also informed to carefully complete the questionnaire and request to fill out the complete questionnaire without omitting any statement.

Results

Reliability of the ILS scales in the present study

Table 1

Internal Consistency Reliability for the ILS Scales-Cronbach's alpha (N = 495)

	Standard a	Item variance	Inter-item covariance	Inter-item correlation
Sensing-Intuitive	.691	.650	.021	.717
Visual-Verbal	.719	.608	.074	.651
Sequential-Global	.750	.611	.027	.499
Active-Reflective	.690	.565	.055	.717
ILS	.790	.211	.032	.901

The internal consistency of the ILS was estimated by calculating Cronbach's alphas for the four subscales. The Cronbach's alpha reliability of the 44-item Felder-Soloman Index of Learning Styles (ILS) was .790, as shown in Table 1, and can be considered as adequate for any test (Field, 2013). The Cronbach's alpha values indicate that the items were homogeneously consistent.

Table 2

Inter-scale Correlation (N = 495)

	Sensing-Intuitive	Visual-Verbal	Sequential-Global	Active-Reflective
Sensing-Intuitive	1	.08	.10**	.82**
Visual-Verbal		1	.46**	.88**
Sequential-Global			1	.90**
Active-Reflective				1

**p<0.01

The inter-scale correlation was also calculated as shown in Table 2. Results show that subscales were correlated significantly with each other. (r = .10 to .90, p ≤.01) except sensing-intuitive and visual-verbal (r = .08).

Demographic Characteristics of Participants

The sample comprised of 495 students, ages ranging from 18 to 26 years of age. The mean age was 20.07 years, and the SD was 2.07. The demographic characteristics of the sample have been given in Table 3.

Table 3
Demographic Characteristics of the Study's Sample (N=495)

Variables	Frequency	Valid %	*M*	*SD*
Age in Years			20.07	2.07
18-20	199	37%		
21-23	218	41%		
24-26	78	13%		
Gender				

Male	206	42%	
Female	289	58%	
Study Stream			
Bio Sciences	80	15%	
Social Sciences	127	24%	
Arts & Humanities	76	14%	
Management Sciences	140	26%	
Engineering	76	14%	

Note. Percentages have been rounded off

General profiles of Learning Styles of students

Table 4
Statistics of Scale Scores for the ILS (N = 495)

Variables	*M*	*SD*	Std. error mean	Kurtosis
Sensing-Intuitive	5.7	2.26	.187	-.956
Visual- Verbal	5.9	2.12	.142	-.045
Sequential-Global	5.8	1.85	.122	.190
Active-Reflective	5.2	1.76	.156	-.303
ILS	23.25	4.50	.121	-.025

To know the general profile of the learning styles of the study participants, the mean and standard deviation of the ILS scales were calculated. The means and standard deviations for each ILS dimension i.e., sensing-intuitive, visual-verbal, sequential-global, and active-reflective have been presented in Table 3. The mean scores (as shown in Table 3) demonstrate that the participants scored 5.7 on Sensing-Intuitive, 5.9 on Visual-Verbal, while 5.8 on Sequential-Global, and 5.2 on Active-Reflective. This means that in general more than half of the students in the present study were sensing, verbal, global, and active learners.

Gender differences in learning styles

Table 4

Independent Samples t-Test Showing Gender Differences on the Subscales of ILS (N = 495)

Variables	Gender	*M*	*SD*	*df*	*t-value*	*D*
Sensing-Intuitive	Male	5.60	1.75	142	1.24	0.13
	Female	5.96	1.83			
Visual-Verbal	Male	4.95	1.03	142	1.04**	0.12
	Female	4.41	1.56			
Active-Reflective	Male	5.94	2.74	142	2.42**	0.21
	Female	5.10	2.72			
Sequential-Global	Male	5.35	2.85	142	-1.17**	0.23
	Female	5.04	2.77			

**p<0.01

Likewise, similar findings were noted regarding gender differences among students. It can be seen in Table 4 those female students scored 5.96 on Sensing-Intuitive, 4.41 on Visual-Verbal, 5.04 on Sequential-Global, and 5.10 on Active-Reflective while males scored 5.60, 4.95, 5.35 and 5.94 on

the four ILS scales respectively. This reveals that female respondents were sensing, verbal, global, and reflective learners, whereas more than half of male students were intuitive, visual, sequential, and active learners. The findings revealed that gender differences regarding Visual-Verbal (t = 1.04, p = .011), Sequential-Global (t = -1.17, p = .000) and Active-Reflective (t = 2.42, p = .000) were statistically significant. The effect sizes were also computed as indicated in Table 4. On the other hand, male students in the present study were significantly less verbal, and reflective and more visual and active learners.

Discipline differences in learning styles

Table 5

Analysis of Variance (ANOVA) for the Subscales of the ILS regarding five Categories of Disciplines (N = 495)

Variables	*Study stream*	*M*	*SD*	*Df*	*F*	Ω
Sensing-Intuitive	Biosciences	7.41	1.73			
	Social Sciences	6.90	1.56	(3,605)	1.93**	0.14
	Arts & Humanities	7.04	1.50			
	Management Sciences	7.32	1.66			
	Engineering	7.28	1.70			
Visual-Verbal	Biosciences	4.68	2.09			
	Social Sciences	5.26	2.12	(3,605)	2.09**	0.15
	Arts & Humanities	5.12	2.47			
	Management Sciences	5.38	2.95			

	Engineering	5.09	2.00			
	Biosciences	6.18	1.85			
Active-Reflective	Social Sciences	6.40	1.41	(3,605)	2.74**	0.12
	Arts & Humanities	6.49	1.79			
	Management Sciences	6.72	2.02			
	Engineering	6.21	1.99			
	Biosciences	7.29	2.47			
Sequential-Global	Social Sciences	5.55	1.71	(3,605)	1.28**	0.11
	Arts & Humanities	5.40	2.44			
	Management Sciences	5.44	2.39			
	Engineering	4.90	2.27			

*Note. **p<0.01*

Moreover, the analysis of variance (ANOVA) was performed to see the differences in the learning styles of students regarding specific disciplines (as shown in Table 5). The mean and standard deviation of the Felder-Soloman Index of Learning Styles (ILS) for different disciplines were also computed.

As shown in Table 5, the mean score demonstrates that bioscience students were sensing, verbal, global, and active learners, social sciences students were sensing, verbal, sequential, and active learners while arts and humanities students were sensing, verbal, global, and active. Business and management students were sensing, verbal, global, and active whereas engineering students were sensing, verbal, global, and active learners.

The ANOVA table also revealed that the students scored differently in learning styles concerning disciplines in the four ILS scales. The differences in Visual-Verbal (F = 2.09, p = .051), Sequential-Global (F = 1.28, p = .000) and Active-Reflective (F = 2.744, p = .000) were found to be significant. It is clearly shown from the table that bioscience students were significantly different from their class fellows in social sciences and business and management in Visual-Verbal. It has also been observed that business management students were significantly different from bioscience, social science, and engineering students in Active-Reflective. Regarding Sequential-Global, bioscience students were significantly different from those of management science, social sciences, and arts & humanities.

Discussion

The current study provides valuable evidence that the Felder-Soloman instrument is a reliable and valid instrument for measuring learning styles. This study is a noteworthy contribution to the existing literature indicating that the consistency of previous findings regarding ILS as a valid and reliable tool continues across distinct student groups. In the present study, the scale attained quite moderate scores of reliability and were correlated positively to each other as evident from other studies (Zywno, 2003; Livesay, Dee, Nauman & Hites, 2002).

The reliability estimates of 0.79 indicates that the ILS satisfies the criterion of acceptability while the Cronbach alphas on the four dimensions of the scale was also moderate which was noted in the other studies as well (Zwanenberg, Wilkinson, & Anderson, 2000). Therefore, the outcomes of this study also establish the scale validity. However, the internal consistency and the inter-scale correlations findings of this study were lower as stated in other contexts (Felder & Spurlin, 2005; Zywno, 2003).

The current study findings revealed that students in Pakistan appeared to be sensing, verbal, global and active learners. These findings were not consistent with Felder & Spurlin (2005) who claimed that engineering students were mostly sensing, visual, sequential, and active somewhat different from the students in Western countries. The probable justification for this might be the differences of teaching pedagogies between the West and Pakistan. A good number of Pakistani students had been taking instructions orally from their teachers ever since primary school or even kindergarten. Teachers did not frequently use slides or images in lectures nor there were many pictures used in textbooks until recently. It is therefore easy to understand that the verbal style was chosen by majority of university students in Pakistan. Furthermore, while the exam-oriented education and learning had been prevalent in Pakistan, the

instructors and learners may have become used to making general outlines to evaluate for upcoming exams, especially for the science and arts students, leading to a global preference. However, it should also be observed that as compared to other studies, the general mean scores of all four scales in this study were lower and closer to the average which could be due to the large number of participants. It is also evident that Pakistani teachers had been integrating different styles into their classroom teaching letting students to had adapt themselves into a more balanced way of teaching and learning. Though, the phenomena require to investigate further.

This study demonstrated significant gender differences regarding three ILS scales i.e., visual-verbal, active-reflective and sequential-global. However, an extensive number of research studies are available on learning styles regarding gender (Baykan & Nacar, 2007; Murphy, Gray, Straja, & Bogert, 2004; Zeraati, Hajian, & Shojaian, 2008). These researches have contradictory findings and suggest no significant gender differences exists between medical, humanistic, and midwifery students concerning learning styles. Researchers has been recommended that it is significant to explore gender differences among students of different culture (Llach & Gallego, 2012; Tatarintseva, 2002). Though, it would enable the researchers, academicians, scholars to narrow the gender gap in education.

Regarding discipline, the current study revealed significant differences among students of different disciplines in Pakistani contexts. As presented in Table 5, majority of the business administration students were the active learners as compared to the five disciplines. This may be because management students were often needed to participate in collaborative activities, such as group discussions and seminars. Additionally, students of social sciences usually required to learn more and prefer to learn the concept in a holistic way instead of the logical steps and details as compared to natural sciences and engineering students. Moreover, non-significant difference was found on the subscale of Sensing-Intuitive.

Conclusion

The current study provides a significant addition to the existing literature regarding university students learning styles. The Felder-Soloman Index of Learning Styles (ILS) was used for this purpose for students enrolled in five universities in Pakistan. Statistical analyses explored the following results:

1. The Index of Learning Styles (ILS) was a valid as well as reliable measure of learning style.
2. The findings also showed that university students in Pakistan are inclined towards sensing, verbal, global, and active learners as compared to university students in the West.
3. There were significant differences regarding gender among university students on three subscales: visual-verbal, active-reflective, and sequential-global probably indicating differences in personality and thought patterns across genders (Costa, Terracciano & McCrae, 2001).
4. There were significant differences were found between students of specific disciplines regarding learning styles.

Recommendations

It is imperative to know that both gender and discipline had a considerable influence on the students' preferences of learning style. Knowledge about suitable learning styles is imperative for both learners and teachers. Students may have a better picture of the learning as well as the teaching process if they know what type of learners they are. This study will also be beneficial for the learners because it will help them select their learning strategies according to their learning style, which, ultimately plays an influential role in academic achievement. As far as teachers are concerned, it is of utmost significance for teachers to recognize learning styles diversity, and their theories. They should know that learners have diverse learning styles, also every student learns differently from another. Based on this fact, teachers must adapt and find a balanced teaching approach. It sheds light on the fact that various approaches to teaching should be adopted for accommodating diverse learning styles.

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