Social Sciences & Humanity Research Review
ISSN 3007-3170(O), ISSN :3007-3162(P)
Volume 3 issue 1,pp. 423-447
January-March 2025

Received: 01 January 2025 ,Accepted: 28 January 2025

DOI: https://doi.org/10.33282/jssr.vx2i4.24

Learning Styles and Academic Achievement among University Students

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ABSTRACT

The purpose of this research was to investigate the connection between different learning styles and individual levels of academic achievement. There were a total of 202 female participants and 98 male participants in the sample. University students were the primary subjects of the investigation. During the course of the research, a method known as convenience sampling was used. We employed a study strategy known as cross-sectional research. A demographic and learning style questionnaire was used to gather data, and informed permission was obtained from participants. In order to analyze the data, SPSS was used, and correlation, regression, and independent sample t-tests were performed. For the most part, the findings indicate that there is a substantial association between the visual learning style and academic achievement.

Keywords: learning styles, visual learning style, auditory learning style, kinesthetic learning style, academic achievement

INTRODUCTION

Individuals' behaviors and the amount of information they acquire are significantly impacted by their interactions with their surroundings. Learning is recognized as an ongoing process that takes place throughout a person's whole life (Karol, 2023). Education is a fundamental aspect of an individual's existence. A human being acquires knowledge throughout life from several sources. Learning has a significant position in psychology, since it substantially influences human existence across developmental, cognitive, educational, and social domains. Learning is an interactive process between students and educational materials, directed towards the attainment of defined objectives (Nasution & Fuad, 2022). Students adopt various learning methods based on their preferences and the attainment of academic goals.

Early psychological theories and classifications, such as those presented by Thelen in 1954 and subsequently elaborated upon by Gardner's Theory of Multiple Intelligences (Xing, 2023), played a role in the development of the concept of learning styles. This concept originated from the recognition that individuals have distinct preferences for the acquisition of knowledge. A great number of inventories, such as Kolb's and Fleming's VARK, have been developed in order to categories these styles, which typically consist of kinesthetic, auditory, and visual modalities (Sood & Sarin, 2021). The most widely recognized kinds are visual, auditory, and kinesthetic, with visual learners preferring information given visually, auditory learners benefiting from hearing, and kinesthetic learners engaging via movement and touch (Auliyah et al., 2023). Furthermore, some research broadens this categorization to include tactile, individual, and group learning styles, emphasizing learners' diverse preferences (Sumitha P. & Prasadh, 2022). Furthermore, identifying these styles may have a substantial impact on educational tactics

and curriculum design, since knowing students' preferences allows for individualized teaching techniques that improve learning results. Here are some learning styles models.

VARK Model. In his VARK model, Neil Fleming classified people's preferred methods of learning as either visual, auditory, reading/writing, or kinesthetic. While the VARK model's efficacy in enhancing learning outcomes remains debatable, recent research have provided evidence for its usefulness in varied educational contexts. The usefulness of VARK for individualizing classroom instruction, especially in online and hybrid settings, was validated in 2019 research. Although the VARK model is widely used to assess learning styles, it should not be used in isolation to help students with various requirements (Mayer, 2019).

Gardener's Theory of Multiple Intelligences. Multiple kinds of intelligence linguistic, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalistic are proposed by Howard Gardner's theory of intelligence. Learning experiences that cater to diverse intelligences have a favorable impact on students' engagement and academic achievement. This is especially true in inclusive classrooms. Gardner mentioned that the linguistic intelligence appears to be the one most widely shared by humans across the world because without linguistic skills in semantics, phonology, syntax, and pragmatics, people would have difficulty functioning with efficacy in the world. In contrast, the abilities of gymnasts, mathematicians, musicians, and visual artists are often perceived as remote and even mysterious by the average person (Nulhakim & Berlian, 2020).

Kolb’s Model. David Kolb's concept incorporates four distinct kinds of learners Converging, Diverging, Assimilating, and Accommodating and places an emphasis on experiential learning. Four steps make up the model's cycle: seeing the world firsthand, reflecting

on that experience, conceptualizing the world abstractly, and finally, actively trying out new things. Research conducted investigated the use of Kolb's model in higher education and professional development, specifically in regards to the promotion of reflective learning and critical thinking (Ng, 2019). A growing body of evidence emphasizes its value in supporting adult education in the workplace.

Honey and Mumford's Learning Styles. Honey and Mumford expanded upon Kolb's model to provide a typology that emphasizes the relevance of theory to professional growth and organizational contexts: pragmatists, activists, reflectors, and theorists. Honey and Mumford's model has been the subject of ongoing research; most recently, Parikh and Kamat (2018) found that the model can improve staff development programs by catering to various kinds of learners.

Cognitive and Neuroscientific Methods. Recent studies have shown that cognitive neuroscience methods, which center on mental workload, memory systems, and brain processes, are superior to more conventional learning techniques. While cognitive techniques do not refer to a certain "learning style" they do study how people take in and make sense of data. Learning style theories were criticized in a 2017 study of cognitive neuroscience in education by John Hattie, who also highlighted the significance of retrieval practice and cognitive load theory in improving learning (Hattie, 2017).

The concept of learning styles refers to the diverse ways in which individuals perceive, process, and retain information (Aslaksen & Lorås, 2018). These preferences can have a significant impact on the learning outcomes of students, as they directly influence the effectiveness of the instructional methods employed (Putra & Pratiwi, 2020).

Learning styles have a substantial impact on academic achievement, as proven by several research that investigate this link in a variety of educational settings. For example, a study of nursing students discovered that convergent and accommodator learning styles were connected with improved academic achievement, implying that personalized learning settings may improve student results. Similarly, study on first-year education students found a strong link between preferred learning techniques and academic achievement, underscoring the notion that recognizing individual learning styles is critical for successful teaching (Uyangoren & Ibojo, 2024). However, the link is complicated; although some research finds a modest negative association between learning styles and academic accomplishment, they underline the more important effect of academic desire in determining performance (Shala et al., 2024).

The relationship between learning styles and academic achievement can vary significantly across cultures due to differing educational systems, societal values, and cognitive expectations. Studies from various countries have explored the relationship between learning styles and academic achievement. Students who are taught in a way that aligns with their preferred learning style tend to perform better academically. For example, visual learners may achieve higher academic success when they are provided with infographics or videos that complement lecture content (Pashler et al., 2009). In more traditional or collectivist cultures, group learning and social interaction can play a significant role in reinforcing learning. Students in such cultures may thrive in environments where learning is a social activity, and the sharing of knowledge is encouraged (Vygotsky, 1978). Pakistan’s education system is influenced by both Eastern traditions and the legacy of British colonialism. As a result, the country has a blend of learning environments that might vary between regions and institutions. Like many other South Asian countries, Pakistan has traditionally relied on rote memorization as a teaching method.

This method primarily caters to visual learners who learn best by reading or memorizing written materials (Hossain & Fiala, 2019). The medium of instruction in Pakistani universities is often English, a second language for many students. This language barrier may limit the effectiveness of auditory learners, who benefit from discussions and lectures in their native language. Students may struggle with comprehension, leading to lower academic performance (Mahboob, 2009).

Rationale of the Study

In educational research learning styles and academic achievement has been an interesting area. As students become increasingly diverse, it is critical to know how individual preferences for processing information shape learning outcomes so that more effective educational strategies can be developed. The variance in learning styles referring to ways in which a student would learn is not forgetting about the visual, auditory, kinesthetic modalities and how it significantly influences academic performance.

Researchers have conducted very little work on learning styles and academic achievement in traditional educational models in Pakistan. This study will help fill this gap by investigating the influence learning styles may exert on the academic success of university students in a South Asian context in the light of the growing body of literature on this subject.

Objectives of the Study

1. To examine the relationships among learning styles (visual, auditory and kinesthetic) and academic achievement.
2. To examine the role of learning styles (visual, auditory and kinesthetic) in predicting academic achievement.

3. To see the group differences on learning styles (visual, auditory and kinesthetic) and academic achievement in terms of gender among university students.

Hypothesis

1. There will be significant relationships between learning styles (visual, auditory and kinesthetic) and academic achievement among university students.
2. Learning styles (visual, auditory and kinesthetic) will significantly predict academic achievement.
3. There will be significant group differences in learning styles (visual, auditory and kinesthetic) an academic achievement in terms of gender among university student.

Literature Review

Individuals have distinct preferences for the way in which they absorb information, which in turn affects their learning experiences and the results they achieve in their academic endeavors, according to the learning styles theoretical framework.

Cognitive psychology, which emphasizes the mental processes associated with learning, can provide a fundamental comprehension of learning approaches. During the initial phases of cognitive theory, individuals such as Jean Piaget and Jerome Bruner established the foundation for comprehending the various processes by which humans generate knowledge. According to Piaget's cognitive development theory, human beings undergo a series of intellectual maturation stages, each of which is distinguished by its own unique information processing techniques (Piaget, 1952).

According to the constructivist theory, learners are presumed to develop their own understanding of the world through their interactions with their environment, which encompasses sensory experiences and social interactions. Upon this perspective, learning patterns are regarded as a reflection of an individual's method of knowledge formulation. The formation of this approach is influenced by personal preferences, as well as social and cultural factors (Vygotsky, 1978; Bruner, 1996, Khattak et al., 2011).

Howard Gardner's Theory of Multiple Intelligences (1983), which was published in 1983, represents a substantial theoretical advancement in the field of learning patterns. Gardner's theory posits that intelligence is multifaceted and that individuals may exhibit proficiency in multiple cognitive domains. Nevertheless, it is crucial to recognize that this concept is not a definitive account of specific learning approaches. Gardner's holistic approach encompasses naturalistic intelligence, linguistic intelligence, logical-mathematical intelligence, spatial intelligence, acoustic intelligence, bodily-kinesthetic intelligence, interpersonal intelligence, and intrapersonal intelligence.

Both the framework of learning styles and the paradigm of information processing, which has been significantly influenced by cognitive psychology, are critical factors. The human intellect is compared to a computer for the purpose of this concept, as the latter is capable of receiving, processing, storing, and retrieving information. In the context of this discourse, learning styles are perceived as individual variations in the processes of information encoding, storage, and retrieval. The cognitive burden hypothesis, which was initially developed by John Sweller in 1988, is frequently implemented in this context.

The study of learning styles owes a great deal to Herman Witkin's (1976) bipolar concept of field reliance and field independence, which assesses the degree to which an individual is affected by their immediate environment. The accuracy with which one can distinguish a basic item from a background of more complicated figures is measured by his Group Embedded Figures Test (GEFT) and other instruments created for this purpose (Claxton & Murrell, 1987; Griggs, 1991). Because they rely on internal referents to organize events on their own, field independent persons are able to work more independently. These individuals may discern figures in the middle of their surroundings. individuals who are unable to distinguish between figures are known as field dependent or field sensitive, and they are more affected by and sensitive to their surroundings, which includes other individuals. In order to process information, they use their whole environment. Students who are sensitive to their field pay equal attention in class to the instructor's interpersonal interactions and communication style as they do to the topic itself (Anderson & Adams, 1992; Griggs, 1991; Hvitfeldt, 1986). It is important to recognize that there are more than just two kinds of individuals in the world, say Claxton and Murrell (1987).

The multi-dimensional model that tackles learner variances within the context of the learning process is this outer layer of the onion. The Canfield Learning Style Inventory is one such model (1980). According to Claxton and Murrell (1987), industrial psychologist Canfield drew extensively on Maslow's theory of the hierarchy of needs, McClelland's study on achievement motivation, and Joseph Hill's work on cognitive style mapping. Canfield established scales in four domains in 1980. Affiliation (the student's need to form personal relationships with both other students and the teacher), structure (the student's desire for order and precision), achievement (the student's desire for autonomy and the establishment of

personal goals), and eminence (the student's orientation toward rivalry and power) are all factors that contribute to the first learning condition. Subject matter choices of students constitute the second domain. This encompasses the following domains: numeric (numerical and logical labor), qualitative (words and language work), inanimate (objects and their repair or construction), and people (interaction with humans, interviews, sales, etc.). Expectations and manner are evaluated in the third and fourth sections. When asked about their preferred style of instruction, students often cite listening, reading, modeling, and first-hand experience.

This research intends to investigate the function of motivation in academic achievement. Among the most important fields of study concerning academic achievement is motivation. Developed by Deci and Ryan (2000), the key hypothesis Self-Determination hypothesis (SDT) explains how motivation affects academic results. This idea holds that motivation may be internal—that is, when the source is inside—that of interest in or enjoyment for something—or external—that of a grade or acceptance you are seeking for. Carol Dweck's theory of Growth Mindset is another crucial idea that greatly affects academic performance in the previous ten years till today. Dweck's (2006) hypothesis holds that pupils' opinions of their own ability are quite crucial. While pupils with a "fixed mind set" feel that intellect and talents don't change with work and persistence, those with a "growth mindset" believe that these things can change with those things. Studies by Yeager and Dweck (2012) have shown that, when applied with students, interventions grounded on growth mindset concepts may really improve student performance in demanding fields of study, including mathematics. This notion encourages perseverance and tenacity in the face of these academic obstacles as we know that students who see their capacities as capable of developing will study harder

and finally end up gaining higher academic achievement. Second, we discard the importance of cognitive elements and self-efficacy, implying that human data may not teach us anything. Another rather crucial component of academic success is self-efficacy, and a fundamental idea in Bandura's Social Cognitive Theory (1986). Bandura's theory of how individuals participate in activities that are good rather than bad emphasizes on the need of conviction in oneself (self-efficacy) on the relevance of academic performance of students. Those that feel they can succeed are more likely to apply the necessary effort for success, to keep on despite obstacles, and use smart learning techniques. In such vain, most particularly in the field of STEM education, current research have underlined the need of personal efficacy driving academic performance (Zimmerman, 2013). Bronfenbrenner's Ecological Systems Theory (1979) has value since it helps us to see that academic success can be influenced by the several layers of influence, from family and peer relationships (microsystem) and to those outside of the individual such as society norms. Last decade's study has clarified the part family background, school environment, and larger society expectations play in the conceptualizing of academic success. O'Connor (2019) claims that macro level events, particularly those related with socioeconomic inequalities, which are more noticeable in underprivileged populations, affect student results. The way the theory explores the interdependence of many environmental systems raises awareness of the complexity of academic success that must be nurtured holistically rather than isolated one.

Research, especially in higher education, continues to investigate the correlation between learning styles and academic accomplishment. Recent studies have shown a beneficial association between learning styles and academic success when teaching methods align with students' preferences. Vasco, Lopes, and Pimenta (2017) performed research at a Portuguese

institution investigating the impact of various teaching styles on students' academic achievement. The findings indicate that teachers using a multimodal approach, integrating visual, aural, and kinesthetic modalities, yielded enhanced student satisfaction and academic performance. In a same setting, Al-Hathy (2017) investigated the correlation between learning styles and academic performance among university students in Saudi Arabia. The researchers found that students instructed using techniques aligned with their preferred learning styles, such as visual and kinesthetic approaches, had superior comprehension and performance in engineering courses. The research demonstrated that incorporating learning preferences into course design enhances students' academic performance, particularly in technical disciplines that heavily depend on experiential learning and visual aids.

RESEARCH METHODOLOGY

Population and Sample of the Study

The term "population" is used to describe the totality of things or people that share a certain quality. In research and analysis, it stands in for the bigger, more inclusive group (Banerjee & Chaudhury, 2010). The population of the study is university students.

Researchers extrapolate from a smaller, more controllable group, the sample, to the larger population (Taherdoost, 2016). The sample was 300. There were 98 males and 202 females who participated in the study.

Research Design

The research design used in the study is cross-sectional correlational. Correlational research design was used to analyze the relation between learning styles and academic achievement. Correlational research findings may ascertain prevalence and correlations among

variables, as well as predict occurrences based on existing data and expertise (Curtis et al., 2016).

Sampling Strategies

According to Shorten and Moorley (2014), sampling is a method used in research to pick a subset of a population. For conducting research, convenience sampling was used. Convenience sampling is a non-probability sampling strategy. The data collection process from a research population that is easily accessible to the researcher is referred to as convenience sampling (Rahi, 2017).

Sample Size

G*power 3.1 is a general power analysis program applied in studies to determine sample size and estimate power (Verma & Verma, 2020). In order to determine the size of the sample, we used an effect size of.3, a statistical power of.95, and an alpha error probability level of.05. It was determined that the sample size was 134.

Inclusion Criteria

- The graduate and postgraduate students were included.
- Students who demonstrated a high level of comprehension were incorporated.

Exclusion Criteria

- The undergraduate was excluded from the studies.
- The questionnaires that were not filled completely were excluded.

Instrument

Learning Style Questionnaire reproduced by O'Brien in 1985 used (O'Brien, 1989). The questionnaire consists of 30 questions under the visual, auditory and kinesthetic elements. Each question has three preferences; "never applies to me"; "sometimes applies to me"; and "often applies to me." Maximum 30 marks and minimum ten marks were given for each section. If students have marked "often applies to me" in every category, they considered as mix learners. The Cronbach's alpha for the three main is areas respectively 0.83, 0.80, and 0.77.

All students place a high value on academic achievement. Lawrence and Vimala (2012) state that academic achievement is obtained from formal education based on test scores, grade points, averages, and degrees. In order to improve students' academic achievement, identifying and controlling variables that affect students' academic achievement is one of the main goals of the education system in the world (Naseer, Haq & Farooq, 2018; Maryam et al., 2019). Academic Achievement was measured through CGPA of the students.

RESULTS

The data of the subjects was analyzed using statistical computerized software called statistical package for social sciences version 26(SPSS-26). To gain a better understanding of the association and discrepancy among individuals with financial hardship, various statistical techniques such as correlation, multiple regression, independent t-test and Anova were employed. This allowed assessing the relationships between different variables. To provide a comprehensive overview of the research participants, the demographic variables were examined alongside the frequency and percentages, which are presented in the table below.

Table 1: Frequency and Percentage of Variables of the Sample (n = 300)

Respondent's	Characteristics	*f*	*%*
Gender	Male	98	32.7
	Female	202	67.3
Marital Status	Unmarried	279	93.0
	Married	21	7.0
Education	Graduate	202	67.3
	Post graduate	98	32.7
Social Economic Status	Lower	16	5..3
	Middle	262	87.3
	Upper	22	7.3
Institute	Government	150	50
	Private	150	50
Major	Social Sciences	53	17.7
	Engineering and Technology	48	16.0
	Computer Sciences	45	15.0
	Humanities	42	14.0
	Health and Medicine	11	3.7
	Arts and Design	34	11.3
	Business and Management	67	22.3

Note: f = Frequency, % = Percentage

The data indicates that women make up 67.3% of the sample, while men make up 32.7% of the respondents. With 93% of the sample being unmarried and only 7% being married, a sizable number of the respondents are either younger or single. The majority of participants have higher education, as evidenced by the fact that 67.3% are graduates and 32.7% have studied post-graduate courses. The majority of respondents (87.3%) come from middle-class backgrounds, with fewer coming from lower (5.3%) or upper (7.3%) socioeconomic brackets. With 50% of the responses coming from each type of educational institution, the sample is evenly split between public and private institutions, indicating balanced representation from each. Business and Management is the most common academic focus, accounting for 22.3% of responses. Social Sciences (17.7%), Engineering and Technology (16%), and Computer Sciences (15%) are the next most popular majors. Though to a lesser degree, the humanities (14%) and arts and design (11.3%) are also represented, while health and medicine has the lowest percentage (3.7%). In general, the sample is made up primarily of middle-class women with doctoral degrees who have a wide range of interests in technical, social, and business domains.

Table 2: Reliability and Descriptive Statistics of Learning Style Questionnaire and its Subscales (n=300)

Variables				Ranges			
	M	SD	α	Potential	Actual	Skewness	Kurtosis
Learning Styles							
Visual Learning Style	20.71	2.75	.67	10-30	10-28	-.12	.12
Auditory Learning Style	19.52	2.89	.64	10-30	11-28	.04	-.10

Kinesthetic Learning Style	20.09	2.77	.57	10-30	13-29	.30	.12

Note: M = Mean, SD = Standard Deviation, α = Alpha

Descriptive statistics for a collection of variables associated with learning styles, such as the Learning Style Questionnaire and its subscales: Visual, Auditory, and Kinesthetic Learning Styles, are presented in the table. Each variable's mean (M) scores represent the average response. The mean scores for the individual learning styles are 20.71, 19.52, and 20.09 for visual, auditory, and kinesthetic learning styles, respectively. The response variability for each scale is indicated by the standard deviation (SD) values. The variability of all learning styles are followed by the Auditory (2.89), Kinesthetic (2.77), and Visual (2.75) Learning Styles. The internal consistency (α) of visual is .67, auditory (.64) and kinesthetic is (.57). This indicates the extent to which the items within each scale are correlated. The distribution shape of the data is indicated by the skewness and kurtosis values. In general, the learning style scales are relatively symmetric (skewness close to 0), and their distributions are a close approximation to normal, with slightly flatter tails (kurtosis near -0.15 for the full questionnaire and around 0 for subscales). Based on this, it appears that the data is approximately normally distributed within an acceptable range.

Table 3

Pearson's Product Moment Coefficient of Correlation between Academic Achievement Visual Learning Style, Auditory Learning Style, Kinesthetic Learning Style and Learning Styles (n=300)

Variables	1	2	3	4
1. Academic Achievement	-	.70	-.178**	-.105

Learning Styles			
2.Visual Learning Style	-	.329**	.344**
3. Auditory Learning Style		-	.479**
4. Kinesthetic Learning Style			-

The table shows the correlation between academic achievement and different learning styles (visual, auditory, and kinesthetic), as well as a general learning style measure. Academic achievement is favorably connected with Visual Learning Style (r =.70), implying that students with greater visual learning styles do better academically. Visual learning style shows favorable, moderate relationships with auditory (r =.329) and kinesthetic (r =.344) learning styles, suggesting that students who prefer visual learning also exhibit preferences for them. Kinesthetic and auditory learning styles are substantially associated (r =.792), indicating they overlap. Note that the general "Learning Styles" measure is highly correlated with all three individual learning styles, with the strongest relationship with Kinesthetic Learning Style (r =.790), indicating that the general measure reflects individual preferences. Though statistically significant for Auditory Learning Style, the negative correlations between academic achievement and both auditory (r = -.178) and Kinesthetic (r = -.105) Learning Styles suggest weaker, negative associations, suggesting that these learning styles may have less of an impact or even an inverse relationship with academic achievement. The overall trend reveals that visual learning style is most positively associated with academic achievement.

Table 4 Multiple Linear Regression of Learning Styles as Predictors of Academic Achievement (n=300)

Variables	Learning Styles					
	Visual Learning		Auditory Learning		Kinesthetic Learning	
	B	SE	B	SE	B	SE
	.04**	.01	-.02**	.01	.02**	.01
Constant	3.8	.17	3.9	.13	3.8	.17
R^2	.23		.18		.23	
ΔR^2	.05		.03		.05	

Note: R^2 = R square, ΔR^2 = Adjusted R square, **p<.01

The table presents the results of a multiple linear regression analysis examining the relationship between learning styles (visual, auditory, and kinesthetic) and academic achievement. For Visual Learning, the regression coefficient is .04, indicating that visual learning predicts academic achievement. The standard error for this coefficient is 0.01, indicating the precision of the estimate. For Auditory Learning, the coefficient is -.02, suggesting a negative relationship between Auditory Learning and the academic achievement. The standard error is .01, similar to that for Visual Learning. For Kinesthetic Learning, the coefficient is .02, indicating a positive relationship with the dependent variable, again with a standard error of .01.

Table 5 Independent Sample T test (n=300)

	Men (n=98)		Women (n=202)				*95%Cl*		
Variables	*M*	*SD*	*M*	*SD*	*t*	*P*	*LL*	*UL*	*Cohen's d*

Academic Achievement	3.4	.29	3.5	.32	-3.14	.002	-.20	-.04	-.38
Learning Styles									
Visual Learning Style	20.17	2.44	20.96	2.87	-2.34	.019	-1.5	-.12	-.28
Auditory Learning Style	20.10	2.77	19.24	2.91	2.42	.015	.16	1.6	.30
Kinesthetic Learning Style	20.69	2.86	19.79	2.69	2.63	.008	.23	1.6	.33

The table presents a comparative analysis of male and female individuals across several variables, including Academic Achievement and Learning Styles, accompanied by pertinent statistical tests and effect sizes. In the domain of Academic Achievement, male participants (M = 3.4, SD = 0.29) exhibited lower scores than their female counterparts (M = 3.5, SD = 0.32), with this difference being statistically significant (t = -3.1, p = 0.002). The 95% confidence interval (CI) for the difference in means spans from -0.20 to -0.04, suggesting that, on average, men scored between 0.20 and 0.04 points lower than women. The effect magnitude, quantified by Cohen's d, is -0.38, indicating a modest to moderate effect. In the context of Learning Styles, the mean scores for males (M = 60.96, SD = 6.27) and females (M = 60.00, SD = 6.27) exhibit a high degree of similarity. Furthermore, the observed difference between these scores is not statistically significant (t = -4.7, p = 0.220). The confidence interval for the mean difference spans from -0.60 to 2.5, and the effect size, as measured by Cohen's d, is 0.15, which is considered minor. This suggests that there is a negligible difference between the two groups.
In the domain of Visual Learning, male participants exhibited lower scores (M = 20.17, SD =

2.44) compared to their female counterparts (M = 20.96, SD = 2.87). This disparity is statistically significant, as indicated by the t-value of -2.3 and a p-value of 0.019. The 95% confidence interval for the mean difference ranges from -1.5 to -0.12, and the effect size is calculated at -0.28, indicating a small to moderate difference that favors women. In the domain of Auditory Learning, male participants (M = 20.10, SD = 2.77) exhibited superior scores compared to their female counterparts (M = 19.24, SD = 2.91), with this difference being statistically significant (t = 2.4, p = 0.015). The confidence interval for the difference in means ranges from 0.16 to 1.6, and the effect size, as indicated by Cohen's d = 0.30, implies a small to moderate effect that favors males. In the domain of Kinesthetic Learning, male participants (M = 20.69, SD = 2.86) exhibited higher scores than their female counterparts (M = 19.79, SD = 2.69), with this difference being statistically significant (t = 2.6, p = 0.008). The 95% confidence interval for the mean difference spans from 0.23 to 1.6, and the effect size, as indicated by Cohen's d = 0.33, suggests a moderate effect that favors males.

DISCUSSION

The study was undertaken to assess the impact of various learning styles on academic achievement. The identified modalities of learning encompass visual, auditory, and kinesthetic approaches. The results of the correlation analysis revealed a noteworthy relationship among the variables. The visual learning style exhibited a favorable relationship with academic achievement. The observed negative correlations between academic achievement and both auditory and kinesthetic learning styles suggest a weaker, negative association, indicating that these learning styles may have a diminished impact or even an inverse relationship with academic achievement. The prevailing trend suggests a strong positive correlation between the

visual learning style and academic achievement. According to (Pashler et al., 2008), the concept of learning styles has a significant impact on the area of education. It is commonly encountered at all levels, from kindergarten to higher education. (Wang, 2007) describes learning style as a method for students to acquire individual information in the way or style that they choose.

The regression table suggests an inclination towards a visual learning style. Furthermore, it predicts a negative relationship between auditory learning and academic achievement. The correlation between kinesthetic learning and academic achievement is notably favorable. This finding is supported by Pourhosein Gilakjani (2011), who identifies that the predominant learning type among Iranian EFL students is visual, followed by auditory and kinesthetic learning methods. Wahab and Nuraeni (2020) found that about fifty percent of the pupils were identified as visual learners. The visual learning type is the predominant learning mode.

The independent sample t test reveals a statistically significant difference in Academic Achievement that favors women, alongside variations in specific Learning Styles particularly Visual, Auditory, and Kinesthetic with differing effect sizes. However, the overall findings indicate only modest differences between men and women across the variables being investigated.

CONCLUSION

This research aimed to explore the relationship between various learning styles and individual academic achievement levels. The study aimed to assess the impact of learning styles on academic achievement. The recognized learning types were visual, auditory, and kinesthetic. The correlation study revealed a substantial relationship among the variables. The visual learning approach showed a favorable relationship with academic achievement. The negative correlations identified between academic achievement and both auditory and kinesthetic learning styles suggest weaker, adverse linkages, indicating that these learning styles may have less effect or possibly an inverse relationship with academic success. The prevailing tendency is that the visual learning style has the most positive correlation with academic success. The regression table demonstrates a preference for the visual learning modality. Furthermore, it predicts a negative association between auditory learning and academic achievement. Kinesthetic learning correlates positively with academic success. The independent sample t-test demonstrates a statistically significant difference in Academic Achievement favoring women, alongside variations in specific Learning Styles (notably Visual, Auditory, and Kinesthetic) with differing effect sizes; however, the overall findings indicate only modest differences between men and women across the examined variables.

LIMITATION

- Firstly, measuring learning styles through self-reports or surveys can introduce bias and inconsistency, as students may not accurately identify their preferred learning style.
- Small or non-diverse sample sizes can limit the generalizability of findings
- The increasing use of technology in education also complicates the assessment of learning styles, as digital tools may engage multiple styles simultaneously.

- Additionally, students' self-assessment of their learning style may not be accurate, introducing potential bias.

RECOMMENDATION

- First, to more accurately identify students' learning styles, it is beneficial to use a combination of assessment methods, such as self-reports, teacher assessments, and performance-based tasks.
- Instead of focusing solely on learning styles, the study should consider a holistic approach, examining how other factors like motivation, prior knowledge, and cognitive abilities influence academic achievement.
- It's also important to ensure that the sample is diverse and large enough to improve the generalizability of the findings.
- Longitudinal studies are also recommended to assess the long-term effects of learning styles on academic achievement, as short-term studies may not capture the full impact.
- In addition, professional development programs for teachers could help raise awareness about the potential benefits of learning styles while emphasizing the need for adaptable teaching methods.

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