Original Article

Association between Academic Learning Strategies and Annual Examination Results among Medical Students of King Edward Medical University

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Abstract

Learning style is the composite of cognitive, affective, and physiological characteristics that serve as relatively stable indicators of how a learner perceives, interacts and responds to the learning environment. Felder – Solomon Index of Learning Style (ILS) includes Sensitive/Intuitive, Visual/Verbal and Sequential/ Global, Active/reflective. The learning strategies are a major indicator of exam performance of students.

Objective: To find the association between academic learning strategies and annual examination results among medical students of King Edward Medical University.

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Study Design: Cross – sectional study design.

Study Setting and Duration: King Edward Medical University and 3 months.

Materials and Methods: The study was conducted among the 3rd, 4th, and 5th year medical students of KEMU Lahore. Informed consent was taken. A total of 300 students, 100 each from 3rd, 4th and 5th year were taken. 132 males (44%) and 168 females (56%) were part of the study. Simple Random sampling (non-probability sampling) was used.

Results: The overall dominant learning strategies among students of King Edward Medical University were sensing/SNS (64.3%), visual/VIS (80.7%), sequential/SEQ (63.7%) and Active/ACT (50.3%). Chi squared test for individual learning combinations against achiever types showed no significant association between academic learning strategies and annual exam performance (p value > 0.05). Results also showed that females performed better academically than their male counterparts.

Keywords: Learning strategies, Index of learning styles, exam performances, medical students.

Introduction

"Learning style is the composite of cognitive, affective, and physiological characteristics that serve as relatively stable indicators of how a learner perceives, interacts and responds to the learning environment".[1] Student oriented learning has taken precedence over teacher oriented one. This has resulted in adoption of new teaching methods that allow students to employ their own methodology.[2] The learning style of a student is a major indicator of his performance in examinations. Students with different learning styles perform differently on different exam questions.[3] Various studies have been conducted in the past in order to establish the spectrum of learning styles adopted by students. Till date there has been no study carried out to establish the relationship between exam performance and learning styles employed by students.

Different researchers have developed different methods to qualify and quantify different learning strategies. VARK developed by Fleming[4] describes students' preference for Visual (V), Aural (A), Read/ Write (R) and Kinesthetic (K); it tells us which teaching style is the most conducive to a student's learning in a particular setting. Index Learning Style (ILS) is an instrument developed by Felder and Silverman[5] which is used to assess preferences on four dimensions[6] of a learning style model. These four dimensions are: Processing: Active/Reflective, Perception: Sensing/Intuitive, Input: Visual/Verbal, Understanding: Sequential/ Global. Vermunt[7] developed a method spanning four dimensions of cognitive processing, metacognitive regulation, mental learning models and learning orientations. Based on these characteristics, he classified student learning styles as undirected, reproduction – directed, meaning – directed and application – directed. We shall use ILS model in our study because VARK has little to say about personality, motivation, social preferences, physical environment or intraversion – extraversion and also because it inclines more towards teaching directed than self – directed learning. ILS identifies Vermont's four learning styles and is a more practical in use. An individual learning style is subject to variation with time, learning environment and course enrollment. The learning preponderance of an engineering major may not be the same as that of a medical student. A student's inclination towards a particular learning dimension provides an insight into his strengths, habits and tendencies which might affect his performance in academic set up. ILS is designed to assess preference on the four dimension of Felder – Silverman learning style. Based on ILS model, a study conducted in 2003 on 493 first year engineering students of Aalborg University, Denmark revealed that the majority was active, visual and sensing type while sequential and global learners were relatively equal.[8] Furthermore, among 129 Materials engineering majors at Iowa State university, 63% were active, 67% sensing type, 85% visual and 58% sequential learners. Undergraduates totaling 2506 from various engineering disciplines and from across different universities were tested for the preponderance of learning strategies. Active (64%); Sensing (63%); visual (82%) and sequential (60%) were the dominant preferences. A relative mismatch was observed between the engineering undergraduates' learning preferences and the teaching styles. Teaching methodology was more inclined towards reflective, intuitive and global learning.

In the past, the predominant learning style in medical students has been found.[9] However, to date, no research of sorts has been conducted regarding correlation of exam scores and learning styles of medical students particularly in the context of Pakistan. The rationale of this study is to establish the preponderance of learning strategies according to the ILS questionnaire amongst the students of King Edward Medical University and its association with exam performance.

This research aims to investigate the preponde-

rance of learning strategies among under – achievers, achievers, high achievers and overachievers. It will help form a comparison between the different strategies adopted and establish the superiority of the learning strategies of high – achievers, which shall lead to the establishment of a successful pattern of academic learning styles that could revolutionize the exam results and curb the social problems arising due to failure. Additionally, this could call for a more uniform question – writing in exams and for instructors to have a better match between their teaching styles and students' needs.

Materials and Methods

The study was conducted among the 3rd, 4th, and 5th year medical students of KEMU Lahore. Informed consent was taken. A total of 300 students, 100 each from 3rd, 4th and 5thyear were taken. 132 males (44%) and 168 females (56%) were part of the study. Cluster sampling (probability sampling) was used. Excluded from our study were:

- Students of Allied Health sciences/MD/MS programs.
- Students from other colleges.
- Students having any physical disability.
- Students having any mental illness.
- Students other than 3rd, 4th and final year MBBS.
- Non cooperative students.

Study Design

Cross sectional study.

Study Setting and Duration

King Edward Medical University and 3 month duration.

Data Collection Procedure

Data is pretested. A total of 300 3rd, 4th and final year MBBS students were asked to fill out the bio – data pro forma and Felder – Solomon Index of Learning Style (ILS) questionnaire manually. Data was collected by all our team members. According to ILS questionnaire, each participant is given 44 questions, 11 from each dimension of learning style with a possible 'a' or 'b' answer. The scores of 'b' in each dimension are subtracted from scores of 'a' in the same dimension to reach an integer between -11 to +11 which indicates both the learning strategy and its strength. The inclination towards a particular style maybe mild, moderate or strong.

Operational Definitions

Exam Performance

- **Under – achievers:** Scoring less than 65% in their exams (mean of all professional exam scores).
- **Achievers:** Scoring 65% or above and less than 70% in their exams (mean of all professional scores).
- **High – achievers:** Scoring 70% or above and less than 75% in their exams (mean of all professional scores).
- **Overachievers:** Scoring 75% or above (mean of all professional scores).

Learning Strategies

There were 4 pairs of learning strategies in total which are as follows:

1. Sensing/Intuitive:

- **Sensing (SNS):** Concrete thinker, practical, oriented towards facts and procedures.
- **Intuitive (INT):** Abstract thinker, innovative, oriented towards theories and underlying meanings.

2. Visual/Verbal

- **Visual (VIS):** Prefer visual representation of presented material such as pictures, diagrams and flow charts
- **Verbal (VRB):** Prefer written or spoken explanation.

3. Active/Reflective

- **Active (ACT):** Learn by trying things out, enjoy working in groups.
- **Reflective (REF):** Learn by thinking things through; prefer working alone or with a single familial partner.

4. Sequential/Global

- **Sequential:** Liner thinking process, learn in small increment steps.

- **Global:** Holistic thinking process, learn in large leaps.

Hypothesis

There exists an association between academic learning strategies and annual examination results among medical students of King Edward Medical University.

Null Hypothesis

There is no association between academic learning strategies and annual examination results among medical students of King Edward Medical University.

Data Analysis

All collected data was entered and analyzed in computer program SPSS version 22. Frequency and percentage of dominant learning strategies among overachievers, high achievers, achievers and underachievers was calculated. Inter – gender and inter – class comparison was also a part of the study. The p value ≤ 0.05 was considered significant. **At df = 3 and $p \leq 0.05$; $X^2_{crit} = 7.81$. If X^2_{calc} is more than 7.81, result becomes significant.**

Results

Examination Results and Academic Learning Strategies

The overall dominant learning strategies among students of King Edward Medical University were sensing/SNS (64.3%), visual/VIS (80.7%), sequential/SEQ (63.7%) and Active/ACT (50.3%). Majority of the overachievers were Reflective (REF), Visual (VIS) and Sequential (SEQ). The number of Sensing (SNS) and Intuitive (INT) learners among overachievers was the same. High achievers had the greatest proportion of Active learners compared to the other three achiever types. High achievers showed preponderance for active, sensing, visual and sequential learning strategies. While majority of high achievers were of the Active type, the greatest proportion of overachievers was of the Reflective type. Achievers were mainly reflective, sensing, visual and sequential. As far as the underachievers are concerned, majority were of the Reflective, Sensing, Visual and Sequential types. The most common learning strategy from the four learning combinations in all achiever types was Visual. **Chi squared test for individual learning combinations against achiever types showed no significant association between academic learning strategies and annual exam performance (p value > 0.05).**

Gender Preponderance

An analysis drawn between gender and learning types revealed that more males were Reflective, Sensing, Visual and Sequential while females only differed from their male counterparts in being more Active.

Furthermore, our study shows that significant statistical difference exists between exam performances of females and males. Females out – perform their male counterparts.

Percentages ACT/REF

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ACT	151	50.3	50.3	50.3
	REF	149	49.7	49.7	100.0
	Total	300	100.0	100.0	

SNS/INT

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SNS	193	64.3	64.3	64.3
	INT	107	35.7	35.7	100.0
	Total	300	100.0	100.0	

VIS/VRB

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	VIS	242	80.7	80.7	80.7
	VRB	58	19.3	19.3	100.0
	Total	300	100.0	100.0	

SEQ/GLO

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SEQ	191	63.7	63.7	63.7
	GLO	109	36.3	36.3	100.0
	Total	300	100.0	100.0	

Achiever type

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Overachiever	16	5.3	5.3	5.3
	High achiever	101	33.7	33.7	39.0
	Achiever	122	40.7	40.7	79.7
	Underachiever	61	20.3	20.3	100.0
	Total	300	100.0	100.0	

COMPARISON

			ACT/REF		Total
			ACT	REF	
Achiever type	Overachiever	Count	6	10	16
		% within Achiever type	37.5%	62.5%	100.0%
	High achiever	Count	59	42	101
		% within Achiever type	58.4%	41.6%	100.0%
	Achiever	Count	58	64	122
		% within Achiever type	47.5%	52.5%	100.0%
	Underachiever	Count	28	33	61
		% within Achiever type	45.9%	54.1%	100.0%
Total		Count	151	149	300
		% within Achiever type	50.3%	49.7%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.964[a]	3	.397
Likelihood Ratio	2.902	3	.407
N of Valid Cases	300		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.71.

The X^2_{calc} is less than 7.81 so result is statistically insignificant

			SNS/INT		Total
			SNS	INT	
Achiever type	Overachiever	Count	8	8	16
		% within Achiever type	50.0%	50.0%	100.0%
	High achiever	Count	69	32	101
		% within Achiever type	68.3%	31.7%	100.0%
	Achiever	Count	80	42	122
		% within Achiever type	65.6%	34.4%	100.0%
	Underachiever	Count	36	25	61
		% within Achiever type	59.0%	41.0%	100.0%
Total		Count	193	107	300
		% within Achiever type	64.3%	35.7%	100.0%

Chi-Square Tests

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			VIS/VRB		Total
			VIS	VRB	
Achiever type	Overachiever	Count	13	3	16
		% within Achiever type	81.3%	18.8%	100.0%
	High achiever	Count	83	18	101
		% within Achiever type	82.2%	17.8%	100.0%
	Achiever	Count	99	23	122

		% within Achiever type	81.1%	18.9%	100.0%
	Underachiever	Count	47	14	61
		% within Achiever type	77.0%	23.0%	100.0%
Total		Count	242	58	300
		% within Achiever type	80.7%	19.3%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.681[a]	3	.878
Likelihood Ratio	.663	3	.882
N of Valid Cases	300		

a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 3.09.

The X^2_{calc} is less than 7.81 so result is statistically insignificant

			SEQ/GLO		Total
			SEQ	GLO	
Achiever type	Overachiever	Count	12	4	16
		% within Achiever type	75.0%	25.0%	100.0%
	High achiever	Count	63	38	101
		% within Achiever type	62.4%	37.6%	100.0%
	Achiever	Count	81	41	122
		% within Achiever type	66.4%	33.6%	100.0%
	Underachiever	Count	35	26	61
		% within Achiever type	57.4%	42.6%	100.0%
Total		Count	191	109	300
		% within Achiever type	63.7%	36.3%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.396[a]	3	.494
Likelihood Ratio	2.431	3	.488
N of Valid Cases	300		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.81.

The X^2_{calc} is less than 7.81 so result is statistically insignificant

			ACT/REF		Total
			ACT	REF	
Gender	Male	Count	64	68	132
		% within Gender	48.5%	51.5%	100.0%
	Female	Count	87	81	168
		% within Gender	51.8%	48.2%	100.0%
Total		Count	151	149	300
		% within Gender	50.3%	49.7%	100.0%

			SNS/INT		Total
			SNS	INT	
Gender	Male	Count	87	45	132
		% within Gender	65.9%	34.1%	100.0%
	Female	Count	106	62	168
		% within Gender	63.1%	36.9%	100.0%
Total		Count	193	107	300
		% within Gender	64.3%	35.7%	100.0%

			VIS/VRB		Total
			VIS	VRB	
Gender	Male	Count	111	21	132
		% within Gender	84.1%	15.9%	100.0%
	Female	Count	131	37	168
		% within Gender	78.0%	22.0%	100.0%
Total		Count	242	58	300
		% within Gender	80.7%	19.3%	100.0%

			SEQ/GLO		Total
			SEQ	GLO	
Gender	Male	Count	78	54	132
		% within Gender	59.1%	40.9%	100.0%
	Female	Count	113	55	168
		% within Gender	67.3%	32.7%	100.0%
Total		Count	191	109	300
		% within Gender	63.7%	36.3%	100.0%

Association between Inter – gender Exam Performances

Achiever type * Gender Cross – tabulation

			Gender		Total
			Male	Female	
Achiever type	Overachiever	Count	3	13	16
		% within Gender	2.3%	7.7%	5.3%
	High achiever	Count	28	73	101
		% within Gender	21.2%	43.5%	33.7%
	Achiever	Count	58	64	122
		% within Gender	43.9%	38.1%	40.7%
	Underachiever	Count	43	18	61
		% within Gender	32.6%	10.7%	20.3%
Total		Count	132	168	300
		% within Gender	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	32.996[a]	3	.000
Likelihood Ratio	34.029	3	.000
N of Valid Cases	300		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.04.

The X^2_{calc} is more than 7.81 so result is statistically significant

Class Preponderance

A greater number of 4th year students were Reflective as opposed to relatively higher Active learning style seen in 3rd and final year. All three years inclined more towards Sensing, Visual and Sequential learning types.

			ACT/REF		Total
			ACT	REF	
Class	3rd year MBBS	Count	51	49	100
		% within Class	51.0%	49.0%	100.0%
	4th year MBBS	Count	45	55	100
		% within Class	45.0%	55.0%	100.0%
	5th year MBBS	Count	55	45	100
		% within Class	55.0%	45.0%	100.0%
Total		Count	151	149	300
		% within Class	50.3%	49.7%	100.0%

			VIS/VRB		Total
			VIS	VRB	
Class	3rd year MBBS	Count	82	18	100
		% within Class	82.0%	18.0%	100.0%
	4th year MBBS	Count	87	13	100
		% within Class	87.0%	13.0%	100.0%
	5th year MBBS	Count	73	27	100
		% within Class	73.0%	27.0%	100.0%
Total		Count	242	58	300
		% within Class	80.7%	19.3%	100.0%

			SNS/INT		Total
			SNS	INT	
Class	3rd year MBBS	Count	69	31	100
		% within Class	69.0%	31.0%	100.0%
	4th year MBBS	Count	61	39	100
		% within Class	61.0%	39.0%	100.0%
	5th year MBBS	Count	63	37	100
		% within Class	63.0%	37.0%	100.0%
Total		Count	193	107	300
		% within Class	64.3%	35.7%	100.0%

			SEQ/GLO		Total
			SEQ	GLO	
Class	3rd year MBBS	Count	66	34	100
		% within Class	66.0%	34.0%	100.0%
	4th year MBBS	Count	66	34	100
		% within Class	66.0%	34.0%	100.0%
	5th year MBBS	Count	59	41	100
		% within Class	59.0%	41.0%	100.0%
Total		Count	191	109	300
		% within Class	63.7%	36.3%	100.0%

Discussion

Preponderance of learning strategies among Engineering majors and Medical students was found in the past but no such study of this type has ever been conducted in the context of Pakistan. Our study goes a step further in order to find the association between exam per-

formance and academic learning strategies. However, no statistical significance was found between exam performance and academic learning strategies. Exam performance is multifactorial. Probable reasons explaining the results of our study coming out negative could be difference in intellectual capacity of students, different approach towards examination, poor grading system, difference in dedication towards studies, peer pressure, diversity in strength of foundation in basic sciences and varying attitude of students towards teachers. Certain policy measures to boost academic performance would involve uniform exam writing, replacement of pass/fail criteria by Grade Point Average (GPA) and opting channels for proper counseling of students. However, some factors were not accounted for – IQ being one of them. Further limitations include our study being conducted only on students from King Edward Medical University. Moreover, only Index Learning of Styles (ILS) was used to determine learning strategies. Other models were not followed. For further studies, other models can also be followed to evaluate learning strategies. Medical students hailing from different institutions can be researched upon. Factors like IQ should be controlled in other studies. An ILS model for teaching strategies should be conducted among teachers and compatibility established with predominant learning strategies shown by our research.

Conclusion

The Null Hypothesis that states that there is no association between academic learning strategies and annual examination results among medical students of King Edward Medical University cannot be rejected. Our research establishes that females outperform their male counterparts in academic performance.

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