

ORIGINAL ARTICLE

LEARNING STYLE OF MEDICAL STUDENTS AND ITS CORRELATION WITH PREFERRED TEACHING METHODOLOGIES AND ACADEMIC ACHIEVEMENT

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Background: Researchers have categorized the learning styles in many ways. Kolb proposed a classification of learner's styles as convergers, divergers, assimilators and accommodators. Honey and Mumford simplified learning styles as activists, reflectors, theorists and pragmatists. Neil Fleming's VARK model (Visual, Auditory, Read/write and Kinesthetic) is also popular. This study was carried out to determine the frequency of learning styles (Honey and Mumford) of medical students and its correlation with preferred teaching methodologies and academic achievements. **Methods:** A total of 77 medical students of 4th year MBBS were selected through non-probability convenient sampling for this study. Honey and Mumford's learning style questionnaire, and a 2nd questionnaire to know their preference for different teaching methodologies were distributed to the students. Learning styles were identified and correlated with preferred teaching methodologies and academic achievements by Chi-square test. **Results:** Mean age of the medical students was 22.75±1.05 years. Twenty one (27.3%) participants were males and 56 (72.7%) females. By learning styles, 7 (9.1%) medical students were activists, 36 (46.8%) reflectors, 13 (16.9%) theorists and 21 (27.3%) were pragmatists. Out of 77 students, 22 preferred interactive lectures; 16, small group discussion; 20 problem based learning, 10 preferred demonstration on models. Only 01 students preferred one-way lecture as the best teaching methodology. No significant correlation was found between learning styles and preferred teaching methodologies and learning styles and academic scores. **Conclusion:** Most of the medical students had reflector (46.8%) and pragmatist (27.3%) learning styles. Majority preferred interactive lectures (28.57%) and problem based learning (25.98%) as teaching methodologies. Aligning our instructional strategies with learning styles of the medical students will improve learning and academic performance.

Keywords: Learning styles, learning style questionnaire, instructional, strategies, teaching methodologies, academic achievement.

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INTRODUCTION

All over the world, new concepts and themes are coming up in various areas of medical education. Traditional teacher centred approach has gradually evolved into a student centred learning. In recent years, the study of various learning styles of learners has received a significant attention, and it is becoming vital that educators know and utilize the best possible methods to help students to learn successfully. A learning style refers to the way a learner perceives and processes information and is defined as "a distinctive and habitual manner of acquiring knowledge, skills and attitude through study and experience".¹ All learning styles are of equal value and importance and they only represent different ways of acquiring knowledge in different persons.²

Researchers have categorized the learning styles in many ways. Neil Fleming's presented a VARK model (sometimes VAK).³ According to this model, students' learning is influenced by sensory

preferences. According to VARK model there are four learning modalities Visual, Auditory, Read/write and Kinesthetic. Pask divided learners into two groups, serialistic (analytic) and holistic (gestaltic) based on their learning styles.⁴ Later on Kolb simplified the classification of learners based on bipolar construct (perception continuum and process continuum) into convergers, divergers, assimilators and accommodators.⁵ Honey and Mumford proposed a new classification and named learning styles as activists, reflectors, theorists and pragmatists. An activist likes to take direct action, welcomes new challenges and experiences. A Reflector is a good listener, thoughtful before action, likes to reflect and evaluate. The theorist is logical and objective paying great attention to details, likes to see the overall picture with clear objectives. The pragmatist is practical and likes to see how things work, enjoys experimenting and problem solving.⁶ Every learning style has got its own suitable instructional strategies. Research has shown a clear link between the two.⁷

Valley showed that the use of a single instructional strategy for all types of learning styles is not suitable for learning process.⁸ Activists learn best in an environment with variety of continued activity like problem based learning, group discussion, hands on experience, simulations and role play. Reflectors learn best when learning activity provides the opportunity to think and reflect like reading, clinical decision making, clinical rotations, audio/video films. Pragmatists learners learn when issues of learning are practical, and objective oriented like practicals, workshops, demonstrations and field trips. Theorists learn when they are allowed to analyze and synthesize ideas like reading and analysing theories and concepts, lectures, interactive discussions, and question-answer sessions.^{6,7}

Learning styles and instructional strategies in a society could be affected by many variables.⁹ Understanding the way students learn, helps in selection of the instructional strategies best suited to them.¹⁰ The distribution of learning styles amongst the undergraduate medical students is different from the styles found in postgraduates. The postgraduates commonly have the reflector learning style while the undergraduates are predominantly activists and theorists.¹¹

The aim of this study was to know the various learning styles of undergraduate medical students; and their correlation with preferred teaching methodologies, and academic scores in university examination.

MATERIAL AND METHODS

This correlational study was conducted at Khawaja Muhammad Safdar Medical College, Sialkot from March to July 2014. Approval for this study was obtained from Institutional review board. Seventy seven (77) out of 95 medical students of 4th year MBBS were selected through non-probability convenient sampling. All students, both male and female, who had appeared in the second professional university examinations, were included in the study and those students who had been relegated to this class because of failing supplementary university examination were excluded from the study. An informed consent was sought after a re-assurance that the individual data gathered will remain confidential and will not be shared with any administrative authority. Honey and Mumford Learning Style Questionnaire (LSQ) was used to categorize the participants into various learning styles. The students were explained the purpose and aim of this study. The format of LSQ was explained, and the queries raised by the participants about the Questionnaire were clarified. The participants were required to mention their names on questionnaire as the

academic scores were to be compared with learning styles. The participants were given 30 minutes to fill the questionnaire. Second Questionnaire was also distributed to the participants to know their preferences for teaching methodologies (instructional strategies). All the students had appropriate exposure to all the teaching methodologies like One-way lecture, interactive lectures, small group discussion (SGD), students presentation in tutorials, Problem based learning (PBL), demonstration on models and specimens (DMS), guest speakers and self-study. It included selecting the best teaching methodology and also scoring all the methodologies regarding usefulness in learning on a 5 point likert scale from strongly agree (5) to strongly disagree (1).

Learning styles of the concerned medical students were identified by entering data of the Honey and Mumford' questionnaire in the scoring page of the same questionnaire. Numbers of the question marked yes by a students, were encircled on the scoring page of LSQ. The learning style which scored maximum marks was taken as the specific learning style and students were thus categorized into four learning styles described by Honey and Mumford as activist, reflector, pragmatist, and theorist. Preferences of students for teaching methodologies were identified from second questionnaire. Results of first professional (part 1 and 2) and second professional university examination (UHS) of medical students who participated in the study were also obtained from examination branch of the college. Mean Scores achieved were assigned various grades as A (70% and above), B (60–69%), C (50–59%), and D (<50%). Data was analysed by SPSS, version 20. Frequency and percentages were calculated for categorical variables like gender, learning styles, and teaching methodologies and academic success grades. Mean and standard deviations were calculated for quantitative variables like age and likert scale scoring for teaching methodologies. Various learning styles were correlated with preferred teaching methodologies and academic success grades using Pearson chi-square tests. Preferred teaching methodologies were also correlated with academic success grades. A *p*-value of <0.05 was considered significant.

RESULTS

Seventy seven (77) students participated in this study. Age of the participants ranged from 21 to 25 years with a mean of 22.75±1.05 years. Twenty one (27.3%) of the participants were males and 56 (72.7%) were females. Based on Honey and Mumford's learning style questionnaire, the participants were distributed into following four types: activists, reflectors, theorists and pragmatists.

Learning styles and gender distribution among students is given in table-1.

In this study, students were also asked to choose the teaching methodology by which they learn the best. Detail of students' preferences for different teaching methodologies is given in table-2. Majority of the students had chosen interactive lectures (22, 28.57%), problem based learning (20, 25.98%) and small group discussions (16, 20.78%) as their preferred teaching methodologies. Among students who preferred interactive lectures, 17 were females and 5 males, among problem based learning 16 were females and 4 males, while students who chose small group discussion, 10 were females and 6 male students.

Students also showed their perception about usefulness of each methodology by scoring on a likert scale. Frequencies and percentages of responses for each methodology along with mean scores and standard deviations are given in Table II. If we take strongly disagree and disagree as combined (SD+D), then overwhelming majority (71, 92.2%) rejected one way lecture as the best teaching method while strongly supporting (Strongly Agree+Agree) interactive lectures (63, 81.9%), SGD (67, 87.1%), DMS (66, 85.5%) and PBL (60, 78%). Further details are given in table-2.

Teaching methodologies preferred by medical students having different learning styles were also analysed in this study. Among activists majority (42.8%) preferred PBL while nobody chose any sort of lectures. Among reflectors majority (38.9%) chose interactive lectures as their preferred methodology followed by PBL (25%). Theorists preferred SGD and DMS equally (30.7%) while pragmatists preferred PBL

mostly (33.34%) followed by interactive lectures (23.8%) and SGD (23.8%). It is noteworthy that no student among pragmatists preferred one way lecture (OWL), guest speakers (GS) or self-study (SS) as their best method and only one student chose lab work (LW) and student presentations (SPT) as their favourite methodology. Please see table-3 for further details.

Academic achievements of students in their 2nd professional university examination were also analysed in our study keeping in view different learning styles of these students. Grade 'A' was achieved by 20 (25.9%) students, grade 'B' by 44 (57.2%), grade 'C' by 4 (5.2%) and grade 'D' by 9 (11.7%) students. Among activists, majority got grade A (4, 57.1%), however among reflectors , theorists and pragmatists majority of the students got grade B as 55.5%, 46.2% and 71.4% respectively. As far as grade 'D' (failure in university exam) was concerned no body among the activists got grade 'D'. However 6 (16.6%) reflectors, 1 (7.8%) theorist and 2 (9.5%) pragmatists failed the university examination (Table-4)

Learning styles were compared for any correlation with preferred teaching methodologies and academic success grades by Pearson Chi-square test. It was observed that there was no significant correlation between learning styles and preferred teaching methodologies ($p=0.171$) and between learning styles and academic success grades ($p=0.318$). Preferred teaching methodologies and academic success grades when compared also showed no significant correlation by Chi-square test ($p=0.519$). Gender distribution and learning styles also showed no significant relationship ($p=0.263$).

Table-1: Frequency of learning styles and gender distribution (n=77)

Learning Style	Number	percentage	Males n=21	Females n=56
Activists,	7	9.09 %	4 (19.04%)	3 (5.36%)
Reflectors	36	46.75 %	10 (47.62%)	26 (46.43%)
Theorists	13	16.88 %	3 (14.28%)	10 (17.86%)
Pragmatists	21	27.27 %	4 (19.06%)	17 (30.35%)

Table-2: Preference of teaching methodologies' and their Likert Scale Scoring by medical students (n=77)

Methodolgy	Number (%)	Mean±SD	SD	D	N	A	SA
Interactive lecture	22 (28.57%)	4.12±0.778	1 (1.3%)	00	13 (16.9%)	38 (49.4%)	25 (32.5%)
Problem based learning	20 (25.98%)	4.13±0.978	3 (3.9%)	00	14 (18.2%)	27 (35.1%)	33 (42.9%)
Small group discussion	16 (20.78%)	4.26±0.849	2 (2.6%)	00	8 (10.3%)	33 (42.9%)	34 (44.2%)
Demonstration on models	10 (12.98%)	4.29±0.741	00	1 (1.3%)	10 (13.0%)	32 (41.6%)	34 (44.2%)
Self-study	4 (5.10%)	3.82±0.942	3 (3.9%)	2 (2.6%)	18 (23.4%)	37 (48.1%)	17 (22.1%)
Lab work	2 (2.60%)	3.73±0.968	2 (2.6%)	7 (9.1%)	16 (20.8%)	37 (48.1%)	15 (19.5%)
One way lecture	1 (1.30%)	1.40±0.712	54 (70.1%)	17 (22.1%)	4 (5.2%)	2 (2.6%)	00
Student presentation	1 (1.30%)	2.91±1.194	12 (15.6%)	17 (22.1%)	19 (24.7%)	24 (31.2%)	5 (6.5%)
Guest speaker	1 (1.30%)	3.00±0.960	7 (9.1%)	12 (15.2%)	34 (44.2%)	22 (28.6%)	2 (2.6%)

SA=Strongly Agree, A=Agree, N=Neutral, D=Disagree, SD=Strongly Disagree . Data presented is shown as means, standard deviations, frequencies or percentages of responses for individual teaching methodologies.

Table-3: Frequency of preferred teaching methodologies among different learning styles (n=77)

Learning Style	Preferred Teaching Methodologies								
	OWL	IL	SGD	GS	SPT	LW	SS	DSM	PBL
Activists (n=07)	0	0	1 (14.3%)	0	0	0	2 (28.6%)	1 (14.3%)	3 (42.8%)
Reflectors (n=36)	0	14 (38.9%)	6 (18.2%)	1 (2.8%)	0	1 (2.8%)	2 (5.6%)	3 (8.3%)	9 (25%)
Theorists (n=13)	1 (7.7)	3 (23.1%)	4 (30.7%)	0	0	0	0	4 (30.7%)	1 (7.8%)
Pragmatist (n=21)	0	5 (23.8%)	5 (23.8%)	0	1 (4.8%)	1 (4.8%)	0	2 (9.5%)	7 (33.34%)

OWL=One-way lecture, IL=Interactive Lecture, SGD=Small Group Discussion, GS=Guest speakers, SPT=Students' presentation in tutorials, LW=Laboratory work, SS=Self-study, DSM=Demonstration on specimens and models, PBL=Problem based learning

Table-4: Learning styles and academic success grades

Learning Styles	Academic grades				p- Value
	Grade A (n =20)	Grade B (n=44)	Grade C (n=4)	Grade D (n=9)	
Activist (n=07)	4 (57.1%)	3 (43.1%)	0	0	0.318
Reflector(n=36)	9(25%)	20 (55.5%)	1 (2.7%)	6 (16.6%)	
Theorist(n=13)	5 (38.4%)	6 (46.2%)	1 (7.8%)	1 (7.8%)	
Pragmatist(n=21)	2 (9.5%)	15 (71.4%)	2 (9.5%)	2 (9.5%)	

Grade A=70% score and above, Grade B=60–69%, Grade C=50-59%, Grade D=<50%

DISCUSSION

The educational world is acknowledging the importance of understanding the students' different learning style preferences and their role in attaining academic success.¹² In our study, therefore, we used Honey and Mumford's learning styles questionnaire to evaluate the learning styles among the students of a public sector medical college. Majority of the students were found to be Reflectors (46.75%). Pragmatists (27.27%) were also prominent followed by theorists (16.88%) and activists (9.09%). Results of our study are partly similar to the observations of Rasool and Rawaf about the distribution of learning styles in the nursing students. They found in their study that 44% students were reflectors, 16% activists, 5% theorists, 5% pragmatic and 33% were dual reflector/ theorists.¹³ Both studies differ in case of pragmatic learning style. This difference may be attributed to the different types of participants in both studies. In another study conducted at Armed Forces Postgraduate Medical Institute Rawalpindi learning styles of undergraduate and postgraduate students were compared. Among 85 undergraduate medical students, 45% had a very strong preference for being an activist and 35% for being theorist.¹⁰ Results are contrary to our study in which 46.75% students were reflectors and 27.27% were pragmatists. This difference may be due to academic environment and seniority of the medical students as in our study only 4th year MBBS students were included. Observations of Fleming & Co-workers on learning styles of undergraduate nursing students are partially consistent with our findings as in both studies the most preferred learning style was reflector.¹⁴

Our study showed some preponderance of males in reflector style and of females in pragmatist style however this difference was not significant. Thus this result is consistent with a study by Slater *et al* which demonstrated no significant gender

differences in different learning styles.¹⁵ Baykan & Nacar also showed results in line with Slater *et al* as far as gender differences were concerned.¹⁶ Both these studies used VARK learning preferences questionnaire instead of Honey and Mumford Learning style Questionnaire. Our results are in contrast to a study by Wehrwein *et al.* which indicated that male and female students have significantly different learning styles.¹⁷

In our study participants were also asked to show their preferences for teaching methodology. Majority of the medical students chose interactive lectures (22, 28.57%), problem based learning (20, 25.98%) small group discussions (16, 20.78%) as their preferred teaching methodologies. Our study results are consistent with Costa *et al* who found that students learn more through interactive lectures and small group discussion.¹⁸ In our study problem based learning was the second most preferred teaching methodology. This finding is similar to a study by Novak and his colleagues which found that pharmacy students learn best through problem-based learning.¹⁹ The least preferred teaching methodology identified by medical students was didactic or one-way lecture. This observation of ours is consistent with a study by Mukhtar *et al* which also showed that didactic lecture was least preferred by the students, however the laboratory work (70%) was the most preferred, followed by problem based learning, and interactive lectures.²⁰ Students in our study significantly preferred small group discussion (26.08%) and this finding is augmented by another study by Carrier *et al.*²¹

To see whether learning styles have any effect on academic achievement, we in our study also compared different learning styles using Pearson Chi square test with academic grades achieved by medical students in university

examinations. It was observed that there was no correlation between different learning styles and academic grades as p -value was not significant ($p=0.318$). Our results are consistent with a study carried out at Queen's University Belfast on a cohort of first year medical and dental students using Honey and Mumford Learning Style Questionnaire which found that learning styles of students vary but have no effect on academic performance of the students.²² Another study done in a medical college in Nepal got the same results as ours where learning styles were compared with teaching methods and exam scores and no significant association was found among them.²³ A study by Lynch *et al* used Kolb Learning Style Inventory (LSI) and studied correlation of learning styles with exam scores of MCQs and computer-based case simulations (CBX). This study concluded that there was a significant correlation between learning styles and MCQs score but no relationship was seen between learning style and performance score using CBX.²⁴ This partial difference from our study may be due to the reason that only MCQs scores were used for academic achievement while we used university exam results which included all assessment methods; moreover LSI was used in this study instead of Honey and Mumford LSQ which may be a cause of this difference in results.

Our results are also consistent with a study by Wilson who found no significant correlation between different learning styles and academic scores in his doctoral dissertation.²⁴ Similar results were found in another study done by Gurpinar *et al* who studied learning styles relationship with PBL and traditional teaching scores.²⁵ Literature review shows varied results as far as learning styles and academic performance is concerned, highlighting that a complex relationship exists between the two.

Our study found no correlation between learning styles and preference for different teaching methodologies. This result is consistent with two other studies found in the literature. In one study Wilson demonstrated a lack of significant correlation between students' learning styles and instructional strategies.²⁶ In another study, Mubarak found no clear correlation between the students preferred styles and their choice of instructional mode. However, student satisfaction and success, as well as their positive and negative learning experiences, did correlate with their learning style preferences.²⁷ Same results were achieved by Gurpinar *et al* who found no clear relationship between learning styles of medical students and different instructional methods used in medical school.²⁴

CONCLUSION

Current study revealed that most of the medical students had reflector (46.75%) and pragmatist (27.27%) learning styles. Majority preferred interactive lectures (28.57%), problem based learning (25.98%) and small group discussion (20.78%) as their teaching methodologies while one way lectures, student presentations and guest speakers were preferred least. Medical teachers should align their instructional strategies with learning styles of the students and should employ a variety of Modes of Information Transfer (MITs). Policy makers concerned with medical education should keep in mind the diversity of learning styles while developing the curriculum of medical institutions.

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AUTHOR'S CONTRIBUTION

All the others contributed equally in literature search, data collection, data interpretation, article writing and proof reading.

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