Learning Styles and Preferred Teaching Methodologies of Medical Students in Relation to Year of Study

Muhammad Zafar Iqbal Hydrie[1], Syed Muhammad Zulfiqar Hyder Naqvi[2], Syed Imtiaz Ahmed Jafry[3]

Abstract

Objective: To assess learning styles and preferred teaching methodologies of medical students in relation to year of study.

Methods: A cross-sectional study was carried out among 523 medical students from May 2019 to October 2019. All male and female students from first to final year, who attended the undergraduate MBBS program in a medical college, were included in the study. The study questionnaire was administered to all enrolled undergraduate medical students, from first to fifth year, on the campus out of which 523 forms were collected. The study instrument was a questionnaire containing students' demographic details, David Kolb's Learning Style Inventory 4.0 and their preferred teaching methodologies scored using a 5-point Likert scale. The association of various learning styles and preferred teaching methodologies with year of study was assessed by using Pearson chi-square test.

Results: Out of 523 students who returned the form 518 had completed the questionnaire. A majority of the students had imagining (n=271, 52.3%) or experiencing (n=181, 34.9%) learning style. The top three teaching methodologies with highest mean scores were small group discussion (3.58 ± 1.12), problem-based learning (3.56 ± 1.11) and demonstration on models (3.54 ± 1.20). A significant association between some preferred teaching methodologies and year of study was found such as interactive lecture (p=0.011), problem-based learning (p=0.026), small group discussion (p=0.024), and one way lecture (p=0.028) while a highly significant association was noted in case of student presentation (p=0.001).

Conclusion: The present study showed that different years of study at medical schools did not significantly affect students' learning styles, although the students did change their preferences to some teaching methodologies. Longitudinal studies are necessary to reveal whether there is an effect of learning styles over time in medical education.

Keywords: Learning, Teaching Methods, Students, Medical

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Introduction

The continuous update and increase of knowledge has brought an overwhelming flow of information. With this increasing knowledge a significant change is arising to equip students with skills of self-learning. Accordingly, medical schools have started to use integrated teaching methods[1].

The emphasis of teacher based learning has shifted to student-based learning making it important to identify the student's learning psychology and preferred effective study methods. The term "learning style" was first introduced by Rita Dunn in 1960 to refer to different ways of learning and defined learning styles as unique ways used by different individuals as they prepare to learn and recall any information[2].

Literature has shown four distinct learning styles using Kolb's learning style inventory versions 1-3.1: Diverging, Assimilating, Converging, and Accommodating, that are affected by culture,

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[1-3] Department of Community Medicine, Baqai Medical University.

Correspondence:Dr.S.Muhammad Zulfiqar Hyder Naqvi
Department of Community Medicine, Baqai Medical University
Email: dr.smzhnaqvi@gmail.com
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personality type, educational specialization, career choice, and current job role and tasks[3]. Kolb defined learning style as the individual's preferred method in perceiving and processing information and argued that learning styles of individuals are not constant and may change over time[4]. Literature reveals many descriptive studies determining the learning styles of students[5-7]. These original four learning style types—Accommodating, Assimilating, Converging and Diverging shown over the years by empirical and clinical studies have been recently refined further into a nine-style typology that better defines the unique patterns of individual learning styles and reduces the confusions introduced by borderline cases in the old 4 style typology[8-9].

The Kolbs Learning Style Inventory 4.0 is the first major revision of the Kolb's Learning Style Inventory (KLSI) since 1999. The new nine styles defined by KLSI 4.0 are Initiating, Experiencing, Imagining, Reflecting, Analyzing, Thinking, Deciding, Acting and Balancing[10]. A primary purpose of the KLSI 4.0 is to empower learners to understand and intentionally improve their learning capability. This ability to deliberately learn from experience is perhaps the most powerful source of adult learning and based on many years of research involving scholars from around the world[3].

To the best of our knowledge, there is no study in the literature that investigates if any change exist using Kolb's learning styles inventory version 4.0 on medical students and the effect of study duration on learning styles. Determining the effects of study duration such as year of study on preferred teaching methods and learning styles has the potential to contribute towards the advancement of medical education. In the given context, this study was carried out to assess learning styles and preferred teaching methodologies of medical students in relation to year of study.

Subjects and Methods

After taking ethical approval, a cross-sectional study was carried out among 518 medical students from May 2019 to October 2019. All male and female students from first to final year who attended the undergraduate MBBS program in a medical college were included in the study while those refusing to filling and returning the questionnaire were excluded from the study.

Taking the percentage of the study outcome as 50% for the most liberal estimate, with 95% confidence level and 5% precision, the minimum required sample size was calculated to be 385 participants.

Prior to data collection, all participants were given relevant information about the purpose and process of the study to take their verbal informed consent followed by an explanation session conducted by the principal investigator on how to complete the questionnaire. The independent variables of the study were gender, year of study, and preferred teaching methodologies while learning styles were the dependent variable of the study. The study questionnaire was administered to all (n=530) enrolled undergraduate medical students from first to fifth year on the campus, out of which 523 forms were returned and included in the study using convenient sampling technique.

The Kolbs Learning Style Inventory (KLSI) 4.0 was used to assess learning styles; it has 20 items in this format, 12 that are similar to the items in the old version 3.1, which has been previously well validated in medical students, and 8 additional items that are about learning in different contexts. These 8 items are used to assess learning flexibility[5]. Each respondent was requested to respond to the questions by ranking the four given choices by assigning 4 to the option that best describe him/her, 3 to the one that next describes him/her, 2 to the next, and finally, 1 to the option that is least descriptive of him/her. Using David Kolb's 3.1 learning style questionnaire we initially ranked the participants into six types, four primary learning modes and two combination modes to identify the KLSI 4.0 nine style typology. The participants were finally distributed into following nine styles: Imagining, Experiencing, Reflecting, Balancing, Initiating, Thinking, Acting, Deciding and Analyzing. The Kolb's LSI (version

3.1) has earlier been shown to be a reliable and a valid assessment tool[3, 6, 11, 12]. Its reliability has been proven with Cronbach's alpha coefficients ranging from 0.77 to 0.84[3].

The questionnaire also included personal information such as age, gender and year of study of the students while their preferred teaching methodologies were assessed in the second part of the questionnaire. All the students had appropriate exposure to all the teaching methodologies like one-way lecture, interactive lectures, small group discussion (SGD), student's presentation in tutorials, problem-based learning (PBL), demonstration on models and specimens (DMS) and self-study. They were asked to score all the teaching methodologies on a five-point Likert scale from strongly agree (5) to strongly disagree (1).

The data were entered and analysed using the Statistical Package for Social Sciences (SPSS) version 23.0. Descriptive analysis was performed by calculating means and standard deviations for age and teaching methodologies while frequency and percentages were calculated for gender, learning styles, and teaching methodologies. Inferential analysis was performed by using Pearson chi-square test. Statistical significance was set at $p<0.05$.

Results

Out of total 523 forms collected; the final data analyzed were of 518 students. The mean age of the students was 21.5±1.69 years and 213 (40.7%) of them were males while 310 (59.3%) were females. By learning styles, 271 (52.3%) medical students had Imagining, 181 (34.9%) Experiencing, 35 (6.8%) Reflecting, 25 (4.8%) Balancing while 3 (0.6%), 2 (0.4%) and 1 (0.2%) had Initiating, Thinking and Acting Learning styles respectively. Deciding and analyzing learning styles were not found in any participant in this study (table 1).

Table 1. Frequency of Kolb's learning styles and gender distribution (n=518)

Learning Style	Count	Percentage	Males (n=208)	Females (n=310)
Imagining	271	52.3	100 (48.1%)	171 (55.2%)
Experiencing	181	34.9	77 (37.0%)	104 (33.5%)
Reflecting	35	6.8	16 (7.7%)	19 (6.1%)
Balancing	25	4.8	12 (5.8%)	13 (4.2%)
Initiating	3	0.6	1 (0.5%)	2 (0.6%)
Thinking/Acting/ Deciding/Analyzing	3	0.6	2 (1.0%)	1 (0.3%)

Gender distribution and learning styles were not found to be significantly associated in this study. As the distribution of the study group according to learning style was investigated, it was found that majority of the students were having imagining or experiencing learning styles in all years. This was followed by reflecting and balancing learning styles in students from first to fourth year. The students in our study group predominantly adopted the imaging and experiencing learning styles in all years with 79.7% (n=55) in first year, 81.4% (n=70) in second year, 90.7% (n=156) in third year, 88.8% (n=150) in fourth year and 95.5% (n=21) in fifth year (table 2).

Table 2. Frequency of Kolb's learning styles and year of study distribution (n=518)

Learning Style	1st Year (n=69) Count (%)	2nd Year (n=86) Count (%)	3rd Year (n=172) Count (%)	4th Year (n=169) Count (%)	5th Year (n=22) Count (%)
Imagining (n=271)	34 (49.3)	42 (48.8)	85 (49.4)	99(58.6)	11(50.0)
Experiencing (n=181)	21 (30.4)	28 (32.6)	71 (41.3)	51(30.2)	10(45.5)
Reflecting (n=35)	8 (11.6)	9(10.5)	6 (3.5)	12(7.1)	Nil
Balancing (n=25)	5 (7.2)	4 (4.7)	9 (5.2)	6(3.6)	1(4.5)
Initiating/Thinking/ Acting/ Deciding/Analyzing (n=6)	1 (1.4)	3 (3.5)	1 (0.6)	1(0.6)	Nil

The distribution of students in the learning style groups did not significantly change over time from the first year to fifth year.

Moreover, the students were also asked to choose the teaching methodology by which they learn the best and to show their perception about usefulness of each methodology by scoring on a Likert scale. The top three teaching methodologies

with highest mean scores were small group discussion (3.58±1.12), problem based learning (3.56±1.11) and demonstration on models (3.54±1.20). Further detail of students' preferences for different teaching methodologies is given in table 3.

Table 3. Preference of teaching methodologies and their scoring by medical students (n=518)

Methodology	Mean±SD	SD Count (%)	D Count (%)	N Count (%)	A Count (%)	SA Count(%)
Interactive lecture	3.32±1.26	76 (14.5)	50(9.6)	109(20.8)	208(39.8)	80(15.3)
Problem based learnin	3.56±1.11	33(6.3)	60(11.5)	113(21.6)	217(41.5)	100(19.1)
Small group discussion	3.58±1.12	38(7.3)	30(5.7)	161(30.8)	177(33.8)	117(22.8)
Demonst-ration on models	3.54±1.20	44(8.4)	54(10.3)	120(23.0)	183(35.1)	121(23.1)
Self-study	3.47±1.19	50(9.6)	53(10.1)	124(23.7)	193(36.9)	103(19.7)
Lab work	3.31±1.21	55(10.5)	67(12.8)	154(29.4)	154(29.4)	93(17.8)
One way lecture	3.31±1.21	45(8.7)	92(17.9)	130(25.2)	153(29.7)	95(18.2)
Student presentation	3.46±1.21	45(8.6)	66(12.6)	129(24.7)	167(31.9)	116(22.2)

SA=Strongly Agree, A=Agree, N=Neutral, D=Disagree, SD=Strongly Disagree.

To identify which was the most preferred choice of teaching method in each year of study, students were asked to list their preferred teaching methods. Although students listed multiple preferences, it was observed that first year students preferred problem based learning, while second year students preferred interactive lectures and self-study, third year students preferred small group discussion, fourth year students preferred interactive lectures while fifth year students had multiple teaching method preferences such as problem based learning, small group discussions, demonstration on models, self-study, and student presentations(table 4).

Table 4. Teaching Methods and Years of Study (n=518)

Preferred methods	1st Year Count (%)	2nd Year Count (%)	3rd Year Count (%)	4th Year Count (%)	5thYear Count (%)
Interactive Lecture	40 (56.4)	58 (65.9)	85 (49.2)	92 (54.4)	13 (59.1)
Problem Based Learning	48 (67.6)	53 (60.2)	101 (58.4)	100 (59.2)	15 (68.2)
Small Group Discussion	45 (64.4)	51 (57.9)	106 (61.3)	75 (44.4)	17 (77.3)
Demonstration on Models	41 (57.8)	57 (64.8)	105 (60.7)	85 (50.6)	16 (72.8)
Self-Study	39 (54.9)	60 (68.2)	97 (56.0)	85 (50.3)	15 (68.2)
Lab Work	43 (60.5)	47 (53.4)	74 (42.8)	70 (41.4)	13 (59.1)
One Way Lecture	39 (54.9)	45 (51.1)	81 (46.8)	69 (42.8)	14 (63.7)
Student Presentation	45 (63.4)	50 (56.8)	87 (50.3)	96 (50.9)	15 (68.2)

Discussion

The medical course is one of the most difficult and challenging educational program worldwide. Over the long course, the student needs to be adequately furnished with professional skills such as communication and counselling in addition to professional knowledge. Though equivocal literature is vailable[13, 14], aims of medical schools may be better achieved by instructing students on improving their weaknesses and imparting awareness about students' learning styles among lecturers and teachers[15, 16].

In our study four learning styles i.e. imagining, experiencing, reflecting and deciding made up 98.8% of the medical students. No students in our study had deciding or analyzing learning styles. The Initiating style (n=3) is distinguished by the ability to initiate action to deal with experiences and situations. The Thinking style (n=2) is distinguished by the capacity for disciplined involvement in abstract reasoning, mathematics and logic while the Acting style (n=1) is distinguished by a strong motivation for goal directed action. These last three styles made up only 1.2% of the medical students in our study.

Our study showed that out of the nine learning styles over 90% of the students were using only four learning styles. Of this the great majority of medical students included in the study had imagining and experiencing learning styles. Thus, taken together the imagining and experiencing styles accounted for 87.2% of learning styles in our study. None of the students in our study group had deciding and analyzing learning styles, thus the results we are reporting are of only seven learning style

out of which further three learning styles were only present in 1% students. Thus, predominantly the students adopted the imaging and experiencing learning styles in all years as mentioned above with around 80% students following this learning style in each year. As KLSI 4.0 is a newer version and studies have not reported the newer nine learning styles, our study is one of the pioneer studies which reports imaging and experiencing learning styles as the profession preferences for medical students of the different learning style groups in our region.

Based on Imagining learning style, the students reflect from previous experiences to see things from different perspectives and consider diverse opinions. Thus, they are able to recognize the qualities medical students need to develop to become good doctors. Students with experiencing learning style have deep involvement in life experiences and rely on feelings and reactions to people and situations to learn. Many of these qualities are seen in physicians. The above mentioned two learning styles made up a vast majority of the learning styles found in medical students in this study.

Having Reflecting learning style enables students to use observation and reflection as the primary basis for learning, with the ability to engage both in feeling and thinking. Only 6.8% of medical students had this learning style in this study.

The primary approach of those with balancing learning style is to switch approaches from feeling to thinking and from reflecting to acting with ability to navigate through the learning cycle to change their approach to learning based on the situation. Only 4.8% of the medical students reported this learning style.

Since only six out of 518 medical students reported Initiating, Thinking and Acting learning styles we will not describe them here in detail. Also no medical student was found to have the deciding and analyzing learning style in this study which seeing in line with their characteristics is appropriate since those with deciding learning style tend to concentrate on helping others to sol-

ve their problems efficiently and effectively when they work with people rather than focusing on feelings and interpersonal issues while those with Analyzing learning style are probably less focused on people and more interested in abstract ideas and concepts.

Moreover, no overall change took place in the learning styles of the students in the study group according to year of study. In the preferred teaching methodologies the greatest shift in learning styles took place in the student presentations over the years of study followed by interactive lectures, small group discussion, PBL and one way lecture. As the change occurred over time probably the students learned more from the various teaching methodologies and adapted according to the four learning styles, especially the initial two learning styles which made a great majority of these students. Therefore, it can be assumed that although medical students learning styles do not change over time, their preferred teaching methodologies may be influenced by how the subject is taught.

The pattern of learning styles followed by medical students was similar in first, second, third, fourth and fifth-year level which was also similar to the overall pattern followed by college students. Students cannot be labeled to different learning styles only on the basis of teaching methods in different cohorts. As stated by Cuthbert P in 2005, we cannot exclude the effect of learner's past experience in affecting his response to this questionnaire items, hence affecting the results[17].

Zualkernan I et al., in 2006 compared participants studying at an American Midwestern University in the United Arab Emirates, with students from an American background. Both groups responded to the Felder Solomen index of learning styles. The researchers reported no significant differences in learning style between both groups[18].

Joy S and Kolb D in 2009 studied a sample of 533 students from seven countries responding to the Kolb's inventory; and found a significant interaction between culture and AC–CE but no sin-

nificant interaction between culture and AE–RO[19].

The study results further showed that the top three teaching methodologies with highest mean scores were small group discussion, problem-based learning and demonstration on models. Interestingly, Bhalli MA et al., in 2015 reported the same three teaching methodologies i.e. demonstration on models, small group discussions and problem based learning to have the highest

Conclusion

The present study showed that different years of study at medical schools did not significantly affect students' learning styles, although the students did change their preferences to some teaching methodologies. Longitudinal studies are necessary to reveal whether there is an effect of learning styles over time in medical education.

Conflict of Interests

Authors have no conflict of interests and received no grant/funding from any organization

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