

Assessment of Learning Styles using Kolb's Learning Style Inventory among Medical College Students: A Cross-sectional Study

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ABSTRACT

Introduction: Technology has become increasingly integral in medical education, especially with the implementation of newer Competency Based Medical Education (CBME) curricula. Blending conventional methods with e-learning and ensuring its effectiveness in supporting student learning requires effort and consideration. In this regard, Kolb's learning styles, introduced in 1984, can be helpful in identifying different types of learners within the student population and tailoring teaching methods accordingly to enhance student outcomes.

Aim: To assess the learning styles of medical students using Kolb's Learning Style Inventory, version 3.1, and to compare the learning styles with the year of study.

Materials and Methods: A cross-sectional, questionnaire-based study was conducted in the Department of Pharmacology, Terna Medical College, Navi Mumbai, Maharashtra, India. on 194 first and second Bachelor of Medicine and Bachelor of Surgery (MBBS) students. The study included students who were present when the questionnaire was administered. The learning styles were assessed using Kolb's Learning Style Inventory, version 3.1. Descriptive statistics were applied.

Results: The total strength of both the first and second-year batches combined was 254. Out of these, 194 students were present when the questionnaire was administered, resulting in a response rate of 76.38%. Seven incorrectly answered questionnaires were excluded from the analysis. Among the 194 valid questionnaires received, 55 students (29.41%) had convergent as their learning style, making it the most common learning style. The next most common learning style was accommodative, with 52 students (27.81%) exhibiting this style. Specifically, among the first-year MBBS students, 35 out of 108 (32.41%) had a convergent learning style, while among the second-year MBBS students, 24 out of 79 (30.38%) had an accommodative learning style. There was a statistically significant difference observed in the learning styles between the first and second-year MBBS students (p -value < 0.05).

Conclusion: In present study, it was observed that the convergent learning style was dominant among the medical students in the first and second years combined, with the first year being predominantly convergent and the second year being predominantly accommodative.

Keywords: Accommodative, Assimilative, Convergent, Divergent, Kolb's questionnaire

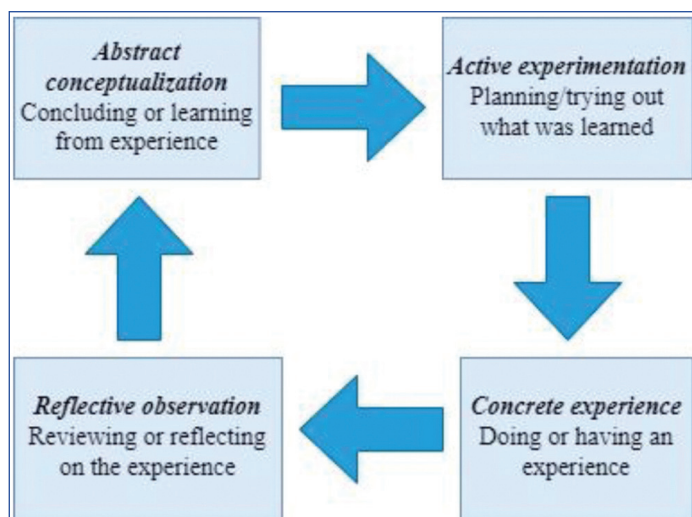
INTRODUCTION

Medical education has been evolving over the years, with the development of different teaching methods other than the traditional didactic lectures. Technology-assisted learning has become increasingly integral in medical education with the newer CBME curriculum. There is a necessity to increase the flexibility of learning and adopt a more learner-centered approach in medical education. Experiential learning plays a crucial role in this regard. With the advent of the Coronavirus Disease-2019 (COVID-19) pandemic, teaching strategies had to be changed worldwide. There was a growing need to rethink traditional college education and transition towards a more blended learning approach for students [1]. Simulation-based learning can be effectively developed for e-learning. E-learning refers to the use of the Internet to enhance knowledge, allowing learning materials to be accessed repeatedly. The World Health Organisation (WHO) has recognised e-learning as a valuable tool in addressing the educational needs of healthcare workers, particularly in developing countries [2,3]. However, blending different teaching methods and ensuring their effectiveness for diverse student populations can be challenging. Students come from varied backgrounds and employ different learning styles to cope with the curriculum.

In Kolb's learning styles, which were introduced back in 1984, there is some usefulness in understanding students' learning methods. Kolb's theory defines a perceiving continuum for grasping and a

processing continuum for transformation, both necessary for learning to occur. The combination of these two continuums creates four quadrants representing different learning styles: Diverging, where the learner uses concrete experience, feeling, and watching; Assimilating, where the learner uses abstract conceptualisation, thinking, and watching; Converging, where the learner uses abstract conceptualisation, thinking, and doing; and Accommodating, where the learner uses concrete experience, feeling, and doing [4]. Each phase of Kolb's cycle is essential for an optimal learning experience. Kolb's 4-stage cycle consists of: (a) concrete experience; (b) reflective observation; (c) abstract conceptualisation; and (d) active experimentation. Kolb's experiential learning theory is based on constructivism and states that knowledge results from the process of grasping and transforming experience [Table/Fig-1] [4]. Kolb's questionnaire helps determine the different types of learners within the student population.

Identifying and understanding the learning styles of students helps in determining if they align with the new CBME curriculum. Several studies have been conducted on the learning styles of different groups of students [5,6]. Those conducted on medical students often utilised the Visual, Auditory, Reading/Writing, Kinesthetic (VARK) method. The VARK method, developed by Neil Fleming, categorises learners into four main types: visual, auditory, reading/writing, and kinesthetic [7].



[Table/Fig-1]: Kolb's cycle of learning-figure developed using Kolb's cycle of learning as a base [4].

First-year medical students are new to medical studies and are unfamiliar with the CBME curriculum, which may lead them to employ different learning styles while adapting to the various subjects of the first MBBS. Second-year MBBS students have just completed the foundational subjects of the first year and are now transitioning to more application-oriented subjects. They encounter various challenges as they embark on their studies, and objective is to comprehend their learning styles and explore ways to support them in achieving better performance. The present research aimed to determine the preferred learning styles of first and second-year MBBS students in this institution and assess if there are any differences based on the year of study.

MATERIALS AND METHODS

A cross-sectional, questionnaire-based study was conducted on first and second MBBS students after obtaining the necessary permissions from the Institutional Ethics Committee (Approval Letter Number-IEC-8/71). The study took place at Terna Medical College, Mumbai, India, and was conducted during June and July 2023. Students who were absent when the questionnaire was administered and those who submitted incomplete questionnaires were excluded from the study.

Inclusion and Exclusion criteria: All first and second MBBS students who were present on the designated day and willing to complete the questionnaire were included in the study. Incomplete and inaccurately filled questionnaires were excluded from the dataset.

Sample size: The first MBBS cohort comprised a total of 150 students, while the second MBBS cohort had 104 students. Hence, the overall sample size amounted to 254 participants.

Study Procedure

The Kolb's Learning Style Index version 3.1 was utilised in conjunction with demographic questions, such as gender and year of study, and a 10-point questionnaire for the remaining items. Each prompt in the questionnaire presented four choices, which participants ranked on a four-point scale according to their similarity to their learning style. The Learning Style Inventory has been previously established as a reliable and valid assessment tool, with Cronbach's alpha coefficients ranging from 0.77 to 0.84 [8].

Undergraduate students were requested to assign a ranking of four to the choice that best described their preferred learning style and a ranking of one to the least preferred choice. Each item's four responses corresponded to the four learning abilities defined by Kolb: Concrete Experience (CE)-learning by feeling, Reflective

Observation (RO)- learning by reflection and watching, Abstract Conceptualisation (AC)- learning through abstract thinking, and Active Experimentation (AE)- learning by taking action. The scores for each participant, obtained from the 10 items, were summed for CE, RO, AC, and AE, and plotted on a four-quadrant graph known as the learning style type grid provided in the questionnaire [9].

Kolb's four learning styles were described as follows: Converging-thinking and doing; Diverging- feeling and watching; Assimilating-thinking and watching; and Accommodating- feeling and doing [9].

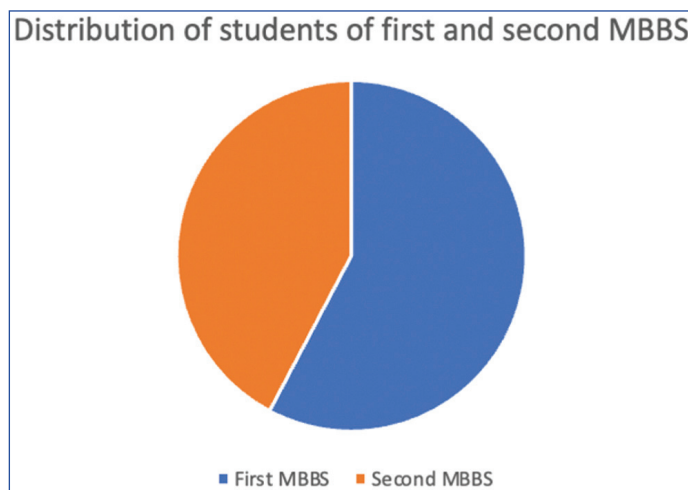
Prior to administering the questionnaire, proper informed consent was obtained from the students. An explanation of the various learning styles was provided to the students, and supplementary materials explaining the different learning methods were shared with them to reference while answering the questions.

STATISTICAL ANALYSIS

The data was entered into Microsoft Excel and analysed using descriptive statistics.

RESULTS

The first MBBS cohort consisted of 150 students, while the second MBBS cohort had 104 students. Out of the total 254 students, 194 were present when the questionnaire was administered, resulting in a response rate of 76.38%. However, seven questionnaires had to be excluded (five from the first MBBS and two from the second MBBS) due to incorrect method of answering. Therefore, the final analysis was conducted on 187 questionnaires, with 108 (57.75%) from the first MBBS and 79 (42.25%) from the second MBBS, as depicted in [Table/Fig-2]. The gender distribution of the students is presented in [Table/Fig-3], with a total of 99 females and 88 males among both the first and second MBBS cohorts.



[Table/Fig-2]: Year-wise distribution of MBBS students.

Gender	First MBBS	Second MBBS	Total
Females	61	38	99
Males	47	41	88
Total	108	79	187

[Table/Fig-3]: Gender-wise distribution of students.

[Table/Fig-4] depicts the learning styles of first and second MBBS students. Among the students, 55 (29.41%) had convergent as their learning style, making it the most common. The next most common learning style was accommodative, with 52 students (27.81%) having this style. Out of the 108 first MBBS students, 35 (32.41%) had convergent as their learning style, while 24 (30.38%) out of the 79 second MBBS students had an accommodative learning style. Among the total of 187 students, 8 students from the

Learning style	First MBBS n (%)	Second MBBS n (%)	Total n (%)	p-value
Accommodative	28 (25.93%)	24 (30.38%)	52 (27.81%)	0.056853
Assimilative	15 (13.89%)	20 (25.32%)	35 (18.72%)	0.071748
Convergent	35 (32.41%)	20 (25.32%)	55 (29.41%)	0.000149*
Divergent	22 (20.37%)	9 (11.39%)	31 (16.58%)	0.00000583*
Accommodative, assimilative	1 (0.93%)	0	1 (0.53%)	-
Accommodative, convergent	5 (4.63%)	2 (2.53%)	7 (3.75%)	0.026881*
Divergent, accommodative	1 (0.93%)	0	1 (0.53%)	-
Divergent, assimilative	1 (0.93%)	0	1 (0.53%)	-
Assimilative, convergent	0	4 (5.06%)	4 (2.14%)	0.039768*
Total	108	79	187	

[Table/Fig-4]: Learning styles of students depicted as n (%).

*Statistically significant values

first MBBS and six students from the second MBBS had provided ratings indicating that their learning styles fell into two categories. The most common pair was accommodative and convergent, followed by assimilative and convergent. There was a statistically significant difference in the learning styles between first-year and second-year MBBS students, except for the accommodative and assimilative learning styles (p-value <0.05).

DISCUSSION

The study was conducted to understand the learning styles of the students in MBBS. The student population is usually diverse and comes from different learning backgrounds. Learning styles vary for each student, and knowing this helps in providing feedback to slow learners for improving their learning. Additionally, employing diverse teaching methods by the faculty might contribute to overall better student outcomes.

In present study, the convergent learning style was the most common among students, accounting for 29.41%. This indicates that they are more inclined towards thinking and doing. A similar finding was observed in a study conducted on respiratory therapy students in Saudi Arabia by Johnson S et al., [10]. However, the results of present study contrast with another study by Nair MA et al., on nursing students, where the most common learning style was Divergent at 50.3% [11]. Suliman WA also identified that nursing students preferred divergent learning styles [12]. Divergent learners tend to feel and observe. Additionally, in a study carried out in Saudi Arabia by AlQahtani DA and Al-Gahtani SM, it was found that while students preferred the Assimilating style during their preclinical years, the diverging style emerged as the dominant preference among dental students during their clinical years [13].

In present study, a comparison between the performance of the students and their learning styles could not be conducted as they had only completed their first internal exam. Furthermore, studies have indicated that abstract conceptualisation (Assimilators and Convergents) was associated with medium to high performance in various assessment methods [14-16]. Another study conducted by Taheri M et al., compared Kolb's learning style inventory with VARK's learning styles and found no difference in academic performance and learning style among dental students [17].

Limitation(s)

The study had certain limitations. Firstly, it was conducted at a single medical college and included only first- and second-year students,

which may limit its generalisability to all students. Additionally, it was not possible to include third- and fourth-year students in the study due to overlapping postings and exams. Further studies are needed to evaluate the learning styles of students as they progress through their respective years and to determine if there are any changes in their preferred learning styles based on the subject. It is worth assessing whether there is a shift towards more visual learning in clinical subjects compared to theoretical subjects.

CONCLUSION(S)

In present study, it was found that the convergent learning style was dominant among the medical students in the first and second years combined. However, within this group, the first-year students exhibited predominantly convergent learning style, while the second-year students leaned towards an accommodative learning style. Conducting a follow-up study to correlate learning styles with performance would provide valuable insights into student preferences in teaching and could help formulate alternative approaches for students who perform lower academically.

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