Original Article

Learning Styles of Undergraduate Medical Students and their Relation with Preferred Teaching-Learning Methods

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Abstract

This descriptive type of cross-sectional study was conducted to determine the learning styles of undergraduate medical students and their relation with preferred teaching-learning methods. The study period was from July 2017 to June 2018. The study was carried out among the students of the 2nd, 3rd, and 4th phases of the MBBS course at three government and four non-government medical colleges in Bangladesh. Out of seven medical colleges, four were within Dhaka and three outside Dhaka. The sample size was 1004. Medical colleges were selected purposively, and a convenience sampling technique was adopted for data collection. Bangla translated version of Fleming's VARK (visual, auditory, read/write, and kinesthetic) questionnaire was used to identify the learning styles of students. Linear regression was used to compare the VARK learning styles scores with teaching-learning methods.

The study revealed that out of 1004 medical students 64.2% preferred multimodal learning styles, and the rest, 35.8% preferred unimodal learning styles. Among unimodal learning preferences, auditory (A) and kinesthetic (K) were the most preferred sensory modalities of learning. The most preferred teaching methods among the students were bedside teaching (29.9%), followed by tutorials (25.9%), and practical sessions (20.6%). The most preferred learning method among the students was mixed methods (60.3%). A positive correlation was present between VARK modes and teaching-learning methods (P <0.05).

Majority of students preferred multimodal learning styles. Students are able to learn effectively as long as the teacher provides a blend of visual, auditory, read/writing, and kinesthetic activities. The study recommended that teachers be aware of the medical students' learning styles and that aligning teaching-learning methods with learning styles will improve their learning and academic performance.

Keywords: Learning styles, Undergraduate medical students, and Teaching-learning methods

Introduction

'Learning style' is the individual's preferred method of gathering, processing, interpreting, organizing, and analyzing information.[1] Herbert Thelen introduced the term "learning style" in 1954.[2] The idea of individualized learning styles became popular in the 1970s. Genetic traits, past experiences, and social environment help determine the predominant learning styles of

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individuals.[3] There are many different models available for assessing learning styles. Some of these models include Honey and Mumford and VARK by Fleming and Kolb's learning model.

These learning styles models are based on different learning theories, principles of learning, and psychological constructs.[4] The VARK model developed by Fleming and Mills is concise, appropriate, simple, and reliable and therefore considered in this study.[5]

VARK is an acronym for the Visual (V), Auditory (A), Read/Write (R), and Kinesthetic (K) sensory modalities. It provides learners an insight into their preferred sensory modalities in perceiving the information. For the best information processing, the visual learners learn better when the study material is presented as graphs, pictures, diagrams, and handouts, the auditory learners on hearing information through lectures, discussions, and tapes, the read-write learners by text-book reading and notes writing and kinesthetic learners learn by doing experiments, dissections, case history taking and clinical examination.[6] Students may learn by single mode (unimodal), two modes (bimodal), three modes (trimodal) or all four modes (quadrimodal) of the information presented.[7] Same students can exhibit different approaches to studying depending upon the content, context, and demands of particular tasks.[8]

In medical education, different learners have different learning styles. The instructional methods used to teach undergraduate medical students include lectures, practical sessions, tutorials, demonstrations, seminars, and bedside teaching to impart and acquire knowledge. If the instructional methods conform to their learning style, they learn better, which may enhance students' performance. While disparity can result in failure, educators are interested in identifying the preferred learning styles of their students and "tailor instructions" so that the medical students appreciate and follow it to learning.[9]

Materials and Methods

This was a descriptive type of cross-sectional study. The study period was from July 2017 to June 2018. The study was carried out among the students of the 2nd, 3rd, and 4th phases of the MBBS course at three government and four non-government medical colleges in Bangladesh. Four of seven medical colleges were within Dhaka, and three were outside Dhaka. The sample size was 1004. Medical colleges were selected purposively, and a convenience sampling technique was adopted for data collection. Foreign students were excluded from the study.

A self-administered structured questionnaire including VARK (visual, auditory, read/write, and kinesthetic) version 7.3 was used. Fleming and Miles' VARK assessment questionnaire were used because it is a recognized, well-tested, and validated tool to assess students' learning styles.10 It consists of 16 questions with four options each. Students could choose more than one option for each question to identify their learning styles. The purpose of each question is also to identify their preferred learning styles. For easy understanding, these 16 questions were customized and translated into Bangla, considering the country's context. The study protocol and instruments were approved by the institutional review board (IRB) of the Center for Medical Education, Mohakhali Dhaka.

After briefly explaining the purpose and procedure of the study, the questionnaires were distributed to the students to give their opinions/views. Completed questionnaires were collected.

Data were analyzed by SPSS, version 20. Descriptive statistics were used to identify the learning styles of students. The Chi-square test was used to compare four VARK learning styles between male and female students. ANOVA was used to compare four VARK learning styles among students of different phases. Finally, linear regression was used to compare the VARK learning styles scores with teaching-learning methods.

Results

A total of 1004 undergraduate medical students participated in this study. Of them, 50.3% were studying in the medical colleges located in Dhaka, and the rest, 49.7% located out of Dhaka.

Among the medical students who participated in this study, 64.2% preferred multimodal learning styles, and 35.8% chose unimodal learning styles. In both sex, multimodal learning styles preference were predominant (Table 1).

Table 1: Distribution of learning styles preferences and gender among the undergraduate medical students

Learning styles	Gender		Total
	Male	**Female**	
	n (%)	n (%)	**n (%)**
Unimodal	130 (12.9%)	229 (22.8%)	**359 (35.8%)**
Multimodal	249 (24.8%)	396 (39.4%)	**645 (64.2%)**
Total	**379 (37.7%)**	**625 (62.3%)**	**1004 (100%)**

Among the multimodal preferences, 32.5% were bimodal, 21.4% tri-modal, and only 10.4% were quadri-modal of VARK learning styles (Figure 1). Among the unimodal learning style preferences, Auditory (19.5%) and Kinesthetic (11.3%) were predominant. Among the bimodal learning styles, the combination of Auditory and Kinesthetic (AK) was 15.9%, and among the tri-modal learning styles, the combination of Auditory, Read/write & Kinesthetic (ARK) 12.9% preferences was predominant. Only 10.4% used all four modes of VARK (Figure 2). It was interesting to note that only 7.65% of medical students are aware of their own learning styles, and the rest, 92.35%, do not know about their learning styles (Figure 3).
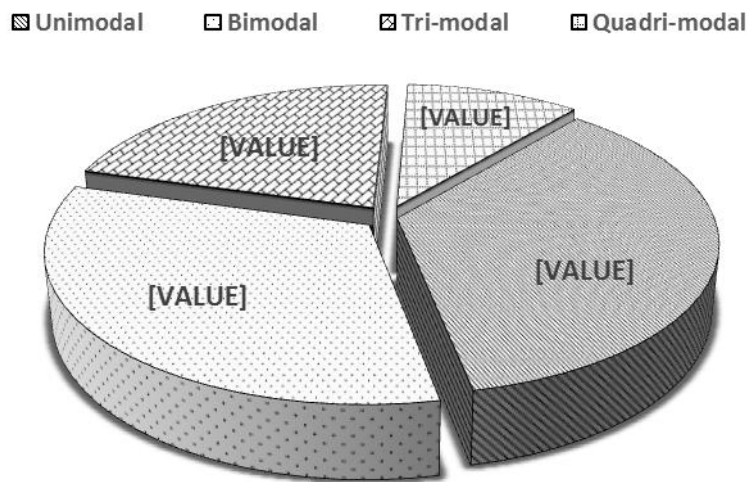
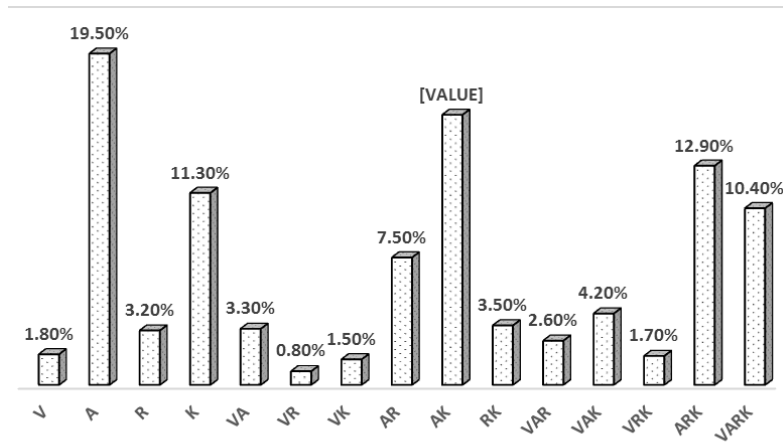Figure 1 Distribution of students by their (major) learning styles (n = 1004)

19.50%

[VALUE]

12.90%

11.30%

10.40%

7.50%

1.80%   3.20%   3.30%   3.50%   4.20%
              0.80% 1.50%   2.60%   1.70%

V   A   R   K   VA   VR   VK   AR   AK   RK   VAR   VAK   VRK   ARK   VARK

Figure 2 Distribution of learning style preferences of medical students

92.35%
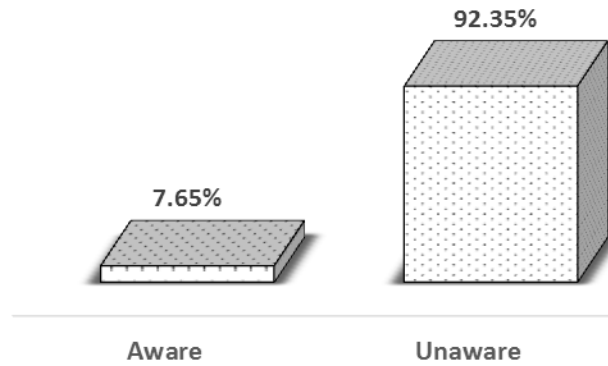
7.65%

Aware   Unaware

Figure 3 Distribution of medical students by their awareness of own learning styles (n=915)

There were only significant differences in the mean scores of visual learning styles among the male and female students, but the effect size was only 0.1906. There were no significant differences in the scores of the other three learning styles (Auditory, Read/write, and Kinesthetic) among the students in relation to their gender (Table 2). There were only significant differences in the mean scores of visual, auditory, and kinesthetic learning styles of VARK mood among the student of different phases. However, the effect size ranged from 0.1679 to 0.2109.

The most preferred teaching methods among the students were bedside teaching (29.9%), followed by tutorials (25.9%), and practical sessions (20.6%). Lecture as a teaching method was preferred by only (9%) of students (figure 4).
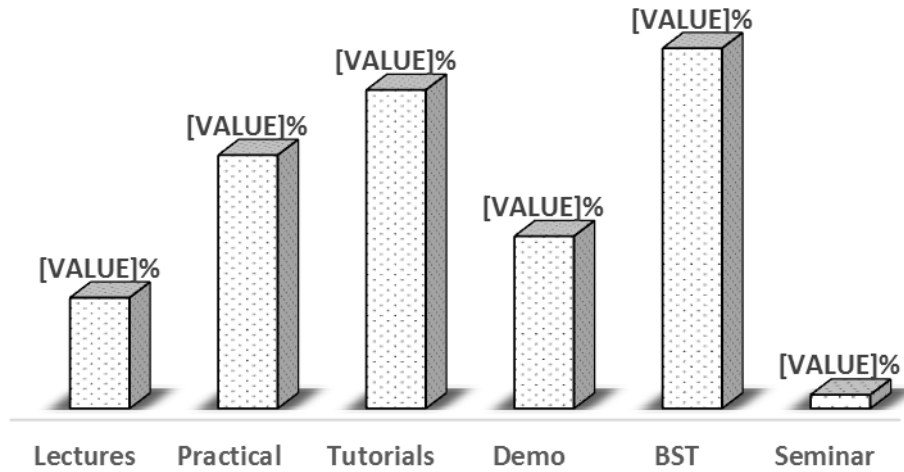
Figure 4 Distribution of students by their preferred teaching methods (n=999)

Demo=Demonstrations, BST= Bedside teaching

The opinions of the students regarding the benefits of different teaching methods. The students opined that bedside teaching is the most interesting method(28.9%), and practical sessions built the most confidence for their learning (24.2%). They considered tutorials as the most interactive (34%), help to make a good student-teacher relationship (61.6%), and have a scope of feedback (55.4%). Lectures were considered the best teaching method for imparting maximum knowledge (22.7%) and helping to take down notes easily (42.7%). The most preferred learning methods among the students were mixed methods (60.3%), followed by self-study (20.3%) and group study (19.3%). There was a small positive correlation between the scores of different VARK learning styles and the scores of different teaching methods. But this correlation was statistically significant in the case of auditory and lecture (P=0.000), read/write and lecture (P=0.000), auditory and tutorials (P=0.002), kinesthetic and demonstrations (p=0.038), visual and bedside teaching (P=0.000), auditory and seminar (P=0.022) and all VARK modes and practical sessions (Table 2). A small positive correlation was present between the scores of different VARK learning styles and scores of different learning methods. But this correlation was statistically significant in the case of kinesthetic and self-study (P=0.009), auditory and group study (P=0.020), and also kinesthetic and mixed methods (P=0.020).

Table 2: Relation between the VARK learning styles scores with teaching methods

Teaching Methods	Learning styles			
	Visual r, r^2 (t) P	**Auditory** r, r^2 (t) P	**Read /Write** r, r^2 (t) P	**Kinesthetic** r, r^2 (t) P
Lectures (n=1001)	0.025, 0.001 (0.802) 0.423	0.117, .014 (3.716) **0.000***	0.115, 0.013 (3.668) **0.000***	0.017, 0.000, (0.532) 0.595
Practical (n=996)	0.094, 0.009 (2.976) **0.003***	0.078, 0.006 (2.476), **0.013***	0.091, 0.008 (2.881) **0.004***	0.104, 0.011 (3.292) **0.001***
Tutorials (n=997)	0.000, 0.000 (.009) 0.993	0.099, 0.010 (3.141) **0.002***	0.043 .002 (1.371) 0.171	0.046, 0.002 (-1.448) 0.148
Demo (n=992)	0.031, 0.001 (0.979), 0.328	0.014, 0.000 (0.429) 0.668	0.066, 0.004 (2.092) 0.037*	0.066, 0.004 (2.073) **0.038***
BST (n=996)	0.113, 0.013 (3.592) **0.000***	0.022, 0.001 (0.708) 0.479	0.031, 0.001 (0.972) 0.331	0.018, 0.000 (0.572) 0 .567
Seminar (n=992)	0.004, 0.000 (0.131) 0.896	0.073, 0.005 (2.298) **0.022***	0.030, 0.001 (0.947) 0.344	0.019, 0.000 (-0.605) 0.545

Demo=Demonstrations, BST= Bedside teaching

Discussion

Health Profession usually requires several simultaneous skills involving sensory components such as visual (i.e., deciphering graphic content in research articles), auditory (i.e., listening to patients or clients), reading-writing (i.e., reading journal articles and keeping records), and kinesthetic (i.e., learning or performing physical exams and procedures). Thus, in addition to improving their academic performance, knowledge of learning theory may help students become aware of and develop ways to master these lifelong professional skills. As an educator, it is crucial to know the students' preferred learning styles. It helps educators identify and solve learning problems among students, thus making them more effective learners. Understanding students' preferred learning style also helps to overcome the predisposition of many educators to treat all students similarly.

This study used the VARK questionnaire to determine undergraduate medical students' learning preferences because it is a recognized, well-tested, and validated tool to assess students' learning styles.[10] The VARK learning style

questionnaire measure four sensory modalities used for learning, namely visual (V), auditory (A), read/write (R), and kinesthetic (K). According to the individual preferences, the learner can be classified as unimodal if they show predominantly one learning preference or multimodal if they prefer two (Bimodal), three (Tri-modal), or four (Quadri-modal) learning styles.

In the present study, most students (64.2%) exhibited a multimodal learning style (Table 1). Other studies that have used VARK learning style questionnaire also reported similar results (Kharb et al. 61%, Bakan and Nacar 63.9%, Khalid et al. 64.0%).[7, 11, 3] Students who prefer multimodal learning style do not learn by simply sitting in a classroom listening to the educator, memorizing assignments. Thus, teaching should be multisensory and filled with variety. Students are able to learn effectively as long as the teacher provides a blend of visual, auditory, read/writing and kinesthetic activates. The use of multimedia can represent multiple contents (text, animations, and images) to accommodate for the students with diverse learning styles. According to the "meshing hypothesis"[12] learning increases exponentially by incorporating the predominant learning styles in teaching.[13]

Among the unimodal learning style preferences auditory (A) 19.5% and kinesthetic (K) 11.3% learning styles were predominant. Among the bimodal learning styles, the combination of Auditory and Kinesthetic (AK) was 15.5%, and among the tri-modal learning styles, the combination of Auditory, Read/write & Kinesthetic (ARK) 12.9% preferences were predominant (Figure 2). These results are similar to the study by Gayathri et al. and Kharb et al. on first-year undergraduate medical students.[14, 7]

In the present study, auditory and kinesthetic modes were most predominant among unimodal and multimodal learning styles. So, if the information was given to students in connection with reality, experience and practice, the students would acquire the information in a better way, and learning could be accomplished effectively.

The students should be aware of their own learning styles and preferences; it will be helpful in using appropriate learning strategies that enable them to become lifelong and self-directed learners, thus maximizing their potential. In our study, it was interesting to note that only 7.65% of medical students have awareness about their own learning styles, and the rest, 92.35%, do not have understanding about their own learning styles (Figure 3).

Two studies by Gayathri et al. and Urval et al. showed no difference in the learning styles preferences between males and females.[14, 15] Another study by Kharb et al. showed that a significantly higher number of female students preferred the auditory mode of learning style compared to the males. In contrast, a considerably higher number of male students preferred the kinesthetic mode (p value<0.05).[7] In the present study, there were only significant differences in the mean scores of visual learning styles among the male and female students, but the effect size was only 0.1906. There were no significant differences in the scores of the other three learning styles (Auditory, Read/write, and Kinesthetic) among the students in relation to their gender (Table 2). Considering the differing result from various studies, no generalizations can be made regarding the influence of sex. This study also found significant differences in mean scores of visual, auditory, and kinesthetic learning styles of VARK mood among the students of different phases, but the effect size ranged from 0.167 to 0.210.

The present study reveals a small positive correlation between the scores of different VARK learning styles and the scores of different teaching methods. But this correlation was statistically significant in the case of auditory and lecture (P=0.000), read/write and lecture (P=0.000), auditory and tutorials (P=0.002), kinesthetic and demonstrations (p=0.038), visual and bedside teaching (P=0.000), auditory and seminar (P=0.022) and all VARK modes and practical sessions (Table 2). These results are almost similar to the study Khalid et al. in Pakistan.[3] This study finding also showed a small positive correlation

between the scores of different VARK learning styles and scores of different learning methods. But this correlation was statistically significant in the case of kinesthetic and self-study (P=0.009), auditory and group study (P=0.020), and also kinesthetic and mixed methods (P=0.020).

Limitations of the study

I. Medical colleges and students were not selected by probability sampling. This impaired the generalizability of the study.

II. Like any other learning style inventory, VARK analyzes only one aspect of the learning style.

III. To identify students learning styles total of sixteen questions were customized considering our socio-cultural context, and these were also translated into Bangla; ultimately, this may interfere with the results of this study.

Conclusion

Every student has unique learning styles which may differ from others. Having an understanding of the learning styles of students is very much crucial for both the medical teachers and the students. If the learners identify their learning preferences, it will be helpful in using appropriate learning strategies that enable them to become lifelong and self-directed learners, thus maximizing their potential. Teachers can incorporate learning styles in teaching-learning methods to optimize learning. This would not only create an efficient learning environment, but it would also motivate the students to achieve academic success.

Conflict of interest: None declared

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