

Medical Education / Original Article

## Learning Style Preferences of Undergraduate Dental Students of a North Indian Dental College

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### Abstract

This study was undertaken to determine the learning style preferences of first and 2<sup>nd</sup> year BDS students by administering VARK questionnaire. Stepping stone method was used to identify sensory modality preference of each student. 51% students preferred single mode of learning style (27% kinesthetic, 15% aural, 6% read/write and 3% visual mode of learning style). 49% students preferred multiple modes (23% bi-modal, 17% tri-modal, 9% had quad-modal preference). The mean V, A, R, K scores were determined and compared using Mann-Whitney U test. V score of 2<sup>nd</sup> year was significantly higher compared to 1<sup>st</sup> year (p value = 0.012). V score of females was significantly higher than that of males (p value= 0.004). The results showed diversity in preference of learning style of students. This diversity necessitates a change from traditional teaching (aural lecture and flowcharts/diagrams) to active learning strategies, for a more productive educational experience.

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### Introduction

Most educators agree that learning styles do exist, while acknowledging the significance of learning styles on acquiring information. It is an accepted fact that every individual has a learning style e.g. some people prefer reading books, some prefer to listening to tape others prefer to learn by discussion,

some prefer to learn in groups and others prefer to work alone. On entering a dental college, after pre-dental education, difference in volume of education and study content are faced by students. This transition from pre-dental to dental education and requirement to adapt to dental college curriculum may present difficulties leading to stress and frustration in students. If the teaching instructions are adapted to accommodate students learning style, student motivation, improved learning and improved performance may result (1, 2, 3, 4). Students adopt significantly different learning styles, so it is the responsibility of the instructor catering to this diversity to develop appropriate learning approaches (5). Reiff and Keefe state that faculty awareness of

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learning styles can help reduce the students' frustration and improve teaching delivery methods (3, 6, 7). Suskie suggested that instructors should alter their teaching methods according to learning styles to create a more conducive environment (1). VARK questionnaire developed by Neil Fleming is designed to assess individuals learning style preference based on sensory modalities. VARK is an acronym for Visual, Aural, Read/ Write, and Kinesthetic. Visual learners prefer to learn through maps, spider diagrams, charts, graphs, flow charts, labeled diagrams, and other devices that can be used to represent what could have been presented in words. Aural learners have a preference for information that is "heard or spoken". They learn best from lectures, group discussion, and radio, using mobile phones, speaking, web-chat and conversation. People with preference for read/write mode prefer to learn from information displayed as words; they prefer manuals, reports, essays and assignments, lists, diaries, dictionaries, thesauri, quotations etc. Those with preference for kinesthetic mode of learning prefer to use experience and practice to learn. They prefer to learn from examples, simulation, demonstrations, videos, case studies, practice and applications. The objective of our study was to understand the learning style preferences of dental students so that appropriate teaching strategies could be adopted or developed to accommodate their needs.

## Material

A cross sectional study was conducted on undergraduate dental students of Dr. H.S.J Institute of Dental Sciences & Hospital, Punjab University, Chandigarh. The objective of our study was to assess and acknowledge the learning style preferences of undergraduate dental students and to compare mean VARK scores of BDS 1<sup>st</sup> and 2<sup>nd</sup> year and male and female student so that appropriate teaching strategies could be adopted or developed to accommodate their needs. The study was approved by Ethics Committee of the Panjab University, Chandigarh. Students of BDS 1<sup>st</sup> and 2<sup>nd</sup> year were approached during their theory lecture class. Permission was taken to explain the purpose of the study. Students were provided information about the study, its objectives, being assured of confidentiality. Those who voluntarily

agreed to participate signed a free informed consent; those who were not willing to give consent were not included. Out of total 200 students, 163 students; 78 (17 males, 61 females) 1<sup>st</sup> year BDS, and 85 (14 males and 71 females) 2<sup>nd</sup> year BDS students willingly participated in the study. For assessing the preferred learning style, each participating student was administered VARK questionnaire (Version 7.1) which has 16 questions. Each of the question places the respondents in a "learning" situation. Each question has four options marked A, B, C and D. The students were instructed to choose the answer which best explains their preference and encircle the letter(s) next to it. If a single answer did not match their perception then they could mark more than one response. If a question did not apply to them they could leave it blank. Completed questionnaires were collected. The scoring chart given in the VARK website ([www.vark-learn.com](http://www.vark-learn.com)) was used to find the VARK category that each of the answer corresponds to. Total numbers of responses belonging to each category were calculated (i.e. total 'V', A, R, and K responses). Stepping-stone method explained in the VARK website ([www.vark-learn.com](http://www.vark-learn.com)) was then used to assess each student's preferred learning style. Students were divided into two groups; unimodal and multimodal (having preference for one or more than one mode of learning style respectively). Percentage of students in each group was calculated. In the uni-modal group the students were further divided according to their preferred mode i.e., visual, aural, read/write or kinesthetic mode. Percentage of students preferring each mode (either V, A, R, or K) was calculated. In the multimodal group, the percentage of students who had preference for two (for all combinations i.e. VA, VR, VK etc), three (for all combinations i.e. VAR, VRK, VAK etc) and four (VARK) modes of learning style was also calculated separately. Mean VARK scores of BDS 1<sup>st</sup> and BDS 2<sup>nd</sup> year students, male and female students were calculated and comparison was done using Mann-Whitney U test. P value <0.05 was considered significant.

## Results

Out of total 200 students (100 BDS 1<sup>st</sup> year and 100 BDS 2<sup>nd</sup> year) 163 students willingly participated in the study.

Table I shows the number of students in BDS 1<sup>st</sup> year and BDS 2<sup>nd</sup> year and number of males and females in the study.

Fig. 1 shows the percentage of students in BDS 1<sup>st</sup> year and BDS 2<sup>nd</sup> year and percentage of males and females in the study.

On assessing each student preferred learning style, it was found that 51% of undergraduate dental students had preference for single mode (uni-modal), 49% preferred multiple modes of learning style (multi-modal). Of the students who have uni-modal (either visual, auditory, reading/writing, or kinesthetic) preference, maximum number of students' preferred kinesthetic mode followed by aural and read/write mode. Visual mode was preferred by only 5 out of 163 students. Fig. 2 represents the percentage of students having uni-modal and multi-modal preference.

Of the students who had multi-modal preference, maximum number of students preferred two modes (N=37), 28 students preferred three modes and 15 students preferred four modes of learning style. Fig. 3 presents the percentage of uni-modal, bi-modal,

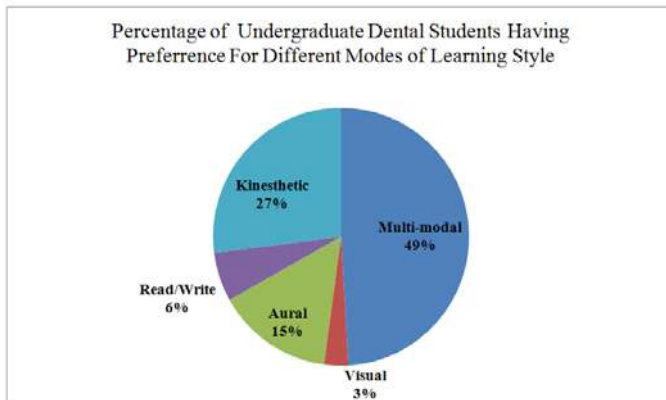


Fig. 2: Percentage of dental students having preference for single or multiple modes of learning style.

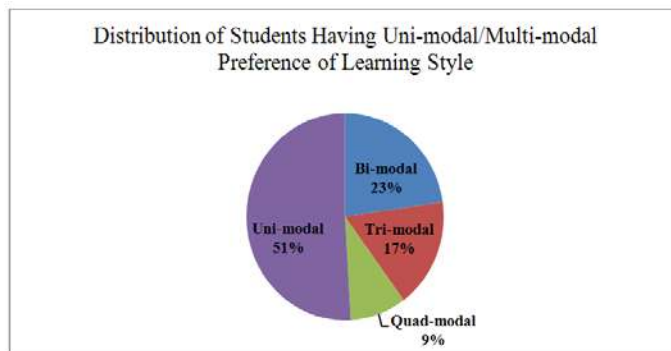


Fig. 3: Percentages of students having uni-modal/multi-modal preference of learning style.

TABLE I: Number of students in each group.

	Males	Females	Total
BDS 1 <sup>st</sup> year	17	61	78
BDS 2 <sup>nd</sup> year	14	71	85
	31	132	163

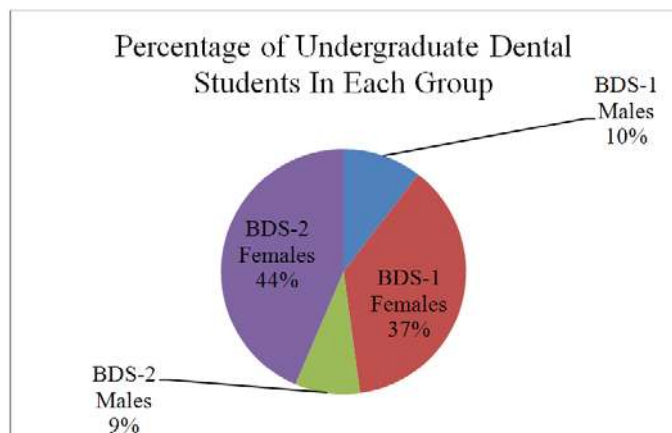


Fig. 1: Percentage of students in each group.

tri-modal and quad-modal students. Most students preferred two or three modes (40%) of learning style.

Of the students who had preference for two modes of learning style, most preferred aural and kinesthetic (AK) mode, followed by read/write and kinesthetic mode (RK). Amongst the tri-modal students, only one student preferred visual, aural and read/write mode (VAR), ten students preferred visual, aural, and kinesthetic (VAK), four students preferred visual read/write, and kinesthetic (VRK) and thirteen students preferred aural, read/write and kinesthetic (ARK) modes.

Amongst the students preferring multiple modes, maximum students preferred two modes, followed by three modes of learning style. Only 15 students preferred all four modes of learning style.

Fig. 4 shows the percentages of students having preference for two, three, or four modes of learning

style, out of 80 multi-modal students. In students having preference for more than one mode of learning style, AK mode was most preferred and VAR was preferred (N=20) by least number of students (N=1).

Mean VARK scores of BDS 1<sup>st</sup> year and BDS 2<sup>nd</sup> year students, and male and female students were calculated. Table number II shows the mean VARK scores of BDS 1<sup>st</sup> year and BDS 2<sup>nd</sup> year students with standard deviation. On applying Mann-Whitney U test and comparing mean V, A, R, K scores with respect to year of BDS study (BDS 1<sup>st</sup> year vs. BDS 2<sup>nd</sup> year) and gender, significant difference was found for visual (V) scores. V score of BDS 2<sup>nd</sup> year was significantly higher than that of BDS 1<sup>st</sup> year (p value = 0.012). No difference for A, R, K scores was found.

Table III shows the mean VARK scores of male and

TABLE III: Mean VARK Scores of male and female dental students.

Modality of learning	Gender	N	Mean±SD	p-value
V	Male	31	2.32±1.681	0.004**
	Female	132	3.47±2.002	
A	Male	31	4.94±2.175	0.761
	Female	132	5.08±2.340	
R	Male	31	3.61±1.726	0.722
	Female	132	3.76±2.101	
K	Male	31	6.03±2.601	0.620
	Female	132	5.82±2.041	

V-Visual, A-Aural, R-Read/Write, K-Kinesthetic, SD-Standard deviation, \*\* - statistically significant.

female students with standard deviation. V score of female dental students was significantly higher than that of males. (P value=0.004). No difference for A, R, K scores was found.

TABLE II: Mean VARK Scores of BDS 1<sup>st</sup> and BDS 2<sup>nd</sup> year students.

Modality of learning	Class	N	Mean±SD	p-value
V	BDS-1	78	2.85±1.773	0.012*
	BDS-2	85	3.62±2.116	
A	BDS-1	78	4.82±2.272	0.226
	BDS-2	85	5.26±2.326	
R	BDS-1	78	3.63±2.199	0.541
	BDS-2	85	3.82±1.872	
K	BDS-1	78	5.92±2.191	0.716
	BDS-2	85	5.80±2.126	

V-Visual, A-Aural, R-Read/Write, K-Kinesthetic, SD-Standard deviation, \* - Statistically significant.

## Discussion

BDS 1<sup>st</sup> and 2<sup>nd</sup> year students are taught preclinical subjects. BDS 1<sup>st</sup> year curriculum delivers basic medical sciences content; Anatomy, Physiology, Biochemistry, Dental anatomy and oral histology. BDS 2<sup>nd</sup> year students are taught Microbiology, Pharmacology, Pathology and Dental materials. Presently the first and second year dental students in India are being delivered information (five out of seven hours of daily dental teaching); through aural lectures with some of the teachers' also using, over head projectors/power point presentations for describing the flow charts, pictures, and other visuals diagrams. Two hours of daily teaching also includes either tutorials/discussions or Laboratory sessions. This mode of teaching (tutorial/discussions) accommodates those who have preference for aural mode of learning (tutorial/discussions) and to some extent those who prefer kinesthetic mode (practical class). These modes of teaching are being used with the supposition that all students have similar needs. Considering the proposition that everyone has a learning style, and, if instruction is adapted to accommodate that style, improved learning will result, this study determined preferred modes of learning style of dental undergraduate students. Knowing their preferred mode of learning would help our teaching

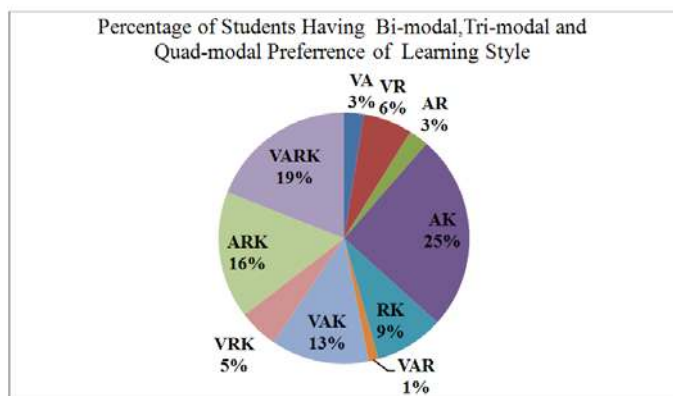


Fig. 4: Percentages of multi-modal students having preference for two, three, or four modes of learning style.

faculty to acknowledge the diverse needs of our students, the need to customize teaching strategies and overcome the predilection to teach everyone with one method. Also it would be helpful to students if they are told about their assessed learning style preference (4, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, and 19). They would be able to identify and employ strategies (use the modes they prefer, while avoiding those that are not conducive), leading to success in the adopted learning environment.

We administered VARK questionnaire to BDS first and second year students. 81.5% students willingly participated in the study and returned the completed questionnaire. The number of students preferring single mode was found more in our study unlike other studies which reported multimodality more preferred among medical and dental students (20, 21, 22).

27% students preferred kinesthetic mode in our study. These students prefer to utilize all their senses i.e. touch, hearing, smell, taste, and sight for learning. They prefer to learn from examples, simulation, demonstrations, videos, case studies, practice and applications. They have a strong preference to learn from the experience of doing something and they value their own background of experiences rather than some one else's experience. Unfortunately for them only 2-4 hour practical time per subject per week is scheduled in present day dental college teaching in India. Since large number of students in our study had preference for kinesthetic mode, attempts should be made to include field trips in the teaching strategies. Also these students should be taught more by simulation, demonstrations, videos, case studies and Hands-on approaches. Traditional lectures given in dental colleges for preclinical subjects should be made more perceptive by giving real-life examples.

Students preferring aural mode prefer to learn by speech i.e. discussions, tutorials, tape recorded lectures etc. Aural lectures, discussions and tutorials are the most employed modes of teaching in Indian dental colleges. Our results reflected only 15% students preferring 'aural' mode which means our method of delivering information was accommodating

a small part of our student population. 6.13% students in our study preferred read/write mode; using printed words, handouts, textbooks, notes and manuals. They would learn better if given notes, manuals, and assignments etc. Only 3% of the students preferred the visual mode of learning. Information provided with maps, spider diagrams, charts, graphs, flow charts, and labeled diagrams would help them. Some of these teaching strategies (flow charts, diagrams) are being followed. Usually whole class is promoted to use flow charts and diagrams for studying in Indian dental colleges, which is good for visual learners but at the same time we should keep in mind to accommodate needs of other students.

49.1% dental students in our study had multimodal preference of learning style. The percentage of students preferring multiple modes is slightly less as compared to results reported by other studies which found 58.0% multimodal preference in the caregivers of asthmatic children, 63.8% in first-year medical students, 53.2% in medical students in their first 3 year and 56.0% in dental students (21, 20, 22, 23). Multi-modal students prefer to use variety of modes. In our study of the multimodal students some had two strong preferences (22.7%) or three strong preferences (17.2%) or some (9.2%) almost prefer all four modes equally. According to Neil Fleming inventor of VARK inventory, we can divide them in two categories. One category includes those who switch from mode to another depending on the need, i.e. what they are working with. They choose any single mode as per the need of occasion or situation e.g. for legalities they will prefer to use Read/write mode, for watching demonstration, they will switch to their Kinesthetic preference. The second category of multimodal learners prefers to learn by using all their preferred modes put together and they are not satisfied until they have been supplied information in all of their preferred modes. Since they may take time to gather information from each of their preferred mode for the deeper and broader understanding, they may some times be misunderstood as slow-learners or slow deliverers though they may be merely gathering all the information before acting - and their decision making and learning may be better because of that breadth of understanding (20, 24). Students

who had preference for single mode of learning style feel more comfortable and satisfied to receive information by using the set of strategies that align with that single preference (24) so teachers have to provide information using strategies having combination of blend of visual, auditory, reading/writing, and kinesthetic modes because if a student prefer one of the modalities over the other three strongly he/she may struggle to understand the subject matter delivered unless it is delivered in his preferred modality. Since there is multiplicity in preferred modes of learning style in dental students, teachers at dental colleges need to adopt teaching methodologies which accommodate different group of students. One answer could be active learning strategies where models and demonstrations discussion, debate, games, question-answers, and role playing, case studies etc satisfies diverse group of students and helps them learn better (25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37).

The conventional way of teaching in dental colleges accommodates those who have preference for aural mode of learning and to small extent those who prefer kinesthetic mode. This shows that the way the information is being given to the first and second year dental students is accommodating only small percentage of students. Since a large number of students (27%) have preference for kinesthetic mode in our study, it becomes the duty of teacher/dental faculty to include field trips and lectures with real-life examples and hands-on approaches

On comparing mean VARK scores it was found that

mean visual score of female students was higher as compared to males and 2<sup>nd</sup> year BDS students had significantly higher visual score (V) as compared to BDS 1<sup>st</sup> year. Higher V scores of 2<sup>nd</sup> year students could be because of constant use of diagrams, flow charts, pictures as part of dental teaching in dental institutes.

### Conclusion

The results have given us an insight of learning preferences of our students and need to bring change in teaching strategies to accommodate all the students. It has also given us an impetus to inquire about the teaching modes used by dental faculty more closely and to encourage them into using alternate teaching strategies which satisfies diverse group of students and helps them learn better.

The higher mean V scores of 2<sup>nd</sup> year students has given us a stimulus to do a longitudinal research to see if the VARK scores or VARK profile of 1<sup>st</sup> and 2<sup>nd</sup> year students would change with exposure (years of dental education requirements), once they enter 3<sup>rd</sup> and 4<sup>th</sup> year of BDS study. It would also be beneficial for students if we record what they presume their learning style preference is and then compare it with their assessed learning style preference.

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