



## Study of Sensory Learning Styles of Second Year Undergraduate Dentistry Students and its Use in Microbiology Teaching

### KEYWORDS

Dentistry , Surveys and Questionnaires, Learning style, VARK.

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**ABSTRACT** A student's learning style is the preferred way in which information is processed and strategies are adopted for effective learning . The VARK survey instrument developed by Neil Fleming in 1987 in New Zealand , distributes the learning styles according to the sensory modes of perception i.e Visual / Aural / Read-Write / Kinaesthetic . **Objective** : To know how students learn . **Methods** : This qualitative , questionnaire based study was conducted in Faculty of Dentistry Jamia Millia Islamia, New Delhi for 11 yr BDS students . The VARK questionnaire version 7.8 (2014) was used after taking online permission from Neil Fleming. During a Microbiology lecture hour . **Result** : 56.8% students were multimodal and 43.2% were unimodal. The VARK mean scores showed that Kinaesthetic preference ranked highest (8.06 ), followed by aural (5.43), read-write (4.77) and visual (4.70). **Conclusion** : The learning preference reflects a multimodal pattern .

### INTRODUCTION

Learning style is the preferred way in which information is processed and strategies are adopted for effective learning .<sup>1</sup> It is important for teachers to be aware of this fact and to reflect on the effectiveness of their modes of instruction .<sup>2</sup> The VARK questionnaire , a survey instrument , was developed by Neil Fleming in 1987 in New Zealand . It distributes the learning styles according to the sensory modes of perception , viz., Visual / Aural / Read-Write / Kinaesthetic . Visual learners have a preference for assimilating information in the form of flow charts and graphs . Auditory learners learn by listening , reading out the written material to themselves . Read/Write learners prefer to learn by reading the printed text in books or their written in their notes . Kinaesthetic learners learn by ' doing it themselves' for e.g role play , making a model, performing a particular experiment or going on a field trip and living that experience . Depending on their preferences , there are various styles of learning , unimodal and multimodal . Multimodal learners learn via two or more sensory modalities whereas unimodal learners have a strong preference for a particular sensory modality.<sup>3-7</sup>

**MATERIALS & METHODS** : This is a qualitative , questionnaire based study of 2<sup>nd</sup> year BDS students at the start of their 2015-2016 academic session. The VARK questionnaire version 7.8 (2014)<sup>4</sup> was used after taking online permission from Neil Fleming . The VARK survey instrument is a questionnaire with 16 questions . Each question has four options as answers and categorizes the learning style preference of the student . For each question , a student can select anywhere from zero to four response choices

During a Microbiology lecture hour , a brief overview of the learning styles was given to the students . They were informed that the exercise was a voluntary one. The VARK questionnaire along with the demographic data form and individual consent form was distributed to them and they were asked to fill up the same. Blinding was not done

**Scoring** : Preferences were calculated by totalling all A responses ( Visual ) , all B responses (aural ) , all C responses

( read / write ) and all D responses ( Kinaesthetic) . The dominant preference was defined by determining the category which received the highest responses. Scoring for each student was done by the Stepping -Stone method, given in the website.

### RESULTS

Forty four students in the age group of 18-25 were enrolled in the study, the mean age being 20.3 yrs . There were 24 female students and 20 male students as shown in Table 1 .

**Table 1. Age and Gender Distribution of 2nd year BDS students (n=44)**

Age (Yrs )	Gender	
	Male (20)	Female (24)
18	0	1
19	4	6
20	3	8
21	6	5
22	3	3
23	3	0
24	0	0
25	1	1

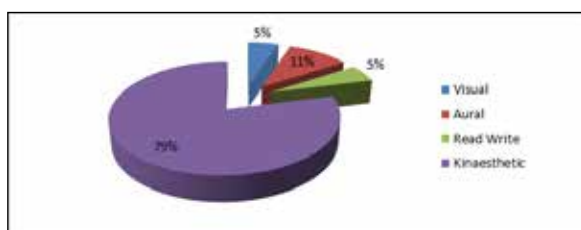
Of the 44 students, 23 were from Uttar Pradesh, 13 from New Delhi, 5 from Bihar and 1 each from Haryana, West Bengal and Uttarakhand . 23 students (52.3%) were from the urban areas or big cities getting more exposure to various modalities of teaching in their schools before reaching the college while 21 students (47.7%) belonged to small towns or villages of India where the schools focus on more conventional ways of teaching in the form of didactic lectures etc. . The learning styles differed in students from rural and urban backgrounds, as shown in Table 2 .

**Table 2: Rural-Urban Distribution Of 2nd year Students and their Learning Styles**

	Unimodal(n=19)	Multimodal(n=25)
Rural	09 (47.3% )	12(48%)
Urban	10 ( 53%)	13 (52%)
Total	19	25

57% students had multimodal and 43 % , unimodal style of learning . Unimodal students had a preference for kinaesthetic sensory modality [Fig. 1].

**Fig.1 Learning Preferences Of Unimodal Students of 2<sup>nd</sup> year BDS (n= 19 )**



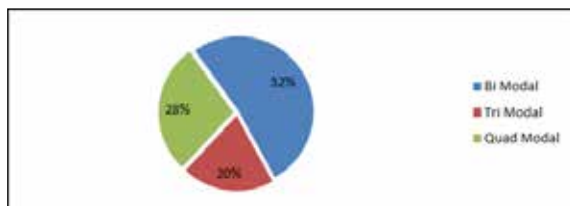
The VARK mean scores showed that Kinaesthetic preference ranked highest (8.06), followed by aural (5.43), read-write (4.77) and visual (4.70) . The Mean and S.D values are shown in Table 3 .

Learning Styles	Mean ± S.D
VISUAL	4.704 ± 2.368
AURAL	5.431 ± 2.627
READ/WRITE	4.772 ± 2.370
KINAESTHETIC	8.068 ± 2.326

**Table 3 . Mean and Standard deviation for Sensory Modes of Perception of 2<sup>nd</sup> yr BDS students (n=44)**

Of the multimodal students , 52% were bimodal, 28% quadrimodal and 20% trimodal [Fig.2].

**Fig.2 Learning Styles Of Multimodal Students Of 2<sup>nd</sup> Year BDS ( n=25 )**



**DISCUSSION**

Learning is a pleasure, if information is presented in a favourable style .<sup>7</sup> This 'favourable style' can be tailored to some extent, if educators are sensitive to the learning

need of the students. Learning style varies from one group to another , based on culture, the nature of the studies and the characteristics of students.

The need for the present study arose from the question 'How do our students learn?'. Ours being a relatively young institute, no such study had been done previously in the past 7 years , since its inception . The students here are pursuing Bachelor Of Dentistry course, which calls upon them to acquire a lot of skill based knowledge .

Students hailed from diverse geographical areas from the Northern and Eastern states of India . Uttar Pradesh , geographically quite close to New Delhi, finds its students flocking to our institute in large numbers in search of an opportunity for higher studies compared to students from New Delhi , Bihar , West Bengal, Haryana and Uttarakhand . The reasons can be a mix of geographical location , educational opportunities and inclination towards dentistry . It can also be noted that students from UP, Bihar ,West Bengal and Haryana were mostly multimodal . New Delhi students were equally distributed . There was one student from Uttarakhand who was unimodal.

The VARK mean scores showed that Kinaesthetic preference ranked highest (8.06 ), followed by aural (5.43), read-write (4.77) and visual (4.70) , see Table 3 . In a study by Saran et al , the mean score for kinaesthetic preference (6.65) had also ranked the highest . In the study by Urval et al , however , the mean score for kinaesthetic preference (6.94) was next to that for aural preference (7.11) .<sup>6,8</sup>

In Microbiology , theory classes are taken with the help of power point presentations with interactive methodologies , like , check-in questions and clarification pauses . Practical classes comprise of mainly bench -work of microbiological techniques , observation of exhibits and small group discussion and project based activities . Kinaesthetic component forms a major part of practical class and since Kinaesthetic mode was the predominant mode of learning in the present batch , this would definitely have helped the students . Also, for students of dentistry , kinaesthetic skills are very important in their later years also. It has been seen that , science and engineering students are kinesthetic learners whereas business students are read/write learners .<sup>15</sup>

Majority ( 56.82%) of 2<sup>nd</sup> year BDS students preferred multimodal style of learning . 52% of t were bi-modal, 20% tri-modal and 28% quadri -modal [Fig . 2 ] . This implies that most of the 2<sup>nd</sup> year BDS students of this college are able to learn as long as the teacher provides a blend of visual, auditory, reading/writing and kinaesthetic activities . Emphasis can be given on implementation of role playing or manipulating model in lectures for the kinaesthetic learners .<sup>16 - 18</sup> This is similar to the findings of Urval et al in Manipal , where 68.7% of 2<sup>nd</sup> year BDS students preferred multimodal style of learning , with quadri - modal(36.6%) being predominant , followed by bi-modal (18.1%)and tri-modal (14%)<sup>8</sup>. In a study in 1<sup>st</sup> year BDS MBBS students by Mukherjee et al , it was found that 84.21% were multimodal .<sup>16</sup>

Contrary to our findings ,Saran et al , in 2015 reported unimodal learning to be the preferred mode (55%) amongst 2<sup>nd</sup> year BDS students.<sup>6</sup> Rajaratnam N et al in 2013, had also reported unimodal style of learning as the preferred mode of learning, but in 1<sup>st</sup> year BDS students .<sup>9</sup>

Multimodal learners include bimodal, trimodal and quadrimodal and they may have any of the learning preference combinations, VA, VR, VK, AR, AK, RK, VAR, VAK, VRK, ARK, and VARK. These students can adapt to more than one mode of presentation. Some educators are of the opinion that this can be challenging as, a curriculum design covering all the sensory learning modalities has to be formulated and teachers have to adapt to this.<sup>6</sup>

Multimodal students had the following 11 types of learning preference combinations, i.e. VA, VK, VR, AK, AR, RK, VAR, VAK, VRK, ARK and VARK. Visual and Kinaesthetic components are dominant. Microbiology theory teaching in our institute is through power point presentation solely and in order to stimulate the visual learners, it becomes imperative to organize the content in such a way, so that the student reads and understands during the one hour time.<sup>8,10</sup> Practical classes are structured to stimulate the kinaesthetic sense of learning, through bench work, which includes microscope handling, biosafety spill management, biomedical waste disposal, staining methods (Gram, ZN and Albert's), handling of inoculating loop, handling a culture plate, hanging drop preparation and culture exercise.

No comparisons were made between the learning styles. This is because, preference for a learning style is an individual's uniqueness and therefore, no two students can be compared.

**Limitations** Match and match statistics was not done between the learning preferences and self perceived preference. Learning preferences, can be contrary to the students' learning perception and therefore the VARK questionnaire helps the students to actively engage in a learning environment that they would have otherwise perceived to be unsuitable. Influence of learning styles on learning outcomes was not done as it was a time bound project. In a study by Dobson et al, it was seen that there was a significant relationship between sensory modality and course performance.<sup>14</sup>

**Strength** : The learning preferences of all students could be evaluated. Going by the VARK philosophy, everyone can learn if their preferences are addressed and hence teachers are motivated to ask themselves a very critical question 'How can we teach our students if we do not know how they learn?'<sup>20</sup>

**CONCLUSION** : Students' learning needs are a priority for the educators. Hence, feeling the 'pulse' of the student is very necessary. The present batch of II BDS students are typical adult learners as is reflected by their multimodal pattern. Mentors should be attentive of these differences in order to incorporate opportunities for the different kinds of learners. The mere fact that a student has a preferred mode does not mean he/she cannot function successfully in another.

**The Path Ahead** : Several queries have arisen from the present study and lay the foundation stone for the path ahead, namely:

Is there any correlation between learning styles and learning outcomes?

What is the learning style in pre-university stage?

Is there a transition in the learning style in parallel to the

transition from the pre-clinical to the clinical stage?

How should the teachers strike a balance while teaching a population of students with varied learning styles?

Is it advisable to bring about change in the curriculum, since the learning styles of a particular batch may not be similar to another batch?

Further studies have to be carried out across all stages of dental curriculum in order to observe any significant change so that teaching strategies can be flexi-modified, to increase student satisfaction with course content and delivery. It might be impractical to aim at tailor making the course to each student's learning need. Here, the VARK questionnaire can come to the student's help during self-directed learning hours. Matching teaching methods to a preference or style does not necessarily improve learning<sup>2,21</sup>. By stimulating them to think, to chew before they swallow and to actively digest, they will remember far more and for a much longer time.<sup>22</sup>

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