

Original Article

# Learning style preference for basic medical science: A key to instructional design

Himel Mondal, Shaikat Mondal<sup>1</sup>, Debasish Das

Department of Physiology, Maharaja Krishna Chandra Gajapati Medical College, Ganjam, Odisha, <sup>1</sup>Department of Physiology, Medical College and Hospital, Kolkata, West Bengal, India

## Abstract

**Background and Aim:** Students have specific learning style preference, and it is important for designing classroom instruction to make a better learning environment. There are mainly four sensory modalities for learning (V = visual, A = aural, R = read/write, and K = kinesthetic) and these can be assessed.

**Methods:** A cross-sectional study of the 1<sup>st</sup>-year medical students ( $n = 146$ ) was carried out. VARK<sup>®</sup> questionnaire version 7.8, a set of 16 multiple-choice questions with a pretested additional questionnaire, was used to assess the preferred learning mode.

**Results:** Kinesthetic mode is most preferred (total score = 1146), followed by aural (total score = 808), visual (total score = 624), and read/write (total score = 584). Mean value:  $V = 4.27 \pm 2.87$ ,  $A = 5.53 \pm 2.95$ ,  $R = 4 \pm 2.21$ ,  $K = 7.85 \pm 2.72$ . Preference for practical class is 52%, discussion with teacher is 39%, 1-h lecture is 5%, and tutorial is least preferred (4%). For lecture, chalk and talk gets 76% preference with the second choice as PowerPoint™ (PPT) presentation (13%). For PPT slides, “salient points and diagram” in the slide are most preferred (58%), followed by “diagram only” in the slide (30%). Animated image or video is preferred by majority (52%) of students. Moreover, learners enjoy a class with some breaks and humor (48%) while 31% like interaction with teachers. During lecture, 82% students like to take notes whereas 18% do not like to take notes.

**Conclusion:** This study has revealed that most students learn best by kinesthetic method and practical classes. Still, students prefer blackboard/whiteboard teaching with some humor. For PPT presentation, they prefer salient points and diagram with a preference of animation or video. Majority take notes from class. These findings would help a teacher to design their instructional material for effective teaching.

**Key words:** Instructional design, learning style preference, medical students, VARK

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## INTRODUCTION

Learning is a process by which mind reacts to external conditions, the reactions being modified by what has been experienced before. No two minds react identically in the same situations because each has a different learning preference.<sup>[1]</sup> Independent learning, having choices about what to learn, and building on students' intrinsic motivation and natural curiosity, all present special challenges for medical educators. No matter what strategy is used in teaching basic medical science, it is important to maintain student's natural curiosity about

how the human body works. Most students come to medical school with high levels of curiosity, but the more they are required to memorize isolated facts or engage in very deep learning about relatively esoteric principles, the less likely they are to maintain that enthusiasm.<sup>[2]</sup> Learning is an extremely important issue in medical education. Medical education aims at providing an optimal context for medical students to facilitate this learning.<sup>[3]</sup> It is

**Address for correspondence:** Dr. Himel Mondal, Department of Physiology, M.K.C.G. Medical College, Ganjam, Odisha, India.  
E-mail: [himelmkg@gmail.com](mailto:himelmkg@gmail.com)

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unfortunate, but true, that some academics teach students without having much formal knowledge of how students learn. Many lecturers know how they learned/learn best but do not necessarily consider how their students learn. There is no simple answer to the question "how do we learn?" Not everyone learns in the same way, or equally readily about all types of material.<sup>[4]</sup> How well students learn is influenced by a variety of factors. Their own prior knowledge and motivation are certainly important.<sup>[2]</sup>

Multiple tools, such as VARK<sup>®</sup> inventory (V = visual, A = aural, R = read/write, K = kinesthetic) (Flemming), Kolb learning style inventory-Version 3.1, and the Myers-Brigg type indicator, can be used to identify individual preference.<sup>[5]</sup> VARK<sup>®</sup> questionnaire is widely used and simple tool to apparently assess the sensory modality of learning preference. Several previous studies in India and abroad used the VARK<sup>®</sup> questionnaire and found that medical students learn best by multimodal preference.<sup>[6-12]</sup> Audio-visual substitutes for reality and it makes its own contribution to the educational process. Sometimes, when two or more types can be brought to bear on the same topic, their strengths are pooled and their limitations are minimized.<sup>[1]</sup> PowerPoint™ (PPT) has developed into a powerful and versatile presentation support tool. The trick with presentation software is to use the slide to help the audience mentally engage and visualize the things.<sup>[2]</sup> Despite ideal slide preparation guidelines,<sup>[13]</sup> PPT slide preparation varies among teacher to teacher. Along with VARK<sup>®</sup> questionnaire for maximum preference score, we have used additional questionnaire to assess the learning preference among different teaching modes, with an emphasis on audio-visual material organization.

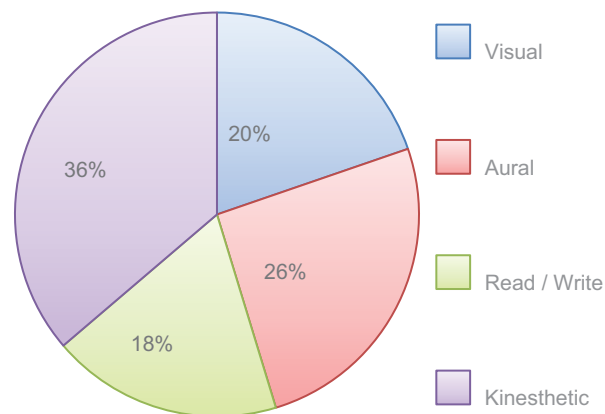
## MATERIALS AND METHODS

After obtaining permission from the Institutional Ethics Committee of M.K.C.G. Medical College, Odisha, we have conducted the study for a time span of 3 months from February to April 2016. To avoid bias, single teacher had taught four classes each with four types of teaching mode: Speech only, chalk and talk, overhead projection presentation, and PPT presentation. For the lectures, a combination of high content, salient contents only, lecture with breaks and with some humor, and asking question in between the lecture were used. For lecture classes with the PPT slide presentation, four types of combinations were used: Text describing whole topic in slide with diagram and teachers tell those text, text describing whole topic in slide with diagram and teachers tell salient point only, salient points of topic in slide and teachers describe points in detail, diagram only in slide and teachers describe the whole topic verbally. For preference of visual material, four options were provided: Simplified diagram which can

be drawn in the examination, colored diagram, colored diagram with labeling, and animation or video. During this study period, each student was exposed to a combination of 1-h lecture (total number = 55), physiology practical class (total number = 12), and tutorial (total number = 12) and students were encouraged to interact with teachers face-to-face in tutorial classes. Permission to use the printed VARK<sup>®</sup> questionnaire was obtained through the website copyright permission procedure.<sup>[14]</sup> The VARK<sup>®</sup> questionnaire version 7.8 composed of 16 multiple-choice questions to assess the sensory modality of learning preference with visual (V), aural (A), read/write (R), and kinesthetic (K) categorization.<sup>[15]</sup> Students have option to choose multiple answers for the same question and option not to answer any question. After obtaining written consent from the students ( $n = 146$ ), they were distributed the printed VARK<sup>®</sup> questionnaire version 7.8 and a pretested additional questionnaire to fill up. The collected filled up questionnaire is then analyzed.

## RESULTS

Among the participants ( $n = 146$ ), kinesthetic method is the most preferred (total score = 1146) sensory modality of learning, followed by aural (total score = 808) and visual (total score = 624) method, and read/write (total score = 584) is the least preferred method. Figure 1 shows the percentage value of total obtained score of the V, A, R, K preference, and Table 1 shows the mean and standard deviation of the VARK score. The preference in kinesthetic method also evident in the most preferred teaching method as practical classes (52%), where face-to-face discussion with the teacher gets the second preferred method (39%) and 1-h lecture and tutorial gets the least preference. Figure 2 shows the preference among different teaching methods. For the 1-h lecture class, most preferred method is chalk and talk with a remarkable 76%.



**Figure 1:** Percentage value of total score obtained for each sensory mode of learning (V, A, R, K)

PPT presentation is the second choice (13%) and only 2% preference is for lecture with speech-only mode. Figure 3 shows the choices for 1-h lecture mode in percentage. For PPT presentation slides, salienpoints are most preferred (58%), followed by diagram only (30%). Figure 4 also shows that typing the whole topic in slide gets the least preference (5%). For the visual material in the PPT slide, animation or video is the most preferred (52%). Figure 5 shows the relative preference of other visual materials. Students prefer some humor during the lecture classes (48%). Thirty-one percent of students prefer to interact with teacher during lecture. Preferred lecture type is shown in Figure 6. During the lecture, majority of students (82%) take notes, and among them, 66% write the salient points only. Sixteen percent of students write as much as they can follow [Figure 7].

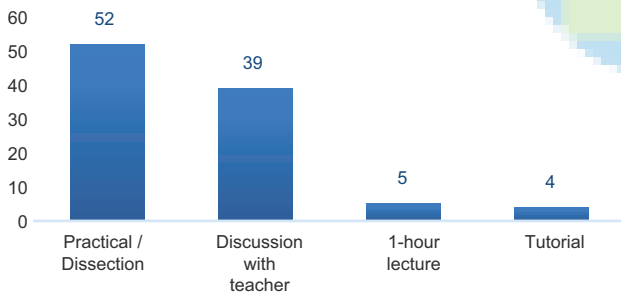
can affect learning.<sup>[16]</sup> However, individual preferences in learning cannot be considered on the basis of course design for a large group of learners. In our study, we found that among the tested sensory modalities, kinesthetic mode gets the highest preference (36%) [Figure 1]. Sinha and Prithishkumar found the highest preference for kinesthetic mode in unimodal learners. However, Farooque found highest score for aural (635), followed kinesthetic (629) mode. Anu, Rajaratnam, and Nujhat also found aural as the most preferred mode in unimodal learners. However, we found aural as the second preferred mode (26%). From all previous studies, it is vivid that students learn best by multimodal style and there is no major difference between male and female learners.<sup>[17]</sup> Hence, in those studies, a large portion of kinesthetic score was inside multimodal preference score. In our study, we have used the total score and we found kinesthetic as the maximum preferred mode and it is concordant with the choice of practical class with 52% preference in our study [Figure 2]. During practical classes, students get hands-on experience of the theories they consumed and it helps in better assimilation of knowledge. However, it is not possible to cover the entire course by practical classes, neither it is necessary. However, an emphasis on practical classes would be a good effort to facilitate better learning. Despite many innovations in teaching and learning methods, the 1-h lecture remains a mainstay of medical education. Although the learning during the lectures is in doubt,<sup>[2]</sup> lecture remains an effective and valuable format in medical education because it offers greater economy

## DISCUSSION

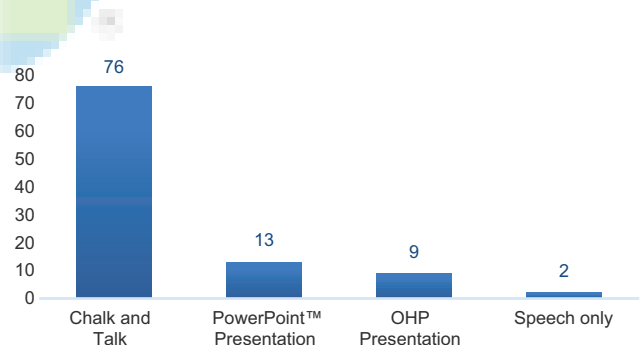
Both behavioral and cognitive theories of learning agree that difference among learners and in the environment

**Table 1: Mean and standard deviation of V, A, R, K scores**

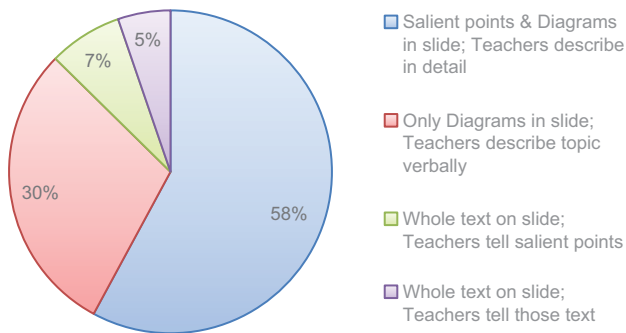
	Mean	Standard deviation
Visual	4.27	2.87
Aural	5.53	2.95
Read/write	4.00	2.21
Kinesthetic	7.85	2.72



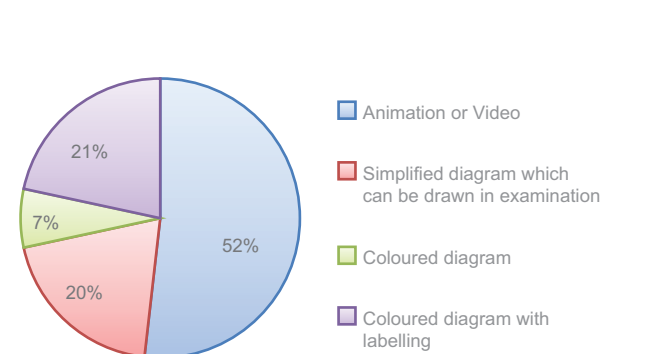
**Figure 2: Preference of different teaching method in percentage**



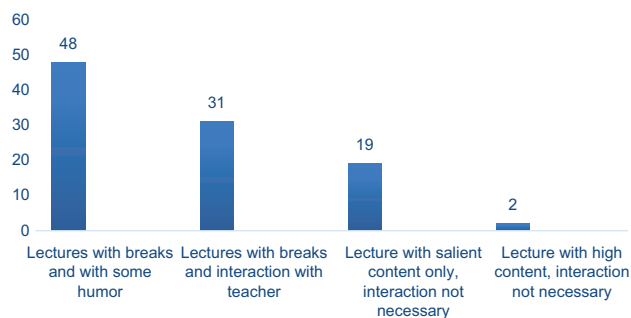
**Figure 3: Preference of different mode of lecture delivery in percentage**



**Figure 4: Preference of different types of PowerPoint™ slides in percentage**

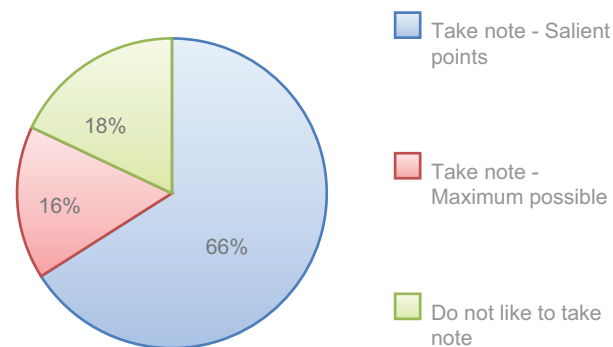


**Figure 5: Visual material preference in percentage**



**Figure 6:** Preference in lecture type in percentage

of time for teaching a large group and students receive an overview of the curriculum.<sup>[18]</sup> Classic pedagogic thought is concerned with good education since the 1980s.<sup>[19]</sup> It is common to become fascinated with new technologies for delivering and assisting teaching. However, survey suggests that younger students do not necessarily prefer to learn using these newer technologies.<sup>[2]</sup> In our study, we found that still students prefer chalk and talk for the lecture class (76%) [Figure 3]. Our findings support the study of Papanna *et al.*, where they found that blackboard teaching is still preferred by students.<sup>[20]</sup> However, it is not possible to deliver lecture effectively with chalk and talk for every topic of the medical science. It is necessary to aid the teaching with audio-visual material, especially for complex color diagram which cannot be drawn properly in a short time on blackboard or whiteboard. For this purpose, visual presentation mode contributes a lot. We have found that students prefer the PPT slide with salient content and diagram (58%) where teachers describe the topic in detail. A good percentage of students prefer lecture with only diagram in slide (30%) [Figure 4]. For the visual material presented during the lecture, it must be clear and legible for the class. Majority of the participants (52%) of our study prefer animation or video for visual material. However, it is difficult to arrange reliable video or animation for each topic. However, a color diagram with labeling can be obtained and it is preferred by 22% participants. A photograph of the standard textbook or image from the publisher can be obtained, where the textbook comes with an access of its image bank. But, when it is not possible, a hand drawn simple diagram can effectively increase the interest of learners. In our study, 20% of students prefer simple diagram which can be drawn easily in examination [Figure 5]. Studies have shown that note-taking increases learning and retention of the material presented in a large group of learners.<sup>[2]</sup> We found that 82% of students like to take notes [Figure 7]. Hence, for the majority of students, the slide preparation and lecture should be delivered in such a fashion that they can take notes. Students always appreciate the entertainment value of the lecture.<sup>[2]</sup> We also found that students prefer lecture with some humor (48%) [Figure 6]. However, to adopt this, a teacher must be cautious about the Doctor Fox effect,<sup>[21]</sup>



**Figure 7:** Percentage of students taking notes in the lecture class

where humor overflows the teaching. During 1-h lecture, students have ability to concentrate only 15 min.<sup>[22]</sup> Hence, some healthy humor or interaction with students helps in regaining the concentration.

### Limitations of the study

Our study has some limitations. Participants are 1<sup>st</sup>-year medical students of a single institute, and hence, it might not represent the medical students of different institutes. Further studies involving multiple institutes with a larger sample size may provide more reflection of learning style of students. The study was done with the 1<sup>st</sup>-year medical students who learn the basic medical sciences. Further studies with students studying clinical subjects may reveal their learning style preference as the learning preference changes with knowledge and environment.

## CONCLUSION

Majority of the students prefer kinesthetic mode for learning basic medical science. Despite availability of different technology-assisted lecture, the 1<sup>st</sup>-year medical students still prefer chalk and talk for lecture classes. Moreover, for PPT presentation, salient points and diagram in slide should be best with a preference for relevant scientific animation or video. Lectures with breaks and with some healthy humor or interaction with students would be a better option for beating boredom and to promote note taking for facilitation of better learning.

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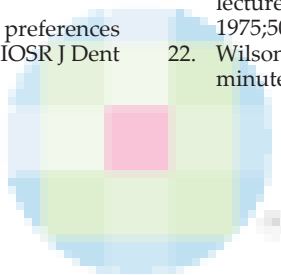
Nil.

### Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Thurber WA, Collette AT. How boys and girls learn science. In: Teaching Science in Today's Secondary Schools. 2<sup>nd</sup> ed. Boston, USA: Allyn and Bacon; 1964. p. 72-253.
2. Huggett KN, Jeffries WB. Facilitating student learning. An Introduction to Medical Teaching. 2<sup>nd</sup> ed. New York: Springer; 2014. p. 3-139.
3. Norman GR, Cees PM, Newble DI. The psychology of learning. In: International Handbook of Research in Medical Education. Dordrecht: Kluwer Academic Publishers; 2002. p. 164.
4. Fry H, Ketteridge S, Marshall SA. Enhancing academic practice and understanding student learning. In: A Handbook for Teaching and Learning in Higher Education. 3<sup>rd</sup> ed. New York, UK: Routledge (Taylor and Francis); 2009. p. 8-16.
5. Walsh K. Assessing learners need. In: Oxford Textbook of Medical Education. Oxford, UK: Oxford University Press; 2013. p. 456.
6. Anu S, Anuradha, Meena T. Assessment of learning style preference among undergraduate medical students – Using VAK assessment tool. *Int J Med Clin Res* 2012;3:229-31.
7. Sinha NK, Bhardwaj A, Singh S, Abas AL. Learning preferences of clinical students: A study in a Malaysian Medical College. *Int J Med Public Health* 2013;3:60-3.
8. Prithishkumar JJ, Michael SA. Understanding your student: Using the VARK model. *J Postgrad Med* 2014;60:183-6.
9. Farooque I, Mustafa S, Mohammad F. Learning style preferences of first year undergraduate medical students. *J Evid Based Med Healthc* 2014;1:1445-52.
10. Rajaratnam N, Suganthi V, D'cruz SM. Learning preferences of students studying physiology in South India. *IOSR J Dent Med Sci* 2013;7:15-9.
11. Mukherjee S, Das S, De S, Mukhopadhyay D. Learning style preferences of first year medical students of a rural medical college, West Bengal, India. *Int J Sci Res* 2013;2:10-3.
12. Nuzhat A, Salem RO, Quadri MS, Al-Hamdan N. Learning style preferences of medical students: A single-institute experience from Saudi Arabia. *Int J Med Educ* 2011;2:70-3.
13. Holzl J. Twelve tips for effective PowerPoint presentation for the technological challenged. *Med Teach* 1997;19:175-9.
14. Available from: <http://www.vark-learn.com/contact/copyright-permission-form/>. [Last retrieved on 2016 Mar 04].
15. Fleming N. VARK: A Guide to Learning Styles. Available from: <http://www.vark-learn.com/english/index.asp>. [Last retrieved on 2016 Mar 05].
16. Schunk D. Introduction to the study of learning. In: Learning Theories – An Educational Perspective. 6<sup>th</sup> ed. Boston: Pearson Education, Inc.; 2012. p. 3-22.
17. Slater JA, Lujan HL, DiCarlo SE. Does gender influence learning style preferences of first-year medical students? *Adv Physiol Educ* 2007;31:336-42.
18. Matheson C. The educational value and effectiveness of lectures. *Clin Teach* 2008;5:219-21.
19. Swanwick T. Understanding medical education evidence, theory and practice. In: Teaching and Learning in Medical Education: How Theory Can Inform Practice. 2<sup>nd</sup> ed. UK: Wiley-Blackwell; 2014. p. 7-19.
20. Papanna KM, Kulkarni V, Tanvi D, Lakshmi V, Kriti L, Unnikrishnan B, *et al.* Perceptions and preferences of medical students regarding teaching methods in a medical college, Mangalore India. *Afr Health Sci* 2013;13:808-13.
21. Ware JE Jr., Williams RG. The Dr. Fox effect: A study of lecturer effectiveness and ratings of instruction. *J Med Educ* 1975;50:149-56.
22. Wilson K, Korn JH. Attention during lectures: Beyond ten minutes. *Teach Psychol* 2007;34:85-9.



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