

RESEARCH ARTICLE

Cognitive style assessment of Indian medical faculty - A step toward achieving cognitive integration in teaching practices

Bhalendu S Vaishnav¹, Smruti B Vaishnav², Jagdish Varma³, Anusha Prabhakaran³, Mahendra Chotaliya⁴

¹Department of Medicine, Pramukhswami Medical College, Karamsad, Gujarat, India, ²Department of Obstetrics and Gynaecology, Pramukhswami Medical College, Karamsad, Gujarat, India, ³Department of Psychiatry, Pramukhswami Medical College, Karamsad, Gujarat, India, ⁴Postgraduate Department of Education, SP University, Vallabh Vidyanagar, Gujarat, India

Correspondence to: Smruti B Vaishnav, E-mail: smrutiv@charutarhealth.org

Received: January 15, 2018; Accepted: February 19, 2018

ABSTRACT

Background: Prodigious growth of medical knowledge necessitates pedagogical shift of focus from knowledge-based teaching to metacognitive teaching. Teachers' knowledge about their cognitive style can be used in implementing practices which synergize the same with medical students' cognitive styles for the better educational outcome. **Aims and Objectives:** The present study was carried out to determine cognitive styles of medical teachers and enhance their awareness about metacognition based teaching practices, with a view to derive logical implications for enhancing teaching-learning process. **Material and Methods:** Cognitive style assessment of teachers was carried out using "Alert Scale of Cognitive Style." Pre-session awareness, post-sensitization awareness, relevance, usefulness, and applicability of cognitive styles were tapped using single Likert-type questions. Analysis was done to know cognitive style preferences, their association with age, gender, handedness, subject specialization, and teaching experience. Faculty members were sensitized about cognitive styles and methods of synthesizing them in teaching. **Results:** Of 88 participants studied, left, middle, and right brain cognitive styles were observed in 32%, 56%, and 12%, respectively. Cognitive style was not found associated with any factors. Mean awareness about cognitive styles was 3.6 before the sessions. Post-sensitization mean rating for awareness, relevance, usefulness, and applicability of cognitive style was 6.57, 6.81, 6.89, and 6.73, respectively. **Conclusion:** Study significantly enhanced cognitive style awareness, which was low before the intervention. Sensitization sessions helped teachers for orienting them to combining analytical and synthesizing processes in teaching. Cognitive diversity among teachers is an institutional resource for pedagogic interventions.

KEY WORDS: Cognitive Style; Medical faculty; Metacognition

INTRODUCTION

"The true basis of education is the study of the human mind. Any system of education which ignores the instrument

of study - the human mind - is more likely to hamper and impair intellectual growth."^[1] Empowering students for excellence in the presence of rapidly expanding knowledge and constantly metamorphosing nature of clinical practice is a unique pedagogic challenge in medical education. While modifying the structure and content of medical education is essential, approaches to enhance meta-cognition based learning remains quintessential in view of the depth and dimensions of medical education. Knowledge of cognition and regulation of cognition are important foundational principles in medical education but are inadequately incorporated as of yet.

Access this article online

Website: www.njppp.com

Quick Response code

DOI: 10.5455/njppp.2018.8.0102119022018



National Journal of Physiology, Pharmacy and Pharmacology Online 2018. © 2018 Smruti B Vaishnav, *et al.* This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), allowing third parties to copy and redistribute the material in any medium or format and to remix, transform, and build upon the material for any purpose, even commercially, provided the original work is properly cited and states its license.

Designing one's classroom teaching which caters effectively to varying cognitive styles of students and appropriately addresses depth and dimensions of subjects to be taught, is an important metacognitive strategy, which can shift the focus of learning from resource to its source of learning and enable students to learn.

We set out to determine the cognitive styles of medical teachers in our institution with an aim to sensitize them about characteristics, strengths, and weaknesses of their own cognitive styles and help them in utilizing this awareness for better teaching practices through appropriate metacognitive applications.

MATERIALS AND METHODS

Setting

The study was conducted in a medical college affiliated to a University in Central Gujarat, India.

Design

This was a cross-sectional study done over 6 months.

Participants

All medical teachers of the Medical College were eligible for the study.

Conduct

Faculty members were oriented to the concept of cognitive style and were asked to carry out self-assessment of their own cognitive style using the Alert Scale of Cognitive Style proposed by Dr. Crane.^[2] Sensitization of faculty was carried out by providing them with facts and explanations on cognitive styles, metacognition, and specific examples for incorporating them in teaching. They were also briefed about the unifying trend aimed to unite and systematize multiple style dimensions while giving them metacognitive pedagogy. Feedback was obtained from all participants after sensitization session. It was designed to study teachers' awareness and to enable them to make a meaning of the entire process demonstrating its application in one's professional development and teaching. Logical implications were derived from results and feedback so as to strengthen metacognition powered teaching practices.

Analysis

Data were analyzed in reference to cognitive style and its association with variables such as age, gender, handedness, and designation/years of academic experience. Faculty members were informed about the obtained data of the entire group, and metacognitive basis of teaching was reinforced.

Ethics

The Institutional Ethics Committee approved the conduct of the study.

RESULTS

Out of 130 eligible faculty members, 88 faculty members participated in the voluntary sensitization session conducted as a part of "Learning to teach better" activity of the institution. There were 41 females (46.6%) and 47 males (53.4%). There were 6 (6.81%) tutors/senior registrars, 24 (27.27%) assistant professors, 22 (25%) associate professors, and 36 (40.90%) professors. Right and left-handedness was present in 80 and 8 faculty members, respectively. Middle brain cognitive style was found to be present in 51 (57.95%) faculty members, followed by left brain cognitive style in 27 (30.68) and right brain cognitive style in 10 (11.36). Overall cognitive style distribution according to gender faculty members is shown in Table 1. Details of cognitive style distribution according to its subtypes for faculty members are shown in Table 2. No correlation was observed between cognitive style and gender, mother tongue, seniority, subjects taught, medium of education, handedness and religion.

Responses and observations on feedback: The questions asked in the feedback and participants' response are as shown in Table 3. Feedback revealed that there was inadequate awareness about one's cognitive styles before the study. Mean reported awareness on single Likert scale of all participants was 3.78 on a scale of 0–9, which increased to 6.76 post-sensitization. The faculty members rated the importance of awareness about cognitive style and metacognition at 6, whereas their beneficial effects in learning better were rated at 7. The sensitization sessions enhanced their clarity about the "how" and "why" of learning as means to become better health professionals was rated as 7. The faculty members

Table 1: Overall cognitive style distribution according to gender

Cognitive style	Males <i>n</i> (%)	Females <i>n</i> (%)
Left brain	11 (12.5)	16 (18.18)
Middle brain	29 (32.95)	22 (25.00)
Right brain	07 (7.95)	03 (3.40)
Total	47	41

Table 2: Details of cognitive style distribution

Cognitive style	All	Males	Female
Strong left brain	04 (4.5)	02 (2.37)	02 (2.37)
Moderate left brain	23 (26.1)	09 (9.09)	14 (18.18)
Middle brain	51 (57.95)	29 (32.95)	22 (25.00)
Moderate right brain	09 (10.22)	06 (6.81)	03 (3.30)
Strong right brain	01 (1.1)	01 (1.13)	00 (0.00)

reported that the study and sensitization session resulted in increasing the strengths as a teacher at 6.7 on the Likert scale and rated its positive impact in the way of teaching at 6.8.

DISCUSSION

Conducting learner-centric and patient-centered teaching activities are an area of high priority in our institution. Results of our study provide insight into degree of awareness and cognitive characteristics of faculty members about their own thinking processes and their improved perception after sensitization. In the present study, mean awareness about cognitive style was low before sensitization in all faculty members, which increased significantly post-sensitization. The present study was a part of a larger metacognitive exercise of creating cognitive and metacognitive awareness among students and teachers which is being carried out over past several years. It focused on helping teachers to think about their own thinking processes and expand their cognitive process through illustrative examples.

Lack of awareness about metacognitive principles in students too has been observed in several studies. Rachel Hanebutt has observed that metacognitive awareness can be increased from 14% to 59% through systematic sensitization.^[3] Significant number of faculty members of all seniority and varied subject expertise (preclinical, paraclinical, and clinical years) were more oriented to left/middle brain dominant cognitive styles than right brain dominant cognitive style. There was no significant subject, seniority or gender effect on the cognitive style of faculty members. Studying cognitive styles of teachers of science and humanities, Khandagale observed in their study that 50% teachers had moderate left brain cognitive style, 28% had middle brain, 14.28% had strong left brain, 7% had moderate right brain, and 0% strong right brain cognitive styles. This pattern was same for teachers of science and humanities.^[4] In an unpublished study carried out by the authors covering 500 university students from faculties of humanities and social science, business administration, and education; middle, left, and right brain dominance patterns were observed in 65%, 25%, and 10% students, respectively. In a study of cognitive styles in business and management undergraduate and postgraduate students

from diverse cultures and countries (Egypt, Greece, Hong Kong, and United Kingdom), Savvas *et al.* observed that in the undergraduates there were no statistically significant differences in cognitive style.^[5] Newble *et al.* have reported that students entering the medical school had left brain dominance bias preferences similar to science students than arts students.^[6] The evidence to date suggests that much of what teachers do, does little to enhance the chance that individual students will achieve their full potential and, indeed, there are clear indications that some activities of teachers may inhibit or distort student learning.^[7] Our results indicate that 30.6% and 11.06% teachers had dominant left and right brain cognitive orientation. Characteristically, left brain dominant cognitive style represents objective, analytical, logical, and sequential approach to process information, the right brain dominant cognitive style represents subjective, synthesizing, intuitive, and holistic approach.^[8] Teachers commonly utilizing left cognitive styles are busy separating out the parts that constitute the whole, while the one with right brain cognitive style is busy in presenting a constituent whole through a synthesizing outlook while teaching. As students move from learning of pre- and para-clinical subjects to clinical subjects, a progressively widening outlook is required to understand the depth and complexities of clinical medicine. The preferred methods of left brain cognitive orientation comprises lecture and discussion with focus on facts and figures, whereas the preferred methods of a right brain cognitive orientation comprises hands-on activities with focus on subjective, synthesizing, intuitive, and holistic approach to processing information. Left brain-based teaching methods bring about clarity, objectivity, and specificity in learning subject, while right brain teaching methods use sensitivity. The “what” of the subject is best expressed by left brain-based teaching methods. They serve best the cognitive needs of left brain-based learners who are rational and organizational learners who prefer sequential learning processes. The “How” of the subject is best expressed using right brain cognitive methods. Higher prevalence of left brain dominant cognitive style as compared to right brain cognitive raises important pedagogic questions. Are the teachers capable of covering their topics in totality as would be demanded for a doctor in making? Are they ready to strategically modify their teaching practices? Studies have also shown that medical students’ cognitive

Table 3: Faculty perception about cognitive style analysis and sensitization session

Feedback questions	Mean score (on a scale of 0–9)
Were you aware about your cognitive style before participating in this study?	3.78
Was the survey useful in orientating about cognitive style and metacognitive principles?	6.62
Was there clarity in the questionnaire?	6.57
Has the survey resulted in increasing the awareness about strengths and weaknesses as a teacher in particular based on your cognitive style?	6.76
Has the survey resulted in increasing the strengths and weaknesses as a teacher in particular, based on your cognitive style?	6.57
Was the explanation about different cognitive style useful?	6.81
Do you think it will have some positive impact in the way you teach from now onward?	6.89

style influence their learning and performance in the examinations. It also changes over time during their studies.^[8] Orienting teachers to cater to diverse and changing cognitive preferences of medical students is an important pedagogic intervention. Knowledge of cognition and regulation of cognition are important metacognitive strategies to enable medical students to meet with professional demands of the 21st century. If cognitive styles of teacher and students match with each other, the process of learning improves. When a teacher inculcates both right and left brain cognitive approach driven instructional methods in her teaching, then it would make teaching of future medical graduates complete and integral. The expected humane dimensions in a medical graduate cannot be inculcated without incorporating right as well as left brain orientation. The students we teach have diverse learning styles that require different approaches. However, in most medical schools considerable attention in curriculum design and teaching practices are given to the “what” they learn rather than “how” they learn.^[5] From a holistic perspective, we need teachers who are capable of using both the characteristics through neuroplasticity and present the subject in its totality through metacognitive regulation. Neelopant *et al.* have evaluated the learning modalities adopted by the medical students of the 3rd year at Kannur Medical College. They found that students’ learning modalities were multimodal (69%), with reading/writing as the predominant modality used. There was no gender difference. There was also no difference in academic performance of uni- and multi-modal learners.^[9]

There are several metacognitively driven teaching activities that are being offered in our institution for facilitating strategic learning. These include foundation course, horizontal and vertical integration of contents of learning, exposing students to village population through domiciliary field studies, and special participatory sessions termed “Evolve Meetings,” which help them to broaden their understanding about patient care. Dulloo *et al.* have documented benefits of horizontal and vertical integration in teaching.^[10]

Our study is probably the first of its kind in medical education. Focus on self-assessment and self-reflection of cognitive style of the faculty is the uniqueness of the study. The awareness about one’s cognitive style for a medical teacher can serve as a guide in strategically designing the teaching activity. It opens a scope of future research based pedagogic action on a large scale in medical institutions. Study of cognitive style of teachers and students needs to be carried out to achieve teacher-student cognitive synergism for specific learning activities. Our results provide crucial resource and source of knowledge in this area for planning faculty orientation on metacognition based teaching practices, since knowing is a process, not a product. The results also allow us to bring about cognitive synergism in teaching-learning practices using cognitive diversity of teachers as a valuable resource for specific learning activities. It is known that too much

cognitive synchronism can have myopic effects in learning. Compartmentalization of knowledge can serve the purpose of domain learning to an extent, but not beyond a certain point in life sciences.

Preparation and try out of tutoring program for students having extreme left or right brain cognitive style should be carried out to expand their cognitive abilities. Finally, there is a need to use metacognitive basis in redefining curriculum and formative assessment. Study of learning style and multiple intelligences of students is another area for future study. The study also raises some fundamental issues. Are we training doctors who have, by and large, limited orientation to right brain cognitive styles? Is it the root cause of lack of “being sensitive” on part of the medical graduates? Are we missing out on giving due importance to process knowledge while focussing heavily on domain knowledge? Are we forgetting education while focussing on training? There are few limitations of the study. The study did not analyze the impact of social and cultural variables on cognitive styles. Given the fact that Indian culture is pluralistic, such an analysis in future studies is required for complete exploration. Cognitive style assessment and metacognitive sensitization carried out in the present study is a one-time activity and do not obviate the need of a long-term program wherein all teaching-learning activities include metacognitive components. The first necessity in helping students to become a strategic learner is indeed to help teachers to find, define and refine their own cognitive styles. Study of cognitive style using “Alert’s Scale of Cognitive Style” relates to the analytical - holistic aspects of information processing as suggested by Coren D. Although this assumption is not accurate in light of current theories in neuroscience, many researchers have claimed that the degree to which behavior is global - holistic or differentiated - analytic is a key element in differences among individuals.^[8] Investigators in numerous applied fields of cognitive science and education have found that cognitive style has better predictive power for academic achievement than general intelligence or situational factors.^[11-13] It is essential that every educator employs to the fullest principles of neuroplasticity to directly transform teaching-learning styles and influence how students think about their own learning and modify it.^[14]

CONCLUSION

Explaining faculty how they think is an important metacognitive strategy. Identification of cognitive diversity is a primary pedagogic act for improving teaching-learning competence and offers basis for enhancing classroom teaching. Middle brain cognitive style was the most common among the faculty. Higher incidence of left brain cognitive style as compared to right brain cognitive style was observed. This cognitive diversity calls for the need to metacognitively empower faculty members. Sensitization sessions significantly increased faculty members’ awareness

about details, importance, perspective and relevance of cognitive styles in teaching and learning. Our study calls for further research on incorporating various unifying teaching activities which cater to diverse cognitive needs of students and observing its effects on learning outcomes.

Effective teaching is a journey from resource (cognition) to source (metacognition). A paradigm shift which focuses on the instrument of learning (the human brain) and processes of learning can bridge the gap between the reality and ideal of medical education. Focus on self-assessment and self-reflection of cognitive style of the faculty is the uniqueness of the study. The awareness about one's cognitive style for a medical teacher can serve as a guide in strategically designing the teaching activity. Effective learning requires cognitive apprenticeship between student and teacher, use of realistic problems and conditions, and an emphasis on multiple perspectives. If cognitive styles of teacher and students match with each other, the process of learning improves. When a teacher inculcates both right and left brain cognitive approach driven instructional methods in her teaching, then it would make teaching of future medical graduates complete and integral. The expected humane dimensions in a medical graduate cannot be inculcated without incorporating right as well as left brain orientation.

REFERENCES

1. Aurobindo S. Early Cultural Writings. Pondicherry: Complete Works of Sri Aurobindo; 2003. p. 382.
2. Crane LD. The Alert Scale of Cognitive Style. Kalamazoo: Western Michigan University; 1989.
3. Hanebutt R. Metacognitive Regulation Intervention(s) in Undergraduate Science Instruction. Education Seminar Research Thesis, EDUC 2015;480A:43.
4. Khandagale VS. A study of cognitive style among teacher educators. *Int J Arts Hum Manag Stud* 2016;2:12-20.
5. Savvas M, El-Kot G, Sadler-Smith E. Comparative study of cognitive styles in Egypt, Greece, Hong Kong and the UK. *Int J Train Dev* 2001;5:64-73.
6. Newble DI, Gordon MI. The learning style of medical students. *Med Educ* 1985;19:3-8.
7. Connell JD. Brain-based strategies to reach every learner. *Teaching Strategies*. New York: Scholastic, Inc.; 2005.
8. Dunlap JC. Changes in students' use of lifelong learning skills during a problem-based learning project. *Perform Improv Q* 2005;18:5-33.
9. Neelopant SA, Sura T, Devakar S. Learning preferences among undergraduate medical students. *Int J Med Sci Public Health* 2016;5:986-8.
10. Dulloo P, VEDI N, Gandotra A. Impact of horizontal and vertical integration: Learning and perception in first-year medical students. *Natl J Physiol Pharm Pharmacol* 2017;7:1170-6.
11. van Heugten, CM, Ponds RW, Kessels RP. Brain training: Hype or hope? *Neuropsychol Rehabil* 2016;26:639-44.
12. Tinajero C, Lemos SM, Araujo M, Ferraces MJ, Paramo MF. Cognitive style and learning strategies as factors which affect academic achievement of Brazilian University students. *Psicol Reflex Crit* 2012;25:105-13.
13. Messick S. The nature of cognitive styles: problems and promise in educational practice. *Educ Psychol* 1984;19:59-74.
14. Zohar A, David AB. Explicit teaching of meta-strategic knowledge in authentic classroom situations. *Metacogn Learn* 2008;3:59-82.

How to cite this article: Vaishnav BS, Vaishnav SB, Varma J, Prabhakaran A, Chotaliya M. Cognitive style assessment of Indian medical faculty - A step toward achieving cognitive integration in teaching practices. *Natl J Physiol Pharm Pharmacol* 2018;8:1065-1069.

Source of Support: Nil, **Conflict of Interest:** None declared.