

Comparison between the Learning Styles of Medical Students in the Preclinical Versus Clinical Years at the Faculty of Medicine Suez Canal University

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Abstract

Background: The Field of learning styles is complex, over 70 different learning style models identified in a recent review. The literature seems to suggest that diagnosing students' learning styles can be an easy and effective process because students can identify their own learning styles and score higher on tests when they are complimented with a teaching style that matches their learning style. **Aim:** The aim of this study was to compare the learning styles of the undergraduate medical students in the preclinical versus clinical years at the Faculty of Medicine, Suez Canal University in order to help them to maximize their learning. **Materials and Methods:** This study is a descriptive cross sectional study. All medical students (from first year to sixth year) during the academic year 2012/2013 were included in the study (total comprehensive sample) then comparison between the learning styles of medical students in the preclinical versus clinical years was done. A self-administered anonymous VARK (Visual, Auditory, Read and write, Kinesthetic) questionnaire was used to identify their learning styles. The questionnaire was translated into Arabic to facilitate its administration. **Results:** Seven hundred and twenty nine students responded to the questionnaire. T- Test for comparing means of continuous data was used. The results showed that there is a statistically significant difference ($p= 0.022$) between the learning styles of students in the pre-clinical and clinical years despite those students in both the preclinical and clinical years preferred to use the unimodal learning style. **Conclusion:** The study concluded that students in the preclinical years have different learning styles than students in the clinical years and that it is important to increase the awareness of both the faculty and students about learning styles and its importance and implications.

Keywords: Learning style, VARK, Preclinical, Clinical

Introduction

Students learn in many ways; by seeing and hearing, reflecting and acting, reasoning logically and intuitively, and memorizing and visualizing. The ways in which an individual characteristically acquires, retains, and retrieves information are collectively termed the individual's learning style⁽¹⁾.

Another definition of learning style is the manners or the conditions in which learners most efficiently and effectively perceives process, store and recall what they are attempting to learn⁽²⁾. The term learning style may include more than 70 different models with conflicting assumptions about learning, and with different designs and starting points⁽³⁾. The two most fa-

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mous and used models are Kolb's Learning Styles Model, which describes the information processing and is frequently used as a starting point in problem based learning, and Dunn's Learning Styles Model, which is multidimensional and is widely used in elementary and secondary schools as well in adult education as higher education⁽⁴⁾. Knowing the learning styles of the learners aids the designer or instructor to develop a curriculum to address various needs of the learners in a group or class⁽⁵⁾. Fleming's VARK model is one of the most common and widely used categorizations of various types of learning styles that includes: visual learners or tactile learners, reading/writing- preference learners and kinesthetic learners or tactile learners^(6,7). As learning styles preferences strongly affect student achievement, satisfaction and success, it is important to identify the preferred learning styles among undergraduate medical students on how they preferred to learn and whether there are differences among the undergraduate medical students in the six years by identifying their learning styles and compare between the first three years (pre-clinical years) where the students study mainly the basic medical sciences (i.e. anatomy, physiology, pharmacology, microbiology, etc.) versus the second three years (clinical years) where they study mainly clinical sciences (i.e. internal medicine, surgery, pediatrics, obstetrics and gynecology, ophthalmology, etc.) Therefore, this study aimed at helping the undergraduate medical students select and be aware of their particular preference (s) to understand how they should learn and use information for more effective learning and communicate.

Methods

The study was a descriptive cross sectional study that was conducted to assess the

learning styles among the under graduate medical students in the six years at the Faculty of Medicine Suez, Canal University during the academic year 2012/2013. All the students from the first year to the sixth year were included in the study (total comprehensive sample). A self administered anonymous VARK questionnaire was used to identify the students' learning style.

Validity of the VARK Questionnaire

The VARK questionnaire was used to evaluate the learning styles of the under graduate medical students. The questionnaire contained only 16 questions as experience suggested that if there were too many questions (25+), some people would take the questionnaire less seriously and some may become bored with it. VARK replicates how real decisions are made using many preferences so the multiple answers for each question make statistical analysis very difficult. There are no "right" answers! From Dr Leite's research, the reliability estimates for the scores of the VARK subscales were 0.85, 0.82, 0.84 and 0.77 for the Visual, Aural, Read/write and Kinesthetic subscales, respectively. The VARK Questionnaire was used to determine the main learning style for each year Visual, Aural, Read/Write or Kinesthetic. Then comparison between the main learning style of the first and second phases (pre-clinical) versus the third phase (clinical) was done to assess if the level of maturation affected the students learning styles or not.

Data collection

Informed written consent was obtained from the faculty administrators introducing the questionnaire. Questionnaires were delivered to the students after classes.

Statistical Analysis

Data were presented using descriptive statistics in the form of frequencies and per-

centages. Diagrammatic and tabular forms were used when appropriate by Excel Vista for windows. Qualitative categorical variables were compared using chi-square test. Whenever the expected values in one or more of the cells were less than 5, Fisher exact test was used instead. All statistical analyses were run using the statistical package SPSS 16.0 for windows. Results were considered significant in a two-sided test if $P < 0.05$.

Results

The total number of the students in all academic years is 828 students while the number of the students who respond to the questionnaire and returned it is 729 students from which 281 male students and 448 female students (Table 1). There was a statistically significant difference ($p=0.01$) of unimodal learning styles of medical students showing the highest percentage of

auditory learning style among students of the 2nd and 3rd years students, the highest percentage of kinesthetic learning style among students of the 3rd and 5th year students, the highest percentage of read/write learning style among students of the 1st year students, the highest percentage of visual learning style among students of the 6th year students (Figure 1). The study showed that that auditory and kinesthetic bimodal learning style is decreasing from the second year to reach the least at the sixth year. While almost all the students keeping the same pattern of using auditory and read/write style across different academic years (except 2nd and 5th years). Second, third and fourth year students do not use kinesthetic and read/write bimodal learning style while kinesthetic and visual bimodal learning style is highest in the fifth year (Figure 2 and 3).

Table 1: The demographic data of the studied population

academic year	Number students	Returned Questionnaires	male students	female students
1 st Year	155	140	59	81
2 nd Year	135	121	40	81
3 rd Year	13	11	8	3
4 th Year	162	135	48	87
5 th Year	165	150	59	91
6 th Year	198	172	67	105
Total	828	729	281	448

Otherwise, it is the same pattern across different academic years with absence among third year students. There is a statistically significant difference in learning styles between successive academic years and with using the sixth year as a reference considering they are the most mature students it shows that there is a statistically significant difference in learning styles between the fifth year and the sixth year students otherwise there is no statistically significant difference where the unimodal

learning style is higher among students in the 4th and 5th academic years while multi-modal learning style is higher among students in the 1st and six year (Table 2). The results showed that males and females are almost the same in using unimodal learning style (Figure 4). Finally, there is statistically significant difference in the learning styles between pre-clinical and clinical years where students in both the preclinical and clinical years prefer to use the unimodal learning style (Table 3).

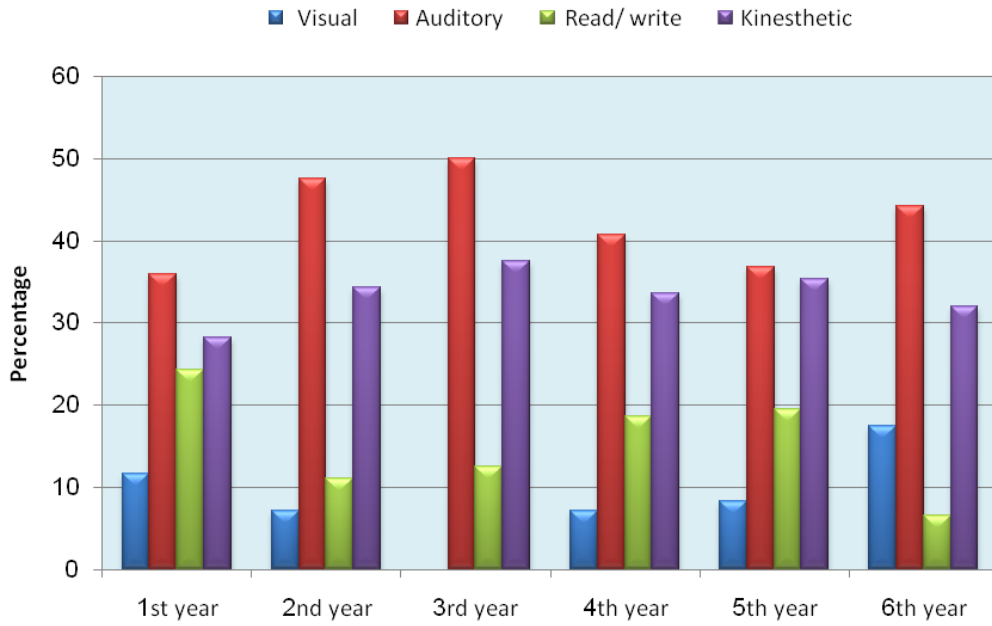


Figure 1: Frequencies of unimodal learning style among successive years

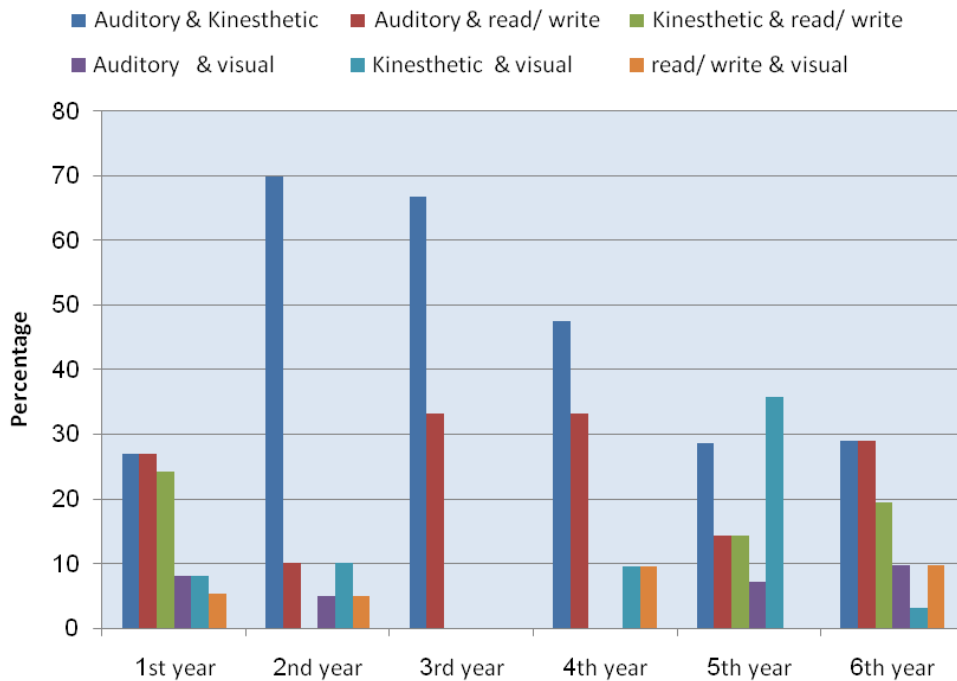


Figure 2: Bimodal learning style preferences among successive years

Discussion

Knowing the learning style of students is a valuable skill in education. Knowledge of learning styles may help educators identify and solve learning problems among students, thus helping their students to be

come more effective learners and increase their academic performance⁽⁸⁾. The implication of a particular learning style should be clear to the educators. Learning style will also be seriously considered where a student does not meet the expected performance.

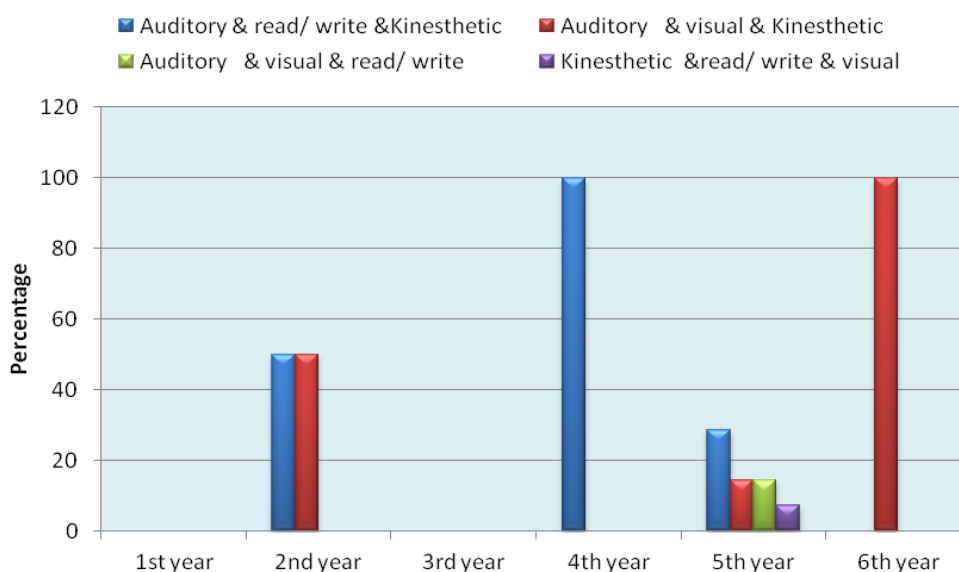


Figure 3: Trimodal Learning style preferences among successive years

Table 2: Differences of learning styles between successive years

	Unimodal No. (%)	Multimodal No. (%)	p	p
1 st yr	103 (73.6)	37 (26.4)	0.1763	0.033*
2 nd yr	99 (81.8)	22 (18.2)	0.7649	
3 rd yr	8 (72.7)	3 (27.3)	0.467	
4 th yr	113 (83.7)	22 (16.3)	0.4601	
5 th yr	133 (88.7)	17 (11.3)	0.0465*	
6 th yr	138 (80.2)	34 (19.8)	Ref.	

Table 3: Differences of learning styles between pre-clinical and clinical years

	Pre-clinical yrs (N= 272) No. (%)	clinical yrs (N=457) No. (%)
Unimodal	210 (77.2)	384 (84.0)
Multimodal	62 (22.8)	73 (16.0)
P value	0.022*	

Applying student learning styles to individual students, especially for struggling students will be of great help to the students⁽⁹⁾. The results of the current study show that the majority of the students in

different academic years prefer unimodal learning styles. As most of the first, second, third years students (74%, 81.8%, and 72.7% respectively) use unimodal learning styles. This finding agreed with a study held by Sabiha⁽¹⁰⁾ that was conducted among medical and dental students of 1st, 2nd and 3rd years in Islamabad University. They found that the majority of medical and dental students had a single learning style, while only one sixth of medical and one third of dental students had multiple learning styles. Both disciplines collectively showed that (14.2%) students had visual, (22.6%) had auditory, (19.4%) had reading and writing, (30.1%) had kinesthetic and (19.9%) had multiple styles of learning. We suggest that the cause of the predominance of using unimodal learning style among the students is that they were not trained to use more than one style since the start of their educational life from 1st elementary to high school using the unimodal auditory learning style in which the system depends mainly on lecturing and the other reason may be that the learning style are relatively a stable patterns of behavior.

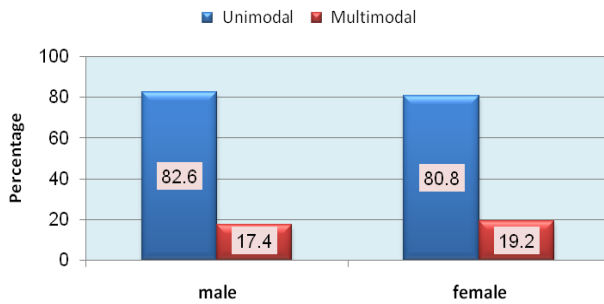


Figure 4: Learning style preferences in female and male student respondents

But our findings are in contrast with some studies as a study held in Turkey by Baykan & Naçar⁽⁹⁾ who reported 64% of first year medical students applying multimodal learning style. Another study held by Ayesha Nuzhat⁽¹¹⁾ conducted in KSA showed that multiple learning styles of medical students represented 73%. Also, Heidi's⁽¹²⁾ study that was conducted on first year medical students in Michigan (USA) showed that only 36.1% of the students preferred unimodal learning style. Among these students, 5.4% preferred visual, 4.8% preferred auditory, 7.8% preferred reading and writing, and 18.1% preferred kinesthetic learning style. In contrast, most students (63.8%) preferred multiple modes [2 modes (24.5%), 3 modes (32.1%), or 4 modes (43.4%)] of information presentation. This ought to that these learning styles were adapted during their premedical training and the marked difference between the Turkish and Saudi Arabian studies and our findings signifies a difference in teaching methodology at premedical level and indicating a different teaching technology during premedical years. While the contrast with the American study may be due to that their students are well trained on using multiple learning style since the start of their educational life. In current study, auditory style (26.4%, 38.8%, 36.4%, 34.1%, 32.7%, 35.5% respectively from the 1st to the 6th year) was ranked highest by the students followed by kinesthetic style (20.7%,

28.1%, 27.3%, 28.1%, 31.3%, 25.6% respectively from the 1st to the 6th year) and this is consistent with a study held by Zeraati⁽¹³⁾ showing that the dominant learning preference of the students was auditory preference (30.8%) followed by read/write (20.6%), while (7.5%) were kinesthetic and (5.6%) were visual learners; the rest of the students (35.5%) represented a multimodal learning preference. Another study held by Javadinia⁽¹⁴⁾ in Iran revealed that the learning style mostly used by these students was auditory (48.6%). This predominance of auditory learning style and the reason that the students do not change their learning style in spite of using Problem Based Learning (PBL) strategy as for some reasons, and over the years earned a change in the application of strategies of education in the faculty that drive about learning versus teaching which inspired the students trend towards concepts and strategies for teaching and what helped them spread of interactive lectures in different academic years, as well as the familiarity of the students with this technique of teaching used in previous study years but it still keeping some effects presented in the form that kinesthetic learning style comes after the auditory style in order. Also, the predominance of auditory learning style preferences over other styles may be due to the dependence of the students on PBL tutorial sessions and the interactive lectures that are used as instructional methods in our problem based learning strategy. In our Faculty the system of teaching in preclinical years emphasize on teaching the students by kinesthetic style by using the clinical skills lab and training in primary health care units. While in the 2nd three years students' learning occurs mainly in the hospital through clinical rounds that emphasize both the auditory style through the interactive discussion and lectures that held in the rounds and the kinesthetic style

through case based teaching method. In the current study the most preferred bimodal learning style is auditory and kinesthetic style while most of the students that prefer auditory, read/ write and kinesthetic style that used in second 50% and fourth year being the only used trimodal learning style among the fourth year students and quadrimodal learning style is almost absent among the students. These findings were consistent with Chinmay's⁽¹⁵⁾ study in India who found that (32%) of the students preferred bimodal learning style and 62% of the student that prefer bimodal learning style preferred auditory and kinesthetic bimodal learning style while (26%) of the students preferred Trimodal learning style with 52% of the student that preferred trimodal learning style preferred auditory, read/write and kinesthetic trimodal learning style and only one student acquire the quadrimodal learning style preferences among the studied population. These findings suggest that India and Egypt share to great extent some of the cultural background that affects the students learning style. Javadinia's study⁽¹⁴⁾ in Iran revealed that among 148 people participating in their study, 77% were females and most of them (66.2%) were passing the basic sciences stage. There was no significant relationship between the preferred learning styles and gender ($P=0.18$) this is consistent with our results that shows no statistically significant gender difference is observed in selecting unimodal or multimodal learning styles as males and females are almost the same in using unimodal learning styles. Also, other studies^(9,16) showed that there was no statistically significant difference between learning styles used by either male or female students. Our results reveals that male students prefer to use auditory 44% learning style a little more than females who prefer using read/ write 17.7% learning style a little more than males. The-

se findings are in contrast to Chinmay's⁽¹⁵⁾ study that was conducted in India where unimodal learning style female students' preferred auditory learning style over other styles, while male students showed equal preference of auditory and kinesthetic learning style. Also, Choudhary's⁽¹⁷⁾ study in India revealed that males (92.98%) and females (76.27%) preferred information to reach them via multiple sensory modalities. In addition, only 15.52% of all students (6.25% males and 23.75% females) preferred using a single sensory modality for information intake. There was a significant gender difference in the percentages of males and female students who preferred multimodal or unimodal styles of information presentation. While the study held by Wehrwein⁽¹⁸⁾ that was conducted in Michigan (USA) showed that 54.2% of females and only 12.5% of males preferred a single mode of information presentation. Among the female students, 4.2% of the students preferred visual, 0% of the students preferred auditory, 16.7% of the students preferred read/write, and 33.3% of the students preferred kinesthetic. In contrast, male students were evenly distributed in preference, with 4.2% of the students preferring auditory, read/write, or Kinesthetic learning style, respectively, while 0% of the students preferred visual learning style. Furthermore, 45.8% of female and 87.5% of male respondents preferred multiple modes. This difference between our findings and the Indian studies was attributed to that males being more focused externally and females being introspective and self critical. While the difference with the American study was attributed to the different cultures where the students raised. In Shenoy's⁽¹⁹⁾ study that was conducted in India, they found that the multimodal learning style had increased from 12.06% in the first year to 22.11% in the final year. This is not consistent with our results that

shows predominance of unimodal learning style as follows the highest percentage of auditory learning style among students of the 2nd and 3rd year students, the highest percentage of kinesthetic learning style among students of the 3rd and 5th year students, the highest percentage of read/write learning styles among students of the 1st year students, the highest percentage of visual learning style among students of the 6th year students. But in our study the learning styles used by the students are almost the same in different academic years; this may be due to the PBL strategy that is being adopted by our faculty of Medicine in Suez Canal University that integrates both basic and clinical sciences starting from the 1st year until reaching the final 6th year. As in the 1st three years (pre-clinical) the students go to a clinical skill lab where they learn several skills and having the chance for trial and error in a safe learning environment and go to the primary health care units giving the students the opportunity to actively participate the learned skills on real patient and inauthentic situation. While in the 2nd three years (clinical) the students work mainly in the hospital where the main bulk of clinical learning take place integrated with some basic medical sciences. So in our faculty, the students study both the basic and clinical sciences from the start up to the final year this may be the reason behind that all the students in different academic year have almost the same patterns of the used learning styles. In the current study, we found that there is statistically significant difference in the learning styles between pre-clinical and clinical years with read/write learning style more in preclinical years than clinical years and kinesthetic learning style is a little more in clinical years than pre-clinical years despite that the students in pre-clinical and clinical years are almost using the same unimodal learning

styles. A study held by Kumar⁽²⁰⁾ in Malaysia among preclinical students showing preference for unimodal learning styles where (51.4%) of the students preferred a single mode of information presentation and (48.6%) who preferred multiple modes of information presentation which is consistent with our study results. This difference may be due to the different depth and exposure of the clinical practice between the preclinical years, which only go to the PHC units, one day per week where the students mainly concerned with the clinical setting, including the functions of the PHC units and the services provided there and learning communications skills as an introduction to the clinical practice while in the clinical years the students go to the hospital four days per week where the students are mainly concerned with acquiring the required skills needed to be competent physicians. The study of Zeraati⁽¹³⁾ that was performed at Department of Internal Medicine (Imam Reza hospital) in Iran is also consistent with our study findings showing that the dominant learning preference of the students was a unimodal learning style preference (64.5%), while the rest of the students (35.5%) represented a multimodal learning preference. This could be due to Egypt and Iran may be similar in their teaching methods in premedical years and the two countries almost have the same cultural background that may affect the learning styles of the students. The study held by Ayesha Nuzhat⁽¹¹⁾ conducted in KSA among preclinical students shows that 5.5%, 11.6%, 2.1%, and 8.2% of students only preferred the visual, auditory, reading/writing and kinesthetic modes, respectively. A further analysis showed that 72.6% of students preferred multiple learning styles that is in contrast to our study results where the unimodal preferences is the main learning style among the preclinical students. This could be due to the fact that

Saudi Arabian students are heavily involved in new technology. Technology is so vital in enhancing learning. Today, the technology works effectively with education and learning. Technology can help many students improve their learning capabilities. In this respect, behavioral sciences are improving the educational technology processes which can identify varied examples of individual differences and innumerable human characteristics⁽²¹⁾.

Conclusion

The study concluded that it is important to increase the awareness for both the instructors and students about learning styles and its importance and implications in improving the medical education and producing more competent doctors.

Limitations of the study

There is a large number of learning styles based on different psychological constructs and assessed using a range of measurement instruments, so it is impossible to categorize students into fixed learning styles as many other factors can influence the learning style preferences of the students. Also, it was difficult to make all the students responding to the questionnaire satisfactorily.

References

1. Felder RM. Learning and Teaching Styles in Foreign and Second Language Education. *Foreign Language Annals*. 1995; 28 (1): 21–31.
2. James W, Gardner D. Learning styles, implication for distance learning. *New Dir Adult Contin Educ*. 1995; 67: 19-32.
3. Boström L, Lassen L. "Unrevealing learning, learning styles, learning strategies and meta-cognition" *Education and Training*, 2006; 48 (2): 178-189.
4. Pallapu P. Effects of Visual and Verbal Learning Styles on Learning, Institute for Learning Styles Journal, 2007; Volume 1, p. 34-39.
5. Fleming N, Mills C. Not another inventory, rather a catalyst for reflection. *To Improve the Academy*, 1992; 11, 137-155.
6. Fleming N, VARK. A guide to Learning Styles. Available from URL <http://www.varklearn.com/english/page.asp> (Last accessed, March 15th, 2012).
7. Murray C. Use of learning styles to enhance graduate education. *J Allied Health*. 2011; 40(4):67-71.
8. Haq S, Yasmeen S, Ali S, Gallam F. Students' Learning Styles Require Modified Teaching Strategies. *J Rawal Med Coll (JRMC)*, 2012; 16(2):191-193.
9. Baykan Z, Naçar M. Learning styles of first-year medical students attending Erciyes University in Kayseri, Turkey. *Adv Physiol Educ*. 2007; 31(2):158- 160.
10. Sabiha M., Shahina Y, Ali S, Gallam FI. Students' Learning Styles Require Modified Teaching Strategies. *Journal of Rawalpindi Medical College (JRMC)*, 2012; 16(2):191-193.
11. Nuzhat A, Salem R, Quadri M, Al-Hamdan N. Learning style preferences of medical students. *Int J Med Educ*, 2011; 2:70-73.
12. Heidi L, Stephen E. First-year medical students prefer multiple learning styles. *Adv Physiol Educ*, 2006; 30: 13–16.
13. Zeraati A, Hajian H, Shojaian R. Learning Styles of Medical and Midwifery Students in Mashhad University of Medical Sciences. *J Med Educ* 2008;12 (1-2):17- 22.
14. Javadinia S, Sharifzadeh G, Abedini M, Khalesi M, Erfanian M. Learning Styles of Medical Students in Birjand University of Medical Sciences According to VARK Model. *Iran J Med Educ*, 2012, 11(6): 584-589.
15. Chinmay S, Naisargi J, Mehta HB, Gokhle PA. Learning styles adopted by medical students. *Intern Res J Pharmacy IRJP*, 2011; 2 (12), 227-229.
16. Slater JA, Lujan HL, DiCarlo SE. Does gender influence learning style preferences of first-year medical students? *Adv Physiology Education*, 2007; 31: 336–342.
17. Choudhary R, Dullo P, Tandon RV. Gender Differences in Learning Style Preferences

- of First Year Medical Students. *Pak J Physiology*, 2011; 7(2).
18. Wehrwein EA, Lujan HL, DiCarlo SE. Gender differences in learning style preferences among undergraduate physiology students. *Adv Physiol Educ*, 2007; 31: 153–157.
 19. Shenoy UG, Kutty K, Vinutha Shankar MS, Annamalai N. Changes in the Learning Style in Medical students during their MBBS Course. *Int J Sci Res Pub*, 2012 Volume 2, Issue 9.
 20. Kumar LR, Voralu K, Pani SP, Raman SK. Predominant Learning styles adopted by AIMST University students in Malaysia. *South East Asian J Med Educ*, 2009; 3 (1): 37-46.
 21. Solvie P, Kloek M. Using technology tools to engage students with multiple learning styles in a constructivist learning environment. *Contemporary Issues in Technology and Teacher Education*. 2007; 7(2):7-27.