ORIGINAL ARTICLE

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Preferred learning style between Iranian and international medical students: A comparative study

Background: Learning styles as student preferences for acquiring and nurturing knowledge are different by considering their individual and social factors. Socio-cultural factors and the educational structure of different countries are some of the factors affecting this matter. The present study aimed to compare the learning style of Iranian and international medical students of Tehran University of Medical Sciences. The present descriptive cross-sectional study was conducted among the medical students studying in the basic science courses of Tehran University of Medical Sciences during the educational year of 2018-2019.

Methods: In the present study the complete enumeration was used for sampling and data were collected by using VARK standard questionnaire, and then they were analyzed by SPSS 21.

Results: Among 225 students participating in the present study 46.4 and 53.5% of the participants were Iranian and international students, respectively. Based on comparing the mean score of four learning styles among Iranian and international medical students, two kinesthetic (P<0.05) and aural (P<0.05) styles were significantly different. The results of the present study represented the preference of bi-model learning style among Iranian and international students (87%) compared to that of tri- and quad-model ones.

Conclusion: Based on the results of the present study, the learning style of both groups was bi-model although a difference was observed between Iranian and international students regarding uni-model style. Thus, different active education methods should be used to improve the academic performance of students in order to utilize all senses for learning.

Keywords: Learning style, Internationalization, Medical students

مقارنة بين أسلوب التعلم للطلاب الإيرانيين و الدوليين بجامعة طهران للعلوم الطبية في مسار التدويل

الخلفية والهدف: أساليب التعلم هي ما يفضله الطلاب لاكتسابها وتعليمها التي تختلف باختلاف العوامل الفردية و الاجتماعية. أحد العوامل الفعالة في هذا المجال هو العوامل الاجتماعية و الثقافية و الهيكل التعليمي لمختلف البلدان. كان الهدف من هذه الدراسة هو مقارنة أسلوب التعلم لطلاب الطب الإيرانيين و الدوليين في جامعة طهران للعلوم الطبية.

الطريقة: أجريت الدراسة المقطعية الوصفية الحالية بين طلاب الطب في مقرر العلوم الأساسية بجامعة طهران للعلوم الطبية في العام الدراسي ١٣٩٨-١٣٩٧ هجريا شمسيا. تم أخذ العينات عن طريق العد و جمع البيانات باستخدام استبيان معيار VARK و تحليل البيانات باستخدام برنامج SPSS-21.

النتائج: من بين ٢٢٥ طالبًا شاركوا في الدراسة الحالية ، كان ٤٦.٤% من الطلاب الإيرانيين و ٥٣.٥% من الطلاب الدوليين. بناءً على مقارنة متوسط الدرجات لأربعة أنماط التعلم بين طلاب الطب الإيرانيين و الدوليين، كان الأسلوبان الحركي (P 0.05<)و السمعي (P 0.05<) مختلفين بشكل كبير.

أظهرت النتائج أن تفضيل أسلوب التعلم ثنائي الأبعاد بنسبة ٨٧% بين الطلاب الإيرانيين و الأجانب هو أكثر من ثلاثي الأبعاد و رباعي الأبعاد.

الخلاصة: أظهرت نتائج الدراسة الحالية أن هناك فرقا بين الطلاب الإيرانيين والأجانب في أسلوب التعلم من جانب واحد لكن أسلوب التعلم لكلا المجموعتين من الطلاب ثنائي الأبعاد. لذلك من أجل استخدام جميع الحواس في التعلم؛ من الضروري استخدام طرق مختلفة من التعليم النشط لتحسين الأداء الأكادمي للطلاب.

الكلمات المفتاحية: أسلوب التعلم ، التدويل ، طلاب الطب

مقایسه سبک یادگیری دانشجویان ایرانی و بین الملل دانشگاه علوم پزشکی تهران در مسیر بین المللی سازی

زمینه و هدف: سبک های یادگیری، ترجیحات دانشجویان برای کسب دانش و پرورش آنها است که با توجه به عوامل فردی و اجتماعی میان آنها متفاوت است. یکی از عوامل موثر در این زمینه عوامل فرهنگی-اجتماعی و ساختار آموزشی کشورهای مختلف است. هدف از مطالعه حاضر مقایسه سبک یادگیری دانشجویان پزشکی ایرانی و بین الملل در دانشگاه علوم پزشکی تهران است.

روش: مطالعه حاضر به روش توصیفی – مقطعی میان دانشجویان پزشکی دوره علوم پایه دانشگاه علوم پزشکی تهران در سال تحصیلی ۹۷-۱۳۹۸ صورت گرفته است. نمونه به روش تمام شماری و گردآوری اطلاعات با استفاده از پرسشنامه استاندارد وارک VARK انجام شد. داده های حاصل با استفاده از نرم افزار SPSS-21 مورد تجزیه و تحلیل قرار گرفت.

یافته ها: از مجموع ۲۲۵ نفر از دانشجویان شرکت کننده در مطالعه حاضر ۴۶.۴ درصد آنها دانشجوی ایرانی و ۵۳.۵ درصد آنها دانشجوی بین الملل هستند. مقایسه میانگین چهار سبک یادگیری میان دو گروه دانشجویان پزشکی ایرانی و بین المللی نشان داد که در دو سبک یادگیری جنبشی (P < 0.05) و شنیداری (P < 0.05) میان دو گروه تفاوت معناداری مشاهده می‌شود. یافته های پژوهش نشان داد که ترجیح سبک یادگیری دو وجهی با ۸۷ درصد میان دانشجویان ایرانی و بین المللی بیش از حالت سه وجهی و چهار وجهی است.

نتیجه گیری: یافته پژوهش حاضر نشان داد که میان دانشجویان ایرانی و بین الملل در سبک یادگیری تک وجهی تفاوت وجود دارد. اما سبک یادگیری هر دو گروه دانشجویان دو وجهی هستند. لذا لازم است به منظور بهره گیری تمام حواس برای یادگیری از روشهای مختلف آموزش فعال استفاده شود تا میزان عملکرد تحصیلی دانشجویان ارتقاء یابد.

واژه های کلیدی: سبک یادگیری، بین المللی سازی، دانشجویان پزشکی

عالمی معیار کے حصول کے لئے تہران میڈیکل یونیورسٹی میں ایرانی اور دیگر ممالک کے طلبا کے تعلیمی طریقوں کا موازنہ

بیک گراونڈ : پژوہائی کے طریقوں سے حصول علم و و دانش کے لئے طلباء کی ترجیحات کاپتم چلتا ہے، یہ طریقے فردی اور سماجی اسباب کی بنا پر الگ ہوتے ہیں۔ ان میں سے ایک سبب مختلف ملکوں کا تعلیمی سسٹم اور ثقافتی سماجی ڈھانچہ ہے ۔ اس تحقیق کا ہدف تہران یونیورسٹی کی میڈیکل فیکلٹی میں ایرانی اور دیگر ملکوں سے آئے ہوئے طلبا کی پژوہائی کے سلیقوں کا موازنہ کرنا ہے ۔

روش : یہ تحقیق دوہزار اٹھارہ اور دو ہزار انیس میں تہران یونیورسٹی کی میڈیکل فیکلٹی میں انجام پائی ڈیٹا کی جمع آوری کے لئے وارکVARK معیار کا سوالنامہ استعمال کیا گیا ۔ ڈیٹا کا تجزیہ ایس پی ایس ایس اکیس سے انجام دیا گیا ۔

نتیجی : اس تحقیق میں ایک دو سو پچیس طلبا نے شرکت کی ان میں چھیالیس اعشاریہ پانچ فیصد ایرانی طلبا اور ترین اعشاریہ پانچ فیصد طلبا دیگر ملکوں کے طلباء تھے ۔ اس تحقیق سے واضح ہوتا ہے کہ دونوں گروپوں میں سیکھنے اور سن کے سیکھنے میں خاصہ فرق پایا جاتا ہے۔ ایک اورنتیجہ جو اس تحقیق سے حاصل ہوتا ہے وہ یہ ہے کہ دونوں گروپوں کے ستاسی فیصد طلبا سیکھنے کے دو طریقوں پر تیسرے اور چوتھی پر ترجیح دیتی ہیں۔

سفارش : اس تحقیق سے پتہ چلا ہے کہ ایران اور بیرونی طلبا میں سیکھنے کے پہلے طریقے میں اختلاف پایا جاتا ہے لیکن دونوں گروپوں کے سیکھنے کے طریقے دو طرح کے طریقے ہیں لھذا ان توانائیوں سے استفادہ کرنے کی بھرپور کوشش کی جائے اور طلبا کی تعلیم کو بہتر بنانے کے لئے سیکھنے مختلف طریقے آزمائے جائیں۔

کلیدی الفاظ : سیکھنا ، طلبا ، طریقی بہتر

INTRODUCTION

Internationalizing educational system is regarded as one of the important strategies of higher education system during recent years. The internationalization of higher education has faced the inclusive growth and welcomed well by the universities and higher education institutions in Iran (1). Soderqvist (2) considered internationalizing higher education as the process of changing the status of one higher education institution from national to international in order to increase educating and learning quality and achieve desired and intended competency at a superior and international level.

The internationalization of higher education in the theory of "the process of integrating international dimension into the activities and programs of higher education" aimed to raise a new responsible, critic, and global citizen generation students (3). Based on the previous studies, internationalizing higher education system is positively related to the improvement of curriculum quality (4). Educational departments focus on increasing the quality of activities and programs by internationalizing curriculum. Improving teaching standards in departments based on international standards and indexes is considered as one of approaches for increasing the quality of higher education programs (5). In this regard, paying attention to the learning style of learners is regarded significantly important. The learning styles of students with various cultures are different due to the dependency of these styles on culture (6). Effort to understand students is ineffective for achieving educational objectives and improving educational quality, regardless of the cultural background of learners. Universities should recognize the differences between learning styles in different cultures so that they can support learning and modifying educational programs for empowering students (7).

Learning style is the habit of processing received information and is regarded as one of the factors affecting learning. It is considered as cognitive and emotional trait and physiological behaviour which relative constantly indicates how educational environment is understood, acted and responded. Researchers believe that each learner possesses preferred recognizable and stable methods for understanding, organizing, and storing information (8).

Fleming considered learning styles as individual differences and preferences for collecting, organizing, and thinking about information (9). Additionally, he proposed four learning styles based on Neuro-Linguistic Model and described them based on Sensory Modalities. VARK is regarded as the classification of educational preferences and focuses on individual differences in the method of acquiring information. Four approaches of learning style are as following. Learners with visual learning style are trained by using map, chart, graph, colour, and image. The learners having aural style prefer to explain contents to some disputable topics with other students and professors and they prefer to learn by listening. Regarding read/Write learning style, learners print articles, reports, and textbooks, in addition they take notes from web pages and read them.

Learners with kinaesthetic style often learn through trial and error, activities done for the better understanding of concepts, referral to lab, problem solving, and sample collection (10), which is abbreviated as VARK. Considering this theory, learners can apply uni-model learning style (visual or aural) or the multi-model style meaning the use of a few styles involving bi-, tri-, and quad-model for their learning. Learners with multi-model learning style prefer to receive information in different forms. Accordingly, they receive and process information with all their senses (11).

The studies conducted in different countries represented that the students of medical sciences university's prefer different learning styles (12). For example, aural and kinaesthetic styles were dominant in first-year Indian medical students (13, 14). Pre-clinic medical students in Oman possessed multi-model learning style, while aural and kinaesthetic style was often observed in learners with bi-model learning style (15). Multi-model style was reported in pre-clinic medical students in Barbados (16). Regarding Pakistani medical students, 44 and 36% preferred bi- and multi-model learning styles, respectively (17). Pre-clinic medical students in Malaysia possessed multi-model style although kinaesthetic learning style was dominant (18).

Various studies mentioned different learning style as the dominant style of Iranian medical students, among which some introduced visual (11) or aural style as the dominant one (19-21). Gebru et al. (22) reported read/Write learning style as dominant among international students of Tehran University of Medical Sciences. Considering the conducted studies, the learning style of Iranian and international medical students should be known in order to improve education methods. In this regard, the education methods of Iran can be matched with the learning styles of Iranian and international students. Moreover, a kind of balance can be created among their styles based on recognizing and comparing their learning style and preferences. One of the weaknesses of some research in this field is the lack information about dominant style of Iranian medical students. Thus, the present study aimed to identify and compare the learning style of Iranian and international medical students, which affects the internationalization of university.

METHODS

The present descriptive cross-sectional study was conducted among medical students of Tehran University of Medical Sciences during 2018-2019. Complete enumeration was applied for sampling. The data were collected by using the Persian version of VARK questionnaire (23). The present questionnaire involving 16 four-choice questions sought to measure learning style. Regarding the method of scoring in VARK standard questionnaire, the collected scores of guidance of questionnaire were determined based on the type of filled choice in each question to determine the type of dominant style. Further, choices were designed to select each option specifying a particular style, while more options could be selected if one option failed to represent their opinions. Furthermore, acquiring higher score in each learning style indicated greater individual's tendency to that

style, while multi-model style was considered if individuals achieved equal score in two or more styles. The technical characteristics of the present study were reported in Persian version (21).

Protecting the personal and confidential information of all participants was exactly predicted and they participated voluntarily in the present study. Data were analysed by using SPSS 21. The frequency distribution of questionnaire results was examined. The means for each item were calculated and items with higher use were identified. The standard of P <0.05 was used to determine the statistical significance of results.

RESULTS

The statistical population included 225 students of Tehran University of Medical Sciences in basic science courses with the mean age of 21.5 ± 1.5 years old. Furthermore, 55.2% of students were male and 44.8% were female. In addition, 46.4 and 53.6% were Iranian and international students respectively.

Figure1 displays the distribution of learning style among Iranian medical students, among whom 24, 18, 14, and 12% preferred aural, kinaesthetic, read/Write, and visual learning styles, respectively. Additionally, multi-model style was observed in 32% of participants, among whom 87, 9.67, and 3.33% preferred bi-, tri- and quad-model learning style, respectively. Figure 2 indicates learning styles involving uni-, bi-, and multi-model among Iranian medical students.

Figure 3 displays the distribution of learning styles among international medical students, by indicating that aural, kinaesthetic, read/Write and visual styles were preferred by 15, 23, 14, and 9% of participants, respectively. Furthermore,
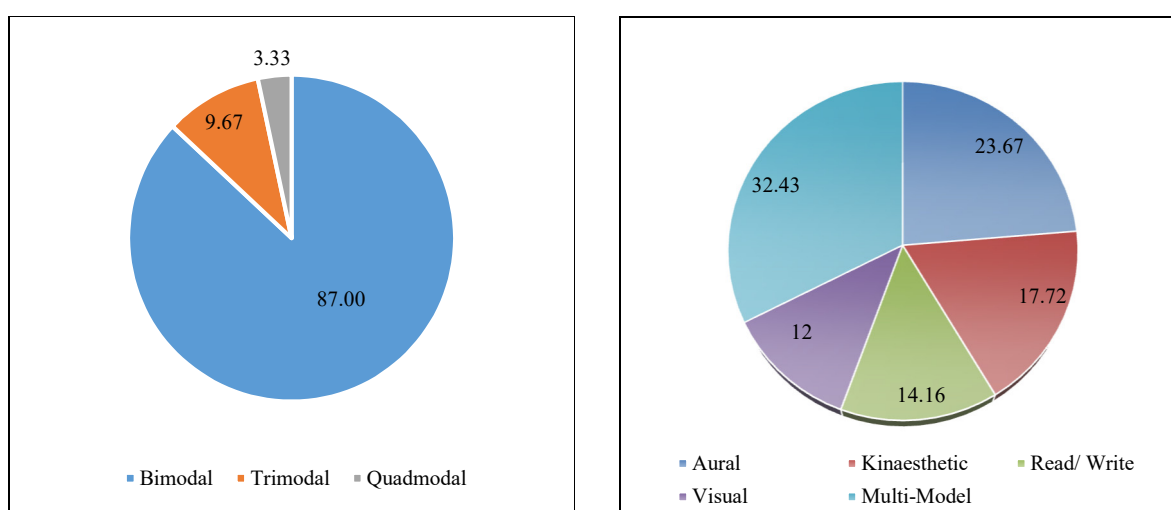

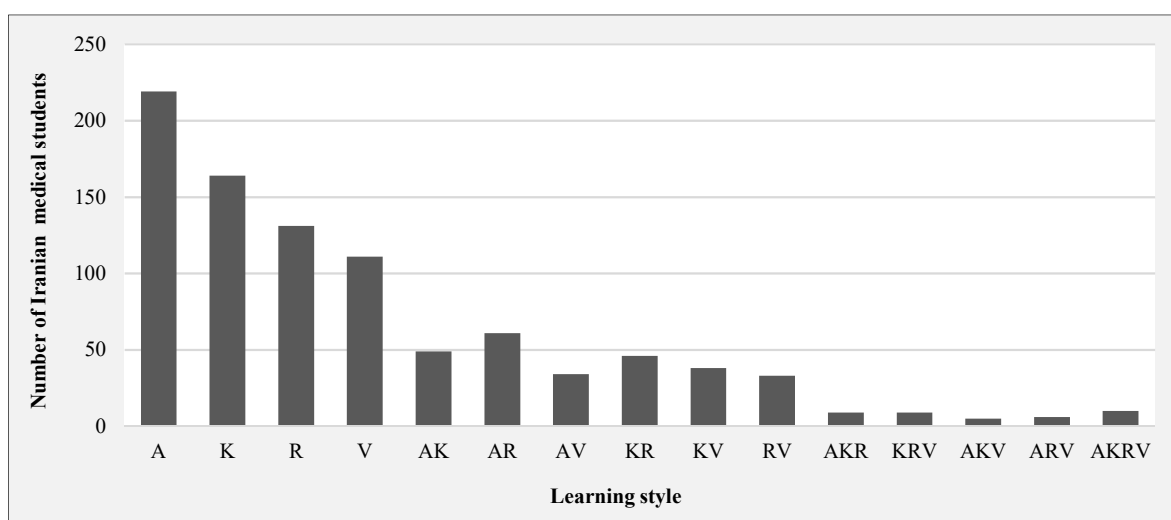**Figure 1. Distribution of learning styles among Iranian medical students**

Figure 2. Learning style of Iranian medical students
(V- visual, A- auditory, R- read-write, K- kinesthetic)

39% of students possessed multi-model learning style, among whom 87.59, 11.69, and 0.73% learned by bi-, tri-, and quad-model styles, respectively. The uni-, bi-, and multi-model learning styles of international medical students are separately represented in Figure 4.

As shown in Table 1, the kinaesthetic ($P<0.05$) and aural ($P<0.05$) learning styles of Iranian and international medical students are significantly different by comparing the mean scores related to two groups. The mean score of the kinaesthetic style related to international students ($M=14.25$) is higher in comparison to that of Iranian students, while mean score of aural style is more in Iranian students ($M=13.75$) compared with international ones. Furthermore, no difference was observed between the two groups regarding other learning styles.

DISCUSSION

The present study aimed to assess the learning preferences of Iranian and international medical students based on VARK model. Tehran University of Medical Sciences as the most top medical sciences university in Iran has considered attracting international students and internationalizing university as its perspective during past years. In this regard, recognizing the learning preferences of students for matching educational strategies is regarded as one of the priorities of educational system.

Based on the results of the present study, a significant difference was observed between Iranian and international students regarding kinaesthetic and aural learning styles. The mean score of the aural style related to Iranian students was
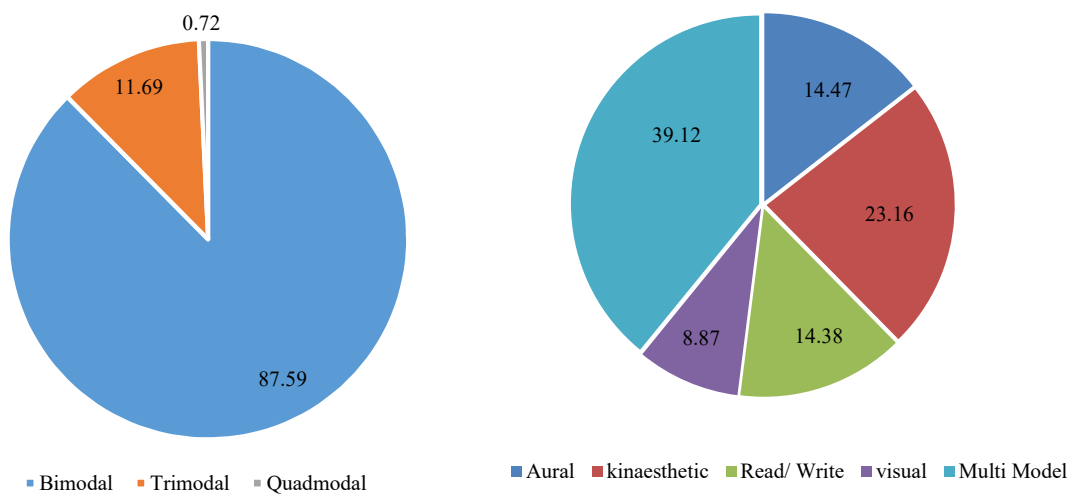

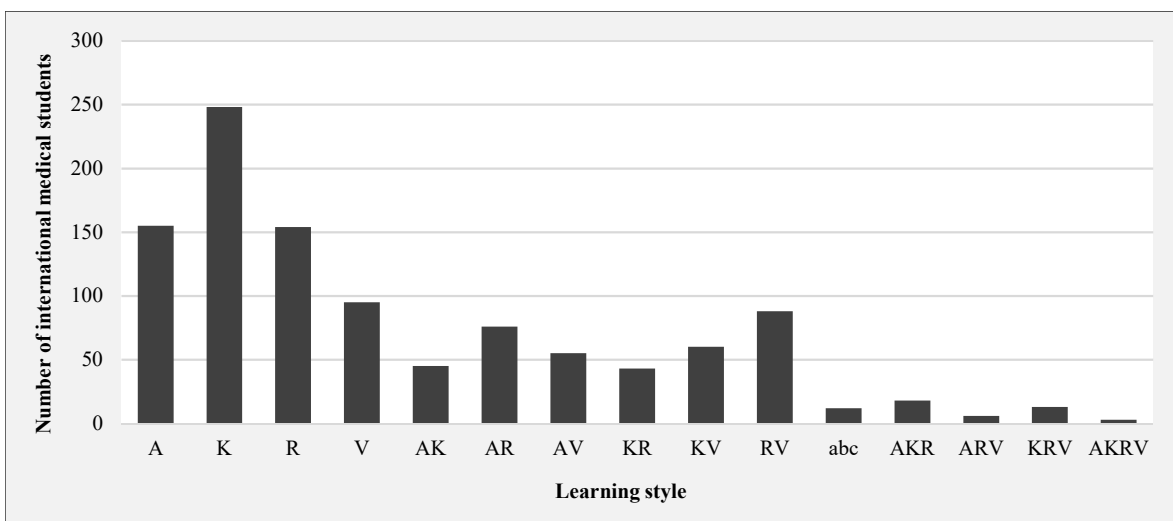Figure 3. Distribution of learning styles among international medical students

Fig. 4. Learning style among international medical students
(V- visual, A- auditory, R- read-write, K- kinesthetic)

VARK	Students	Mean (SD)	t-value	P
Table 1. Mean gender differences on the learning style VARK				
Kinaesthetic	Iranian students	10.25 (5.23)	-1.59	0.012*
	International students	14.25(8.57)		
Aural	Iranian students	13.75(8.29)	1.59	0.012*
	International students	9.68(5.87)		
Read/Write	Iranian students	8.18(5.03)	-0.59	0.559
	International students	9.75(9.24)		
Visual	Iranian students	6.93(4.7)	0.60	0.548
	International students	5.93(4.55)		
indicates that the value is statistically significant at the 0.05 level				

higher compared with that of the international students, while the mean score of kinaesthetic learning style related to international students was more in comparison to that of Iranian students. The results of the present study are consistent with those of Parashar (14) who reported that the students utilized aural devices to learn their basic science courses during the early years of educating, direct their learning preferences toward aural learning style due to the feature of digital generation students (14). Additionally, they selected kinaesthetic preferences and a scientific activity for doing practical skills which are in line with the results of the present study. According to Peymani et al. (24) 58% of Iranian medical students preferred multi-model learning style and their dominant style was aural style. Bokhari and Zafar (25) concluded that medical students used bi-model learning style with preference of aural style. Lio et al. found that the dominant learning style of pre-clinic students in Malaysia was uni-model style with the preference of kinaesthetic style (26). Aural style was reported as dominant learning style for Saudi medical students (25). According to Jamani et al., 80% of students in the Pangam of Pakistan possessed a uni-model style with preference of kinaesthetic style (18). Accordingly, different learning preferences were observed for the students with diverse educational programs in various countries. The existence of different education methods and strategies in the educational systems of various countries is regarded as one of the most important reasons as shown by the results of the present study. Unfortunately, the educational method governing education in Iran is lecture through which students are trained and entered into higher education system. Based on the results of the present and previous studies, Iranian students mostly prefer aural learning style to acquire information because of governing lecture method in medical educational system. However, the international students entered into the medical educational system of Iran possess kinaesthetic style and prefer to acquire information through practical sessions. Thus, this difference should be considered to improve the academic performance of medical students and internationalize medical educational system. Learners with visual and kinaesthetic learning style prefer visual and practical educational methods, respectively. The value of learning increases by harmonizing educational methods and learning styles (27). Accordingly, in order to consider the different learning styles of students with various socio-cultural history for developing the internationalization of educations, current differences should be highlighted as well as modern, active, and diverse medical educational methods should be used.

Based on the results of the present study, uni- and multi-model learning styles were preferred by 61 and 39% of international medical students, respectively, while 68% of Iranian students possessed uni-model and 32% had multi-model learning style. In addition, bi-model style was preferred by 87% of participants and it was regarded more important compared with tri- and quad-model styles. Uni-model learning style was reported as the style preferred by medical students in some studies (28-30). However, multi-model style was preferred by 61-69% of American students (31) and 69% of Korean medical students as reported by Daud et al. (30). Regarding the educational systems of countries, active learning strategies are used more in comparison to lectures. In fact, active learning strategies results in nurturing the learners having different learning styles (28), while conventional methods such as lecturing are used by students with aural style because of learning contents and information mentioned orally without interaction with teacher. The focus of educational system in Iran on lecturing and limitation of some methods such as discussion and practical activity are regarded as one of the main reasons for preferring uni-model learning style among the students under study. Based on the previous studies, multiple learning environments, especially using aural and visual contents, increase learning (32). Considering the development of modern technologies in educational system, modern educational methods should be utilized along with digital media and simulation tools to nurture and empower learners with multi-model learning style. Furthermore, it is suggested that the learning styles of students be assessed by using other relevant tools in further studies.

Some limitations were observed in the present study similar to other studies. Accuracy in generalizing results is regarded as one of the important limitations of the present study. The present study was conducted among a limited number of students in basic science courses. Consequently, selecting

and comparing the information related to the different groups of medical students are recommended for further studies.

Considering the learning preferences and styles of students, it is suggested that the professors of medical sciences be empowered necessarily to be familiar with and apply active educational strategies. Finally, their effectiveness was evaluated to increase learning and motivation among medical students.

Based on the present study, the students of Tehran University of Medical Sciences possessed uni-model learning style. Aural and kinaesthetic styles were preferred by Iranian and international students, respectively. Thus, various educational methods should be used to apply all the senses of students for learning contents in order to get a multi-model learning.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

ACKNOWLEDGEMENT

REFERENCES

1. Knight J. International education hubs: Student, talent, knowledge-innovation models: Springer Science & Business Media; 2013.
2. Söderqvist M. Internationalisation and its management at higher-education institutions. Applying conceptual, content and discourse analysis: Helsinki School of Economics; 2002.
3. Altbach PG, Knight J. The internationalization of higher education: Motivations and realities. Journal of studies in international education. 2007;11(3-4):290-305.
4. Horn AS, Hendel DD, Fry GW. Ranking the international dimension of top research universities in the United States. Journal of Studies in International Education. 2007;11(3-4):330-58.
5. Biddle S. Internationalization: Rhetoric or reality?: American council of learned societies, New York; 2002.
6. Holtbrügge D, Mohr AT. Cultural determinants of learning style preferences. Academy of Management Learning & Education. 2010;9(4):622-37.
7. Joy S, Kolb DA. Are there cultural differences in learning style? Int J Intercult Relat. 2009;33(1):69-85.
8. Rezigalla AA, Ahmed OY. Learning style preferences among medical students in the College of Medicine, University of Bisha, Saudi Arabia (2018). Adv Med Educ Pract. 2019;10:795.
9. Fleming N, Baume D. Learning Styles Again: VARKing up the right tree! Educational developments. 2006;7(4):4.
10. Urval RP, Kamath A, Ullal S, Shenoy AK, Shenoy N, Udupa LA. Assessment of learning styles of undergraduate medical students using the VARK questionnaire and the influence of sex and academic performance. Adv Physiol Educ. 2014;38(3):216-20.
11. Lujan HL, DiCarlo SE. Too much teaching, not enough learning: what is the solution? Adv Physiol Educ. 2006;30(1):17-22.
12. Marcy V. Adult learning styles: How the VARK Learning Styles Inventory can be used to improve student learning. Perspectives on Physician Assistant Education. 2001;12(2):117-20.
13. Mondal H, Mondal S, Das D. Learning style preference for basic medical science: A key to instructional design. Int J Clin Exp Physiol. 2016;3(3):122-6.
14. Parashar R, Hulke S, Pakhare A. Learning styles among first professional northern and central India medical students during digitization. Adv Med Educ Pract. 2019;10:1.
15. Panambur S, Nambiar V, Heming T. Learning style preferences of preclinical medical students in Oman. Oman Med J. 2014;29(6):461.
16. Ojeh N, Sobers-Grannum N, Gaur U, Udupa A, Majumder MAA. Learning style preferences: A study of Pre-clinical Medical Students in Barbados. J Adv Med Educ Prof. 2017;5(4):185.
17. Khan AK, Khan KR, Bashir Z, Hanif A. Learning style preferences among students of medical and dental colleges. Advances in Health Professions Education. 2015;1(1).
18. Jamani NA, AbdAziz KH, Ab Karim HSC, Nizar FA, Dzulkarnain HN, Azimi MI. Learning Style Preferences among Pre-clinical Medical Students in a Public University in Pahang. Age. 2018;21:0.84.
19. Javadinia A, Sharifzade G, Abedini M, Khalesi M, Erfaniyan M. Learning styles of medical students in Birjand University of Medical Sciences according to VARK model. Iranian journal of medical education. 2012;11(6):584-9. Persian.
20. Zamani N, Kaboodi A. Evaluation of the VARK model learning styles selection in medical students. Health Research. 2017;2(2):109-15. Persian.
21. Akhlaghi N, Mirkazemi H, Jafarzade M, Akhlaghi N. Does learning style preferences influence academic performance among dental students in Isfahan, Iran? Journal of educational evaluation for health professions. 2018;15. Persian.
22. Gebru AA, Nasrabadi AN, Nigussie AW, Kahsay WG. Assessment of postgraduate international students' learning preference's at Tehran University of Medical Sciences, Tehran, Iran. Journal of Medical & Allied Sciences. 2016;6(1):14.
23. Mehdipour M, Mortazavi H, Yazdani J, Namdari M, Moradi M. Learning Styles of Dental Students at Shahid Beheshti University of Medical Sciences Using VARK Questionnaire. Iranian Journal of Medical Education. 2018;18:176-82. Persian.
24. Peyman H, Sadeghifar J, Khajavikhan J, Yasemi M, Rasool M, Yaghoubi YM, et al. Using VARK approach for assessing preferred learning styles of first year medical sciences students: a survey from Iran. Journal of clinical and diagnostic research: JCDR. 2014;8(8):GC01. Persian.
25. Bokhari NM, Zafar M. Learning styles and approaches among medical education participants. Journal of Education and Health Promotion. 2019;8(1):181. Persian.
26. Liew S-C, Sidhu J, Barua A. The relationship between learning preferences (styles and approaches) and learning outcomes among pre-clinical undergraduate medical students. BMC Med Educ. 2015;15(1):44.
27. Cuevas J. Is learning styles-based instruction effective? A comprehensive analysis of recent research on learning styles. Theory Res Educ. 2015;13(3):308-33.
28. DiCarlo SE. Too much content, not enough thinking, and too little FUN! Adv Physiol Educ. 2009;33(4):257-64.
29. Almigbal TH. Relationship between the learning style preferences of medical students and academic achievement. Saudi Med J. 2015;36(3):349.

30. Haq SM. Students' learning styles require modified teaching strategies. Journal of Rawalpindi Medical College. 2012;16(2):191-3.

31. Breckler J, Joun D, Ngo H. Learning styles of physiology students interested in the health professions. Adv Physiol Educ. 2009;33(1):30-6.

32. Sankey M, Birch D, Gardiner M, editors. Engaging students through multimodal learning environments: The journey continues. Proceedings ASCILITE 2010: 27th annual conference of the Australasian Society for Computers in Learning in Tertiary Education: curriculum, technology and transformation for an unknown future. University of Queensland; 2010.