Original Article

Access this article online
Quick Response Code:

Website: www.jehp.net
DOI: 10.4103/jehp.jehp_224_20

# A comparison of learning styles of undergraduate health-care professional students at the beginning, middle, and end of the educational course over a 4-year study period (2015–2018)

**Hamid Reza Koohestani, Nayereh Baghcheghi[1]**

*Department of Medical Education, Social Determinants of Health Research Center, Saveh University of Medical Sciences, [1]Department of Nursing, Saveh University of Medical Sciences, Saveh, Iran*

**Address for correspondence:**
Dr. Nayereh Baghcheghi, Department of Nursing, Saveh University of Medical Sciences, Saveh, Iran.
E-mail: baghcheghinayereh@gmail.com

Received: 13-03-2020
Accepted: 28-03-2020
Published: 31-08-2020

**Abstract:**

**BACKGROUND AND AIM:** There is a growing interest in learning styles of undergraduate health-care professional students; however, the evidences about learning styles over time during undergraduate programs are rare. In this study, the learning styles of undergraduate health-care professional students from the beginning to the completion of the program were examined to determine changes in learning style over time.

**METHODOLOGY:** This is a longitudinal descriptive study from 2015 to 2018. A total of 101 health-care professional students were selected by census method. Learning styles were evaluated using the Perceptual Learning-Style Preference Questionnaire three times in the study at the beginning (T1), the middle (T2), and the end of the educational course (T3). The data were analyzed using repeated measures ANOVA.

**RESULTS:** In T1, auditory (mean = 13.99) and visual (mean = 13.54) styles were preferred as major learning styles, whereas at T2, visual style (mean = 13.6) was the only preferred major learning style. At T3, the major learning styles were kinesthetic (mean = 14.32), tactile (mean = 13.98), and visual (mean = 13.58). There were statistically significant differences in auditory, kinesthetic, tactile and group scale scores between the three time points ($P < 0.05$). Group learning style was in the negative type at all three time points.

**CONCLUSIONS:** Learning styles can change depending on the context, environment, teaching method, and the subject of learning material and are probably a flexible changing feature rather than a fixed inherent feature a student possesses.

**Keywords:**

Health occupations, learning styles, longitudinal studies, students

## Introduction

Learning styles have been described as the individualized and preferred ways that students perceive, process, and retain information.[1] Several studies have shown that students adopt different methods in the process of acquiring and processing information. The differences indicate the learning styles adopted by a student.[2] Learning styles directly influence the learning process of a student so that based on their personality, different learners adopt different learning styles.[3] Learning styles are a key factor in determining how students learn so that it significantly affects



**How to cite this article:** Koohestani HR, Baghcheghi N. A comparison of learning styles of undergraduate health-care professional students at the beginning, middle, and end of the educational course over a 4-year study period (2015–2018). J Edu Health Promot 2020;9:208.

learning strategy chosen by the student and notably influences the outcomes of learning.[4]

Knowing about the preferred styles of learning can be used in planning, delivering, resource usage, and evaluation of learning activities.[5,6]

Many believe that learning styles are effective factors in success in higher educations. The authors have reported that the knowledge of learning styles can be useful for the educators and students as well.[7] It is argued that learning about the differences in learning styles gives the teacher a chance to adjust their methods to match better with the preferences of their students.[8-10] In addition, it is important to determine an individual's learning styles. In the case of student, determining learning styles can be highly beneficial and useful.[11] In addition, the learner can enjoy decisions that may improve the outcomes of learning process and increase the student's satisfaction with the education process.[7,9,12]

To make effective plans and deliver teaching–learning activity in an effective manner, the educators need to know what learning styles are used by students.[13,14] In the fields of health-care profession education, instruction considerably depends on a combination of didactic and practical elements, which grab the attention of students through a mixture of sensory inputs. This complicated nature of health-care profession education highlights the gravity of learning about preferences that might be found among health-care professional students and the specifications of these preferences. Learning about these preferences may potentially lead to more efficiency of health-care profession education process. It is possible to improve health' professional development through detecting their preferred learning styles.[9,15]

Literature review showed that different models have been developed to determine learning styles. The most commonly used models are Dunn and Dunn Learning Style,[16] Riechmann and Grasha Learning Style,[17] Gregorc Learning Style,[18] Kolb's Learning Style,[19] McCarthy Learning Style,[20] and Reid's Learning Style.[21] Different learning style models focus on different aspects. For example, Reid's Learning Style Scale can be easily understood and administered so that it uses clear and understandable questions.[21] In light of these advantages, it was used in this study for data gathering.

There is a growing interest in learning styles of undergraduate health-care professional students; however, the evidences about learning styles over time during undergraduate programs are rare. Some experts in education field believe that students' learning style is part of their personality that cannot be changed.[22] Most studies have assessed students' learning style preferences. However, changes in learning styles over a period of time have been less evaluated. To our knowledge, no one has assessed if any change exists in learning style of undergraduate health-care professional students over time. We carried out a longitudinal descriptive study to answer this question: if the learning style of undergraduate health-care professional student changes over time in the educational course.

## Methodology

### Design

The current study is a longitudinal descriptive study from 2015 to 2018. The data gathering tool was administered for baseline at the beginning of the program (T1) followed by two further times: one at the end of the 2nd year (T2) and another at the end of the program (T3) (4-year follow-up).

### Sample and participants

The study population were the undergraduate health-care professional students in Saveh University of Medical Sciences, Iran. The participants were selected through convenience sampling ($n$ = 108) from the students who met the inclusion criteria, i.e., enrolled in BSc program of nursing, midwifery, operating room technology, and anesthesia. The students who missed one of the time points were excluded with a total of 101 (93.51%) students completing all time points.

### Instruments

The participants' perceptual learning style preferences were determined using the Perceptual Learning-Style Preference Questionnaire (PLSPQ). It was designed by Reid in 1987. One part includes questions that uncover the demographic structure of the participant including age, gender, and educational program. The tool includes 30 learning strategy statements that are arranged in a random order with six subcategories each with five statements. The subcategories include auditory learning, visual learning, tactile learning, kinesthetic learning, group learning, and individual learning. Auditory learners tend to remember what they hear and students with this learning style are good at remembering and recalling the information they learn through hearing so that they are better learners using hearing sense. Students with visual learning style preference learn better with shapes, figures, tables, schemes, designs, graphics, and pictures. They are good observers and good with drawing. These students usually use jests, mimics, and nod, and they are also good with recalling what they have seen. Tactile learners memorize things they draw, write, craft, and touch. Eye–hand coordination in these individuals is well-developed, and they are good at recalling what they have felt by their tactual sense. Kinesthetic learners prefer taking action rather than talking; they are good

at remembering what they learn through participation in role-playing studies in classroom. Students with individual learning style preference achieve better learning performance by studying alone. They like to accept individual responsibility, and they believe they are better off working alone. Group learners can work with others perfectly, as they find it hard to concentrate when they are alone. Students with this learning style are more successful when working with others as a team.[21] The questionnaire is designed based on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree), and the reliability is supported (Cronbach's alpha = 0.96). Reid (1987) further classified the styles as major, minor, or negligible (or negative). By definition, a preferred learning style is major, a learning style that learner can still work with is minor, and a negligible learning style refers to those that the learner has difficulty to work with. Reid recommended cutoff points for each category so that the cutoff point of major is 13.5 and above, 11.5–11.49 for minor, and 11.49 or less for negligible. Negahban and Ansari[23] translated PLSPQ into Farsi in 2013, and the same version was used in this work. The content validity of the instrument was determined providing the tool to 10 experts in medical education. The reliability of the tool (Cronbach's alpha = 0.73) and the subscales was also supported. The Cronbach's alpha for the subscales was 0.81 for visual, 0.75 for auditory, 0.77 for kinesthetic, 0.82 for tactile, 0.72 for individual, and 0.89 for group subscale. To examine test–retest reliability, the tool was administered in a 14-day interval with a sample group of 20 health-care professional students. The intraclass correlation coefficient (ICC) for scale with 30 statements was 0.91, which means an acceptable test–retest reliability. The subscale ICC was 0.89 for the visual subscale, 0.87 for auditory subscale, 0.93 for kinesthetic subscale, 0.85 for tactile subscale, 0.94 for individual subscale, and 0.89 for group subscale.

### Ethical considerations

The Ethics Committee of Saveh University of Medical Sciences approved the study (Number: 93.012). The participants took part in the study voluntarily and under the condition of anonymity. The participants were given an ID code to track the subsequent survey data, and the authors were unaware of identity of the participants. The participants were provided with a participant information statement, a consent form, a demographics questionnaire, and PLSPQ. The students expressed their consent to take part in the study orally and in writing.

### Statistical analysis

To illustrate the basic demographics of the participants, descriptive statistics were used. The data were further analyzed using repeated measures ANOVA to find any within-subject differences in PLSPQ scores between time points. All the statistical tests were performed with an alpha level of 0.05 in SPSS 19 software (SPSS Inc., Chicago, IL, USA).

## Results

The participants were 67 females (66.33%) and 34 males (33.67%) at the age range of 18–22 years and mean age of 18.99 years (standard deviation = 0.97) at the beginning of the study. With regard to the field of study, 38 were nursing students, 21 were operating room technology students, 20 were anesthesia students (BSc), and 22 were midwifery students.

There was no statistical difference in terms of field of study and learning style at T1 and T2. However, group learning style was significantly higher in nursing students comparing with other fields at T3 ($P < 0.05$). There was no significant difference according to gender in terms of learning style ($P > 0.05$).

According to cutoff point, the mean scores of auditory (13.99 ± 2.38) and visual (13.54 ± 2.55) learning style preferences were at the major category at T1. That is, the participants preferred auditory-oriented materials as a learning method at the beginning of their program. In addition, the participants' individual (12.78 ± 3.13) and tactile (11.58 ± 2.01) learning style preferences were minor; that is, they could function within these preferences. Eventually, kinesthetic (10.45 ± 2.11) and group learning (11.33 ± 3.1) scores were at negative or negligible category so that the students found it hard or uneasy to participate in activities that needed group work.

At T2, the visual style (13.6 ± 2.32) was at major category and group style (11.01 ± 2.87) was at negligible category and other styles were on the minor category.

At T3, the visual (13.58 ± 2.01), kinesthetic (14.32 ± 1.92) and tactile (13.98 ± 1.85) styles were at major category and group (9.79 ± 2.55) and auditory styles (11.38 ± 2.65) were at negligible category. The change trend of learning styles is shown in Figure 1.

Repeated measures ANOVA test was used along with Bonferroni's *post hoc* test to examine significant differences of learning style preferences among the three time points [Table 1].

## Discussion

As far as the authors know, this is the first study to investigate the learning styles of undergraduate health-care professional students over the course of their undergraduate program. There is no evidence on changeability of learning styles after graduation from university. The findings indicated that learning

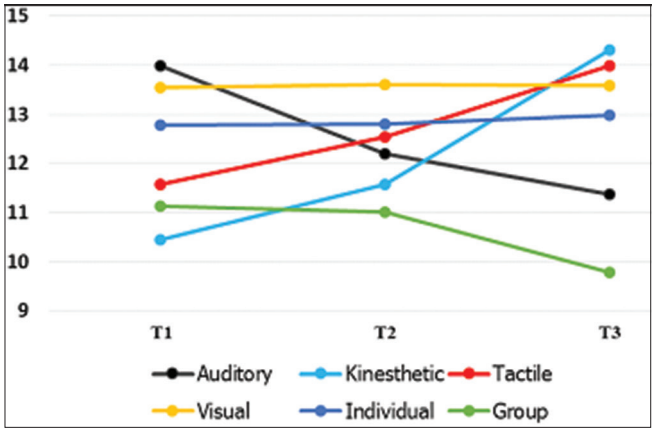


**Figure 1:** The change trend of learning styles

**Table 1: The mean and ANOVA tests and Bonferroni's *post hoc* test for learning styles of the students at the beginning of the education (T1), the middle (T2), and the end of the educational course**

| Style preference | T1 | T2 | T3 | *P* | Bonferroni's *post hoc* test* |
|---|---|---|---|---|---|
| Visual | 13.54 | 13.6 | 13.58 | >0.05 | - |
| Auditory | 13.99 | 12.2 | 11.38 | <0.05 | T1>T2, T1>T3, T2>T3 |
| Kinesthetic | 10.45 | 11.57 | 14.32 | <0.05 | T1<T2, T1<T3, T2<T3 |
| Tactile | 11.58 | 12.54 | 13.98 | <0.05 | T1<T2, T1<T3, T2<T3 |
| Individual | 12.78 | 12.81 | 12.99 | >0.05 | - |
| Group | 11.33 | 11.01 | 9.79 | <0.05 | T1>T3, T2>T3 |

*Mean differences for the Bonferroni's *post hoc* test pairwise comparisons (*P*<0.05)

styles may actually vary depending on the content, environment, teaching method of teacher, and the subject. Therefore, learning styles are flexible changing traits rather than an unchangeable innate trait of the student. The majority of the previous studies on learning styles have used cross-sectional approach and different tools to measure learning styles.

With regard to the relationship between learning styles and gender, no significant difference was observed between the genders. This is consistent with Ahmadi and Allami,[24] Darvishzade *et al*.,[25] and Rasouli *et al*.[26] and inconsistent with Nuzhat *et al*.[27] and Prajapati *et al*.[28]

The majority of the students had auditory learning style at T1, which might be explained by the fact that the main teaching style at school and high school is auditory. Taking into account that the visual learning style was the most common learning style at the beginning of the program, using visual teaching tools at the early stages of the program might improve learning in the students. Rasouli *et al*.[26] showed that visual learning style was the most common and kinesthetic style was the least common learning style in nursing students. It is notable that their study was a cross-sectional study and limited two nursing students at the 2nd year.

At the end of the program, the participants showed a preference toward kinesthetic and tactile styles that included a practical and experiential approach to learning. The students preferred a more engaging approach to learning experience at this stage. The high preference of kinesthetic learning style in the students at the end of the program can be attributed to the acquisition of clinical skills and learning at clinical environment and the student's engagement with practical activities.

This piece of finding is inconsistent with the results obtained in Enrera[29] study. In this study, the learning style preference of most of the clinical laboratory science students was kinesthetic for the 2nd and 3rd years, whereas the 4th-year students prefer group learning. It is notable that the participants in Enrera study were different from the participants in the present study and that it was a cross-sectional study, i.e., the subjects at different levels were examined at the same time – not a longitudinal study.

As the results indicated, kinesthetic and tactile learning style preferences were at the major category at T3. The most significant changes in learning styles were found in kinesthetic learning style, which indicates that the students were more interested in active involvement in learning. The practical elements of the program required dedicating 50% of learning time to clinical environment. The clinical environment is a key part of preregistration education, where the students experience nursing profession. A supporting environment with planned learning opportunities is essential.

Therefore and given the learning styles of students, the teachers and officials need to pay more attention to learning styles and prepare the ground for practice-based learning styles. As far as medical science students are concerned, the practical activities are assumed as an interesting learning approach for them. Assignments may also help learning and comprehending the theoretical part of the course.

What is emphasized in practice-based learning in health-care profession education is the role and gravity of clinical settings and trainers. The result of this method can be proper guidelines for filling the gap between theoretical and clinical trainings, promotion of lifelong learning, self-directedness, self-actualization, and gaining new knowledge based on experiences in different professional positions.[30]

Group learning was the least preferred style, which means the student found in hard to work with partner(s) in a learning activity. This is consistent with Peacock[31] and Riazi and Mansoorian.[32]

Despite the fact that cooperative and group learning has long drawn the attention of educational planners and professors, the results showed that the students were less interested in this learning style at the beginning of their education in university. In addition, preference of group learning declined significantly during the program, which means that the teachers need to adopt supportive and incentivize policies to promote group-based learning along with implementing cooperative learning approaches.[33]

Recent years have witnessed the development of several creative strategies that promote active learning, and some of them encourage students to work collaboratively with peers. Cooperative learning groups prepare the ground for the students to learn social skills.[33,34] Also one study showed that team-based learning as a structured type of cooperative learning had a positive effect on nursing students' perception of the psychosocial climate of the classroom.[35]

The results of this study indicate that the learning styles varied during the educational program depending on educational conditions. Different educational materials and different natures of the contents taught during the program might be some of the probable causes of this change. During the 1st year of undergraduate program, the courses are mostly theoretical, and during the next years, the students are given the chance to analyze the theories and put them into practice in clinical environment along with perceptual learning. Knowledge about learning styles facilitates training students with higher competency.[36] Since the learning styles of students change depending on the situation and different educational periods, it is essential to pay more attention to these changes and adjust teaching methods based on their learning styles.

The knowledge about learning styles and its variation over the course can improve learning performance, optimize environmental factors depending on individual learning styles, and eliminate ineffective measures.[2,9]

In addition, this knowledge improves the learning environment, the way teachers and students interact, and learning teaching methods. Thereby and to achieve higher learning performance, teachers and educational planners need to learn differences in learning styles of students and adjust the teaching techniques based on the needs of students at different stages.[5,6]

In present study, this fact that group learning style was less preferred than other learning styles indicates that the students require more interaction with teachers and other students to practice and comprehend materials in classroom and clinical settings.[35]

The findings of this work are useful information for increasing the quality of the teaching and learning experiences of undergraduate health-care professional students. The most important implication in teaching is that more than one approach are needed to accommodate different learning styles in the classroom. Teachers need to know that there can be different learning styles in the classroom and there is a need to test different procedures and techniques in the classroom and clinical settings.

Small sample group and selecting the participants through census rather than sampling are some of the limitations of this study. Future works with larger sample groups on other fields of study are recommended.

## Conclusions

The result of this longitudinal study showed that learning styles can be changed based on the context, environment, teaching method, and the subject of the course. Therefore, learning styles are flexible traits rather than an unchangeable innate trait of the student. The findings can be used to improve the quality of teaching and learning experiences of undergraduate health-care professional students.

### Acknowledgment

The study is based on a research plan approved by Saveh School of Medical Sciences. The authors wish to express their gratitude to all the officials and participating students for their valuable contributions.

### Financial support and sponsorship

This study was financially supported by Saveh University of Medical Sciences (Ethical code: 93.012).

### Conflicts of interest

There are no conflicts of interest.

## References

1. Caulley L, Wadey V, Freeman R. Learning styles of first-year orthopedic surgical residents at 1 accredited institution. J Surg Educ 2012;69:196-200.
2. Günes MH. Learning styles of the students of biology department and prospective biology teachers in Turkey and Their Relationship with Some Demographic Variables. Univer J Educ Res 2018;6:366-77.
3. Vizeshfar F, Torabizadeh C. The effect of teaching based on dominant learning style on nursing students' academic achievement. Nurse Educ Pract 2018;28:103-8.
4. Huang F, Hoi CKW, Teo T. The Influence of Learning Style on English Learning Achievement Among Undergraduates in Mainland China. J Psycholinguist Res 2018;47:1069-84.
5. Mangold K, Kunze KL, Quinonez MM, Taylor LM, Tenison AJ. Learning style preferences of practicing nurses. J Nurses Prof Dev 2018;34:212-8.
6. Nejat N, Kouhestani H, Rezaei K. Effect of concept mapping on approach to learning among nursing students. Hayat

2011;17:22-31.
7. Romanelli F, Bird E, Ryan M. Learning styles: A review of theory, application, and best practices. Am J Pharm Educ 2009;73:9.
8. Aldosari MA, Aljabaa AH, Al-Sehaibany FS, Albarakati SF. Learning style preferences of dental students at a single institution in Riyadh, Saudi Arabia, evaluated using the VARK questionnaire. Adv Med Educ Pract 2018;9:179-86.
9. Rezaei K, Kouhestani HR, Ganjeh F, Anbari Z. Learning styles of first semester students in Arak University of Medical Sciences, 2008. J Arak Uni Med Sci 2010;12:44-51.
10. Collins CS, Nanda S, Palmer BA, Mohabbat AB, Schleck CD, Mandrekar JN, *et al*. A cross-sectional study of learning styles among continuing medical education participants. Med Teach 2019;41:318-24.
11. Şener S, Çokçalışkan A. An investigation between multiple intelligences and learning styles. J Educ Train Stud 2018;6:125-32.
12. Koohestani HR, Arabshahi SK, Ahmadi F, Baghcheghi N. The experiences of healthcare professional students about the educational impacts of mobile learning. Qualitative Report 2019;24:1593-609.
13. Kirschner PA. Stop propagating the learning styles myth. Comput Educ 2017;106:166-71.
14. Koohestani HR, Arabshahi SK, Ahmadi F. The paradox of acceptance and rejection: The perception of healthcare professional students about mobile learning acceptance in Iran University of Medical Sciences. Q Res Educ 2018;7:144-69.
15. Dickerson P. Core curriculum for Nursing Professional Development. 5th ed. Chicago: Association for Nursing Professional Development; 2017.
16. Dunn RS, Dunn KJ. Teaching Secondary Students through Their Individual Learning Styles: Practical Approaches for Grades 7-12. Boston: Allyn and Bacon; 1993.
17. Riechmann SW, Grasha AF. A rational approach to developing and assessing the construct validity of a student learning style scales instrument. J Psychol 1974;87:213-23.
18. Gregorc AF. Learning-teaching styles-potent forces behind them. Educ Leadership 1979;36:234-7.
19. Kolb D. Experiential Learning as the Science of Learning and Development. Englewood Cliffs, NJ: Prentice Hall; 1984.
20. McCarthy B, White C, McNamara MC. The 4MAT system: Teaching to learning styles with right/left mode techniques. Barrington, IL: Excel, Inc. 1987.
21. Reid JM. The learning style preferences of ESL students. TESOL quarterly. 1987;21:87-111.
22. Saif AA. Educational Psychology: Psychology of Learning and Instruction. 13th ed. Tehran: Doran Publisher; 2018.
23. Negahban T, Ansari A. Does student's preferred studying environment related with their perceptual learning style preference? Community Health J 2013;6:9-16.
24. Ahmadi M, Allami A. Comparison of health workers learning styles based on Vark and Kolbs'questionnaires and their relationship with educational achievement. Res Med Educ 2014;6:19-28.
25. Darvishzade M, Sabzevari S, Garrosi B, Hassanzade A. Reviewing learning styles regarding medical students of kerman university of medical sciences and providing a teaching method appropriate based on their views. Strides Dev Med Educ 2013;10:376-84.
26. Rasouli D, Soheili A, Mohammadpour Y, Zareiee F, Ebrahimi M. Nursing and midwifery students' preferred learning styles in Urmia university of medical sciences. J Nurs Midwifery Urmia Univer Med Sci 2015;13:84-9.
27. Nuzhat A, Salem RO, Al Hamdan N, Ashour N. Gender differences in learning styles and academic performance of medical students in Saudi Arabia. Med Teach 2013;35 Suppl 1:S78-82.
28. Prajapati B, Dunne M, Bartlett H, Cubbidge R. The influence of learning styles, enrolment status and gender on academic performance of optometry undergraduates. Ophthalmic Physiol Optics 2011;31:69-78.
29. Enrera JA. Perceptual learning style preferences of clinical laboratory science students. J Nurs Health Sci 2018;7:34-6.
30. Parandeh A, Hage Amini Z. Practice-based learning and its outcomes in nursing students' education. Educ Ethics Nurs 2013;2:1-8.
31. Peacock M. Match or mismatch? Learning styles and teaching styles in EFL. Int J Applied Linguistics 2001;11:1-20.
32. Riazi A, Mansoorian MA. Learning style preferences among Iranian male and female EFL students. Iran EFL J 2008;2:88-100.
33. Baghcheghi N, Koohestani HR, Rezaei K. A comparison of the cooperative learning and traditional learning methods in theory classes on nursing students' communication skill with patients at clinical settings. Nurse Educ Today 2011;31:877-82.
34. Sohrabi Z, Koohestani HR, Baghcheghi N, Delavari S, Rezaei Shahsavarloo Z. The effects of group blogging on the attitude towards virtual education in nursing students. Med J Islam Repub Iran 2017;31:132.
35. Koohestani HR, Baghcheghi N. The effects of team-based learning techniques on nursing students' perception of the psycho-social climate of the classroom. Med J Islam Repub Iran 2016;30:437.
36. Pazargadi M, Tahmasebi S. Learning styles and their application in nursing. Educ Strateg Med Sci 2010;3:73-6.