Learning styles of medical students from a university in China

Hai-ping Liu
  Inner Mongolia Minzu University

Yue-hui Liu (✉ liuyuehui19800411@163.com)
  Affiliated Hospital of Inner Mongolia Minzu University

Abstract

Background: Investigating students' learning styles can generate useful information that can improve the curriculum design. This study adopts diverse measures to identify the learning styles of the students, though, there is limited literature related to clinical medical students in China. Hence, we utilized Felder's Index of Learning Styles to examine the learning style characteristics of clinical medical students at Inner Mongolia Minzu University.

Methods: This cross-sectional study investigated clinical medicine students for their learning style preference and the difference across genders. This study also analyzed data collected from other published studies. A total of 411 students from medical school at Inner Mongolia Minzu University furnished the Index of Learning Styles Questionnaire. The proposed questionnaire assesses the learning styles of students from four dimensions; namely visual-verbal learning; sequential-global learning; active-reflective leaning; and sensing-intuitive learning.

Results: Analysis result shows that clinical medicine students choose to receive visual information (chose by 73.97% of the sample student) instead of verbal information. These students prioritize sensory information (67.15%) rather than intuitive information, and process reflective information (51.82%) rather than active information. They prefer to process information sequentially (59.85%) instead of globally. Our results also show that male students present a higher preference for an active learning style over a reflective learning style, while females seem to present a higher preference for a reflective learning style over an active learning style. These preferences varied between cohorts (gender), but the difference was not statistically significant. Compared to data collected from other published studies, sensing and visual are the most popular styles of learning adopted by medical science students; however, preferences in other dimensions vary by group.

Conclusions: In general, the study findings conclude that Inner Mongolia Minzu University clinical medicine students prefer visual, sensing, and sequential learning styles. Gender has no significant effect on medical students' learning styles. Compared to data collected from other published studies, research consistently shows that sensing and visual are the most famous learning styles among medical students.

Background

In China and the West, the education and teaching philosophy that embodies the concept of "student-centered" has existed since ancient times. In both ancient and modern times, most successful educational and teaching practices consciously or unconsciously embody the concept of "student-centered". For example, in the Analects of Confucius, there are many expositions, "Learning without thinking wastes efforts", "Gain new insights through reviewing old materials", "There must be my teacher among three people", "Hear a lot, choose the good one and follow it", and "Make no social distinctions in teaching" [1].

To improve students' learning efficiency, effort has been made to innovate teaching methods, switching from classroom-based traditional didactic methods to more activity-based, student-centered strategies, including problem-based learning, team-based learning and active learning. In the last few decades of the twentieth century, researchers hypothesized that optimal instruction is a function of the instructor's teaching method and the student's learning style. Generally by definition, learning style is "an individual's preferred way of gathering, organizing, and thinking about information" [2]. Consequently, examining student learning styles, especially aspects of instructional and information processing preferences, can yield information useful in designing effective learning activities. A number of inventories and assessment instruments have been developed to assess individuals' preferred modes for information acquisition and processing or preferred learning style [3]. In medical education, one of the most widely used models to measure students' learning styles is the Felder-Silverman model [4].

The Index of Learning Styles (ILS) is an easy-to-use tool designed to assess the learning styles of students [4]. The ILS defines four domains, or major aspects, of learning style preferences. Each domain contains two opposing descriptors [5]. The ILS puts forward the self-reported preferences to determine whether the student prioritizes processing information in a reflective or active manner, receives information on a verbal or visual basis, understands the information in a global or sequential fashion, recalls and focuses on sensory information (what is heard and seen) or intuitive information (theories, ideas, and possibilities). We used the ILS to report whether the learning styles of our clinical medicine students differ from those of other medical students and to explore whether the learning style profile of our students varied with selected demographic data. We related our results to previous studies documented in the medical education literature. According to the Field and Silverman learning style model, through teaching practice, we reflected on the impact of teaching design on students' learning efficiency.

Methods

Participants in the current study were gathered from medical school in a university in China, Inner Mongolia. The students came from four cohorts of grades one to four from the School of Clinical Medicine.

In this study, we adopted the classification in Felder and Silverman, which comprised 44 questions, each with 2 alternative options referring to four dimensions [6]. Students were asked to select the option that they felt most accurately or most frequently described their personal style.

SPSS software (version 17.0) is used to process the statistical analysis. Descriptive statistics are also calculated in this study. Besides, Chi-square confirms the significance of referential analysis at a significance level of 5%.

Results

Demographic characteristics

411 clinical medical students completed the survey. The demographic features of the students participating in the survey are presented in Table 1.

Table 1
Demographic Characteristics of
Surveyed Students (N = 411)

Characteristic	No. (%)
Age (in years)	
Mean ± SD	21 ± 1.5
Gender	
Male	161 (39.17)
Female	250 (60.83)
Class	
Freshman	148 (36.01)
Sophomore	83 (20.19)
Junior	77 (18.73)
Senior	103 (25.06)

Student learning style distribution

The clinical medicine students tended to prefer visual, sensing, and sequential learning styles across all cohorts (Table 2 and Fig. 1). On the visual/verbal dimension, students showed a significant preference for the visual learning style ($p < 0.01$). Among the 411 students who completed the ILS instrument, 304 (73.97%) preferred visual learning, while only 107 (26.03%) preferred verbal learning. On the intuitive/sensing dimension, students showed a significant preference for the sensing learning style, with 276 (67.15%) students prefer sensing learning and 135 (32.85%) students preferring intuitive learning. Students also showed a significant preference for sequential learning on the sequential/global dimension. There were 246 (59.85%) students who preferred the sequential learning style, while only 165 (40.15%) students reported a preference for the global learning style, Strength of students' learning preference for each learning style was also measured with the 1−11 scale (discussed earlier). From Fig. 1, which shows the preferences of all students, one can see that students are more sequential, sensing, and visual, while they are more balanced for the active/reflective dimension. Across all cohorts, the strongest trend was a preference for the visual, rather than the verbal, learning style, with 73.97% of the total clinical medicine student sample preferring visual information.

Table 2
Overall Learning Style Results (N = 411)

Dimension N (%)	Number of Students
Active versus Reflective	
Active	198 (48.18)
Reflective	213 (51.82)
p value	>0.05
Sensing versus Intuitive	
Sensing	276 (67.15)
Intuitive	135 (32.85)
p value	<0.01
Visual versus Verbal	
Visual	304 (73.97)
Verbal	107 (26.03)
p value	<0.01
Sequential versus Global	
Sequential	246 (59.85)
Global	165 (40.15)
p value	<0.01

Learning style preference by various student groups

Statistical analysis was performed to confirm whether learning style differs across different groups of students by comparing learning styles between genders. Male and female students did not differ significantly in terms of their preferences across all four domains (Table 3).

Table 3
Learning Style Preferences by Gender

Dimension N (%)	Males	Females
Active versus Reflective		
Active	69 (42.9)	129 (51.6)
Reflective	92 (57.1)	121 (48.4)
p value	>0.05	
Sensing versus Intuitive		
Sensing	103 (64)	173 (69.2)
Intuitive	58 (36)	77 (30.8)
p value	>0.05	
Visual versus Verbal		
Visual	111 (68.9)	193 (77.2)
Verbal	50 (31.1)	57 (22.8)
p value	>0.05	
Sequential versus Global		
Sequential	88 (54.7)	158 (63.2)
Global	73 (45.3)	92 (36.8)
p value	>0.05	

Learning style preference by grade. There were some variations between the learning styles of cohorts, including a significant (p, 0.01, 0.05) difference between the percentage of the freshman and the sophomore/junior/senior student samples preferring the sensor/visual/sequential learning style (Fig. 2). These data indicate that it is likely that a variety of learning styles are present in a given group of clinical medical students and that some variations in learning style preferences can exist within groups of students of the same major at the same university.

Compared to data collected from other published studies (Fig. 3): The percentage of Inner Mongolia Minzu University clinical medicine students preferring the active learning style was significantly (p < 0.01) lower than the rates for a dental student sample from Taibah University [7].

The percentage of Inner Mongolia Minzu University clinical medicine students preferring the sensory learning style was significantly ($p < 0.01$) lower than published rates for a medical student sample from Korea University [8].

The visual learning style preferences of all participating Inner Mongolia Minzu University clinical medicine students were similar to those of students from Korea University, Utrecht University [9], Nazarbayev University [10], and Taibah University. However, the preferences were significantly ($p < 0.01$) lower than those of a medical student sample from King Edward Medical University [11].

Finally, a significantly (p, 0.05) higher percentage of the Inner Mongolia Minzu University clinical medicine student sample preferred the sequential learning style than that of students from Nazarbayev University and Taibah University dental students. The above results show that students' aggregate learning styles vary across universities (e.g., variations in the sensor/sequential domain of Fig. 3).

Discussion

The current study is the first to analyze learning style preferences and the preference's gender differences, and associate learning style preferences in data collected from other publications with clinical medicine students at Inner Mongolia Minzu University.

Overall, our results suggest that students prefer perceptual, sequential, and visual styles of learning. This indicates that the sampled students from the medical field prefer to learn through demonstrations, photos, and practice, oriented by facts, diagrams, and procedures in a sequential and linear fashion, as demonstrated elsewhere [8, 9, 11]. However, the analysis found no statistically significant differences between preferences for continuous active-reflective learning.

Research studying gender differences in medical students' learning styles has presented conflicting outcomes. On one hand, some research demonstrates empirical evidence showing gender's significant effect on medical students' learning styles. For instance, Daniel Hernández-Torrano found that male medical students preferred visual learning to verbal learning more than female medical students. Women also seem to be more inclined than men to a sequential learning approach rather than global learning [10]. Hosford & Sides [12] reports that a substantially higher number of female medical students prefer the perceptual learning mode, as compared to the male students, while the visual mode is preferred by a large proportion of male medical students. Furthermore, it is already supported by research results that women prefer to learn in an active style, such as by practice, doing, or trying, rather than in a reflective style, such as thinking about problems [11]. Contrarily, certain studies challenge the role of gender in the learning style preferences of the students. These studies demonstrated no observable evidence between female and male medical students in the learning style or learning preference using the ILS instrument [13]. In the current study, the proportion of female students was higher than that of male students who preferred active and perceptual learning styles, but the difference was not statistically significant.

In general, studies consistently show that medical students most commonly adopt visual and sensing as learning styles [7–13]. Our results show that medical students prefer perceptual and visual learning styles, again supporting the findings of previous studies. Certain studies suggest that medical students majorly prefer using the reflective method in their learning [12, 14]. Furthermore, while other studies have shown that medical students have positive learning style preferences [8, 11], others have found an insignificant preference for reflective or active processing of information [12]. Our results showed that students displayed more balance on the active/reflective dimension and that these students were more sequential. This is consistent with the learning style of King Edward Medical University medical students.

Knowing the learning style preferences of an individual student would be beneficial because, with this knowledge, the student would be better at understanding himself and better at applying this knowledge to their own strengths in order to maximize the effectiveness of learning practices. A longitudinal study on chemical engineering courses showed that, compared with control classes, courses designed specifically to accommodate a variety of student learning styles increased students' confidence in academic readiness [15] and their overall academic performance [16]]—even in subsequent courses taught by other faculty using "traditional" methods [15]—increased student retention [9] and increased graduation rates. Therefore, teachers should approach teaching methods that are consistent with this type of student. Ross [17] claims that if teachers' teaching methods and learning materials match the learning methods that students prefer, learning activities become easier, which can improve learning efficiency and shorten learning time. In the teaching of "Chemical Methodology", Liu et al. [18] used the Felder & Silverman learning style model to study the learning styles of chemistry students, divide students into different learning groups according to the differences in students' learning styles, and design diverse learning materials and teaching activities. Through teaching practice, this diversified learning method can improve students' adaptability and expand students' learning methods.

Nevertheless, the current study verifies the existence of a spectrum of learning styles among clinical medical students and extends an incentive for teachers to understand how their teaching styles can incorporate multiple styles of learning.

Conclusions

Overall, our findings suggest that clinical medicine students at Inner Mongolia University for Nationalities prefer perceptual, visual, and sequential learning styles. We found no evidence of differences in learning styles between female and male medical students through ILS equipment. This study is helpful for medical students to incorporate new techniques of sensing learning in order to improve their performance. Similarly, the instructors can also benefit from this study by embracing the new and, adapting the existing approaches of teaching. Lastly, the validation of proposed observations through future studies will add incremental value to the relevant literature.

Abbreviations

ILS
Index of Learning Styles

Declarations

Ethics approval and consent to participate

The study was approved by the Ethics Committee of The Affiliated Hospital of Inner Mongolia Minzu University and that all methods were carried out in accordance with relevant guidelines and regulations. This study was carried out in compliance with the Declaration of Helsinki guidelines. The written informed consent was obtained from all subjects and/or their legal guardian(s).

Consent for publication

Not applicable.

Availability of data and materials

The data generated and analysed in this study are included in this published article. The raw dataset analysed is available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

Authors' contributions

Haiping Liu and Yuehui Liu contributed to the design of the research. Haiping Liu carried out the data acquisition. Yuehui Liu analysed and interpreted the data. Haiping Liu and Yuehui Liu prepared the article. All authors read and approved the final manuscript.

Acknowledgements

Authors' information

[1] College of Life Science and Food Engineering, Inner Mongolia Minzu University, Tongliao, Inner Mongolia 028043, China

[2] Affiliated Hospital of Inner Mongolia Minzu University, Tongliao, Inner Mongolia 028007, China

* Correspondence: liuyuehui19800411@163.com

References

1. Liu XJ. On the student-centered idea. J High Educ. 2012;33:1–6.

2. Fleming ND. Teaching and learning styles: VARK strategies. Christchurch, New Zealand: IGI Global; 2001.

3. Sims RR, Sims SJ. The importance of learning styles: understanding the implications for learning, course design, and education. Westport CT: Greenwood; 1995.

4. Felder RM, Silverman LK. Learning and teaching styles in engineering education. Eng Educ. 1988;78:674–81.

5. Felder RM, Stice JE, Brent R. National effective teaching institute coursepack. In: Annual conference of the american society for engineering education. Seattle, WA: ASEE; 1998. p. A5–9.

6. Felder RM. Reaching the second tier: learning and teaching styles in college science education. J Coll Sci Teach. 1993;23:286–90.

7. Omar E. Perceptions of teaching methods for preclinical oral surgery: a comparison with learning styles. Open Dent J. 2017;11:109–19.

8. Ahn S, Kim M, Ahn D. Relationships between cognitive and learning styles of premedical students. Korean J Med Educ. 2010;22:7–13.

9. Groenwold RH, Knol MJ. Learning styles and preferences for live and distance education: an example of a specialisation course in epidemiology. BMC Med Educ. 2013;13:93.

10. Hernández-Torrano D, Ali S, Chan CK. First year medical students' learning style preferences and their correlation with performance in different subjects within the medical course. BMC Med Educ. 2017;17:131.

11. Tariq S, Khan MA, Afzal S, Shahzad SR, Hamza M, Khan HA, et al. Association between academic learning strategies and annual examination results among medical students of King Edward Medical University. Ann King Edw Med Univ. 2016;22:124–34.

12. Hosford CC, Siders WA. Felder-soloman's index of learning styles: internal consistency, temporal stability, and factor structure. Teach Learn Med. 2010;22:298–303.

13. Alghasham AA. Effect of students' learning styles on classroom performance in problem-based learning. Med Teach. 2012;34 Suppl 1:S14-9.

14. Kim M, Kim S, Lee J, Ahn D, Lee Y. Characteristics of medical students' learning styles and their relationships to GPA. Korean J Med Educ. 2006;18:133–40.

15. Felder RM, Felder GN, Dietz EJ. A longitudinal study of engineering student performance and retention. V. Comparisons with traditionally-taught students. J Eng Educ. 1998;87:469–80.

16. Felder RM. A longitudinal study of engineering student performance and retention. IV. Instructional methods. J Eng Educ. 1995;84:361–7.

17. Rose C. Accelerated learning. New York: Bantam Dell Publishing Group; 1998.

18. Liu C, Xue CH, Zhuang QY, et al. Teaching practice of "chemistry methodology" based on different learning styles. Chinese Journal of Chemical Education. 2016;37:38–41.
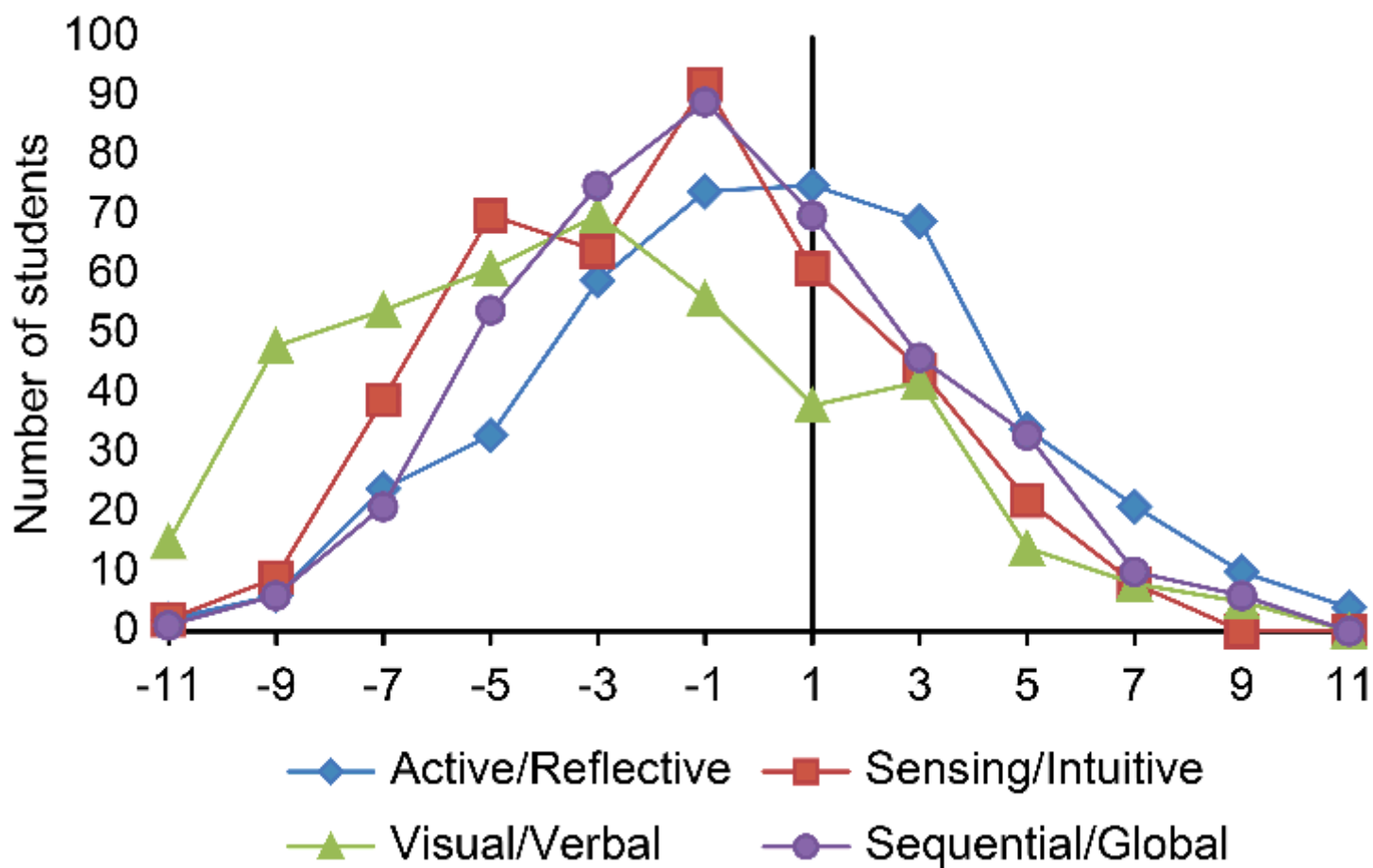
Figures

Figure 1

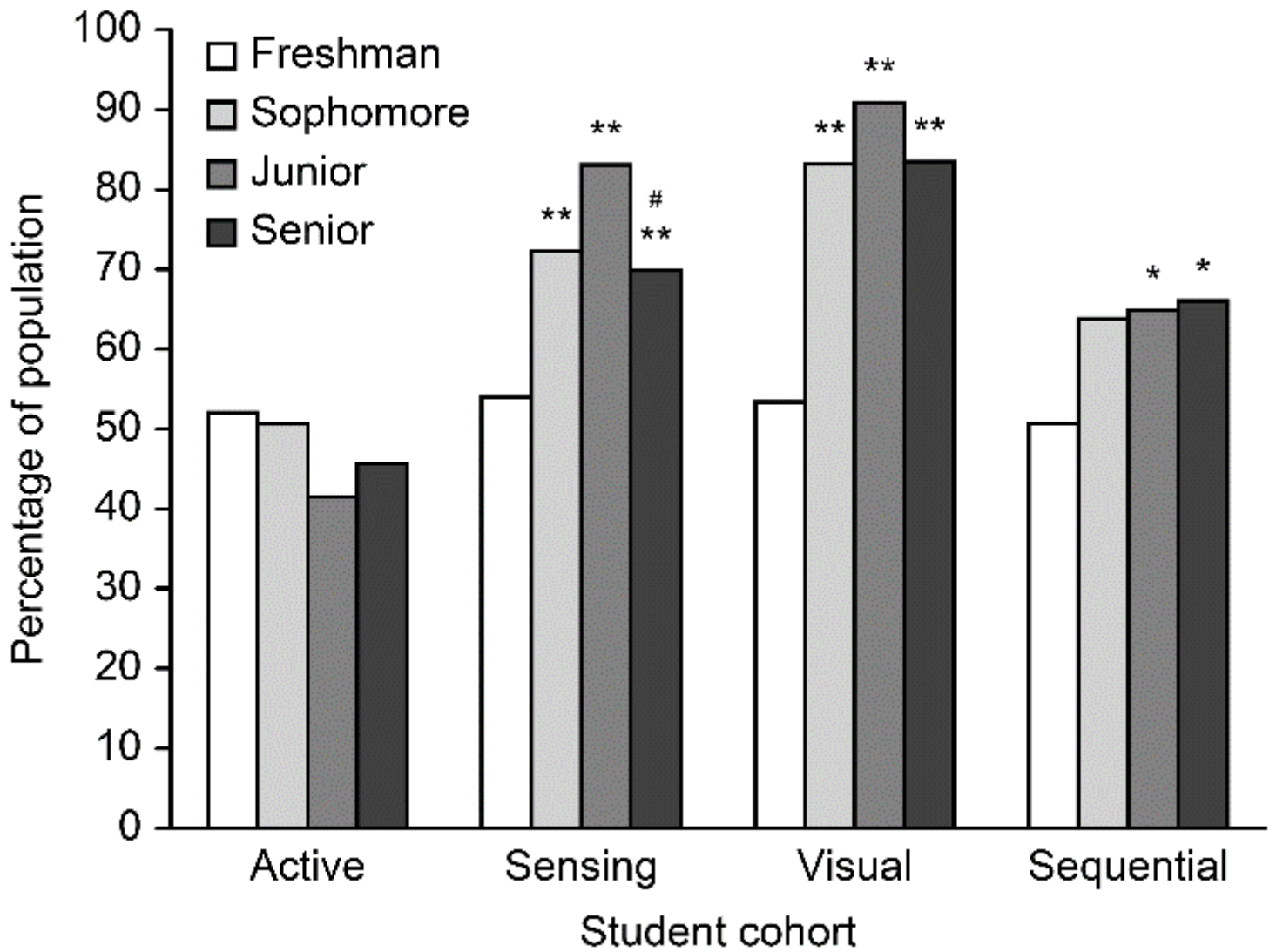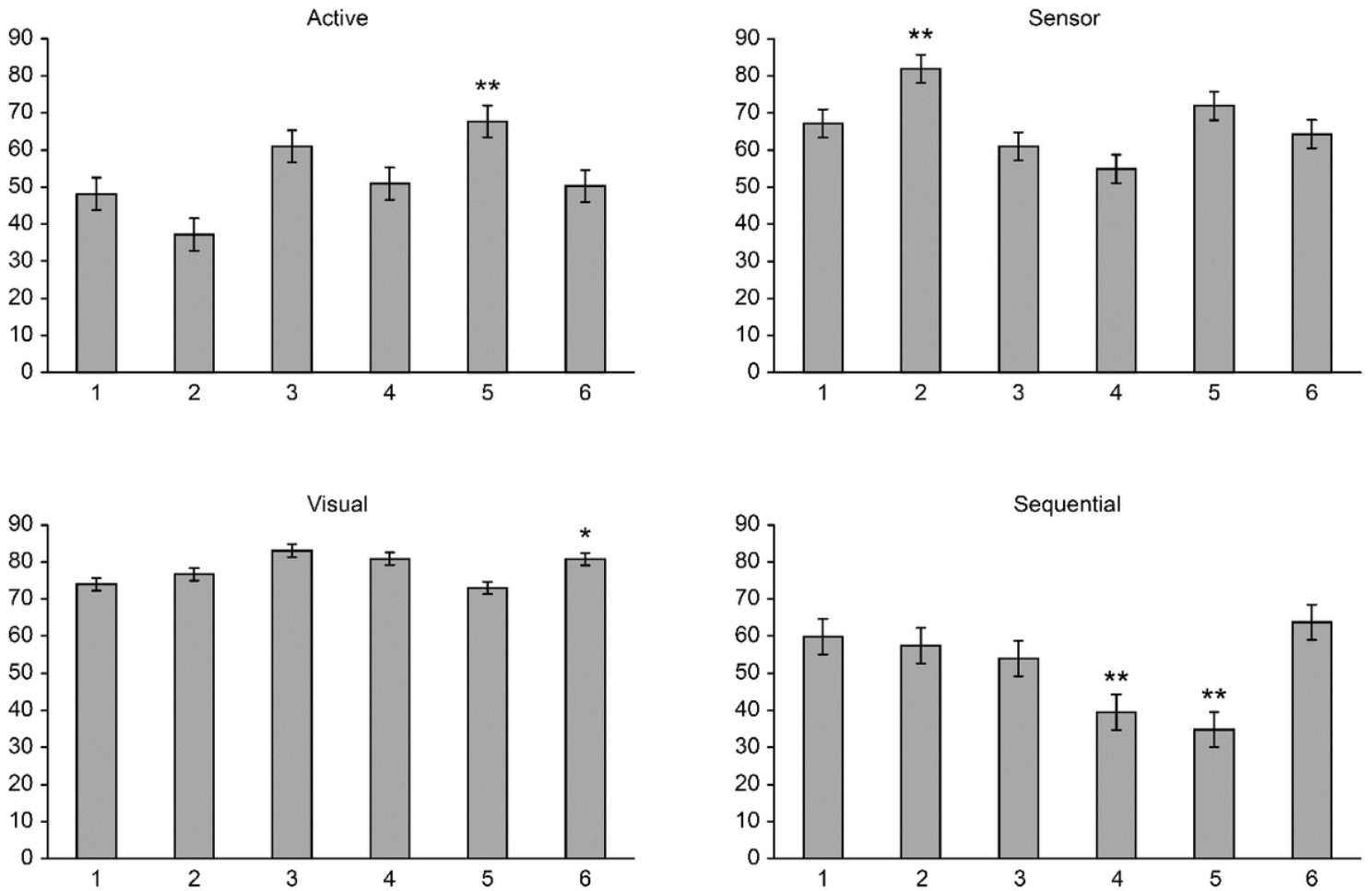Distribution of all four dimensions of the students' learning styles

Figure 2

Learning style preference by grade

Comparison between junior and senior, # $p < 0.05$

Comparison between freshman and sophomore, junior, senior, ** $p < 0.01$ * $p < 0.05$

Figure 3

Preferred learning styles of Inner Mongolia Minzu University students compared to those of other medical students. 1 Inner Mongolia Minzu University; 2 Korea University; 3 Utrecht University; 4 Nazarbayev University; 5 Taibah University; 6 King Edward Medical University. ** $p < 0.01$, * $p < 0.05$.