



Assessment of Learning Style Preferences of Saudi Nursing Students

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Abstract

Objective In line with global trends, growing number of educational institutions in Saudi Arabia are developing their curricula based on the feedback and suggestions from their students to help improve the quality of teaching. This study aims to assess the differences in learning style preferences among female nursing students of Saudi Arabia.

Methods This cross-sectional study included 124 female nursing students who were asked to answer the culturally adapted Arabic version of visual, aural/auditory, read/write, and kinesthetic (VARK) survey. Data were analyzed with SPSS, version 23. The Wilks' lambda or multivariate analysis (MANOVA) was used to determine the relationship between the participants' learning preferences, sociodemographic characteristics, and year of study.

Results Nursing students who had visual learning preferences had a significantly different learning style as compared to those who preferred aural and kinesthetic learning ($p < 0.001$). On the contrary, there was not enough evidence to conclude that the same was true for students who preferred to read/write.

Conclusions Further research is required to explore the relationship between learning style preferences and learning outcomes with the inclusion of a larger sample size and representatives of two genders, males and females. The findings of the current research provide the foundation for adaptive learning by identifying the individual preferences in learning among the nursing students.

Keywords

- ▶ learning preferences
- ▶ visual
- ▶ aural/auditory
- ▶ read/write
- ▶ kinesthetic
- ▶ VARK survey
- ▶ nursing students
- ▶ Saudi Arabia

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Introduction

Research in the field of teaching and learning has suggested that assessing students' learning preferences is important since students have various learning method preferences based on which educators can link their teaching methods with the students' learning techniques.^{1,2} Psychologist David Kolb (1984) who was one of the firsts to propose the theory of learning styles believed that individual learning styles arise from genetics, life experiences, and the demands of the current environment.³

According to Shirazi and Heidari, teaching methods and assessments are highly dependent on students' level of intelligence or understanding, their subject of interest, the educator-student relationship, the quality of education and educators, and socioeconomic status.⁴ Furthermore, studies of the different learning styles have shown that most students prefer a combination of two or even three different learning styles rather than sticking to one method.^{1,2,5} Thus, nurses are particularly encouraged to practice a variety of learning styles due to the nature of the profession. As a result, they develop and implement creative, workable, and effective solutions in social situations and communication, especially with patients who have complex and complicated health conditions, and instill strong problem-solving skills.^{1,2}

Most studies have emphasized the importance of collaborative communication between students and educators for an effective curriculum structure.⁶ In line with global trends, more and more educational institutions in Saudi Arabia are developing their curricula based on the feedback and suggestions from their students to help improve the quality of teaching. However, there is no fixed pattern in the preference for learning styles among Saudi nursing students. Thus, a study by Alharbi et al among students at King Saud University showed that the majority of students (67.9%) preferred the visual learning style, 51% preferred the active learning style, while 37.5% preferred sequential learning as one of the most effective learning styles in nursing education. The least common style preferred by nursing students was verbal learning.¹ In addition, Stirling and Alquraini reported that Saudi nursing students had less preference for reading and writing.⁷ Furthermore, Aljohani and Fadila revealed that participants prefer to learn using the unimodal VARK (i.e., visual, aural/auditory, read/write, and kinesthetic) modalities, with the dominance (25%) of the kinesthetic learning style.⁸ The VARK model establishes a number of principles before addressing learning styles. These principles state that a student's preferred learning patterns significantly impact student learning and behavior. Moreover, the particular preferred learning style of students must be supported by appropriate learning strategies.^{8,9}

Accumulating evidence in the current literature demonstrates contradicting data. Some students report visual and verbal learning as the predominantly preferred styles, while reading and writing were less important for Saudi nursing students. In contrast, other researchers found that nursing

students' preferred learning styles were kinesthetic, aural-visual kinesthetic, and social.⁸⁻¹⁰ This can pose many challenges for educators in developing effective teaching methods. It is important to understand the learning styles of different students to develop a curriculum and clinical teaching strategies, thereby meeting student learning needs.^{11,12}

This study aims to test the null hypotheses that there are no significant differences in the preferred learning styles measured in terms of modality scores among female nursing students at different year levels in the Eastern Province, Saudi Arabia. The current research results are expected to be used to develop appropriate teaching methodologies to enhance their academic performance.

Methods

Sample

This is a cross-sectional study among female nursing students in the Eastern Province of Saudi Arabia. A total of 128 Bachelor of Science Nursing Bridging (BSNB) students and second to fourth year Bachelor of Science Nursing (BSN) students were recruited, of which 124 agreed to participate.

Instrumentation & Procedures

The culturally adapted Arabic version of the VARK questionnaire was administered. The VARK questionnaire was developed by Fleming in 1987 to measure learning style preferences. It recognizes that students tend to have different styles to feel comfortable in understanding and processing the information received. Students can select multiple answers per question that match their perceptions. Answers were then grouped into unimodal or multimodal (bimodal, trimodal, or quad modal) groups.

Analysis

Collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 23 (SPSS Inc., Chicago, IL, United States). In addition, Wilks' lambda or multivariate analysis (MANCOVA) was used to determine the relationship between participants' learning preferences, sociodemographic characteristics, and year of study (p -value of 0.05 was considered significant).

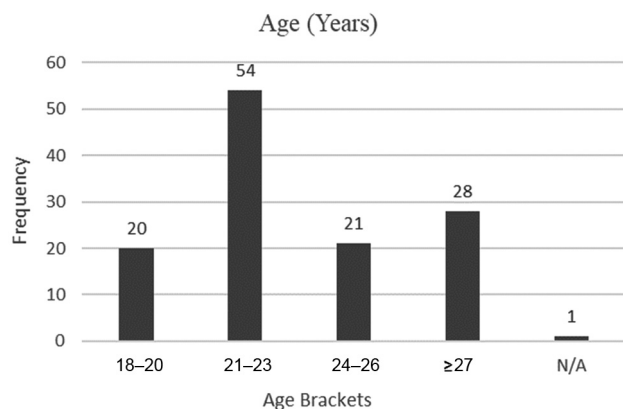
Results

Out of the 128 recruited female nursing students, 124 students participated in the study for a response rate of 96.88%. The majority of the participants (54) were students aged 21 to 23 years (43.55%), while 20 (16.13%) respondents were in the age group of 18 to 20 years (► **Table 1**). The majority of participants (104/124; 83.87%) were single. The level of education of the students showed that most of the participants (31; 25%) were Bachelor of Science in Nursing 4 (BSN4) students; among bridging students, the prevalent groups were BSBN4 and BSBN6, with 26 (20.97%) students each in the two groups (► **Fig. 1**).

Table 1 Multivariate tests among study sample ($n = 124$)

Wilks' lambda effect	Value	F	Hypothesis df	Error df	Significance
BSNB2	0.702	1.983	3.000	14.000	0.163
BSNB4	0.342	15.391	3.000	24.000	0.001
BSN4	0.223	32.513	3.000	28.000	0.001
BSN6	0.383	11.839	3.000	22.000	0.001
BSN8	0.596	4.735	3.000	21.000	0.011

Abbreviation: BSNB, Bachelor of Science Nursing Bridging; df, degrees of freedom of the F statistics.

**Fig. 1** Sociodemographic characteristics of the sample (age in years, $n = 124$).

► **Table 1** shows the results of the multivariate test for different levels of BSN and BSNB students. Since the p -values of BSNB2, BSNB4, BSN4, and BSN6 were less than 0.05, the corresponding null hypotheses were rejected in favor of the corresponding alternative hypotheses about different levels of BSN and BSNB at a 95% significance level.

► **Table 2** shows the summary of the multivariate test of all levels of BSN and BSNB students. The Wilks' lambda's p -value was 0.001. Therefore, the null hypothesis of no significant difference was rejected at a 95% significance level. Thus, there was sufficient evidence to prove a significant difference between nursing modality scores at all levels.

► **Tables 3 to 6** show the mean differences between the VARK scores for bridging level 4, BSN4, BSN6, and BSN8, and whether the differences are statistically significant at a 0.05 confidence level. Results have shown that visual modality is

Table 2 Summary of all levels of multivariate tests

Effect	Value	F	Hypothesis df	Error df	Significance
Wilks' lambda	0.442	50.884	3.000	121.000	0.001

Table 3 Pairwise comparison, VARK scores for Bachelor of Science in Nursing bridging level 4

(I) VARK		Mean difference (I-J)	Standard error	Significance	95% confidence interval for difference	
					Lower bound	Upper bound
V	A	-2.333	0.724	0.020	-4.401	-0.266
	R	-0.444	0.463	1.000	-1.767	0.878
	K	-3.185	0.518	0.000	-4.663	-1.707
A	V	2.333	0.724	0.020	0.266	4.401
	R	1.889	0.690	0.066	-0.083	3.861
	K	-0.852	0.784	1.000	-3.090	1.387
R	V	0.444	0.463	1.000	-0.878	1.767
	A	-1.889	0.690	0.066	-3.861	0.083
	K	-2.741	0.505	0.001	-4.183	-1.298
K	V	3.185	0.518	0.001	1.707	4.663
	A	0.852	0.784	1.000	-1.387	3.090
	R	2.741	0.505	0.001	1.298	4.183

Abbreviation: VARK, visual, aural/auditory, read/write, and kinesthetic; I-J, mean difference.

Table 4 Pairwise comparison of VARK scores for Bachelor of Science in Nursing level 4

(I) VARK		Mean difference (I-J)	Standard error	Significance	95% confidence interval for difference	
					Lower bound	Upper bound
V	A	-2.871	0.522	0.001	-4.346	-1.396
	R	0.065	0.362	1.000	-0.958	1.087
	K	-4.226	0.475	0.001	-5.566	-2.885
A	V	2.871	0.522	0.001	1.396	4.346
	R	2.935	0.554	0.001	1.369	4.502
	K	-1.355	0.652	0.278	-3.196	0.486
R	V	-0.065	0.362	1.000	-1.087	0.958
	A	-2.935	0.554	0.001	-4.502	-1.369
	K	-4.290	0.549	0.001	-5.841	-2.739
K	V	4.226	0.475	0.001	2.885	5.566
	A	1.355	0.652	0.278	-0.486	3.196
	R	4.290	0.549	0.001	2.739	5.841

Abbreviation: VARK, visual, aural/auditory, read/write, and kinesthetic.

Table 5 Pairwise comparison of VARK scores for Bachelor of Science in Nursing level 6

(I) VARK		Mean difference (I-J)	Standard error	Significance	95% confidence interval for difference	
					Lower bound	Upper bound
V	A	-2.680	0.854	0.027	-5.135	-0.225
	R	-0.760	0.590	1.000	-2.455	0.935
	K	-4.720	0.793	0.001	-6.999	-2.441
A	V	2.680	0.854	0.027	0.225	5.135
	R	1.920	0.785	0.133	-0.337	4.177
	K	-2.040	0.906	0.203	-4.646	0.566
R	V	0.760	0.590	1.000	-0.935	2.455
	A	-1.920	0.785	0.133	-4.177	0.337
	K	-3.960	0.776	0.001	-6.190	-1.730
K	V	4.720	0.793	0.001	2.441	6.999
	A	2.040	0.906	0.203	-0.566	4.646
	R	3.960	0.776	0.001	1.730	6.190

Abbreviation: VARK, visual, aural/auditory, read/write, and kinesthetic.

statistically significant to both aural and kinesthetic sensory modality with p -values ranging from 0.001 to 0.027, excluding **Table 7**, where the visual modality shows no statistical significance with the other three modalities.

Tables 3 and **5** show that aural modality is statistically significant compared to a visual-only modality with p -values ranging from 0.020 to 0.027. **Table 5** exhibits significance to visual and read/write modalities with a p -value of 0.001. On the other hand, **Table 7** shows that the modality has no statistical significance with the other three modalities.

The read/write modality (**Table 3, 5, and 6**) revealed that it is statistically significant compared to the kinesthetic sensory modality with p -values of 0.001 to 0.015. In

addition, **Table 4** shows that the read/write learning mode is statistically significant for both aural and kinesthetic sensory modalities with the same p -value of 0.000. At the same time, kinesthetic sensory modality is reported in **Tables 3–5** to be statistically significant to visual and read/write modalities with a p -value of 0.000. However, as shown in **Table 6**, the kinesthetic sensory mode of learning is significant to only the read/write modality having a p -value of 0.015.

Finally, **Table 7** shows the mean difference between the VARK scores for all levels to determine whether the differences are statistically significant at the 0.05 confidence level. Visual and read/write modality is statistically significant to

Table 6 Pairwise comparison of VARK scores for Bachelor of Science in Nursing level 8

(I) VARK		Mean difference (I-J)	Standard error	Significance	95% confidence interval for difference	
					Lower bound	Upper bound
V	A	-1.792	0.737	0.140	-3.919	0.336
	R	-0.292	0.509	1.000	-1.760	1.177
	K	-2.000	0.712	0.060	-4.056	0.056
A	V	1.792	0.737	0.140	-0.336	3.919
	R	1.500	0.657	0.191	-0.395	3.395
	K	-0.208	0.754	1.000	-2.385	1.968
R	V	0.292	0.509	1.000	-1.177	1.760
	A	-1.500	0.657	0.191	-3.395	0.395
	K	-1.708	0.502	0.015	-3.156	-0.260
K	V	2.000	0.712	0.060	-0.056	4.056
	A	0.208	0.754	1.000	-1.968	2.385
	R	1.708	0.502	0.015	0.260	3.156

Abbreviation: VARK, visual, aural/auditory, read/write, and kinesthetic.

Table 7 Pairwise comparisons of VARK scores for all levels

(I) VARK test		Mean difference (I-J)	Standard error	p-value	95% confidence interval for difference	
					Lower bound	Upper bound
V	A	-2.306	0.320	0.001	-3.166	-1.447
	R	-0.234	0.224	1.000	-0.834	0.366
	K	-3.290	0.309	0.001	-4.119	-2.462
A	V	2.306	0.320	0.001	1.447	3.166
	R	2.073	0.319	0.001	1.217	2.928
	K	-0.984	0.365	0.048	-1.962	-0.006
R	V	0.234	0.224	1.000	-0.366	0.834
	A	-2.073	0.319	0.001	-2.928	-1.217
	K	-3.056	0.292	0.001	-3.840	-2.273
K	V	3.290	0.309	0.001	2.462	4.119
	A	0.984	0.365	0.048	0.006	1.962
	R	3.056	0.292	0.001	2.273	3.840

Abbreviation: VARK, visual, aural/auditory, read/write, and kinesthetic.

both the aural and kinesthetic sensory modes of learning, having the same p -value of 0.001. In contrast, the aural and kinesthetic sensory modality is statistically significant to all other learning modes with p -values ranging from 0.001 to 0.048.

Discussion

The results of this study show that students have significantly different learning preferences, which is consistent with Kolb's learning theory, that is, "Learning is the process whereby knowledge is created through the transformation of experience" (Kolb, 1984:38, as cited in McLeod³). Accord-

ing to the VARK model, this study showed that regardless of the level of nursing students, there are still differences in learning style preferences. Likewise, an earlier study by Sener and Çokçaliskan among medical school students and their preferred learning style found that most students (63.8%) preferred multiple modes.¹³ This gives them the benefits of information in all visual, aural, and kinesthetic forms, resulting in greater information retention.

When using a range of activities, technologies, and experiences, skilled educators will be able to modify their approach to how course objectives are reached. That is, teachers are balancing between what they want to convey, based on research and evidence, and creativity. As a result, the nursing

students and faculty members share accountability for the learning experience. In-depth learning can only happen when both parties are interested in the experience.⁷ Therefore, educators are often recommended to develop a multi-modal learning system that will encourage students to be more creative and lead them to more cognitive engagement in the required study section.^{13,14}

The findings of the current study are consistent with an earlier study by Fleming and Baume, who found that individuals' learning style depends on their preferences for absorbing, processing, understanding, and retaining information, which indicates the importance of such studies among students.¹⁵ Thus, in this study, nursing students who prefer visual learning have a significantly different learning style than those who prefer aural and kinesthetic learning styles ($p < 0.001$). In contrast, there was no sufficient evidence to conclude the same for students who preferred the read/write modality.

For more than decades, teacher-centered learning and curriculum development have been the mainstream approach to education in most educational institutions, both in Saudi Arabia and worldwide.^{16–18} However, available evidence suggests that teacher-centered learning leads to a number of disadvantages for students as they invest less in their own knowledge.^{16,17} Given the evidence presented in this study, which is consistent with previous studies, new improvements are needed in teaching future health care providers.¹⁸ This requires a deeper understanding of how nursing students learn effectively. Prioritizing student learning preferences will result in teachers being held accountable for individual curriculum design, that is, adopting a student-centered approach that allows learners to interact when providing feedback on curriculum design.¹⁸

Providing multiple modalities in learning procedures has been shown to increase student retention in learning. There is a significant educational benefit to nursing students in the system as teaching in the preferred learning style maximizes the students' ability to learn.^{3,18} Current research results provide the basis for adaptive learning among Saudi nursing students, by identifying individual teaching preferences for nursing students. It is recommended that nursing students who prefer visual learning styles be guided in the same way as those who prefer the read/write mode of learning. The same should be done for those who prefer an aural and kinesthetic learning.

Conclusions

The learning preference of nursing students can be a basis for adaptive learning in which students and educators share mutual responsibility for learning materials tailored to learners' input. Further research is required to explore the relationship between learning style preferences and learning outcomes with the inclusion of a larger sample size and representation of both genders, males and females. We also recommend nursing educators to be responsible for individual curriculum design if they prioritize student learning

preferences, which means using a student-centered method that encourages learners to engage while offering input in the curriculum design. In-depth learning can only happen when both parties are interested in the prepared and structured learning experience.

Ethics

The study was approved by the Institutional Review Board (IRB-2021-NUR-007) of Prince Sultan Military College of Health Sciences (PSMCHS). Informed consent was obtained from the participants before data collection.

Data Availability Statement

The data underlying this article will be shared on reasonable request to the corresponding author.

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Conflict of Interests

None declared.

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