Study of VARK learning preferences in undergraduate health science students at Hetauda, Nepal

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ABSTRACT

INTRODUCTION
Insights into individual learning styles that can inform more effective teaching strategies are provided by the VARK model, which categorizes learning preferences into four modalities: Visual, Aural, Read/Write, and Kinesthetic. This investigation was designed to evaluate the distribution of unimodal and multimodal learning patterns among undergraduate health science students at Madan Bhandari Academy of Health Sciences, Hetauda, Nepal, and to identify their learning preferences using the VARK model.

MATERIAL AND METHODS
A descriptive cross-sectional study with 142 students from four academic programs was carried out between January and April of 2025. Statistical Package of Social Sciences (SPSS) version 25 was used for data analysis after the VARK questionnaire (version 8.01) was distributed. To investigate relationships between academic departments and learning styles, chi-square tests were used.

RESULTS
Multimodal learning preferences were present in most students (87.3%), with bimodal learning styles being the most common (44.4%), followed by trimodal (22.5%) and quadrimodal (20.4%). Kinesthetic learning predominated among the 12.7% who showed a unimodal preference. The modalities with the greatest average scores were kinesthetic and auditory. There was no statistically significant difference between academic department and learning style ($p = 0.77$).

CONCLUSION
Multimodal learning strategies were preferred by the majority of the students, especially kinesthetic ones. In order to improve educational outcomes, these findings highlight the necessity of a variety of teaching methodologies that accommodate different learning preferences.

KEYWORDS
Aural, Health Science Education, Kinesthetic, Learning Preferences, Multimodal

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INTRODUCTION

The VARK model is a well-known framework for determining individual learning preferences that was created by Neil Fleming at Lincoln University in New Zealand in 1998. This paradigm divides students into four different learning styles: Visual, Aural/auditory, Read/write and Kinesthetic. Based on individual learning preferences, each category represents a distinct method of acquiring and interacting with knowledge.[1, 2]

Learners who prefer the visual style grasp concepts more efficiently when information is presented through images, diagrams, charts and other visual tools. In contrast, those who favor aural (auditory) learning benefit most from listening to lectures, discussions, and verbal explanations, as they process information more efficiently through sound.[2] Learners who prefer the read/write style engage best with materials presented in textual form, such as notes, handouts, and manuals, and they often favor reading and writing tasks for internalizing knowledge. Meanwhile, kinesthetic learners prefer experiential learning, thriving in environments where they can observe demonstrations, conduct hands-on experiments, and interact with real-life applications to develop a deeper understanding of the subject matter.[1, 3]

Learning is a multifaceted process that is exposed to a range of effective elements, such as the expertise and enthusiasm of the teacher, classroom activities, assessment activities, effective feedback, and the ability of the teacher to effectively engage with the pupils.[4] It is difficult to study learning styles, and new research indicates that there are 70 different types of learning styles. Numerous pertinent studies have been conducted as a result of this one; the current study examines the VARK learning style.[5] In the medical or the health science school, the focus is on teaching a predetermined and frequently vast syllabus in a condensed amount of time using the lecture format. Afterwards, limited opportunity is available to assess the learning styles.[6,7]

The aim of the current study is to evaluate the pupils using the VARK model. Another goal of our study was to look into the Madan Bhandari Academy of Health Sciences students' single-modal and multimodal learning patterns. Finding out the students' preferred learning methods will be the study's greatest contribution to improving instruction for the students.

MATERIAL AND METHODS

The study was designed in the descriptive and the cross sectional way. The study site was Madan Bhandari Academy of Health Sciences, Hetauda, Nepal. One hundred and sixty students studying Bachelor of Science in Laboratory Medicine, Bachelor of Pharmacy, Bachelor of Nursing and Bachelor of Public Health were enrolled in the study after taking the verbal and the written consent. The enrollment of the participants were voluntary. The information sheet was provided The study was started after getting the ethical approval letter from the Institutional Review Committee (IRC) of Madan Bhandari Academy of Health Sciences, Hetauda, Nepal [ethical approval number: IRC-059-081-82]. The study duration was four months (January 2025 to April 2025). The convenient sampling technique was used in order to enroll the participants. A total of 142 undergraduate students were enrolled for the study from four different departments currently running at Madan Bhandari Academy of Health Sciences, Hetauda, Nepal.

The VARK questionnaire consists of 16 multiple-choice items, each with four options representing Visual (V), Aural (A), Read/write (R), and Kinesthetic (K). For each item, respondents could choose one or more possibilities, and the appropriate modality got one point for each chosen option. The cumulative scores for each modality normally range from 0 to 16, though totals may surpass 16 if multiple answers are picked for individual items. Each chosen option adds one point to the corresponding modality. Based on the relative distribution of the scores across the four modalities that are Visual (V), Aural (A), Read/write (R), and Kinesthetic (K) the learning preferences were classified using the VARK questionnaire. When one modality scored more than two points higher than the others, it was considered a unimodal preference. When two modalities scored similarly, with a difference of two points or less and higher than the other modalities, a bimodal preference was given. When three modalities had comparable scores within a two-point range and the fourth was comparatively lower, this was referred to as a trimodal preference. When there was no dominating learning style and all four modalities had scores within a two point range, it was considered a quadrimodal preference.[2]

The structured VARK questionnaire version 8.01 was used to record the response of the participants. The observed response was entered on Microsoft Excel version 13 and analyzed accordingly using the Statistical Package for Social Sciences (SPSS) version 25. The observed data was analyzed using the descriptive statistics to check the distribution of data. The categorical data were represented using chi square test. One way Analysis of Variance (ANOVA) was run to compare the mean VARK score among four groups. The *p*-value of less than 0.05 was considered as statistically significant.

RESULTS

A total of 142 undergraduate students from various health science departments of Madan Bhandari Academy of Health Sciences participated in the study. Among them, 56.3% were female and 43.7% were male. The majority of participants were from the Laboratory Medicine department (57.7%), followed by Pharmacy (19.0%), Nursing (14.1%), and Public Health (9.2%) as illustrated in the Table 1.

Table 1. Descriptive analysis of variables and their categories (n=142)

Variables & categories		Frequency (n)	Percentage (%)
Gender	Female	80	56.3
	Male	62	43.7
Departments	Lab Medicine	82	57.7
	Pharmacy	27	19.0
	Public Health	13	9.2
	Nursing	20	14.1
Modals of learning	Unimodal	18	12.7
	Bimodal	63	44.4
	Trimodal	32	22.5
	Quadrimodal	29	20.4

The mean age of participants was 22.26 ± 3.37 years. Among the VARK components, the highest average score was observed in the Kinesthetic domain (9.88 ± 3.35), followed by Aural (8.95 ± 3.79), Visual (7.14 ± 3.23), and Reading/Writing (5.03 ± 3.09) as highlighted in the Table 2.

Table 2. Descriptive analysis of age and total VARK score (n=142)

Variables	Mean ± SD
Age (years)	22.26 ± 3.37
Total Visual score (V)	7.14 ±3.23
Total Aural score (A)	8.95 ± 3.79
Total Reading score (R)	5.03 ± 3.09
Total Kinesthetic score (K)	9.88 ± 3.35

Percentage of Learning Preferences

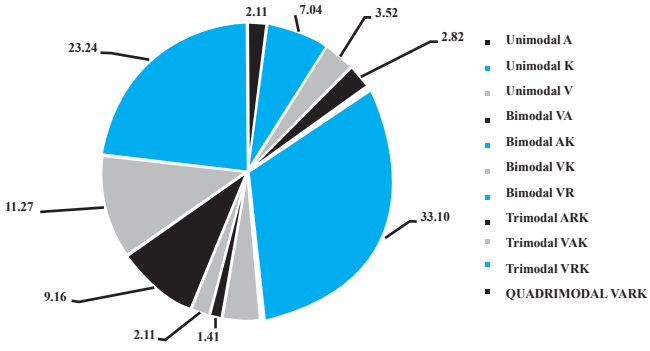

Figure 1. Learning Preferences based on the response on VARK questionnaire (n=142)

Regarding learning preferences assessed through the VARK questionnaire, 44.4% of students exhibited a bimodal learning style, making it the most predominant, followed by trimodal (22.5%), and quadrimodal (20.4%), and unimodal preferences (12.7%) as shown in Figure 1. Further breakdown of the unimodal learners (n = 18) showed that the Kinesthetic (K) modality was the most preferred single learning style, accounting for 7.0% of all participants. This was followed by the Aural (A) preference (3.5%), Visual (V) (1.4%), and Read/Write (R) (0.7%). These results suggest that even among unimodal learners, there is a strong tendency toward kinesthetic and aural styles of learning.

As illustrated in Figure 1, the overall distribution highlights a dominance of multimodal learning preferences, indicating the necessity for flexible and diverse instructional methods to accommodate the varied learning needs of health science students.

When comparing learning preferences across departments, bimodal learning was the most common modality in all groups. However, no statistically significant association was found between departmental affiliation and learning style preference ($p = 0.77$).

Table 3. Comparison of modals of learning among the students of different departments

(n=142)

Departments	Modals				Total	*p*- value
	Unimodal	Bimodal	Trimodal	Quadrimodal		
Lab Medicine	8(9.8%)	38(46.3%)	18(22.0%)	18(22.0%)	82(100.0%)	0.77
Pharmacy	5(18.5%)	13(48.1%)	4(14.8%)	5(18.5%)	27(100.0%)	
Public Health	2(15.4%)	3(23.1%)	5(38.5%)	3(23.1%)	13(100.0%)	
Nursing	3(12.7%)	9(44.4%)	5(22.5%)	3(20.4%)	20(100.0%)	

The table 4 illustrated the gender-wise comparison of mean VARK scores (Table 4), no statistically significant differences were observed between female and male students in the visual (7.18±3.35 vs. 7.10±3.08; p=0.89), aural (9.19±3.60 vs. 8.65±4.03; p=0.40), and kinesthetic (9.86±3.34 vs. 9.90±3.38; p=0.94) learning modalities. However, a significant difference was noted in the reading/writing scores, where male students had a higher mean score compared to female students (5.79±3.20 vs. 4.44±2.88; p=0.009).

Table 4. Genderwise comparison of mean VARK scores (n=142)

Total VARK scores	Gender	Frequency	Mean ± SD	*p*-value
Total visual score (V)	Female	80	7.18 ± 3.35	0.89
	Male	62	7.10 ± 3.08	
Total aural score (A)	Female	80	9.19 ± 3.60	0.40
	Male	62	8.65 ± 4.03	
Total reading/writing score (R)	Female	80	4.44 ± 2.88	<0.01*
	Male	62	5.79 ± 3.20	
Total Kinesthetic score (K)	Female	80	9.86 ± 3.34	0.94
	Male	62	9.90 ± 3.38	

The table 5 illustrates the comparison of mean VARK scores among the unimodal, bimodal, trimodal and quadrimodal learning preferences group. A statistically significant difference were observed among the groups (p<0.01). Unimodal learners had the lowest mean score (22.17 ± 8.95), whereas bimodal (29.37 ± 7.56), trimodal (34.56 ± 8.84), and quadrimodal (36.21 ± 10.12) learners had increasing mean scores.

Table 5. Comparison of mean VARK score among the groups (n=142)

Different learning modals	N	Mean ± Std. Deviation [VARK score]	*p*-value
Unimodal	18	22.17 ± 8.95	<0.01*
Bimodal	63	29.37 ± 7.56	
Trimodal	32	34.56 ± 8.84	
Quadrimodal	29	36.21±10.12	

DISCUSSION

The current study aimed to explore the distribution of VARK learning preferences and compare them across the undergraduate health science students (B.Sc. Laboratory Medicine, Bachelor of Pharmacy, Bachelor of Public Health and Bachelor of Nursing) of Madan Bhandari Academy of Health Sciences, a newly established institution in Nepal. Our findings indicate, a predominance of bimodal learning preferences (44.4%) with the kinesthetic modality receiving the highest average score among all VARK domains. These results are consistent with previous studies conducted among medical and allied health students, which often report multimodal preferences particularly favoring kinesthetic and aural styles. A study done in India using VARK questionnaire version 8.01 among Indian students revealed the kinesthetic preference as a major learning modality.[8]

The relatively low proportion of unimodal learners (12.7%) underscores the complexity and diversity of learning approaches among students. Within the unimodal group, the dominance of kinesthetic preference aligns with the hands-on nature of health science education, where practical and experiential learning is emphasized. The least favored unimodal style was Read/Write, which may reflect a shift in learning habits influenced by digital media and interactive tools. A study done in Oman had revealed that, most of the students preferred the multimodal learning styles in agreement with our study. They used VARK questionnaire to obtain the responses of 292 students on undergraduate medical students. The majority (54%) preferred a multimodal learning style, with most favoring a bimodal approach (30%). Among those with a unimodal preference, the kinesthetic style was the most common (30%).[9] A study done in Iran in 184 undergraduate dental students revealed, the most prevalent learning styles were unimodal (42%, n = 55) and bimodal (31.3%, n = 41). Similarly, among low-performing students, unimodal (47.2%, n = 28) and bimodal (45.3%, n = 24), in contradiction to our study.[10]

Although bimodal learning was the most prevalent across all departments, the interdepartmental differences in learning preferences were not statistically significant (p = 0.77). A study done in dental students at B.P. Koirala Institute of Health Sciences by Shrestha A et al, Dharan in 2019 in undergraduate dental students revealed the variations in learning in the dental students using the VARK questionnaire version 7.8. They revealed the unimodal learning type as a common learning preferences (35.3%). However, the bimodal AK type was the second most types in their students.[11] This suggests a homogeneity in learning style distribution across disciplines, despite differences in course content and teaching methods. These findings highlight the importance of incorporating a variety of instructional methods such as visual aids, discussions, hands-on practice, and reading materials to address the diverse needs of students. In a study in Oman in 148 preclinical students authors revealed, more than one-third (35%) of the participants indicated a preference for a single learning modality—visual (8%), auditory (9%), read/write (9%), or kinesthetic (9%). The rest favored a multimodal approach, with 14% choosing two modes, 19% opting for three, and 32% utilizing all four sensory modalities.[12]

Furthermore, the predominance of multimodal learners (bimodal, trimodal, and quadrimodal accounting for 87.3%) reflects a need for flexible and blended teaching strategies that can cater to multiple learning styles simultaneously. Educators should consider adopting multimodal delivery of content to enhance comprehension, engagement, and academic performance. A study done by Khanal L et al at B.P. Koirala Institute of Health Sciences, Dharan, Nepal also revealed the undergraduate students prefer the diverse learning styles from their study in the Department of Anatomy. They have also highlighted the majority of students (53.52%) demonstrated a preference for multimodal learning styles, with bimodal being the most frequently reported among them (26.06%). Among unimodal learners, the kinesthetic style was the most commonly preferred (29.06%) like our study.[13]

Our study also revealed the significant difference between male and female in the reading/writing scores, higher mean score was observed in male (*p*-value: 0.009). This suggests that, the male students demonstrated the stronger inclination towards the reading/writing learning style. The observed preference among male students for the reading/writing (R) learning style, as indicated by significantly higher mean scores compared to female students, may be influenced by several factors. A study by Wehrwein et al. found that 87.5% of male undergraduate physiology students preferred multiple modes of information presentation, with a notable proportion favoring the reading/writing style. This preference may be attributed to the alignment of reading/writing strategies with traditional academic practices, such as note-taking and text-based learning, which are often emphasized in educational settings. Additionally, cultural and educational backgrounds can play a role; in some contexts, male students might be encouraged to engage more with textual materials, reinforcing their affinity for the reading/writing modality. [14] However, a study by Murphy RJ et al. revealed no significant difference of the gender with learning styles in their dental students. They also revealed the visual learning at higher percentage and kinesthetic at lower percentage in contradiction to our study.[15]

The total VARK scores of unimodal, bimodal, trimodal, and quadrimodal learners varied significantly in the current study, with quadrimodal learners exhibiting the highest scores and unimodal learners the lowest. A recent study on this revealed significant differences in the VARK scores and academic performances between unimodal and multimodal learners similar to our findings. Moreover, they also evaluated the students based on the Grade Point Average (GPA).[16]

The limitations of the present study is that the students are assessed based on the VARK questionnaire only in a single center. Sometimes, the VARK modal fails to explain the cognitive and contextual factors. The another important limitation could be that the questionnaire may not resonate with the students from different linguistics backgrounds. Moreover, the learning preferences are fixed which may be changed based on the subject matter.

CONCLUSION

The results revealed that a majority of students favored a multimodal approach to learning, reflecting the complexity and diversity in individual learning styles. Among the unimodal learners, the kinesthetic was most commonly preferred modal. This finding suggest that, a notable inclination toward hands-on, experiential learning, particularly among those with a single dominant learning preference. The overall diversity in learning preferences emphasizes the importance of incorporating a variety of teaching strategies in the health sciences curriculum. By aligning instructional methods with students' preferred learning modalities particularly emphasizing kinesthetic and multimodal approaches teachers can potentially enhance student engagement, comprehension, and academic success.

CONFLICT OF INTEREST

None

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