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Preference for Unimodal Learning Among Dental Students: Insights from the VARK Learning Style Model. A Cross-Sectional Study

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ABSTRACT

Objective: This study aimed to investigate the learning style preferences of dental students in their first and fifth academic years using the VARK learning style model to identify potential changes over time.
Methods: A cross-sectional study was conducted among first- and fifth-year undergraduate dental students at the University of Science and Technology, Aden, Yemen. The Arabic version of the VARK questionnaire, comprising 16 multiple-choice questions, was administered via Google Forms.
Results: A total of 86 students participated in the study, with a response rate of 38.1%. Both first- and fifth-year students predominantly preferred unimodal learning styles, with auditory and kinesthetic modalities being the most favored (auditory: 32.5%, kinesthetic: 30.4%). The read/write learning style was the least preferred across all groups. The prevalence of unimodal learning was 99.4% in first-year students and 98.3% in fifth-year students. Multimodal preferences, including bimodal, trimodal, and quadmodal styles, were rare. No significant shifts in learning style preferences were observed between the two academic levels.
Conclusion: Dental students exhibit a strong preference for auditory and kinesthetic learning styles, with minimal changes across academic years. These findings emphasize the need for teaching strategies that cater to these preferences to enhance engagement, motivation, and academic performance.

Keywords: Dental education, VARK learning styles, Auditory learning, Kinesthetic learning

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INTRODUCTION

In the 21st century, dental education faces numerous challenges, particularly due to evolving philosophies in learning and education. The focus has shifted from traditional educator-centered or course-centered teaching approaches to more student-centered learning paradigms (1). Additionally, the rapid pace of scientific advancements and changes in knowledge presents a challenge for dental educators, who must equip students with the skills to become self-directed learners and take responsibility for their education. Such self-learning capabilities are essential for achieving effective lifelong learning in the dynamic field of dentistry (1). However, dental students often encounter difficulties in aligning their educational experiences with their learning preferences. Many express frustrations with curricula that fail to accommodate their preferred learning styles. Moreover, the intensive four-year predoctoral dental program leaves limited scope for students to effectively bridge biomedical science courses with clinical patient experiences, which are crucial for their professional development (2,3).

Lectures remain the primary teaching method in most dental schools, despite being a passive approach that primarily emphasizes rote memorization and note-taking. With the ever-evolving nature of dental knowledge, students are often overwhelmed by the sheer volume of information presented (1). Furthermore, students' diverse learning styles and preferences are not always adequately considered in teaching practices. A promising strategy to address these challenges is to identify students' learning preferences and incorporate them into the design and delivery of instructional materials.

Since the 1960s, psychologists have developed various tools to assess individual learning styles. Among these, the VARK Learning Style Inventory (Visual, Auditory, Read, and Kinaesthetic) is one of the most widely used, particularly in medical education contexts (4,5,6). Developed by Neil D. Fleming and Charles C. Bonwell, the VARK model categorizes learners based on sensory modalities: Visual learners prefer diagrams, maps, and figures; Aural learners benefit from lectures, discussions, and verbal interactions; Reading / Writing learners favor text-based materials like books and notes; and Kinesthetic learners thrive with hands-on experiences and physical engagement (7).

Although the number of studies investigating dental students' learning styles has increased in recent years, many remain descriptive. As dental students' progress through their academic journey, the instructional focus shifts from didactic teaching to hands-on practical training in simulation labs and clinical settings. This transition may influence their learning style preferences. While Kolb suggested that learning styles can evolve over time, this has yet to be conclusively proven, particularly in dental education (1). Examining the learning preferences of students at different academic stages could provide valuable insights into potential shifts in their learning styles. However, existing literature suggests that short observation periods, such as two years, are insufficient to detect significant changes in learning preferences. Additionally, prior studies often employed the Kolb Learning Style Inventory rather than the VARK questionnaire, which focuses on sensory modality preferences and offers a more contemporary approach compared to Kolb's 1980s framework.

To the best of our knowledge, no study has explored the longitudinal effects of time on dental students' learning styles using the VARK instrument. This underscores the need for a comprehensive investigation into how learning style preferences may evolve throughout dental education. The present study aims to identify the learning styles preferences of dental students in their first and fifth years.

METHODS

Study Design

A cross-sectional study was carried out between February and April 2023 to investigate changes in learning styles among dental students across

different academic years. The study population included first- and fifth-year undergraduate dental students.

Data Collection

The Arabic version of the VARK questionnaire was distributed to the participants via Google forms. The questionnaire consists of 16 multiple-choice questions, each providing four options. Participants were permitted to select multiple options if applicable. A total of 86 students completed the questionnaire. The completion of the questionnaire was counted as obtainment of informed consent.

Learning preferences were classified according to the guidelines provided on the VARK website. Based on their responses, students' learning styles were categorized as follows; Unimodal which preference for a single modality include Visual (V), Auditory (A), Read/Write (R), or Kinesthetic (K). Bimodal (VA, VR, VK, AR, AK, or RK). Trimodal (VAR, VAK, VRK, or ARK). Quadmodal, preference for all four modalities (VARK).

VARK Learning Style:

The VARK questionnaire assesses students' learning preferences, based on four sensory modalities: Visual, Auditory, Read/Write, and Kinesthetic. Responses were processed following the VARK website guidelines, and data were tabulated and analyzed using Microsoft Excel (8).

Data Analysis:

The collected data were analyzed using SPSS version 23. Descriptive statistics were used to evaluate the distribution of learning styles across different years of study, providing insights into potential changes in learning preferences evolve over time. The proportion of students favoring each VARK modality and combinations of modalities was calculated by dividing the number of students in each category by the total number of participants. Chi-square test was employed to compare the learning preferences between first- and fifth-year students. Statistical significance was defined at P-value of <0.05.

Participants and Ethics:

This study was conducted at the University of Science and Technology (UST) in Aden, Yemen. Ethical approval was obtained from the ethical committee of the Faculty of Health and Sciences, (ethical Approval number: MEC AD052). The study targeted undergraduate dental students from the Faculty of Medicine and Health Sciences, including both male and female participants.

RESULTS

A total of 86 students out of 226 completed the questionnaire, representing a response rate of 38.1%. The overall distribution of VARK learning style among first- and fifth-year students showed similar patterns, with preference auditory (A) and kinesthetic (K) learning styles over visual (V) and reading/writing (R) styles.

Among first-year students, the most preferred learning style was auditory (A) at 31.8% (n = 655), followed by kinesthetic (K) at 30.5% (n = 627), reading/writing (R) at 19.9% (n = 409), and visual (V) at 17.6% (n = 363). Similarly, fifth-year students also showed a preference for auditory (A) at 33.2% (n = 334), followed by kinesthetic (K) at 30.3% (n = 305), visual (V) at 18.5% (n = 186), and reading/writing (R) at 17.9% (n = 180). Overall, students from both academic years demonstrated a higher preference for auditory (32.5%) and kinesthetic (30.4%) learning styles Table 1.

Unimodal learning preferences were predominant among both first- and fifth-year students, with 99.4% of first-year students and 98.3% of fifth-year students favoring this category. Other learning preferences, such as bimodal, trimodal, and quadmodal, were less common. Bimodal preferences were observed in 0.5% of first-year students and 1.7% of fifth-year students. Trimodal preferences were present in 0.2% of fifth-year students but not observed in first-year students. Quadmodal learning preferences were

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reported by 0.1% of first-year students, with no occurrences among fifth-year students Table 2.

Table1: Overall Distribution of VARK n=86

Type Learning style	Student's level				Total	
	1st Year		5th Year			
	n	%	n	%	n	%
Visual (V)	363	17.6%	186	18.5%	549	36%
Auditory (A)	655	31.8%	334	33.2%	999	65%
Reading/ Writing (R)	409	19.9%	180	17.9%	589	37.8%
Kinesthetic (K)	627	30.5%	305	30.3%	932	60.8%

Table2: Unimodal and Multimodal VARK Distribution by different levels of student. N=86

VARK	Student's level				Total	Total
	1st Year		5th Year			
	n	%	n	%	n	%
Visual (V)	363	17.6%	186	18.5%	549	36%
Auditory (A)	655	31.8%	334	33.2%	999	65%
Reading/Writing (R)	409	19.9%	180	17.9%	589	37.8%
Kinesthetic (K)	627	30.5%	305	30.3%	932	60.8%
Total Unimodal	2054	99.8%	1003	99.9%	3069	199.6%
VA	2	0.1%	4	0.4%	6	0.5%
VR	0	0%	4	0.4%	4	0.4%
VK	4	0.2%	1	0.1%	5	0.3%
AR	2	0.1%	2	0.2%	4	0.3%
AK	1	0.05%	3	0.3%	4	0.35%
RK	1	0.05%	3	0.3%	4	0.35%
Total bimodal	10	0.5%	17	1.7%	27	2.2%
VAR	0	0%	0	0	0	0
VAK	0	0%	2	0.2%	2	0.2%
VRK	0	0%	0	0	0	0
ARK	0	0%	0	0	0	0
Total Trimodal	0	0	2	0.2%	2	0.2%
VARK	2	0.1%	0	0		
Total Quadmodal	2	0.1	0	0		

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DISCUSSION

This study aimed to identify the learning styles preferences of dental students in their first and fifth years. The findings revealed that both groups predominantly preferred a unimodal learning approach, with auditory (A) and kinesthetic (K) learning styles being the most favored modalities. These results are consistent with previous studies investigating the learning styles of dental students worldwide. The strong preference for auditory and kinesthetic learning styles aligns with findings from numerous studies using the VARK questionnaire (9,10,11,12,13,14,15,16,17). These consistency highlights the importance of incorporating discussions, tutorials, and hands-on activities into dental education to effectively accommodate these learning styles. While auditory and kinesthetic preferences dominate, the read/write learning style was the least favored across all academic levels. This observation aligns with previous research (12,18,11) and reflects the practical, hands-on nature of dental education. Auditory learners tend to thrive in discussions and seminars, whereas kinesthetic learners excel in practical, physical activities, aligning well with the hands-on aspects of dentistry. Conversely, visual learners prefer diagrams and charts, and read/write learners benefit from textual materials (19). Although the dental curriculum transitions from lecture-based teaching in the early years to hands-on pre-clinical and clinical training in later years, this study found no significant changes in learning style preferences. Students consistently favored auditory and kinesthetic styles throughout their academic progression. This consistency suggests that students with kinesthetic preferences may naturally gravitate toward dentistry, as the discipline's practical nature aligns well with their strengths (2).

Understanding students' learning styles is essential for improving teaching effectiveness and reducing frustration. Research demonstrates that aligning teaching methods with students' preferences enhances academic performance (20,21,17). This study underscores the need to design curriculum models that cater to auditory and kinesthetic learners, who constituted approximately 61% of first year and 63% of fifth-year students in this study. Tailoring educational methods to students' predominant learning preferences can significantly enhance engagement and success. Auditory learners benefit from activities such as discussions, verbal feedback, and audio presentations, while kinesthetic learners excel with practical activities, such as experiments and role-playing. Incorporating these strategies into teaching practices can create a more inclusive and effective learning environment.

CONCLUSION

Both first- and fifth-year dental students at the University of Science and Technology, Aden, exhibited a strong preference for unimodal learning approach, with auditory and kinesthetic styles being the most favored. These findings highlight the importance of increasing faculty awareness regarding the impact of learning styles on teaching effectiveness. By planning sessions that address diverse learning preferences, educators can foster a more inclusive learning environment, enhance student motivation, and improve academic outcomes.

Limitations

This study has several limitations that should be considered when interpreting the findings include single-institution scope, relatively low response rate, reliance on self-reported data, cross-sectional nature of the study and finally limitations of VARK Instrument. All the above the current study limitations may lead to limit the generalizability of the results and may introduce different bias. Future research should address these limitations by including a more diverse sample, employing longitudinal designs, and exploring additional factors that influence learning preferences.

Disclosure

The author reports no conflicts of interest in this work.

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