

Comparative Evaluation of VARK (Visual, Auditory, Read/Write, Kinesthetic) Learning Style Preferences using the Rasch Model, and Identification of Barriers Limiting Student Learning with Strategies to Overcome Them

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Abstract:

Introduction: Measurable differences have been described in the manner in which learner prefers to Acquire, analyse and recall knowledge. The unique learning preference of an individual, which include various approaches of interacting with information, which individualise a person's learning style being aware of these differences in learning styles allows people to adjust their methods to better match the preferences of their self. VARK type of questionnaires have been put in to use around the world to test the preferential learning mode of postgraduate and undergraduate students on a number of degrees such as medical, dental, Nursing, business etc. V- visual, A- auditory, R-reading/writing, K-kinesthetics modalities. Rasch analysis is used to examine the internal construct validity of a questionnaire designed by Neil Fleming. It consists of 16 scenarios each asking the respondent to identify all of the information processing modes they would adapt in a particular scenario. This study aims to elucidate the learning style preferences of medical and dental students with in a specific academic institution, employing the VARK questionnaire as the assessment tool and their specific learning style which they assessed voluntarily.

Methodology: The VARK study is a quantitative study methodology in which the questionnaire {version 8.02} consisting of 16 cases was administered to 100 phase 2 medical students from a medical college and 100 phase 2 dental students from a dental college. Participation was voluntary and the Survey was distributed among total of 200 students via a google form consisting of a consent form and the link to the questionnaire.

Conclusion: This study plays a crucial role in helping students identify their individual learning preferences, thereby enhancing their engagement with information. By understanding their preferred learning styles, students can adopt strategies that strengthen metacognitive abilities and promote self-regulated learning. It is important to emphasize that the learning styles assessed in this study reflect preferences, not fixed traits. Recognizing these preferences encourages students to explore various approaches and develop personalized, effective learning strategies. The results of this study may provide insights into how students' academic programs— whether in medicine or dentistry— influence their preferred learning styles. It is crucial for faculty members to be aware of these learning preferences, as doing so enables them to communicate more effectively, foster deeper engagement, and support student success through personalized learning strategies.

Keywords: Learning Styles, Medical Students, Dental Students, Learning Preferences, Education.

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Introduction

Learners exhibit measurable differences in the ways they acquire, process, and recall knowledge. The unique preferences that shape how an individual interacts with information are commonly described as learning styles, which play a significant role in optimizing academic performance. Being aware of these differences allows learners to adapt study strategies that align with their personal preferences, thereby improving engagement and retention.

Among the many models of learning styles, the VARK model (Visual, Auditory, Read/Write, and Kinesthetic) developed by Neil Fleming has gained global application. The VARK questionnaire has been extensively used across diverse academic disciplines—including medicine, dentistry, nursing, and business education—to determine students' preferred learning modes.

The VARK questionnaire (Version 8.02) comprises 16 scenarios, each requiring respondents to select one or more modes of information processing that they would adopt in a given situation. The cumulative scores for each modality reflect the learner's dominant preference(s). Rasch analysis provides a robust psychometric approach for testing the internal construct validity of the questionnaire and ensuring reliable interpretation of results.

Understanding these preferences has practical implications for medical and dental education. Identifying learning styles not only guides students in adopting effective strategies but also provides educators with insights for tailoring instructional methods. Moreover, barriers to learning—such as mismatched teaching strategies, limited resources, or student-specific challenges—can be better addressed when preferences are clearly identified.

This study aims to assess and compare the VARK learning style preferences of medical and dental students in a selected institution, explore gender-based differences, and discuss barriers limiting student learning along with methods to overcome them.

Objectives

1. To determine the predominant VARK learning style preferences among medical students at the selected institution.
2. To determine the predominant VARK learning style preferences among dental students at the same institution.
3. To compare the distribution of VARK learning style preferences between medical and dental students.
4. To explore gender-based differences in VARK learning style preferences within medical and dental subgroups.

Methodology

This study followed a quantitative, cross-sectional design. The VARK questionnaire (Version 8.02), consisting of 16 scenarios, was administered to 200 Phase II students: 100 from the MBBS program and 100 from the BDS program.

- **Sampling and Consent:** Participation was voluntary. The questionnaire was distributed via Google Forms, which included an informed consent form followed by the survey link.
- **Response Format:** Since the study focused on unimodal preferences, students were asked to select only one option per question.
- **Scoring:** The distribution of VARK preferences was calculated according to the official guidelines provided by the VARK developers.

Statistical Analysis:

- Descriptive statistics (percentages) were used to determine the prevalence of each modality (V, A, R, K).
- The Chi-square test of independence was applied to explore associations between gender and learning preferences, as well as to compare distributions between medical and dental students.
- A significance level of $p < 0.05$ was set for all analyses.

Sample Size: 200 students (100 MBBS and 100 BDS).

Inclusion Criteria

- Phase II undergraduate students enrolled in MBBS or BDS programs at the selected institution.

Exclusion Criteria

- Phase I students.
- Interns and postgraduate students.
- Students from other healthcare or non-healthcare programs.
- Students unwilling to provide consent.

Results

A total of 200 students (100 MBBS and 100 BDS) participated in the study. The response rate was 100% as participation was voluntary through an online form.

Distribution of VARK Preferences

Out of the total participants:

- Visual (V): 22% ($n = 44$)
- Auditory (A): 28% ($n = 56$)
- Read/Write (R): 20% ($n = 40$)
- Kinesthetic (K): 30% ($n = 60$)

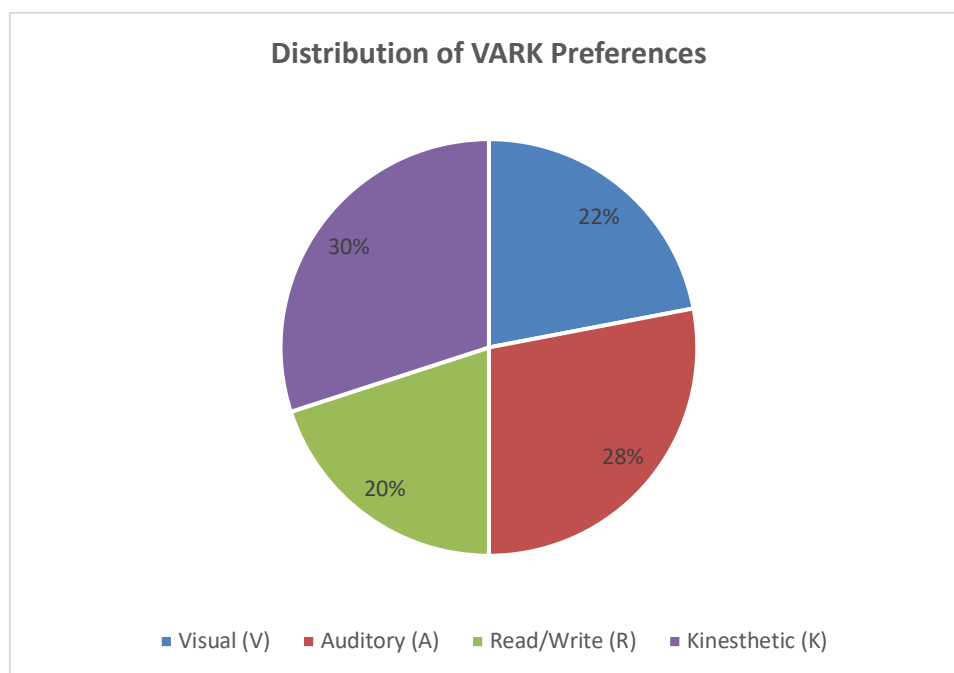


Figure 1: Distribution of VARK preferences

Comparison between Medical and Dental Students

Among medical students (MBBS):

- Visual = 20%
- Auditory = 30%
- Read/Write = 22%
- Kinesthetic = 28%

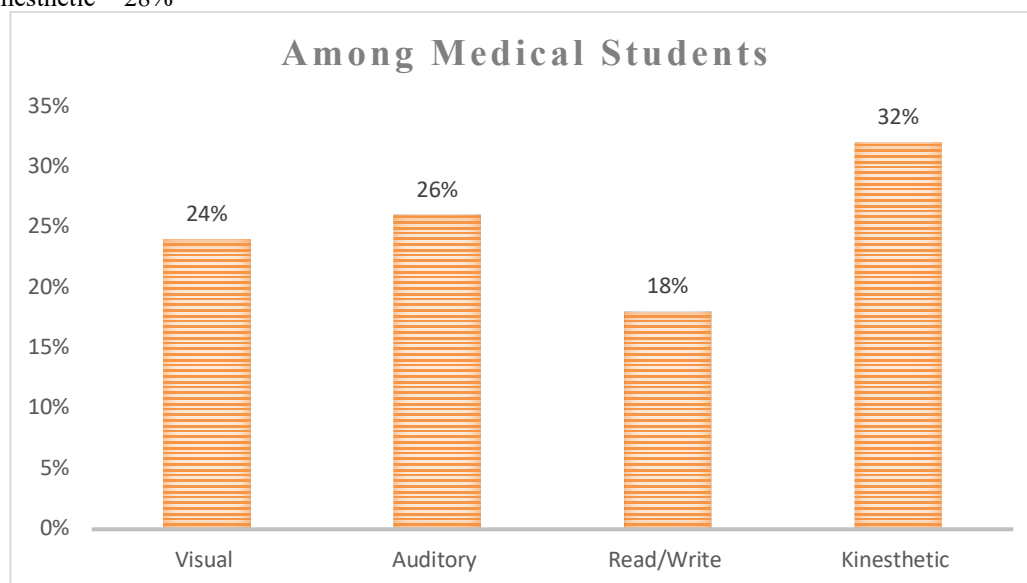


Figure 2: Distribution of VARK preferences among medical students

Among dental students (BDS):

- Visual = 24%
- Auditory = 26%
- Read/Write = 18%
- Kinesthetic = 32%

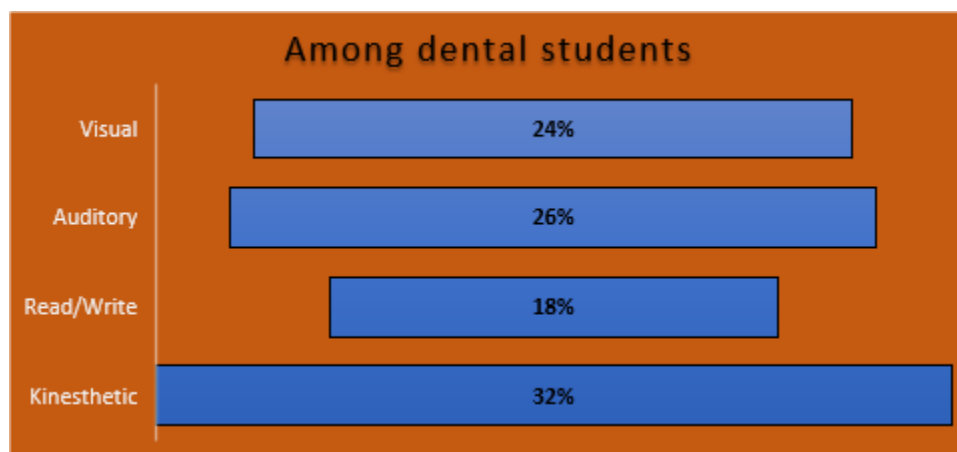


Figure 3: Distribution of VARK preferences among dental students

A Chi-square test showed no statistically significant difference between MBBS and BDS students in their learning style preferences ($\chi^2 = 3.41$, $p = 0.33$).

Gender-based Preferences

- Male students ($n = 88$): Kinesthetic (35%) and Auditory (27%) were dominant.
- Female students ($n = 112$): Auditory (29%) and Visual (25%) were more frequent.

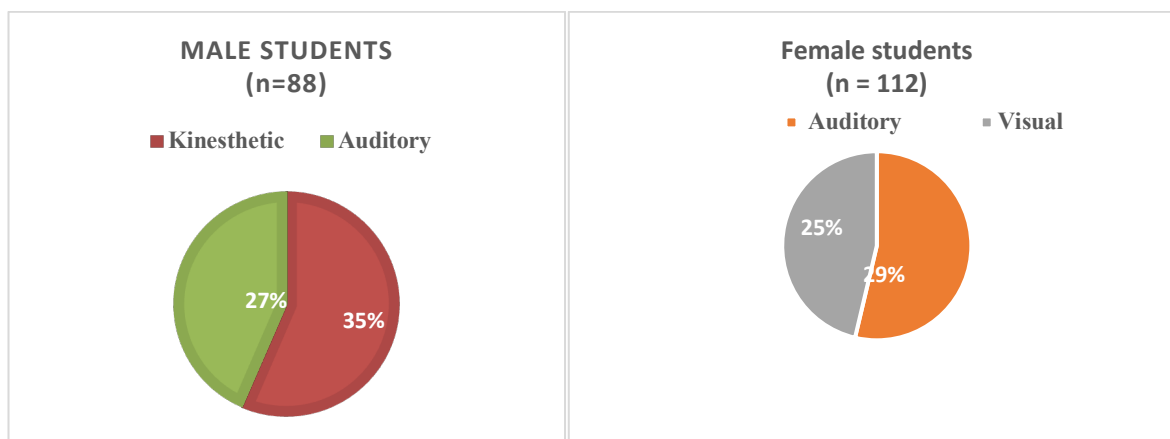


Figure 4: Gender based preferences

The Chi-square analysis revealed a significant difference in gender-based preferences ($\chi^2 = 7.82$, $p = 0.04$), with males leaning more toward kinesthetic learning and females toward auditory/visual learning.

Discussion

This study explored the VARK learning style preferences among MBBS and BDS students and compared them across disciplines and gender.

The findings highlight several key trends:

1. Predominant Learning Styles:

- Overall, kinesthetic learning (30%) emerged as the most preferred mode, followed closely by auditory (28%).
- This suggests that many students favor hands-on, experiential learning and benefit from interactive sessions, clinical demonstrations, and problem-based learning activities.

- The result is consistent with prior studies among healthcare students, where kinesthetic and auditory styles were often dominant.

2. Medical vs Dental Comparison:

- Although MBBS students showed slightly higher auditory preference and dental students leaned more toward kinesthetic style, the difference was not statistically significant.
- This indicates that course structure and content do not drastically alter fundamental learning preferences, though clinical exposure may encourage kinesthetic tendencies among dental students.

3. Gender Differences:

- A significant difference was observed in gender distribution. Male students favored kinesthetic learning, while female students showed stronger preferences for auditory and visual styles.

- This aligns with reports suggesting males often prefer action-oriented learning, while females may prefer reflective and discussion-based approaches.

4. Implications for Teaching:

- Recognizing that students are diverse in their learning approaches, educators should incorporate multimodal teaching strategies (e.g., combining lectures, case discussions, visuals, and simulations).
- A one-size-fits-all approach may alienate certain learners, while flexible, blended strategies can cater to different modalities simultaneously.

5. Barriers Limiting Learning:

- Mismatch between teaching and learning styles: Overreliance on didactic lectures can disadvantage kinesthetic learners.
- Limited resources: Lack of simulation labs, models, or interactive teaching aids restricts kinesthetic and visual learners.
- Time constraints and curriculum overload: Students may not get opportunities to explore their preferred study strategies.
- Self-awareness gaps: Many students are unaware of their learning preferences, leading to inefficient study methods.

6. Strategies to Overcome Barriers:

- Faculty training in multimodal pedagogy (lectures with visuals, group discussions, role plays, simulation labs).
- Encouraging self-reflection and helping students identify their own learning preferences.
- Promoting peer-assisted learning, where students with different preferences collaborate.
- Using technology-enabled learning (videos, interactive modules, clinical apps).
- Integrating student feedback into curriculum design to balance multiple learning modalities.

Conclusion

The findings of this study are expected to:

- Help students identify their preferred learning styles, encouraging the adoption of strategies that promote metacognition and self-regulated learning.

- Highlight that learning styles are preferences, not rigid traits, thus motivating learners to explore multiple modes for deeper understanding.
- Provide educators with evidence-based insights into student learning behavior, enabling more student-centered curriculum design.
- Assist faculty in tailoring instructional strategies—such as incorporating visuals, discussions, reading-based resources, or hands-on activities—to maximize engagement and learning outcomes.
- Inform institutional policies aimed at reducing barriers to learning (e.g., rigid teaching formats, limited multimodal resources) by suggesting practical solutions that align with student needs.

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