

Evaluation of Different Learning Styles and Their Effect on Academic Performance among Undergraduate Dental Students

Research Article

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Abstract

Introduction: Every individual has own way of perceiving, processing and retaining the information and has a unique learning style. The current study was aimed at evaluating the learning styles preferences and their influence on the academic performance of undergraduate dental students.

Materials and Methods: 322 undergraduate dental students were involved in this cross-sectional questionnaire-based study. The VARK questionnaire (Version 7.8) was used in this study.

Statistical analysis used: Independent samples' t-test was carried out to evaluate the differences in the mean scores of learning style categories between the female and male students and also between the preclinical and clinical students. Pearson's correlation coefficient test was utilized to determine whether there is a relationship between the academic performance and the mean scores of different learning styles.

Results: There were no statistically significant differences noted between the female and the male students in regards to the mean scores of visual ($t(296) = -0.796, p=0.426$), auditory ($t(296) = 0.061, p=0.952$) and kinesthetic ($t(296) = -1.681, p=0.094$) types of learning styles. A very weak positive correlation value was obtained between the academic performance and the reading type of learning style ($r = 0.125, p = 0.03$).

Conclusions: The male students showed more predilections towards the kinesthetic type of learning style and visual learners are predominant among females. A very weak positive correlation was observed between the academic performance and the reading type of learning style.

Keywords: Learning Styles; Dental Students; Academic Performance; Vark Questionnaire.

Introduction

Learning is a process whereby one acquires knowledge, skills, values and attitudes through teaching, study and experience. Learning leads to a relatively permanent change in a person's knowledge or behaviour [1]. Learning styles and learning approaches are two different processes of learning [2]. Various learning styles are used in the process of learning and gaining the information. Every student is different in one's own way of perceiving, processing and retaining the information and has a unique learning style.

Learning approach can be described as the behavioural and philosophical strategies followed by the students in understanding and retaining the information [2]. Biggs Study Process Questionnaire (SPQ) is a valuable tool to recognize and understand the learning approaches of the students [3]. Based on the SPQ scores, students are categorized into three domains of learning approaches namely, the surface, deep and strategic domains. Surface learning approach involves memorizing the information with rote learning and leads to short-term and superficial retention of the facts. It does not lead to long-term retention of information and knowledge. Deep learning involves understanding the facts to develop

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conceptual frameworks and helps in long-term retention of the information. Strategic approach involves use of both surface and deep approaches to achieve the specific goals like achieving high grades in the examinations [4]. Strategic learners use 'cues and clues' about the assessment and are driven by learning that leads to positive results [5].

Humans primarily gain knowledge through four sensory modalities: visual, auditory, reading or writing and kinesthetic [6, 7]. Likewise, Fleming and Mills also have proposed four categories of learning styles [8]. VARK is an acronym that represents the four modalities/styles of learning; visual, auditory, reading and kinesthetic. VARK questionnaire can be used to assess the learning styles of university students. It is a short and simple questionnaire that tells you something about yourself which you may or may not know. It is practical and easy to understand and can help people to understand each other and assists them to learn more effectively in many situations.

Visual learners learn best when the information is displayed as graphs, drawings and illustrations. They prefer to perceive the data which is represented in a visual manner rather than in written form [9]. Auditory learners learn best by hearing information. They acquire lot of information from lectures and also prefer to read out loud to remember the information better. Read or write learners prefer to gather information that is displayed as words. This type of learners mainly prefers textbook based learning materials. These people always take notes during classes and while reading books [10]. Kinesthetic learners learn best by touching and carrying out the procedures. They enjoy performing task that involves directly manipulating objects and materials. These learners like to gain information through experience and practice rather than reading or listening. They also have to practice doing something in order to learn it. The VARK inventory can be a useful tool for instructors to comprehend the learning styles of their pupils and empowers them to teach more effectively [11]. The primary objective of the teaching is to facilitate the learning process. Hence, understanding the various learning styles and learning behaviour of the students is vital for the educators. Teachers should put an effort to modify their teaching approaches to accommodate all the students with different learning styles and create an opportunity to learn according to their preferences [9]. When instructors include various teaching methods, they can encourage active learning among their students. Adult learners are self-directed and learn best when they actively participate in the education process. So, the teaching should be more "learner-centred" for adult learners. High quality teaching always contributes to high quality learning.

Learning style preferences can influence the academic performance and achievement of the students [12]. Some of the previous studies in the literature have demonstrated a close relationship between learning style and academic performance [13, 14]. However, few other studies have failed to establish the relationship between the learning styles and the academic performance [15, 16].

To the best of our knowledge, no study has been published in the literature to evaluate the different learning styles of the dental students in Malaysia by using VARK inventory. The studies assessing the different learning styles and their effect on the academic performance of the dental students are scarce in the literature.

Hence, this study was undertaken to evaluate the predominant learning styles and their influence on the academic performance of dental students. The differences in the learning style preferences if any based on the gender and between the pre-clinical and clinical students were also assessed.

Materials and Methods

It was a cross-sectional questionnaire-based study involving 322 undergraduate dental students from years 1 to 5. Individual consent was obtained from all the participants who were willing to participate in the study. The study was carried out after obtaining the approval from the University Human & Animal Ethics Committee (AUHAEC). The questionnaire employed in the study consisted of two parts. First part of the questionnaire comprised of demographic details (name, age, and gender) and year of study of the participants and the second part consisted of a structured VARK questionnaire (Version 7.8).

The VARK questionnaire was used to assess the four different learning styles: Visual, Auditory, Reading and Kinesthetic. The questionnaire used in the study consists of 16 multiple-choice questions with four options to choose an answer for each question. Each option signifies one of the four learning styles. Students can select more than one option for each question. VARK scoring chart is used to calculate the total score for all the four learning style categories of a participant.

Students were briefed about the main purpose of the study and subsequently hardcopies of the questionnaires were circulated to the students after the lecture classes. No communication was allowed among the students while answering the questionnaire and the students had to answer to the best of their understanding. Academic performance was assessed by the scores achieved in the continuous assessment examination and the overall average score was calculated. All the data was coded and the confidentiality was maintained.

Statistical Analysis:

Results were analyzed using Statistical Package for the Social Sciences (SPSS) software for windows version 22. Independent samples' t-test was carried out to evaluate the differences in the mean scores of all the four learning style categories between the female students and the male students. This test was also used to explore the differences in the mean scores of all the four learning style categories between the preclinical and clinical students. The predominant learning styles among the male & female students and the preclinical & clinical students were calculated. Pearson's correlation coefficient test was utilized to determine whether there is a relationship between the academic performance and the mean scores of different learning styles.

Results and Discussion

Of the 322 participants who completed the questionnaires, only 298 responses were complete and considered for the statistical analysis. Among the 298 participants, 192 (64.43%) were female students and 106 (35.57%) were male students. Majority of the students 282 (94.63%) were unimodal learners and only 3.69% of students were bimodal learners with only 1.68% of multimodal

learners.

Independent samples' t-test was performed to evaluate the differences in the mean scores of all the four learning style categories between the female students and the male students. An alpha level of 0.05 was utilized. Descriptive statistics for all the four learning styles are presented in the Table 1. There were no statistically significant differences noted between the female and the male students in regards to the mean scores of visual ($t(296) = -0.796, p=0.426$), auditory ($t(296) = 0.061, p=0.952$) and kinesthetic ($t(296) = -1.681, p=0.094$) types of learning styles. Pertaining to the mean scores of "Reading" learning style, there was statistically significant difference noted between the female students and the male students ($t(296) = 2.402, p=0.017$). The predominant learning style among the male students was kinesthetic type with a mean score of 27.95% followed by visual learners 27%, auditory 24.47% and the reading type of learners with 20.58%. Among females, visual learners are predominant with a mean score of 25.88% followed by kinesthetic learners 25.55%, auditory 24.54% and reading type with 24.02%.

There were 128 students (42.95%) from the preclinical years (BDS Years 1&2) and 170 students (57.05%) from the clinical years (BDS Years 3, 4 &5). To explore the differences in the mean scores of all the four learning style categories between the pre-clinical and clinical students, Independent samples' t-test was employed. Descriptive statistics for all the four learning styles are presented in the Table 2. Statistically significant differences were noted between the preclinical and the clinical students in regards to the mean scores of visual ($t(296) = 2.179, p= 0.03$), auditory ($t(296) = 2.891, p= 0.004$), and reading ($t(296) = -3.324, p= 0.001$) types of learners. With respect to kinesthetic type of learners

($t(296) = -1.289, p= 0.199$), there was no statistically significant differences noted between the preclinical and clinical students.

The predominant learning style amongst the preclinical students was visual type with a mean score of 27.98% followed by auditory learners 26.46%, kinesthetic 25.39% and the reading type of learners with 20.17%. Among clinical students, kinesthetic type of learners are predominant with a mean score of 27.17% followed by visual learners 25.04%, reading 24.74% and the auditory type of learners with 23.05%.

Pearson's correlation coefficient test was performed to determine whether there is a relationship between the academic performance and the mean scores of different learning styles. A very weak positive correlation value was obtained between the academic performance and the reading type of learning style ($r = 0.125, p= 0.03$). (Table 3) We could not find any significant relationship between the academic performance and the visual, auditory and kinesthetic learning styles.

Discussion:

The current study assessed the learn style preferences and the predominant learning styles of dental students using the VARK questionnaire. The overall predominant learning style amongst the students was kinesthetic which is followed by visual, auditory and reading types. Hands-on experience is vital for the dental students to achieve various clinical competencies. This can be the reason for having a stronger preference towards the kinesthetic learning style by the students. This finding varies from the study conducted by Robert J. Murphy et al in which the dental students showed predominantly the visual learning style followed by read-

TABLE 1. Descriptive statistics for all the four learning styles between the female students and the male students.

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|-------------|---------|-----|------|----------------|-----------------|
| Visual | Females | 192 | 4.14 | 1.835 | 0.132 |
| | Males | 106 | 4.32 | 1.93 | 0.187 |
| Auditory | Females | 192 | 3.93 | 1.574 | 0.114 |
| | Males | 106 | 3.92 | 1.746 | 0.17 |
| Read | Females | 192 | 3.84 | 1.978 | 0.143 |
| | Males | 106 | 3.29 | 1.74 | 0.169 |
| Kinesthetic | Females | 192 | 4.09 | 1.841 | 0.133 |
| | Males | 106 | 4.47 | 1.958 | 0.19 |

TABLE 2. Descriptive statistics for all the four learning styles between the pre-clinical and clinical students.

| Learning Style | Students Category | N | Mean | Std. Deviation | Std. Error Mean |
|----------------|-------------------|-----|------|----------------|-----------------|
| Visual | Pre-clinical | 128 | 4.48 | 1.94 | 0.171 |
| | Clinical | 170 | 4.01 | 1.773 | 0.136 |
| Auditory | Pre-clinical | 128 | 4.23 | 1.704 | 0.151 |
| | Clinical | 170 | 3.69 | 1.543 | 0.118 |
| Read | Pre-clinical | 128 | 3.23 | 1.837 | 0.162 |
| | Clinical | 170 | 3.96 | 1.916 | 0.147 |
| Kinesthetic | Pre-clinical | 128 | 4.06 | 1.791 | 0.158 |
| | Clinical | 170 | 4.35 | 1.956 | 0.15 |

TABLE 3. LEGEND: Correlation between different learning styles and the academic performance.

| | | Academic Grades | Visual | Auditory | Read | Kinesthetic |
|--|---------------------|-----------------|---------|----------|---------|-------------|
| Academic Grades | Pearson Correlation | 1 | -0.085 | 0.047 | .125* | -0.084 |
| | Sig. (2-tailed) | | 0.143 | 0.419 | 0.03 | 0.148 |
| | N | 298 | 298 | 298 | 298 | 298 |
| Visual | Pearson Correlation | -0.085 | 1 | -.399** | -.264** | -.370** |
| | Sig. (2-tailed) | 0.143 | | 0 | 0 | 0 |
| | N | 298 | 298 | 298 | 298 | 298 |
| Auditory | Pearson Correlation | 0.047 | -.399** | 1 | -.306** | -.162** |
| | Sig. (2-tailed) | 0.419 | 0 | | 0 | 0.005 |
| | N | 298 | 298 | 298 | 298 | 298 |
| Read | Pearson Correlation | .125* | -.264** | -.306** | 1 | -.489** |
| | Sig. (2-tailed) | 0.03 | 0 | 0 | | 0 |
| | N | 298 | 298 | 298 | 298 | 298 |
| Kinesthetic | Pearson Correlation | -0.084 | -.370** | -.162** | -.489** | 1 |
| | Sig. (2-tailed) | 0.148 | 0 | 0.005 | 0 | |
| | N | 298 | 298 | 298 | 298 | 298 |
| *. Correlation is significant at the 0.05 level (2-tailed). | | | | | | |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | | | |

ing type [17]. In a study done by Krishnamurthy et al among the medical students, the students showed high predilection towards the visual type of learning [2].

The predominant learning style among the preclinical students was visual type followed by auditory, kinesthetic and the reading type of learners. But the clinical students showed predilection towards the kinesthetic type of learning style followed by visual, reading and the auditory types. This might be explained by the fact that the main teaching style during the preclinical years is by giving lectures and problem-based learning tutorials which promotes visual and auditory learning styles. High predilection towards the kinesthetic type of learning among the clinical students can be attributed to the need for acquisition of clinical/practical skills during these years.

In regards to the analysis of gender differences, the findings of our study revealed that kinesthetic type of learning style is predominant in male students and visual learners are predominant among females. Similar results were observed in studies published by Krishnamurthy et al and Sarabi-Asiabar et al where male students showed kinesthetic type of learning styles and females showed visual type of learning styles predominantly [2, 18]. Though, statistically significant difference noted between the female students and the male students in relation to the mean scores of reading type of learning style, there were no statistically significant differences noted pertaining to the mean scores of visual, auditory and kinesthetic types of learning styles. These findings are consistent with the studies published by Slater JA et al and Urval RP et al where the authors could not find statistically significant differences between the male and female students [19, 20].

Though, we could not find any significant relationship between the academic performance and the visual, auditory and kinesthetic types of learning styles, a very weak positive correlation was observed between the academic performance and the reading type of learning style. No significant correlation was noted between the academic performance and the learning styles of the students in the studies published by Urval et al., 2014 and Baykan et al., 2007. We could not draw any generalized conclusions with regard to the influence of learning styles on the academic performance with the existing literature.

Limitations and Recommendations:

Our study has few limitations. It is a cross-sectional study involving the dental students of only one University. A longitudinal, multicenter study involving a cohort of students is more helpful in understanding the learning style preferences of the dental students and their influence on the academic performance.

Conclusion

The results of our study showed that the predominant learning style among the male students was kinesthetic type followed by visual, auditory and the reading type of learners. Visual learners are predominant among females followed by kinesthetic, auditory and reading type of learners. There was statistically significant difference noted between the female students and the male students in regards to the mean scores of reading type of learning style. Pertaining to the mean scores of visual, auditory and kinesthetic types of learning styles between the female and the male students, there were no statistically significant differences noted.

The predominant learning style amongst the preclinical students was visual type followed by auditory, kinesthetic and the reading type of learners. Among clinical students, kinesthetic type of learners is predominant followed by visual, reading and the auditory type of learners. Statistically significant differences were noted between the preclinical and the clinical students in regards to the mean scores of visual, auditory and reading types of learners. Regarding, kinesthetic type of learners there was no statistically significant differences noted between the preclinical and clinical students.

A very weak positive correlation was observed between the academic performance and the reading type of learning style. We could not find any significant relationship between the academic performance and the visual, auditory and kinesthetic types of learning styles.

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