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Analyzing the relationship between learning styles (Kolb and VARK) and creativity with the academic achievement of dental students

Mahdokht Taheri, Mehran Falahchai¹, Mandana Javanak, Yasamin Babae Hemmati², Mehdi Dasht Bozorgi³

Medical Education Research Center, Education Development Center, Guilan University of Medical Sciences, Rasht, Iran, ¹Department of Prosthodontics, Dental Sciences Research Center, School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran, ²Department of Orthodontics, Dental Sciences Research Center, School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran, ³School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran

Address for correspondence:

Dr. Yasamin Babae Hemmati, Department of Orthodontics, Dental Sciences Research Center, School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran.
E-mail: yasamin.hemmati@gmail.com

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Abstract:

BACKGROUND: One of the influential factors in students' learning is their learning styles which have the capacity to change. Furthermore, creativity is considered one of the essential cognitive features of humans. Thus, this study aimed to analyze the relationship between learning styles (Kolb and VARK) and emotional creativity with the academic achievement of dental students.

MATERIALS AND METHODS: In this descriptive-analytical study, the statistical population included dental students of the third semester and above (250 persons). The data collection tools included Kolb and VARK learning style questionnaires, Averill emotional creativity questionnaire, the total Grade Point Average (GPA), and the GPA over the past two semesters of students to measure academic achievement. The data were analyzed using the measures of the descriptive (mean and standard deviation) and the inferential statistics tests including one-sample *t*-test, independent *t*-test, correlation coefficients of Pearson, and Eta squared.

RESULTS: Based on Kolb and VARK learning styles, the majority of the students had accommodating learning style (64%) and read-write style (31.6%) and also were single-styled (80.4%). No significant relationship was found between the learning styles (Kolb and VARK) and creativity with academic achievement. The students scored higher than average in emotional creativity and all of its three elements. Moreover, there was a significant relationship between emotional creativity and the gender of the students ($P = 0.01$). Female students showed higher emotional creativity (97.26 ± 10.34) compared to the male students (94.24 ± 8.96).

CONCLUSION: There was no significant relationship between learning styles and emotional creativity of the students with their academic achievement. The accommodating and read-write learning styles were more prevalent among students and they showed high emotional creativity.

Keywords:

Academic achievement, creativity, dental students, learning

Introduction

Students are considered one of the selected stratum of any country's society that also shape its future.^[1] Therefore, the psychological traits of students and factors affecting their academic performance should be noted.^[2] Learning is a very complex variable that is influenced by several

factors such as intelligence, motivation, proper environment, domestic factors, community, school quality, and teacher quality. Similarly, the learning style of learners is another factor contributing to their learning.^[3] Learning styles are personal processes that are used to understand and memorize information and acquire knowledge or a skill.^[4] Keefe defines

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learning styles as combination of cognitive, emotional, and physiological features that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment.^[5] Knowledge of the essence and types of learning styles and the specific type of learning style used by each student helps the teachers assist their students in making optimal use of various learning styles. Moreover, it could change their teaching method to correspond with the learning style of their students in order to achieve the highest academic efficiency.^[3]

Kolb's model is among the methods used to assess learning styles. Based on this theory, students achieve academic success when they can make their learning styles compatible with their learning environment and adapt with it properly.^[6] This theory states that learning happens in a four-staged process which includes concrete experience, reflective observation, abstract conceptualization, and active experimentation. This presents two dimensions: concrete experience through reflective observation and abstract conceptualization for the purpose of active experimentation. These two dimensions consist of four different learning styles: converging, diverging, assimilating, and accommodating.^[7]

The VARK questionnaire is another method which is designed to assess students' learning and study. In this method based on their abilities, students are divided into subgroups such as individuals with strong visual performance (the visual style), individuals with strong reading and writing performance (the read and write style), individuals with strong listening performance (the aural style), individuals with strong skilled performance (the kinesthetic style), and individuals with multimodal performance that simultaneously use two or more abilities to learn.^[8]

Creativity as one of the cognitive and essential features of humans is potentially inherited and existent in each individual more or less.^[9] "Creativity is the interaction among aptitude, process, and environment by which an individual or group produces a perceptible product that is both novel and useful."^[10] Emotional creativity as a new realm in the discussion about the interaction between emotion and cognition has been introduced by Averill.^[11] Emotional creativity consists of expressing yourself (authenticity) with a new method (novelty) based on which the individual's lines of thought are expanded and their interpersonal relationships are increased (effectiveness). According to this definition, authenticity, novelty, and effectiveness are three main elements of the emotional creativity.^[11]

Understanding the factors affecting academic achievement can improve educational planning and

increase teaching efficiency.^[12] Understanding the type of learning style, students' creative ability, and their relationship to academic achievement provides the basis for moving toward targeted learning.^[13] Identifying the learning style of learners in various fields is essential due to the diversity of personal traits in learning. In addition, accurate awareness of the emotional creativity of students and their academic enthusiasm can build insight in authorities who are closely involved in the higher education system. Thus, the goal of the current research is to study learning styles, emotional creativity, and their relation with the academic achievement of the dental students.

Materials and Methods

In this descriptive-analytic study, the statistical population is comprised of dental students of the third semester and above (554 persons) in the 2019–2020 academic year. Using the simple random sampling technique, the sample size was decided to be 250 persons based on the Morgan's table. The inclusion criteria were to be a student of the third semester or above, and the exclusion criteria were to be not inclined in participating. Furthermore, those students that fail to fill one of the questionnaires have been eliminated from the study. Researchers assured the students that their information would be kept confidential and the results would be published without mentioning any names and merely as part of a group. Three questionnaires were used in the present study. Two of the questionnaires were related to assessing the learning styles of the students (Kolb and VARK) and the other questionnaire was regarding the emotional creativity of the students.

Kolb learning style questionnaire includes 12 multiple-choice questions. The participants respond to the questions with regard to how they learn, and the scores of respondents are ranked from 1 to 4 in which 4 is most consistent with the participants' learning style, 3 to some extent, 2 poorly consistent, and 1 not consistent. Each option represented one of the four main learning styles: concrete learning, reflective observation, abstract conceptualization, and active experimentation. By adding the scores of every option attributed to one of the four main learning styles, four grades were achieved for the four learning styles. By two-by-two subtraction of the scores of abstract conceptualization from concrete learning, and also subtraction of the scores of active experimentation from reflective observation, two new grades were attained. These two new grades were put on the two axes of the coordinate system and from the convergence of these numbers on the two axes, four learning styles namely diverging, converging, assimilating, and accommodating were represented. The content validity of the Kolb questionnaire has been

studied and verified.^[14,15] Based on the Cronbach's alpha method, the internal reliability of the questionnaire was estimated to be 0.96 in Allaa's study.^[16]

VARK learning style questionnaire consists of 16 questions on the four learning styles (visual, aural, read-write, and kinesthetic). The questions were designed to be about the individual's performance in various situations. All questions had four choices and each choice assessed one aspect of a learning style and the participants were able to choose more than one option. Hence, each individual could have scored 16 at most and 0 at least in every dimension. Leite had studied the validity and reliability of this questionnaire in 2010 in which the subscale of this learning style was fluctuating between 0.77 and 0.85.^[17] Javadinia estimated the reliability of this questionnaire to be 0.8 by taking the test for a second time after 2 weeks on all the students who had participated in the previous stage of the same test and verified its validity as well.^[18]

Averill's emotional creativity questionnaire consists of 30 questions regarding how the students think, feel, and perform in different situations and their beliefs about different topics. The aim of this questionnaire was to evaluate three aspects of emotional creativity (namely emotional preparedness, the ability to react, and effectiveness and authenticity) in students. The method of grading was based on a scale with five choices: 5 being the highest score and 1 the lowest score.

The academic achievement was assessed using the Grade Point Average (GPA) of the students over the past two semesters and their total GPA. Using SPSS 19 (SPSS Inc., Chicago, IL, USA) and Microsoft Excel, the data were analyzed by measuring the descriptive statistics (mean and standard deviation) and the inferential statistic tests such as one-sample *t*-test, independent *t*-test, Pearson correlation coefficient, and Eta-squared.

Results

The results showed that from the 250 total students that participated, 129 individuals (51.6%) were male and 121 individuals (48.4%) were female. The average age of the students was 24 ± 2.9 . The results also indicated that among VARK styles, the read and write style had the highest mean with 5.2 ± 1.99 and the visual style had the lowest mean with 3.8 ± 2.05 . Among the Kolb learning styles, learning through doing or active experimentation had the highest mean with 34.50 ± 5.17 and the concrete learning had the lowest mean with 25.17 ± 4.14 . Among the elements of emotional creativity, novelty or the ability to react had the highest mean with 44.97 ± 5.79 and the emotional preparedness element had the lowest mean with 22.17 ± 2.91 .

Regarding frequency distribution values of the dentistry students according to Kolb's learning style, the preference style of the dental students was accommodating style (64%) and then assimilating style (16%), diverging style (14.8%), and converging style (5.2%), respectively.

According to VARK Learning Style, each student can use any of these single styles or two, three, or even four styles together. Based on the results of the present study, the preference style of the dental students was the read-write style (31.6%), and then aural style (24.8%), kinesthetic style (12.4%), and visual style (11.6%), respectively. The results also showed that the majority of the students preferred single learning style (80.4%) and only 19.6% of them were using blended learning style. Among the blended learning styles, the most frequent one was the read-write/aural style (5.6%).

Table 1 shows that there was a significant distinction between female and male students in the level of emotional creativity. Female students had significantly higher emotional creativity than male students ($P = 0.01$). Furthermore, emotional preparedness and novelty among the elements of the emotional creativity were significantly higher in female students than the male ones. In general, one sample *t*-test showed that the students scored higher than average in emotional creativity and all of its three elements ($P < 0.01$).

To determine the relationship between emotional creativity and academic achievement, the Pearson correlation coefficient was used. Table 2 shows that there is no significant relationship between emotional creativity and academic achievement of the students ($r = 0.08$, $P > 0.01$).

Table 3 reveals that there is no significant relationship between Kolb learning style and academic achievement by calculating the Eta-squared correlation coefficient 0.005 ($P = 0.76$). Moreover, there was no significant relationship between VARK learning style and academic achievement by calculating the Eta-squared correlation coefficient 0.019 ($P = 0.32$) [Table 4].

Discussion

The results of the current study indicated that the dominating Kolb learning style is the accommodating style. The assimilating, diverging, and converging styles are in the next ranks, respectively. The fact that these students mostly have accommodating learning styles, as the results of the present study, means that instead of caring for learning through mental and abstract teachings, which is a necessity for the assimilating learning style, they prefer and like concrete concepts and working in a real environment. Perhaps

Table 1: Comparison of emotional creativity based on gender among the dentistry students (independent t-test)

Variable	Gender	n	Mean±SD	F	T	Significant
Emotional creativity	Female	121	97.26±10.34	248	-2.47	0.01
	Male	129	94.24±8.96			
Emotional preparedness	Female	121	22.57±3.00	248	-2.03	0.04
	Male	129	21.82±2.77			
Novelty	Female	121	45.76±6.14	248	-2.25	0.02
	Male	129	44.14±5.25			
Effectiveness - authenticity	Female	121	28.93±3.51	248	-1.39	0.16
	Male	129	28.27±3.98			

SD=Standard deviation

Table 2: Results of the correlation matrix of emotional creativity with academic achievement variables

Row number	Variables	1	2	3	4	5
1	Academic achievement	1				
2	Emotional creativity	0.08	1			
3	Emotional preparedness	0.05	0.56**	1		
4	Novelty	0.06	0.89**	0.30**	1	
5	Effectiveness - authenticity	0.06	0.78**	0.23**	0.56**	1

**P≤0.01

Table 3: Relationship between academic achievement variables and Kolb learning style

Variables	Source	SS	Significant
Academic achievement	Between groups	1.93	0.76
Kolb learning style	Within groups	412.01	
	Total	413.93	

SS=Sum of square

Table 4: Relationship between academic achievement variables and VARK learning style

Variables	Source	SS	Significant
Academic achievement	Between groups	7.85	0.32
VARK learning style	Within groups	406.09	
	Total	413.93	

SS=Sum of square, VARK=Visual, Auditory, Reading/Writing and kinesthetic?

in defining the utilization of the accommodating style, it can be claimed that the learners learn the material in a practical way and through their emotions. This is not unexpected from dental students since the nature of their field involves practicality and students have a close relationship with their patients and so they favor this style. However, in the study of Wang and Liu.^[19] on the relation of dental students' learning styles to their satisfaction with traditional and inverted classroom models, the converging, assimilating, accommodating, and diverging styles were the dominant learning styles among participants in order from most dominance to least. Study of Hosseini *et al.*^[20] on dental students showed that the dominant learning style of participants was assimilating. Moreover, some other studies^[21-23] (the majority were not on the dental students) were not in line with the results of the current study.

The results of this study indicate that based on the VARK learning style, dental students mostly prefer the

read-write style and then aural, kinesthetic, and visual styles, respectively. The results also reveal that generally most of the students prefer the single-styled learning style and only a few of them use multistyled learning styles. Mozaffari *et al.*^[24] demonstrated that most dental students have the read-write learning style which is in line with the present study. Kumar *et al.*^[25] have also mentioned similar results. The read-write learning style may have been brought to the university by students as a habit developed from their time in high school. Considering the diversity of learning styles adopted by university students, it is imperative that teachers and planners, in addition to being cognizant of this diversity, design and execute their academic plans and methods according to the needs of the students so that the academic efficiency and learning can be improved as much as possible. However, some studies on dental students showed that kinesthetic and aural are the dominant learning styles.^[3,26] Studies of Nuzhat *et al.*^[27] Daud *et al.*^[28] and Urval *et al.*^[29] suggested that the aural learning style is prevalent among medical students, which is contradictory to the results of the current study. Moreover, the study of Bokhari and Zafar^[30] on medical students showed that kinesthetic and then aural are commonly used learning styles. Perhaps, the reason behind this discrepancy is in the age of learners, the teaching methods, number of participants, and the cultural and surrounding conditions.

The results of the present study revealed that there is no significant relationship between emotional creativity and academic achievement among the dentistry students. This finding is in line with the study of Chifamba and Wijaya.^[31] Moreover, Olatoye *et al.*^[32] showed that there is no significant relationship between emotional

creativity and academic achievement of the students. However, other studies^[33-35] demonstrated that there is a significant relationship between emotional creativity and academic achievement of the students, which contradicts the findings of the current study. It is expected that emotional creativity augments students' ability to satisfy their academic needs, but the method for measuring learners' success may not encourage creativity. In this case, the very creative learners may not really enjoy much creative benefits. Teaching methods and the environment may also hamper the creative and emotional capabilities of the students of these faculties. Furthermore, the results indicated that female students enjoy more emotional creativity compared to the male students and this can be attributed to female students being more emotional and dealing with their personal-sentimental problems.

The present study was a kind of research in education which nowadays considers more valuable in the field of medical education. Another strength point of the research was assessing the learning styles of the dentistry students for the first time at Guilan University of Medical Sciences. However, we were not able to control intervening variables during the process which can be considered as the weakest point of the present study.

Due to the differences in learning styles between students at the university, it is suggested that professors and educational planners design and implement their programs and teaching methods in order to fit the needs of students, so that educational efficiency and learning outcomes will be improving as much as possible. Moreover, given the practical nature of dentistry and accommodating learning style of the majority of the students in the present study, it can be suggested that planning practical workshops and increasing working hours in different parts of the dental clinics should be considered.

Conclusion

Within the limitation of the present study, it can be concluded that there is no significant relationship between learning styles and emotional creativity with the academic achievement. Moreover, the results showed that the predominant style among students is accommodating and read-write and they had high emotional creativity. Since the dentistry field is essentially practical and most students prefer the accommodating style, it is suggested that dental clinics set up practical workshops and raise the working hours for some sections of their clinic. The emotional needs of the students should also be identified and fulfilled in the creative process. Finally, authorities of the education system in the medical science universities should attempt to offer educational courses to foster emotional creativity in students.

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Conflicts of interest

There are no conflicts of interest.

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