Satisfaction and Effectiveness of Virtual Education Among Clinical Dental Students

Dehdilani M. MD[1], Pasha Abgarmi Sh.[2], Pourlak T. MD[3*]

Abstract:

Background and Objective: The rapid advancement of information and communication technology has revolutionized higher education, particularly within the medical and dental fields. Virtual education serves as a critical component of the learning process, providing students with enhanced access and flexibility, while also presenting challenges that warrant careful consideration. This study aims to evaluate the satisfaction levels of clinical dental students at Tabriz University of Medical Sciences with respect to virtual education and to identify the key factors influencing their learning experience.

Materials & Methods: A cross-sectional analytical study was conducted involving 165 clinical dental students who had completed at least one theoretical course through virtual education. Data were collected using a structured questionnaire developed by Houri et al. in 2022, which assessed various dimensions of online learning, including content delivery, professor-student interaction, technical support, and evaluation methods. The data were analyzed using SPSS software version 26, applying descriptive statistics, independent t-tests, and one-way ANOVA to explore differences in satisfaction based on gender, academic semester, and year of entry. The Pearson correlation coefficient was employed to examine the relationships between satisfaction scores and demographic factors, with a significance threshold set at a P-value of less than 0.05.

Results: Overall satisfaction scores ranged from 27 to 78, yielding a mean of 47.05 ± 8.6, indicating a moderate to high level of satisfaction with virtual education. Statistically significant differences in satisfaction levels were not observed between female (47.36 ± 8.41) and male students (46.84 ± 8.7) (P = 0.620), across academic semesters (seventh semester 46.18 ± 9.53, ninth semester 47.9 ± 3.8, and eleventh semester 46.18 ± 9.53) (P = 0.600), or between years of entry (2018 47.08 ± 13.8, 2019 47.3 ± 3.8, and 2020 46.18 ± 9.53) (P = 0.600).

Conclusion: The findings of this research suggest that virtual education is an effective means for delivering theoretical knowledge in the field of dental education. Nonetheless, it is essential to enhance interactive elements, adopt blended learning models, and strengthen technical support to increase student engagement and improve learning outcomes. This study underscores the necessity for ongoing assessment and refinement of virtual education strategies to better align with the educational needs of students.

***Keywords:** Virtual education, dental students, online learning, student satisfaction, e-learning, dental education*

[1]Assistant Professor of Anesthesiology, Department of Anesthesiology, Faculty of Medicine, Tabriz University of Medical Sciences
[2]Dental Student, Department of Maxillofacial Surgery, Faculty of Dentistry, Tabriz University of Medical Sciences
[3]Assistant Professor of Maxillofacial Surgery, Department of Maxillofacial Surgery, Faculty of Dentistry, Tabriz University of Medical Sciences
Received: 15/12/2025
Accepted: 11/04/2026

Corresponding Author: Dr. Tannaz Pourlak
Tel: 04133378563

E-mail: tannazpourlak@gmail.com

Background and Objective

The evolution of information and communication technology has profoundly transformed the landscape of higher education, particularly within the medical and dental sciences. Distance education has emerged as a vital component for conveying theoretical concepts and skill training, especially in the post-COVID-19 era, which has necessitated a transition towards remote learning.[1] This educational transformation offers opportunities to enhance access, flexibility, and efficiency in the learning process; however, it also presents challenges that require careful monitoring and optimization.[2]

Historically, dental education has placed significant emphasis on extensive practical and clinical training. The advent of virtual education allows for theoretical knowledge to be imparted in a more interactive and self-directed format. Research indicates that well-designed e-learning courses can markedly improve students' comprehension and retention of complex medical and dental concepts.[2] Furthermore, computer-based learning environments, particularly when integrated with multimedia content and interactive assessments, have demonstrated a positive correlation with increased student motivation and engagement.[3]

Despite these advantages, the efficacy of virtual education is contingent upon several factors, including the quality of educational resources, faculty engagement, technological infrastructure, and students' digital proficiency. A significant challenge within online learning environments is the diminished opportunity for face-to-face interactions between students and instructors, which can adversely impact the effectiveness of questioning and the immediacy of feedback.[4] Additionally, technical issues can further hinder the educational experience.[5]

As online education increasingly becomes a focal point in the field of dentistry, it is essential to examine student satisfaction with this mode of learning. Prior research has established that student satisfaction is a critical indicator of the effectiveness of educational objectives within online learning environments.[6] Notable factors influencing the overall student experience include the accessibility of course materials, the quality of instructor interactions, and the perceived significance of online assessments.[5] This study seeks to assess the satisfaction levels of clinical dental students at Tabriz University of Medical Sciences regarding their experiences in virtual education.

Materials and Methods

1. Study Design and Participants

This cross-sectional analytical study evaluated the satisfaction levels of clinical dental students about their virtual education experience at Tabriz University of Medical Sciences. The study participants consisted of clinical students who had successfully completed at least one theoretical course through online educational platforms and provided informed consent for participation in the research.

2. Inclusion and Exclusion Criteria

The study included clinical dental students who had successfully completed at least one theoretical course in a virtual format and who provided informed consent to participate in the research. Exclusions from the study encompassed students who had no prior experience with virtual education and those who did not fully complete the questionnaire.

3. Data Collection

Data were collected through a structured self-reported questionnaire designed to evaluate key aspects of virtual education. This instrument assessed several dimensions, including the quality of content delivery—evaluating clarity, relevance, and organization of materials—the nature of professor-student interactions in the online environment, the availability of technical support, the user-friendliness of the Learning Management System (LMS), and the assessment methods employed (focusing on the fairness and reliability of online tests and assignments). Responses were recorded on a

five-point Likert scale, where 1 indicated "strongly disagree" and 5 represented "strongly agree." Overall satisfaction scores were computed by summing the individual item scores, with higher totals indicating greater satisfaction. The questionnaire, developed by Houri et al. at Payame Noor University of Isfahan, demonstrated established validity and a robust reliability coefficient of 94%. The total item count was 21, with a scoring range from 21 to 105, where higher scores correlated with elevated satisfaction levels. Given its focus on the effectiveness of virtual education, the questionnaire is posited to be applicable across a variety of academic fields.[7]

4. Sample Size Determination

Sample size was determined based on prior research concerning satisfaction with virtual education. Assuming a standard deviation of 6 and a permissible error margin of one unit at a 95% confidence level, the minimum sample size was calculated to be 138 participants. To account for a potential dropout rate, this figure was increased by 20%, resulting in a final sample size of 165 students for the study.

5. Statistical Analysis

Data were analyzed using SPSS software version 26. Descriptive statistics, including mean, standard deviation, and frequency distribution, were employed to characterize the satisfaction levels among students. The Kolmogorov-Smirnov test was utilized to verify the normality of data distribution. An independent t-test was conducted to assess differences in satisfaction scores based on gender, while one-way ANOVA was employed to compare satisfaction across different academic years. The significance level was established at $P < 0.05$.

6. Ethical Considerations

This research received approval from the Ethics Committee of Tabriz University of Medical Sciences (approval code: IR.TBZMED.REC.1402.962). Prior to the initiation of the study, informed consent was acquired from all participants, and data confidentiality was rigorously maintained throughout all phases of the research. All participant information remained anonymous and was utilized exclusively for academic purposes.

Findings

Demographic Characteristics of Participants

A total of 165 clinical dental students participated in this study, of which 52.7% (87 students) were female and 47.3% (78 students) were male. The mean age of participants was 23.37 ± 0.99 years, with ages ranging from 22 to 26 years. A weak positive correlation was observed between age and satisfaction scores, indicating that older students reported slightly higher levels of satisfaction; however, this correlation was not statistically significant ($r = 0.0001$, $P = 0.98$) (refer to Figure 1).

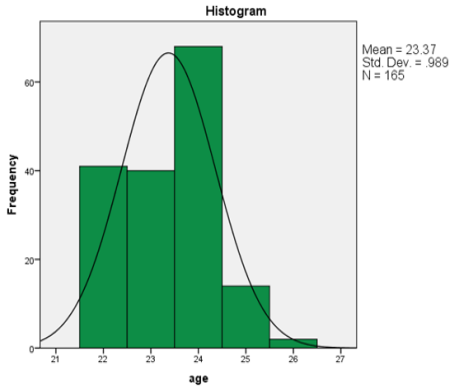

Figure 1 - Histogram of age distribution of students

Overall Satisfaction with Virtual Education

Satisfaction scores varied from 27 to 78, yielding a mean of 6.8 ± 5.47. Histogram analysis indicated that the distribution of these scores approximated a normal curve, reflecting that the majority of students reported moderate to high satisfaction with their virtual education experience.

Satisfaction Based on Gender

As illustrated in Table 1, the mean satisfaction scores for female students (41.8 ± 36.47) were marginally above those of male students (84.8 ± 7.47); nevertheless,

this difference was not statistically significant (P = 0.620).

Table 1- Comparison of satisfaction based on year of entry

Year of entry	Number	Mean satisfaction score	Standard deviation	Probability value
1397	55 people	47.08	8.13	
1398	55 people	47.9	8.3	0.006
1399	55 people	46.18	9.53	

Satisfaction Based on Year of Enrollment

Participants were divided into three groups based on their year of enrollment. Comparisons of satisfaction scores among these groups revealed no significant differences (P = 0.600), indicating that students from various academic years exhibited similar levels of satisfaction (refer to Table 1).

Table 2- Satisfaction based on academic semester

Academic semester	Number	Mean satisfaction score	Standard deviation	Probability value
Semester 11	55 people	47.08	8.13	
Semester 9	55 people	47.9	8.3	0.006
Semester 7	55 people	46.18	9.53	

Satisfaction Based on Academic Term

In our analysis, students were classified into three groups according to their academic terms. The statistical evaluation indicated no significant variations in satisfaction levels among these groups (P = 0.6), suggesting a consistent level of satisfaction across different stages of clinical education (refer to Table 2).

Discussion

Virtual learning utilizes the Internet and digital technologies to provide students with access to educational content without necessitating physical presence in a traditional classroom setting.[1,5] The COVID-19 pandemic has ushered in substantial changes within educational systems globally, prompting many institutions to transition either fully or partially to virtual learning platforms.[5,8] This abrupt shift not only created new learning opportunities but also posed challenges for both students and instructors. In the realm of dental education, virtual learning has garnered attention for its capability to transcend geographical and epidemiological barriers, facilitating remote education tracking for students.[10] Prior research has shown that such methodologies can effectively enhance theoretical knowledge and introduce students to innovative educational practices.[11] The findings of the present study, which document moderate to high satisfaction levels among clinical dental students at Tabriz University of Medical Sciences with respect to virtual education, corroborate this existing evidence.

Our study aligns with findings from Wenger et al. (2023), who explored the implementation of interactive e-learning modules within medical education, concluding that formal digital educational tools significantly enhance student engagement. Furthermore, our results resonate with the research conducted by You et al. (2024), which demonstrated that interactive e-books surpass traditional resources in fostering confidence and comprehension in nursing education. These parallels underscore the pivotal role of interactive components in optimizing virtual education within clinical dentistry.[7,10]

A systematic review conducted by Mohammad et al. (2022) determined that approximately 75% of students expressed satisfaction with online education, emphasizing factors such as easy access to resources, technical support, and meaningful interaction with instructors as primary contributors to their satisfaction. Conversely,

this review also identified considerable deficiencies, including the lack of in-person interaction and direct guidance, challenges that our current study also recognized as detrimental to the quality of learning.[6] Subsequent studies have underscored significant limitations of virtual education in practice-oriented disciplines. For example, research by Marcus Medeiros et al. (2023) and Ohisato et al. (2022) asserts that while international online courses can provide valuable global perspectives, the absence of practical experience remains a significant barrier.[11,12] A study by Deng et al. (2023) revealed the effectiveness of mobile visual atlases in teaching histology, suggesting that the integration of such tools into dental education could create a more enriched and visually engaging learning experience.[13]

Despite the distinctive advantages offered by virtual education, inherent weaknesses adversely affecting student satisfaction must be acknowledged. The foremost deficiencies include: the lack of clinical practical experience; limitations in real-time faculty-student interactions[8] that hinder active engagement and mentorship roles;[14] technical difficulties such as slow internet speeds and inadequate educational platforms;[5] and concerns regarding the reliability and fairness of online assessments.[6] To optimize this educational modality, we advocate for the adoption of hybrid models that integrate hands-on workshops with online theoretical instruction designed to cultivate practical skills. Furthermore, the inclusion of interactive elements such as virtual simulators, case discussions, and game-based learning modules could substantially bolster student engagement.[10]

Enhancing the technical infrastructure, improving the quality of learning management systems, and ensuring equitable internet access and technical support are critical measures to pursue in the future. In terms of assessment, the implementation of supervised testing, competency-based evaluations, and AI-assisted grading tools can increase the credibility and fairness of evaluations.[7]

This study, which encompassed a substantial sample of 165 students, provides valid and generalizable quantitative insights into the satisfaction levels associated with virtual education in clinical dentistry. Not only do the findings affirm the efficacy of this educational approach, but they also illuminate the urgent need for structural and content reforms aimed at substantially elevating the quality and effectiveness of virtual education.

Conclusion

The results of this research indicate that virtual education represents a valuable asset in contemporary dental education, affording flexibility and accessibility while simultaneously illuminating various challenges. The study highlights the potential of hybrid educational models to foster more effective interactions between instructors and students, thereby enhancing the overall efficacy of virtual education in dentistry through improved technical support. Moreover, the integration of interactive elements, competency-based assessments, and advanced digital resources is essential in enriching the quality of virtual education within clinical dentistry.

However, several limitations must be acknowledged in the present study. Firstly, the effectiveness of virtual education is significantly influenced by the prevailing technological infrastructure across different institutions, which may restrict the generalizability of the results. Secondly, this research did not assess variations in participation and learning outcomes based on students' levels of digital literacy or access to equipment. Another limitation pertains to the predominant emphasis on technological aspects of virtual education, with less focus on the pedagogical strategies required for optimal implementation in clinical contexts. Lastly, it is important to recognize that the findings reflect current trends and that future innovations or challenges in virtual education, which evolve concurrently with technological advancements, may not be comprehensively captured.

References:

1. Bozkurt A, Jung I, Xiao J, Vladimirschi V, Schuwer R, Egorov G, et al. A global outlook to the interruption of education due to COVID-19 pandemic: Navigating in a time of uncertainty and crisis. Asian Journal of Distance Education. 2020; 15(1): 1-126.
2. Schönwetter D, Reynolds P, Eaton K, De Vries J. Online learning in dentistry: an overview of the future direction for dental education. Journal of oral rehabilitation. 2010; 37(12): 927-40.
3. Johnson SG, Potrebny T, Larun L, Ciliska D, Olsen NR. Usability methods and attributes reported in usability studies of mobile apps for health care education: scoping review. JMIR Medical Education. 2022; 8(2): e38259.
4. Hrastinski S. Asynchronous and synchronous e-learning. Educause quarterly. 2008; 31(4):51-5.
5. Dhawan S. Online learning: A panacea in the time of COVID-19 crisis. Journal of educational technology systems. 2020; 49(1):5-22.
6. Mohammed LA, Aljaberi MA, Amidi A, Abdulsalam R, Lin C-Y, Hamat RA, et al. Exploring factors affecting graduate students' satisfaction toward E-learning in the era of the COVID-19 crisis. European Journal of Investigation in Health, Psychology and Education. 2022; 12(8): 1121-42.
7. Horri E, Ayat S. Validation of Student Satisfaction Questionnaire of Payam Noor University E-Learning System (LMS). Research in School and Virtual Learning. 2022; 10(2):51-60.
8. Martinez-Garcia A, Horrach-Rosselló P, Mulet-Forteza C. Evolution and current state of research into E-learning. Heliyon. 2023;9(10).
9. Roth MJ, Maggio LA, Costello JA, Samuel A. E-learning Interventions for Quality Improvement Continuing Medical Education-A Scoping Review. Journal of Continuing Education in the Health Professions. 2025; 45(1):35-43.
10. Yu T, Dai J, Chen X, Wang C. Factors influencing continuance intention in blended learning among business school students in China: Based on grounded theory and FsQCA. Interactive Learning Environments. 2024:1-28.
11. Palmier AC, Braga ISN, da Silva RR, Lucas SD. Auxiliares em saúde bucal aperfeiçoando conhecimentos e práticas. 2021.
12. Naciri A, Radid M, Kharbach A, Chemsi G. E-learning in health professions education during the COVID-19 pandemic: a systematic review. Journal of educational evaluation for health professions. 2021; 18.
13. Bassey G. TEXILA INTERNATIONAL JOURNAL OF PUBLIC HEALTH.
14. Bhan A. Online Assessment-Enhanced Learning in Pre-Doctoral Orthodontic Clinical Decision Making: Temple University; 2018.