ERD European Journal of Research in Dentistry

ORIGINAL ARTICLE / ARAŞTIRMA MAKALESİ

Quantitative and Qualitative Analysis of Distance Learning in Dental Education During COVID-19 Outbreak

COVID-19 Salgınında Diş Hekimliğinde Uzaktan Eğitimin Kantitatif ve Kalitatif Analizi

Hatice Kalender[1], Şükrü Can Akmansoy[2], Mehmet Özyurt[3], Tuğba Emine Beyhan[4], Burcu Aksoy[5], Zehra Özge Çandereli[6], Nur Şişman-Kitapçı[7], Berceste Polat-Akmansoy[8], *Okan Cem Kitapçı[7], Nuri Sertaç Sırma[9], Ümit Karaçaylı[10], Meral Yay[11], John A.G. Buchanan[12], Farida Fortune[13], Yasemin Kulak-Özkan[2], Gonca Mumcu[14]

[1] Vocational School, Department of Medical Services and Techniques Program of Medical Imaging Techniques, Maltepe University, Istanbul, Turkey.
[2] Deparment of Prosthodontics, Faculty of Dentistry, Marmara University, Istanbul, Turkey.
[3] Department of Health Management, Faculty of Health Sciences, Mardin Artuklu University, Mardin, Turkey.
[4] Department of Health Management, Faculty of Business Administration, Düzce University, Düzce, Turkey.
[5] Department of Health Management, Institute of Postgraduate Education, Istanbul University-Cerrahpasa, Istanbul, Turkey.
[6] Department of Health Management, Faculty of Economics and Administrative Sciences, İzmir Katip Çelebi University, Izmir, Turkey.
[7] Department of Health Management, Faculty of Health Sciences, Marmara University, Istanbul, Turkey.
[8] Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Marmara University, Istanbul, Turkey.
[9] IT Director, Faculty of Dentistry, Marmara University, Istanbul, Turkey
[10] Department of Oral and Maxillofacial Surgery, Gülhane Faculty of Dentistry, University of Health Sciences, Ankara, Turkey.
[11] Department of Statistics, Faculty of Science and Arts, Mimar Sinan Fine Art University, Istanbul, Turkey.
[12] Centre for Education and Innovation, Institute of Dentistry, Faculty of Medicine and Dentistry, Queen Mary University of London, United Kingdom.
[13] Centre for Immuno-Biology and Regenerative Medicine, Behçet's Centre of Excellence, Barts and the London School of Medicine and Dentistry, Queen Mary University of London, United Kingdom.
[14] Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Istanbul Okan University, Istanbul, Turkey.

Corresponding Author
Okan Cem Kitapçı (✉)
okancm@yahoo.com

Article History

Submitted	16.08.2024
Revised	27.12.2024
Accepted	29.12.2024
Published	30.04.2025

ABSTRACT

Objectives: The aim of this study was to analyse the feedbacks that dental students provided about Distance Learning (DL) and to find clues regarding readiness for possible national or global emergencies during a potential COVID-19 outbreak by using both Quantitative and Qualitative Methods.

Materials and Methods: This cross-sectional study involved 608 dental students (F/M: 405/203). Data were collected by using online Focus-Group discussions as a Qualitative method and electronic questionnaires (E-Questionnaire) as a Quantitative method. In both methods, students were asked to evaluate questions or statements focused on cognitive load and the advantages and disadvantages of DL. Moreover, in the E-Questionnaire, the integration of technology into dental education was evaluated by the Tendency Scale for Technology Use in Class (TSTUC).

Results: Two subtopics, namely *"Technology Use"* and *"Motivation and Technology"* were defined for the TSTUC scale in the Factor Analysis. Elevated scores were observed in dental students' responses, whose professional improvements regarding *"Internalizing the professional environment"* (4.214±0.630 vs 3.991±0.766)" and *"Critical thinking"* (4.026±0.683 vs 3.667±0.891)" were positively affected by DL ($p<0.05$). During the focus-group discussions, *"Difficulties in the Understanding of the Course Content"*, *"Inability to Relate Theoretical Knowledge with Practice"*, and *"Insufficient Interactions between the Students and Lecturers"* were defined to be the main problems regarding DL.

Conclusions: Future DL strategies should be taken into account, considering the constraints of DL for dentistry students' professional development. Moreover, the TSTUC scale was found to be a valid and reliable tool to evaluate the implementation of DL for dental students' education.

Keywords: Dental student, Dental education, Distance learning.

How to cite this article: Kalender H, Akmansoy ŞC, Özyurt M, Beyhan TE, Aksoy B, Çandereli ZÖ, Şişman-Kitapçı N, Polat-Akmansoy B, Kitapçı OC, Sırma NS, Karaçaylı Ü, Yay M, Buchanan JAG, Fortune F, Kulak-Özkan Y, Mumcu G. Quantitative and Qualitative Analysis of Distance Learning in Dental Education During COVID-19 Outbreak. *European Journal of Research in Dentistry,* 2025;9(1): 9-17. DOI: http://dx.doi.org/10.29228/erd.87

ÖZ

Amaç: Bu çalışmanın amacı, COVID-19 pandemisi sebebiyle uygulanan uzaktan eğitimin lisans diş hekimliği eğitimine etkilerini kantitatif ve kalitatif yöntemlerle değerlendirmektir.

Gereç ve Yöntemler: Bu kesitsel çalışmaya 608 diş hekimliği öğrencisi (K/E: 405/203) dâhil edilmiştir. Veriler, kalitatif yöntem kullanılarak odak grup görüşmeleri ve kantitatif yöntem kullanılarak e-anket aracılığıyla elde edilmiştir. Her iki yöntemde de öğrencilere uzaktan eğitimin avantajları, dezavantajları ve uzaktan eğitimde bilişsel yük ile ilgili sorular sorulmuştur. Ayrıca, e-anket formunda diş hekimliği eğitimine teknolojinin entegre edilmesini değerlendirmek için "Derste Teknoloji Kullanımına Yönelik Eğilim Ölçeği (DTKEÖ)" kullanılmıştır.

Bulgular: Faktör analizinde "Teknoloji Kullanımı" ile "Motivasyon ve Teknoloji" boyutları tanımlanmıştır. UE'de "Mesleki ortamı içselleştirme (4,214±0,630 vs 3,991±0,766)" ve "Eleştirel düşünme (4,026±0,683 vs 3,667±0,891)" açısından mesleki gelişimlerinin olumlu yönde etkilendiğini düşünen diş hekimliği öğrencilerinde ölçeğin her iki alt boyutuna ait puanların daha yüksek olduğu gözlenmiştir ($p<0,05$). Odak grup görüşmelerinde belirtilen başlıca sorunlar; ders içeriğini anlamada güçlükler, teorik bilginin klinik uygulama ile ilişkilendirilememesi, öğrenci ve öğretim üyesi etkileşiminin yetersizliğidir.

Sonuç: Gelecekteki olası global düzeydeki acil durumlar için uzaktan eğitimin avantajları ve sınırlılıklarının yanı sıra diş hekimliği öğrencilerinin ihtiyaçları da göz önünde bulundurulmalıdır. Bununla birlikte DTKEÖ, diş hekimliğinde uzaktan eğitimin değerlendirilmesinde kullanılabilecek geçerli ve güvenilir bir ölçektir.

Anahtar Kelimeler: Diş hekimliği öğrencisi, Diş hekimliği eğitimi, Uzaktan öğrenim.

INTRODUCTION

Educational activities were adversely affected by the quarantine and social isolation due to the COVID-19 pandemic (Amir et al., 2020; Chang et al., 2021; Clemente et al., 2021; Schlenz et al., 2020; Silva et al., 2021). Although theoretical, pre-clinical and clinical training are fundamental elements of dental education, dentistry schools should be required to modify their standard curriculum to cope with interruptions during the prevalence of coronavirus disease (Loch et al., 2021; Schlenz et al., 2020; Silva et al., 2021; Wang et al., 2021). Commenting on this point, the World Economic Forum (WEF) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) declared that integrating technology into education is vital for the future (UNESCO, 2020).

Distance learning (DL) as a technology-based education method is regarded as an option for dental education at universities to manage global health risks (Abbasi et al., 2020; Amir et al., 2020; Chang et al., 2021; Dost et al., 2020; Moazami et al., 2014; Schlenz et al., 2020; Silva et al., 2021; Varoni et al., 2022; Wang et al., 2021). While preclinical training and the theoretical courses were converted into a DL platform to continue dental education at the beginning of the pandemic, emergency cases were only treated in dental clinics to limit interaction among dental students, lecturers, and patients during the pandemic (Amir et al., 2020; Herr et al., 2021; Schlenz et al., 2020; Silva et al., 2021). These structural changes significantly impacted the educational activities and professional development of dental students (Chang et al., 2021; Cidral et al., 2018; Mahlangu, 2018; Nortvig et al., 2018; Rohayani et al., 2015; Wei & Chou, 2020).

The success of DL hinges on several crucial factors: The quality of the course content, effective course design, well-defined assessment and evaluation procedures, the lecturers' experience with online teaching, the functionalities of the chosen educational platform, and internet connection stability. Furthermore, the lack of technological readiness of higher educational institutions themselves presents a major hurdle in developing and implementing online versions of courses, particularly during unforeseen circumstances like the COVID-19 outbreak (Samra et al., 2021).

Although technology-based education provides opportunities for the professional development of students (Samra et al., 2021; Wang et al., 2021), virtual environments cause some difficulties for the practical training of dentistry (Costa et al., 2022; Mahlangu, 2018).

Assessment and evaluation are other challenging issues for both students and lecturers in DL (Almeida & Monteiro, 2021).

One of the greatest challenges in developing and implementing online course versions at higher education institutions during the COVID-19 pandemic was the technological (un)preparedness of these institutions. In addition to the institutional factors, student readiness is essential for an effective DL experience. Student readiness and preparedness include factors like learner control, online communication skills, self-directed learning skills, and motivation for learning, all of which contribute to a student's academic development in a DL environment. In this context, effective time management, effective communication skills, and technical competence are critical for students to succeed in online learning (Ali, 2020; Chung et al., 2020; Estriegana et al., 2019; Horzum et al., 2015; Rohayani et al., 2015; Yilmaz, 2017).

When the risks embodied in future national or global emergencies are considered, DL could be a vital method of learning for students in health sciences (Chang et al., 2021). Organizational, technical, and behavioral challenges should also be taken into consideration for the assessment of readiness in distance education (Mosa et al., 2016).

Therefore, the aim of this study was to analyse feedback about the dental students' perspectives regarding DL by using both Quantitative and Qualitative methods in the COVID-19 outbreak and to find clues about alertness for possible future national or global emergencies.

MATERIALS AND METHODS

This cross-sectional study was carried out at the Dentistry School of Marmara University, located in Istanbul, Turkey. Data were collected by both Qualitative and Quantitative research methods during the study.

E-questionnaire and online focus group discussions were conducted to obtain data. Ethics approval for the study was obtained from the Ethical Committee of Marmara University Medical School (09.2020.1292) and the study was conducted according to the principles of the Declaration of Helsinki. Students approved to participate in the study protocol voluntarily.

Dental Education During COVID-19 Outbreak

Due to the outbreak, theoretical and practical educational activities were suspended as of March 2020 for pre-clinical and clinical students. All courses were immediately moved to the DL platform provided by the university. Six months after performing DL for all the students, the dentistry school was only opened for the fifth-year students in October 2020 in order to enable them to continue their practical training. While the study was being conducted, the total period of clinical experience of the clinical group was 6 months for the 4th-year students (September 2019-March 2020) and 19 months for the 5th-year students (September 2018-July 2019; September 2019-March 2020; October 2020-January 2021) (Fig. 1). Five online focus-group interviews with dentistry students and online surveys were conducted at the end of the fall semester in 2021 (from January 14, 2021 to February 10, 2021).

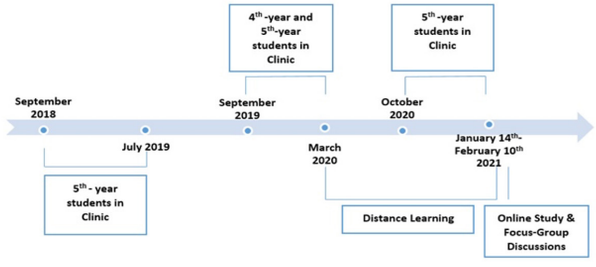

Figure 1: Students' Clinical Experiences While Participating In the Online Survey

Study Design

Both Qualitative and Quantitative methods were applied to assess the effectiveness of DL during the COVID-19 pandemic. Focus-group discussions were carried out with dental students as a Qualitative method, and as a Quantitative method, Electronic-questionnaire (E-questionnaire) surveys, which included information about the participants' feedback on DL and the Tendency Scale for Technology Use in Class with DL during the COVID-19 outbreak were used. Information obtained from both methods was collected and interpreted together (Fig. 2).

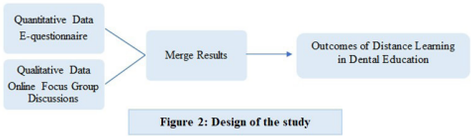

Figure 2. Design of the study

Qualitative Method

Qualitative data were collected by Focus-Group discussions. Ten students from each grade were randomly selected. Five online meetings were performed with fifty students (F/M:25/25). The duration of the Focus-Group discussions was at least one hour. Firstly, open-ended questions were asked about DL. Then, data were transcribed as verbatim. Data that focused on group discussions were analyzed via content analysis, through which the main themes and sub-themes were detected by defining thematic units (De Wever et al., 2006) (Table 1).

Table 1. The Qualitative Results of DL related to Professional Development

Main Theme: Cognitive Load: Students had to put more effort into learning due to the changes in the learning process.
Sub-themes were as follows:
Unavailability learning by doing
Easily forgetting what was learned theoretically
Limitations in the video-based courses
Elevated anxiety level due to lack of clinical competence and self-confidence
Problems related with measurement and evaluation methods
Student-Content Interaction, Student-Lecturer Interaction and Student-Student Interaction
Sub-themes were were as follows:
Insufficient method for some courses such as Endodontics and Radiology.
Lack of peer support in learning
Lack of synchronization between question and answer sections
Feeling stressed while writing questions in the chat section
Feeling anxious due to lack of clinical competency
Slow improvement in clinical competency due to high levels of anxiety and insufficient clinical performance during DL
Main Theme: Attendance to Courses in DL Platform
Sub-themes as follows:
Lack of motivation to participate courses via camera and microphone at home
Technical problems faced while connecting to the internet, sharing the internet with other family members, poor internet connection to open slides during online courses

Questions in Focus-Group Discussions were designed according to topics such as *"Increase in Cognitive Load", "Advantages of DL", "Feeling uneasy Participating in DL with a Camera and Audio on the DL Platform", "Feeling Uneasy While Sharing His/Her Name on the Chat Screen in the DL Platform", "Concerns About Logging into the DL Platform From a Computer Opened to Public Use", "Feeling Uneasy While Logging into the DL Platform From a Computer Open to Public Use due to Information Security", "Providing Sufficient Guidance for The Improvement of Professional Competency in DL", "Learning Performance with Video-Based Courses (Asynchronous)", "Technical Problems with the Internet Connection"*.

Quantitative Method

In this part of the study, 608 dental students (F/M: 405/203, mean age: 21.64±2.07 years) were included. Data were collected by using E-questionnaire about the DL process during the COVID-19 outbreak. The E-questionnaire covered the profile of the students, DL-related factors, technological skills (10-mm visual analog scale; 1:very bad-10:very good), satisfaction with the DL (10-mm visual analog scale; 1:I am not satisfied – 10:I am very satisfied), the effect of internet connection speed on lecture attendance (10-mm visual analog scale; 1:none – 10:very much), opinions related to technology use in lectures were assessed with the Tendency Scale for Technology Use in Class (TSTUC) (Günüç & Kuzu, 2014) and questions regarding the effects of DL on the professional development of students.

The effects of DL on "*Self-confidence*", "*Crisis management*", "*Professional competencies*", "*Internalizing the profession*", "*Critical thinking skill*", "*Motivation*", "*Anxiety level*", "*Communication between student-student and student-instructor*", "*Content interaction*" were assessed as "increased", "neutral" and "decreased". The most important advantages and disadvantages of DL were also assessed by open-ended questions.

Tendency Scale for Technology Use in Class

Items in Tendency Scale for Technology Use in Class (TSTUC), assessed technology use in class during the instructional activities as well as students' out-of-class communication with the lecturers and students' fulfillment of task-related responsibilities (e.g. homework, research, project, etc.). Items were rated through a 5-point Likert scale (from 1: strongly disagree to 5: strongly agree). The Turkish version of the validated scale (Ayyıldız et al., 2022; Günüç & Kuzu, 2014) was used in the study.

Statistical Analysis

The TSTUC scale was also validated for dental students. An explanatory factor analysis was carried out to check the *Construct validity* of the scale. Sixteen items were classified into two subgroups regarding *Technology Use* (n:5; 23.36%; Cronbach's alpha value: 0.782) and *Motivation and Technology* (n:11; 42.71%; Cronbach-alpha value: 0.957) (Table 1). Items regarding "*Internalizing the professional environment*" and "*Critical thinking*" (increased vs neutral/decreased) as outcomes of DL were used to check the *Content validity* of the scale. Data were analyzed by using the Mann-Whitney U Test (SPSS 28.0 statistical program, Chicago, IL, USA). In this study, a p-value of ≤0.05 was considered statistically significant.

RESULTS

Qualitative Data – Focus-Group Discussions

As a result of online focus group discussions with 50 students from 1st to 5th grades, the main themes were determined as High Cognitive Load, Disadvantages and Advantages of DL (Table 1). The main themes were subdivided as follows: Cognitive load, student-content interaction, student-lecturer interaction, and student-student interaction.

- The main reasons for ***High Cognitive Load of DL*** were stated as follows: "Decrease in learning motivation and professional confidence", "Increase in the anxiety level", and "Difficulties to understand the course content and relating theoretical knowledge with practice".
- ***The Disadvantages of DL*** were associated with insufficient interactions among students, the lecturer, and the course content as well as problems in grading students' performance, unreliable internet connections, limited broadband data and access to the education platform.
- The main ***Advantages of DL*** were stated as the opportunity to re-access the course content, a convenient learning environment and flexibility to access the course anywhere.

According to the participant students, the other factors affecting cognitive load were stated as *ICT-related problems (Information and Communication Technologies), inadequate communication with the lecturer and the students' inability to get peer support from each other.* For ICT-related problems, *poor internet access and inability to open the slides during the online course* were mentioned. As factors that prevented students from interacting with the instructor on the distance education platform, the following points were noted: *Difficulties in time management due to the flexible timing of the course programs, difficulty in focusing on the lecture due to the camera and audio participation and intrusion of privacy in the home environment when the camera/audio was switched on.* While communicating with the lecturer, *the lack of synchronization between the question and answer on the online education platform and the pressure on the student to write the questions in the chat section* was noted as hurdles that negatively affected learning and effective communication with the lecturer responsible for the course (Table 1).

Table 1. The Qualitative Results of DL related to Professional Development

Main Theme: Cognitive Load: Students had to put more effort into learning due to the changes in the learning process.
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Quantitative Data – Tendency Scale for Technology Usage in Class (TSTUC)

In this part of the study, E-questionnaires were filled out by 608 dental students. In TSTUC, the mean scores were calculated as 3.845±0.639 in the "***Technology Use***" subgroup and 3.401±0.826 in the "***Motivation and Technology***" subgroup (Table 2).

Table 2. The Factor Analysis of Tendency Scale for Technology Use in Class (TSTUC) during Distance Learning in COVID-19 Outbreak

Tendency Scale for Technology Use in Class	Factor Loads	Variance	Mean	SD
Technology Use (n=5 α=0.782)		23.36%	3.845	0.639
1. I want technology to be used more in classes.	0.507			
2. Using technology facilitates to do my course-related responsibilities/ assignments.	0.683			
3. I like communicating with faculty members via the Internet.	0.678			
4. I want new/different technologies to be used in classes.	0.678			
5. I like sharing documents with my classmates via the Internet.	0.684			
Motivation and Technology (n=11 α=0.957)		42.71%	3.401	0.826
1. I am more active in classes which involve technology use.	0.848			
2. I am more willing to attend classes which involve technology use.	0.846			
3. I attend classes more often which involve technology use.	0.844			
4. I follow/listen to lectures better which involve technology use.	0.828			
5. I am better prepared for classes which involve technology use.	0.793			
6. Technology use in classes increases my motivation.	0.766			
7. I enjoy learning with technology.	0.696			
8. I would like technology to be used in all classes.	0.684			
9. I learn better in classes which involve technology use.	0.680			
10. I give more importance to classes which involve technology use.	0.679			
11. Classes involving technology use are more entertaining.	0.592			
	Total: 66.07%			0.730

Higher sub-dimensions of TSTUC were determined on *Technology Use*. Motivation and Technology were identified among the 2nd, 3rd, 4th and 5th grade undergraduate dental students who thought that DL increases the internalization of the professional environment and critical thinking. Elevated scores were observed with dental students whose professional improvements regarding "*Internalizing the professional environment*" (4.214±0.630 vs 3.991±0.766)" and "*Critical thinking*" (4.026±0.683 vs 3.667±0.891)" were positively affected by DL ($p<0.05$). The lowest scores were given to the items regarding "*DL increased Motivation*", "*DL increased Student-Course Content Interaction*", and "*DL increased Student-Lecturer Interaction*" by the first-year students, in contrast to the upper-class students ($p<0.05$) (Table 3).

Table 3. The Quantitative Results of The Effect of Distance Learning on Professional Development as a Content Validity and Sub-Group Scores of the Scale of Technology Usage Tendency in Class (TSTUC)

		Technology Use-Subgroup						Motivation and Technology-Subgroup					
		Internalizing the Professional Environment			Critical Thinking			Internalizing the Professional Environment			Critical Thinking		
		Increased	Neutral/ Decreased	p*	Increased	Neutral/ Decreased	p*	Increased	Neutral/ Decreased	p*	Increased	Neutral/ Decreased	p*
1st phase (n=114)	Mean	3.700	3.651	0.593	3.786	3.609	0.106	3.424	3.108	0.104	3.336	3.072	0.079
	SD	0.629	0.671		0.757	0.626		1.011	0.745		0.952	0.700	
2nd phase (n=128)	Mean	4.060	3.655	0.001	3.910	3.615	0.002	3.806	3.188	0.001	3.606	3.109	0.000
	SD	0.659	0.545		0.694	0.478		0.736	0.773		0.877	0.687	
3rd phase (n=111)	Mean	4.168	3.813	0.035	4.055	3.786	0.020	3.995	3.294	0.001	3.691	3.281	0.011
	SD	0.700	0.573		0.560	0.614		0.778	0.803		0.734	0.857	
4th phase (n=123)	Mean	4.552	3.713	0.000	4.109	3.716	0.002	4.311	3.236	0.000	3.737	3.242	0.002
	SD	0.455	0.657		0.737	0.644		0.655	0.846		1.027	0.747	
5th phase (n=132)	Mean	4.390	4.032	0.007	4.281	4.024	0.016	4.204	3.604	0.000	3.946	3.615	0.018
	SD	0.442	0.555		0.747	0.681		0.507	0.703		0.747	0.681	
All students (n=608)	Mean	4.214	3.776	0.000	4.026	3.762	0.000	3.991	3.292	0.000	3.667	3.279	0.000
	SD	0.630	0.617		0.683	0.600		0.766	0.790		0.891	0.765	

* Mann-Whitney U test was used.

DISCUSSION

While DL was recognized as an appropriate approach for colleges and universities during the COVID-19 pandemic (Cobanoglu & Cobanoglu, 2021; Wei & Chou, 2020), web-based distance education for dentistry was considered to be a challenging idea because hands-on training is vital for dentistry students to gain practice (Haroon et al., 2020). Regarding this point, the study aimed to analyse the feedbacks of dental students on the application of DL during the COVID-19 outbreak by using both Quantitative and Qualitative methods and to find clues for an applicable dental education model in potential global or local emergencies.

In the qualitative phase of the study, the students stated that problems regarding Evaluation and Assessment were critical, as also mentioned previously in the literature (Kaya & Tan, 2014). In this respect, it would be advisable to use both formative and summative program evaluations during the DL process. Depending on the course requirements of the departments, alternative methods of assessment and evaluation, such as assignments and projects, could be used instead of midterms and final exams. Another issue to be considered was whether exams should be held face-to-face or online (Bilgiç & Tuzun, 2020). Effective and efficient assessment and evaluation processes in distance education could be provided with a well-functioning distance education system infrastructure. Besides that, orientation programs for the efficient use of distance education platforms by both the students and lecturers are essential.

It is noteworthy to emphasize that an extended interruption of practical training will probably have a negative effect on dental students' clinical competence and self-confidence. (Carolina Loch et al., 2021). Clinical training in dentistry can not be entirely replaced by online classes (Wang et al., 2021). Students are at the center of the education system in higher education, so especially in dentistry, professional competency and the quality of health care provided in the clinics where students are being trained are crucial aspects of clinical training. In addition, a student's anxiety directly affects perceived knowledge improvement and cognitive load (Tzafilkou et al., 2021), which can only be overcome by regular hands-on practice.

The qualitative phase of the study sheds light on clues for future dental education models in case of global or local emergencies. The participating students declared that cognitive load was quite cumbersome for them during the DL process. They generally agreed that courses such as Endodontics and Radiology were not suitable for DL. At this point, it can be deduced that a lack of professional self-confidence related to clinical practice affects their cognitive burden (Ilić et al.). Therefore, lecturers and course designers should carefully devise online courses addressing the needs and concerns of the students by avoiding the use of unnecessarily rich media that might cause cognitive overload for students (Iturbe-LaGrave, 2020; Tzafilkou et al., 2021).

According to the quantitative results of the study, elevated scores for the topics "Technology Use" and "Motivation and Technology" were obtained from the responses of dental students, whose professional improvements regarding "Internalizing the professional environment" (4.214±0.630 vs 3.991±0.766)" and "Critical thinking" (4.026±0.683 vs 3.667±0.891)" were positively affected by DL ($p<0.05$). As predicted, the lowest scores given to the

items regarding “DL increased Motivation”, “DL increased Student-Course Content Interaction”, and “DL increased Student-Lecturer Interaction” were noted in the first-year students’ responses in contrast to the others. DL is not a substitute for actual clinical experience, as we all know (Sharka et al., 2020). However, this pandemic also revealed several other areas that could shape hybrid dentistry education in the future. New technology tools are currently being used in dentistry education to help students become more competent professionals. (Chang et al., 2021). When sufficiently improved, made accessible, and portable, haptic and virtual reality (VR) and augmented reality (AR) technologies will be able to mimic patient encounters and aid in the virtual continuity of clinical education and assessment during crises (Alkadi, 2021; Elangovan et al., 2020). Simulation exercises are one of the safest forms of clinical skills practice without the need for physical presence in the clinical environment and direct contact with patients (Barabari & Moharamzadeh, 2020). Evidence-based simulation devices, accompanied by haptic technology, provide tactile feedback to enable the students to feel and touch the virtual teeth. In short, AR/VR technology is an effective supplementary teaching tool, which enables students to gain clinical experience without being in a clinical environment (Haroon et al., 2020). On the other hand, oral radiology teaching includes theoretical and practical classes with image interpretations and radiographic technique performances. Despite this, ensuring the attention and effective involvement of the students, concerning practical activities of radiological interpretation and endodontics is vital for the quality of dental treatments (Ivanka & Teodor, 2023; Pontual et al., 2020; Qualtrough, 2014). In this age of technology, even a mobile phone app’s design could include a variety of real-world clinical examples to help dentistry students strengthen their critical thinking skills in order to plan prosthodontic rehabilitation and identify endodontic problems. (Deshpande et al., 2017). The learning platforms can also offer the possibility of case-based discussions. Besides chat discussions, live discussions can also be held while sharing clinical, imaging and/or histopathological images. Case-based discussions can also be performed using social media (Machado et al., 2020).

The results of the TSTUC could be used as clues for the professional development of undergraduate dental students to combat the limitations of DL. In addition, the TSTUC scale was also found to be a reliable tool to evaluate DL. The first-grade undergraduate dentistry students declared in the study that process management in distance education could be a challenge for them. Therefore, orientation programs should be provided for the specific needs of first-year dentistry students in the case of DL.

The main strength of the study was to use both quantitative and qualitative methods with a large student sample. Yet, data were collected from a single center. Therefore, it is recommended that future studies be designed to contain both public and private dentistry schools. In addition, the lecturers’ and curriculum designers’ perspectives could be taken into consideration for dental hybrid education in the future because an integrated approach is crucial for the success of a DL – centered approach.

CONCLUSION

Consequently, the limitations of DL for the professional development of dental students as well as effective methods for integrating technology into education should be the major considerations in devising plans for DL in case of national or global emergencies. As an end note, the TSTUC scale was found to be a valid and reliable tool to evaluate the feasibility/practicality of DL in dentistry education.

CONFLICTS OF INTEREST STATEMENT

The authors have no conflicts of interest to declare that are relevant to the content of this article.

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