



## Perspectives of Students and Educators on the Effects of the COVID-19 Pandemic on Undergraduate Dental Education

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### ABSTRACT

**Objectives:** The novel coronavirus pandemic has become a real challenge for provision of dental education. The aim of this survey study was to evaluate the opinions of dental faculty educators and students about online education after e-learning experience.

**Materials and Methods:** The research was conducted on educators and 4th and 5th grade students at Ankara University, Faculty of Dentistry. Questionnaire items for educators and students were categorized into the following factors: educators'/students' personal and professional skills and attitudes towards online education, online theoretical education, online practical training, online exams, handling and quality of education during pandemic. The data obtained was recorded as percentage (%) and interpreted.

**Results:** 281 undergraduate students and 52 educators participated in this survey study. 36.7% of the students and 24.5% of the educators stated that online courses were as successful as face-to-face education. In addition, 84.2% of the students stated that online learning was not sufficient to acquire clinical skills. 55.9% of the students reported that the educators' effective use of communication methods (videos, surveys, etc.) increased their motivation. 89% of students and 69.8% of educators thought that students should attend in a postgraduate program to acquire clinical skills that they have not acquired due to the pandemic.

**Conclusions:** The results of this study showed that academicians hold a negative view of distance learning as they think online theoretical courses, practical training and exams impaired the quality of learning. On the other hand, dentistry students have a positive attitude towards online theoretical education but are concerned about clinical skill acquisition.

**Keywords:** Covid-19, Dental Education, Distance Learning.

## Öğrenci ve Eğitimcilerin Covid-19 Pandemisinin Diş Hekimliği Lisans Eğitimine olan Etkilerine Bakış Açıları

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#### ÖZ

**Amaç:** Yeni koronavirüs pandemisi, diş hekimliği eğitiminin sürdürülmesi açısından zorlayıcı bir duruma haline gelmiştir. Bu anket çalışmasının amacı, diş hekimliği fakültesi eğitimci ve öğrencilerinin e-öğrenme deneyimi sonrası online eğitim hakkındaki görüşlerini değerlendirmektir.

**Gereç ve Yöntemler:** Araştırma, Ankara Üniversitesi Diş Hekimliği Fakültesi'ndeki eğitimciler ile 4. ve 5. sınıf öğrencileri üzerinde gerçekleştirilmiştir. Eğitimciler ve öğrenciler için anket maddeleri şu kriterlere göre kategorize edilmiştir: eğitimcilerin/öğrencilerin çevrimiçi eğitime yönelik kişisel ve mesleki beceri ve tutumları, çevrimiçi teorik eğitim, çevrimiçi pratik eğitim, çevrimiçi sınavlar, pandemi sırasında eğitimin ele alınması ve kalitesi. Elde edilen bulgular % olarak kaydedilmiş ve yorumlanmıştır.

**Bulgular:** Bu anket çalışmasına 281 lisans öğrencisi ve 52 eğitimci katılmıştır. Öğrencilerin %36,7'si eğitimcilerin ise %24,5'i çevrimiçi derslerin yüz yüze eğitim kadar başarılı olduğunu belirtmiştir. Ayrıca, öğrencilerin %84,2'si çevrimiçi öğrenmenin klinik beceri kazanmak için yeterli olmadığını belirtmiştir. Öğrencilerin %55,9'u eğitimcilerin iletişim yöntemlerini (videolar, anketler vb.) etkin kullanmasını onların motivasyonunu artırdığını bildirmiştir. Öğrencilerin %89'u ve eğitimcilerin %69,8'i öğrencilerin pandemi nedeniyle edinemediği klinik becerileri elde etmek için bir lisansüstü programa kaydolması gerektiğini düşünmektedir.

**Sonuçlar:** Bu çalışmanın sonuçları, akademisyenlerin çevrimiçi teorik derslerin, uygulamalı eğitimlerin ve sınavların öğrenmenin kalitesini bozduğunu düşündükleri için uzaktan eğitime olumsuz baktıklarını göstermiştir. Öte yandan, diş hekimliği öğrencileri çevrimiçi teorik eğitime karşı olumlu bir tutuma sahip olmakla birlikte, klinik beceri kazanımı konusunda endişelidirler.

**Anahtar Kelimeler:** Covid-19, Diş Hekimliği Eğitimi, Uzaktan Öğrenme.

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## Introduction

The novel coronavirus (COVID-19) pandemic has become a real challenge for healthcare providers around the world and has significantly affected the dental professionals in practices, universities and research institutions.<sup>1-3</sup> Dental procedures by their nature have a high risk of COVID-19 infection due to face-to-face communication with patients and the dental team. Clinical studies indicate that most of the dental procedures involving use of rotary handpieces generate considerable amount of contaminated and potentially infectious aerosol and droplets.<sup>4-7</sup> Due to high risk of COVID-19 transmission, in-person procedures in both undergraduate and graduate dental education came to a halt globally, and theoretical and clinical learning processes shifted to being conducted online.<sup>1,8,9</sup>

Academic dental institutions have, since March 2020, closed teaching clinics and sent students home to continue didactic learning in accordance with governmental stay-at-home measures for months. It was challenging for faculty members to adapt the entire curriculum and evaluation methods in a short period of time. Dental faculties managed to produce an online curriculum by utilizing teleconference and file-sharing platforms to deliver virtual lectures. In addition, preclinical simulation activities have stopped at many institutions.<sup>1,2,8,9</sup>

On the other hand, although the coronavirus pandemic has caused many difficulties for provision of dental education, it was also an opportunity for the dental educators to modernize their teaching approaches using novel digital concepts.<sup>4</sup>

In light of the foregoing facts, the aim of this study was to evaluate the student and educator experience of distance learning/teaching, their level of motivation and attitude toward distance education, and the barriers encountered when learning and teaching online after one year of online education.

## Materials and Methods

### Ethical Approval and Inclusion Criteria

The ethical board approval required for the study was obtained from Ankara University, Faculty of Dentistry Clinical Research Ethics Board (No:14/4, 09.12.2020). Participation in the study was voluntary for both students and educators. The study included 52 academicians and 281 undergraduate students (4th and 5th grade) who have been involved in online theoretical and practical education in e-learning period.

During this time, the theoretical courses were given on a dedicated internet platform with 20-minute virtual sessions. To avoid disruptions in clinical training, online videos were uploaded to the system.

### Conducting the Survey and Contents of Survey Sub-headings

The survey was delivered to the participants by e-mail or through social media platforms by using the "Google

Forms" application. Variables of the survey research were classified into 9 sub-headings for both students and educators.

Questionnaire items for students were divided into the following categories: (1) students' personal and professional skills and attitudes toward online education, (2) students' own conditions, (3) online theoretical education, (4) online practical training, (5) online exams, (6) educator's attitudes toward online education, (7) handling and quality of education during the pandemic, (8) school administration attitudes, and (9) recommendations for better online learning experience.

Questionnaire items for educators were categorized into the following factors: (1) educators' personal and professional skills and attitudes towards online education, (2) lecturers' own conditions, (3) online theoretical education, (4) online practical training, (5) online exams, (6) students' interest and participation, (7) handling and quality of education during pandemic, (8) the school administration attitudes, and (9) recommendations for better online learning experience.

The survey was rated on a 5-point Likert scale with the responses of 1) Agree, 2) Strongly Agree, 3) Undecided, 4) Disagree, 5) Strongly Disagree.

The findings were obtained and evaluated by adding the percentages of agree and strongly agree for the positive response of the participants to a question. Similarly, the findings were obtained and evaluated by adding the percentages of disagree and strongly disagree for the negative response of the participants to a question.

## Results

52 educators and 281 undergraduate students participated in this survey study. The main answers to the survey questions were as follows.

During the online education process, 82.7% of the students stated that they had enough technological knowledge to follow the online courses. On the other hand, 32% of the students reported that they easily adapted to online education conditions. 41.2% of the students reported that they had regularly attend online classes. However, 28% of the students stated that they had not have technological resources (laptop, webcam, microphone) for online education (Table 1). While 69.8% of the educators reported that they easily adapted to the online education conditions, 35.9% said that the courses they gave had no educational value (Table 1).

36.7% of the students stated that online theoretical courses were as successful as face-to-face courses. 72% of the students said that their theoretical education skills could only be increased in a face-to-face courses. The majority of the students (84.2%) stated that online learning was not sufficient to acquire clinical skills (Table 2). 24.5% of the educators stated that online theoretical courses were as successful as face-to-face courses. Only 9.4% of the educators stated that they were more comfortable in online theoretical lessons than in face-to-

face lessons. For online practical training, 81.2% of the trainers reported that training videos could be useful for improving practical skills (Table 2). 56.4% of the students reported that the online course materials were sufficient for them to be successful in the exams. 60.5% of the students reported that they were more successful in online exams than face-to-face exams (Table 3). 74% of the educators stated that online exams could not accurately determine the knowledge level of the student (Table 3).

55.9% of the students reported that the educators' effective use of communication methods (videos, surveys, etc.) increased their motivation. 61.6% of the students reported that the educators were not as competent in online education as in face-to-face education (Table 4). 77.4% of the educators stated that the interaction between the student and the educator was better in face-to-face education (Table 4).

21.4% of the students stated that they preferred the suspension of education completely during the Covid-19 pandemic. 89% of students thought that they should attend in a postgraduate program (PhD or Dental Speciality Exam - DSE) in order to acquire clinical skills that they could not acquire due to the pandemic (Table 5). 69.8% of the educators agreed with this opinion (Table 5).

68% of the students stated that the quality of education could be improved by increasing the online equipment. The vast majority of students (85.1%) thought that increasing visual materials in online education could reduce the deficiencies in education (Table 6). 90.4% of the educators thought that improving the online education facilities at the university would increase the quality of distance learning (Table 6).

## Discussion

Educational processes in the field of dentistry include an education model in which theoretical knowledge is supported by clinical practice and applications. Also, face-to-face, mutual and open communication in dental education increases trust and cooperation.<sup>9,10</sup> However, the COVID-19 pandemic caused disruption in education, as in other interactive processes. Moreover, dental educators and clinical students are at high risk of contamination in potentially infected environments where aerosol-generating procedures are performed intensively.<sup>7,11,12</sup>

In this context, the immediate effects of COVID-19 on dental education were noticed very soon after the announcement of the need for "social distancing" and minimizing all face-to-face communication including teaching and educational activities. Because dental schools are different than other dental practices and institutions, as they have large open clinics and a need for supervising dentists to move between patients, all dental schools and post-graduate teaching providers stopped their routine face-to-face educational sessions and hands-on pre-clinical teaching as well as the supervised clinical training and shifted to alternative methods of teaching delivery and assessment such as online lectures, webinars,

problem-solving sessions, written reports and computer-based exams.<sup>1-4</sup>

Much of the dental literature on e-learning has concentrated on students' experience to such innovations.<sup>13-17</sup> There is also little information available about how dental teachers perceive e-learning approaches. Very little is also known about how dental teachers experience e-learning approaches. In this regard, the purpose of this study is to assess students' and educators' perspectives on the effects of the COVID-19 pandemic on undergraduate dental education and the educational model, which has taken on a new dimension as a result of the pandemic. Our study included educators who have been teaching online classes and students who have been attending distance learning for the past academic year. The student survey group was drawn from 4th and 5th grade students who had received both face-to-face and online education. In recent years, online survey applications have become a frequently used method in survey studies in the literature with the help of rapid developments in technology. This method offers fast and low-cost access to a large number of participants.<sup>18</sup> For this reason and considering the social distancing measures brought by the COVID-19 pandemic, the online survey forms in our study were delivered to the participants via social media or e-mail in order to reach a higher sample size.

This survey was rated on a 5-point Likert scale with the responses of 1) Agree, 2) Strongly Agree, 3) Undecided, 4) Disagree, 5) Strongly Disagree. In this type of scale, there is an expression that states an attitude or opinion about the subject/opinions being researched, and options that indicate different rates of endorsement of this statement. Participants are offered multiple options on a scale in order to determine the level of endorsement of the opinion/topic being researched.<sup>19</sup>

In a recent survey focusing on the European management of the COVID-19 crisis, 90% of dental schools reported using online pedagogical software tools, 72% used live or streamed videos, 48% provided links to further online materials, 65% participated in organizing virtual meetings and, less frequently, small-scale working groups, social media groups or journal clubs.<sup>20</sup> New forms of classroom conference and lectures, using video conference systems were implemented at many institutions.<sup>21-24</sup> Generally, students were found to have positive impressions despite technical problems and related stresses. While these platforms are advantageous because they are already structured and universal, they require improvements, constant maintenance, and a high-quality internet connection. Although face-to-face education is a more effective communication modality for clinical case-based discussions; remote, internet-based discussions on virtual platforms enable a more relaxed discussion ambience.<sup>8</sup> Easy adaptation of current graduate students to online education may also be explained by their belonging to Generation Z. Generation Z takes advantage of all the opportunities of the information age and closely follows technological

developments, internet environment, social media and different communication channels. These individuals are highly capable of multi-tasking with equally high levels of oral, cognitive and learning skills.<sup>25</sup> However, according to the results of this study, only 32% of the students said that they easily adapted to e-learning conditions. However, this may be attributed to the increased level of anxiety that might have been caused by the abrupt introduction of an extraordinary education setting without preliminary preparation, together with the sudden pandemic process, rather than the students' inability of adapting to distance learning.<sup>26</sup> The study's authors believe that students' ability to adapt to distance education will improve over time. On the other hand, 28% of students stated that they lacked proper technical means such as computers and web cameras for online learning, and 32% of them expressed concern on how to tackle problems they may encounter while using the online education platform. In this respect, the technological shortcomings can be explained by the low-income levels of some students' families, and the difficulty of overcoming the problems encountered can be due to the fact that distance education was not widely used in dentistry before the COVID-19 pandemic.<sup>27</sup> In this context, providing students with necessary technological equipment, the preparation of manuals that will help them troubleshoot most basic problems they may encounter in online education processes, and establishing dedicated helpdesks will be beneficial. Whereas, a sizeable majority of the educators have stated that they could easily adapt to online education conditions (69.8%), their personal technological equipment was adequate for online education (81.1%), and their universities' infrastructure for distance learning were sufficient (66%). Considering that the educators are generally belonging to Generation X, these results are promising and show good adaptation levels. However, in case of technological expertise, only a small proportion of the educators stated using effective communication methods (h5p, forums, surveys, etc.) which is in line with the properties of Generation X.<sup>28</sup> University administrations should provide practical training opportunities to educators related to these issues.

Although online education is indispensable during the pandemic period, the advantages or disadvantages of online education over face-to-face education have become a matter of debate. Indeed, in a study conducted by Abbasi *et al.*<sup>29</sup> on medical and dental school students, 85% of the students reported that online learning was less effective than face-to-face learning. Hattar *et al.*<sup>26</sup>, reported that 5<sup>th</sup> grade students sensed that they actually missed important learning experiences especially the clinical sessions. Similarly, in this study, 72% of the students for theoretical lessons and 89.1% of the students for clinical education expressed belief that skills can only be improved via face-to-face teaching. Only a small portion of the educators (24.5%) stated that online theoretical classes are as successful as face-to-face classes. Moreover, 40% of the educators said that the duration of the classes was not long enough to teach the

contents of the class. On clinical practical training, a big majority of the educators (81.2%) said practical videos will be beneficial whereas only 49% of the educators stated that clinical conditions could be simulated for online practical training. Drawing from these findings, we may say that improvements should be made to the adaption of educators to online education conditions. Indeed, we believe that students' opinions and suggestions about the educators will be enlightening. In this respect, 55.9% of the students said their motivation for participation in the classes are increased when educators used effective communication methods such as videos, surveys, etc. In addition to this, only 45.4% of the students said that their educators continuously looked for ways to self-improve themselves for better online teaching. Given that dental training mainly hinges on the mutual communication of the student and the educator,<sup>10,30</sup> we believe that the educators should be willing to act in line with the students' feedback and suggestion and self-correct and strive for a better-quality training.

Another potential setback the educators are concerned about in distance learning is the efficacy of online exams.<sup>31</sup> A vast majority of the educators (74%) expressed belief that online exams could not fully assess the level of knowledge. In this respect, 79.3% of the educators said that they searched for ways to improve question formulation techniques for online exams while a sizeable part of the educators (81.2%) said online exams encouraged cheating. In this context, modern information technology (IT) can be used for high quality exams. By means of exam precautions like the lockdown browser, students cannot search on the internet (like Google and so on) to find an answer during the internet examination. However, it is obvious that an examination platform for dental education will also need to be developed.<sup>32</sup> 71.1% of the students stated that the exams should not be interactive or video-based. For online education, open book exams may be preferred to traditional or closed book exams. The main premise for open book exams is that teachers can devise questions that require students to answer in more critical and analytical ways thus encouraging high-order thinking skills in their students; as compared to closed book or traditional exams that tend to encourage rote learning and more superficial application of knowledge. The COVID-19 national lockdown resulted in re-structuring of assessments to open-book formats so learners could complete their examinations at home and has provided a novel opportunity to reflect on examination practices.<sup>33</sup>

Case-based discussions/exams are important learning strategy, applied in several dental specialties and courses. Virtual patient (VP)-based learning consists of simulating clinical cases to improve students' skills in decision making and diagnosis.<sup>3,8</sup> The findings of the present survey also showed that nearly half of the students suggested that the inclusion of more case planning that feature clinical visual materials in online education can reduce the shortcomings in practical training.

On the other hand, regarding the problems encountered during the pandemic, a small portion of the students stated that they could convey their problems to the administrators (29.9%) and that they could find solutions to these problems through administrators (23.2%). 41.9% of the students said that infrastructure problems at their universities substantially reduced the quality of online education. In order to resolve the pandemic-related problems or setbacks, which have been confirmed by the responses of students and educators who participated in our study, and to make improvements, the suggestions presented here and their implementation in an appropriate framework are of utmost importance. In the last section of our study, we examined feedback from students and educators to potential suggestions. In this respect, a substantial portion of the students (85.1%) have suggested that online education should include more case planning that feature clinical visual materials. Moreover, students suggested that even during the pandemic, partial face-to-face teaching should be offered side by side distance learning (51.1%), website recommendations by educators for access to reliable learning resources (83.9%) and education management and planning should involve more feedback from students (89.4%).

As for suggestion by educators, a great majority of the educators (90.4%) said that improvements to university's online infrastructure and diversification of ways for access to distance education will increase the quality of education, and 94.3% of the educators called for improved access to online learning tools such as computers, microphones, web cameras, etc. On a similar rate with the students, 90.6% of the educators emphasized that feedback should be given more place within education plans.

Considering that the education model in dentistry has changed and differentiated with the COVID-19 pandemic, Deery<sup>1</sup> evaluated the impacts of COVID-19 on the provision of dental education in the 67 dental schools in the United States and stated that schools should re-evaluate their policies and curricula and incorporate appropriate methods of distance learning permanently into their teaching.

Considering our new reality, it is possible to continue teaching theoretical content, keeping students' unequal access to quality internet in mind, especially those with

low income. However, few effective alternatives are available to dental students today, considering pre-clinical and clinical scenarios. The challenges will be greater in developing countries. Unequal student access to quality internet can compromise achievement in remote activities. To return to clinical activities, major investments must be made in dental school clinics, to adapt to the new biosafety reality of the post-pandemic period.<sup>1,8</sup> Moreover, in an educational setting such as dental training whereby interaction between students and educators play a crucial role, their feedback should be subject of regular scrutiny and necessary revision and adjustments must be made in line with their suggestions. Besides, it is acceptable to suggest that infrastructural services should be improved considering that distance learning will a permanent part of dental education even though dental training is a process that is mostly based on clinical practice.

## Conclusions

The results of this survey study showed that academicians hold a negative view of distance learning as they think remote theoretical courses and practical training, and online exams impaired the quality of learning. Results of this survey study demonstrated that dental students have a positive attitude towards online theoretical education but are concerned about clinical skill acquisition.

Online education, which has forced its way to become a part dental education due to the COVID-19 pandemic, may remain as a supporting feature in the future for several advantages it presents such as repeatable learning tools, effective communication skills, instant evaluation, and visual education materials.

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## Conflict of interest

The authors declare no conflict of interest.

**Table 1:** Factors Related to Students' and Educators' Own Attributes and Conditions

	Agree (%)	Strongly Agree (%)	Undecided (%)	Disagree (%)	Strongly disagree (%)
<b>Factors Related to Students' Own Attributes</b>					
I have enough computer technology skills to follow online classes.	36.6	46.1	8.5	5.3	3.5
I can easily adapt to online education conditions.	18.7	13.3	23.7	31.3	13
I know how to solve problems in the online education system when I face one.	24.6	8.7	34.7	21.5	10.5
I regularly attend online classes.	31.3	9.9	30.6	21.5	6.7
I abide by the rules of online education.	51.8	34.9	8.8	2.8	1.7
<b>Factors Related to Students' Own Conditions</b>					

I do not have adequate resources (laptop, webcam, microphone etc.) for online education.	17.3	10.7	11.5	38	22.5
I am having problems connecting to internet.	23.9	13.7	27.1	25.7	9.6
Sharing my computer with family members is causing issues attending online classes.	18	12.3	7.4	32	30.3
I am forced to attend online classes elsewhere other than my house (another house or institution, at neighbors' or cafe, etc.) due to internet connection issues.	3.5	5.3	7.7	35.6	47.9
<b>Factors Related to Educators' Own Attributes</b>					
I can easily adapt to online education conditions.	37.7	32.1	18.9	5.7	5.6
Online classes I teach have no educative value.	18.9	17	22.6	32.1	9.4
My computer technology skills are not enough to online classes.	62.3	15.1	13.2	5.7	3.7
I am not informed enough to troubleshoot problems encountered during online classes.	47.2	9.4	15.1	18.9	9.4
I abide by the rules of distance learning.	50.9	34	9.4	1.9	3.8
I know how to handle problems I face in online education environment.	28.3	9.4	37.7	20.8	3.8
<b>Factors Related to Educators' Own Conditions</b>					
I have adequate resources (laptop, webcam, microphone etc.) for online education.	41.5	39.6	5.7	9.4	3.8
The equipment I own conforms to the distance learning infrastructure of our university.	41.5	24.5	13.2	17	3.8
I am having internet issues during online classes.	30.2	17	11.3	32.1	9.4

**Table 2:** Student and Educator Opinion on Online Theoretical and Clinical Training

	Agree (%)	Strongly Agree (%)	Undecided (%)	Disagree (%)	Strongly Disagree
<b>Student Opinion on Factors Related to Online Theoretical Training</b>					
Online theoretical classes are as successful as face-to-face classes.	18	18.7	14.7	20.1	28.5
"Learning management system" guides are sufficient enough for me to get acquainted with online education environment.	28.2	14.1	31.6	16.2	9.9
Duration of online classes is sufficient.	29.6	12	17.3	24.6	16.5
I can follow online classes more easily than I can do with face-to-face classes.	25	28.9	12.3	10.6	23.2
Online classes are held regularly and on time according to schedule.	48.6	15.5	22.9	8.1	4.9
I feel I am taught efficiently after online courses.	19.7	8.1	28.9	24.3	19
Repeatable online sessions boost my learning capacity.	35.6	46.5	11.6	4.2	2.1
I believe theoretical training skills can only be improved in a face-to-face setting.	45	27	15.1	6.1	6.8
<b>Student Opinion on Factors Related to Online Practical Training</b>					
Practical training videos are good for me to improve my skills.	23.6	8.5	33.4	14.8	19.7
Watching practical training videos hones my clinical skills.	24.3	6.7	26.8	20.8	21.4
Online learning is not sufficient enough for me to gain clinical skills.	24.3	59.9	11.6	0.7	3.5
I believe clinical training skills can only be improved in a face-to-face or a clinical setting.	29.2	59.9	6.7	2.1	2.1
<b>Educator Opinion on Factors Related to Online Theoretical Training</b>					
Duration of online classes is long enough to teach the content.	43.4	5.7	10.9	17	23
I always offer my students additional accessible resources during my classes.	47.2	26.4	15.1	11.3	0
Online theoretical classes are as successful as face-to-face classes.	15.1	9.4	28.3	26.4	20.8
I provide students feedback about their mistakes in their assignments.	32.0	5.7	15.1	30.2	17
I am more comfortable with online theoretical classes than I am with face-to-face classes.	1.9	7.5	17	43.4	30.2
I regularly upload my teaching material to the learning management system.	45.3	43.4	9.4	0	1.9
Online classes are not as effective as in-person classes.	41.5	22.6	26.4	3.8	5.7
My motivation is negatively affected if number of students attending my classes is low.	39.6	34	7.5	17	1.9
I do use effective communication methods (h5p, forums, surveys, etc.) in my classes.	18.9	1.9	28.3	35.8	15.1
<b>Educator Opinion on Factors Related to Online Practical Training</b>					
Practical training videos are good for improving skills.	47.2	34	15.0	0	3.8
I regularly update my documents to provide students resources regarding practical training.	45.3	24.5	24.5	3.8	1.9
Online practical education does not help gain critical thinking skills.	15.1	30.2	28.3	17	9.4
I try to improve my students' skills of choosing the right method for diagnosis and treatment by planning cases in online practical training.	32.1	30.1	20.8	11.3	5.7
I strive to simulate clinical conditions during online practical training sessions.	22.6	26.4	30.2	15.1	5.7

**Table 3: Students' and Educators' Opinion on Online Exams**

	Agree (%)	Strongly Agree (%)	Undecided (%)	Disagree (%)	Strongly Disagree (%)
<b>Students' Opinion on Online Exams</b>					
Online course material is sufficient enough for me to achieve success in exams.	38.4	18	24.6	11.3	7.7
I believe my level of knowledge is fully measured by online exams.	30.6	13.4	24.3	13.7	18
I get more anxious during online exams than I get in in-person education.	14.1	12	17.3	28.9	27.7
I am more successful in online exams than I am in face-to-face learning.	41.5	19	31.3	4.9	3.3
I believe that exams should be interactive or held via video-conferencing rather than being multiple-choice.	6.7	1.4	20.8	19.7	51.4
Online exams should be composed of open-ended (classical) questions.	4.9	1.1	25.7	22.9	45.4
I have connection issues during online exams.	31	9.9	33.8	18.3	7
<b>Educators' Opinion on Online Exams</b>					
Online exams can not assess knowledge level correctly.	39.6	34.4	11.3	5.3	9.4
I strive to improve my methods of formulating questions for online exams.	32.1	47.2	9.4	7.5	3.8
Online exams encourage cheating.	34	47.2	17	1.8	0

**Table 4: Students' and Educators' Opinion on Interrelated Situations**

	Agree (%)	Strongly Agree (%)	Undecided (%)	Disagree (%)	Strongly Disagree (%)
<b>Student Opinion about Educator</b>					
Effective use of communication methods (videos, surveys, etc.) by educators boosts my motivation to attend classes.	40.1	15.8	30.6	8.6	4.9
Getting feedback from educators helps me learn more easily.	54.6	21.5	16.9	3.5	3.5
Educators in online education are not as competent as they are in face-to-face education.	37.7	23.9	18.3	13.7	6.4
Educators offer learning resources for each class.	30.3	6.3	29.9	24.3	9.2
Slides shown by educator and content of the course affect my participation in classes.	45.4	37.3	9.5	4.6	3.2
I can easily reach educators and convey my problems to them outside online classes.	31.7	9.9	30.6	20.1	7.7
Educators are constantly self-improving for better quality online teaching.	38.4	7	29.2	15.5	9.9
<b>Educator Opinion on Factors Related to Student Attention and Class Participation</b>					
I believe that students have a low level of motivation to participate in online classes.	49.1	30.2	9.4	1.9	9.4
My students feel more comfortable asking questions during online sessions than in face-to-face classes.	30.2	9.4	18.9	24.5	17
I believe that interaction between the student and the educator is better in face-to-face education.	28.3	49.1	13.2	7.5	1.9
My students are pleased to receive feedback about their mistakes during online education.	32.1	15.1	49.1	0	3.7

**Table 5: Students' and Educators' Opinion on the Pandemic Period and Administrative Attitude of the Institution**

	Agree (%)	Strongly Agree (%)	Undecided (%)	Disagree (%)	Strongly Disagree (%)
<b>Student Opinion on Factors Related to the Pandemic</b>					
I'd rather education was suspended altogether during the pandemic.	6.3	15.1	9.9	32.7	36
I'd rather receive face-to-face education during the pandemic.	11.6	21.5	21.1	20.4	25.4
Classes during the pandemic are strengthening my communication with my friends and instructors.	15.8	19	20.4	27.8	17
When the pandemic is over and clinical practices resume, clinical training should be planned on a priority basis.	25.7	60.2	10.6	1.1	2.4
I believe I should be enrolled in a postgraduate program (PhD or Dental Specialist Exam – DSE) to obtain clinical skills I failed to gain due to the pandemic.	23.2	65.8	7.4	2.8	0.8
Online education in post-pandemic era should be replaced by face-to-face education entirely.	21.8	25	23.2	16.9	13.1

<b>Student Opinion on Factors Related to Administrative Attitude of Institution</b>					
I can communicate my problems to managing authorities.	24.6	5.3	34.9	24.3	10.9
I can solve my problems through managing authorities.	19.7	3.5	39.4	23.9	13.5
Shortcomings in internet connection or infrastructure on the part of my university substantially takes away from the quality of online education.	26.1	15.8	37	16.9	4.2
Faculty management asks about our thoughts on drawbacks of online education and heeds our solution offers.	28.9	7.7	36.6	14.8	12
Faculty's student affairs office finds solutions to my problems.	15.8	3.2	40.5	21.1	19.4
<b>Educator Opinion on Factors Related to the Pandemic</b>					
I'd rather education was suspended altogether during the pandemic.	3.8	22.6	24.5	35.8	13.3
Face-to-face clinical practice should be conducted during the pandemic.	15.1	15.1	17	30.2	22.6
Students who graduate during the pandemic will lack clinical skills.	26.4	66	7.6	0	0
Students who graduate during the pandemic should improve practical skills through tutorials and workshops before they attend to independent clinical practice.	26.4	66	3.8	3.8	0
Students who graduate during the pandemic should receive postgraduate training (PhD or Dental Specialist Exam – DUS) before they attend to independent clinical practice.	32.1	37.7	22.6	7.6	0
<b>Educator Opinion on Factors Related to Administrative Attitude of Institution</b>					
I can communicate my problems to managing authorities.	41.5	39.6	11.3	1.9	5.7
I can solve my problems through managing authorities.	15.1	15.1	22.6	34	13.2
Shortcomings in internet connection or infrastructure on the part of my university substantially takes away from the quality of online education.	32.1	18.9	3.8	28.3	16.9

**Table 6:** Solution Offers by Students and Educators

	Agree (%)	Strongly Agree (%)	Undecided (%)	Disagree (%)	Strongly Disagree (%)
<b>Solution Offers by Students</b>					
Quality of education can be improved through live streaming from physical classroom and clinics by increasing online infrastructure.	36.3	31.7	21.1	5.6	5.3
Inclusion of more case planning that feature clinical visual materials in online education can reduce our shortcomings in practical training.	44.7	40.4	10.9	2.5	1.5
Learning process can be improved by incorporating collective discussion sessions into online education.	35.6	18.7	26.1	16.2	3.4
Instead of full-time online education, partial face-to-face learning will be beneficial.	20.8	30.3	23.9	8.5	16.5
Educators' sharing of safe internet sites as resources will help boost my clinical skills.	45.3	38.6	10.9	2.8	2.4
Student feedbacks should occupy more space in educational planning.	43.7	45.7	9.1	1.4	0.1
<b>Solution Offers by Educators</b>					
The improvement of my university's online education infrastructure and diversification of options to access to education will increase the quality of distance learning.	41.4	49	3.8	0.1	5.7
My university should provide educators the necessary equipment (PC, microphone, webcam, etc.) for distance education.	30.2	64.1	0.1	0	5.6
Post pandemic education planning should include programs to compensate for losses especially in clinical practice.	32.1	64.2	3.7	0	0
Faculty managements should provide professional assistance to produce of practical videos.	18.9	71.7	3.8	0	5.6
Solutions should be offered for all stakeholders to increase the quality of education.	24.5	66	3.8	0	5.7
Student and educator feedback should be included in the educational planning to a greater extent.	34	56.6	7.4	0	2

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