

Digital Dental Education: Perceptions, Outcomes, and Satisfactions of Dentistry Graduate Students

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Abstract

Background: The conduct of online graduation in dentistry classes (BDS) was made obligatory during COVID-19 pandemic and students had to face many problems while taking online courses. There was a dire need to bring about the necessary changes to make distance learning more successful in the future.

Objective: The study aims to assess the outcomes and general problems faced by students while taking online classes.

Study type, settings & duration: This cross-sectional study was conducted at Altamash Institute of Dental Medicine, Karachi from February to March 2022.

Methodology: The data was collected using a structured questionnaire Google Forms containing 35 questions, with convenience sampling from 194 students after completion of final assessment. All the completed forms were evaluated for the results using SPSS 26.

Results: According to the results from 194 students, the quality of e-learning during the COVID-19 pandemic was satisfactory with suitable service quality by administrative, technical, and learning assistance through teachers. Instructors played an active role in online education with their responsiveness and timely feedback, most of them believed that it was good to use technology. Students' digital competencies were reasonable, but most preferred the traditional face-to-face teaching methods. Most of the students scored grades A and B (24.1% and 43.6% respectively) in final assessments with distance learning.

Conclusion: The impact of e-learning quality on student performance was satisfactory as most of them scored well in the final assessment and online is strongly mediated by student understanding and satisfaction.

Key words: SARs coronavirus, online learning, continuing dental education, dental education, learning, student's perception, assessment, outcomes, academic performance.

Introduction

The worldwide spread of COVID-19 resulted in the adjournment of classes for more than 850 million students globally, disrupting the teaching plans of schools in the respective countries and regions.¹ The omnipresence of information

technology, which had already been impacting almost all aspects of our lives, gained even more popularity during this time. This opened an arena of online education, as being more practical technologically, economically, and operationally; its popularity grew exponentially with the advent of COVID-19. During the crisis, many countries began to offer online teaching to students as not to waste time and to encourage online education with stable and secured teaching standards.¹

Online learning is a novel educational slant, where instruction and content are focused on interactivity, learner-centered approaches, and facilitated teaching experiences which are essentially carried out through an unlatched and flexible learning environment.²

Problems faced in this new system of learning are the quality of material prepared, hidden costs, misuse of technology, and the attitudes of instructors, students, and administrators in providing the facilities of distance learning as a product. As

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Authors Contribution

RA conceptualized the project. HW & DM did the literature search and statistical analysis. RA & EFB did the data collection. Drafting, revision & writing of manuscript were done by RA, TFB & MA.

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teachers were not technology-friendly, needed to be given training sessions.³ There was a lack of interactive teaching with a risk of easy distraction, especially with annotations and improper chatting when the teacher was not well-trained. Technical issues included non-availability of gadgets, improper access to internet services, and availability of electricity. Although classical face-to-face classroom teaching is not possible to replicate through online teaching, still it is a cheap and feasible method which helps to improve the knowledge of the students.⁴

During COVID-19 pandemic situation conduction of online classes in institutes was made obligatory by the educational boards. This brought out a drastic change in the educational system of the entire world. Teaching institutes, around the globe, moved to virtual classes suspending physical classrooms with the development new teaching strategies.⁵ As there is no concrete evidence that online learning is less effective than onsite learning, distance learning was used to strengthen the quantity and quality of medical education.⁶

Developing countries such as Pakistan, lack proper infrastructure, in terms of sufficient classrooms, medical instructors, and related academic resource, which can reduce the effectiveness of online teaching. Studies conducted have assessed increased stress levels in dental and medical students.⁷ However, there is meager literature regarding the psychological well-being of health sciences students in online teaching.⁸

Therefore, the following article describes the results of a survey that was carried out to understand the students' responses regarding the new process of online education. The survey aimed to explore the general problems faced while taking online classes. Relevant data were collected to equip the instructors, facilitators, and college and university management with an understanding of the views of the students to bring about the necessary changes to make online education more successful. Further, it can be implemented together with classroom teaching in the future.⁵

Methodology

A descriptive cross-sectional study was conducted from February to March 2022. Students who were studying in the BDS course at Altamash Institute of Dental College in Karachi, Pakistan participated via an online platform using zoom meetings platform with synchronous setting during COVID-19 lockdown. The organization offered classroom services, to BDS students participating in their e-learning classes for the first, second, third, and final-year students, respectively. Current

students in the year 2022 of the study sites from their first to fourth academic years were actively involved in this study. With non-probability convenience sampling technique, participants filled up the online questionnaire. The sample size was calculated using reference article with 95% confidence interval 7% margin of error and population size 50, the estimated minimum sample size was 211.⁸

A structured survey questionnaire was used for data collection in this study, and was validated with Cronbach's Alpha of 0.943. Google Forms containing 35 questions was shared with 220 students in Altamash Institute of Dental Medicine and 194(response rate 88%) replied to the form. The questionnaire was divided into sections including demographic data, information related to the course, the student's expectations from the course, lecture content, methods of presentation, simulated online learning, communication accessibility, students' perceptions, and opinion (Table-1). The inclusion criteria were male and female dental students of all academic years, and students who are still studying in AIDM dental school and whose dental school was in the south region. The exclusion criteria were those who had finished their academic and internship year or their dental school was outside the south region.

Table 1: Demographic Details

Characteristics n=194	Percentages
Age	
<20	43 (22.1%)
21-25	140 (71.8%)
>25	13 (6.7%)
Gender	
Female	126 (64.6%)
Male	69 (35.4%)
Duration of online teaching	
1 month	25 (12.8%)
2-3 months	84 (43.1%)
>3months	88 (45.1%)

Data were collected using a structured questionnaire (google form) using a simple random technique on Linkert's scale. Data were analyzed using frequencies, percentages, mean and Standard deviation for 194 completed questionnaires. The mean from 1-1.08 shows strongly disagrees, whereas from 1.81-2.60 depicts disagree. On the other hand, 2.61-3.40 shows neutral, 3.41-4.2 relates agree, and finally, 4.21-5 means strongly agree by the participants.⁹

The ethical approval was obtained from the Ethical Review Board of Altamash Institute of Dental Medicine, Karachi vide letter no. ERB/AIDM_1.

Results

According to the mean, most of the answers settled in the range of neutral and were further evaluated according to percentages. About the course, most of the students agreed that the resources used contributed to the learning of students (39%), neutral was selected for the course being completed on time (37%), for the

understanding of the subject (33.8%), assessment for assignments (35.4%), length of the course (42.1%), fair methods of evaluation (43.6%) and for valuable feedback (36.9%).

Regarding content, most of them agreed that adequate information was provided in online learning sessions (37.4%), depth of knowledge (31.8%), and latest information provided (42.1%) were satisfactory.

Table 2: Questions and responses from student.

Questions	SA	A	N	DA	SDA	Mean $\pm$ SD	p-Value
About course	n(%)	n(%)	n(%)	n(%)	n(%)		F/M vs M
The resources used in the completion of my required online course contribute to learning	19(9.7)	76(39)	67(34.4)	21(10.8)	14(7.2)	3.37 $\pm$ 1.0	0.09
Integrated online teaching with tutorials and practices was effectively used along with the lectures	14(7.2)	51(26.2)	55(28.2)	50(25.6)	29(14.9)	2.88 $\pm$ 1.17	0.06
<i>Content</i>							
The instructor used the latest information in the lecture for the course	28(14.4)	82(42.1)	58(29.7)	20(10.3)	9(4.6)	3.4 $\pm$ 1.0	0.37
Lecture topics were discussed in sufficient depth by the instructors	26(13.3)	62(31.8)	53(27.2)	40(20.5)	22(11.3)	3.48 $\pm$ 1.02	0.28
<i>Method of presentation</i>							
The instructor had an organized method of presentation	30(15.4)	86(44.6)	55(28.2)	17(8.7)	12(6.2)	3.15 $\pm$ 1.21	0.07
The teaching methods used by the instructor were appropriate for the material being presented	18(9.2)	71(36.4)	69(35.4)	27(13.8)	12(6.2)	3.55 $\pm$ 1.03	0.31
<i>Simulate online learning</i>							
The instructor motivated me to do my best work	20(10.3)	60(30.8)	65(33.3)	33(16.9)	24(12.3)	3.03 $\pm$ 1.08	0.73
<i>Communication accessibility</i>							
The physical presence of an instructor is not necessary for good learning.	14(7.2)	28(14.4)	38(19.5)	49(25.1)	71(36.4)	3.45 $\pm$ 1.02	0.06
<i>Students' perceptions and opinion</i>							
Online lectures provide a better way of learning than traditional lecture	6(3.1)	27(13.8)	44(22.6)	44(22.6)	76(39)	2.36 $\pm$ 1.27	0.18
Online learning saves many resources such as time, electricity, and fuel	19(9.7)	49(25.1)	62(31.8)	35(17.9)	34(17.4)	2.24 $\pm$ 1.18	0.15
It is easier and more convenient as one does not need to dress up and leave home	30(15.4)	61(31.3)	44(22.6)	31(15.9)	36(18.5)	2.95 $\pm$ 1.22	0.92
Online learning keeps a person mentally relaxed and comfortable	20(10.3)	35(17.9)	35(17.9)	53(27.2)	55(28.2)	3.11 $\pm$ 1.33	0.72
In my opinion, I find online teaching more interesting as it provides ease in taking notes	16(8.2)	36(18.5)	50(25.6)	45(23.1)	54(27.7)	2.58 $\pm$ 1.33	0.68
Online teaching gives me a feeling of being modern and more civilized	17(8.7)	37(19)	55(28.2)	47(24.1)	40(20.5)	2.57 $\pm$ 1.22	0.24
I have also improved my computer skills while taking online lectures and courses	17(8.7)	46(23.6)	71(36.4)	37(19)	26(13.3)	2.71 $\pm$ 1.23	0.52
In my view, online teaching increases the screening time which can be harmful	72(36.9)	58(29.7)	40(20.5)	16(8.2)	12(6.2)	3.51 $\pm$ 1.19	0.13
Online teaching helps in building self-motivation, self-discipline, and time-management skills	14(7.2)	40(20.5)	67(34.4)	36(18.5)	42(21.5)	3.36 $\pm$ 1.14	0.17
<i>Students' expectations from the course</i>							
Which Grade they received after the online course as per my knowledge and understanding of the subject	Grade A 47(24.1)	Grade B 85(43.6)	Grade C 47(24.1)	Grade D 33(16.9)			0.9

SA=strongly agree, A=agree, N=neutral, DA=disagree, SDA=strongly disagree

For presentations, most of them agreed that the presentation shown for learning was organized (44.6%) and appropriately presented (36.4%). Opinions were neutral for the stimulation, motivation, and generation of enthusiasm by the instructor about the course.

For communication accessibility, most of them fully agreed that instructors were available whenever a query had to be solved (45.1%) and that the teachers in the session were prepared well for the subject (41.5%). But at the same time, they disagree that the physical presence of an instructor is not required for proper learning by the students. 39% of them believed that the traditional style is better than the online class as far as learning and understanding are concerned but at the same time, they were of the view that online learning is safe in time and effort and is more convenient and easier. Most of the students stated that no resources are saved with online teaching methodologies (31.8%). Students' opinion was neutral regarding the sense of modernization and civilization with online teaching (28.2%) and online teaching helped in building up time management, self-motivation, and self-discipline skills in the students (34.4%). It is believed that at the time of situations such as COVID, it is a good use of technology rather than wasting time (38.5%). The opinion regarding the improvement of computer skills with online learning was neutral (36.4%). Most of them agree that online teaching should not be continued further as the traditional style is better for the understanding of subjects in dentistry particularly for clinical subjects (33.8%).

When results were tabulated for gender stratification for there was no significant difference for any question. In the final assessment, (24.1%) of students scored grade A, while (43.6%, 24.1%, and 16.9%) attained grades B, C, and D respectively in final assessments with distant learning with no gender discrimination ($p > 0.9$) (Table-2).

Discussion

Literature has reported that students prefer traditional teaching methods compared to e-learning for their theory and practical classes.¹⁰ The utilization of computerized advances to empower and support correspondence and joint effort among individual understudies has emerged as a key test connected to the blended online method.¹¹ These issues were flagrantly uncovered by the pandemic with regards to metropolitan-designed education and apprenticeship. Further, it also assists students for creating relational, correspondence, and

collaboration abilities through sharing thoughts, trading information, and companion learning.¹²

Most of the students agreed about the style of learning from the resources used, while it felt neutral in facilitating integrated teaching, understanding the subject matter, content, and objectives, were clear. This partly supports the argument that it was found that students were more satisfied with the face-to-face teaching method, as it would be difficult to ask questions in an e-learning class. Our findings are consistent with Bidaki who found that students prefer face-to-face teaching,¹³ whereas, our results are inconsistent with a study conducted by Richmond, in which it is unveiled that e-learning may be as effective as face-to-face training on the learning of healthcare professionals with no difference in outcomes.¹⁴ Nevertheless, neutral rating was given, might be because all the assignments had to be mailed to the instructor to grade, and emailed timely to the students. Our results agree with Walker, who concluded that a timely response by the teacher helps the teacher and the learner to identify the problems, and providing timely feedback.¹⁵ It is coherent that when students have issues, opportune assistance from the instructor urges students to learn. The value of clear and timely fashion feedback has been recently illustrated as an important factor in higher education studies.¹⁶

In the domain of instructor content, a question that received a significantly higher mean value was regarding the latest information provided and, they were provided with multiple means to understand and memorize the subject. Alsharif and colleagues have earlier reported that an instructor's demeanor, zeal, and method of teaching affect students' learning. It was crucial to ascertain whether students could establish a connection with a distance educator in the same way as they can in a face-to-face setting. It was comforting to learn that students had a good understanding relationship with the teacher.¹⁷

In the domain of learning for communication accessibility, the preparation of instructors for every online class had a significantly higher mean value. Against this, the questions about the instructor accessibility when students had any query and encouragement of independent learning, had a neutral mean value. As teachers were also extremely cognizant of online learning processes, planning courses allowed them to join the classrooms to explain new topics and facilitate meaningful dialogues. Without a lesson plan, children may lose interest rapidly, and teachers may find themselves unsure of what to do next. Wei Goh and fellows also stated that students value the

physical presence of instructors more for understanding the subject.¹⁸

Similarly, in a local qualitative study three themes were identified; students' diverse experiences of panic and anxiety, the unprecedented academic experiences' and despite facing a lot of challenges, the students still saw 'light at the end of the tunnel'. The effects of COVID on the physical, psychological, social and academic life of medical students were enormous. It is highly recommended that institutes and faculty provide support for personal and professional development of students in these unprecedented times.¹⁹

Students' ability to successfully participate in online courses is dependent upon the availability of the resources and instruments important to deal with the demands of their web-based coursework.²⁰ Most of the respondents selected neutral opinion in questions dealing with online learning saving many resources such as time, electricity, fuel and whether it is easier and more convenient. It is significant to take note that equivalent access to proper equipment and framework should be provided.²¹

Most of the respondents disagree on the question regarding whether online learning helps to keep a person mentally relaxed and comfortable. E-learning can lead to social isolation and calls for good time management and self-motivation abilities.²² The majority of the students agree that the use of technology in cultural situations is better than wasting time. Web tools, cameras, word processors, and software can help generate opportunities for independence and inclusion. This combined with online teaching certainly leads to an unprecedented increase in these students' screen time which can be harmful to the students.²³

Most of the students achieved good and satisfactory scores in the final assessments with online learning. Lestari also declared that the scores of many important subjects improved overall with distance learning in dental education and generally, students had a positive response towards online learning management and results despite facing some challenges.²⁴

HEC Pakistan provided an online teaching preparedness agenda encompassing six points. Readiness of the university, course, faculty, library, technology and students, all had to be appropriately managed to ensure effective delivery of online sessions.²⁵

Sharif suggested that a hybrid type of teaching should be incorporated in the future to make the teaching and learning process for both the teachers and the students more favourable.⁹ Furthermore, for decision-makers and everyone engaged in the implementation of similar strategies

soon, may be crucial to understand the elements that affected students' performance following the hurried introduction of e-learning. The findings of our study provide a clear plan for policy, research, and education. It is advised to encourage investment in the growth of students' and faculty members for digital competencies, as well as initiatives encouraging research and multidisciplinary innovative collaborations.

The quality of e-learning during the COVID-19 pandemic was quite satisfactory and mainly derived from service quality with administrative, technical, and learning assistance through teachers' active role in online education with their responsiveness and timely feedback. Moreover, our study shows that the impact of e-learning quality on student performance is strongly mediated by student understanding and satisfaction.

As a cross-sectional study, the perspectives of the participants could evolve with time. Therefore, more longitudinal research is needed to better understand the factors that influence the uptake of e-learning systems in contemporary society. Further research can be done in the future to evaluate the adoption and acceptance of e-learning at higher education institutions.

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References

1. Chen T, Peng L, Yin X, Rong J, Yang J, Cong G. Analysis of user satisfaction with online education platforms in China during the COVID-19 pandemic. *Healthcare* 2020; 8(3): 200.
2. Madathil KC, Frady K, Hartley R, Bertrand J, Alfred M, Gramopadhye A. An empirical study investigating the effectiveness of integrating virtual reality-based case studies into an online asynchronous learning environment. *Comput Edu* 2017; 8(3): 1-0.
3. Raja HZ, Saleem MN, Saleem T, Rashid H, Ehsan S, Hakeem S, Hanif A. Perceived stress levels in Pakistani dental students during COVID-19 lockdown. *European J Dent Oral Health*. 2020; 1(4).
4. Verma A, Verma S, Garg P, Godara R. Online Teaching During COVID-19: Perception of Medical Undergraduate Students. *Indian J Surg* 2020; 82(3): 299-300.
5. Nambiar D. The impact of online learning during COVID-19: students' and teachers' perspective. *Int J Indian Psychol* 2020; 8(2): 783-93.
6. Pei L, Wu H. Does online learning work better than offline learning in undergraduate medical education? A systematic review and meta-analysis. *Med Educ Online* 2019; 24: 1666538.
7. Bashir TF, Hassan S, Maqsood A, Khan ZA, Issrani R, Ahmed N, Bashir EF. The Psychological Impact Analysis of Novel COVID-19 Pandemic in Health

- Sciences Students: A Global Survey. *Eur J Dent* 2020; 14: s91-6
8. Ikhtlaq A, Hunniya BE, Riaz IB, Ijaz F. Awareness and attitude of undergraduate medical students towards 2019-novel coronavirus. *Pak J of Med Sci* 2020; 36 (COVID-19-S4): S32.
 9. Sharif M, Rahim S, Tahir A, Minallah S, Sheikh MW, Riaz MU. Perception of dental students regarding online classes during the pandemic. *Pak Armed Forces Med J* 2020; 70(1): S369-74.
 10. Sanders J, Correia R, Dankbaar M, de Jong P, Goh P, Hege I, et al. Twelve tips for rapidly migrating to online learning during the COVID-19 pandemic. *Med Ed Publish* 2020: 3068.
 11. Perez-Aranda J, Medina-Claros S, Urrestarazu-Capellán, R. Effects of a collaborative and gamified online learning methodology on class and test emotions. *Edu Inform Technols* 2024; 29(2): 1823-55.
 12. Peimani N, Kamalipour H. Online Education in the Post COVID-19 Era: Students' Perception and Learning Experience. *Educ Sci* 2021; 11(10): 633.
 13. Bidaki MZ, Sanati AR, Semnani MN. Students' attitude towards two different virtual methods of course delivery. *Proc Soc Behav Sci* 2013; 83: 862-6.
 14. Richmond H, Copsey B, Hall AM, Davies D, Lamb SE . A systematic review and meta-analysis of online versus alternative methods for training licensed health care professionals to deliver clinical interventions. *BMC Med Educ.* 2017; 17 (1): 227.
 15. Walker SL, Fraser BJ. Development and validation of an instrument for assessing distance education learning environments in higher education: the distance education learning environments survey (DELES). *Learn Environ Res* 2005; 8: 289-308.
 16. Shute VJ. Focus on Formative Feedback. *Rev Educ Res* 2008; 78: 153-89.
 17. Alsharif NZ, Qi Y. A three-year study of the impact of instructor attitude, enthusiasm, and teaching style on student learning in a medicinal chemistry course. *Am J Pharmaceut Edu* 2014; 78(7): 132.
 18. Goh W, Ayub E, Wong SY, Lim CL. The importance of teacher's presence and engagement in MOOC learning environment: A case study. In 2017 IEEE Conference on e-Learning, e-Management and e-Services (IC3e) 2017 Nov 16 (pp 127-132). IEEE.
 19. Iftikhar S, Saleem S, Aziz I. Experiences of medical and dental students of Pakistan during COVID-19 pandemic lockdown: a qualitative study. *BMJ Open* 2022; 12: e066442.
 20. Kamalipour H. Feeding forward in urban design pedagogy: A critique strategy. In *Effective Design Critique Strategies across Disciplines*; Watson Zollinger, S., Nyboer, J., Eds.; University of Minnesota Libraries Publishing: Minneapolis, MN, USA, 2021.
 21. Central WA, Oliveira T, Di Felice M, Aparicio M. E-learning success determinants: Brazilian empirical study. *Comput Educ* 2018; 122: 273-90
 22. Realyvásquez-Vargas A, Maldonado-Macías AA, Arredondo-Soto KC, Baez-Lopez Y, Carrillo-Gutiérrez T, Hernández-Escobedo G. The impact of environmental factors on academic performance of university students taking online classes during the COVID-19 Pandemic in Mexico. *Sustainability* 2020; 12(21): 9194.
 23. Keržič D, Alex JK, Pamela Balbontín Alvarado R, Bezerra DD, Cheraghi M, Dobrowolska B, et al. Academic student satisfaction and perceived performance in the e-learning environment during the COVID-19 pandemic: Evidence across ten countries. *PloS one.* 2021; 16(10): e0258807.
 24. Lestari W, Ichwan SJA, Yaakop SZ, Sabaznur N, Ismail A, Sukotjo C. Online Learning during the COVID-19 Pandemic: Dental Students' Perspective and Impact on Academic Performance, One Institution Experience. *Dent J* 2022; 10: 131.
 25. Muhammad M, Sohail M, Saeed MH, Bhatti UA, Ahmed A, Javed MQ. Self-efficacy and Online Learning Readiness of Undergraduate Dental Students in Pakistan During COVID-19 Pandemic *Med Edu* 2023; 33(8): 910-14.