

Article

Virtual and Traditional Lecturing Technique Impact on Dental Education

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Abstract: This study tries to identify the influence of the new coronavirus pandemic on dental education by assessing dental students’ perception and their didactic performance regarding virtual and traditional lectures. The final academic performances of students from different years of study at the Faculty of Dental Medicine who participated in undergraduate courses through two different lecturing modes (traditional and virtual) were compared. The same students were evaluated in terms of their preference between the two lecturing techniques. There was a statistically significant difference in the mean values for final grades of virtual and traditional technique in favor of the latter one. In pandemic conditions, because of safety reasons, virtual lecturing was the most preferred technique. For dental faculty, this process of transitioning from traditional to virtual is a continuous process, which was suddenly imposed, but which at this moment offers multiple opportunities from a didactic point of view. Analyzing the grade, the virtual lecturing techniques demonstrated superior didactic performance. Although students preferred the virtual lecturing technique more than the traditional one, better-designed research is required to verify the long-term effect of the two lecturing techniques on students’ formation and deepening of knowledge.

Keywords: coronavirus; dental education; virtual lecturing; traditional lecturing



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1. Introduction

Coronaviruses (CoV) are a subfamily of viruses that have been responsible for repeated disease outbreaks in the recent past. COVID-19 infection was defined as a pandemic by the World Health Organization (WHO) in March 2020 and is a global challenge for education that changed perspectives on teaching and interaction in many dental schools [1–3].

In Romania, the Faculty of Dentistry lasts six years, of which the first three years are based mainly on preclinical study and the last three on in-depth clinical study. Furthermore, there is a focus on clinical skills practice, which usually takes place in the summer, at the end of each academic year over four working weeks. Each academic year is divided into two semesters of 14 weeks and at the end of each semester there is an examination period. (Winter period: January–February, Summer period: June–July, respectively). Dental studies are taught in Romanian, English, or French, depending on candidate preference. The Faculty of Dental Medicine, “Ovidius” University Constanta offers two programs of study in dentistry, in English and Romanian languages.

The six years of studies are finalized with the bachelor’s exam. Graduates who pass the bachelor’s exam receive the title of Doctor of Dental Medicine (DMD) and the right to free practice.

Postgraduate training can be continued through residency programs in 7 different specialties (endodontics, orthodontics, pedodontics, periodontics, prosthetics, general dentistry, oral and maxillofacial surgery) and through master’s degree programs or PhD programs.

Before this pandemic, all courses were delivered by traditional classroom lectures, as oral presentations, or clinical practice in face-to-face activities. The dental teaching has an important curriculum in the clinic where patients attend dentistry practice and dental students train their manual and cognitive skills that are required for the profession. The Faculty of Dental Medicine, “Ovidius” University Constanta had to move from the usual, face-to-face way of teaching to virtual learning classes to ensure social distancing, which has been recommended to control the spread of the disease [4].

Given the conditions of insecurity and uncertainty from the beginning of this pandemic, virtual lessons were the only possibility to carry out the didactic activity. In Europe, 90% of dental schools used online teaching software tools, 72% used live videos, 48% provided links to further online materials, and 65% participated in organizing virtual meetings, working groups, and social media groups for theoretical purposes [5,6].

Educational electronic platforms like WebEx[®] (Webex by Cisco, Milpitas, CA, USA) and Moodle[®] are an official alternative to traditional learning and can be used for didactic activity and the evaluation of students. WebEx[®] is a new form of classroom conference and lectures, using video conference systems, that was implemented at many institutions [7]. The WebEx[®] platform is an alternative to classroom settings, although it depends on a quality internet connection. Moodle[®] platforms are extensively used by dental schools for active learning activities [8]. On Moodle[®], it is possible to send didactic material, post videos, provide formative-assessments, and accommodate various question formats.

There is little evidence regarding the long-term impact of virtual lecturing on students' formation and consolidation of knowledge.

We must not lose sight of the fact that besides theoretical education, dental students must acquire clinical skills to make a correct diagnosis and to correctly execute the necessary treatment [9]. Abbasi et al. conducted a study among health science students regarding the perception and satisfaction of virtual learning and most of the students agreed that this learning method was not useful for developing the needed clinical skills [10]. Similar results were obtained in another study, in which most dental students considered online classes not to be as effective as face-to-face classes [11]. The advantages of hybridizing the teaching technique by combining traditional techniques with a virtual lecture technique should also be considered [12].

Pending the resumption of face-to-face teaching, an adaptation of educational offerings and infrastructure is recommended for occupational risk management with an emphasis on the safety of students, teachers, and patients [13]. As it is not known how long this situation will last, alternatives must be found to keep training students until the resumption of dental clinical practice. Guidelines and recommendations for simulated training courses for clinical skills acquisition in dentistry during and after the COVID-19 pandemic have been formulated to ensure the safety of students and teaching staff, dental auxiliary staff, and patients. However, the guidelines are considered appropriate only when the number of COVID-19 outbreaks has been significantly reduced, for example when the epidemiological curve has flattened in the concerned area. The criteria for lifting restrictions on activities should be in accordance with the legal provisions in force in the concerned area [14].

Considering this pandemic context, this study aimed at assessing the perception of clinical dental students on virtual and traditional lectures and at comparing their didactic performance obtained by the two lecturing techniques.

2. Materials and Methods

The present study was carried out considering the disciplines of pedodontics and orthodontics which are included in the curriculum of the second semester of the fourth and first semester of the fifth year of study and oral rehabilitation that is in the first and second semester of the sixth year of study at the Faculty of Dental Medicine, “Ovidius” University Constanta. For the 2019–2020 academic year, in 2019, the didactic activity took place by traditional teaching that consisted of face-to-face oral lectures and clinical practices. In 2020, to ensure social distancing, the transition to virtual teaching was decided upon. So,

the students were lectured virtually, by new forms of classroom conference and lectures, using Zoom[®] and WebEx[®]. For students' evaluation, the Moodle[®] platform was used. One hundred and six students were involved in this study.

Students' perceptions of both traditional and virtual lecturing was assessed by an online survey, consisting of eight questions. Participation in this survey was optional and all participants provided their informed consent before completing the questionnaire. The answers of each participant were anonymous. The first part of the survey contained three categorizing questions, about student's year of study, gender, and grade received at the pedodontics, orthodontics, and oral rehabilitation exam. The second part included questions regarding students' preference in terms of flexibility in assigning lecture time, lecture duration, interaction with the teaching staff, student comprehension, knowledge gained from the lecture, and overall student preference. Considering the study participants' preferences, the possibilities for answering questions were classified as follows: Virtual, Traditional, No difference. All the questions included in the questionnaire are shown in Table 1.

Table 1. Participants' preferences regarding the traditional and virtual lecturing.

Questions	Participant Preference		
	Virtual	Traditional	No Difference
Regarding the flexibility of lecture time (morning, afternoon, evening), which lecturing technique do you prefer?	82 (77.35%)	18 (16.98%)	6 (5.66%)
Regarding the flexibility of the duration of the lectures (length of the lecture), which lecturing technique do you prefer?	76 (71.69%)	17 (16.03%)	13 (12.26%)
Regarding the interactivity (ability to interact with the lecturer), which lecturing technique do you prefer?	46 (43.39%)	51 (48.11%)	9 (8.49%)
Regarding the lecturer's accessibility (the ability to ask the lecturer a question after the lecture), what teaching technique do you prefer?	44 (41.50%)	46 (43.39%)	16 (15.09%)
Regarding the lectures comprehension (ability to gain information from the lecture), which lecturing technique do you prefer?	46 (43.39%)	39 (36.79%)	21 (19.81%)

Students' educational performance was assessed by comparing the final didactic grades of all students. The test consisted of 40 multiple choice questions covering all lectures of the course. In Romania, the grading system is from 1 to 10, grade 10 being the best, grade 1 being the worst and 5 is the minimum passing grade.

Descriptive statistics were performed to analyze the students' answers. All variables are presented as frequencies and percentages. For students' perception of both traditional and virtual lecturing, Pearson's chi-squared test was used to analyze the responses concerning the categorical variables. For the students' didactic performance, the independent samples *t*-test was employed to identify the significance among pairs of means. The Statistical Package for Social Studies (SPSS 22; IBM Corp., New York, NY, USA) was used for the data analysis. *p* values < 0.05 were considered statistically significant.

3. Results

All students from the above-mentioned disciplines were enrolled in the study, representing a total of 128 clinical undergraduate dental students, of which 79.69% (*n* = 102) were female and 20.31% (*n* = 26) were male. Of the 128 students, 106 submitted the questionnaire responses, representing a percentage of 82.81%. About 81.13% of the participants were female (*n* = 86), the rest of 18.86% (*n* = 20) were male.

Regarding the grades obtained in the three study disciplines, for traditional lecturing technique 8.49% of participants were 10 grade students (*n* = 9), 27.35% were 9 grade

students ($n = 29$), 35% were 8 grade students ($n = 37$), 22.64% were 7 grade students ($n = 24$), and 6.60% were 6 grade students ($n = 7$).

For the virtual technique, 46.22% participants were 10 grade students ($n = 49$), 35.84% were 9 grade students ($n = 38$), 15.09% were 8 grade students ($n = 16$), 1.88% were 7 grade students ($n = 2$), and 0.94% were 6 grade students ($n = 1$).

The traditional lecturing technique was compared with the virtual technique, which resulted in better final grades at the clinical course for the three study disciplines. Regarding the grades obtained by the same student, the differences were generally one point or no difference in some cases. Only one student scored lower on the virtual exam because he was not used to this assessment technique and made mistakes in approaching the test. Despite the small difference in the mean grades between the two lecturing techniques, which was about 0.9, such a difference was of no significance from an educational point of view, confirming the close effectiveness between the two lecturing techniques.

Analysis of the responses in relation to the categorical variables indicates no correlations between participants' preferences and their year of study or their grade ($p > 0.05$).

Furthermore, the current study revealed that dental students were highly in favor of the virtual modality in terms of the flexibility of both time (77.35%) and duration (71.69%) of the lecture. This point indicates a clear advantage for virtual learning from the perspective of dental students, as it offers comfort in terms of time.

Regarding lecture interactivity, a significant increase in student preference toward the traditional technique was observed. Our study revealed that 48.11% of the students preferred the traditional method, 43.39% preferred the online method, whereas 8.49% of them were indifferent.

Lecturer approach ability and lecture comprehension shared close levels of preference, 41.50% and 43.39% respectively, although the virtual lecturing technique was preferred. These two points intersect and together contribute to students' knowledge gain. Table 1 presents the participants' preferences regarding the traditional and virtual lecturing.

4. Discussion

To limit the spread of COVID-19, most of the faculties were closed for a certain period. Consequently, the only way to continue the educational process was by virtual teaching which was progressively adopted even in the field of dental education. At the Faculty of Dental Medicine, it was decided that WebEx[®] and Moodle[®] platforms will be used for the didactic activity and the students' evaluation.

This study demonstrated that the virtual learning method is comparable to the traditional one in teaching pedodontics, orthodontics, dental rehabilitation, theoretical education, and clinical skills in undergraduate dental courses. The results of this study were like those of other studies in this field, in which online learning can be considered a potential method in medical teaching [15,16].

The COVID-19 pandemic has shown that virtual learning will play an important role in the future development of dental education [17].

Regarding the flexibility of lecture time and duration of the lectures, the students from our study appreciated the virtual learning technique. A recently published similar survey done in an Italian dental school confirmed the results of our study. The online lectures were appreciated for qualities such as: time feasibility, the ability to resume lectures at anytime, the ability to better understand complex concepts, and easy access to shared materials [18].

Regarding lecture interactivity, our study revealed a significant increase in student preference toward the traditional technique, like the findings of a German study where the students expressed it very clearly that they missed the communication between each other and the teaching staff [19].

When it comes to lecturer approachability and lecture comprehension, the virtual lecturing technique was preferred with small difference. Similar responses were found in a study in which students were asked to compare the effectiveness of the two methods in terms of knowledge transfer [19].

The results of several studies on online teaching among different faculties of dentistry in different countries during these pandemics have reported positive or negative attitudes [20].

In other studies, dental students believe that online learning can be useful to supplement, but cannot replace, traditional teaching methods [21,22].

Similar results have been reported in other studies with reference to endodontics and radiology courses, in which the average knowledge scores of dental students who received virtual education were higher than those obtained by of students who received traditional learning [23]. The results of the online survey conducted by Meirinhos et al. expresses the perception of the participants in an online conference by emphasizing that most of them consider online lectures a great way to supplement their knowledge [24].

Because dental students require training for their clinical skill development, some alternative solutions for practical application of these skills have been sought, one of which is humanoid robots that simulate a patient. Humanoid robots have a realistic human appearance and can interact with the students through speech and movements [25].

The current study investigated students' preference between the two teaching methods from the perspective of advantages and disadvantages.

Human physical presence might facilitate interactivity, as observed in the current survey. This preference was not surprising, as evidence evaluating the interactivity from open online courses revealed a significant decline in participants' interaction with time, hence explaining the tendency of online courses to go for shorter course periods [26].

Our study has several limitations. The first limitation of this study was that the learning methods were evaluated in the students from the higher years of studies. As the knowledge varies between academic years, using senior students could lead to bias in the study because their knowledge and skills in pedodontics, orthodontics, and oral rehabilitation depend on the knowledge acquired from other disciplines. Second, generalization is also difficult because the study was conducted for three disciplines in a single educational unit. Third, this study evaluated the impact from the theoretical point of view and did not consider the analysis of acquired clinical skills. As in any other study of this kind, another limitation of the study format is that the questionnaire consisted of closed questions only and did not give participants the opportunity to provide free text answers or comments, which restricted participants from expressing their views.

However, to fully understand the impact of virtual learning on student performance, additional studies on other specialties as well as studies assessing their clinical competencies are needed [27].

5. Conclusions

Given the findings of the study, we can say that virtual learning can serve as an effective alternative to traditional face-to-face learning for teaching pedodontics, orthodontics, and oral rehabilitation knowledge and skills to dental students. Virtual and traditional teaching techniques are both valid methods. Further studies with better designs are needed to verify the real effect of the two lecture techniques on student performance. Although students preferred the virtual lecturing technique more than the traditional one, better-designed research is required to verify the long-term effect of the two lecturing techniques on students' formation and deepening of knowledge. However, one of the limitations of this study is that students from only one dental school participated in this study. Given the high relevance of this topic, to get a comprehensive overview of the measures taken worldwide, a thorough review of the articles addressing this topic is needed.

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References

1. WHO. Rolling Updates on Coronavirus Disease (COVID-19). Available online: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen> (accessed on 22 April 2021).
2. Chang, T.Y.; Hsu, M.L.; Kwon, J.S.; Lindawati, M.F.; Kusdhany, S.; Hong, G. Effect of online learning for dental education in Asia during the pandemic of COVID-19. *J. Dent. Sci.* **2021**, *16*, 1095–1101. [[CrossRef](#)] [[PubMed](#)]
3. Chang, T.Y.; Hong, G.; Paganelli, C.; Phantumvanit, P.; Chang, W.J.; Shieh, Y.S.; Hsu, M.L. Innovation of dental education during COVID-19 pandemic. *J. Dent. Sci.* **2021**, *16*, 15–20. [[CrossRef](#)] [[PubMed](#)]
4. Centers of Disease Control and Prevention. Guidance for Unvaccinated People. Social Distancing. Keep a Safe Distance to Slow the Spread. Available online: <https://www.cdc.gov/> (accessed on 22 April 2021).
5. Quinn, B.; Field, J.; Gorter, R.; Akota, I.; Manzanares, M.C.; Paganelli, C.; Davies, J.; Dixon, J.; Gabor, G.; Mendes, R.A.; et al. COVID-19: The immediate response of European Academic Dental Institutions and future implications for dental education. *Eur. J. Dent. Educ.* **2020**, *24*, 811–814. [[CrossRef](#)] [[PubMed](#)]
6. Halpin, P.A.; Lockwood, M.K. The use of Twitter and Zoom videoconferencing in healthcare professions seminar course benefits students at a commuter college. *Adv. Physiol. Educ.* **2019**, *43*, 246–249. [[CrossRef](#)]
7. Klein, K.P.; Hannum, W.M.; Koroluk, L.D.; Proffit, W.R. Interactive distance learning for orthodontic residents: Utilization and acceptability. *Am. J. Orthod. Dentofac. Orthop.* **2012**, *141*, 378–385. [[CrossRef](#)]
8. Memon, A.R.; Rathore, F.A. Moodle and online learning in Pakistani Medical Universities: An opportunity worth exploring in higher education and research. *J. Pak. Med. Assoc.* **2018**, *68*, 1076–1078.
9. Esteban, A.; Romero, C.; Zafra, A. Assignments as Influential Factor to Improve the Prediction of Student Performance in Online Courses. *Appl. Sci.* **2021**, *11*, 10145. [[CrossRef](#)]
10. Abbasi, M.S.; Ahmed, N.; Sajjad, B.; Alshahrani, A.; Saeed, S.; Sarfaraz, S.; Alhamdan, R.S.; Vohra, F.; Abduljabbar, T. E-Learning Perception and Satisfaction among Health Sciences Students amid the COVID-19 Pandemic. *Work Read. Mass.* **2020**, *67*, 549–556. [[CrossRef](#)]
11. Tuladhar, S.L.; Pradhan, D.; Parajuli, U.; Manandhar, P.; Subedi, N. Study on the Effectiveness of Online Classes for Undergraduate Medical and Dental Students of Gandaki Medical College during COVID 19 Pandemic Period in Nepal. *Orthod. J. Nepal.* **2020**, *10*, 36–40. [[CrossRef](#)]
12. Pickering, J.D.; Roberts, D.J. Flipped classroom or an active lecture? *Clin. Anat.* **2018**, *31*, 118–121. [[CrossRef](#)]
13. Emami, E. COVID-19: Perspective of a dean of dentistry. *JDR Clin. Trans. Res.* **2020**, *5*, 211–213. [[CrossRef](#)] [[PubMed](#)]
14. Hong, G.; Chang, T.Y.; Terry, A.; Chuenjitwongsa, S.; Park, Y.S.; Tsoi, J.K.; Lindawati, M.F.; Kusdhany, S.; Egusa, H.; Yamada, S.; et al. Guidelines for innovation in dental education during the coronavirus disease 2019 pandemic. *J. Oral Sci.* **2021**, *63*, 107–110. [[CrossRef](#)]
15. Aljarbou, F.A.; Riyahi, A.M. Comparing dental students’ performances and perceptions on virtual lecturing and the traditional technique. *Int. J. Med. Dent.* **2021**, *25*, 15–19.
16. 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. [[CrossRef](#)] [[PubMed](#)]
17. Zitzmann, N.U.; Matthisson, L.; Ohla, H.; Joda, T. Digital Undergraduate Education in Dentistry: A Systematic Review. *Int. J. Environ. Res. Public Health* **2020**, *17*, 3269. [[CrossRef](#)]
18. Varvara, G.; Bernardi, S.; Bianchi, S.; Sinjari, B.; Piattelli, M. Dental Education Challenges during the COVID-19 Pandemic Period in Italy: Undergraduate Student Feedback, Future Perspectives, and the Needs of Teaching Strategies for Professional Development. *Healthcare* **2021**, *9*, 454. [[CrossRef](#)]
19. Huth, K.C.; von Bronk, L.; Kollmuss, M.; Lindner, S.; Durner, J.; Hickel, R.; Draenert, M.E. Special Teaching Formats during the COVID-19 Pandemic—A Survey with Implications for a Crisis-Proof Education. *J. Clin. Med.* **2021**, *10*, 5099. [[CrossRef](#)] [[PubMed](#)]
20. Wang, K.; Zhang, L.; Ye, L. A Nationwide Survey of Online Teaching Strategies in Dental Education in China. *J. Dent. Educ.* **2021**, *85*, 128–134. [[CrossRef](#)] [[PubMed](#)]
21. Mengoni, P.; Poggioni, V.; Li, Y. Community elicitation from co-occurrence of activities. *Future Gener. Comput. Syst.* **2020**, *110*, 904–917. [[CrossRef](#)]
22. Asiry, M.A. Dental Students’ Perceptions of an Online Learning. *Saudi Dent. J.* **2017**, *29*, 167–170. [[CrossRef](#)]
23. Moazami, F.; Bahrapour, E.; Azar, M.R.; Jahedi, F.; Moattari, M. Comparing Two Methods of Education (Virtual versus Traditional) on Learning of Iranian Dental Students: A Post-Test Only Design Study. *BMC Med. Educ.* **2014**, *14*, 45. [[CrossRef](#)] [[PubMed](#)]

24. Meirinhos, J.; Pires, M.; Da Costa, R.P.; Martins, J. Receptivity and Feedback to the Online Endodontics Congress Concept as a Learning Option—An International Survey. *Eur. Endod. J.* **2020**, *5*, 212–218. [[CrossRef](#)]
25. Nishioka, T.; Mayanagi, G.; Dds, Y.I.; Hong, G. Impact of the COVID-19 pandemic on dental clinical training and future prospects. *J. Dent. Educ.* **2021**, *85*, 1999–2001. [[CrossRef](#)] [[PubMed](#)]
26. Zhan, Z.; Fong, P.S.; Mei, H.; Chang, X.; Liang, T.; Ma, Z. Sustainability education in massive open online courses: A content analysis approach. *Sustainability* **2015**, *7*, 2274–2300. [[CrossRef](#)]
27. Mengoni, P.; Piccinato, F. Artificial intelligence visual metaphors in e-learning interfaces for learning analytics. *Appl. Sci.* **2020**, *10*, 7195.