

# Audience and Presenter Comparison of Live Web-Based Lectures and Traditional Classroom Lectures During the COVID-19 Pandemic

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## Keywords

Online Training; Covid-19; Postgraduate Prosthodontics Training; Web-based training.

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## Abstract

**Purpose:** The purpose of the study was to assess participants' and presenters' perceptions of a live web-based lecture series in comparison to traditional in-person lectures.

**Materials and Methods:** A virtual lecture series was organized by the——from March 25th until June 3rd of 2020. Twenty-five postgraduate prosthodontics programs and 81 presenters participated. Two surveys were developed and distributed to the audience (N = 330) and the presenters (N = 81). Follow-up emails were sent one week, three weeks, and four weeks after the initial email survey to encourage its completion. The data were analyzed descriptively. One-way ANOVA ( $p = 0.05$ ), followed by a post hoc test, were used to compare the response percentages among the different generations of presenters and participants.

**Results:** Fifty-two percent of participants, and 65% of presenters, completed the survey. More than 96% of participants and presenters were satisfied with the lecture series. Seventy-nine percent of audience members felt that the live web-based lectures were as effective as traditional classroom lectures, or more effective; 32% of presenters agreed. Millennial audience members had significantly ( $p = 0.0028$ ) more negative responses than the other generations.

**Conclusion:** Participants have more positive perceptions of web-based lectures than presenters.

The World Health Organization announced in January 2020 that a novel coronavirus (COVID-19) constituted an international public health concern. By mid-March of that year, many areas of the United States and Canada began to implement lockdowns of their populations.<sup>1</sup> Dentists were noted to be at especially high risk for infection and transmission;<sup>2</sup> dental schools were asked to discontinue their clinical activities, and students were relegated to mostly improvised electronic learning (e-learning) for the remainder of the semester.<sup>3,4</sup>

E-learning is broadly defined as “utilizing electronic technologies to access educational curriculum outside of a traditional classroom”.<sup>5</sup> “Traditional classroom” denotes a face-to-face lecturing scenario. There are many variations in e-learning content delivery, including internet or computer-based training with either interactive or passive presentation. This method can be self-paced and individual in nature, or entail live web-based audio and video conferencing. Although more than four million students experienced e-learning in at

least one course module in 2007, the use of e-learning has been limited in dentistry.<sup>6–8</sup> However, its popularity in health professions is growing due to its flexibility, availability, and convenience. Its drawbacks include the lack of an educator's physical presence, learner isolation, and diminished peer support and competition.<sup>9–12</sup>

Studies have suggested that supplementing the traditional lecture style with e-learning could improve core knowledge of students by amplifying their attention and enhancing their overall learning experience.<sup>13–21</sup> These findings are supported by a recent meta-analysis<sup>22</sup> which revealed no significant difference between online modules and classroom lectures in the areas of knowledge, practical skills, and satisfaction, with the exception of a single study<sup>23</sup> which favored online learning.

Due to the necessity of halting in-person educational activities, the American Dental Education Association (ADEA) announced ADEA Connect, a consortium in which dental educators could network and share their experience via web-based

**Table 1** Content of the lecture series as it relates to the curricula

Content of presented lectures	
Biomaterials	Multidisciplinary Diagnosis and Treatment Planning
Craniofacial Complex Defects	Occlusion
Craniofacial Growth and Development	Orthodontics
Diagnosis	Periodontology
Digital Technology	Prosthodontic Diagnosis and Treatment Planning
Endodontics	Prosthodontics Board Exam Preparation
Esthetic Dentistry	Removable Prosthodontics
Fixed Prosthodontics	Sleep Disorders
Implant and Implant Therapy	Surgical Principles
Intraoral Photography	Temporomandibular Disorders and Orofacial Pain
Maxillofacial Prosthetics	Wound Healing

learning modules, which launched on March 19, 2020.<sup>24</sup> The ADEA communicated with members multiple times per week, and members provided educational webinars on a weekly basis. Prosthodontics organizations such as the American College of Prosthodontists, the Academy of Osseointegration, The American Prosthodontics Society, and the International College of Prosthodontists, also initiated internationalization of their continuing education.<sup>25–27</sup> They also provided weekly continuing education via live web-based lectures and recorded lectures for their members and expanded their invitations to international audiences. Similarly, University of Buffalo, School of Dental Medicine (UB SDM)—organized a live web-based lecture series for postgraduate prosthodontic dental residents, featuring faculty from a variety of dental schools. Considering the absence of preexisting comparative research on live web-based lectures and traditional classroom lectures, the purpose of this study was to analyze perceptions of both the new program and traditional classroom education.

## Materials and methods

From March 25 until June 3, 2020, University of Buffalo, School of Dental Medicine (UB SDM) — hosted a live web-based lecture series in collaboration with multiple postgraduate prosthodontics programs. Forty-one postgraduate prosthodontics residency programs and three general dentistry programs were invited to join the lecture series. Three hundred and thirty postgraduate dental residents, and faculty from 25 postgraduate residencies (22 representing prosthodontics and three from general dentistry programs), participated. During this period, 125 live lectures, ranging in length from one to two hours, were delivered by 81 educators and private practitioners via web-based software (Zoom Video Communications, Inc.; San Jose, CA or Cisco WebEx; Milpitas, CA). Table 1 presents the content of the lectures as it relates to the curricula.

After the series' conclusion, a survey was designed to gather audience and presenter feedback, in addition to demographics. Two questionnaires were developed by three educators

(Tables 2 and 3) to inquire about the perceived quality of education delivered by live web-based lectures and traditional classroom lectures. The participants' survey consisted of 12 multiple-choice, and four open-ended, questions. The presenters' survey consisted of nine multiple-choice, and three open-ended, questions. Questions comparing web-based lectures to the in-person lectures, as well as other multiple-choice questions, offered 5-point Likert scale answer choices.

The study was approved by the Institutional Review Board at the University of Buffalo—(STUDY00004623). UB SDM Study candidates' email addresses were obtained through the—Restorative Dentistry Department, through which the lecture series was initiated. Two emails were drafted, describing the purpose of the study and the estimated time required to complete the survey (10 minutes). An online program (SurveyMonkey, Palo Alto, CA) was used to administer the surveys. Potential respondents were informed that participation in the study was voluntary, and that survey results would be anonymous. Delivery protocol followed the modified Dillman total design survey methodology.<sup>28</sup> Follow-up emails were sent one week and three weeks after the initial email.<sup>28</sup> A final email was sent at the four-week mark in order to encourage participation.

Responses to each question were evaluated by SurveyMonkey. Results were analyzed as an aggregate, and as generational groups defined as traditionalists ( $\geq 75$  years old), baby boomers (56–74 years old), generation X (40–55 years old), millennials (24–39 years old), and generation Z ( $\leq 23$  years old).<sup>29</sup> In addition, residents were grouped into two levels, junior (first-year residents) and senior (second and third-year residents), to assess the impact of residency year on attitudes.

Statistical analyses were performed using GraphPad Prism (V.8.0.0 for Mac OS, Prism Graph Inc.; San Diego, CA) at a significance level of  $p < 0.05$ . For the purposes of statistical analysis, when questions offered 5-point Likert scale answer choices, answer choices of “poor,” “very bad,” “disagree,” and “strongly disagree” were combined, and considered as a negative response. One-way ANOVA, followed by a t-test post hoc test, was then used to compare the negative response percentages among generations. For the survey, a t-test was used to compare the percentage of negative responses between the junior and the senior residents, as well as residents and faculty.

## Results

One hundred and seventy-two out of 330 participants (52%) responded to the survey. Sixty-eight percent of participants were postgraduate residents (63% prosthodontics residents, 5% other postgraduate residents) and 32% of participants were faculty (27% full-time faculty, 5% part-time faculty) ranging between 24 and 74 years old. (Figs 1, 2) Fifty-three out of 81 presenters (65%) participated in the survey. Seventy percent of presenters were full-time faculty, while part-time faculty and private practitioners accounted for 17% and 10% of them, respectively. The remaining presenters were other professionals. The majority of presenters (52%) were 40 to 55 years old. (Fig 2)

Overall, 99% of participants and 96% of presenters were satisfied with the live web-based lecture series. The majority of

**Table 2** Survey for audience members

## Questionnaire

- Q1.** Position; **Q2.** Affiliation; **Q3.** Age
- Q4.** Overall, I was satisfied with the live web-based lecture series.  
-Strongly agree -Agree -Neutral -Disagree -Strongly disagree
- Q5.** Overall, the information presented during the live web-based lecture series was up to date.  
-Strongly agree -Agree -Neutral -Disagree -Strongly disagree
- Q6.** Please rate the quality of education that you received during the web-based lecture series.  
-Excellent -Good -Fair -Poor -Very bad
- Q7.** Overall, the information presented during the live web-based lecture series was relevant and applicable to my work.  
-Strongly agree -Agree -Neutral -Disagree -Strongly disagree
- Q8.** Overall, the information presented during the live web-based lecture series was evidence-based and free of commercial bias.  
-Strongly agree -Agree -Neutral -Disagree -Strongly disagree
- Q9.** In your opinion, having the live presentation delivered on Zoom/Webex rather than in a classroom is:  
-More effective -As effective -Less effective
- Q10.** The opportunities to ask questions for the live presentation delivered on Zoom/Webex are equal to a presentation delivered in a classroom.  
-Strongly agree -Agree -Neutral -Disagree -Strongly disagree
- Q11.** Did you experience any technical difficulties during the live presentation delivered on Zoom/Webex that influenced your learning experience?  
-Yes -No
- Q12.** Based on your experience, would you watch a live presentation on Zoom/Webex seminar again in the future?  
-Likely -Neutral -Not likely
- Q13.** For all of the participants, what changes may you make in your work, based on the materials presented?
- Q14.** For faculty only, what changes may you make in your teaching technique, based on the materials presented?
- Q15.** Based on your experience, what are the advantages and disadvantages of the live presentations delivered on Zoom/Webex?
- Q16.** Additional comments:

participants (99%) believed that the information presented during the three-month lecture series was up-to-date, relevant, and applicable to their work. More than 90% of the participants described the quality of education as excellent or very good, felt that the information presented to them was evidence-based, and opined that they would likely attend a web-based lecture in the future.

Figure 3 summarizes participants' attitudes toward the web-based lecture series in comparison to traditional classroom lectures. Seventy-nine percent of participants believed that the web-based lectures were as effective, or more effective, than classroom lectures, and that they had an equal amount of opportunity (65%) to ask questions. Figure 3 also shows that 88% of participants experienced no technical difficulties. Participants who did (12%) defined technical difficulties as troublesome internet connection, unclear and interrupted voice, background noise, video buffering issues, unmuted microphones, and problems with signing in. Figure 4 shows the percentage of negative responses among generations for participants. "Less effective," "strongly disagree," "disagree," and "yes" in response to questions 9, 10, and 11, respectively, were considered negative responses. One-way ANOVA analysis revealed the significant impact of generation on responses. Post hoc t-test demonstrated that millennials had significantly ( $p = 0.0028$ ) higher negative response rates compared to generation X and baby boomers. The t-test did not show a significant ( $p > 0.05$ ) difference in negative response rate between junior and senior residents, or between residents and faculty.

Figure 5 shows the comparison of presenters' assessments of the web-based lecture series in comparison to classroom lectures. Presenters believed that the live web-based lecture was more challenging (47%), less effective (68%), less personal (85%), and didn't provide similar interaction with the audience (56%). However, 49% of presenters believed that web-based lectures grant similar opportunities as the classroom lecture for answering questions, and provided an exchange of knowledge that is not possible in the classroom. Selecting "more challenging," "less effective," "less personal," "strongly disagree," and "disagree" for questions 4 through 9, respectively, were categorized as negative responses. Since there were only two members of the traditionalist generation within the presenters' group, responses from baby boomers and traditionalist groups were combined. One-way ANOVA found that generation did not significantly ( $p > 0.05$ ,  $p = 0.872$ ) impact responses of presenters.

When presenters were asked what changes they would implement to improve e-learning in the future, their answers varied. The most common answer (chosen 20 times) was "making use of audience engagement tools such as polling." The second most common answer was "they plan to host more web-based lectures and to have structure for them." Recording the lectures to broaden the audience was also suggested.

When participants were asked how to improve the online lecture series, their answers fell into three categories: (1) use of evidence-based practice to incorporate fundamentals and new technologies; (2) use of photography to improve patient

**Table 3** Survey for presenters

## Questionnaire

**Q1.** Position; **Q2.** Age**Q3.** Overall, I was satisfied with the live web-based lecture series.

-Strongly agree -Agree -Neutral -Disagree -Strongly disagree

**Q4.** In your opinion, presenting the live presentation delivered on Zoom/Webex rather than in a classroom is:

-More challenging -As challenging -Less challenging

**Q5.** In your opinion, interaction with the audience during the live presentation delivered on Zoom/Webex rather than in classroom is:

-More effective -As effective -Less effective

**Q6.** In your opinion, interaction with the audience during the live presentation delivered on Zoom/Webex rather than in a classroom is:

-More personal -As personal -Less personal

**Q7.** The opportunities to answer questions for the live presentation delivered on Zoom/Webex are equal to a presentation delivered in a classroom.

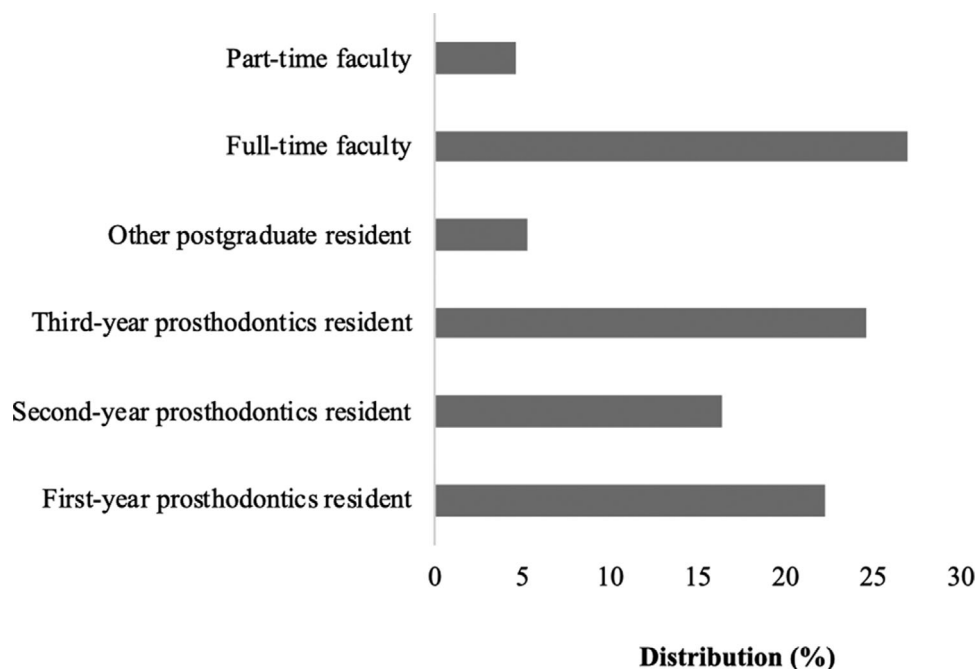
-Strongly agree -Agree -Neutral -Disagree -Strongly disagree

**Q8.** Overall, the live presentation delivered on Zoom/Webex can provide similar interaction with the audience compared to a presentation delivered in a classroom.

-Strongly agree -Agree -Neutral -Disagree -Strongly disagree

**Q9.** Overall, the live presentation delivered on Zoom/Webex provides an opportunity for the exchange of knowledge which was not possible with a presentation delivered in a classroom.

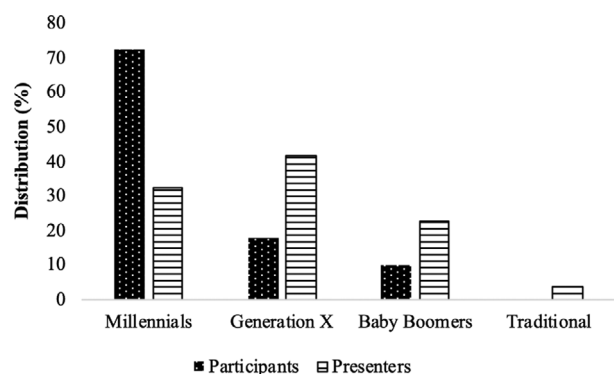
-Strongly agree -Agree -Neutral -Disagree -Strongly disagree

**Q10.** Based on your experience, what are the advantages and disadvantages of the live presentations delivered on Zoom/Webex?**Q11.** Based on your experience during the web-based lecture series, what changes may you make in your teaching technique?**Q12.** Additional comments:**Figure 1** Demographics of audience members who participated in the study.

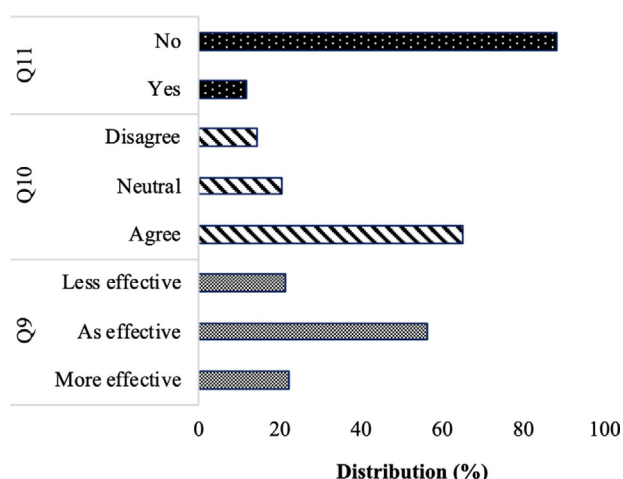
documentation; (3) modification of the teaching style with new virtual classroom technologies to continue the exchange of lectures between schools.

Participants noted many advantages of the web-based lectures: (1) Accessibility to a diverse group of presenters who are experts in numerous fields; (2) convenience and ease of ac-

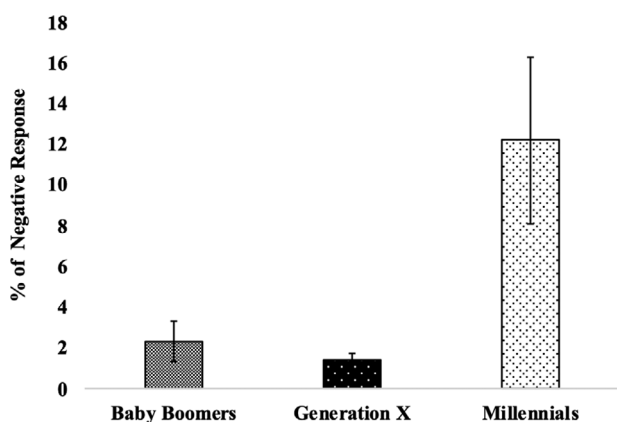
cess; (3) facilitation of asking questions during the lectures; (4) access to a broad audience; (5) less distraction/more focus during presentations; (6) economically advantageous for exchange of knowledge; (7) allowance for multitasking; and (8) opportunity to record the lecture and to take notes. They remarked that disadvantages included: (1) Limited, or loss of, human



**Figure 2** Distribution of presenters and audience members based on generation.



**Figure 3** Audience perceptions of live web-based lecture series.



**Figure 4** Percentage of negative response divided by generation for participants.

interaction; (2) technical issues due to internet, unmuted audience, delay in buffering slides with video, or special effects; (3) time zone difference; (4) less opportunity to ask questions; (5) screen fatigue and distraction; (6) failure by the presenter

to assess the attentiveness of the audience; and (7) inability to engage in hands-on activity.

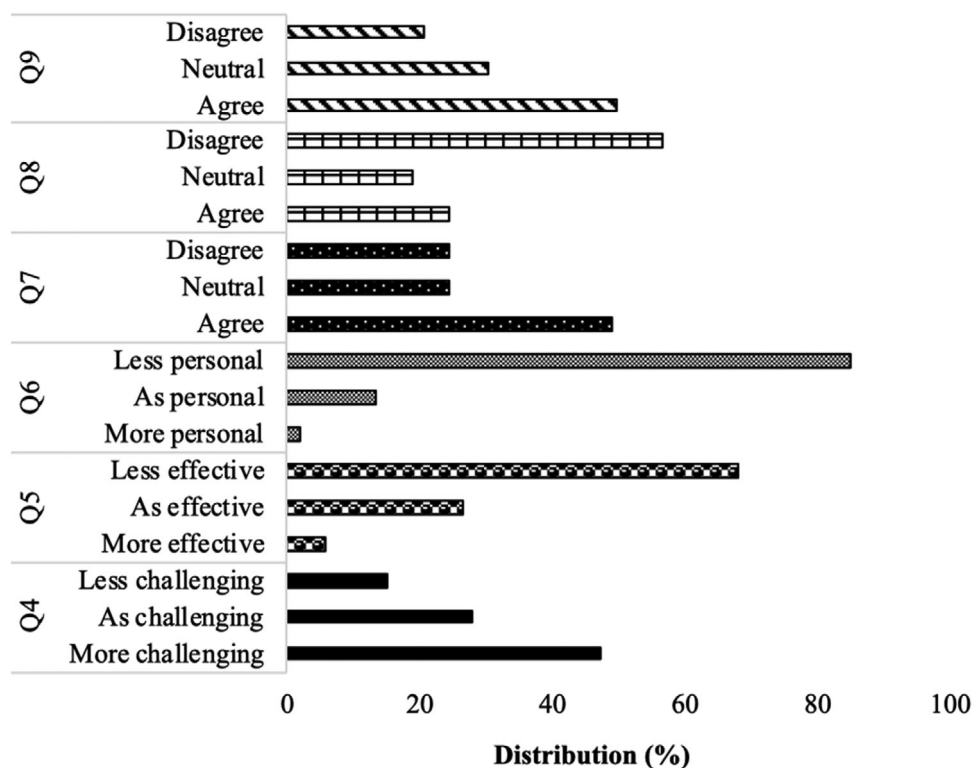
## Discussion

This survey study evaluated both presenter and audience assessments of the postgraduate prosthodontics programs' curriculum update, which was instituted in response to the COVID-19 pandemic. The response rates for the surveys were as expected, based on previous research.<sup>28</sup> The higher response rate of presenters (65%) compared to participants (52%) may highlight the importance of this comparison study for educators; however, a prospective study comparing two teaching methodologies and their impact on the learning outcome seems inevitable. More than 90% of participants and presenters were satisfied that the program delivered quality content, addressed relevant topics, and provided evidence-based education. However, a large portion of postgraduate dental education is focused on developing clinical skills, which cannot be replaced by lectures or telehealth education.<sup>30</sup>

Supporting previous studies on e-learning,<sup>22,23</sup> we found that the majority of participants (78%) perceived the live web-based lecture series to be equally effective, or more effective, than classroom lectures (Fig 3). Additionally, 65% of the participants believe that the opportunity to ask questions during the web-based lecture is similar to that offered in the classroom. This may be due to the chat room function in the lecture platform. Because the lectures were delivered by well-known presenters, the audience may have compared the web-based lecture experience with conferences in which the audience does not have the chance to ask questions. Participants may feel more comfortable asking questions in the chat room compared to the lecture hall, as writing in the chat room does not necessitate interrupting the speaker.

Eighty-five percent of presenters found it as, or more, challenging to present a web-based lecture as opposed to an in-person lecture; they also remarked that it felt less personal. Sixty-eight percent of presenters stated it was more challenging to interact with the audience, and 57% of them disagree that they have a similar interaction level with the audience. All of these data complement each other and demonstrate that presenters prefer classroom lectures because they provide insight, they can analyze their audience's level of engagement, the audience can interrupt them during the lecture, and the presenter can change the course of the presentation to refocus the audience's attention. A number of methods might be adopted to resolve this lack of connection; for instance, using two desktops and presenting to a smaller group with unmuted audio/video, the presenter could observe the audience on one desktop and interact with them via audio/video while the presentation is projected on the second desktop. Online presentations with small group discussion between the presenters and the learners have shown to be an effective method of teaching, and to increase the level of engagement.<sup>31</sup> This survey study finds that faculty are interested in the implementation of the new technology; furthermore, they are willing to make use of engagement tools for their own benefit and that of students. Faculty may only need additional training, assistance, and support from their institutions.<sup>32,34</sup>





**Figure 5** Presenters' responses to live web-based lecture series.

Previous studies have shown that the experience of presenters and students improved after exchanging educational information between peers in an online setting.<sup>35,36</sup> Participants in this survey also believe that the reception of lectures from experts in the field were advantageous. Similarly, 50% of presenters believe that web-based lectures provided opportunities for exchange of knowledge which are not possible with classroom presentations.

Technical, internet, and hardware/software issues impact students' e-learning experiences.<sup>37</sup> Fortunately, only 12% of our participants encountered technical difficulty, which impacted their learning experience. Some of the technical issues may have been personal, such as poor internet connection and difficulty signing in; 88% of the participants had no such challenges. Other issues, such as unmuted microphones of audience members, are not inherently the fault of the format. The organizer could mute the audience upon entry, or the audience could be held accountable for muting their microphones. However, difficulties such as buffering videos might need to be resolved by presenters adapting their lectures, and limiting videos and special effects on slides.

The generational gap between educators and students does impact the response to technology in dental education; however, evidence suggests that the technological literacy of students is not as high as often suggested.<sup>38</sup> In this study, millennials had a significantly higher negative response ( $p = 0.028$ ) compared to other generations, although they have grown up in a world suffused by technology. Baby boomers, on the

other hand, may possess advanced technological skills due to personal interest or professional requirements.<sup>38–40</sup> In addition, students from different socioeconomic and cultural backgrounds may have varied exposure to technology.<sup>39</sup> In contrast, there was no significant difference ( $p = 0.814$ ) in negative response rates between residents and faculty. Millennials were the youngest generation among the participants, and their significantly higher negative response may be related to their unfamiliarity with the topics presented.

This study had several limitations. The surveys were distributed at a time when the dental schools had very recently instituted new protocols, and the pandemic was a significant stressor. In addition, third-year residents were struggling to complete the required patient care to graduate and may not have had enough time to complete the survey; this could account for the participants' rate of survey completion (52%) being lower than presenters' (68%). Future studies should focus on the learning outcomes of collaboration with other schools and the use of live web-based lectures. Further research could analyze comparisons prospectively and control some variables such as the institution hosting the program and quality of internet access for presenters and participants.

## Recommendations

This study provided insight into the advantages and disadvantages of live web-based lectures. It found that, with reasonable adjustments, live web-based lectures can provide an excellent

and cost-effective educational experience for the audience as well as the presenter. Based on feedback from the participants of the survey, we suggest: (1) the use of small group, web-based lectures to engage the audience, and energize the audience and presenter with personal face-to-face interaction; (2) minimize the technical difficulties by providing presenters and the audience with minimum requirements for network bandwidth; (3) minimizing the use of videos in the lectures; (4) use of engaging tools such as polling to reduce audience fatigue.

## Conclusions

Within the limitations of this study, it can be concluded that:

1. Participants have a more positive opinion of web-based lectures compared to presenters, and find them as effective as classroom lectures.
2. Presenters find web-based lectures to be less personal, less effective, and more challenging than classroom lectures.
3. Participant's generation affects their rate of negative responses toward effectiveness of the web-based lecture series. Millennials have significantly ( $p < 0.05$ ) higher negative response rates compared to those in generation X and baby boomers.
4. Presenters' generation did not impact their negative responses toward effectiveness of the web-based lecture series.

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## Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

**Table S1.** List of residency programs that participated in web-based lecture series.

**Table S2.** List of lecture title presented on web-based lecture series.