

# Influence of the COVID-19 pandemic on learning preferences and perspectives of generation Y and Z students in dental education

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## Abstract

**Objectives:** For the first time in history, the COVID-19 pandemic required students at The University of Texas School of Dentistry (UTSD) to move to remote education. Based on a literature review, it was assumed that younger generations of students would prefer virtual teaching models over in-classroom formats. The purpose of this study is to assess students' perspectives of remote learning during COVID-19 in dental education relative to their generation and programme.

**Methods:** An electronic survey was administered to all UTSD dental and dental hygiene students via Qualtrics. The survey collected information on demographics, pre-pandemic learning preferences, remote learning experiences during the pandemic, and a free response section. Descriptive statistics and Fisher's exact test were used to analyse data.

**Results:** The survey received a 60% response rate ( $n = 290$ ). Over 95% of respondents belonged to Generations Y and Z. There were no significant differences in responses between generations. However, significant differences in responses between programmes arose with more dental hygiene students agreed that they liked learning in a classroom setting compared to dental students ( $p < 0.01$ ). Significantly more dental students agreed that they stayed organized, were less stressed, and felt that the transition to online learning was easy compared to dental hygiene students ( $p < 0.01$ ).

**Conclusion:** Although the majority of students surveyed belong to Generations Y and Z, there are still preferences for traditional, in-person learning. Both cohorts recognized the benefits and challenges of distance learning, and the findings from this study shed light on how students are handling remote learning in dental education.

## KEYWORDS

COVID-19, curriculum, dental, education, learning, students

## 1 | INTRODUCTION

The coronavirus disease 2019 (COVID-19) has affected the educational sector across the globe, and dental education is no

exception.<sup>1,2</sup> In efforts to help slow down the progression of the disease, as recommended by the Centers for Disease Control and Prevention (CDC), all U.S. dental institutions shifted to remote teaching modalities for the first time in history.<sup>3</sup> This drastic change

significantly impacted course delivery to students enrolled in dental and dental hygiene programmes.<sup>4-8</sup> Video conferencing platforms such as Webex and Zoom were quickly utilized in order to ensure that content continued to be delivered in a timely manner for all clinical and didactic courses.<sup>9,10</sup>

At the onset of COVID-19, little information was available in the literature on how dental and dental hygiene students belonging to Generations X, Y (Millennials), and Z were adapting to new educational changes brought on by the pandemic. Generational studies show that Generation X (born between 1965 and 1980) was the first generation with computers, but they limit their technology use mainly for information search.<sup>11</sup> Individuals belonging to Generation Y (born between 1981 and 1996) are known to be “tech-savvy” because they grew up in the evolution of different types of technology; these individuals are aware of the types of technology but may not know how to navigate different platforms without thorough instructions. Generation Z (born between 1997 and 2015), known as “Digital Natives,” have a natural affinity to technology because they were born into advanced technology. They are quicker to adapt to different types of technology compared to Generation Y.<sup>12</sup> Generation Y (Millennials) grew up with computers and other technological devices in their primary education, whereas Generation Z was born into a world run primarily on the internet.<sup>13</sup> Because of constant advancement in technology, both generations have learned to multitask, and are accustomed to and expect rapid diffusion of information.<sup>14,15</sup> Both cohorts prefer to communicate electronically via email, instant messaging, text, and other social media platforms.<sup>16</sup> From an educational perspective, it is often assumed that Generation Y and Z students favour the use of technology in their learning and therefore, would likely prefer web-based or online courses over a traditional classroom format for convenience and flexibility.<sup>17-19</sup> For example, a 2007 national study of undergraduate students found that most students (72%) preferred learning by running internet searches and about one-half (49.7%) reported using social media for communicating with classmates about course-related topics.<sup>20</sup> However, another study conducted in 2017, which surveyed dental students in Saudi Arabia revealed that online learning was viewed as a helpful supplement but should not replace in-person learning.<sup>21</sup> Currently, there is little information available on generational learning preferences and experiences of both dental and dental hygiene students belonging to Generation Y and Z during COVID-19. The aim of this study was to examine students' perspectives of remote learning during COVID-19 in dental education relative to their generation and programme.

## 2 | METHODS

This study was determined to be exempt from Institution Review Board by the Committee for Protection of Human Subjects (CPHS) at The University of Texas Health Science Center at Houston, HSC-DB-20-0377. All students at The University of Texas School of Dentistry (UTSD), 80 from the dental hygiene programme and 400 from the pre-doctoral (DDS) programme, were emailed invitations to

participate in an optional Qualtrics (Provo, Utah) online survey during the period of May–August, 2020. All responses remained anonymous and no risks were associated with this project. Convenience sampling was used in this study based on availability and willingness of the participants to take part in the survey.

The design of the survey questionnaire was developed by the authors and was validated by educational research experts who were responsible for evaluating and checking the construction of the survey questions. The survey consisted of 16 original questions which were divided into five sections. The first section asked about student demographics in regards to programme enrolled and generational categories (two questions). The generational categories included Generation X (born between 1965 and 1980), Y (born between 1981 and 1996), and Z (born between 1997 and 2015). The second section investigated student learning environment preferences prior to the pandemic which includes classroom, online, laboratory, and clinical setting (four questions). The third section asked about student experiences of remote learning in terms of organization, attentiveness in classes, ability to think critically, active participation, likeliness to ask questions, and contentment in remote examinations (six questions). The fourth section was about students' overall perception of remote education regarding their stress level, ease of transition to online learning, and whether some classes should stay remote after the pandemic (three questions). And lastly, a free narrative response section was included in which students could provide additional comments/feedback on their experiences of remote learning (one question). The collected data was extracted from Qualtrics and converted to excel sheets (Microsoft, USA). Descriptive analyses were conducted for the demographic variables. Participants responded to non-demographic questions on a four-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree). Pearson's chi-squared test and Fisher's exact test were used to evaluate the association between responses from the dental hygiene students and dental students and between all UTSD students and their generational categories with the significance level of  $p < 0.05$ . All statistical analyses was performed using R statistical software (R Core Team).

## 3 | RESULTS

### 3.1 | Demographics

A total of 290 out of 480 students participated in the survey giving an overall response rate of 60%. The targeted total class size of first- and second-year dental hygiene students was 80 (40 students in each class) while the targeted total class size of first through fourth year dental students was 400 (100 students in each class). In each programme, there was a 95% response rate from the dental hygiene students ( $n = 76$ ) and 54% response rate ( $n = 214$ ) from the dental students. Generational categories were determined by spans of specific birth years. Generation X was born between 1965 and 1980, Generation Y (Millennials) was born between 1981 and 1996, and Generation Z was born between 1997 and 2015. [Table 1](#) shows

**TABLE 1** Distribution of Participants' Generation by Dental Educational Programme

Generations	Dental hygiene	p-value	Dental	p-value
X (Born between 1965–1980)	1.4% (N = 4)	0.059	1% (N = 3)	0.022*
Y (Born between 1981–1996)	20% (N = 58)	0.059	64.5% (N = 187)	0.109
Z (Born between 1997–2015)	4.8% (N = 14)	0.022*	8.3% (N = 24)	0.109

\*Fisher's exact test shows statistically significant differences ( $p < 0.05$ ).

the distribution of students' demographics by generation and their dental programme. The percentages for dental hygiene and dental students show the proportion of each frequency based on the total sum of student participants.

### 3.2 | Student preferences for learning prior to COVID-19

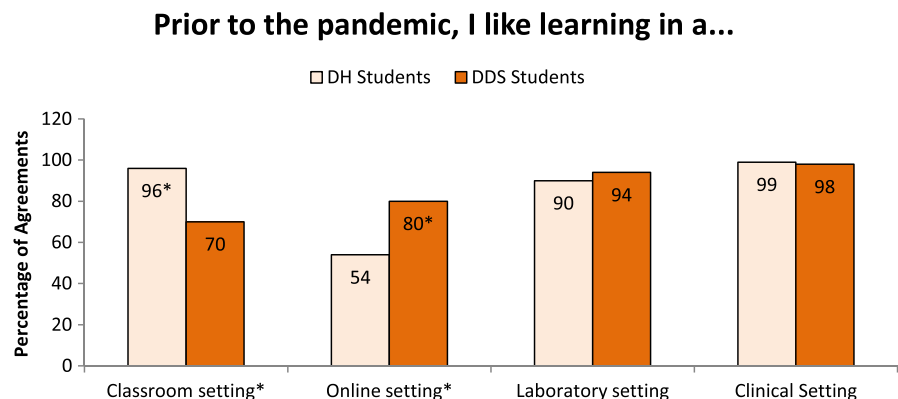
A comparison of students' responses relative to their generation and programme was investigated. There were no statistical differences ( $p > 0.05$ ) found between the three generations (X, Y, and Z) when analysing all statements for student preferences for learning prior to COVID-19. However, statistically significant differences were found between the dental and dental hygiene programmes for the same category (Figure 1). Significantly more dental hygiene student respondents preferred learning in a classroom setting with those that collectively strongly agreed and/or agreed (96%) compared to dental student respondents who collectively strongly agree and/or agree (70%) ( $p < 0.01$ ). In contrast, significantly more dental student respondents liked learning online with those that collectively strongly agreed and/or agreed (80%) compared to dental hygiene students who collectively strongly agreed and/or agreed (54%) ( $p < 0.01$ ). When asked whether students liked learning in a laboratory setting, there were no significant differences between both programmes ( $p = 0.454$ ). Collectively, 90% of the dental hygiene students strongly agreed and/or agreed that they liked learning in a laboratory setting, while 94% of the dental student respondents collectively strongly agreed and/or agreed. With regard to whether students liked learning in a clinical setting, no significant differences were found in responses between the two programmes ( $p = 0.838$ ). Collectively, 99% of the dental hygiene students strongly agreed

and/or agreed that they liked learning in a clinical setting prior to the pandemic while 98% of the dental student respondents collectively strongly agreed and/or agreed.

### 3.3 | Student experiences of learning during the pandemic

To gauge student perception of remote learning during the pandemic, respondents from each generation and programme answered questions regarding their ability to stay organized, their attentiveness in classes, ability to think critically, active participation, likeliness to ask questions, and contentment in remote examinations. There were no statistical differences ( $p > 0.05$ ) found among the three generations (X, Y, and Z) when analysing all of the above statements for learning during the pandemic. However, statistically significant differences were found between the dental and dental hygiene programmes for all statements in this category (Figure 2). Overall, significantly more dental student respondents strongly agreed and/or agreed to all questions ( $p < 0.01$ ) compared to dental hygiene student respondents about their experiences in remote education. Collectively, 79% of dental students strongly agreed and/or agreed that they stayed organized with remote learning, whereas collectively, 56% of dental hygiene students strongly agreed and/or agreed. In addition, significantly more dental students felt more attentive in their remote classes (63% strongly agreed and/or agreed collectively) than dental hygiene students (19% strongly agreed and/or agreed collectively). Significantly more dental students also felt that they were able to think critically during their remote classes (75% strongly agreed and/or agreed collectively) compared to dental hygiene students (39% strongly agreed and/or agreed collectively). More dental students also collectively strongly agreed and/or agreed (80%) that they participated actively during their remote classes compared

**FIGURE 1** Student preferences for learning prior to the pandemic, by percentage of agreements in each group: dental hygiene (DH) and dental (DDS) students. Statistically significant differences (\*) were found between both programmes among specific statements for the same category ( $p < 0.01$ ).



## During the pandemic, in my remote classes, I...

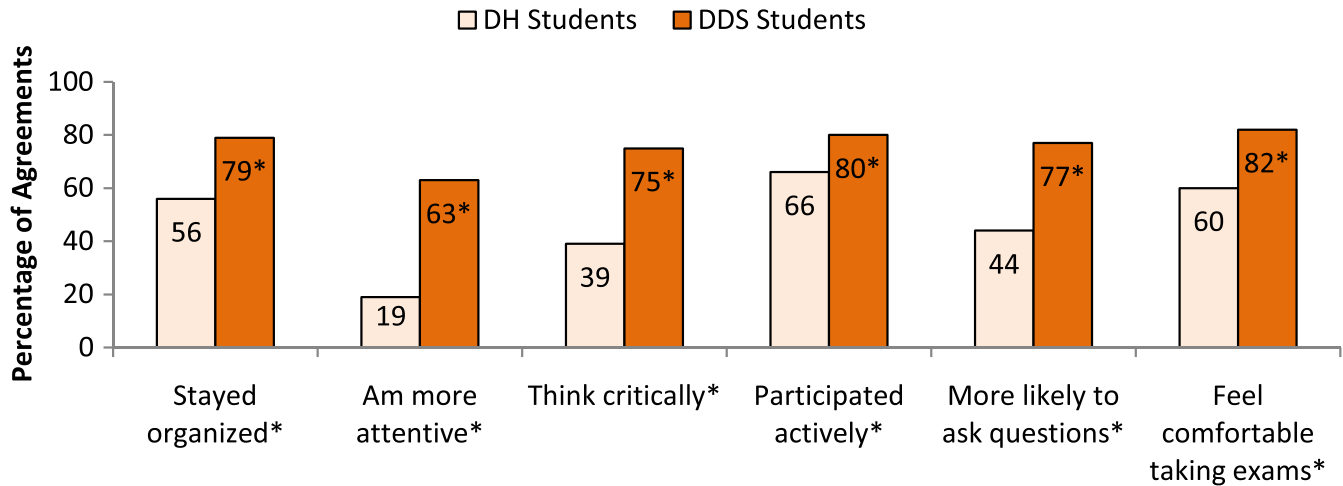


FIGURE 2 Students' learning experiences during the pandemic, by percentage of agreements in each group: dental hygiene (DH) and dental (DDS) students. Statistically significant differences (\*) were found between both programmes for all statements in this category ( $p < 0.01$ )

## Overall thoughts about remote learning.

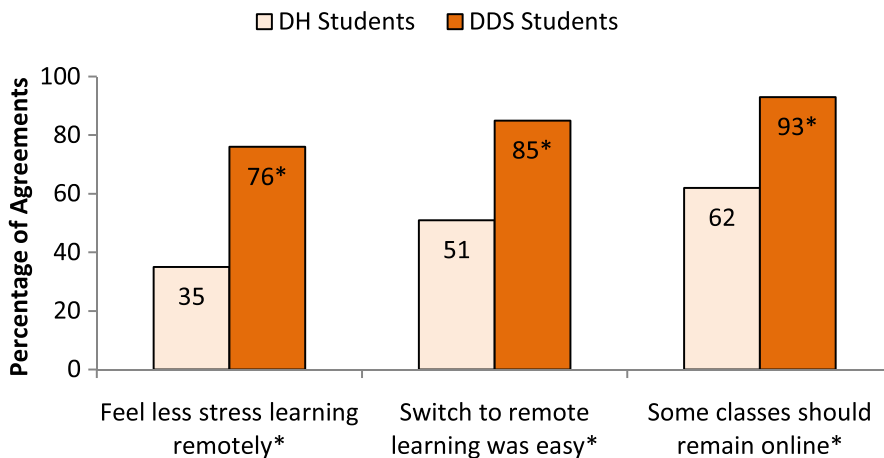


FIGURE 3 Students' overall perception of remote education, by percentage of agreements in each group: dental hygiene (DH) and dental (DDS) students. Statistically significant differences (\*) were found between both programmes for all statements in this category ( $p < 0.01$ ).

to dental hygiene students who collectively strongly agreed and/or agreed (66%). Significantly more dental students also felt that they are more likely to ask questions during their remote classes (77% collectively strongly agreed and/or agreed) compared to dental hygiene students (44% strongly agreed and/or agreed collectively). And lastly, in regards to contentment on taking exams remotely, significantly more dental student respondents collectively strongly agreed and/or agreed (82%) that they were comfortable taking their exams off-campus compared to dental hygiene students who collectively strongly agreed and/or agreed (60%).

### 3.4 | Student overall perception of remote learning

Students from all generations and both programmes were asked about their overall perception of remote learning in terms of stress

level, ease of transition, and whether some classes should stay remote after the pandemic. There were no statistical differences ( $p > 0.05$ ) found among the three generations (X, Y, and Z) when analysing all of the above statements for overall student perception of remote learning. However, statistically significant differences were found between the dental and dental hygiene programmes for all statements in this category (Figure 3).

Significantly more dental student respondents collectively strongly agreed and/or agreed (76%) that they felt less stress learning remotely compared to dental hygiene students who collectively strongly agreed and/or agreed (35%,  $p < 0.01$ ). In addition, significantly more dental students collectively strongly agreed and/or agreed (85%) that the move to remote learning was relatively easy compared to dental hygiene students who collectively strongly agreed and/or agreed (51%,  $p < 0.01$ ). After the pandemic, significantly more dental students respondents collectively strongly

agreed and/or agreed (93%) that some classes should continue online compared to the dental hygiene student respondents who strongly agreed and/or agreed (62%,  $p < 0.01$ ).

### 3.5 | Students' open-ended comments

In the free narrative response section (Table 2), respondents provided feedback on their experiences of remote learning during COVID-19. Some common themes that emerged from the dental student respondents in the comments section were: (1) having didactic lectures online gave students more study time and reduced stress; (2) lab and clinic courses should be in-person; and (3) students are able to learn at their own pace, which gives them time to focus on their overall health and well-being. From among the dental hygiene student respondents, the following themes emerged in the comment section: (1) distractions at home affected their learning; (2) difficulty in staying focused, and (3) technological issues that affected their class time (i.e.

TABLE 2 Selected student feedback on their experiences of remote education during COVID-19

#### Students' shared comments/experiences learning during the pandemic

##### Dental Student Respondents (59 comments received)

"I felt so much confident to ask questions remotely and I felt like I was speaking to each faculty one on one. I have learned a lot remotely than I have in classroom."

"I think making classes more online based just allows us more time to ourselves and helps us handle all the stress that comes from school a little better. I have always been a student that goes to every single class and now I prefer lecture online..."

"...lab and clinic material cannot be simulated online, and learning in person for that is invaluable. But, for didactic material, learning online has a lot of benefits. Reduced stress, more time efficient, easy access to material, students are more easily able to go at their own pace of learning..."

"... we are getting no face-to-face interaction which is really difficult and can be lonely. In the future, some classes like the heavy didactic lecture classes can be done online with labs in person because some learning in person is sometimes necessary..."

##### Dental Hygiene Student Respondents (22 comments received)

"I like the idea about having students learn on-line for certain classes because truly I believe some classes can be taken at home except clinic time."

"I have missed like two lectures since we went online due to my computer crashing and internet issues at home....taking test from home makes me more anxious than taking them at school I feel like I can not concentrate during tests and make careless mistakes on exams."

"My grades dropped when the change to remote learning occurred. I became responsible for both of my children's education AND the adjustment of my own. It has been overwhelming and extremely stressful."

"I've had a hard time to stay focus during online lectures because either my family or dogs distract me."

Note: Anonymous quotes gathered from the free response section in the survey; 81 students submitted comments. Those listed here represent consistent themes in the students' feedback.

computer issues, internet bandwidth issues, learning curve for faculty in using and navigating software/computer issues). Overall, student feedback on remote education was mixed, with students acknowledging both the advantages and challenges of online learning.

## 4 | DISCUSSION

The aim of this study was to examine students' perspectives of remote learning during COVID-19 in dental education relative to their generation and programme. The pandemic necessitated all students at UTSD to move to remote education. It was also assumed that all students belonging to Generations Y and Z would prefer remote teaching methods more so than Generation X students since recent generational studies show that Generations Y and Z tend to favour the use of more technology in their learning. Although the majority of the student respondents at UTSD belonged to Generations Y and Z, interestingly, not all of these students preferred remote/online learning. Instead, significant differences in their responses were found when comparing cohorts from the dental hygiene versus the dental programme.

Prior to the pandemic, the majority of dental students reported that they liked learning online compared to dental hygiene students who preferred learning in a classroom setting. For example, the majority of dental students felt that the switch from in-person to online learning was smooth compared to dental hygiene students. Dental students rated that they were able to manage their study habits well, were more likely to ask questions in their remote classes, and liked the flexibility in their schedule such as extra time for self-paced learning. In a similar study by Hattar et al.<sup>21</sup> which investigated dental students' preferences for online learning in the University of Jordan during COVID-19, the authors reported that 67% preferred online lectures and almost 79% stated that the quarantine actually increased their collaboration with their colleagues. Data from our study also seem to indicate that remote learning was a preferred mode for dental students because of the better flexibility and time management it gave them.

In contrast to the dental student respondents, prior to the pandemic, more dental hygiene students liked learning in a classroom setting compared to online. During the pandemic, the majority of dental hygiene students felt that they were not as attentive in their online classes, and also reported feeling more stress learning remotely. In addition, more dental hygiene students also did not think that they were able to use critical thinking in their remote courses. Some frequent comments from dental hygiene students as to why remote learning has not been ideal included difficulty focusing, distractions in the home learning environment, and/or technological issues. Based from our data, it seems that most dental hygiene students prefer in-person learning during the pandemic. A study by Amir et al.<sup>22</sup> investigated dental students' perspectives of distance learning in Indonesia during COVID-19 and reported that almost 62% of their students disagreed that distance learning gave similar learning satisfaction as compared to

classroom learning, and about 56% also preferred classroom learning over distance learning.

Future research is needed to investigate if differences in the two programmes affected students' preferences for learning. There may have been factors that influenced more dental hygiene students preferring face-to-face learning compared to dental students in this study. Possible influencing factors could be due to the class size, programme length, gender, living situation, expectations of undergraduate versus graduate schooling, as well as the previous education level when entering the programme.

At UTSD, the dental hygiene class size is smaller (40 students) compared to the dental class (108 students). Students in a much larger class size may experience more classroom distractions and less individualized attention from their faculty. For example, dental students commented that they were easily distracted by their classmates in-person and with remote learning, they were able to focus better as well as interact with their professors using the microphone and/or chat box. In addition, because the DDS programme is a four-year programme (compared to dental hygiene's two-year programme), dental students are expected to take more didactic classes. Therefore, dental students may feel that remote learning allows flexibility in their schedule for managing their studies. For dental hygiene students, their smaller class size may allow students to receive more individualized attention from their professors and possibly fewer in-class distractions, and therefore they prefer an in-class learning environment. Although not reported, another important difference to note between the two programmes is that the dental hygiene cohorts mainly consisted of females, whereas the dental cohort has more of an equal distribution of gender. Some studies show that female students tend to adapt and perform better in self-regulated online learning compared to males.<sup>23,24</sup> The physical environment of students could have also impacted their learning.<sup>25</sup> For example, those students who did not have a conducive environment at home might have preferred face-to-face learning compared to those with favourable home environments. The learning expectations may also be noticeably different of undergraduate and graduate programmes, possibly influencing student learning preferences. In addition, the level of education that students had prior to entering the dental or dental hygiene programme could have influenced their skills in organization, learning, and engagement, which could have affected their learning preferences further. These factors may be considered for future studies in pandemic learning in dental education.

Interestingly, an overall consensus between the dental and dental hygiene students is that both cohorts like learning in a laboratory and clinical setting. As indicated in the comments section, although there are advantages with remote education, students generally agree that learning laboratory/clinical skills is best in-person. The results of this study may be considered as an early investigation in understanding students' perspectives of their remote learning experiences during COVID-19 in dental education.

The limitation of this research was that the survey was conducted at only one dental institution. As seen in international

studies from Jordan and Indonesia, students in different schools/countries had differing preferences regarding favouring remote education or in-person learning. It would be interesting to compare and contrast dental and dental hygiene student responses across multiple U.S. dental institutions to see if their opinions of online learning are consistent with this study. Another limitation of this study was the low response rate of the dental students (54%), which may contribute to non-response bias. Due to non-response, it is likely that the dental student respondents in this study were underrepresented. Previous studies have shown that respondents of studies tend to report more positive school experiences and outcomes compared to non-respondents.<sup>26</sup> The low response from dental students may indicate that the outcomes reported in this study may not fully represent the impact of the COVID-19 pandemic on learning preferences and perspectives of the targeted student population within dental education. In addition, research was conducted at the onset of the pandemic where the sudden shift between in-person to remote education did not allow sufficient time for both faculty and students to adapt. A follow-up study to investigate student experiences with remote education would give insight if there has been any shift in perceptions since the onset of the pandemic and the use of remote learning over the span of 1 year.

## 5 | CONCLUSION

The COVID-19 pandemic challenged educational institutions across the globe to quickly transition to distance learning in order to maintain curricular expectations, while ensuring the safety of all students and faculty. In particular, the pandemic completely reformed the future of dental education in terms of innovation in teaching methodologies, improvement in technology, and delivery of course content (didactic and clinical). In addition, the increased usage of technology in education during the pandemic also questions whether Millennials and Generation Z students would truly favour online learning over the traditional classroom format. The findings of this study reveal that although most dental and dental hygiene students at UTSD belong to the Generation Y and Z cohorts, there were differences found between the two programmes. The results from this study showed that more dental students preferred online learning compared to dental hygiene students. Although there were still some dental students who preferred to be in person, it was significantly more preferred by dental hygiene students. Both cohorts recognize the benefits and challenges of distance learning, with dental students in favour of the flexibility of online learning, while dental hygiene students prefer classroom instruction. There is also a consensus between both cohorts that laboratory and clinical courses should be taught in-person. Overall, the results from this study will provide useful insight and considerations on the current generation's preferences for learning in dental education during COVID-19 and may help guide improvements in course delivery.

## 6 | CLINICAL RELEVANCE

### 6.1 | Scientific rationale

The COVID-19 pandemic required all students in dental education to move to remote learning. Because most students are Generation Y and Z, it is assumed that they prefer online learning over the traditional in-person format.

### 6.2 | Principal findings

Despite belonging to the “tech-savvy” generation, not all students favour online learning. Statistically significant differences were found between programmes in which the dental students prefer online learning, whereas the dental hygiene students favour in-person education.

### 6.3 | Practical implications

The results provide insight on how students navigate remote learning during COVID-19 which may help guide future improvement in course delivery post-pandemic.

### AUTHOR CONTRIBUTIONS

T.P. helped design the study, analysed the data, and assisted with the manuscript preparation. V.N., first author, designed the study, analysed the data, created the figures and tables, prepared and drafted the manuscript. Both authors gave final approval and agreed to be accountable for all aspect of this work, ensuring its integrity and accuracy.

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### CONFLICT OF INTEREST

The authors have no conflict of interest.

### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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