COVID-19 pandemic and the impacts on dental education: an evaluation by progress testing

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Abstract
Purpose – The emergence of the COVID-19 pandemic changed the way in which education was delivered in early 2020, and the impacts of these changes continue to be questionable. The aims of this study were to evaluate: (1) the results obtained by students of the Dentistry course in the progress test carried out both before and after the pandemic; (2) the results obtained by a specific group of students who took the test in 2019–2022, and compare their results and (3) subjects that showed a reduction in the percentage of correct answers when the two tests were compared.

Design/methodology/approach – The progress test consisting of 100 multiple choice questions was applied before and after the pandemic to all students in the Dentistry course. The analyses were performed using the IBM SPSS for Statistics v.26 software program. The level of significance of 5% was adopted (<0.05).

Findings – The test was applied to 320 students in 2019 and to 272 in 2022, of whom the sample of this study was composed. The mean score values in 2019 (M = 49.10; SD = 12.03) were significantly (p < 0.026) higher than those in the year 2022 (M = 46.97; SD = 12.15), with the disciplines in the area of specific knowledge showing a greater drop in the percentage of correct answers by students. This study showed that the emergency remote education had a negative effect on the academic performance of students, based on the progress testing as an evaluation method.

Originality/value – Many studies that assessed the impacts of the pandemic on teaching were focused on the opinions of students. However, the great advantage of our study was the use of a theoretical assessment tool to verify student performance. The post-pandemic landscape beckons for comprehensive inquiries into these domains. This type of research would be valuable for gathering evidence relative to the performance of students after the emergency remote education.

Keywords COVID-19, Progress testing, Academic performance, Higher education

Paper type Research paper

Introduction
Evaluating students within the field of health in higher education poses a considerable challenge. Within medical education, knowledge is not a terminal stage; rather, it serves as a foundational element for the cultivation of advanced skills. These encompass attributes such as professionalism, cultural competence, clinical reasoning and others, collectively classified under the umbrella term of competencies Lurie (2012). Consequently, scholarly inquiries into diverse assessment methods have been undertaken with the objective of enhancing their efficacy. The use of progress testing (PT) as an assessment method began in the 1970s at the...
University of Missouri and Maastricht University (Blake et al., 1996). While traditional end-of-term tests promote short-term, surface-level review strategies, PT encourages students to acquire information throughout the duration of the course, motivating students to break the link between learning and examination, reinforcing the curriculum in a spiral (Bennett et al., 2010). The PT is a comprehensive written test, preferably using scenario-based multiple choice items (five items), which is periodically administered to all the students in a curriculum. It fits in with modern constructivist education because it does not reinforce test-directed learning and promotes long-term knowledge and learning methods. Consequently, the PT helps to trace the educational development of students, allows detailed feedback and identifies gaps in knowledge (Coombes et al., 2010).

The emergence of the COVID-19 pandemic changed the way in which education was delivered in early 2020. Dental schools had to implement digital teaching concepts to offer their students web-based interactions or digitalized contents. Nevertheless, dental education involves both didactic content and training in clinical skills (Chang et al., 2021). Most of the training components were transitioned to an online learning platform, and simulation real-life clinical situations virtually posed greater challenges, particularly in replicating the authentic in-person clinical atmosphere (Quinn et al., 2020). The readiness of students to become proficient dentists, equipped with the confidence and competence to provide secure patient care, hinges on gaining a substantial amount of firsthand practical exposure. The advent of the COVID-19 pandemic instigated transformations in dental education that persist till today, giving rise to a range of ongoing hurdles and complexities (Wang et al., 2021; Kerckstra et al., 2022).

It is important to understand that emergency remote education (ERE), implemented during the COVID-19 pandemic, involves novel educational initiatives that are entirely distinct from pre-existing distance education programs. Consequently, the primary aim is not to establish a novel educational paradigm but rather to mitigate the impact of quarantine by ensuring the accessibility of educational content to learners throughout this period (Hodges et al., 2020). The shift from in-person to online instruction in the majority of Dentistry courses was an abrupt emergency measure, undertaken without any accompanying training. So, a distinction needs to be made between the temporary acceptance of remote learning due to COVID-1911 and long-term student acceptance of continued online teaching (Nordmann et al., 2020). Important considerations are that students consider lecture recordings as supplemental tools rather than alternatives to live lectures (Nkomo and Daniel, 2021). Due to its many challenges, it is not surprising that evaluation of the quality of the ERE in health profession programs has generated much attention around the world, with studies being carried out in educational institutions around the world (Ozen et al., 2022; Rossettini et al., 2021; Compton et al., 2020; Choi et al., 2020; Hickland et al., 2020). Thus, one question remained after the end of emergency remote teaching: did a diminishment in the scholastic achievement of students transpire?

Many studies that assessed the impacts of the pandemic on teaching were focused on the opinions of students (Rose, 2020). (Zheng et al., 2021) However, the great advantage of our study was the use of a theoretical assessment tool to verify student performance. Therefore, the PT gives students the opportunity of verifying their performance in the different areas of the course and curriculum, in addition to identifying their strengths and weaknesses. Furthermore, it is worthwhile to explore the potential value of employing qualitative methodologies to delve deeper into learning strategies employed by students and how these strategies influence their performance in examinations (Nouns and Georg, 2010).

The hypothesis formulated in this research postulated that the transition to the ERE during the COVID-19 pandemic exerted a detrimental influence on the academic performance of dental students, when compared to with conventional in-person education modalities. So, the aims of this study were to evaluate: (1) the results obtained by students in the progress
test carried out both before and after the pandemic, (2) the results obtained by a specific group of students who took the test in 2019–2022, and compare their results and (3) subjects that showed a reduction in the percentage of correct answers when the two tests were compared.

Methods
This study was approved by the Institutional Research Ethics Committee, according to resolution 466/12 protocol no. 75157617.3.0000.5103. The ERE was adopted at the institution as from May 7, 2020. Remote or distance learning had never been used as a teaching methodology in this institution. The institution opted for the asynchronous approach and before starting to use the ERE, all professors were trained to carry out activities using the Teams Platform (Microsoft Corporation). The school opted for asynchronous since it allows students to access the content at their convenience and gives them more autonomy in the search for knowledge. This setup also allows students to access and review the content or even pause classes and return as many times as necessary for their understanding and does not depend on the quality of the Internet at the time of the class, allowing them to access the content when the Internet is adequate.

Professors produced a series of 30-min lessons, each delivered via Microsoft Teams platform on a weekly basis. These classes were thoughtfully recorded on week in advance and promptly made accessible to the students. Subsequent to each video lesson, students were assigned a learning activity referred to as the “formative weekly activity.” This activity encompassed a rigorously crafted, high-order cognitive question, which directly pertained to the subject covered in the video lesson. Students were afforded a one-week timeframe within which to submit their responses via the Teams platform.

Test production
The school has implemented the PT since 2009, as an instrument of evaluation in the course of Dentistry. All the students of the institution of all periods took the same test at the same time. Every progress serves as a reference point, aligning with the skill set anticipated from a recently graduate dentist. The assessments are conducted annually throughout the course, with progress gauged through a consistent upward trajectory in attained scores. The nature of these tests is formative, intended to nurture growth. Each evaluation comprises a set of 100 multiple-choice items, focusing on a single best answer. Whenever feasible, questions are intricately woven into relevant dental scenarios, situating the test items within specific clinical contexts. The objective here is to scrutinize the analysis, amalgamation and application of knowledge-distinct from mere factual recollection. Students are presented with a choice of five options from which to select their answers.

An internally developed question repository was established for the program, and all inquiries undergo a rigorous, multiphase quality assurance protocol prior to their definitive inclusion in the repository. Initially, experienced academics and clinicians conduct a preliminary review of novel questions. Subsequently, selected questions are referred to a dental question writing consortium, which meticulously assesses each question from all angles before granting approval. These questions continue to be subject to meticulous examination during both pre-test and post-test deliberations. These sessions serve a dual role: the former involves scrutinizing items prior to assessment creation, while the latter evaluates the performance of the items after students have concluded the assessment.

The following contents were approached in the basic area: Linguistic Instrumentalization, Anatomy/Anesthesiology, Dental Anatomy; Microbiology, Immunology, Biosafety, Histology/Odontogenesis/Embryology, Pharmacology, Bioethics and Health and Methodology. In the specific area, the contents were as follows: Collective health/ Epidemiology, Pathology, Radiology, Periodontology, Endodontics, Pediatric Dentistry, COVID-19 pandemic and dental education.
Sample
This test was applied to 320 students in 2019 and 272 in 2022, of whom the sample of this study was composed. At the institution, students’ participation in the PT is compulsory and the date is proactively disclosed to students at the commencement of the academic term through inclusion in the official academic calendar.

Statistical procedures
Results were presented as means, standard deviation, median and interquartile intervals and minimum and maximum values. The 2019–2022 scores were tested for data normality. Comparisons were made between all students who took the test in 2019 and all students who took the test in 2022, using the Mann–Whitney test (data without normal distribution). Comparisons were made between the same students who took the test in 2019 and in 2022, by using the Wilcoxon test (data without normal distribution). The difference in the percentage of correct answers between the years 2019 and 2022 was calculated according to the subjects in the areas of basic and specific knowledge [percentage of correct answers in 2022 – percentage of correct answers in 2019]. The figures were created using Microsoft Excel software. The analyses were performed using the IBM SPSS for Statistics v.26 software program. The level of significance of 5% was adopted (<0.05).

Results
Table 1 and Figure 1 show the results of the tests carried out in 2019–2022. The mean score values in 2019 (M = 49.10; SD = 12.03) were significantly (p = 0.026) higher than those in the year 2022 (M = 46.97; SD = 12.15).

Table 2 and Figure 2 show the scores obtained by students who took the PT in the years 2019–2022. The means were observed to be significantly higher in the year 2022 (M = 52.71; SD = 12.07) than in the year 2019 (M = 40.19; SD = 9.13). In 2019, ten students (13.0%) were in the first period, 40 (51.9%) were in the second and 27 (35.1%) were in the third period. In 2022, these same students were in the sixth (n = 10; 13.0%), seventh (n = 40; 51.9%) and eighth (n = 27, 35.1%) periods.

Table 3 and Figure 3 show the percentages of students’ correct answers, according to the subject and year of the test. The disciplines of Microbiology (2019: 11.46% and 2022: 10.34%) and Pharmacology (2019: 18.75% and 2022: 18.47%) had the lowest percentages of correct answers in both years. Whereas the disciplines of Biosafety (76.88%) and Bioethics and Health (74.44%) had the highest percentages of correct answers in 2019 and Linguistic

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean(SD)</th>
<th>Median (IQR)</th>
<th>Minimum and maximum values</th>
<th>Mann–Whitney test</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019 (n = 320)</td>
<td>49.10 (12.03)</td>
<td>50.0 (41.0–58.0)</td>
<td>18–76</td>
<td>p = 0.026</td>
</tr>
<tr>
<td>2022 (n = 272)</td>
<td>46.97 (12.15)</td>
<td>47.0 (40.0–54.8)</td>
<td>15–77</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.
Comparison of scores of tests performed in 2019–2022 (n = 592)

Note(s): SD = standard deviation. IQR: interquartile interval (25th–75th percentiles)
Source(s): Authors’ own creation
Instrumentalization (71.78%) and Bioethics and Health (68.43%), the highest percentages of correct answers in 2022.

The majority of disciplines had a drop in student performance, with Biosafety (−14.86%), Pathology (−12.86%) and Dentistry (−12.80%) showing the greatest reductions in the percentages of correct answers between the years 2019 and 2022. Only Periodontics (+5.18%), Dental Anatomy (+4.43) and Public Health/Epidemiology (+2.11) showed an increase in student performance in 2022. In Table 3, it may also be observed that the disciplines in the area of specific knowledge had a greater drop in the percentage of correct answers by students (−4.86%) when compared with the area of basic knowledge (−3.88%).
<table>
<thead>
<tr>
<th>Disciplines: questions</th>
<th>Percentage of correct answers (%)</th>
<th>Percentage difference 2022–2019</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2019</td>
<td>2022</td>
</tr>
<tr>
<td><strong>Area of basic knowledge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linguistic instrumentalization: CEP 1-5</td>
<td>71.94</td>
<td>71.78</td>
</tr>
<tr>
<td>Anatomy/anesthesiology: 6–10; 96</td>
<td>36.72</td>
<td>32.75</td>
</tr>
<tr>
<td>Dental anatomy: 11-12</td>
<td>50.63</td>
<td>55.05</td>
</tr>
<tr>
<td>Microbiology – 13–15</td>
<td>11.46</td>
<td>10.34</td>
</tr>
<tr>
<td>Embryology/Immunology/Histology: CEP 16–20</td>
<td>52.69</td>
<td>42.79</td>
</tr>
<tr>
<td>Bioethics and Health: 21–25</td>
<td>74.44</td>
<td>68.43</td>
</tr>
<tr>
<td>Biosafety: 26</td>
<td>76.88</td>
<td>62.02</td>
</tr>
<tr>
<td>Methodology: 27–31</td>
<td>58.13</td>
<td>55.12</td>
</tr>
<tr>
<td>Pharmacology: 32</td>
<td>18.75</td>
<td>18.47</td>
</tr>
<tr>
<td><strong>Area of specific knowledge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collective Health/Epidemiology: 33–38</td>
<td>49.64</td>
<td>51.74</td>
</tr>
<tr>
<td>Pathology: 39–43</td>
<td>70.63</td>
<td>57.77</td>
</tr>
<tr>
<td>Radiology. 44–48</td>
<td>54.25</td>
<td>48.08</td>
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<tr>
<td>Periodontics. 49–52</td>
<td>60.24</td>
<td>65.42</td>
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<tr>
<td>Endodontics. 53–56</td>
<td>55.24</td>
<td>48.00</td>
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<tr>
<td>Pediatric dentistry; 57–61</td>
<td>38.44</td>
<td>37.77</td>
</tr>
<tr>
<td>Orthodontics: 62–64</td>
<td>42.40</td>
<td>38.44</td>
</tr>
<tr>
<td>Occlusion: 65–70</td>
<td>29.17</td>
<td>26.54</td>
</tr>
<tr>
<td>TMD? 71–73</td>
<td>55.42</td>
<td>45.53</td>
</tr>
<tr>
<td>Surgery 74–79</td>
<td>33.49</td>
<td>29.62</td>
</tr>
<tr>
<td>Dentistry: 80–85</td>
<td>39.22</td>
<td>26.43</td>
</tr>
<tr>
<td>Cariology: 86</td>
<td>60.31</td>
<td>54.36</td>
</tr>
<tr>
<td>Dental materials: 87-88</td>
<td>48.13</td>
<td>45.99</td>
</tr>
<tr>
<td>Dental prostheses: 89–93</td>
<td>50.06</td>
<td>43.00</td>
</tr>
<tr>
<td>Implant dentistry: 94-95</td>
<td>58.28</td>
<td>55.05</td>
</tr>
<tr>
<td>Dentistry for patients with special needs: 97–100</td>
<td>42.11</td>
<td>35.54</td>
</tr>
</tbody>
</table>

**Table 3.** Percentage of correct answers in the test according to subjects and percentage difference between the years 2022 and 2019

**Note(s):** The disciplines that showed a reduction in the percentage of correct answers between 2019 and 2022 were highlighted in red

**Source(s):** Author’s own creation
Discussion
To the best of our knowledge, this study was the first to assess the impact of teaching and learning during the pandemic by means of a PT or even an assessment that measures knowledge, albeit theoretical. At the heart of PT lies the fundamental concept of longitudinal evaluation, tracing the development of knowledge through a series of comparable yet distinct assessments. By amalgamating the outcomes from these assessments, the advancement of each students knowledge is quantified, facilitating more dependable and well-founded choices regarding their progression to subsequent study phases (Freeman and Ricketts, 2010). However, the complex process of elaborating, applying and correcting the PT recommends constant research directed toward the particularities of each study center, in order to consider the PT a valid instrument for measuring knowledge and learning (Blake et al., 1996; Bennett et al., 2010). Furthermore, the formative character (non-relevance for
grades) of PT, as chosen for this study, does not influence formal evaluation of the student’s progress and provides an ad hoc picture of spontaneously recalled knowledge (Nouns and Georg, 2010). However, the formative character requires motivation and maturation of the students since there will be no direct influence on their curriculum and results in lower averages than the students could obtain if there were a summative character. Growth curves can be more irregular, with more ups and downs at a formative design (Albano et al., 1996).

Throughout the periods of lockdown and the subsequent phases of reopening for isolated classes, the utilization of synchronous and asynchronous learning approaches has ensured the uninterrupted flow of education programs. However, the methods have concurrently brought to light significant challenges, which vary in their intricacies based on the educational level and field of study (Sarma, 2020). With the emergence of COVID-19, important changes have also occurred in the provision and utilization of dental care and education, particularly disrupting the way in which medical education, including dental education, is structured and provided (Elangovan et al., 2020). Nevertheless, the majority of students considered it an addition to traditional classes and not a replacement (Elangovan et al., 2020). Due to these changes, a question remained: was there a reduction in students’ cognitive gain due to the pandemic? It is important to clarify that progress testing is traditionally used for theoretical knowledge and not for assessing clinical skills. Moreover, PT offers significantly enhanced avenues for feedback in both internal and external assessments. This framework empowers students and their academic mentors to discern the unique learning requirements of each student, thereby facilitating enhancements in the application of knowledge as they progress in subsequent academic years (Freeman and Ricketts, 2010). In this study, it could be observed that students obtained statistically superior results before the pandemic. However, another study showed that students had similar or better results during the pandemic, justifying that the reduced capacity for technical training during the pandemic may have resulted in more study time for didactic content (Zheng et al., 2021).

Exploring digital teaching concepts reveals a balance of benefits and drawbacks. On the affirmative side, beyond their role in adhering to stringent COVID regulations, e-learning approaches have consistently demonstrated a capacity to foster self-directed learning abilities and adeptness in utilizing online resources, as highlighted in earlier research (Prati et al., 2020; Farrokhi et al., 2021). This transforms students from passive recipients of knowledge into active participants in the construction, sharing and application of knowledge (Froehlich, 2013). Do all students have the ability and maturity to manage their own pace of learning? In this study, we observed the results of students who took the progress test before the pandemic and were in initial periods and compared their results after the pandemic, when they were in more advanced periods and observed an improvement in the grades obtained. However, one question remained: would they have achieved better results if there had been no pandemic? One study pointed out that although most of the students stated a preference for face-to-face teaching and mentioned disadvantages such as the lack of interaction, these do not seem to be considered barriers to reaching the learning objectives of the courses (Antoniadou et al., 2022). Other study related the benefits of the ERE during the pandemic in relation to developing new knowledge and skills such as improved communication skills, enhanced creativity and experience using online Technologies according to students' perspective (Quigley et al., 2023). However, it is imperative to acknowledge that the particular viewpoints expressed by the students cannot be directly construed as conclusive evidence of the tangible influence of the online instructional model on learning outcomes, as these perceptions are based on self-reported data.

Of the 25 disciplines evaluated in the PT, the greatest reductions in the levels of correct answers were in the specific area, mainly in the disciplines of Biosafety, Pathology and Dentistry. During the months of lockdown, students did not perform clinical care and were without practical classes; however, theoretical content continued to be offered online. Content
evaluations were carried out at home and with the possibility of consulting and an established deadline. However, dental education involves training in both didactic and clinical skills. Students work in close proximity to instructors to observe step-by-step procedures, and then students demonstrate the procedure on patients (Liu et al., 2020). Student preparedness is linked to an adequate amount of hands-on practical experience in order to graduate as dentists and dental hygienists who are capable and confident in their ability to safely treat patients (Burford et al., 2014). Although there are advantages with remote education, students generally agree that learning laboratory/clinical skills is best in-person (Nguyen and Patel, 2023; McMillan et al., 2023). The results of this study may be considered an early investigation into understanding students’ evaluation using PT of their remote learning experiences during COVID-19 in dental education.

However, dental education is a comprehensive amalgamation of didactic and clinical skills development. The pedagogical framework entails an intimate engagement wherein students closely collaborate with instructors to meticulously observe stepwise procedures, which is subsequently followed by the students’ practical demonstration of the procedures on patients (Liu et al., 2020). The efficacy of student preparation in intrinsically tied to the accrual of substantial hands-on experiential learning, an essential requisite for the graduation of adept and self-assured dentists and dental hygienists capable of ensuring secure patient care (Burford et al., 2014). Despite the inherent advantages associated with remote education, a consensus among students emerges, underscoring the prevailing sentiment that acquisition of laboratory and clinical proficiencies in optimally achieved through in-person modalities (Nguyen and Patel, 2023; McMillan et al., 2023). This study’s findings, presenting an incipient exploration, serve as a preliminary venture into comprehending the students’ assessment of their remote learning encounters during the COVID-19 era in the realm of dental education.

**Limitations**

Several limitations of this study were considered. The major limitation of the studies that evaluated the PT was the reduced motivation of the students in relation to their accomplishment and importance. Because the test did not have a direct effect on grades, students were unwilling to perform the test in the best possible way and this could result in low averages. Moreover, a lower number of students who took the test after the pandemic (15% reduction) was observed. During this period, a lower number of students entered the institution. An additional constraint pertained to the dearth of extensively documented literature pertaining to the utilizations of the PT within the dental contexts as well as its extended application to undergraduate dentistry and its potential extension to advanced levels. These dimensions warrant in-depth investigation to foster a comprehensive understanding. Moreover, this study’s scope was confined to a solitary dental institution, thereby necessitating prudence in generalizing the findings to broader educational settings and diverse disciplines. To enhance the robustness of findings, subsequent research endeavors could encompass multiple institutions or alternative fields of study for comparative analyses. Another pertinent limitation emerged from the diverse array of emergency remote teaching formats employed, potentially attenuating the direct applicability of certain findings to a wider context.

**Implications and future directions**

The significant question that we must assess after the pandemic is whether the students of Dentistry suffered a loss in obtaining knowledge and skills due to the need to interrupt clinical consultations and face-to-face classes and replace them with ERT. In 1993, Chambers (1993) introduced the concept of competency-based education within the realm of dentistry, delineating competencies as amalgamations of pertinent foundational knowledge and
professional attitudes, executed with consistency within the authentic contexts devoid of external assistance. The question emerges whether the ERE could facilitate the acquisition of such skills. Although certain spheres of higher education may harmonize with exclusive e-learning modalities, the attainment of clinical proficiencies and competencies necessitates a deliberate fusion of conventional pedagogy and online learning methodologies (Wutoh et al., 2004; Ward et al., 2001). Nonetheless, the amalgamation of approaches, known as blended learning, has exhibited efficacy within dental education (Ariana et al., 2016). A pivotal determinant of its success rests upon the methodical incorporation of e-learning components into the existing curriculum framework (Regmi and Jones, 2020). The outcomes derived from our study hold the potential to furnish dental institutions with insights for harnessing the exigencies of emergency e-learning encounters and orchestrating their continuity into the post-COVID-19 epoch. This trajectory of integration could potentially inaugurate an emergent norm in undergraduate, graduate and continuing dental education (Goh et al., 2022).

Parallel to the medical domain, academic achievement stands as just one facet within a constellation of multifaceted proficiencies and qualities anticipated of dental students and alumni. Moreover, it becomes imperative to engage in subsequent investigations aimed at scrutinizing disparities in clinical aptitudes and affective competencies. This encompasses an array of attributes such as effective communication, collaborative teamwork, upholding professionalism, exhibiting emotional intelligence and displaying adeptness in research pursuits, among other pertinent dimensions. The post-pandemic landscape beckons for comprehensive inquiries into these domains. This type of research would be valuable for gathering evidence relative to the performance of students after the ERE (Ali et al., 2017).

**Conclusion**

This study showed that the ERE, which was designed to teach dental students during the COVID-19 pandemic by means of a digital online teaching concept had a negative effect on the academic performance of the students based on the PT as an evaluation method validating the hypothesis of this study. When the same students who took the progress test both before and after the pandemic were compared, an improvement in the success rates was observed. It was not possible to assess whether this improvement would be greater if emergency remote teaching had not replaced face-to-face teaching. Moreover, there was greater impact on the specific disciplines of the Dentistry course. Central to note is the fundamental objective of dental education, which underscores the cultivation of autonomous and self-sufficient dentists adept in the secure and efficient treatment of patients. Within the domain of dentistry, this mission hinges predominantly on the development of refined fine motor skills and manual dexterity, a facet best nurtured through hands-on practical instruction. It is prudent to anticipate that the reverberations of COVID-19 on dental education are poised to endure far beyond the waning of the pandemic itself.

**Abbreviation**

ERE Emergency remote education

**References**


Further reading


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