

**ORIGINAL RESEARCH REPORT**

## Exploring dental student's perspectives: the impact of hybrid learning in a post-pandemic world

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**ABSTRACT**

**Background:** The pandemic crisis prompted the world to adopt unexpected approaches to continue life as normally as possible. The education sector, including professors, students, and the overall teaching system, has been particularly affected. **Objective:** This study seeks to evaluate the benefits, challenges, and strategies related to COVID-19 from the perspectives of college students, particularly those in higher education in Iraq. **Method:** The online survey questionnaire was distributed via Google Forms and specifically aimed at undergraduate dental students. **Results:** A total of 348 students participated in the survey. There was a significant correlation ( $P > 0.01$ ) between student satisfaction with hybrid learning and their experience with electronic teaching during the COVID-19 isolation period. Additionally, the majority of students (62.6%) reported enjoying E-learning during the pandemic. **Conclusions:** Online education has been a crucial lifeline for many students' academic experiences and is becoming increasingly important in the new landscape of higher education. It requires greater attention and appropriate investment from institutions, instructors, and students alike. Additionally, educational systems worldwide should adopt online learning programs to effectively address unexpected circumstances.



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### Highlights

1. Most students indicated that they enjoyed e-learning during the pandemic, underscoring its effectiveness and acceptance among undergraduate dental students.
2. Online education has emerged as an essential resource for maintaining academic progress during the pandemic and is becoming increasingly vital in higher education. This highlights the



necessity for educational institutions globally to focus on proper investment and the establishment of online learning programs to better prepare for unforeseen situations.

## BACKGROUND

Great nations transform crises into valuable lessons to enhance future outcomes. The coronavirus disease, or known as COVID-19, resulting on global pandemic crisis due to high mortality (Pollard et al., 2020), showed weaknesses in many aspects of the health pandemic management globally (Khorram-Manesh et al., 2024), resulting in fail to address population-based requirements during the pandemic (Laage-Thomsen dan Frandsen, 2022) and facing serious difficulties in managing disease spread (Gates, 2018; Khorram-Manesh et al., 2022) such as quarantine. This is attributed to unprepared healthcare systems. To prevent the spread of disease, several strategies have been implemented to limit human gatherings, which necessitated the suspension of operations in many public sectors, including educational institutions (Laksono, 2021), leading to a variety of challenges and changes in educational practices. As an inevitable result, everyone thinks of the possibility of turning the fall into strengths (Aziz dan Isroani, 2022). It compelled the world to adopt unexpected methods to sustain daily life effectively, necessitating new approaches to instruction and assessment within educational settings. (Libre, 2021; Zhan et al., 2022). Individuals in the education sector, including professors, students, and the entire educational system, have been particularly affected, as widespread lockdown measures led to the closure of many schools, colleges, and universities around the world (Rohana et al., 2021).

Undoubtedly, the shift from traditional in-person instruction to entirely online learning during the peak of the COVID-19 pandemi (Mishra et al., 2022) and then the return to hybrid education (Aziz dan Isroani, 2022) across all educational levels is such a challenge that it deserves respect. Digital platform such as Zoom, Google Classroom, and Moodle were used to facilitate synchronous and asynchronous learning (Ahshan, 2021; Deep et al., 2025; Lapitan et al., 2021). Numerous studies have been undertaken to explore the unique educational circumstances arising from the pandemic (Lapitan et al., 2021; Manakatt et al., 2021; Reimers, 2021). The research has looked into several aspects and trends in emergency remote learning, even using online assessment during study exams (Reimers, 2021), and it was discovered that online schooling systems were especially rapid adoption during the pandemic (Tulaskar dan Turunen, 2022). This strategy was implemented to maintain educational activities while complying with social distancing measures. Students' enjoyment of online learning is affected by several factors, including the interaction between students and professors, engagement with peers, the quality of content, the mode of delivery, and technological support. (Ahmed et al., 2024; Libre, 2021), and support services as the epidemic spreads at an alarming rate (Wut dan Xu, 2021a).

The advantages of online learning over traditional face-to-face learning including flexibility (Dost et al., 2020), self-pace learning (Thomas Coffman, 2021), reducing the risk of COVID-19 transmission (Thomas Coffman, 2021), increase the use of technological competencies for both teachers and students (Zhang et al., 2023), had a modest positive effect on students' academic achievement, particularly in fields like medicine, engineering, and natural sciences and active learning performances. Furthermore, high-quality teaching and learning in an online environment contribute to student satisfaction by providing flexibility and accessibility. (Dost et al., 2020; Reimers, 2021). Research indicates that time is a critical factor in online teaching and learning. Flexible study schedules and the incorporation of various media sources to enhance instruction can significantly influence students' online learning experiences. (Rodriguez et al., 2008; Thurmond et al., 2002). The flexibility of online learning allows students to manage their schedules effectively, enabling them to balance their studies with other commitments. This approach also encourages students to focus on essential topics, granting them greater control over their learning processes (Aleid et al., 2024). A cross-sectional study employing a survey questionnaire is an effective method for assessing the impact of the entire experiment on academic life, student aspirations, expectations, and acceptance of remote learning (Saqlain et al., 2020). It is also essential to identify the obstacles and challenges faced by beneficiaries, along with their plans or suggestions for enhancing the effectiveness of this significant shift in teaching and learning delivery methods, even in the post-pandemic period.

## OBJECTIVE

This study aims to evaluate the advantages, challenges, and strategies experienced during and after COVID-19 from the perspectives of college students, particularly within the context of higher education in Iraq.

## MATERIAL AND METHODS

### Study design

An observational analytic cross-sectional study was conducted using an online survey questionnaire distributed via Google Form, specifically targeting second-year dental students. This group was chosen because they were transitioning from complete e-learning during the COVID-19 pandemic to hybrid learning, which integrates online classes with traditional face-to-face lectures. Furthermore, the second-grade curriculum at Baghdad University College of Dentistry emphasizes theoretical rather than practical components, making it particularly relevant to our study of learning experiences during this transitional period. Notably, COVID-19 restrictions were lifted at the end of 2021, marking a significant point in this shift (Ghebreyesus, 2021).

### Data collection

All participants were clearly informed that participation in the survey was voluntary, allowing them to withdraw at any time, and that their responses would remain anonymous and confidential. The survey consisted of twenty-three questions, beginning with a question about gender and divided into five sections. Section I included four questions aimed at clarifying the resources available to students during online and hybrid teaching (first part of Table 1). Section II comprised six questions regarding students' experiences with electronic teaching during the COVID-19 isolation period when all classes were conducted online (second part). Section III contained five questions focused on student satisfaction with online learning during the hybrid teaching phase (third part). Section IV featured six questions comparing e-learning to traditional face-to-face learning during hybrid instruction (fourth part), while Section V included one question addressing the acceptance of remote learning. The elements of the questionnaire are detailed in Appendix 1.

### Data analysis

Data analysis was conducted using SPSS software version 26. First, the reliability and internal consistency of the data were assessed using Cronbach's alpha. The Kolmogorov-Smirnov test was employed to determine whether the data followed a normal distribution. Descriptive statistics were utilized to analyze the frequency of responses to each question. For questions based on the Likert scale, non-parametric tests were applied: the Wilcoxon test for comparisons between paired groups and the Mann-Whitney test for comparisons between independent groups. Chi-square tests were used to assess correlations, while linear regression was applied to explain the relationships among variables.

### Ethical consideration

The study was conducted in the agreement of the local ethical committee at Baghdad College of Dentistry, and followed the STROBE guidelines (Von Elm *et al.*, 2014). Ethical Clearance Number: [Ref. number: 643], Issuing Institution: [The Research Ethics Committee of the College of Dentistry, University of Baghdad] Date of Release: [4-8-2022].

## RESULTS

A total of 375 students received the Google Form, with 348 students responding and participating, representing a response rate of 92.8%. Among the respondents, there were 261 female students (75%) and 87 male students (25%). The reliability statistics indicated a Cronbach's Alpha of 0.87, which is regarded as a very good level of reliability.

The results from the four questions in the first section, which aimed to clarify the resources available to each student, indicate that over half of the participants (53.3%) report having a good to excellent internet



connection. In terms of devices used, 44.3% of students access online classes through smartphones, 29.9% use tablets, and 24.4% utilize laptops or desktop computers. Furthermore, when asked about their typical workspace, 49.1% indicated that they have a room in their home that they occupy alone, 37.4% share a room with other family members, and only 6.6% participate in online classes outside their homes, such as in coffee shops or internet cafés.

When all classes transitioned to an online format, the results for the first question—designed to assess students' experiences with online teaching—revealed the following: 49.4% of dental students reported having taken and completed online courses, 26.1% indicated that they had taken but not completed online courses, and 24.4% participated in hybrid classes. Additionally, 75% of dental students agreed that the college's communication regarding COVID-19 and the modifications to the academic year was clear.

**Table 1.** Comparing the satisfaction responses of participants

Variables	Positive n(%)	Negative n(%)	P value
Satisfaction with remote academic activities	236 (67%)	112 (33%)	<0.001 <sup>a</sup>
Achieving the course learning outcomes with the change in delivery	207 (59.2%)	142 (40.8%)	<0.001 <sup>a</sup>
The instructors (teachers) are empathetic during COVID-19	254 (72.8%)	94 (27.2%)	<0.001 <sup>a</sup>
The instructors are flexible during COVID-19	247 (71%)	101 (29%)	<0.001 <sup>a</sup>

<sup>a</sup>Chi square test

**Table 1** summarizes students' experiences with electronic teaching during the COVID-19 isolation period. The data show that 73.5% of participants viewed the level of support provided by the college to facilitate their transition to remote classes positively. Additionally, 75.8% of students reported that they could access their academic advisors remotely and that their inquiries were addressed. Furthermore, 72.4% confirmed that they could contact an advisor when needed, and 74.7% found remote access to academic support to be effective. Moreover, 67% of students expressed satisfaction with remote academic activities, while 59.2% felt they were still achieving the course learning outcomes despite the change in delivery. Table 1 compares participants' satisfaction responses. Lastly, 73% of dental students believed that their instructors demonstrated empathy, and 71% felt that their teachers were flexible during the COVID-19 pandemic.

**Table 2.** Responses of participants to the type of quiz is more effective for testing the understanding

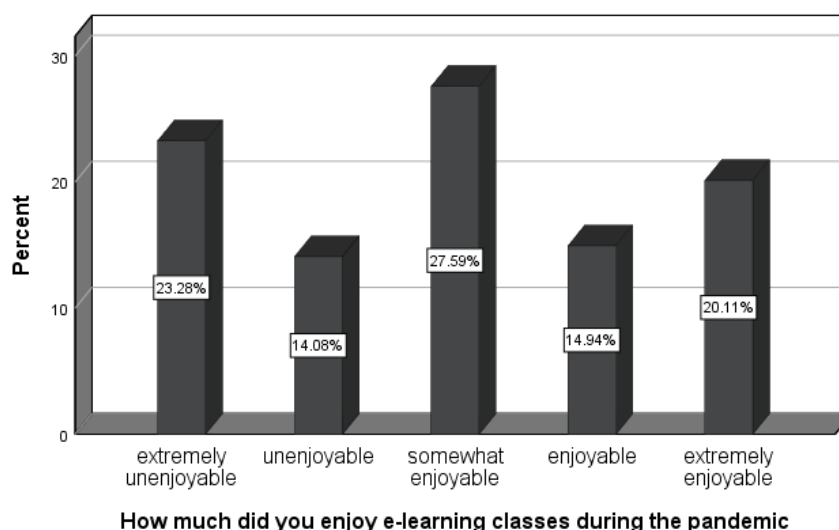
Type of quiz more effective for testing the understanding	n	%	Cumulative Percent
Traditional—pen and paper—MCQ	136	39.1%	39.1%
Traditional—pen and paper—short answers	45	12.9	52.0
Online quiz—MCQ	152	43.7	95.7
Online quiz—short answers	15	4.3	100.0

The final question in this section examines the type of quiz that dental students consider more effective for assessing their understanding, as summarized in Table 2. The results indicate that 52% of students prefer traditional pen-and-paper quizzes, while 48% favor online quizzes. A significant proportion of students expressed a preference for multiple-choice questions, regardless of whether they were administered in traditional pen-and-paper exams or online formats. Additionally, a Pearson correlation analysis assessing student satisfaction with online learning during the COVID-19 pandemic revealed a strong correlation ( $r = 0.696$ ,  $p = 0.000$ ).

The results from Section Four, which compared e-learning and traditional face-to-face learning, revealed a significant difference in knowledge acquisition between the two modes ( $P = 0.037$ ), with e-learning demonstrating a higher mean value. However, there were no significant differences observed

in the enhancement of clinical skills or in student engagement during traditional face-to-face learning compared to e-learning.

Finally, the survey addressed the acceptance of remote learning, specifically how dental students perceived their enjoyment of e-learning classes during the pandemic. As illustrated in Figure 1, 70 students (20%) reported that they found the experience extremely enjoyable, 52 students (14.94%) considered it enjoyable, and 96 students (27.59%) viewed it as somewhat enjoyable. Conversely, a total of 130 students (37.36%) did not enjoy online learning, with 81 students (23.28%) categorizing it as extremely unenjoyable and 49 students (14.08%) as unenjoyable. There were no statistically significant differences in enjoyment levels between male and female participants ( $p = 0.87$ ).



**Figure 1.** The acceptance of remote learning among dental students

## DISCUSSION

This survey study examines the responses of Baghdad University dental students to emergency remote teaching during the COVID-19 pandemic. As of the end of 2022, the pandemic continues to impact individuals in various ways; fortunately, the majority of those infected experience mild to moderate symptoms and recover without the need for hospitalization. Nevertheless, it is essential to maintain precautions, and the lessons learned from this crisis should be regarded as valuable insights for the future (Alwan, 2023).

Online learning offers numerous advantages for students. With mobile devices in hand, students can attend classes from any location, whether at home or elsewhere, and at any time. The electronic learning strategies implemented during COVID-19 can be utilized continuously, enabling students residing outside densely populated areas to participate in interactive lectures remotely. Additionally, these strategies help lower travel costs for students and save valuable time that would otherwise be spent commuting (Amesse, 2008; Wut dan Xu, 2021b). In general, college students in contemporary studies engage in lectures through one of two methods: instructor-led learning (traditional face-to-face) or self-directed learning. The research conducted by Peine et al. concludes that self-directed learning is more effective than traditional face-to-face instruction (Peine et al., 2016).

The results indicate that most dental students prefer using smartphones for online courses rather than computers. This finding aligns with the study by Ammen and Willis, which observed that "Iraqi students favor a hybrid learning approach that utilizes mobile phones instead of relying on computers for online education." (Ameen dan Willis, 2017).

Notably, our findings indicate that dental students are already familiar with contemporary workspaces for hybrid education, including platforms such as Google Meet, Zoom, and other video conferencing



tools. Over two-thirds of the participants reported having taken online courses in the past. Many universities and colleges have enhanced their higher education systems by investing in information and communication technology (Al-Mashhadani dan Al-Rawe, 2018). A significant proportion of students reported satisfaction with online learning and successfully met the learning outcomes despite the shift in delivery method. Additionally, participants perceived their instructors as empathetic and accommodating during the pandemic. Prior studies indicate that students' expectations for quality courses rely on ongoing communication with their instructors, structured interactions among students, and the flexibility to express their ideas (Bickle et al., 2019; Choe et al., 2019).

When surveyed about their preferred quiz format, responses from dental students indicated that the number of participants favoring traditional "pen and paper" exams was nearly equal to those preferring online assessments. A case study suggests that medical students may require additional time to acclimate to computer-based examinations, as their performance exhibited similar results across both assessment types (Guimarães et al., 2018). Furthermore, students expressed a clear preference for multiple-choice questions (MCQs) over essay and short-answer formats. The advantage of multiple-choice questions lies in their visibility of the correct answer, which can help stimulate memory recall and facilitate the selection of the appropriate response (Kaipa, 2020).

A comparison between online learning and traditional face-to-face instruction revealed a significant difference in knowledge acquisition. Dental students were more likely to believe that "e-learning enhances knowledge." Research indicates that students retain 25–60% more information when learning online, compared to only 8–10% in a classroom setting. This increased retention can largely be attributed to the efficiency of online learning; students typically spend 40–60% less time studying online than in traditional classrooms, as they can learn at their own pace, revisiting material, skipping content, or accelerating through subjects as needed (Andarwulan et al., 2021; Aram, 2020; Sakti dan Sukardi, 2021).

The results of the final question indicate that dental students generally appreciated the online learning experience. The benefits that enable both teachers and students to set their own learning pace, ask questions, engage with peers, and study at their convenience help to explain this enjoyment (Davis et al., 2019; Doan, 2020). The primary goal of this study was to evaluate e-learning within a hybrid environment, rather than to introduce e-learning as a substitute for traditional face-to-face instruction.

### **Strengths of the Study**

1. Focus on Dental Education: It fills a significant gap in understanding the effects of hybrid learning within a specialized field such as dentistry.
2. Practical Implications: The findings provide practical recommendations for institutions to enhance their hybrid learning systems.
3. Post-Pandemic Relevance: The study underscores the enduring significance of hybrid learning in higher education, demonstrating its relevance beyond the context of the COVID-19 pandemic.

### **Limitations of the Study**

1. Cross-Sectional Design: This study provides a temporal snapshot, which limits the ability to evaluate long-term trends or establish causal relationships.
2. Limited Focus on Clinical Skills: Although the study assessed knowledge acquisition, it did not thoroughly examine the influence of hybrid learning on practical clinical training, which is essential for dental education.

### **CONCLUSION**

Online education has significantly benefited many students during their academic careers. Although e-learning is not a new phenomenon, it has gained increased prominence in the current landscape of higher

education, necessitating greater attention and investment from institutions, educators, and students alike. Consequently, educational institutions worldwide should incorporate online learning programs into their systems to effectively address unforeseen circumstances.

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### Conflict of Interest

None.

### Funding

None.

### Ethical Clearance

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### Author Contribution

MHA designed the project, collected and analyzed the data, and authored the initial draft of the manuscript. SMZ collaborated on the study design, contributed to the literature review, analyzed data, provided critical feedback on the manuscript, and reviewed the final version prior to submission.

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