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Comparative Perceptions of Online versus Face-to-Face Learning and Assessment among Dental and Medical Students in Malaysia during the Post-COVID-19 Era

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ABSTRACT

The COVID-19 pandemic has catalysed a shift towards student-centric higher education. As physical distancing measures were enforced globally, online education replaced traditional face-to-face learning. In the post-pandemic phase, understanding the perceptions of students is essential for optimising blended learning models. This study examines the perceptions of dental and medical students in Malaysia regarding online learning and assessment during the pandemic, in comparison to traditional methods. Conducted as a cross-sectional study, it involved 585 students (aged 18 to 27 years) from 15 medical and dental colleges in Malaysia. A validated questionnaire was distributed via Google Forms. The study revealed that both dental (50.09%) and medical (49.91%) students were proficient with online learning tools. They expressed a clear preference for a hybrid learning model after the pandemic. While overall perceptions of online education were similar, dental students rated the quality and authenticity of online assessments higher than medical students, indicating differences in assessment preferences. These insights can guide the development of more effective teaching, learning, and assessment strategies in the evolving educational landscape.

Keywords: *COVID-19 pandemic, Digital remote teaching, Face-to-face teaching, Medical education, Online assessment*

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INTRODUCTION

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), also known as COVID-19, has been reported in more than 95% of countries worldwide (1). COVID-19, transmitted through respiratory droplets, led countries to enforce physical distancing measures to slow the infection rate (2). These measures included closing public, cultural, and educational institutions. As a result, distance learning and digital education were implemented, reducing face-to-face learning time and limiting practical, preclinical, and clinical curricula, which are essential, particularly in the medical and dental fields (3).

Although online learning at the time of the pandemic was essential for the continuity of education, many students found themselves stressed, anxious and poorly motivated to engage in learning activities (4). Estimates from some European countries suggest that there was a weekly learning loss of between 0.82% and 2.3 standard deviations (5). This loss in learning manifested as a decreased ability to concentrate and lower exam scores (6). Moreover, students from less advantaged backgrounds were more likely to fall behind due to a lack of access to digital resources and a conducive home learning environment (7). Moreover, isolation from peers and lecturers may also have led to behavioural and psychological problems. In addition, parents experiencing stress due to financial restraints and job insecurity caused by the pandemic had struggled to support their children effectively (5). The COVID-19 crisis has not only made learning difficult for students but has also challenged institutions and lecturers (8). The sudden shift to remote learning created a situation where online resources and skills had to be efficiently provided to students without any prior training. This left institutions with insufficient time for planned preparations (9).

According to a study, the success of online learning is determined and influenced mainly by the ease of access for both students and teachers. Additionally, students' satisfaction and the availability of various online tools play crucial roles in this success. Other contributing factors include the online teaching expertise, preparedness of students to go online, and standards of subject matter and outlines (10).

Thus, in an effort to break the chain of SARS-CoV-2 transmission (11), the educational system around the world is severely impacted (12). Many universities have digitised learning and faced unprecedented challenges (13). Several studies have been done on the students' perception of online learning in the world, one of which was a cross-sectional study in the School of Dentistry of Justus-Liebig-University Giessen (Germany) in 2020, using a questionnaire survey. In this study, which was participated by 242 students, one-third of the students preferred physical learning instead of online learning. While within the research limitations, these students also greatly believed that online learning can continue to be implemented well beyond COVID-19 (3).

Similarly, in a separate study conducted among dentistry students at King Saud University in Saudi Arabia, the results showed that student attitudes towards online learning were positive. However, a majority of the students preferred blended learning, instead of having face-to-face learning completely replaced by online learning (10).

Nevertheless, most of such studies conducted in Malaysia were solely focused on students whose curriculum is theoretical and does not require practical training, whereas courses such as Dentistry and Medicine require more hands-on clinical experience. Therefore, to date, there is an evident lack of studies done concerning the implementation of online learning based on perceptions of dental and medical students (14, 15).

This study is pivotal in shaping the future of student-centric education by exploring the integration of online or e-learning with traditional face-to-face instruction. Focusing on the unique perspectives of dental and medical students in Malaysia during the COVID-19 pandemic, this research seeks to understand their experiences with both online learning and traditional classroom settings. The objectives are twofold: firstly, to gather insights into the students' perceptions of both learning modalities through a comprehensive questionnaire survey; and secondly, to analyse the differences in perceptions between dental and medical students regarding online and face-to-face learning. This investigation stands as a cornerstone for developing educational strategies that resonate with the needs and preferences of future learners, ensuring a balanced and effective educational approach.

MATERIALS AND METHODS

Study Design

A cross-sectional design was applied in this study to assess the perspectives of dental and medical students of Malaysia on face-to-face and online learning and evaluation during COVID-19 pandemic. Phase-validated questionnaire was circulated via Google Forms link.

Data was collected from 15 medical and dental colleges, including MAHSA University, International Medical University, Melaka Manipal Medical College, AIMST University, Penang International Dental College, Universiti Malaya, Lincoln University College, University of Cyberjaya, Newcastle University Medicine Malaysia, SEGi University, Taylor's University, Monash University Malaysia, Universiti Sains Malaysia and Universiti Kebangsaan Malaysia. The snowball sampling method was employed in this study, a non-probability sampling method where data were collected based on connections. The initial participants were selected from a known network of medical and dental students who had prior experience with online learning during the COVID-19 pandemic. These participants were asked to invite other eligible participants from their networks, creating a snowball effect for data collection.

Sample Size

The calculation of the sample size was conducted utilising the formula for a single mean, incorporating the standard deviation derived from students' perspectives (1). Upon inserting the pertinent values, the resultant minimum required sample size for this study was determined to be 571. This calculation accounted for a sampling error margin of 20%.

The inclusive criteria are current medical and dental students in Malaysia who are undergoing online learning during COVID-19 pandemic. The exclusive criteria are non-medical and non-dental students in Malaysia, as well as medical and dental students who are not in Malaysia.

Survey Method

Questionnaire was prepared to assess students' perceptions of online learning and assessment. All study participants could agree or disagree with the statements using a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly

agree). The questionnaire was validated by face validity and content validity (3, 10). Initially, the questionnaire was distributed among 50 respondents (10% of the sample). The questionnaire was also validated by experts in the area of research. Their comments were taken into consideration, and changes were made accordingly.

Consent to participate is taken at the beginning of our questionnaire. To protect the confidentiality of respondents, their names and IC number were not collected. Upon completion of this study, the data were preserved.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics v.19.0. Data were analysed for mean, frequencies and standard deviation with descriptive statistic features in SPSS. Independent sample *t*-test was applied to compare the perceptions of dental and medical students in Malaysia on online teaching and learning, and online assessment. Data were considered significant with $p < 0.05$.

RESULTS

The study gathered responses from a total of 585 students, including 293 dental students and 292 medical students. The perceptions of these students regarding online teaching and learning, as well as online assessment, were categorised into clusters, and their responses were analysed using various statistical methods.

Categorisation of Students' Responses Based on Their Perception of Online and Face-to-Face Learning and Assessment

Questions pertaining to students' perceptions of online teaching and learning (TQ1-TQ16) were categorised into four clusters based on technical aspects on online teaching and learning (Cluster 1), quality of online teaching and learning (Cluster 2), interactions through online teaching and learning (Cluster 3), and preference of online over face-to-face teaching and learning (Cluster 4). The questions of students' perceptions on online assessment (A1–A9) were categorised into three clusters based on technical aspects of online assessment (Cluster 1), quality and authenticity of online assessment (Cluster 2), and preference for online over face-to-face assessment (Cluster 3). The overall perceptions of the students are presented in Figures 1 and 2.

Figure 1 depicts students' perceptions of online teaching and learning, categorised into four clusters: technical aspects, quality, interactions, and preference for online over face-to-face teaching and learning. The violin plots (Figure 1A, C, E, G) reveal that students generally rated the technical aspects (Cluster 1) and the quality of online teaching (Cluster 2) positively, with responses skewed towards higher Likert scale ratings (4 and 5), indicating satisfaction with the technical delivery and quality of online education. The interaction aspects (Cluster 3) also received favourable ratings, though with slightly more variability in responses. Notably, the preference for online over face-to-face teaching and learning (Cluster 4) shows a mixed response, with some students strongly favouring online methods, while others still prefer traditional face-to-face interactions. The density plots (Figure 1B, D, F, H) further emphasise the concentration of responses towards positive perceptions, particularly in the technical and quality clusters.

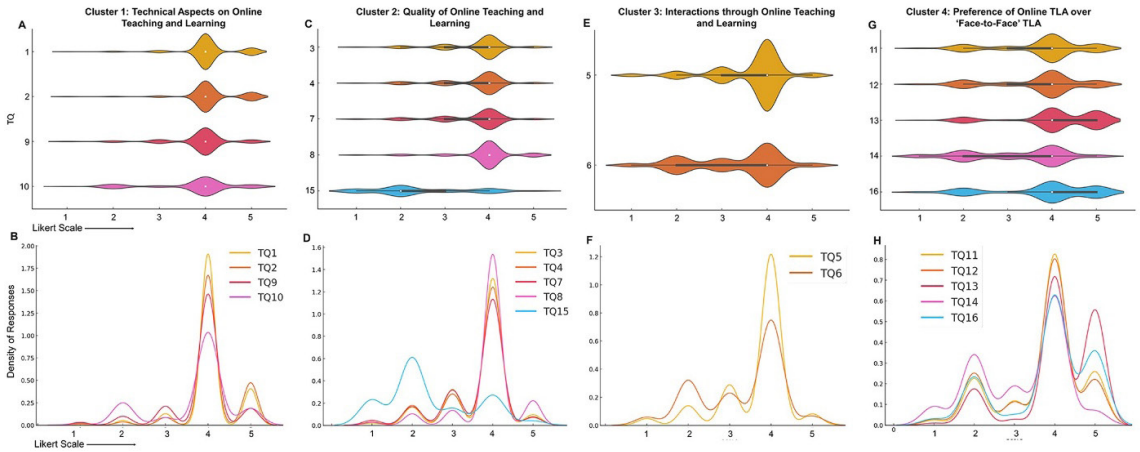

Figure 1: Students' perceptions of online teaching and learning categorised into four clusters.

Cluster 1: Technical aspects of online teaching and learning (A, B). Violin plots (A) show students' ratings (TQ1, TQ2, TQ9, TQ10) on the technical aspects of online teaching and learning, indicating a general positive perception with responses skewed towards the higher end of the Likert scale (ratings 4 and 5). Density plots (B) highlight the concentration of responses, where peaks represent a higher density of student responses at specific Likert scale ratings. For instance, a peak at Likert scale rating 4 indicates that a large number of students rated the technical aspects favourably. Cluster 2: Quality of online teaching and learning (C, D). Violin plots (C) for questions TQ3, TQ4, TQ7, TQ8, TQ15 illustrate students' perceptions of the quality of online teaching, with most responses tending towards higher ratings, signifying satisfaction with the quality. Density plots (D) reinforce this, showing the frequency distribution of responses at each Likert scale point, with peaks around ratings 4 and 5. Cluster 3: Interactions through online teaching and learning (E, F). Violin plots (E) display the variability in responses to questions TQ5 and TQ6, which pertain to interactions during online teaching. While positive, there is more variation compared to other clusters. Density plots (F) show that the majority of students rated interactions highly, with a prominent peak at rating 4. Cluster 4: Preference for online teaching and learning over face-to-face methods (G, H). Violin plots (G) depict mixed responses to questions TQ11-TQ14, TQ16 regarding the preference for online teaching versus face-to-face methods. Some students favoured online teaching, while others preferred traditional methods. Density plots (H) indicate the distribution of preferences, with two prominent peaks showing divided opinions between ratings 4 and 5. In all density plots (B, D, F, H), the height of the peak represents the frequency of responses at a specific rating. Higher peaks suggest a greater number of students rated that particular aspect of online teaching and learning at that point on the Likert scale.

Figure 2, on the other hand, focuses on students' perceptions of online assessment, categorised into three clusters: technical aspects, quality and authenticity, and preference for online assessment over face-to-face methods. The violin plots (Figure 2A, C, E) indicate that students generally perceived the technical aspects (Cluster 1) of online assessments positively, with a strong skew towards higher Likert scale ratings. The quality and authenticity of online assessments (Cluster 2) were rated favourably by students, particularly by dental students, who showed a significant preference in this cluster. However, the preference for online assessment over face-to-face methods (Cluster 3) reveals a more balanced response, with some students favouring the flexibility of online assessments, while others still prefer the perceived rigour of traditional assessments. Overall, the density plots (Figure 2B, D, F) reinforce these findings, highlighting a general satisfaction with online assessments but with some degree of variability depending on the specific aspect being evaluated.

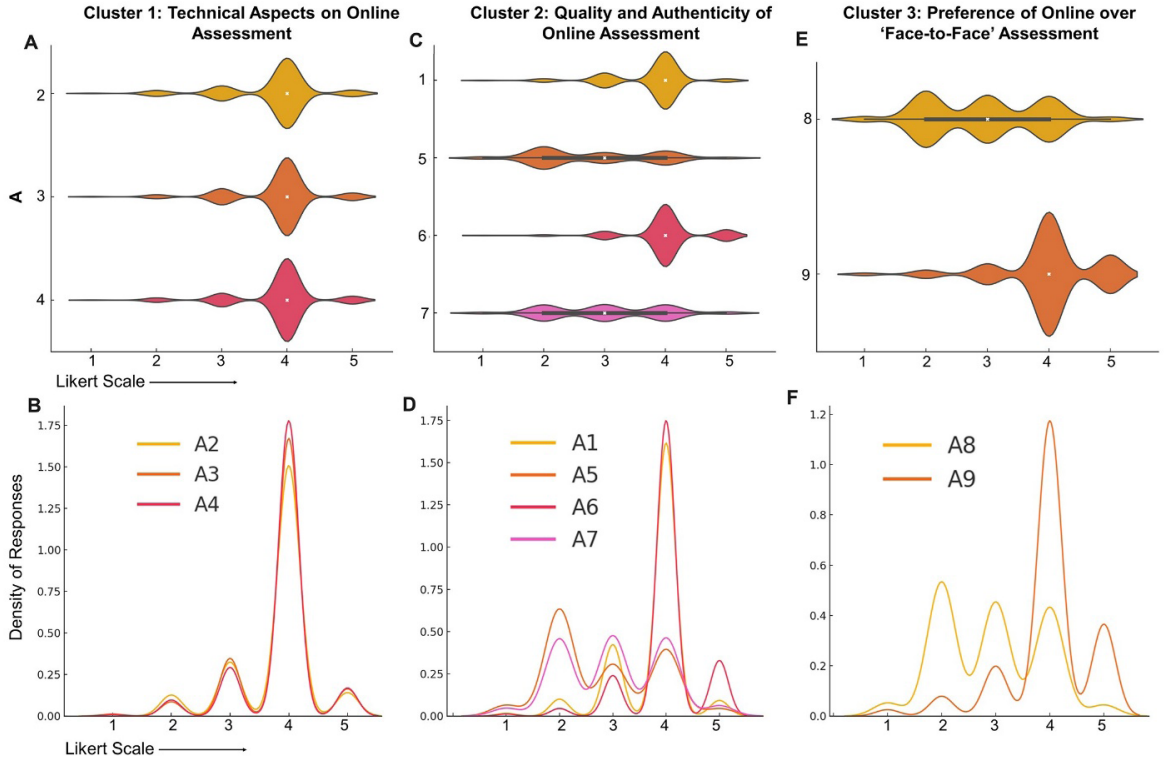

Figure 2: Students' perceptions of online assessment categorised into three clusters.

(A, B) Cluster 1: Technical aspects of online assessment. Violin plots (A) for questions A2, A3, and A4 illustrate students' positive perceptions of the technical aspects of online assessments, with a strong skew towards higher Likert scale ratings. Density plots (B) show a similar trend with a concentration of responses at the higher end of the Likert scale. (C, D) Cluster 2: Quality and authenticity of online assessment. Violin plots (C) indicate favourable perceptions of the quality and authenticity of online assessments (A1, A5-A7), particularly among dental students. The density plots (D) show that these responses are concentrated around the 4 and 5 ratings. (E, F) Cluster 3: Preference for online over face-to-face assessment. Violin plots (E) reveal balanced responses to A8 and A9 regarding the preference for online assessments over face-to-face methods. Density plots (F) highlight the variability in student preferences, with some favouring online flexibility and others still preferring traditional assessment methods.

Comparison of Perceptions of Dental and Medical Students on Online Teaching and Learning System in Malaysia

Figure 3 compares the perceptions of dental and medical students regarding online teaching and learning across the four clusters. The violin plots (Figure 3A–D) suggest that, overall, there were no significant differences between the two groups in terms of their perceptions of the technical aspects (Cluster 1), quality (Cluster 2), and interactions (Cluster 3) involved in online teaching and learning. However, a significant difference was observed in Cluster 4 (preference of online teaching and learning over face-to-face teaching and learning), where dental students demonstrated a slightly higher preference for online learning compared to medical students ($p = 0.0088$).

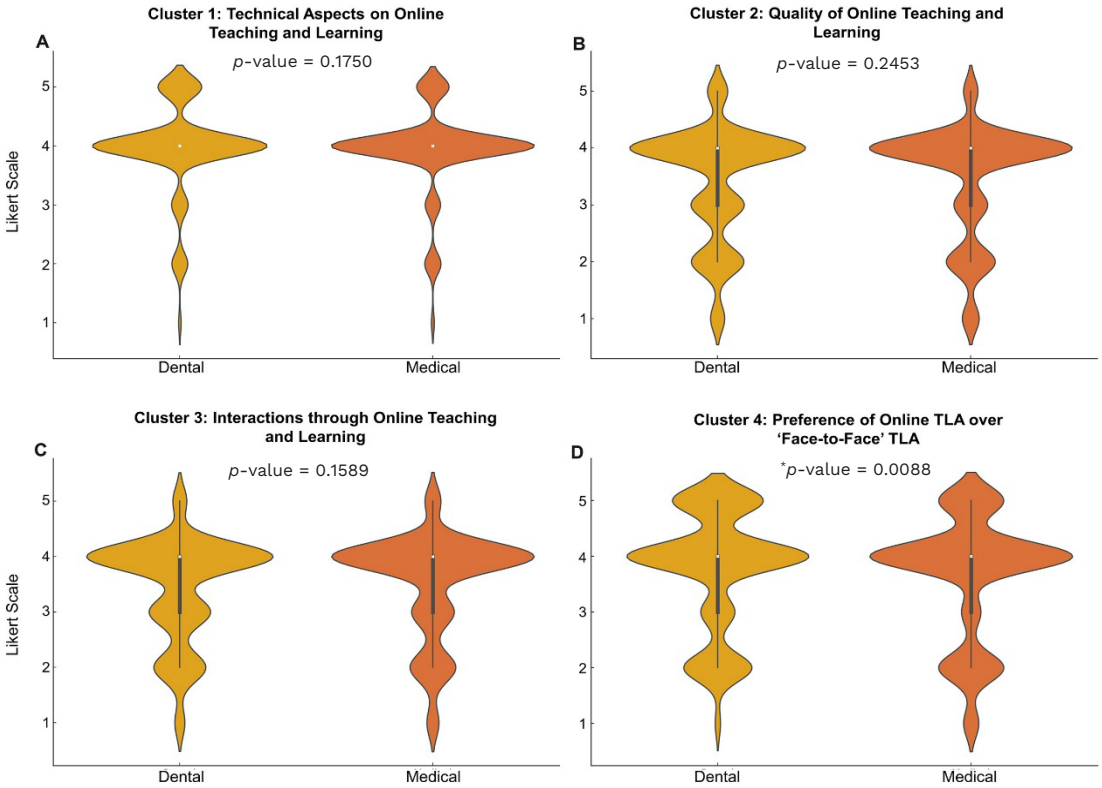

Figure 3: Comparison of perceptions of dental and medical students on online teaching and learning.

(A-D) Clusters 1–4: Technical aspects, quality, interactions, and preference for online over face-to-face teaching and learning. The violin plots (A–D) compare dental and medical students' perceptions across the four clusters. While no significant differences were found in technical aspects (A), quality (B), and interactions (C), a notable difference was observed in preference for online teaching (D), with dental students showing a higher preference compared to medical students ($p = 0.0088$).

Comparison of Perceptions of Dental and Medical Students on Online Assessment in Malaysia

Figure 4 provides a comparison of perceptions regarding online assessments, categorised into the three assessment clusters. The violin plots in Figure 4 indicate that dental students rated the quality and authenticity of online assessments significantly higher ($p < 0.0001$) than medical students, in Cluster 2 (Figure 4B). This suggests that dental students perceived online assessments as more effective and credible than their medical counterparts. No significant differences were observed in Clusters 1 and 3, indicating similar perceptions regarding the technical aspects of online assessments and the preference for online versus face-to-face assessments between the two groups.

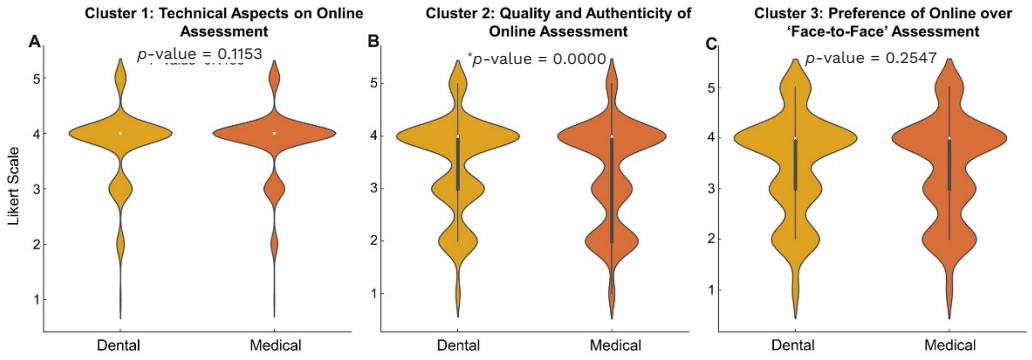

Figure 4: Comparison of perceptions of dental and medical students on online assessment.

(A–C) Clusters 1–3: Technical aspects, quality and authenticity, and preference for online over face-to-face assessment. Violin plots (A–C) illustrate the comparison between dental and medical students' perceptions of online assessments. A significant difference was found in the quality and authenticity cluster (B), where dental students rated online assessments significantly higher ($p < 0.0001$). No significant differences were observed in the technical aspects (A) and preference for online assessments (C) clusters between the two groups.

DISCUSSION

Physical distancing measures are essential during the COVID-19 pandemic and have a significant impact on dental education (16). The level of clarity and ease of use of online platforms is critical for the successful deployment of online learning and online evaluations (17). Furthermore, in order to learn effectively, students should have the appropriate technical abilities and access to high-quality internet services (18). Thus, the present study has evaluated the perceptions of dental and medical students in Malaysia on various aspects of online learning and assessment systems. To maintain the uniformity of the responses, the Likert scale was used, which is the standard procedure for surveys in the field of medicine (3).

The primary strength of the study lies in the high respondent number (n = 585) and the well-distributed sample size based on gender (male = 41.37% and female = 58.63%) as well as course undertaken (50.09% = dental students and 49.91% = medical students). The snowball sampling method used in this study allowed us to efficiently collect data during the COVID-19 pandemic, but it is important to acknowledge that this non-probability sampling technique may limit the generalisability of the findings.

Overall responses showed that the students had the necessary clarity, accessibility and technical skills for feasible and effective online teaching as well as online assessments. However, the students prefer a hybrid system of face-to-face mixed with online learning and assessments to be incorporated into their education system. Despite the allowance of breaching rules and regulations in online assessments, the students agreed that it was still the next best option during this COVID-19 pandemic (Figures 1 and 2).

The perceptions of both dental and medical students were largely similar and showed no significant differences in the areas of technical aspects (Cluster 1), quality (Cluster 2), and interactions (Cluster 3) related to online teaching and learning. However, a notable exception was observed in Cluster 4, where dental students showed a significantly higher preference for online teaching and learning over face-to-face teaching and learning compared to medical students ($p = 0.0088$) (Figure 3). This difference may be attributed to the nature of dental education, which often involves the use of specific online tools that

might be better integrated into their curriculum. Additionally, the perceptions of both groups were aligned in terms of the technical aspects of online assessment (Cluster 1) and their preference for online over face-to-face assessment (Cluster 3). However, in the realm of quality and authenticity of online assessments (Cluster 2), dental students rated these aspects significantly higher than medical students, suggesting that dental students may find online assessments more credible or better suited to their educational needs (Figure 4).

One possible explanation for the dental students' higher ratings of online assessments is the availability of specialised online tools and resources in dental education. Many dental programmes have adopted virtual simulations and software such as digital radiography, dental anatomy visualisation tools, and clinical case simulations, which may enhance the quality and authenticity of online assessments. These tools allow dental students to practice clinical skills in a virtual environment, bridging the gap between theoretical knowledge and practical application during remote learning. By contrast, a medical course, which often requires more extensive patient interaction and varied clinical experiences, may not benefit as uniformly from such specialised tools. Educational institutions aiming to optimise their online learning environments should consider integrating specialised tools that simulate practical scenarios, particularly in fields that require hands-on skills like dentistry. Expanding the use of virtual simulations and interactive assessments in medical education could similarly bridge the gap between theory and practice. Enhancing the quality and accessibility of these tools may not only improve student satisfaction but also ensure that online assessments remain authentic and rigorous.

This research has provided valuable insights into student perceptions of online and face-to-face learning and assessment systems in the medical and dentistry fields during the post-COVID-19 pandemic era. The findings suggest a potential for blending online and traditional face-to-face methods in medical and dental education, as positive feedback has been noted for online learning. However, it is important to recognise that while online learning is effective for theoretical knowledge, hands-on training remains crucial in these fields, particularly during preclinical and clinical training with patients. The effectiveness of online learning is largely gauged by student attitudes and continuous assessment. Thus, hybrid learning models offer a balanced solution by blending online and hands-on training. Virtual simulations and augmented reality enable students to practice procedures in a controlled, risk-free environment, while flipped classroom models allow for online preparation followed by in-person sessions focused on practical tasks. Telemedicine platforms can facilitate supervised, real-time patient interactions. By integrating these approaches, hybrid models ensure comprehensive preclinical and clinical training, preserving the quality of hands-on education while offering flexibility.

While this study offers valuable insights into student perceptions, further research is necessary to evaluate the long-term effects of online assessments on students' clinical competencies. Specifically, future investigations could explore whether the use of online assessments during critical learning periods affects the retention of hands-on skills required in medical and dental practice. Additionally, the psychological toll of prolonged online learning on students' mental health is another area worth investigating. Studies should evaluate whether the stress, anxiety, and isolation experienced during remote learning persist and how they impact students' academic performance and overall well-being.

CONCLUSION

The investigation into the attitudes of Malaysian dental and medical students towards virtual and face-to-face learning modalities during the COVID-19 crisis offers substantial insights into their adaptability and proficiency in various learning environments. This research highlights students' ability to navigate online education effectively, while also revealing a preference for an integrated approach that combines virtual and traditional pedagogies. It highlights the importance of experiential learning in dental and medical curricula, suggesting that although online platforms are effective for theoretical instruction, practical competencies require direct, in-person training. This study lays the groundwork for future educational frameworks, aiming to harmonise digital and traditional teaching methodologies to enhance learning efficacy in a post-pandemic context. These findings also offer education policymakers valuable insights on how to effectively integrate online and face-to-face learning in a world that has adapted significantly from the experiences of the COVID-19 pandemic.

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ETHICAL APPROVAL

This research project was conducted with ethical approval by the Research Management Centre (RMC), MAHSA University, Malaysia (RMC/EC46/2020).

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