



ORIGINAL ARTICLE

Comparison of student satisfaction between virtual and face-to-face classes in dental students at a Peruvian University, 2024



Evelin Yudit Apaza-Vila, Betzy Emelyn Ordoñez-Roiro,
Shirley Estefany Caceres-Chilingano, Jesely Haritz Torres-Ramirez*,
Cesar D. Rojas-Senador, Daniel Kevin Pérez-Alvarez

Facultad de Estomatología, Universidad Peruana Cayetano Heredia, Lima, Peru

Received 30 April 2025; accepted 14 September 2025

Available online 28 October 2025

KEYWORDS

Distance education;
Higher education;
Stomatology;
Dental education

Abstract

Introduction: The COVID-19 pandemic brought about a significant transformation in higher education, particularly in fields such as dentistry, where practical training is essential. This study aimed to compare dental students' satisfaction with virtual and face-to-face classes.

Material and methods: Considering variables such as age, sex, and academic year, a validated questionnaire was administered to 177 third-, fourth-, and fifth-year students from the School of Dentistry at Universidad Peruana Cayetano Heredia in 2024. Statistical analysis included T-tests, ANOVA, Spearman correlation, and hierarchical multiple linear regression.

Results: Results showed similar satisfaction levels across both modalities, with a general mean of 61.46 on a 0–100 scale. Face-to-face classes received a slightly higher average score (71.93) compared to virtual classes (66.86), with no statistically significant differences by age, sex, or academic year. A low positive correlation was found between both modalities ($\rho = 0.247$; $p < 0.001$).

Conclusion: No significant associations were identified in the regression models. These findings highlight the importance of implementing integrated pedagogical strategies that enhance the educational experience and ensure the quality of learning in both in-person and virtual settings.

© 2025 The Authors. Published by Elsevier España, S.L.U. This is an open access article under the CC BY-NC license (<http://creativecommons.org/licenses/by-nc/4.0/>).

* Corresponding author at: Av. Honorio Delgado 430, San Martín de Porres, Lima, Peru.

E-mail address: jesely.torres@upch.pe (J.H. Torres-Ramirez).

PALABRAS CLAVE

Educación a distancia;
Educación superior;
Estomatología;
Educación
odontológica

Comparación de la satisfacción estudiantil entre clases virtuales y presenciales en estudiantes de odontología de una Universidad Peruana, 2024

Resumen

Introducción: La pandemia de la COVID-19 trajo una transformación significativa en la educación superior, especialmente en carreras como odontología, donde la formación práctica es esencial. Este estudio tuvo como objetivo comparar la satisfacción de los estudiantes de odontología con las clases virtuales y presenciales.

Material y métodos: Se consideraron variables como la edad, el sexo y el año académico. Se aplicó un cuestionario validado a 177 estudiantes de tercer, cuarto y quinto año de la Escuela de Odontología de la Universidad Peruana Cayetano Heredia en el año 2024. El análisis estadístico incluyó pruebas T, ANOVA, correlación de Spearman y regresión lineal múltiple jerárquica.

Resultados: Se observaron niveles de satisfacción similares en ambas modalidades, con una media general de 61.46 en una escala de 0 a 100. Las clases presenciales obtuvieron un promedio ligeramente más alto (71.93) en comparación con las clases virtuales (66.86), sin diferencias estadísticamente significativas según la edad, el sexo o el año académico. Se encontró una baja correlación positiva entre ambas modalidades ($\rho = 0.247$; $p < 0.001$).

Conclusión: No se identificaron asociaciones significativas en los modelos de regresión. Estos hallazgos resaltan la importancia de implementar estrategias pedagógicas integradas que mejoren la experiencia educativa y aseguren la calidad del aprendizaje tanto en entornos presenciales como virtuales.

© 2025 Los Autores. Publicado por Elsevier España, S.L.U. Este es un artículo Open Access bajo la licencia CC BY-NC (<http://creativecommons.org/licenses/by-nc/4.0/>).

Introduction

Dental education is a comprehensive training process that encompasses the development of clinical, scientific, and ethical competencies. The COVID-19 pandemic triggered an abrupt shift in educational modalities, compelling higher education institutions to transition to virtual environments, which posed a significant challenge for both students and faculty members.^{1,2} In response, digital tools and platforms such as Zoom®, Google Meet®, and other technologies were implemented to facilitate the continuation of theoretical classes and academic meetings in a remote format.³

Despite these efforts, virtual education has been subject to debate due to its potential limitations in the acquisition of practical skills, unstable internet connectivity, emotional detachment, and the pedagogical adaptation required of educators.^{4,5} Several international studies have assessed university students' perceptions and satisfaction regarding these new teaching modalities, identifying variations based on academic level, institutional context, and technological environment.^{6,7}

In university-level health sciences education, student satisfaction is influenced by multiple interrelated dimensions, including teaching methods, learning materials, and assessment systems. Active learning strategies, such as case-based learning and flipped classrooms, have demonstrated positive effects on engagement and performance.⁸ Likewise, the availability and quality of educational resources, such as multimedia content, simulations, and clinical recordings, play a crucial role in supporting theoretical and practical knowledge acquisition.⁹ Additionally, well-designed and transparent assessment systems are essential to ensure

fairness and motivate learning, especially in virtual contexts where perceptions of academic rigor may be affected.¹⁰ These three dimensions form the backbone of educational quality and are closely related to students' satisfaction in both face-to-face and virtual settings.

In this regard, blended learning has emerged as a structured integration of face-to-face and online modalities, offering flexibility, autonomy, and opportunities for meaningful learning.¹¹ In dental education, Ali et al. have reported that blended learning promotes self-regulated learning and supports conceptual understanding and clinical reasoning.¹² Likewise, Duś-Ilnicka et al. described how a Blended Intensive Programme (BIP) fostered interdisciplinary and international collaboration, enriching students' academic experience.¹³ These findings provide the theoretical basis for considering hybrid approaches as an optimal pedagogical strategy in dentistry, particularly when balancing theoretical content with the acquisition of practical skills.

At Universidad Peruana Cayetano Heredia (UPCH), specific guidelines were established to enable the transition from in-person to virtual learning, prioritizing health and safety while ensuring academic continuity. Nevertheless, concerns emerged about the impact of this shift on the educational experience, particularly in practice-oriented fields such as stomatology.^{14,15}

In this context, it is essential to assess students' satisfaction with both teaching modalities, taking into account variables such as age, sex, and academic year. Therefore, this study aims to compare student satisfaction with virtual and face-to-face classes at the School of Dentistry of UPCH in 2024, in relation to these variables.

Materials and methods

An observational, analytical, and cross-sectional study was conducted. The study population consisted of third-, fourth-, and fifth-year students enrolled in the School of Dentistry at Universidad Peruana Cayetano Heredia (UPCH) in 2024 ($N = 280$). These groups were selected because they directly experienced the transition from face-to-face to virtual education during the COVID-19 pandemic. A non-probabilistic sampling method was used. Student contact information was provided by the Academic Secretariat of the School. Inclusion criteria comprised students enrolled in 2024 with complete academic information. Exclusion criteria included students who had withdrawn, were readmitted, did not agree to participate, lacked regular internet access, or were completing their clinical internship in Social Dentistry.

A structured questionnaire was used, adapted from the scale developed by Recio and Cabero and modified to fit a five-point Likert format (ranging from 1 to 100). The instrument assessed student satisfaction in two educational modalities (virtual and face-to-face) through 20 items divided into two blocks of 10 items each. Within each block, the items were grouped into three dimensions¹: quality of theoretical and practical sessions (4 items),² effectiveness of assessment systems (3 items), and³ usefulness of communication tools and digital platforms (3 items). These items addressed aspects such as clarity and relevance of class content, integration of practical demonstrations, fairness and timeliness of evaluations, and ease of communication with faculty through institutional platforms.

The questionnaire also gathered sociodemographic data, including age (categorized as under 22 and 22 or older, based on the sample median), sex (female or male), and academic year (third, fourth, or fifth). Satisfaction scores were treated as discrete quantitative variables and classified into five categories: strongly disagree (1–20), disagree (21–40), neutral (41–60), agree (61–80), and strongly agree (81–100).

Content validity of the instrument was assessed through expert judgment involving six faculty members with over ten years of experience in teaching, public health, and clinical practice. High agreement was achieved, with a Cronbach's alpha exceeding 0.80. A pilot test was subsequently conducted with 30 s-year students, followed by a one-week test–retest reliability assessment, which also yielded a Cronbach's alpha > 0.80, confirming consistency.

With authorization from the Director of the School of Dentistry at UPCH, students were contacted via institutional email. The survey, created using Google Forms, was sent to those who voluntarily agreed to participate. The data collection was conducted from April 1 to April 15, 2024, and the survey remained open for 14 consecutive days. Of the 280 students invited to participate, 177 completed the questionnaire in full, representing a response rate of 63.2%. Only fully completed questionnaires were included in the analysis. The form included a digital informed consent statement.

Descriptive statistics were used to analyze the data, including frequencies and percentages for qualitative variables and central tendency measures for quantitative ones. Inferential analysis included Student's *t*-test, Mann–Whitney

U test, ANOVA, and Spearman correlation. Hierarchical multiple linear regression was also performed, with log transformation of the data when necessary. Statistical significance was set at $p < 0.05$, and data analysis was conducted using STATA version 17.

This study was approved by the Integrated Research, Science and Technology Management Unit (IRSTMU) and the Institutional Ethics Committee (IEC-UPCH) of Universidad Peruana Cayetano Heredia. Participant anonymity and confidentiality were ensured. All participants provided informed consent electronically.

Results

As shown in Table 1, a total of 177 third-, fourth-, and fifth-year dental students from Universidad Peruana Cayetano Heredia participated in the study. The overall mean satisfaction score across both teaching modalities was 61.46 (SD = 6.21). When comparing by class type, satisfaction was higher with face-to-face classes ($M = 71.93$, SD = 9.70) than with virtual classes ($M = 66.86$, SD = 9.85). No statistically significant differences were found when analyzing satisfaction by age group (under 22 vs. 22 and older, $p = 0.131$), sex (female vs. male, $p = 0.068$), or academic year ($p = 0.833$ for face-to-face and $p = 0.829$ for virtual classes). A weak positive correlation was observed between satisfaction with both modalities ($\rho = 0.247$), which was statistically significant ($p < 0.001$), suggesting that students who reported higher satisfaction in one modality tended to report higher satisfaction in the other as well.

As shown in Table 2, the hierarchical multiple linear regression analysis included three models assessing the relationship between sociodemographic variables and class satisfaction. None of the models yielded statistically significant associations: Model 1 ($p = 0.122$, $R^2 = 0.03$), Model 2 ($p = 0.148$), and Model 3 ($p = 0.280$). In Model 1, the coefficients for age ($\beta = -1.601$; 95% CI: -3.777 to 0.575 ; $p = 0.148$), sex ($\beta = -1.914$; 95% CI: -3.850 to -0.022 ; $p = 0.053$), and academic year ($\beta = 0.285$; 95% CI: -1.062 to 1.633 ; $p = 0.676$) were not statistically significant, indicating that these variables did not meaningfully explain the differences in satisfaction levels reported by the students.

Discussion

The findings of this study show that dental students at Universidad Peruana Cayetano Heredia reported moderate levels of satisfaction with both face-to-face and virtual modalities, with the former being slightly more positively rated. This pattern is consistent with previous research documenting a general preference for in-person education, particularly in programs such as dentistry where practical training plays a central role. The overall satisfaction score (61.46) suggests that both modalities are accepted, although there is room for improvement.

This result aligns with a study conducted at the Universidad Nacional de Concepción (Paraguay), where students expressed significant dissatisfaction with the lack

Table 1 Satisfaction with virtual versus face-to-face classes among students of the school of dentistry at Universidad Peruana Cayetano Heredia, 2024.

	<i>n</i>	%	Satisfaction with virtual vs. face-to-face classes			Satisfaction with virtual classes			Satisfaction with face-to-face classes		
			\bar{X}	SD	<i>p</i>	\bar{X}	SD	<i>p</i>	\bar{X}	SD	<i>p</i>
Total	177	100.00	61.46	6.21		66.86	9.85		71.93	9.70	0.001 ****
Age											
Under 22 year	87	49.15	61.84	6.19	0.131 *	67.89	10.08	0.076 *	72.44	10.36	0.508 *
22 years or older	90	50.85	61.10	6.25		65.87	9.57		71.44	9.03	
Sex											
Female	122	68.93	62.10	6.41	0.068 *	67.70	9.95	0.089 **	71.28	9.82	0.117 *
Male	55	31.07	60.05	5.56		64.98	9.42		73.38	9.33	
Year of study											
3rd year	58	32.77	61.48	7.30	0.601 ***	67.17	11.57	0.829 ***	71.31	11.65	0.833 ***
4th year	61	34.46	62.02	5.59		67.18	8.63		72.13	8.81	
5th year	58	32.77	60.86	5.68		66.21	9.30		72.34	8.49	

n: Absolute frequency. %: Relative frequency. \bar{X} : Mean. SD: Standard deviation. *p*: Statistical significance.

* Mann-Whitney U test.

** Student's t-test.

*** ANOVA test.

**** Spearman's correlation test. Spearman's correlation coefficient, $\rho = 0.247$.

of in-person classes, especially for practical activities. In that study, 38.1% of students considered virtual classes inadequate for developing procedural skills, reinforcing the importance of maintaining in-person learning environments in dental education.^{16,17}

Similarly, Qutieshat et al. found that while students appreciated the flexibility of virtual learning, they also expressed concerns regarding the lack of direct interaction with patients and the inability to perform clinical procedures. This suggests that although digital tools facilitate

Table 2 Hierarchical multiple linear regression of satisfaction with virtual versus face-to-face classes among students of the School of Dentistry at Universidad Peruana Cayetano Heredia, 2024.

Variables	R^2	R^2 change	<i>p</i> -value of R^2 change	β_0	β	β^*	95% CI	<i>p</i> -value	Model <i>p</i> -value
Model 1: Satisfaction with virtual vs. face-to-face classes	0.03	0.00	0.676	65.810					0.122
Age					-1.601	-0.132	-3.777 to 0.575	0.148	
Sex					-1.914	-0.147	-3.850 to 0.022	0.053	
Year of study					0.285	0.038	-1.062 to 1.633	0.676	
Model 2: Satisfaction with virtual classes	0.03	0.00	0.844	74.079					0.148
Age					-2.455	-0.126	-5.931 to 1.021	0.165	
Sex					-2.889	-0.137	-6.013 to 0.235	0.070	
Year of study					0.215	0.018	-1.932 to 2.362	0.844	
Model 3: Satisfaction with face-to-face classes	0.02	0.01	0.237	69.137					0.280
Age					-1.798	-0.096	-5.150 to 1.554	0.291	
Sex					2.295	0.114	-0.722 to 5.311	0.135	
Year of study					1.247	0.108	-0.827 to 3.321	0.237	

R^2 : Coefficient of determination. β_0 : Constant. β : Unstandardized regression coefficient. β^* : Standardized regression coefficient. 95% CI: 95% Confidence Interval. *p*: Statistical significance.

access to theoretical content, they do not fully replace the practical component of clinical education, highlighting the need for blended learning models.^{18,19}

In this regard, our findings support the growing body of evidence that blended learning constitutes a feasible pedagogical approach in dental education. Recent studies indicate that students value a combination of modalities, as theoretical content can be efficiently delivered online while clinical competencies are better acquired in person.^{11,24} Systematic reviews also emphasize that blended learning enhances student engagement, promotes autonomy, and improves academic outcomes when appropriately implemented.¹¹ However, challenges such as unequal access to digital resources and the need for faculty training remain critical factors that may explain why some students still express higher satisfaction with traditional face-to-face classes.¹² These considerations suggest that the integration of hybrid models should be prioritized in curriculum design as a sustainable post-pandemic strategy.

Our results also indicate no statistically significant differences in satisfaction levels based on age, sex, or academic year. These findings are in line with studies by Medina and Alfaro and by Castro and Lara, who noted that students have adapted to different teaching formats, especially after multiple academic cycles of virtual experience.^{20,21} Such adaptation may be attributed to progressive improvements in educational platforms and ongoing faculty training.

However, other studies offer a more nuanced view of the impact of age. For example, Estrada et al. identified variations in satisfaction across age groups, with higher satisfaction levels among older students. This could be related to greater academic maturity, learning autonomy, and time management. Furthermore, factors such as the quality of digital tools, connectivity, and faculty support may influence students' perception of virtual environments depending on their age.²²

Regarding sex, while this study found no significant differences, a slight trend toward higher satisfaction among women was observed in the virtual modality, as reflected in the mean scores for online classes. This aligns with previous literature showing that female students may report greater appreciation for the flexibility and adaptability of virtual learning environments, although differences are often not statistically significant. Madi et al. reported similar results, showing no substantial differences in satisfaction with virtual classes, although male students reported higher satisfaction with face-to-face learning. Additionally, Estrada et al. found that male students had a more favorable perception of virtual education, potentially due to prior technological experience and greater digital confidence.^{21,22}

With respect to academic year, satisfaction levels were similar among third-, fourth-, and fifth-year students. This partially contrasts with the findings of Madi et al., who reported that preclinical students (third and fourth year) showed a stronger preference for face-to-face learning, whereas clinical-level students valued certain advantages of virtual education. This difference may be explained by the nature of the coursework, as theoretical content can be delivered effectively online, while clinical skills require hands-on practice.²³

Finally, the results of this study support the growing acceptance of hybrid learning models. Various authors have emphasized that success in health education does not lie in a single modality, but rather in a pedagogical design that effectively integrates both face-to-face and virtual components. Perceived quality is strongly influenced by factors such as teacher–student interaction, availability of learning resources, academic support, and clarity in assessment. Therefore, rather than replacing one modality with the other, a strategic integration of both is necessary.

In summary, this study showed that dental students at Universidad Peruana Cayetano Heredia expressed moderate satisfaction with both educational modalities, with a slight preference for face-to-face classes. The absence of statistically significant differences by age, sex, or academic year suggests that other pedagogical and contextual factors may play a more decisive role in shaping students' perceptions. These findings reinforce the potential of blended approaches that strategically combine the strengths of each format to improve learning experiences.

Among the limitations of this research are the non-probabilistic sampling method, which restricts the generalizability of the results, and the reliance on self-reported data, which may be subject to bias. The study was also limited to a single institution and did not include qualitative methods that could provide deeper insights into students' experiences. Future research should integrate mixed-method approaches and explore the influence of specific teaching strategies, educational resources, and assessment systems on satisfaction in both virtual and face-to-face contexts.

Acknowledgements

The authors thank the Universidad Peruana Cayetano Heredia for its commitment to cover the article processing charges (APCs) in case of acceptance for publication.

Ethical aspects

The study was approved by the Institutional Research Ethics Committee of Universidad Peruana Cayetano Heredia (CIE-UPCH) on August 23, 2023, and all participants consented to participate.

Conflict of interest

All the authors involved in this project declare that there is no conflict of interest and meet the relevant authorial criteria.

References

1. Delgado SM, Miguel S, Atoche KJ, Arriola LE. Revolution in modern teaching in dentistry since the appearance of the COVID-19 pandemic: a review. *Dent Med Probl.* 2022;59(1):137–41.
2. Ertürk AT, Delikan E. Satisfaction and stress levels of dentistry students relating to distance education. *Dent Med Probl.* 2021;58(3):291–8.

3. Gopal R, Singh V, Aggarwal A. Impact of online classes on the satisfaction and performance of students during the pandemic period of COVID-19. *Educ Inf Technol*. 2021;26(6):6923–47.
4. Guevara DN, Flores KM, Maturrano AG, Matto MA. Educación virtual en odontología durante la pandemia de COVID-19. *Rev Cient Odontol (Lima)*. 2021;9(3):e078.
5. Ramírez I, Jaliri C, Méndez B, Orlandini I. Percepciones universitarias sobre la educación virtual. *Red Docentes IB*. 2020;3(1):1–6.
6. Lovón MA, Cisneros SA. Repercusiones de las clases virtuales en los estudiantes universitarios en el contexto de la cuarentena por COVID-19: el caso de la PUCP. *Propós Represent*. 2020;8 (SPE3):e588.
7. Antoniadou M, Rahiotis C, Kakaboura A. Sustainable distance online educational process for dental students during COVID-19 pandemic. *Int J Environ Res Public Health*. 2022;19(15):9470.
8. Hew KF, Lo CK. Flipped classroom improves student learning in health professions education: a meta-analysis. *BMC Med Educ*. 2018;18(1):38.
9. Chan LK, Patil NG, Chen JY. Advantages and limitations of e-learning in medical education: a systematic review. *Med Teach*. 2010;32(6):e336–42.
10. Kibble JD. Best practices in summative assessment. *Adv Physiol Educ*. 2017;41(1):110–9.
11. López-Belmonte J, Segura-Robles A, Fuentes-Cabrera A, Parra-González ME. Blended learning and sustainability: a systematic review of the literature. *Sustainability*. 2025;17(2):756. doi:10.3390/su17020756.
12. Ali S, Khan SA, Haroon H, Malik A, Sajid MR, Iqbal M, et al. Blended learning in dental education: students' perceptions and experiences during COVID-19. *J Taibah Univ Med Sci*. 2023;18 (1):16–24. doi:10.1016/j.jtumed.2022.11.002.
13. Duś-Ilnicka I, Mierzwińska-Nastalska E, Górski M, Kowalczyk P, Kaczmarek M, Chomyszyn-Gajewska M, et al. Blended Intensive Programme (BIP) in dental education: an innovative approach to interdisciplinary and international learning. *BMC Med Educ*. 2024;24(1):352. doi:10.1186/s12909-024-05301-9.
14. Feria Y, Rodríguez M, Torres MI, Pimienta E. Panorama de conexión durante las clases virtuales en una muestra de estudiantes universitarios. *e-CUCBA*. 2020;14:25–33.
15. Universidad Peruana Cayetano Heredia. Reglamento operativo ante el coronavirus (COVID-19). Lima: UPCH; 2021 [citado 17 ene 2025]. Disponible en: [https://upch-segen-documentos.s3.amazonaws.com/NORMATIVA/REGLAMENTO+OPERATIVO+ANTE+EL+CORONAVIRUS+\(COVID-19\)/RE-133-UPCH_V.01.00_2021.03.24.pdf](https://upch-segen-documentos.s3.amazonaws.com/NORMATIVA/REGLAMENTO+OPERATIVO+ANTE+EL+CORONAVIRUS+(COVID-19)/RE-133-UPCH_V.01.00_2021.03.24.pdf).
16. Recio MA, Cabero J. Enfoques de aprendizaje, rendimiento académico y satisfacción de los alumnos en formación en entornos virtuales. *Rev Medios Educ*. 2005;25:93–115.
17. García A, López F, Martínez D. Percepción de los estudiantes de odontología sobre la modalidad de clases virtuales durante la pandemia en la Universidad Nacional de Concepción. *Rev Cient Cienc Soc*. 2022;10(2):45–53.
18. Abusamak M, Maragha T. Impact of blended learning on dental students' performance and satisfaction in clinical education. *J Dent Educ*. 2019;83(2):136–58.
19. Sanjuán G, del Castillo GD, Rabell O, Gomez M, Morales IC. Satisfacción de educandos a distancia en tiempos de pandemia. *Arch Hosp Univ Gen Calixto García*. 2021;9(2):5–6. Disponible en: <https://revcalixto.sld.cu/index.php/ahcg/article/view/628>.
20. Medina EM, Alfaro NG. Enseñanza presencial vs virtual en el ámbito universitario. *Rev Tecnol Educ Docentes*. 2023;16(1): 109–18. doi:10.37843/rted.v16i1.362.
21. Castro Y, Lara R. Percepción del blended learning en el proceso enseñanza-aprendizaje por estudiantes del posgrado de odontología. *Educ Med*. 2018;19(4):223–8. doi:10.1016/j.edumed.2017.03.028.
22. Estrada EG, Gallegos NA, Puma MA. Percepción de los estudiantes universitarios sobre la educación virtual durante la pandemia de COVID-19. *Rev San Gregorio*. 2022;1(49):74–89. doi:10.36097/rsan.v0i49.1967.
23. Madi M, Gaffar B, Farooqi FA, Zakaria O, Sadaf S, Alhareky M, et al. Virtual versus traditional learning: a comparison of dental students' perception and satisfaction. *Dent J*. 2024;12(12):393. doi:10.3390/dj12120393.
24. Kaur N, Dwivedi D, Arora J, Gandhi A. Quality, effectiveness and outcome of blended learning in dental education during the COVID pandemic: prospects of a post-pandemic implementation. *J Dent Educ*. 2021;85(9):1315–22. doi:10.1002/jdd.12625.