Journal of Dental Sciences 20 (2025) 626–631

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.e-jds.com

Original Article

From microscope to masterpiece: Validating the role of artistic competition in enhancing dental students' engagement in histological study

Chuan-Hang Yu [a,b], **Chun-Pin Chiang** [c,d,e,f*]

[a] *School of Dentistry, Chung Shan Medical University, Taichung, Taiwan*
[b] *Department of Dentistry, Chung Shan Medical University Hospital, Taichung, Taiwan*
[c] *Department of Dentistry, Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, Hualien, Taiwan*
[d] *Institute of Dental Medicine and Materials, College of Medicine, Tzu Chi University, Hualien, Taiwan*
[e] *Graduate Institute of Oral Biology, School of Dentistry, National Taiwan University, Taipei, Taiwan*
[f] *Department of Dentistry, National Taiwan University Hospital, College of Medicine, National Taiwan University, Taipei, Taiwan*

Received 3 November 2024
Available online 13 November 2024

KEYWORDS
Dental education;
Medical humanities;
Photomicrograph competition;
Oral histology;
Oral pathology

Abstract *Background/purpose:* Our previous study found that the integration of arts into the dental education through an innovative photomicrograph competition can increase the dental students' interests in learning microscopic lessons. This study aimed to validate whether the same photomicrograph competition still had its effectiveness to promote the students' interests in learning microscopic lessons.
Materials and methods: A photomicrograph competition was organized for the 477 dental students. The students captured artistic images from the oral histology and oral pathology slides. The entries were evaluated through a peer vote. A post-competition survey was performed to assess the students' perceptions of the activity's impact on their learning interest, satisfaction, and views on the potentially broader implementation.
Results: The photomicrograph competition gathered a 29 % overall participation rate, with the highest engagement from the third-year (66 %) and second-year (50 %) dental students. Of the participants, 73 % reported an increase in interest in the microscopic lessons, 78 % expressed satisfaction with the photomicrograph competition activity, and 80 % supported its annual continuation. Furthermore, 68 % of the students believed the photomicrograph competition could be adopted by all dental schools in Taiwan.

* Corresponding author. Department of Dentistry, Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, Institute of Dental Medicine and Materials, College of Medicine, Tzu Chi University, No. 707, Section 3, Chung-Yang Road, Hualien 970, Taiwan.
E-mail address: cpchiang@ntu.edu.tw (C.-P. Chiang).

https://doi.org/10.1016/j.jds.2024.11.008

Conclusion: This study confirms the effectiveness of integrating arts into the dental education through the photomicrograph competitions. The consistent positive outcomes over time suggest the long-term viability and benefits of this approach in improving the students' histological studies, particularly among the second-year and third-year dental students. A strong support for the continued and broader implementation indicates a high potential for the incorporation of photomicrograph competitions in the dental curricula.

Introduction

The integration of the arts and humanities into the medical and dental education has gained increasing recognition as an important component in the development of well-rounded healthcare professionals. This approach not only enhances students' observational skills and creativity, but also fosters empathy and a holistic understanding of the patient care. The Association of American Medical Colleges (AAMC) has highlighted the unique role of arts and humanities in preparing physicians for the complex challenges of the 21st century, emphasizing medicine as an intricate interplay of science and art underpinned by humanistic values and principles.[1]

Historically, the importance of combining professional ability with humanistic attributes in the medical education has deep roots. Sun Si-Miao, a revered medical sage during the Tang Dynasty, emphasized the parity between professional skills and humanistic qualities in achieving the medical excellence, as articulated in seminal works such as "Virtue of the Great Physician" and "Education of the Great Physician".[2] This historical perspective underscores the lasting importance of a holistic approach to the medical and dental education.

Various methodologies have been proposed to infuse the artistic sensibilities into the medical and dental education. These include narrative medicine,[3—5] literature,[6,7] history,[8—11] art,[2,12,13] and interdisciplinary approaches.[14] Furthermore, the integration of digital imaging, particularly in the basic medical education such as pathology, has become universal. Pathologists now employ digital imaging for the education, diagnosis, patient reports, publication, and data preservation,[15] highlighting the growing intersection of technology, science, and visual arts in the medical education.

In a previous study,[2] we introduced a novel approach to integrate the arts into the dental education through a histological photomicrograph competition. The initial findings suggest that this method effectively increases the students' interest in microscopic studies and provides a unique platform for combining the scientific observation with the artistic expression. The current study aimed to replicate and validate these findings, and further explored the long-term viability of this approach. We sought to determine whether the similar photomicrograph competition consistently enhanced the dental students' interest in histological studies over time, assessed the long-term perceptions of students regarding the integration of this artistic approach into their scientific curriculum, and explored whether there was a sustained support for the broader implementation of this teaching method across the dental schools in Taiwan.

By revisiting this innovative teaching approach, we aimed to establish its reliability and explored its potential as a sustainable method of enriching the dental education with artistic elements. This replication study not only validated our previous findings, but also provided an insight into the long-term viability and impact of integrating art into the dental curricula, contributing to the broader discourse on the interdisciplinary approaches in the medical and dental education.

Materials and methods

The study protocol was reviewed and approved by the Institutional Review Board of Chung Shan Medical University Hospital (CSMUH No. CS1-23133). It was carried out at the School of Dentistry, CSMU during the academic year of 2023. The study subjects comprised the 477 undergraduate dental students from the first year to sixth year of study. The participation in the competition and the subsequent survey was voluntary and had no impact on the students' academic grades. The photomicrograph competition was mainly organized for the second-year (oral histology) and third-year (oral pathology) dental students. The participants were divided into different teams of 5—6 members, forming 12—14 teams per year group of dental students. The dental students were tasked with capturing artistic photomicrographs of oral histology and oral pathology teaching slides used in their regular dental curricula.

The competition guidelines postulated the use of unmodified images captured directly from the microscopes, with each team allowed to submit one entry per category (oral histology or oral pathology). The students were required to provide a creative title for each submission, encouraging them to engage in the material beyond the scope of the scientific observation. This approach aimed to foster a blend of scientific precision and artistic interpretation, challenging the students to view familiar academic material through a new and creative lens.

The data collection was carried out using an online voting system and a post-competition survey using the Google Forms, which was described in our previous study.[2] All dental students (years 1—6) were eligible to vote for their favorite entries, promoting engagement throughout the dental program. The survey included Likert scale

questions assessing the impact on the interest in microscopic studies, the overall satisfaction with the photomicrograph competition, the support for the annual continuation of the event, and the views on the potential adoption by other dental schools in Taiwan. Additionally, an open-ended question solicited qualitative feedback on the photomicrograph competition, allowing for a more understanding of the students' experiences and perceptions.

For data analysis, the quantitative data from responses were analyzed using the descriptive statistics to determine the general trends and levels of agreement. The qualitative responses were reviewed for the common themes and insights, providing a richer context for the quantitative findings. This mixed-method approach allowed for a comprehensive evaluation of the impact and reception among the dental students, offering both the broad trends and the detailed personal insights.

Results

A total of 26 entries were submitted for the photomicrograph competition, and they were split into two categories: 12 in the "oral histology" and 14 in the "oral pathology" photomicrograph competitions. Fig. 1 displays the top three winning photomicrographs for each category.

The photomicrograph competition garnered a significant engagement throughout all years of the undergraduate dental program, as shown in Table 1. Of the 477 total dental students, 140 (29 %) participated in the voting and survey process. The distribution of the participants varied over years, with the highest participation from the third-year students (66 % of the total third-year dental students), followed by the second-year students (50 %) and the first-year students (28 %). The participation rates were lower in the fourth-year (18 %), the sixth-year (8 %), and the fifth-year (7 %) dental students (Table 1).

Table 2 shows the questionnaire survey results of the photomicrograph competition questionnaire survey. The survey results revealed a positive impact on the learning interest, with 73 % of the respondents agreeing that the competition increased their interest in learning microscopic lessons. This finding suggests a strong effect on the student engagement in the histological material. Only 4 % of the participants disagreed with this statement, while 23 % remained neutral (Table 2).

The students' satisfaction and support for the photomicrograph competition were high. A strong support for the continuation of the competition was evident, with 80 % of respondents strongly or very strongly supporting the idea of holding the competition annually. Only 3 % opposed the annual continuation of the event (Table 2).

Importantly, the survey also revealed a strong support for the broader implementation of the photomicrograph competition. A significant majority (68 %) of the students agreed or strongly agreed that the photomicrograph competition could be adopted by all dental schools in Taiwan. This finding suggests that the dental students recognize the potential benefits of this approach beyond their immediate educational context, pointing to the possibilities of a greater impact on the dental education across different institutions (Table 2).

The overall satisfaction rate for the photomicrograph competition activity was notably high. An impressive 78 % of the participants expressed the overall satisfaction with the activity (49 % very satisfied, 29 % satisfied), suggesting that the competition met or exceeded the students' expectations in terms of educational value and enjoyment. Only 2 % reported to be very unsatisfied, and no participants selected the "unsatisfied" option (Table 2).

Discussion

This replication study confirmed and extended the findings of our previous research,[2] demonstrating the consistent positive impact of integrating artistic elements into the dental education through the photomicrograph competitions. The high levels of the students' engagement, satisfaction, and support for the continuation of the competition suggest that this approach offers a sustainable method for enhancing the interest in histological studies.

The increased interest in microscopic lessons reported by a majority of participants (73 %) aligned closely with our previous findings, indicating the reliability of this teaching method in stimulating the students' engagement. This consistency over time is particularly noteworthy, as it suggests that the novelty factor of the competition is not the primary driver of its effectiveness. Instead, it points to a fundamental appeal of combining the artistic expression with the scientific observation, which continues to resonate with the students even if the approach becomes more established in the dental curriculum.

Our findings align with the broader trends in the medical and dental education that emphasizes the integration of the arts and humanities. Moniz et al. found in their scoping review that visual arts are the second most common form of arts integration in the medical education after the literary arts.[16] Our photomicrograph competition added to this body of knowledge by providing a specific example of how visual arts could be effectively incorporated into the dental education, particularly in the often-challenging area of the histological studies.

A strong support for the annual continuation (80 %) and the potential adoption by other dental schools (68 %) highlights the perceived value of this approach among the dental students. This enthusiasm presented an opportunity for a broader implementation of arts integration in the dental curricula, potentially addressing the challenges of engaging the students in traditionally theory-heavy subjects like histology and pathology. The widespread support also suggests that the dental students recognize the transferable skills and perspectives gained through this interdisciplinary approach, which can enhance their overall educational experience and future professional practice.

Interestingly, the participation and enthusiasm for the competition varied across different years of the undergraduate dental program. The highest participation rates were observed among the third-year (66 %) and the second-year (50 %) dental students, which coincided with the years when oral histology and oral pathology are typically the most emphasized courses in the dental curriculum. This finding aligns with the research by Naidu and Kumagai,[17] who emphasized the importance of integrating the

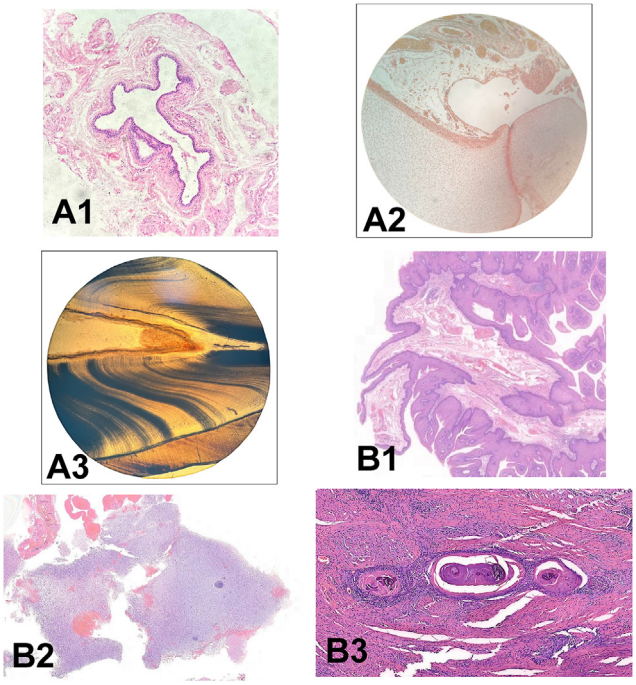

Figure 1 The winning photomicrograph works of the "beauty in the microscope" photomicrograph competition award. (A1-A3) The first- to third-place photomicrograph works in the "oral histology" item, respectively. (A1) The histological tissue section of a part of the salivary gland showing a dilated and irregular excretory duct and its surrounding fibrous connective tissue looked like "Italy kicks away Sicily", with the main ductal structure resembling the Italian peninsula and the other separated portion of the duct reminiscent of the island of Sicily. (A2) The histological tissue section of a part of the developing head of an embryo. The theme of this picture was "a hole in my broken heart", with the embryonic structures at the right upper half of the photomicrograph looking like a broken heart with a central hole opening toward the right side. (A3) The ground section of a tooth cusp showing the S-curved dentinal tubules and the central cone-shaped empty pulp chamber. The theme of this picture was "lonely but warm in the desert", with the curved dentinal tubules resembling the sand dunes in a vast and empty landscape. (B1–B3) The first- to third-place winning photomicrographs works in the "oral pathology" item, respectively. (B1) The histopathological section of a papillomatous lesion with the central fibrous connective tissue stroma and the peripheral thin layer of the epithelium looking like the head and body of a "happy jumping dog" and a papillary projection of the thin epithelial layer toward the left side and its underlying fibrous connective tissue under the dog's head looking like the anterior leg of a "happy jumping dog". The overall shape of the lesion looked like a happy dog jumping through a burning fire ring with many peripheral epithelial projections resembling the flame spikes. (B2) The histopathological section of an apical lesion with three main aggregates of accumulated pus cells. The abscess area at the right lower part looked like a "round-shaped mouse" with the short anterior and posterior legs. (B3) The histologic section of a well-differentiated squamous cell carcinoma with the formation of keratin pearls. The whole picture looked like the "Sid's face", referencing the famous character from the movie of "Ice age". The arrangement of the cancer cell nests with the central keratin pearls and their surrounding bands of the inflammatory cells created an amusing likeness to the animated sloth's distinctive facial appearance.

humanities early in the medical curricula to foster the critical thinking and observational skills. The lower participation rates among upper-year students may reflect their focus on the clinical rotations and practice, but also indicate an opportunity to explore how this approach may be adapted to maintain their engagement throughout the entire dental education journey.

The consistently high satisfaction rates (78 % overall satisfaction) further underscored the value that the students placed on this innovative teaching method. This positive reception was comparable to other innovative teaching methods in the dental education. For example, Huang et al. reported a positive reception of narrative medicine in the dental education, with the students appreciating their roles in improving empathy and the communication skills.[4] Although our approach focused more on the visual rather than the narrative interpretation, it similarly encouraged the dental students to engage in their subject matter in a more holistic and creative manner.

By encouraging the students to view these subjects through an artistic lens, we also fostered the deeper engagement and the potentially enhancing long-term retention of key concepts. This aligns with the research on the active learning in the medical education, which emphasizes the importance of engaging the students through the multiple modalities for effective learning and retention.[18]

The implications of this study for the dental education were multifaceted. First, it provided evidence for a novel and well-received method of engaging the students in the histological studies, addressing a common challenge in the dental curricula. Second, it demonstrated the feasibility of integrating the arts-based approaches into the science-heavy subjects, potentially opening the avenues for the similar interventions in other areas of the dental education. Third, the high levels of satisfaction and perceived value suggest that such approaches may contribute to improve the students' well-being and engagement and are the factors increasingly recognized as crucial in the medical and dental education.[19]

However, it is important to acknowledge the limitations of this study. Although the overall participation rate of 29 % provides a substantial sample, there may be self-selection bias, and the students who are already more interested in histology or art are more likely to participate. Future studies may explore the ways to engage a broader cross-section of the students and investigate the impact on those who initially show less interest in the microscopic studies.

Looking ahead, the future research may explore the long-term impacts of this approach on the students' clinical skills, particularly in those areas that require the keen observational abilities such as the oral pathology diagnosis. Additionally, investigating whether the participation in these competitions correlates with the improved academic

Table 1 Distribution of the participants in each year-grade of the undergraduate dental students.

Year-grade	First	Second	Third	Fourth	Fifth	Sixth	Total
Total number of the dental students	75	74	85	80	83	80	477
Number of participants (Proportion to the total number of participants)	21 (15 %)	37 (27 %)	56 (40 %)	14 (10 %)	6 (4 %)	6 (4 %)	140 (100 %)
Number of participants (Proportion to the total number of undergraduate dental students)	21 (28 %)	37 (50 %)	56 (66 %)	14 (18 %)	6 (7 %)	6 (8 %)	140 (29 %)

Table 2 The questionnaire survey results of the photomicrograph competition.

Questions	Number (percentage)				
	Agree	Neutral	Disagree	—	—
*This photomicrograph competition activity increases my interests in learning the microscopic lessons.	95 (73 %)	31 (23 %)	5 (4 %)	—	—
	Very strong	Strong	Neutral	Opposite	Strongly opposite
**I support to hold this photomicrograph competition activity every year.	74 (55 %)	33 (25 %)	22 (17 %)	2 (1 %)	3 (2 %)
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
*This photomicrograph competition activity is appropriate for the dental students in all dental schools in Taiwan.	61 (47 %)	27 (21 %)	32 (24 %)	7 (5 %)	4 (3 %)
	Very satisfied	Satisfied	Neutral	Unsatisfied	Very unsatisfied
**The overall satisfaction rate of the photomicrograph competition activity	66 (49 %)	38 (29 %)	27 (20 %)	0 (0 %)	3 (2 %)

*Response rate: 94 % (131/140); **Response rate: 96 % (134/140).

performance in the related subjects may provide valuable information on its educational efficacy. It may also be valuable to explore how this approach is adapted or extended to maintain the engagement throughout the clinical years, perhaps by incorporating more clinically relevant histopathological specimens or integrating the competition with the case-based learning.

In conclusion, this replication study not only validates our previous findings but also provides a deep insight into the long-term viability and impact of integrating arts into the dental curricula. As the field continues to evolve and seek ways to produce well-rounded, engaged dental professionals, the approaches that bridge the arts and sciences, like the one we presented here, may play an important role in shaping the future of the dental education.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

Acknowledgments

This work was supported by the Ministry of Education Teaching Practice Research Program under the grant number of PMN1121658.

References

1. Howley L, Gaufberg E, King B. *The fundamental role of the arts and humanities in medical education*. Available at: https://www.aamc.org/about-us/mission-areas/medical-education/frahme, 2021. [Accessed 1 October 2024].
2. Yu CH, Chiang CP. Integration of arts into dental education: beauty in the histological photomicrographs. *J Dent Sci* 2024;19:461—5.
3. Charon R. The patient-physician relationship. Narrative medicine: a model for empathy, reflection, profession, and trust. *JAMA* 2021;286:1897—902.
4. Huang YK, Chen YT, Chang YC. Initiating narrative medicine into dental education: opportunity, change, and challenge. *J Formos Med Assoc* 2021;120:2191—4.
5. Chen YT, Yu CH, Chang YC. Narrative medicine as a novel tool for non-operational capabilities: dental interns' perceptions. *J Dent Sci* 2022;17:1085—6.
6. Marchalik D. Saving the professionalism course. *Lancet* 2015;385:2346—7.
7. Marchalik D. To return to literature-making doctors matter in the new era of medicine. *Acad Med* 2017;92:1665—7.
8. Kent L, Ward PJ. Investigating the presence of the History of Medicine in North American Medical Education: can one of the medical humanities concisely integrate with biomedical and clinical content with reference to clinical competencies? *Med Sci Educ* 2020;30:1531—9.
9. Yu CH. Integrating medical humanity into dental education: an innovative approach using paleodontology and dental history. *J Dent Sci* 2024;19:1261—2.

10. Yu CH, Sato T. The perception of the dental students on the lecture of medical history. *J Dent Sci* 2024;19:741—2.
11. Yu CH, Sato T. Integrating medical humanities into dental education through ancient dental modifications. *J Dent Sci* 2024;19:1208—9.
12. Al-Johany S. Correlation between handwriting, drawing skills, and dental skills of junior dental students. *J Contemp Dent Pract* 2011;12:327—32.
13. Anand R, Sarode G, Sarode S. Integrating art in oral histology and oral pathology lessons: Indian scenario. *J Dent Sci* 2024;19:693.
14. Eichbaum QG. Thinking about thinking and emotion: the metacognitive approach to the medical humanities that integrates the humanities with the basic and clinical sciences. *Perm J* 2024;18:64—75.
15. Pritt BS, Gibson PC, Cooper K. Digital imaging guidelines for pathology: a proposal for general and academic use. *Adv Anat Pathol* 2003;10:96—100.
16. Moniz T, Golafshani M, Gaspar CM, et al. How are the arts and humanities used in medical education? Results of a scoping review. *Acad Med* 2021;96:1213—22.
17. Naidu SB, Kumagai AK. Troubling muddy waters: problematizing reflective practice in global medical education. *Acad Med* 2016;91:317—21.
18. McCoy L, Pettit RK, Kellar C, Morgan C. Tracking active learning in the medical school curriculum: a learning-centered approach. *J Med Educ Curric Dev* 2018;5:2382120518765135.
19. Dunn LB, Iglewicz A, Moutier C. A conceptual model on medical student well-being: promoting resilience and preventing burnout. *Acad Psychiatr* 2008;32:44—53.