

Large language models in artificial intelligence and their impact on dental education and practice

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Dear Editor:

Artificial intelligence (AI) has transformed numerous sectors, with large language models (LLMs) standing out among its most significant advances (1,2). These models, trained by vast amounts of textual data, can understand, interpret, and generate human language with remarkable accuracy. Their ability to hold fluent conversations and provide coherent responses makes them valuable tools in educational and clinical settings (1–4).

In dental education, LLMs can be integrated into clinical case simulators, allowing students to interact with virtual scenarios and receive immediate feedback. Moreover, they can analyze medical records, generate preliminary differential diagnoses, and suggest evidence-based therapeutic options. Similarly, they facilitate personalized learning by adapting content to the individual needs of each student (5).

A recent development is o1-Preview, released by OpenAI (1–4). This model outperforms its predecessor, ChatGPT-4o, by incorporating advanced reasoning based on chain-of-thought techniques, which improves complex problem-solving capabilities (3,4). It is notable for its multimodal capacity, which enables it to process multiple data formats, such as text and images (1,2), facilitating, for example, the interpretation of X-rays and clinical photographs in dentistry. The model also employs reinforcement learning to optimize its performance, contributing to improved accuracy in decision-making (1–4). These features are particularly relevant in clinical settings, where the integration of multiple sources of information is essential to provide accurate and personalized diagnoses and recommendations (1–3).

A study conducted by Goto et al. (1) compared the performance of ChatGPT-4o and o1-Preview on a certification exam for chief radiography operations officers in Japan. While ChatGPT-4o failed due to low accuracy in legal and regulatory aspects, o1-Preview met the passing criteria, excelling in complex logic. Therefore, in dentistry, this model could be a useful tool in preparing for certification exams.

Received: January 15, 2025

Accepted: June 13, 2025

Online: December 30, 2025



Open access article

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Cite as:

Saravia-Rojas MÁ, Geng-Vivanco R. Large language models in artificial intelligence and their impact on dental education and practice. *Rev Estomatol Herediana*. 2025; 35(4): 339-340. DOI: 10.20453/reh.v35i4.6246

Temsah et al. (2) reported that o1-Preview improves efficiency and accuracy in healthcare, helping to address ethical and technical challenges. However, Brodeur et al. (3) compared it with earlier models and human standards, demonstrating advances in diagnoses and reasoning, but no improvements in probabilistic reasoning or differential diagnosis. This suggests that, although promising, o1-Preview may still have limitations for its application in dentistry, where differential diagnosis is fundamental. In addition, a current limitation of this model is that it is only available in a paid version, which restricts access for many users (1).

Although these capabilities are promising, their impact on dental education has yet to be evaluated, considering that clinical practice requires a more complex integration of knowledge and practical skills. Given the rapid pace of these advances, it is essential to continue exploring their applications and limitations, as we are in the early stages of a technological transformation that could redefine current paradigms in education and professional practice.

Authorship contribution:

MASR: conceptualization, writing of the original draft.

RGV: conceptualization, visualization, writing - review & editing.

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REFERENCES

1. Goto H, Shiraishi Y, Okada S. Performance evaluation of GPT-4o and o1-preview using the certification examination for the Japanese “Operations Chief of Radiography With X-rays”. *Cureus* [Internet]. 2024; 16(11): e74262. Available from: <https://doi.org/10.7759/cureus.74262>
2. Temsah MH, Jamal A, Alhasan K, Temsah AA, Malki KH. OpenAI o1-Preview vs. ChatGPT in healthcare: a new frontier in medical AI reasoning. *Cureus* [Internet]. 2024; 16(10): e70640. Available from: <https://doi.org/10.7759/cureus.70640>
3. Brodeur PG, Buckley TA, Kanjee Z, Goh E, Ling EB, Jain P, et al. Superhuman performance of a large language model on the reasoning tasks of a physician [preprint on the Internet]. *arXiv*; 2024. Available from: <https://doi.org/10.48550/arXiv.2412.10849>
4. OpenAI. Introducing OpenAI o1-preview [Internet]. OpenAI; 2024 Sep 12. Available from: <https://openai.com/index/introducing-openai-o1-preview/>
5. Huang H, Zheng O, Wang D, Yin J, Wang Z, Ding S, et al. ChatGPT for shaping the future of dentistry: the potential of multi-modal large language model. *Int J Oral Sci* [Internet]. 2023; 15: 29. Available from: <https://doi.org/10.1038/s41368-023-00239-y>