Letter to the Editor

Never-Skilling in Dental Education: An Emerging Risk of Artificial Intelligence

Artificial intelligence (AI) is rapidly becoming integrated into dental education, offering unprecedented opportunities to enhance learning, improve access to information, and support clinical decision-making.[1] From radiographic interpretation and treatment planning to literature synthesis and patient communication, AI-powered tools are increasingly accessible to dental students and trainees.[1] While much of the current discussion has focused on academic integrity, bias, and accuracy, a potentially more consequential educational risk has received little attention in dentistry: the possibility that excessive reliance on AI may impair the development of foundational clinical competencies.

Recently, Ke and colleagues introduced the concept of "never-skilling" in medical education, describing a phenomenon in which trainees fail to acquire essential clinical reasoning skills because AI performs the cognitive work that would traditionally drive learning and the development of expertise.[2] They distinguished never-skilling from deskilling, in which previously acquired skills deteriorate over time, and mis-skilling, whereby learners internalise incorrect knowledge through uncritical acceptance of erroneous AI outputs.[2,3] While these concepts have been proposed within medical education, they may be particularly relevant to dentistry.

Traditionally, dental training depends upon the progressive acquisition of diagnostic reasoning, procedural judgment, and psychomotor skills.[4] Students learn not merely by receiving answers but by engaging in the cognitive processes that generate those answers. The interpretation of radiographs, differential diagnosis of pulpal and periapical diseases, periodontal risk assessment, treatment planning, and evidence appraisal all require deliberate reasoning developed through repeated practice and feedback. If AI systems routinely provide diagnoses, treatment recommendations, or literature syntheses before learners have developed these capabilities independently, opportunities for skill formation may be diminished.[5]

The risk may be especially pronounced in dental radiology. AI systems are increasingly capable of identifying caries, periapical lesions, periodontal bone loss, and other abnormalities on dental imaging.[6-8] While these technologies may enhance efficiency and diagnostic consistency, students who rely heavily on automated annotations may fail to develop systematic image interpretation strategies and pattern-recognition skills. Similar concerns arise in endodontics, where AI-assisted diagnostic systems may encourage acceptance of recommendations without proper reasoning or integration of clinical symptoms, pulp sensibility testing, and radiographic findings into a coherent diagnostic framework.[9,10]

Dentistry also introduces a dimension that extends beyond the concerns raised in medicine. Unlike many medical specialties, dental education requires mastery of complex psychomotor skills.[11] Students must develop tactile sensitivity, hand–eye coordination, spatial awareness, and procedural judgment through direct clinical experience.[12] Although AI may support cognitive aspects of learning, it cannot substitute for the experiential processes through which procedural competence is acquired.[1,13] Consequently, dentistry may face not only cognitive never-skilling but also procedural never-skilling, whereby learners become increasingly dependent on digital guidance while failing to develop the manual and adaptive skills necessary for independent practice.

Importantly, AI is not inherently detrimental to education. Educational outcomes are likely to depend on how, when, and under what supervision AI is introduced. The framework proposed by Ke and colleagues offers a useful starting point for dental education. Students should first demonstrate baseline competencies independently, then undergo structured training to develop critical evaluation of AI outputs, before progressing to supervised integration of AI into clinical workflows. Such an approach may help ensure that AI augments rather than replaces the learning processes essential for professional development.

At present, empirical evidence regarding AI-induced never-skilling in dentistry is lacking. This should not be interpreted as evidence of absence. Given the pace at which AI technologies are being adopted within dental schools, there is an urgent need for educational research examining how AI influences diagnostic reasoning, clinical judgment, psychomotor skill acquisition, and long-term professional competence. Without such evidence, dental education risks prioritising immediate efficiency gains at the expense of developing future clinicians capable of safe and independent practice.

As dentistry enters the era of AI-assisted education, protecting competency development should become a central priority. The challenge facing educators is not whether AI should be used, but how it can be integrated in ways that preserve the cognitive and procedural foundations upon which clinical excellence depends.

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REFERENCES

1. El-Hakim M, Anthonappa R, Fawzy A. Artificial intelligence in dental education: a scoping review of applications, challenges, and gaps. Dent. J. 2025;13(9). doi: 10.3390/dj13090384.
2. Ke Y, Jin L, Ong JCL, et al. AI-induced never-skilling in medical education. Nat. Med. 2026;32(6):1997–2006. doi: 10.1038/s41591-026-04438-y.
3. El Tarhouny S, Farghaly A. Deskilling dilemma: brain over automation. Front. Med. 2026;13. doi: 10.3389/fmed.2026.1765692.
4. Chrismawaty BE, Emilia O, Rahayu GR, Ana ID. Clinical reasoning pattern used in oral health problem solving - a case study in Indonesian undergraduate dental students. BMC Med. Educ. 2023;23(1):52. doi: 10.1186/s12909-022-03808-7.
5. Turney J, Young TM, Chauhan DR, Beeharry R, Mahmud M. AI use for medical students: impact on clinical skill acquisition and retention. a systematic review. Adv. Med. Educ. Pract. 2026;17:583763. doi: 10.2147/AMEP.S583763.
6. Samaranayake L, Tuygunov N, Schwendicke F, et al. The transformative role of artificial intelligence in dentistry: a comprehensive overview. part 1: fundamentals of AI, and its contemporary applications in dentistry. Int. Dent. J. 2025;75(2):383–96. doi: 10.1016/j.identj.2025.02.005.
7. Tuygunov N, Samaranayake L, Khurshid Z, et al. The transformative role of artificial intelligence in dentistry: a comprehensive overview part 2: the promise and perils, and the international dental federation communique. Int. Dent. J. 2025;75(2):397–404. doi: 10.1016/j.identj.2025.02.006.
8. Yuan Y, Zhou H, Wang B, Li C, Gong B, Li Z. Integrating AI into dentistry: technical pathways and clinical applications in oral diseases—a comprehensive overview. Int. Dent. J. 2026;76(2):109336. doi: 10.1016/j.identj.2025.109336.
9. Turky M, Dummer PMH. Unleashing the future of endodontics: exploring the potential role of explainable artificial intelligence in risk stratification and decision-making in endodontics. Aust. Endod. J. 2025;51(3):861–3. doi: 10.1111/aej.70010.
10. Turky M, Samaranayake L, Osathanon T, Dummer PMH. Explainable artificial intelligence in endodontics: concepts, clinical applications, and future directions. J. Dent. 2026;171:106733. doi: 10.1016/j.jdent.2026.106733.
11. Khan S, Inamdar MNK, Munaga S, Khare N, Farooq MU. Development of psychomotor skills in dentistry based on motor learning principles: a review. World J. Dent. 2020;11(3):247–51. doi: 10.5005/jp-journals-10015-1734.
12. Daud A, Matoug-Elwerfelli M, Khalid A, Ali K. The impact of virtual reality haptic simulators in pre-clinical restorative dentistry: a qualitative enquiry into dental students' perceptions. BMC Oral Health 2024;24(1):988. doi: 10.1186/s12903-024-04704-w.
13. Osathanon T, Vacharaksa A, Schwendicke F, Samaranayake L. Preparing the AI-ready dentist: a call for a competency framework in dental education. Int. Dent. J. 2026;76(2):109450. doi: 10.1016/j.identj.2026.109450.

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