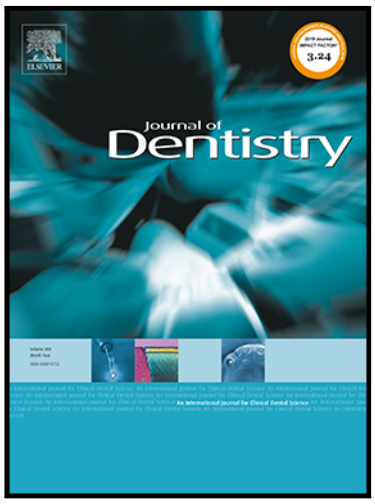

Artificial Intelligence: A Modern Tool for Assessing Dental Students?

C Louca , I Tonni , A Leung , P Fine

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Artificial Intelligence: A Modern Tool for Assessing Dental Students?

Louca, C, Tonni, I, Leung, A, Fine, P.

Affiliations:

Louca, C. School of Dental, Health & Care Professions, University of Portsmouth,

William Beatty Building, Hampshire Terrace, Portsmouth, PO1 2QG, UK

Tonni, I. University of Brescia Dental School, Brescia, Italy

Leung, A. School of Dentistry, Royal College of Surgeons in Ireland, University of Medicine and Health Sciences

Fine, P. UCL Eastman Dental Institute, Rockefeller Building, 21 University Street, London, WC1E 6DE, UK (Corresponding Author)

Abstract:

Objective: To investigate whether and how dental educators use Artificial Intelligence (AI) to develop dental student assessments and to investigate their concerns and perceptions of AI in dental student learning.

Methods: A mixed methods study using a live polling tool was used collect data from dental educators relating to 5 key themes: i) demographics, ii) use of AI in assessing dental students, iii) perceived challenges of AI, iv) threats or opportunities with AI and v) the future use of AI in assessing dental students.

Quantitative and qualitative data were analysed descriptively and thematically, respectively.

Results: 65 international dental educators, 94.4% were aged 30 years and above, participated, including undergraduate (n=29, 70.7%) and postgraduate (n=25, 61.0%) dental school teachers. A small proportion were Heads of School (n=4, 9.8%). 61.9% were not routinely using AI for student assessment. 63% received training support from their university. Most (n=23, 67%) were concerned about students using AI to complete written assessments.

Four themes were identified, i) types of assessment, ii) use of technologies, iii) concerns and iv) advantages/disadvantages.

Conclusion: Although dental educators found AI in student assessment useful, most were not routinely using it for this purpose. This could be due to a lack of knowledge, understanding and confidence limiting the adoption of AI in student assessments. There is a need for ongoing education and support in dental schools and universities, for the implementation of AI in dental education.

Clinical significance: AI needs to be effectively harnessed to contribute to a competent, confident and reflective contemporary dental workforce.

Key Words:

Artificial intelligence; dental education; student assessment.

Introduction:

The use of artificial intelligence (AI) in education is expanding exponentially with it extensively being used in education, across educational institutions, in different formats [1]. Using various platforms, teachers have been able to perform different administrative functions, such as reviewing and grading students' assignments more effectively and efficiently and achieve higher quality in their teaching activities. Following increased investment in technology, AI has been driven by and contributed to significant advancements in its technical capabilities [2]. Medical education is being transformed by the increasing use of AI [3]. Most uses of AI in medicine have been targeted at the diagnosis and prognosis of disease and is considered to 'increases the precision in the estimation of treatment effect in cancer patients and determines prediction outcomes' [4].

AI is also increasingly transforming dental education, particularly in the assessment of dental students [5]. The integration of AI technologies, especially large language models (LLM) like ChatGPT, is reshaping how knowledge and clinical competencies are evaluated, offering both opportunities and challenges [6].

Generative AI tools have been used to create tailored examination questions, ranging from factual recall to clinical reasoning, based on taught materials which are aligned with good educational practice such as Bloom's Taxonomy, [7]. The use of AI to assess dental students was investigated by Kunzle & Paris (2024) [8], who compared the use of ChatGPT version 3.5, version 4.0 and Google Gemini™ . They concluded that ChatGPT 4.0 achieved the highest accuracy score of 72% compared to 44% for both ChatGPT version 3.5 and Google Gemini. All three AI platforms performed best in dental topics such as direct restorative procedures and caries, indicating the value of AI in dental education.

AI can be used to personalise student education, automate assessment grading and provide real-time feedback to help support ongoing learning and improve the efficiency and effectiveness of dental pedagogy in general [9,10,11]. Schwendicke et al. (2023)[12] aimed

to define a core curriculum for both undergraduate and postgraduate oral health education and established four outcomes learners should acquire when taught about dental AI: (i) Basic definitions and terms, the reasoning behind AI, the principals of machine learning, the idea of training, validating and testing models, the definition of reference tests, the contrast between dynamic and static AI, and the problem of AI being a black box and requiring explainability; (ii) clinical cases, the required types of AI to address them, and the typical setup of AI software for dental purposes; (iii) evaluation metrics, their interpretation, the relevant impact of AI on patient or societal health outcomes and associated examples; (iv) issues around generalisability and representativeness, explainability, autonomy and accountability and the need for governance.

Significant variations exist in the scope, structure, and rigor of undergraduate and postgraduate assessments across healthcare education [13] . However, these factors may affect the identification of students who are struggling to learn. While knowledge is central, it is important that students understand what defines a clinician and how new assessment tools should align with these crucial skills [14]. The development of medical education has followed a coherent progression, each new phase building upon and enhancing insights derived from its forerunners [15]. This evolutionary journey has significantly advanced our comprehension and application of assessment practices in medical education, producing highly skilled health professionals with all the required attributes [16].

Studies in medical education have demonstrated that AI-powered simulations can significantly improve students' clinical skills by providing real-time feedback and personalised guidance [17,18]. In dental education, AI has the potential to revolutionise traditional teaching methods by allowing for individualised learning pathways, improving diagnostic accuracy, and offering students immersive, interactive experiences [19]. Recent advances in AI-driven tools, such as virtual reality and machine learning algorithms, are reshaping how dental students acquire theoretical knowledge and practical skills. These technologies enable an enhanced hands-on approach to learning, ensuring that students can practice procedures in a risk-free, controlled environment before applying their knowledge to real-life clinical situations [20]. Furthermore, the integration of AI in dental education is expected to not only enhance student engagement and retention but also improve the overall quality of patient care by producing graduates with advanced technical skills and critical thinking aptitudes and confidence [21]. Enhanced engagement and retention will necessarily require an assessment tool that is up to the task of marking dental students' assignments and encouraging ongoing learning [22]. These authors also showed that problem-based learning (PBL) and case-based learning (CBL) when compared with traditional lectures or seminars without AI integration, facilitated 'an intensive interaction between students and the system and significantly improved students' knowledge acquisition'.

Despite these advantages, the integration of AI into student assessments raises ethical and practical concerns [23]. Issues such as data privacy, algorithmic bias, and the potential

erosion of human judgment must be carefully managed. Moreover, the legal implications of AI-generated assessments and feedback are still under debate, necessitating clear guidelines and regulatory frameworks [24].

The aim of this study was to investigate whether and how dental educators were using AI to develop dental student assessments and to investigate their concerns and perceptions of AI in dental student learning.

Materials & Methods:

This was a mixed methods study that incorporated quantitative data collection via a polling tool app Vevox™ by asking a live audience questions about their use, fears, confidence and vision for the future, of using AI as an assessment tool for dental students. Qualitative data were collected via Vevox™ as open questions. The live audience engaged with the polling tool using their personal mobile phones through a QR code displayed in the room. This survey was conducted during a workshop on AI in dental student assessment at a recent international conference. The questions used in the survey were designed by the authors and piloted with a small group of experienced dental educators. Twenty questions were included in the survey, which were divided into 5 themes: i) demographic data, ii) how dental educators currently use AI in the assessment of dental students, iii) the perceived challenges of using AI, iv) threats or opportunities with using AI and v) the future use of AI in assessing dental students.

Ethics committee approval was granted by University College London Research Ethics Committee (Ethics ID: 6552.014). Informed consent was obtained from participants attending the workshop, following an explanation of the study, including how data would be collected and used. Participants were encouraged to answer all the questions.

The results of each question were immediately shared with the participants in order to facilitate audience engagement. Quantitative data were analysed descriptively, including standard deviations (SD) and mean values. Qualitative data were analysed thematically. The use of this polling app made the collection of data straightforward, consistent and reliable.

Results:

Sixty-five dental educators participated in the workshop, and not all of them answered all the questions; hence, the percentage figures reflect the number of participants who responded to each question rather than the number present (Table 1). Most of the participants were teachers within their dental school/university (Undergraduate: n=29, 70.73%; Postgraduate: n=25, 60.98%). A small proportion were Heads of School (n=4, 9.76%).

Table 1. Demographic details of participants

One third of participants reported currently using AI for student assessments (n=13, 30.95%), whereas 7.4% (n=3) were unsure whether they were actually using AI. Over half (n=19, 54.3%) of the participants reported not using AI at all (Figure 1).

Figure 1. How participants use AI (n= 61 responses)

Participants reported using AI for student assessment in a wide variety of ways (Figure 2). It was interesting to note that AI was frequently used to generate MCQ assessments (n=21, 72.41%) compared to no reported use of AI for practical lab-based examinations.

Figure 2. How participants used AI in dental student assessments.

This study considered whether dental educators were supported by their dental school or university in terms of developing their knowledge and skills in using AI (Figure 3). Almost two-thirds of participants reported receiving support from their dental school or university. However, when asked about their confidence in using AI to design student assessments, participants reported a range of confidence from 1-4 (on a scale where 0=no confidence and 5 = totally confident). The mean level of confidence for the 33 participants who answered this question was 2.88 (SD=0.89).

Figure 3. Percentage of participants receiving support from their dental school or university (2024-2025).

The participants reported that two-thirds of their students (n=24, 66.67%) used AI when undertaking their assessments. However, 30.56% (n=11) of the students were using AI without the permission of their teachers, inferring some degree of possible 'cheating'. A majority of participants were concerned about their students using AI to complete written assessments (n=23, 67%).

Qualitative analysis:

Table 2. Thematic analysis

Theme 1: Participants reported using a variety of different assessments for dental students, including the most popular options (MCQs, Short answer questions, OSCE and Essay).

"Using lecture notes to generate MCQs and short answer questions, I also use it to create distractors for MCQs"

"Using lecture notes to generate potential MCQ and short answer questions. They aren't perfect, but help generate ideas for questions. Also using the program Perusall, which grades student comments and summarises areas of difficulty"

"Essays; Multiple choice questions (MCQs); and Reflective portfolios"

Theme 2: The technologies used to assess dental students were either different online platforms or haptic technologies. The most common online platforms included ChatGPT, Co-Pilot and Moodle.

"Using Co-Pilot to help design and or re-write questions/clinical scenarios for students to consider".

"Online integrated into their clinic patient care program"

"To generate feedback to students on their formative and summative assessments"

"Generate images for case-based scenario exam"

"We use haptic technology to assess students"

Theme 3: More participants expressed concern about the use of AI in dental student assessments than those who did not. Ethical considerations were expressed.

"Concerned that they might simplify the learning process (assessment for learning)"

"Regardless of policy, students inherently lack an understanding of the professional aspects around AI, declaration of use and citation, and plagiarism"

Yes, they are not using it to improve their knowledge but to do things faster and without scientific evidence"

"Concerned. There is zero thinking there. No critical thinking by students"

"It's certainly adding more workload for teachers to make sure that their role as a fairly traditional profession remains relevant. Although AI can save time, it is creating additional tasks for teachers to ensure that the learning outcomes are achieved"

"No. AI can help the students who are willing to learn. For the students who don't want to devote their energy in, AI is just another cheating tool"

"This question has much to do with the level of familiarity with AI the instructor has"

"If given fair guidelines, the students can enhance their learning by using AI"

"No, as technology is evolving and we have to drive the change, not being reluctant or concerned. If we prepare a test to check decision making, I may not be concerned since even using AI, students should think about the topic anyway and could even learn with AI answers"

"Only if there are proper protocols to ensure ethics and prevent plagiarism"

Theme 4: Both advantages and disadvantages when introducing new technology such as AI, were highlighted. The advantages included: time saving, standardisation, and increased accuracy. The disadvantages included: inconsistency, reduced accuracy and plagiarism.

Advantages:

"Assessment is done in a consistent way"

"Reducing time spent on designing questions, actually becoming familiar with the tool and understanding how to prompt it"

"It provides ideas and also time to perform more complex assessment design"

"Innovative technology is motivating students to cocreate with teachers"

Disadvantages:

"Need for careful review, shallow concepts, inconsistencies, incorrect answers"

"Questions generated could be misleading if designers are not reading what's generated carefully"

“Inconsistent. Always lacks context. It counted the questions wrong once 😂. Overall, it can't be used without a human element"

“Technology is evolving rapidly, demanding continuous updating”

Discussion

The use of artificial intelligence in the assessment of dental students is a rapidly evolving field that dental educators must keep up to date with to effectively manage the challenges arising from the ever-changing technology. This study has highlighted some of the concerns, apprehensions and positivity surrounding the use of AI in dental student assessment. The use of a polling software package has proved to be a useful quantitative and qualitative data collection method, allowing dental educators to immediately view feedback data from their contemporaries amongst the participants. This facilitated further discussion during data collection and encouraged interaction amongst the participants. Those participants who attended the workshop at the International Association for Dental Research (IADR) conference in 2025, represented a diverse set of dental educators from across the world, with a wide range of teaching experience and various roles within their dental school/university.

It was interesting to note that most of the participants were not using AI to either develop or deliver assessments to their dental students. A similar finding was reported by Louca et al. (2025) [5], from data collected in 2024. Thus, very little appears to have changed in the use of AI by dental educators over one year despite the ongoing technological advances. It is possible that dental educators are: i) finding it difficult to incorporate AI into their current assessment strategies, ii) not getting the support they need from their school/university, iii) reticent about introducing AI into student assessments due to issues of confidence, knowledge and experience and iv) having to follow restrictive guidelines issued by their dental school/university.

It was disappointing to note that there was a continuing lack of support given to dental educators by their dental school/university (See Figure 3) over the previous year [5]. Support for dental educators can take many forms, ranging from online lectures, video recorded seminars or hands-on workshops [25]. 'Support should be provided by the institution, and it is suggested that, where possible, institutions should appoint an e-learning champion with good interpersonal skills to support and encourage faculty change' [26]. The assessment of healthcare students cannot be designed in the same way as for other non-clinical disciplines. Heavily regulated healthcare professions require clinical competence and patient safety to be demonstrated by students early on in their training. This places an additional burden on both the dental educators using AI in student assessment, and their educational institutions, to ensure knowledge remains up to date and support is ongoing.

Artificial Intelligence can play a significant role in designing comprehensive assessment plans and enhancing the evaluation process in medical education [27,28,29]. AI can be employed to i) develop comprehensive, well-rounded assessment plans that incorporate formative and summative evaluations, competency-based assessments, and effective feedback mechanisms; ii) align assessment methods with learning objectives that accurately measure students' progress towards achieving the desired competencies; and iii) provide timely and

automated feedback to students, identifying areas of strength and weakness, and offering suggestions for improvement [30,31].

This study has demonstrated that AI has yet to be comprehensively adopted by many dental educators. However, AI generated MCQ examinations have been welcomed in undergraduate and postgraduate student assessment. This examination format robustly tests knowledge and understanding, using assessment methods that can be considered not at risk of students abusing AI to formulate their responses [32] .

AI technologies, such as ChatGPT (OpenAI, USA), Co-Pilot (Microsoft, USA) and Gemini (Google, USA) were the most commonly used AI applications by the participants. The practical nature of dental education lends itself very well to the use of AI to develop assessment tools based on clinical scenarios [33].

The ethical implications of using AI in dental students' assessments was highlighted as a concern for the participants. Rokhshad et al. (2023) [34] reported that 'there are ethical concerns around its usage, and users (providers, patients, and other stakeholders), as well as the industry should consider these when developing, implementing, or receiving AI applications based on comprehensive framework to address the associated ethical challenges'.

The introduction of new technologies inevitably introduces some scepticism and uncertainties over their use. The introduction of AI into the assessment of dental students is no exception [35]. Concerns include AI's accuracy, ethical implications, and integration challenges, highlighting the need for further education and research in these areas. Integrating AI into dental curricula is essential for addressing knowledge gaps which prepare students for AI-enhanced practice.

Future research should balance technological advancements with ethical considerations to ensure that AI effectively contributes to improved dental education and patient care.

Strength & Weaknesses of the Study

This study captures a timely and authentic perspective from participating dental educators, who are interested in using AI as a tool in dental student assessments and who represent a broad range of teaching experience. This mixed method study incorporated data collection from a relatively large number of participants, which enhanced the reliability of the data analysis. All participants are self-selected as they have to be members of the International Association for Dental Research (IADR) to attend this research meeting and the workshop. Due to strict time and potential language limitations, not all the participants were able to log all their responses to the pre-determined questions posed during the workshop, in a timely fashion.

Conclusion

Dental educators already using AI in assessing dental students found this technology very beneficial. However, a majority of the study participants were not routinely using AI for this purpose. There is a lack of knowledge, understanding and confidence amongst dental educators limiting the widespread adoption of AI in student assessments. Clearly, there is a need for ongoing education and support in dental schools and universities, for the implementation of AI in dental education.

CRediT authorship contribution statement:

Albert Leung & Peter Fine: Writing – review & editing, Writing – original draft, Validation, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. Ingrid Tonni: Formal analysis, Data curation. Chris Louca: Writing – review & editing, Writing – original draft, Validation, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interests:

The authors declare no conflict of interest, financial or otherwise.

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	No of Years (%)	Mean Score, SD
How long have you been involved in dental education	0-5 years (27.27) 6-10 years (18.18) 11-15 years (12.12) 16-20 years (6.06) 21+ years (36.36)	13.8 years, 2.408
Age in Years	20-30 years (5.56) 31-40 years (33.33) 41-50 years (25) 51-60 years (22.22) 61+ years (13.89)	49.3 years, 3.605
Using or not using AI	Yes (30.95) No (61.90) Not sure (7.14)	
Role in the Dental School	UG Teacher 29 (70.73%) PG Teacher 25 (60.98%) Programme Director 12 (29,27%) Personal Tutor 8 (19.51%) Academic Tutor 3 (31.71%) Head of Department 7 (17.07%) Head of School 4 (9.76%) Other 7 (17.07%)	

Table 1. Demographic details of participants

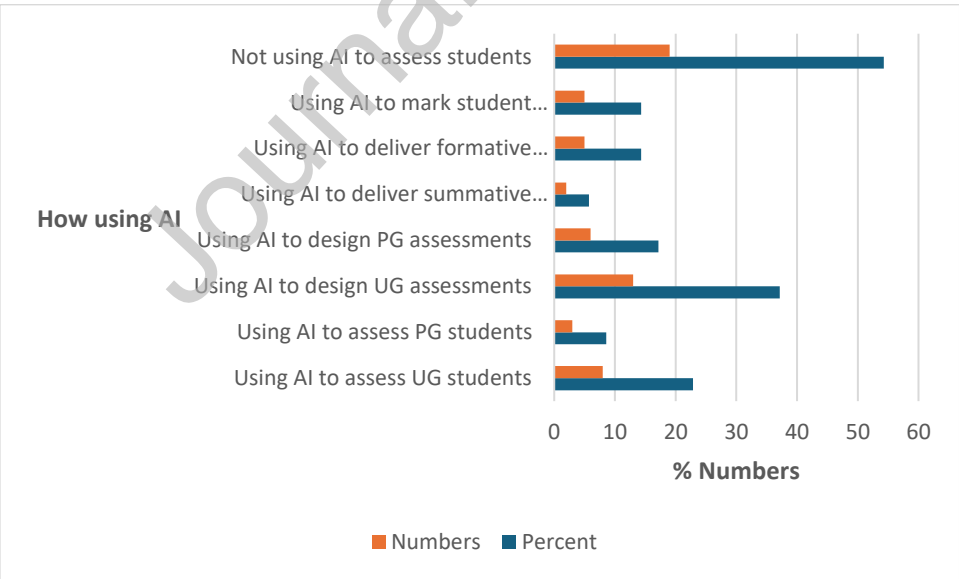

Figure 1. How participants use AI (n= 61 responses)

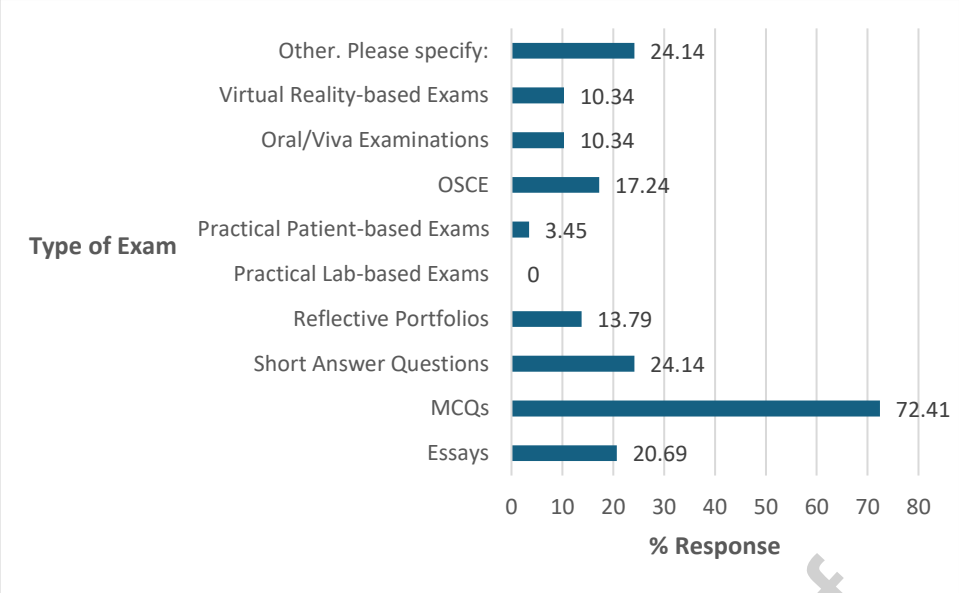

Figure 2. How participants used AI in dental student assessments.

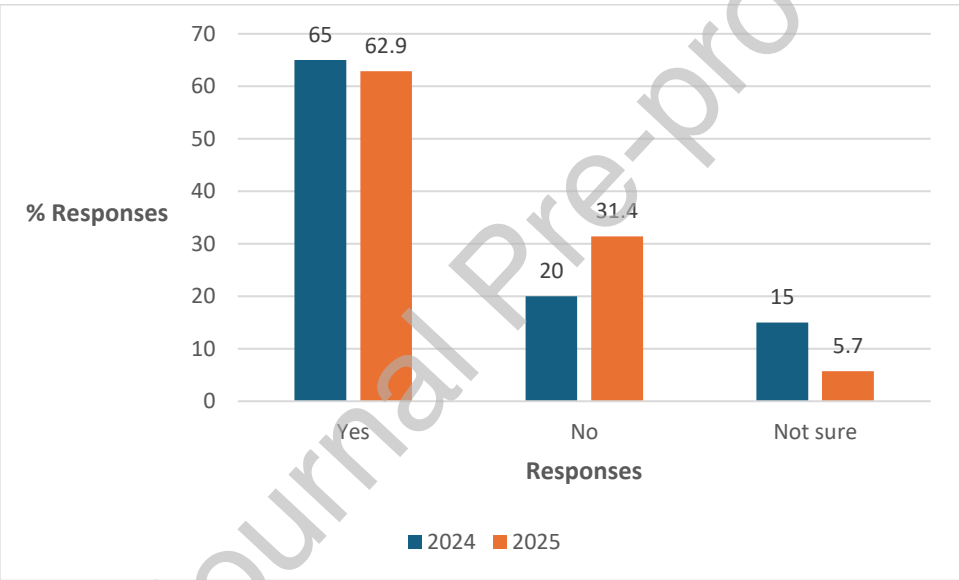

Figure 3. Percentage of participants receiving support from their dental school or university (2024-2025).

Themes	Sub-themes	Sub-sub-theme
Theme 1: Types of assessment	• MCQs • Short Answer questions • OSCE • Essay	
Theme 2: Use of technologies/AI	• Online platforms	• Chat GPT • Co-pilot • Moodle
	• Virtual reality	• Haptics

Theme 3: Concerns	• Yes	• Lack of critical thinking • Cheating/Plagiarism • Hides learning difficulties • Lack of professional understanding
	• No	• Can enhance learning • Problem-solving tool • Evolving technology
Theme 4: Advantages/Disadvantages	• Advantages	• Time saving • Standardisation • More accurate • More efficient
	• Disadvantages	• Inconsistent • Less accurate • Plagiarism • Shallow concepts

Table 2. Thematic analysis

Conflict of Interest Statement

The authors declare no conflict of interest, financial or otherwise.