Original article

Artificial intelligence in health education: teachers' and tech experts' views on replacing teaching competencies

Inteligência artificial na formação em saúde: percepções de docentes e especialistas em tecnologia sobre a substituição de competências docentes

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ABSTRACT | INTRODUCTION: The integration of artificial intelligence (AI) into education reflects rapid technological progress and a shift toward innovative teaching methods. Given AI's disruptive potential, it is essential to assess its impact on teaching competencies in medical education in a comprehensive and multidisciplinary manner. **OBJECTIVES:** To compare the perceptions of medical educators and technology professionals regarding the potential replacement of teaching competencies by AI. **MATERIALS AND METHODS:** A cross-sectional, quantitative study was conducted with 82 participants (65 medical educators and 17 technology professionals) using an anonymous online survey. Participants assessed the likelihood of AI replacing 14 teaching competencies, classified by complexity, automation potential, and expected timeline. **RESULTS:** Agreement between groups was found in 64.3% of competencies. There was 80.0% agreement for low-complexity, high-automation tasks, 60.0% for medium-complexity, partially automatable competencies, and 50.0% for high-complexity, low-automation functions. As task complexity increased, belief in AI replacement decreased. Significant differences emerged in competencies such as rigorous content selection (p=0.029), anticipating student difficulties (p=0.018), linking theory and practice (p=0.032), reinforcing student contributions (p=0.017), and adapting teaching based on feedback (p=0.046). In these cases, technology professionals were more inclined than educators to believe in the replacement of such competencies by AI. Most participants believed replacement could occur within the next five years. **CONCLUSION:** Both groups foresee increasing AI adoption in medical teaching, especially in tasks of lower complexity. While agreement diminishes for more complex competencies, there is a shared expectation that AI will increasingly shape educational practices soon.

KEYWORDS: Artificial Intelligence. Undergraduate Medical Education. Faculty.

RESUMO | INTRODUÇÃO: A incorporação da inteligência artificial (IA) na educação reflete avanços tecnológicos acelerados e a busca por métodos inovadores de ensino. Diante do seu potencial disruptivo, torna-se essencial discutir seus impactos sobre as competências docentes na educação médica de maneira abrangente e multidisciplinar. **OBJETIVOS:** Comparar as percepções de docentes da área médica e profissionais de tecnologia quanto à possível substituição de competências docentes por IA. **MATERIAIS E MÉTODOS:** Estudo transversal, quantitativo, com 82 participantes (65 docentes e 17 profissionais de tecnologia), realizado por meio de questionário online anônimo. Foram avaliadas 14 competências docentes quanto à possibilidade de substituição por IA, considerando complexidade, potencial de automação e prazo estimado para ocorrer. **RESULTADOS:** Houve concordância entre os grupos em 64,3% das competências. A concordância foi de 80,0% para tarefas de baixa complexidade e alta automação, 60,0% para competências de média complexidade e parcialmente automatizáveis, e 50,0% para funções de alta complexidade e baixa automação. À medida que a complexidade aumentava, diminuía a crença na substituição por IA. Houve divergências significativas em competências como seleção de conteúdo com rigor (*p*=0,029), antecipação de dificuldades dos estudantes (*p*=0,018), articulação teoria-prática (*p*=0,032), reforço de contribuições dos alunos (*p*=0,017) e adaptação docente com base em devolutivas (*p*=0,046). Nesses casos, os profissionais de tecnologia mostraram-se mais inclinados a acreditar na substituição dessas competências por IA do que os docentes. A maioria acredita que a substituição pode ocorrer em até cinco anos. **CONCLUSÃO:** Ambos os grupos preveem a adoção crescente da IA no ensino médico, especialmente em atividades de menor complexidade. Embora o consenso diminua em relação às competências mais complexas, há uma expectativa compartilhada de que a IA moldará cada vez mais as práticas educacionais no futuro próximo.

PALAVRAS-CHAVE: Inteligência Artificial. Educação de Graduação em Medicina. Docentes.

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1. Introduction

Artificial intelligence (AI) can be defined as the ability of a technological system to perform activities typically attributed to humans. Although its potential and benefits are generally highlighted, negative outcomes such as breaches of privacy, lack of accountability, and unemployment are often mentioned[1]. Therefore, it is crucial to foster broad and in-depth discussions regarding the benefits and risks of AI in replacing human activities in sectors such as healthcare and education.

Studies emphasize the advances made by AI in these areas, such as process optimization and improvements in disease diagnosis[2,3]. However, there are ongoing debates about the possible socioeconomic effects, such as unemployment and the loss of human touch at work[4,5], in addition to concerns related to developing critical thinking among users, including students and educators, as well as issues of access, reliability of results, and ethical considerations[6,7]. These are especially relevant given the risks of bias and discrimination, lack of deep understanding, and difficulties in evaluating the quality of responses associated with tools such as the ChatGPT[8].

These studies and reflections are pertinent, as AI is increasingly embedded in various sectors of society. In medicine, AI plays important competencies in assisting in disease diagnosis and staging and improving treatment efficacy in several specialties[2,3]. In the field of education, AI has recently gained popularity and practical applicability, especially during the covid-19 pandemic, a period marked by accelerated technological advancements[9,10]. Nevertheless, there is a widespread perception among education professionals that human interaction remains essential in teaching and learning processes[7].

In this context, it is important to emphasize the essential role of teachers, as they have a significant impact on student engagement and development. It is well known, for example, that the quality and training of teaching staff are directly related to the economic and professional development of the population and region[11,12]. With technological advances, albeit slowly but steadily, a growing number of teachers have begun to adopt AI tools to enhance their teaching practices and out-of-class activities to improve student learning, reduce workload, and measure student progress[13].

The increasing use of artificial intelligence (AI) tools in education is associated with a wide range of potential applications, including the development of mind maps, the synthesis of information, the retrieval of scientific articles, the grading of academic assignments, and the resolution of students' inquiries. As these technologies become more widespread and continue to advance, a scenario emerges in which functions traditionally performed by educators may be replaced by automated systems. Despite the relevance of this phenomenon, significant gaps remain in understanding the perceptions of the key actors in this process — educators themselves. Moreover, even less is known about how professionals from other fields, particularly those in technology, perceive this potential displacement of teaching competencies by AI.

Therefore, this study sought to explicitly compare the perceptions of medical education teachers and technology professionals regarding the potential replacement of teaching competencies by AI. By confronting these perspectives, the research question that guides this study can be posed: To what extent do these different professional groups converge or diverge in their views on AI's ability to replace teaching competencies in medical education? This comparative approach is essential to better understand whether the integration of AI into teaching should be interpreted as a threat of substitution or as an opportunity to empower teachers and learners to achieve more effective and holistic outcomes[14].

2. Materials and methods

2.1. Study design

This was a cross-sectional, quantitative study with a descriptive and analytical nature conducted from May 2023 to April 2024.

2.2. Population and sampling methods

The target population of the study was composed of two groups: the first consisted of faculty members from medical programs at Brazilian higher education institutions (HEIs); the second group comprised technology professionals with experience in AI implementation and development in Brazil.

Among the teachers, we included those who were formally affiliated with undergraduate medical programs at Brazilian HEIs. We excluded those who worked exclusively in administrative activities (such as coordination positions or roles without direct contact with students in the classroom context) and those who were on leave or retired.

For the technology professionals, we included those who reported working with AI in companies in the national market. We excluded those who were not directly involved in project design, process optimization, or artificial intelligence technology development.

2.3. Procedures and measurements

For both groups, we analyzed perceptions of the possibility of replacing teaching functions with AI. To this end, a questionnaire containing 14 questions was developed by the authors based on scientific literature regarding teaching competencies in medical education. The questionnaire included the following response options: (I) competence replaceable in the short or medium term (within next five years); (II) competence replaceable in the long or indefinite term (more than five years); and (III) competence not replaceable by AI. The questions addressed 14 professional competencies of teachers and the possibility of these being replaced by AI technologies.

Subsequently, these functions were grouped based on complexity level and automation potential into "low complexity and high automation functions," "medium complexity and partially automatable functions," and "high complexity and low automation functions." For this purpose, the ChatGPT 4.0 tool was used with the following prompt: "Act as a professor specialized in undergraduate medical education. Based on the competencies listed below, classify them into the groups: 'low complexity,' 'medium complexity,' and 'high complexity.'" The resulting stratification was subsequently reviewed and validated by a group of experts and principal researchers (Table 1).

Table 1. Comparison of perceptions between teachers and technology professionals regarding the replacement of teaching functions by AI. Data presented as absolute frequency (n) and relative frequency (%)

Level of complexity and automation	Teaching function
Low complexity and high automation	1. Develop teaching materials for student use.
	2. Adapt teaching materials according to student needs.
	3. Selection/organization of content with scientific rigor, clarity, and depth appropriate to the objectives.
	4. Develop activity schedules to be followed by other teachers and students.
	5. Develop tests and assessments and evaluate student performance in these assessments.
Medium complexity and partial automation	6. Anticipating possible difficulties, questions, and misunderstandings of students.
	7. Relating old and new knowledge in the addressed field.
	8. Correlating theoretical content with practical experiences.
	9. Proposing analogies, problem situations, and constructive questions.
	10. Proposing means for students to develop study autonomy.
High complexity and low automation	11. Guiding and motivating students, considering their individualities.
	12. Resolving conflicts and misunderstandings between students.
	13. Recognizing, encouraging, and reinforcing positive student contributions.
	14. Modifying their own teaching practices based on self-criticism and external feedback.

Source: the authors (2025).

Participants were recruited for the study using the snowball sampling method, a non-probabilistic technique in which initial respondents refer additional participants from their social or professional networks. Demographic factors such as age, gender identity, and professional experience duration were examined as potential variables for association.

The invitation to participate in the research was made through virtual messages sent electronically via email and messaging apps. For the data collection, a link containing all the project information, along with the structured and anonymous questionnaire, was provided.

2.4. Data analysis

The data analysis was performed using JAMOVI software (version_2.5.3). The data are presented using descriptive statistics. Categorical variables are presented as absolute and relative frequencies. For the comparison between group responses, Pearson's chi-square test for independence was applied. The level of statistical significance was set at 5%.

2.5. Ethical aspects

This study complies with the Declaration of Helsinki and Resolutions 466/12 and 510/16 of the Brazilian National Health Council (CNS). The research project was approved by the Brazilian Ethics Committee (CAAE: 69558623.3.0000.5033). The autonomy, confidentiality, and privacy of the participants were respected. All participants were informed about the objectives and methods of the research and signed the informed consent form.

3. Results

A total of 82 professionals from eight Brazilian states (BA, CE, DF, GO, MG, PE, RJ and SP) participated in the study; these professionals included 65 medical school faculty members, mostly male (64.6%), and 17 technology professionals, mostly female (58.5%). The median age of the individuals was similar: 43 years for the faculty sample and 45 years for the technology professionals participating in the study.

3.1. Replacement of teaching functions by AI

Among the 14 teaching functions assessed, there was agreement between faculty members and technology professionals in nine cases (64.3%) regarding the potential replacement of teaching work by AI (Table 2). No statistically significant associations were observed concerning age, gender identity, or length of professional experience.

Technology professionals were generally more likely than faculty members to anticipate the replacement of human labor by AI across all functions. This difference was observed in all levels of complexity (Figure 1A). However, it was most pronounced in high complexity and low automation tasks, where the gap between groups was largest. In contrast, for low- and medium-complexity functions, the difference between faculty members and technology professionals was slightly smaller. Additionally, as function complexity increased, overall agreement on AI replacement decreased, particularly among faculty members, who demonstrated greater resistance to AI replacing these functions (Figure 1B).

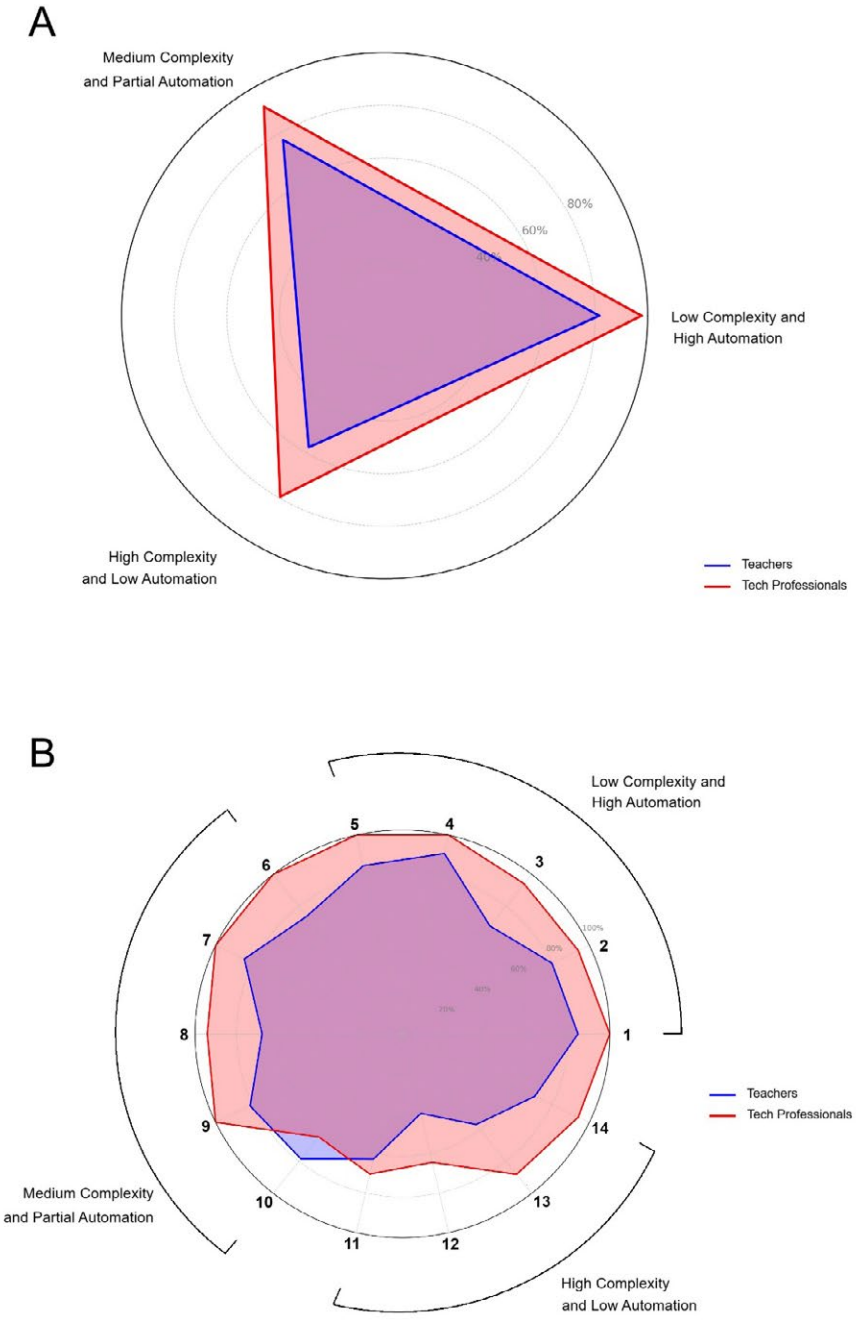
Notably, the only function where faculty members were more likely than technology professionals to foresee AI replacement was "proposing means for students to develop study autonomy", suggesting that educators recognize AI's potential role in fostering independent learning (Figure 1B).

Table 2. Comparison of perceptions between teachers and technology professionals regarding the replacement of teaching functions by AI. Data presented as absolute frequency (n) and relative frequency (%)

Low complexity and high automation			
Develop teaching materials for student use	**Teachers**	**Tech Professionals**	**p-value**
Not replaceable	10 (15.3)	0 (0.0)	0.084
Replaceable	55 (84.7)	17 (100.0)	
Adapt teaching materials according to student needs	**Teachers**	**Tech Professionals**	**p-value**
Not replaceable	13 (20.0)	1 (5.8)	0.168
Replaceable	52 (80.0)	16 (94.2)	
Selection/organization of content with scientific rigor, clarity, and depth appropriate to the objective	**Teachers**	**Tech Professionals**	**p-value**
Not replaceable	21 (32.3)	1 (5.8)	0.029
Replaceable	44 (67.7)	16 (94.2)	
Develop activity schedules to be followed by other teachers and students	**Teachers**	**Tech Professionals**	**p-value**
Not replaceable	6 (9.2)	0 (0)	0.336
Replaceable	59 (90.8)	17 (100,0)	
Develop tests and assessments and evaluate student performance in these assessments	**Teachers**	**Tech Professionals**	**p-value**
Not replaceable	10 (15.3)	0 (0.0)	0.084
Replaceable	55 (84.7)	17 (100.0)	
Medium complexity and partial automation			
Anticipating possible difficulties, questions, and misunderstandings of students	**Teachers**	**Tech Professionals**	**p-value**
Not replaceable	17 (26.1)	0 (0.0)	0.018
Replaceable	48 (73.9)	17 (100.0)	
Relating old and new knowledge in the addressed field	**Teachers**	**Tech Professionals**	**p-value**
Not replaceable	10 (15.3)	0 (0.0)	0.119
Replaceable	55 (84.7)	17 (100.0)	
Correlating theoretical content with practical experiences	**Teachers**	**Tech Professionals**	**p-value**
Not replaceable	21 (32.3)	1 (5.8)	0,032
Replaceable	44 (67.7)	16 (94.2)	
Proposing analogies, problem situations, and constructive questions	**Teachers**	**Tech Professionals**	**p-value**
Not replaceable	12 (18.4)	0 (0.0)	0.063
Replaceable	53 (81.6)	17 (100.0)	
Proposing means for students to develop study autonomy	**Teachers**	**Tech Professionals**	**p-value**
Not replaceable	14 (21.5)	6 (35.2)	0.240
Replaceable	51 (78.5)	11 (64.8)	
High complexity and low automation			
Guiding and motivating students, considering their individualities	**Teachers**	**Tech Professionals**	**p-value**
Not replaceable	24 (36.9)	5 (29.4)	0.564
Replaceable	41 (63.0)	12 (70.6)	
Resolving conflicts and misunderstandings between students	**Teachers**	**Tech Professionals**	**p-value**
Not replaceable	39 (60.0)	6 (35.2)	0.068
Replaceable	26 (40.0)	11 (64.8)	
Recognizing, encouraging, and reinforcing positive student contributions	**Teachers**	**Tech Professionals**	**p-value**
Not replaceable	28 (43.1)	2 (11.7)	0.017
Replaceable	37 (56.9)	15 (88.3)	
Modifying their own teaching practices based on self-criticism and external feedback	**Teachers**	**Tech Professionals**	**p-value**
Not replaceable	19 (29.2)	1 (5.8)	0.046
Replaceable	46 (70.8)	16 (94.2)	

Source: the authors (2025).

Figure 1. Radar chart showing the average responses on the replacement of teaching skills by AI, categorized by level of complexity e automation (A) and by specific teaching skills (B)



Source: the authors (2025).

Caption: The chart illustrates the average responses from teachers and tech professionals regarding the potential automation of teaching functions. Panel (A) categorizes responses by complexity and automation levels, while panel (B) presents responses for each teaching skill individually. Skills are grouped as follows: 1–5 represent low complexity and high automation; 6–10 correspond to medium complexity and partial automation; and 11–14 indicate high complexity and low automation.

Overall, both groups believe in the strong integration of AI into teaching functions, especially in activities with low complexity and high automation potential. Of the five functions classified in this way, there were convergences between groups in four of them (Table 2). The only significant difference in this group was in the competence "selection/organization of content with scientific rigor, clarity, and depth appropriate to the objective," where confidence in the replacement of teaching work by AI was significantly greater among technology professionals than among faculty members (94.2% vs. 67.7%, p=0.029).

Among the five functions classified as medium complexity and partially automatable, there was agreement on the potential replacement by technology in three (60.0%) of them (Table 2). Similarly, confidence in the replacement of human work by AI was significantly greater among technology professionals than among faculty members in the functions "anticipating possible difficulties, questions, and misunderstandings of students" (100.0% vs. 73.9%, p=0.018) and "correlating theoretical content with practical experiences" (94.2% vs. 67.7%; p=0.032).

For the functions classified as high complexity and low automation potential, technology professionals showed greater confidence in the replacement of teaching work by AI in two out of four cases: "recognizing, encouraging, and reinforcing positive student contributions" (88.3% vs. 56.9%, p=0.017) and "modifying their own teaching practices based on self-criticism and external feedback" (94.2% vs. 70.8%, p=0.046). Table 2 summarizes these findings.

3.2. Timeframe for replacing teaching functions with AI

When analyzing the perceptions of faculty and technology professionals regarding the timeframe for replacing teaching functions with AI, among those who believe in such replacement, no statistically significant differences were found between the groups for 13 out of the 14 listed functions (Table 3). In this context, most respondents expect replacement to occur in the short or medium term (within the next five years), particularly for low-complexity functions (Figure 2A).

Table 3. Perceptions of teachers and technology professionals regarding the timeframe for the replacement of teaching functions by AI. Data presented as absolute frequency (n) and relative frequency (%) (to be continued)

Low complexity and high automation			
Develop teaching materials for student use	**Teachers**	**Tech Professionals**	**p-value**
Short/medium term	38 (69.1)	14 (82.4)	0.286
Long/indefinite term	17 (30.9)	3 (17.6)	
Adapt teaching materials according to student needs	**Teachers**	**Tech Professionals**	**p-value**
Short/medium term	32 (61.6)	12 (75.0)	0.324
Long/indefinite term	20 (38.4)	4 (25.0)	
Selection/organization of content with scientific rigor, clarity, and depth appropriate to the objective	**Teachers**	**Tech Professionals**	**p-value**
Short/medium term	22 (50.0)	10 (62.5)	0.391
Long/indefinite term	22 (50.0)	6 (37.5)	
Develop activity schedules to be followed by other teachers and students	**Teachers**	**Tech Professionals**	**p-value**
Short/medium term	38 (64.5)	14 (82.4)	0.161
Long/indefinite term	21 (35.5)	3 (17.6)	
Develop tests and assessments and evaluate student performance in these assessments	**Teachers**	**Tech Professionals**	**p-value**
Short/medium term	38 (69.1)	15 (88.3)	0.118
Long/indefinite term	17 (30.9)	2 (11.7)	

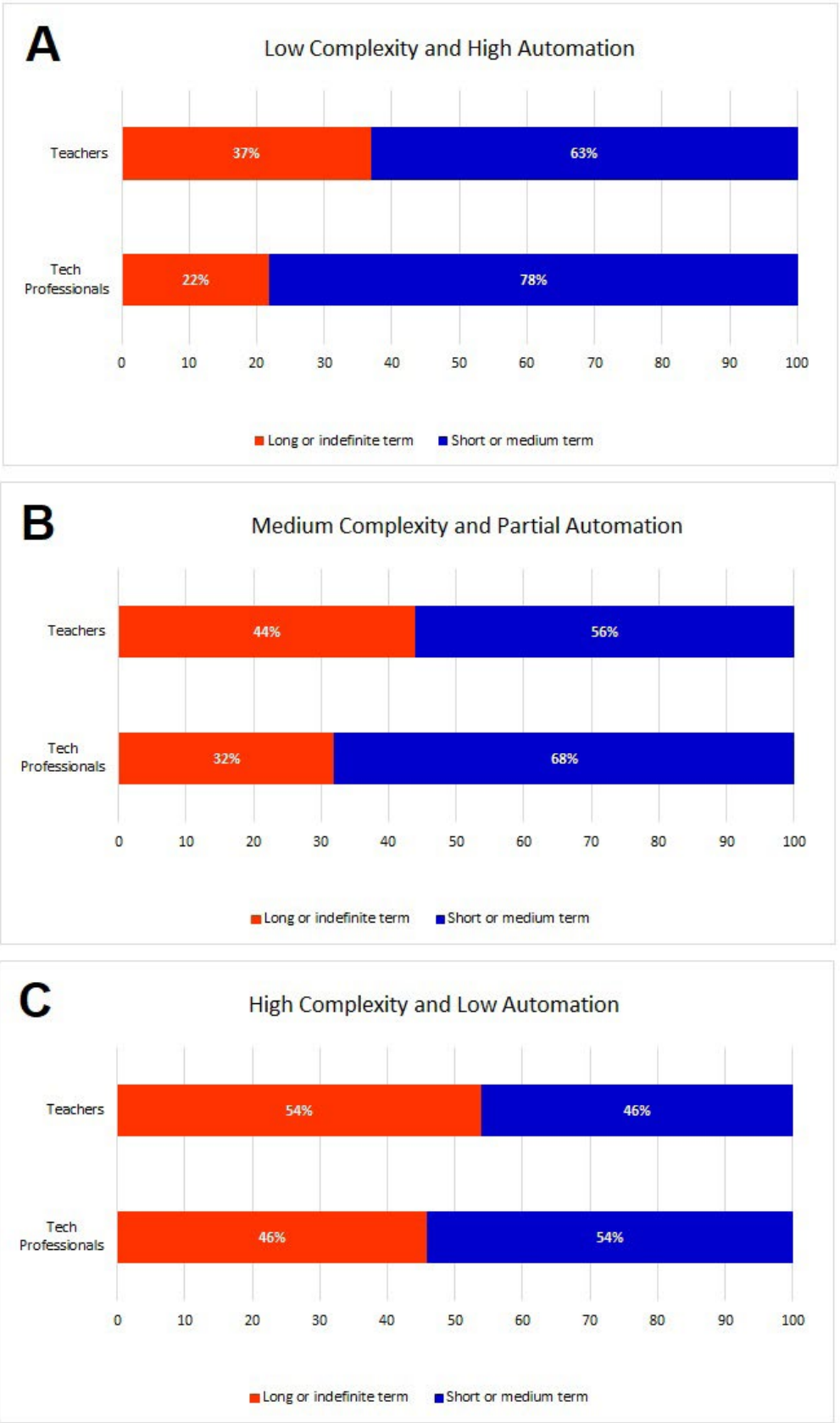
Table 3. Perceptions of teachers and technology professionals regarding the timeframe for the replacement of teaching functions by AI. Data presented as absolute frequency (n) and relative frequency (%) (conclusion)

Medium complexity and partial automation			
Anticipating possible difficulties, questions, and misunderstandings of students	**Teachers**	**Tech Professionals**	**p-value**
Short/medium term	22 (45.9)	12 (70.6)	0.791
Long/indefinite term	26 (54.1)	5 (29.4)	
Relating old and new knowledge in the addressed field	**Teachers**	**Tech Professionals**	**p-value**
Short/medium term	29 (52.8)	0 (0.0)	<0.001
Long/indefinite term	26 (47.2)	17 (100.0)	
Correlating theoretical content with practical experiences	**Teachers**	**Tech Professionals**	**p-value**
Short/medium term	22 (50.0)	10 (62.5)	0.391
Long/indefinite term	22 (50.0)	6 (37.5)	
Proposing analogies, problem situations, and constructive questions	**Teachers**	**Tech Professionals**	**p-value**
Short/medium term	32 (60.4)	12 (70.6)	0.445
Long/indefinite term	21 (39.6)	5 (29.4)	
Proposing means for students to develop study autonomy	**Teachers**	**Tech Professionals**	**p-value**
Short/medium term	35 (68.7)	8 (72.8)	0.789
Long/indefinite term	19 (31.3)	3 (27.2)	
High complexity and low automation			
Guiding and motivating students, considering their individualities	**Teachers**	**Tech Professionals**	**p-value**
Short/medium term	20 (48.7)	7 (58.4)	0.560
Long/indefinite term	21 (51.3)	5 (41.6)	
Resolving conflicts and misunderstandings between students	**Teachers**	**Tech Professionals**	**p-value**
Short/medium term	9 (34.6)	4 (36.3)	0.919
Long/indefinite term	17(65.4)	7 (63.7)	
Recognizing, encouraging, and reinforcing positive student contributions	**Teachers**	**Tech Professionals**	**p-value**
Short/medium term	18 (48.6)	8 (53.4)	0.759
Long/indefinite term	19 (51.4)	7 (46.6)	
Modifying their own teaching practices based on self-criticism and external feedback	**Teachers**	**Tech Professionals**	**p-value**
Short/medium term	22 (47.8)	10 (62.5)	0.312
Long/indefinite term	24 (52.2)	6 (37.5)	

Source: the authors (2025).

Further analysis of those who believe in the replacement of teaching functions indicates that this perception varies proportionally with the complexity of the functions. Specifically, as the complexity of a function increases, the expected timeframe for its replacement by AI tends to be longer (Figure 2). These findings reinforce the idea that the perceived feasibility of AI replacing teaching functions is directly related to the complexity of the tasks performed, with greater resistance to automation as complexity increases.

Figure 2. Bar charts showing the percentages of teachers and technology professionals who believe that teaching skills will be replaced by AI in the short/ medium or long/indefinite term, categorized by level of complexity and automation



Source: the authors (2025).

Caption: The charts display the percentage of agreement with AI replacement for each function group: (A) low complexity and high automation, (b) medium complexity and partial automation, and (c) high complexity and low automation.

4. Discussion

The main results of this study reveal a predominant perception, both among medical educators and technology professionals, regarding the short-term replacement of teaching competencies by AI. The analysis of the teaching functions investigated provides a comprehensive understanding of these two groups' perceptions of AI's potential in undergraduate medical education.

The increasing use of technology in educational activities cannot be denied or ignored. For this reason, digital skills have become essential in higher education[15]. Evidence suggests that educators are aware of this need and have positive perceptions regarding the integration of technology into their teaching and learning practices, making them more interactive and effective[16]. However, adequate training for the use of these tools in teaching practice is highly necessary[9].

The integration of AI into medical education raises important questions about its potential to complement or replace traditional methods, such as bedside teaching — a tool considered fundamental to the basic training of future doctors. This approach cultivates essential skills like communication, empathy, and role modeling[17], which technology has yet to replicate effectively. Although AI offers benefits like personalized learning, efficient assessment, and real-time feedback, it still falls short of capturing the humanistic and contextual nuances inherent in patient interactions. The key challenge lies in integrating AI to enhance bedside teaching, ensuring that technological advancements strengthen holistic and patient-centered medical training.

In support of this, US medical students and faculty show great interest in exploring AI-related topics in their academic activities, despite limited knowledge about technology[18]. The finding that most teachers believe in the possibility of human labor being replaced by AI reinforces the evidence pointing to rapid and substantial changes in the way teaching and learning take place[19]. Similarly, a study conducted at ten medical schools in Nigeria identified strong enthusiasm about the potential of AI, especially among students. The investigation revealed that students used AI tools more frequently than faculty did. However, both groups lacked prior training in the use of these tools. This lack of training may contribute to the perception that AI could dehumanize healthcare, make physicians replaceable, and diminish professionals' competencies[20].

Therefore, there is still a considerable lack of training on the use of these emerging technologies and many doubts about their integration into medicine. Illustrating this strong feeling of uncertainty, a recent United States study revealed that most future professionals believe that some specialties, such as radiology, will be highly affected by AI. This concern led nearly half of the participants to feel threatened when choosing this specialty. However, these perceptions were shaped by online searches rather than formal, theoretical, or practical curricular education, which may contribute to some of the negative views on the subject[21].

In this context, despite evident signs of automation in educational processes, students, teachers, and administrators often lack the requisite knowledge, training, and confidence to integrate AI into their routine professional activities[22]. Likewise, medical schools remain unprepared to fully incorporate this innovation into teaching and assessment frameworks[22-24]. While the inclusion of technology is encouraged by current Brazilian curriculum guidelines, it falls short of addressing the disruptive potential of AI's rapid expansion. Therefore, it is essential to broaden this debate to other professional domains, fostering an interdisciplinary dialogue. In the present study, teachers and technology professionals — in an unprecedented approach — were invited to share their perceptions, contributing to a more comprehensive discussion on the potential implications of AI for teaching functions.

The respondents' agreement on the replacement of low-complexity functions by AI reflects the predominant perception that routine and repetitive tasks are more susceptible to automation. Both groups believe that AI can significantly replace tasks such as preparing and modifying teaching materials, creating schedules, and evaluating student performance. This perception aligns with the literature, which highlights AI's efficiency in automating routine tasks performed by teachers[25].

Only the functions of "selection/organization of content with scientific rigor, clarity, and depth appropriate to the objectives." differed between the perceptions of education and technology professionals. This competence suggests greater confidence among technology professionals in AI's ability to maintain critically high academic standards. In contrast, educators seem more secure and comfortable with the andragogical foundations involved in organizing content, believing that these aspects cannot be entirely replicated by algorithms.

When evaluating medium-complexity functions, we observed no absolute consensus regarding AI's ability to replace them. Activities such as "anticipating possible difficulties, questions, and misunderstandings of students" and "correlating theoretical content with practical experiences" were perceived differently between educators and technology professionals. These differences indicate that educators are more cautious about AI's ability to address the individuality and specific context of students. For them, educators' experience and intuition in identifying and addressing educational issues are aspects that are difficult to replicate via automated systems.

For high-complexity functions, the agreement on the possibility of replacement by AI was lower. This highlights educators' perception of significant limitations in replacing tasks that involve high levels of human judgment, sensitivity, and interpersonal interaction in the educational context. It is important to note that as a task is considered more complex, the conviction of AI replacement decreases in both groups. However, technology professionals are almost always more likely to trust AI's potential to perform these tasks efficiently.

Regarding expectations for the timeline for the replacement of teaching functions, both groups demonstrated a general belief that this replacement could occur in the short or medium term, especially for low- and medium-complexity functions. This optimism, particularly among technology professionals, may be attributed to AI's ability to perform repetitive tasks with high efficiency and precision, coupled with the accelerated pace of technological advances in this area. However, for educators, this perception may stem from the rapid integration of technology into their daily lives, access to AI platforms, and the ease of performing more technical activities.

Among the main criticisms of the large-scale use of AI are the lack of humanization in teaching activities and, consequently, the teacher-student relationship. The literature reports concern about the possibility of a less humanized, individualized, and subjective education that does not recognize the student as a complex and unique being. In this sense, future AI systems in education should ensure human interaction, careful data collection and presentation, and foster closer relationships between teachers and students[26].

Other concerns are based on ethical issues such as threats to academic integrity, plagiarism, privacy and confidentiality issues, and the cultural insensitivity of technological tools[26,27]. The less integrated AI is into academic life and the curriculum, the more these concerns generate insecurity, fear, and difficulty in positively utilizing technology. Therefore, studies indicate the need for adequate training on the use of AI and curriculum adaptation in this new educational scenario[26,28].

The convergence in perceptions regarding the timeline for substitution, with an expectation of automation within the next five years, highlights the urgent need to prepare teachers for this imminent transformation. Educational institutions must invest in training programs that promote the effective use of AI as an andragogical tool, complementing human capabilities and enhancing educational quality. Moreover, it is essential to strengthen teachers' interpersonal and critical skills. In this way, AI integration can result in a more enriching and balanced learning environment in which technology and humanity coevolve harmoniously.

Thus, while the potential benefits of AI for medical education are promising, significant concerns persist. This underscores the pressing need for further research, particularly into educational dimensions that extend beyond treating students as research subjects[29,30]. By generating robust evidence, it will be possible to develop comprehensive strategies for deeply integrating AI into medical education, ensuring its application enhances learning outcomes.

Finally, this study has potential limitations that should be critically considered when interpreting the presented results. The small and unequal group sizes may limit the generalizability of the findings. Additionally, the geographic representativeness of the sample was low, which may further restrict extrapolation. Another potential source of bias relates to the classification of teaching competencies into complexity blocks, which was partly subjective and assisted by AI tools, possibly influencing the interpretation of perceived replaceability. Moreover, the research is based on participants' subjective perceptions about educational aspects, which may not adequately reflect the actual andragogical effectiveness of the technology.

However, this is the first study, to our knowledge, to compare the perceptions of education and technology professionals regarding the integration of AI into teaching practice. The results presented here provide novel insights into how AI may influence educational functions and highlight the importance of broadening the debate beyond the educational domain. Engaging professionals from external areas, such as technology, allows for an interdisciplinary perspective that can uncover potential challenges, opportunities, and unintended consequences that may be overlooked in discussions limited to education specialists. These findings underscore the need for future research to further explore the impact of AI on teaching competencies, fostering collaborative dialogue and informing evidence-based strategies for the responsible integration of AI into educational practice.

5. Conclusion

This study offers important insights into how medical educators and technology professionals perceive the potential replacement of teaching competencies by AI. While low- and medium-complexity tasks appear increasingly automatable, high-complexity functions — grounded in human judgment, empathy, and interpersonal interaction — are still seen as irreplaceable. These findings reinforce the essential role of the human element in holistic medical education.

By identifying areas less amenable to automation, the study helps guide educational strategies and institutional policies. Investing in faculty development to strengthen interpersonal and critical thinking skills is key. Hybrid models that use AI to support — not replace — educators can enhance efficiency while preserving the humanistic core of teaching. This balanced approach is vital to preparing future physicians who are both technically proficient and emotionally intelligent.

Authors' contributions

The authors state that they made substantial contributions to the work in terms of the study's conception or design; the acquisition, analysis, or interpretation of data; and the drafting or critical revision of content for important intellectual merit. All authors approved the final version for publication and agree to take public responsibility for all aspects of the study.

Competing interests

No financial, legal, or political conflicts involving third parties (government bodies, companies, private foundations, etc.) were declared for any aspect of the submitted work, including but not limited to grants and funding, advisory-board participation, study design, manuscript preparation, or statistical analysis.

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