

**KNOWLEDGE, ATTITUDES AND MANNERS OF USING ARTIFICIAL INTELLIGENCE
SOFTWARE AMONG STUDENTS OF MEDICINE AND DENTISTRY**

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Artificial intelligence (AI) is becoming an integral component of healthcare education, creating new opportunities for personalized learning while raising important questions regarding AI literacy, ethics, privacy, and professional responsibility. This study aimed to evaluate AI knowledge, attitudes, and perceptions among medical and dental students and to identify implications for curriculum development.

A cross-sectional survey was conducted among 374 undergraduate medical and dental students. The questionnaire assessed participants' knowledge of AI concepts and applications, attitudes toward AI in education, patterns of AI use, perceptions of benefits and challenges, and views regarding privacy, trust, and human oversight. AI knowledge scores were compared according to demographic and educational characteristics using appropriate statistical analyses.

Overall, participants demonstrated a generally good level of AI knowledge, with 50.3% achieving high knowledge scores, and 47.3% demonstrating moderate knowledge. Nearly all respondents were familiar with AI (95.2%), and most had already used AI in their studies (91.2%). Female students and dental students achieved significantly higher AI knowledge scores than male and medical students, respectively (both $p < 0.01$), while significant differences were also observed across years of study ($p < 0.01$). Despite their positive attitudes, students expressed substantial concerns regarding privacy and ethical governance; 93.3% were uncomfortable with AI collecting personal educational data, only 34.8% supported AI-assisted grading, and 83.2% did not believe that AI could replace human teachers.

Medical and dental students demonstrate good AI knowledge, widespread use of AI technologies, and strong support for their educational applications. However, their acceptance of AI is accompanied by clear expectations regarding ethical governance, privacy protection, transparency, and continued human oversight.

Key words: artificial intelligence, students, privacy, ethics, curriculum development

Znanja, stavovi i načini korišćenja softvera veštačke inteligencije kod studenata medicine i stomatologije

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Veštačka inteligencija (VI) postaje sastavni deo obrazovanja u zdravstvu, stvarajući nove mogućnosti za personalizovano učenje, istovremeno pokrećući važna pitanja u vezi sa pismenošću, etikom, privatnošću i profesionalnom odgovornošću. Cilj ove studije bio je da se procene znanja, stavovi i percepcije o VI među studentima medicine i stomatologije i da se identifikuju implikacije za razvoj nastavnog plana i programa.

Studija preseka sprovedena je među 374 studenata integrisanih studija medicine i stomatologije na Medicinskom fakultetu Univerziteta u Nišu. Standardizovanim upitnicima procenjivano je znanje studenata o konceptima i primenama veštačke inteligencije, stavovima prema

korišćenju softvera veštačke inteligenciji u obrazovanju, obrascima korišćenja veštačke inteligencije, percepcije koristi i izazova, kao i stavovima o privatnosti, poverenju i nadzoru. Ispitivani studenti su pokazali generalno dobar nivo znanja o veštačkoj inteligenciji, pri čemu je 50,3% postiglo visoke rezultate znanja, a 47,3% je pokazalo umereno znanje. Skoro svi ispitanici su bili upoznati sa veštačkom inteligencijom (95,2%), a većina je već koristila veštačku inteligenciju u svojim radovima (91,2%). Studenti stomatologije postigli su značajno više rezultate znanja o veštačkoj inteligenciji negoli studenti medicine ($p < 0,01$), dok su značajne razlike primećene i po godinama studija ($p < 0,01$). Uprkos svojim pozitivnim stavovima, studenti su izrazili značajnu zabrinutost u vezi sa privatnošću i etičkim pitanjima; 93,3% se nije osećalo prijatno zbog toga što veštačka inteligencija prikuplja lične obrazovne podatke, samo 34,8% je podržalo ocenjivanje uz pomoć veštačke inteligencije, a 83,2% njih nije verovalo da softveri veštačke inteligencije mogu da zamene profesore.

Studenti medicine i stomatologije pokazuju adekvatno znanje o upotrebi softvera veštačke inteligencije, njihovu široko rasprostranjenu upotrebu, kao i značajnu podršku njihovim obrazovnim primenama. Međutim, njihovo prihvatanje veštačke inteligencije prate jasna očekivanja u vezi sa etičkim kodeksima, zaštitom privatnosti i transparentnošću.

Ključne reči: veštačka inteligencija, studenti, privatnost, etika, kurikulum

INTRODUCTION

Artificial intelligence (AI) is reshaping healthcare education by transforming how students acquire knowledge, access scientific information, develop clinical reasoning, and prepare for professional practice. Recent advances in machine learning and, particularly, generative AI have accelerated this transformation, making AI-powered tools increasingly accessible to students throughout their education. Applications such as intelligent tutoring systems, adaptive learning platforms, automated feedback, clinical decision-support systems, and large language models are creating new opportunities for personalized learning and knowledge acquisition while simultaneously raising important questions regarding AI literacy, ethical use, data privacy, transparency, and professional accountability (1–3).

Medical and dental students are among the first generations of healthcare professionals to receive their education in an environment where AI is becoming an integral part of everyday academic practice. Students increasingly use AI to retrieve scientific information, summarize literature, generate educational materials, support clinical reasoning, and prepare for examinations. Consequently, AI competence is emerging as a core educational outcome rather than an optional digital skill. Future healthcare professionals will require not only technical familiarity with AI tools but also the ability to critically evaluate AI-generated information, recognize algorithmic limitations, understand ethical and legal implications, and apply AI responsibly within patient-centered healthcare (1,3–5).

A growing body of evidence indicates that healthcare students generally hold favorable attitudes toward AI and recognize its potential to improve both medical education and clinical practice (4,6–10). At the same time, previous studies consistently report important shortcomings, including limited formal AI education, variable AI literacy, insufficient confidence in interpreting AI-generated outputs, and uncertainty regarding the ethical and appropriate use of AI technologies (4,6,7,9,11–13). Across different educational settings, students have repeatedly emphasized the need for structured AI curricula that combine technical knowledge with training in ethics, data governance, algorithmic bias, communication, and clinical decision-making (3–5,14–16).

The rapid emergence of generative AI has further changed the educational landscape. Tools such as ChatGPT and other large language models are now routinely incorporated into students' learning activities, enabling rapid access to information, literature synthesis, drafting of academic content, and support for problem-solving and clinical reasoning (2,17). However, these technologies also introduce important challenges, including factual inaccuracies, hallucinations, automation bias, overreliance on AI-generated information, threats to academic integrity, and concerns regarding privacy and responsible use (2-3,13,17). Consequently, the discussion has shifted from whether AI should be incorporated into healthcare education toward how it can be integrated safely, ethically, and effectively within existing curricula (3,5).

Despite the growing literature, several important knowledge gaps remain. Most previous studies have focused primarily on medical students, whereas comparatively little attention has been paid to dental students or direct comparisons between healthcare disciplines. Furthermore, many investigations have explored students' attitudes toward AI without simultaneously examining objective AI knowledge, educational experiences, patterns of AI use, and perceptions related to trust, privacy, and human oversight. As AI technologies become increasingly embedded in healthcare education, understanding how students balance enthusiasm for AI with expectations regarding transparency, accountability, and the continuing role of human educators has become essential for evidence-based curriculum development (2-4,10,16,18,19).

The present study was designed to address these gaps by evaluating the knowledge, attitudes, and perceptions of medical and dental students regarding artificial intelligence in education. Specifically, we assessed students' AI knowledge, explored their experiences and attitudes toward AI-supported learning, examined perceptions related to privacy, trust, and the role of AI in educational settings, and compared AI knowledge across demographic and educational characteristics. By providing a comprehensive assessment of AI readiness among future healthcare professionals, this study aims to inform the development of longitudinal, competency-based AI curricula that prepare graduates to collaborate effectively with AI while maintaining ethical standards, critical thinking, and patient-centered care.

METHODS

The research was conducted at the Faculty of Medicine of the University of Niš from March to May 2026. A total of 374 students were included in the study.

The students filled in the questionnaires during the classes held for medical and dental students. The parameters tested of all students were assessed using appropriate standardized questionnaires (20, 21). At each of these classes, the two authors of this research work explained all the details related to filling out the questionnaire, while obtaining the consent of those who would accept to participate in this study. The study was conducted in accordance with the Declaration of Helsinki.

For the comparison between the investigated groups of students, in addition to the descriptive statistical findings, which are presented in the tables, other statistical analyzes were also used, in terms of interpreting the differences between the existing observed groups. In the analysis of the obtained data, Student's t-test and One-way ANOVA, as well as independent samples t-test, were also used. The level of statistical significance was set at $p < 0.05$. SPSS version 21 statistical software (Chicago, IL, USA) was used to perform the statistical analysis.

RESULTS

A total of 374 students were included in the study. The mean age of participants was 23.20 ± 2.03 years. Female students predominated, accounting for 61.2% of the sample, while males represented 38.8%. More than half of the participants were medical students (57.0%), whereas 43.0% were dental medicine students (Table 1). Regarding accommodation, the majority lived in apartments (70.3%), followed by rented houses rooms (27.3%), while only a small proportion resided in student dormitories (2.4%). The largest group of respondents were second-year students (43.3%), followed by sixth-year students (33.2%). Students from the fifth year accounted for 15.8% of the sample, whereas third- and fourth-year students were less represented, comprising 2.9% and 4.8% of participants, respectively (Table 1).

Table 1. Baseline characteristics of study participants

Characteristics		$\bar{X} \pm sd / n (\%)$
Age (years)		23,20 $\pm$ 2,03
Sex	Male	145 (38.8)
	Female	229 (61.2)
Type of studies	Medicine	213 (57.0)
	Dental medicine	161 (43.0)
Accommodation	Apartment	263(70.3)
	House	102 (27.3)
	Student dormitory	9 (2.4)
Year of study	Second	162 (43.3)
	Third	11 (2.9)
	Forth	18 (4.8)
	Fifth	59 (15.8)
	Sixth	124 (33.2)

Table 2. Distribution of responses to AI knowledge and perception questionnaire items among study participants-Knowledge and understanding of AI

		n (%)
1. What does AI stands for?	1=Automated Interaction 2=Artificial Intelligence 3=Advanced Innovation 4=Automated Integration	5 (1.3) 369 (98.7) / /
2. Which of the following is NOT a potential application of AI in education?"	1=Personalized learning 2=Grading assignments 3=By eliminating the need for homework assignments 4=Crop rotation techniques	24(6.4) 111 (29.7) 52 (13.9) 187 (50.0)
3. How can AI enhance the learning experience for students?	1=By replacing human teachers entirely 2=By providing personalized learning experiences 3=By eliminating the need for homework assignments 4=By increasing classroom sizes	5 (1.3) 340 (90.9) 19 (5.1) 10 (2.7)
4. Which of the following is an example of AI being used to create educational content?	1=Generating practice questions for students 2=Monitoring student attendance 3=Ordering textbooks for a course 4=Providing counseling services	229 (61.2) 35 (9.4) 18 (4.8) 92 (24.6)
5. Which ethical concern is associated with the use of AI in education?	1=Decreased efficiency in grading assignments 2=Job displacement for educators 3=Lack of access to educational resources 4=Excessive workload for students	54 (14.4) 245 (65.5) 65 (17.4) 10 (2.7)

Table 2. summarizes students' knowledge and understanding of artificial intelligence (AI).

Regarding the applications of AI in education, half of the students (50.0%) correctly recognized that crop rotation techniques are not related to AI-based educational applications, whereas 29.7% incorrectly selected grading assignments.

Table 3. Distribution of responses to AI knowledge and perception questionnaire items among study participants- Perceived Benefits and Applications of AI in Academics

		n (%)
6. How can AI assist in grading and evaluating assignments?	1=By providing instant feedback to students 2=By randomly assigning grades to students 3=By ignoring plagiarism detection 4=By decreasing grading accuracy	331 (88.5) 24 (6.4) 10 (2.7) 9 (2.4)
7. What is the main advantage of using artificial intelligence in learning platforms?	1=One-size-fits-all approach to learning 2=Personalized learning experience for each student 3=Limited access to educational resources 4=Decreased student engagement	113 (30.2) 227 (60.7) / 34 (9.1)
8. Which academic discipline would benefit the most from AI-powered data analysis tools?"	1 = General Education Sciences 2 = Natural Sciences and Mathematics 3 = Arts and Humanities 4 = Social Sciences	98 (26.2) 181 (48.4) 5 (1.3) 90 (24.1)
9. How can artificial intelligence help improve access to education?	1=By increasing tuition fees 2=By providing real-time translation services 3=By excluding students with disabilities 4=By decreasing access to educational materials	/ 330 (88.2) 14 (3.7) 30 (8.0)
10. Which of the following is NOT a potential challenge associated with the integration of artificial intelligence in education?	1=Ensuring data privacy and security 2=Addressing biases in AI algorithms 3= Increasing efficiency in grading assignments 4=Adapting to rapid technological advancements	68 (18.2) 129 (34.5) 89 (23.8) 88 (23.5)

Table 3. presents students' perceptions of the benefits and applications of artificial intelligence in academic settings. The majority of respondents (88.5%) correctly recognized that AI can assist grading and assessment processes by providing instant feedback to students. More than half of the participants (60.7%) identified personalized learning experiences as the main advantage of AI-powered learning platforms, although 30.2% selected a one-size-fits-all approach to learning.

Table 4. Distribution of responses to AI knowledge and perception questionnaire items among study participants- Concerns, Ethical Considerations, and Future Implications of AI

		n (%)
11. What role can AI play in enhancing professional development?	1=By replacing employees with AI-powered robots 2=By providing personalized outputs for workers 3=By decreasing access to professional development resources 4=By ignoring the need for ongoing learning	52 (13.9) 279 (74.6) 29 (7.8) 14 (3.7)
12. Which of the following is an advantage of AI-based tutoring systems?	1=Decreased student engagement 2=Limited access to personalized feedback 3=Tailored learning experiences for individual students 4=No impact on student academic performance	19 (5.1) 43 (11.5) 302 (80.7) 10 (2.7)
13. How can artificial intelligence help reduce learning gaps among students?	1=By increasing educational inequalities 2=By providing personalized interventions and support 3=By excluding students with diverse learning needs 4=By decreasing access to educational resources	43 (11.5) 270 (72.2) 38 (10.2) 23 (6.1)
14. What is the primary purpose of using artificial intelligence in educational research?	1=To decrease data analysis accuracy 2=To ignore emerging trends in education 3=To identify patterns and insights from large datasets 4=To exclude researchers from the data analysis process	30 (8.0) 46 (12.3) 284 (75.9) 14 (3.7)
15. How might artificial intelligence influence the future of education?	1=By decreasing the importance of human teachers 2=By revolutionizing teaching and learning practices 3=By limiting access to educational resources 4=By disregarding the need for ongoing learning opportunities	67 (17.9) 220 (58.8) 29 (7.8) 58 (15.5)

Table 4. presents participants' perceptions regarding the future implications of artificial intelligence, its role in professional development, and its potential contribution to education and research. The majority of respondents (74.6%) recognized that AI can enhance professional development by providing personalized outputs and support for workers. Similarly, most students (80.7%) identified tailored learning experiences as the primary advantage of AI-based tutoring systems.

More than two-thirds of participants (72.2%) believed that AI can help reduce learning gaps among students through personalized interventions and support. In addition, 75.9% correctly identified the primary role of AI in educational research as the ability to identify patterns and insights from large datasets.

Table 5. Comparison of AI knowledge scores according to demographic and educational characteristics of participants

		Mean±SD	p
Sex	Male	10,04±2,60	0,003 ¹
	Female	10,91±2,85	
Study	Medicine	10,01±2,82	0,003 ¹
	Dental medicine	10,86±2,54	
Year of the study	Second	10,81±2,58	0,002 ¹
	Third	8,63±1,62*	
	Fourth	9,61±1,78	
	Fifth	10,86±2,78	
	Sixth	9,85±2,93	

¹ Independent samples t-test; ² One-way ANOVA; * Tukey post hoc test: second-year vs. third-year Table

Female students achieved significantly higher AI knowledge scores than male students (10.91±2.85 vs. 10.04±2.60, p=0.003). Likewise, dental medicine students demonstrated significantly higher knowledge scores compared with medical students (10.86±2.54 vs. 10.01±2.82, p=0.003) (Table 5).

Significant differences in AI knowledge scores were also observed across years of study (p=0.002). Post hoc Tukey analysis revealed a significant difference between second- and third-year students, with second-year students achieving higher knowledge scores (10.81±2.58 vs. 8.63±1.62). No other pairwise comparisons reached statistical significance.

Table 6. Students' attitudes, experiences, and perceptions regarding the use of artificial intelligence in education

		n (%)
How often do you use artificial intelligence?	Never Rarely Sometimes Frequently Always	67 (17.9) 220 (58.8) 29 (7.8) 58 (15.5) /
Are you familiar with the concept of artificial intelligence?	No Yes	18 (4.8) 356 (95.2)
Have you ever used artificial intelligence in your studies?	No Yes	33 (8.8) 341 (91.2)
Do you think artificial intelligence can improve the learning experience for students?	No Yes	29 (7.8) 345 (92.2)
Would you like to see greater integration of artificial intelligence in your educational institution?	No Yes	96 (25.7) 278 (74.3)
Are you interested in learning more about artificial intelligence?	No Yes	74 (17.8) 300 (80.2)
Would you consider a career in artificial intelligence or related fields?	No Yes	271 (72.5) 103 (27.5)
Do you believe that artificial intelligence can enhance creativity and innovation among students?	No Yes	149 (39.8) 225 (60.2)
Do you feel adequately prepared to interact with artificial intelligence in your academic activities?	No Yes	166 (44.4) 208 (55.5)
Would you feel comfortable with artificial intelligence assisting teachers in grading assignments and examinations?	No Yes	244 (65.2) 130 (34.8)
Do you think artificial intelligence could replace human teachers in the future?	No Yes	311 (83.2) 63 (16.8)
Would you feel comfortable with AI collecting and analyzing your personal data for educational purposes?	No Yes	349 (93.3) 25 (6.7)

Table 6. presents students' experiences, attitudes, and perceptions regarding the use of artificial intelligence (AI) in education. More than half of the respondents reported using AI rarely (58.8%), while 17.9% stated that they never use AI. Although students generally viewed AI positively, only 27.5% reported that they would consider pursuing a career in AI or related fields. Nevertheless, 60.2% of them believed that AI can enhance creativity and innovation among students.

Most students (83.2%) did not believe that AI could replace human teachers in the future. Furthermore, concerns regarding privacy and data protection were evident, as 93.3% of respondents reported that they would not feel comfortable with AI collecting and analyzing their personal data for educational purposes.

DISCUSSION

The present study provides a comprehensive assessment of medical and dental students' knowledge, attitudes, and perceptions regarding the use of artificial intelligence (AI) in education. Overall, the findings indicate that participants demonstrated a generally good level of AI knowledge, widespread familiarity with AI technologies, and predominantly positive attitudes toward their educational applications. Most students had already incorporated AI into their learning activities, recognized its potential to improve education and professional development, and expressed strong interest in expanding their AI-related knowledge through formal education.

Knowledge and AI literacy

Our findings contrast with several earlier studies reporting relatively limited AI literacy among healthcare students despite generally favorable attitudes toward AI (4,6,7,9,11-13). Previous investigations frequently described a discrepancy between students' enthusiasm for AI and their confidence in understanding its principles or practical applications. In contrast, participants in the present study demonstrated substantially stronger baseline knowledge. This difference may reflect the rapid expansion of publicly accessible AI technologies during recent years, particularly the widespread availability of generative AI systems. As AI-powered tools have become integrated into students' everyday learning, many learners now acquire AI-related knowledge through routine academic use, independent exploration, and self-directed learning in addition to formal education.

Students' attitudes toward artificial intelligence

The present study also demonstrated highly positive attitudes toward AI among medical and dental students. Our findings are consistent with previous studies conducted in North America, Europe, the Middle East, and Asia, which consistently report favorable attitudes toward AI despite differences in educational systems and healthcare environments (2,4,6,7,9,10,13). Students generally perceive AI as a technology capable of improving personalized learning, facilitating access to educational resources, supporting clinical reasoning, and enhancing learning efficiency. The consistency of these findings across diverse educational contexts suggests that positive attitudes toward AI have become a defining characteristic of contemporary healthcare students rather than an isolated institutional phenomenon.

Differences according to demographic and educational characteristics

The present study also identified significant differences in AI knowledge according to gender, study program, and year of study, suggesting that AI literacy is not uniformly distributed among healthcare students. Although these differences should be interpreted cautiously, they provide valuable insights into how educational experiences and learner characteristics may influence AI competence. Female students achieved significantly higher AI knowledge scores than their male counterparts. Previous studies have reported inconsistent findings regarding sex differences in AI literacy, with some identifying no significant differences and others describing greater confidence or acceptance among male students despite similar levels of knowledge (4,6,12,13). Our findings therefore contribute to an evolving body of evidence indicating that AI competence cannot be explained solely by demographic characteristics.

Limitations

The cross-sectional design precludes conclusions regarding causal relationships or changes in AI knowledge and attitudes over time. Longitudinal studies following the same cohorts throughout their education would provide a more comprehensive understanding of how AI competencies develop and how structured educational interventions influence students' preparedness to use AI responsibly (3,5). Second, this study was conducted at a single higher education institution, which may limit the generalizability of the findings.

Future directions

The findings of the present study identify several priorities for future research. Longitudinal studies are needed to examine how AI knowledge, attitudes, and competencies evolve throughout undergraduate education and into clinical practice. Such studies would help determine whether structured AI curricula produce sustained improvements in AI literacy and whether these improvements translate into more effective, ethical, and responsible use of AI in healthcare settings (3,5). Future research should also examine strategies for ensuring equitable access to AI education across institutions with varying technological resources and educational capacities in AI preparedness among future healthcare professionals (13,22).

Conclusion

This study demonstrates that medical and dental students possess generally good knowledge of artificial intelligence, frequently use AI technologies in their educational activities, and hold predominantly positive attitudes toward their integration into healthcare education. At the same time, students clearly distinguish between AI as a valuable educational support tool and AI as a substitute for human expertise. Their strong concerns regarding privacy, ethical governance, transparency, and the preservation of human oversight indicate that acceptance of AI depends not only on technological capabilities but also on trust in its responsible implementation.

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