

## ARTIFICIAL INTELLIGENCE USE AND PERCEPTIONS AMONG NURSING STUDENTS: A CROSS-SECTIONAL STUDY

Ilda TAKA<sup>1</sup>, Elona HASALLA<sup>1</sup>, Albana SULA<sup>1</sup>, Blerina BAHITI<sup>1</sup>, Rajmonda HIDA<sup>1</sup>,  
Blerina BANI<sup>1</sup>

<sup>1</sup> Faculty of Medical Technical Sciences, University of Elbasan, Elbasan, Albania

[Ilda.taka@uniel.edu.al](mailto:Ilda.taka@uniel.edu.al)

### Abstract

**Introduction:** Artificial intelligence is being increasingly integrated into education and healthcare, offering innovative opportunities to improve the learning process, the understanding of clinical cases, and the self-confidence of students. However, it remains necessary to assess nursing students' perceptions of AI and its impact on their academic and professional development.

The **aim of the study** was to assess the use of AI, students' perceptions of it, and its impact on academic performance and professional preparation among nursing students.

**Methods:** A descriptive cross-sectional study was conducted at the Faculty of Medical Sciences in Elbasan. Data were collected through a structured online questionnaire assessing demographic characteristics, AI use, perceptions, and its impact. The data were analyzed using SPSS 23.0, including descriptive statistics, the chi-square test, and crude odds ratios (COR).

**Results:** A total of 279 students participated in the study. Most of them (83.9%) reported using AI, mainly for information searching (92.3%) and understanding lectures (41%). Virtual assistants such as ChatGPT were the most commonly used tools (78.2%). Academic average was a factor significantly associated with AI use, whereas place of residence and cycle of study did not show significant associations. Students reported a moderate impact on understanding lectures and exam preparation, but a limited impact on practical skills, critical thinking, and empathy.

**Conclusions:** AI represents an effective supportive tool in nursing education by improving theoretical understanding and academic efficiency. However, its impact on human competencies remains limited. In order to optimize its benefits and prevent dependency, a structured and ethical integration is needed.

**Keywords:** Artificial intelligence, nursing education, impact, perception, nursing student

### Introduction

In the last decade, artificial intelligence has been one of the most important developments in the field of technology, being integrated into various fields, including healthcare (Buchanan et al., 2021; Labrague et al., 2025; Rony et al., 2025). Its use is changing the way healthcare services are delivered, but also the way future healthcare professionals are prepared, especially in the context of decision-making and patient management (Fernandes et al., 2026).

Artificial intelligence is also having a visible impact on nursing education. Today, students no longer rely only on traditional learning methods, but increasingly use digital methods to understand and assimilate their theoretical and practical knowledge (Cucci et al., 2025). AI-based technologies such as virtual simulations, virtual patients, and intelligent systems supporting decision-making have enabled an interactive and safe environment for the development of critical thinking and clinical reasoning (Fung et al., 2025; Sriram et al., 2025). These tools also contribute to the development of nursing care plans and to the understanding of complex clinical processes (Wei et al., 2025).

In recent years, a special role has also been taken by various generative AI platforms such as ChatGPT and similar tools, which have become part of students' daily lives (Zgambo et al., 2025). These tools offer quick access to information, help explain difficult concepts, support

the processing of academic materials, and generate structured responses similar to those produced by humans (Guirguis et al., 2026; Khlaif et al., 2025; Lifshits & Rosenberg, 2024). For nursing students, these technologies provide potential support for academic performance and professional development by linking theoretical, practical, and clinical knowledge (George Pallivathukal et al., 2024).

Various studies have shown that the use of artificial intelligence improves clinical reasoning ability, critical thinking, and self-confidence in practice (Buchanan et al., 2021; Labrague et al., 2023). AI also provides personalized and interactive information, adapting to students' needs and offering rapid feedback (Glauberman et al., 2023; Lane et al., 2024). At the same time, the use of technology can help improve the quality of patient care through continuous support in monitoring and decision-making (Martinez-Ortigosa et al., 2023).

However, beyond its benefits, the literature shows that the use of artificial intelligence is associated with a series of challenges and concerns in the field of nursing education. Uncontrolled use of AI may lead to reduced active student involvement in the learning process, increased dep

**There are no sources in the current document.**endence on technology, and reduced professional competence (Dagcan Sahin & Yildirim, 2026; Pailaha, 2023; Sun & Hoelscher, 2023). Other concerns relate to the accuracy of information, academic privacy, and the risk of plagiarism (Le Lagadec et al., 2024; Lund et al., 2025) issues that are particularly sensitive in the field of nursing.

Another aspect that should not be neglected is the need to develop new competencies among nursing students, including the critical use of technology and data analysis (Wynn, 2025). What is important to emphasize is that AI cannot replace the human elements of the nursing profession such as empathy, communication, and patient care (Montemayor et al., 2022).

Although the use and impact of artificial intelligence in nursing education continues to grow, evidence on how students use and perceive it in practice remains limited. Most studies focus on evaluating the theoretical benefits of AI, while less attention has been paid to students' real-life experiences and the factors influencing their use of AI in the educational context (Khlaif et al., 2025). Moreover, there are several barriers such as the lack of standardization in AI education and inequalities in access (El Arab et al., 2025) .

It is important to study nursing students' perceptions and experiences regarding the use of artificial intelligence tools, with a focus on identifying benefits, challenges, and implications in order to develop educational policies for the most effective and ethical use of AI (Abuadas et al., 2025; Dodson et al., 2025).

Therefore, this study aims to analyze the use, perceptions, and challenges of nursing students regarding artificial intelligence in the academic context, as well as the impact of these tools on the learning process and professional practice.

## **Materials and methods**

**2.1 Study design.** A descriptive cross-sectional study was conducted with a combined quantitative and qualitative approach, focusing on the analysis of the frequency of artificial intelligence use, as well as students' perceptions and concerns regarding its impact on academic and practical nursing skills.

**2.2 Study area and population:** The study included students from the General Nursing program at the Faculty of Medical Technical Sciences in Elbasan. Data collection was conducted during the period January–March 2026. Participants were selected through convenience sampling, including students from all years in the Bachelor's and Master's study cycles, who participated voluntarily.

Data were collected through a self-administered structured questionnaire created on the Google Forms platform and distributed through student communication groups. Participants were informed in advance about the purpose of the study, were guaranteed data confidentiality and anonymity, and were asked to provide electronic informed consent at the beginning of the questionnaire. Only fully completed questionnaires were included in the study.

**2.3 Instrument:** A questionnaire was developed by the authors focusing on the use of AI among nursing students. The instrument consisted of three sections:

The *first section* included demographic data, including age, gender, place of residence (urban/rural), study cycle (Bachelor's/Master's), academic average, AI use, and frequency of use. This section also included questions regarding the types of tools used (virtual assistance such as ChatGPT, educational platforms, text-generation tools, or others) and the purpose of use (e.g., information search, studying, academic assignments, understanding clinical cases).

The *second section* consisted of questions evaluating the impact of artificial intelligence on knowledge acquisition and preparation for professional practice, such as understanding lectures, exam preparation, academic performance, saving study time, understanding clinical cases, nursing care, self-confidence during practice, critical thinking, communication skills, and empathy toward patients. A 5-point Likert scale was used for this purpose (1 = "no impact at all" to 5 = "very high impact").

The *third section* assessed students' attitudes and concerns regarding AI through structured questions using a Likert scale (1 = "strongly disagree" to 5 = "strongly agree"). These included the usefulness of AI, its impact on the quality of learning and clinical preparation, the risk of dependency, the reliability of information, and its impact on critical thinking.

**2.4 Data analysis:** The data were analyzed using SPSS version 23.0. Categorical data were presented as frequencies and percentages, while continuous data were presented using means and standard deviations. The chi-square test was used to evaluate the relationship between AI use and variables. To identify factors associated with artificial intelligence use, crude odds ratios (COR) with 95% confidence intervals were reported. A p-value < 0.005 was considered statistically significant. Likert-scale variables were analyzed descriptively and presented as percentages for each response category.

## **Rezultatet**

**3.1 General characteristics:** A total of 279 General Nursing students participated in the study. Of these, 97.8% were female and only 2.2% male. The mean age of participants was  $22.4 \pm 5.7$  years. More than half of the students (55.9%) lived in urban areas, while 44.1% lived in rural areas. Most students (71%) belonged to the Bachelor's study cycle. Regarding academic performance, most students had a grade average within the range of 7.0–7.9 (44.1%), followed by 28% with an average of 6.0–6.9. Meanwhile, 16.1% of students reported an average of 8.0–8.9 and only 4.3% had a very high average of 9.0–10. Students with an average below 6.0

represented only 7.5% of participants. Most students (83.9%) stated that they used artificial intelligence (Table 1).

Table 1. Demographic characteristics of participants (N = 279)

| Variable               | Category      | N              | %     |
|------------------------|---------------|----------------|-------|
| Age (years)            | Mean $\pm$ SD | 22.4 $\pm$ 5.7 | —     |
| Residence              | Urban         | 156            | 55.9% |
|                        | Rural         | 123            | 44.1% |
| Gender                 | Male          | 6              | 97.8% |
|                        | Female        | 273            | 2.2%  |
| Cycle of study         | Bachelor's    | 198            | 71.0% |
|                        | Master's      | 81             | 29.0% |
| Academic average (GPA) | < 6.0         | 21             | 7.5%  |
|                        | 6.0 – 6.9     | 78             | 28.0% |
|                        | 7.0 – 7.9     | 123            | 44.1% |
|                        | 8.0 – 8.9     | 45             | 16.1% |
|                        | 9.0 – 10      | 12             | 4.3%  |
| AI use                 | Yes           | 234            | 83.9% |
|                        | No            | 45             | 16.1% |

**3.2 Use of artificial intelligence:** According to the data, a high percentage of students reported being AI users, specifically 83.9%. Of these, 44.9% stated that they used AI daily, while 29.5% used it weekly. A smaller proportion reported occasional use, with 20.5% using it rarely and only 5.1% monthly. Regarding the types of tools used, 78.2% reported using virtual assistants such as ChatGPT or similar tools, 26.9% used educational platforms, 15.4% used text-generation tools, and 21.8% used other tools. Most participants (93.2%) used AI for information searching, while 41% used it for understanding lectures, 16.7% for academic assignments, and 12% for understanding clinical cases.(Table 2)

Table 2. Frequency, tools, and purpose of artificial intelligence use (N = 234)

| Variable                               | Category                            | N   | %     |
|----------------------------------------|-------------------------------------|-----|-------|
| Frequency of AI use                    | Every day                           | 105 | 44.9% |
|                                        | Every week                          | 69  | 29.5% |
|                                        | Every month                         | 12  | 5.1%  |
|                                        | Rarely                              | 48  | 20.5% |
| Tools used (multiple responses)        | Virtual assistance (ChatGPT)        | 183 | 78.2% |
|                                        | Educational platforms               | 63  | 26.9% |
|                                        | Text generation                     | 36  | 15.4% |
|                                        | Other                               | 51  | 21.8% |
| Purpose of AI use (multiple responses) | Studying / learning lecture content | 96  | 41.0% |

| Variable | Category                      | N   | %     |
|----------|-------------------------------|-----|-------|
|          | Academic assignments / essays | 39  | 16.7% |
|          | Understanding clinical cases  | 28  | 12.0% |
|          | Information search            | 216 | 92.3% |

**3.3 Factors associated with the use of artificial intelligence:** Bivariate analysis showed that students living in urban areas used artificial intelligence more than those in rural areas, but this difference was not statistically significant (COR = 1.56, 95% CI: 0.82–2.96,  $p = 0.23$ ). Likewise, no association was found between study cycle and use of artificial intelligence, as Bachelor's and Master's students had a similar probability of use (COR = 0.84, 95% CI: 0.42–1.65,  $p = 0.736$ ). Bivariate analysis showed that academic average had a significant effect on the use of artificial intelligence. Students with an average of 6.0–6.9 had six times higher odds of using AI compared to those with a GPA below 6.0 (COR = 6.05, 95% CI: 2.11–17.36,  $p < 0.001$ ). The effect was even more evident among students with an average of 7.0–7.9 (COR = 10.18, 95% CI: 3.59–28.88,  $p < 0.001$ ) and 8.0–8.9 (COR = 7.15, 95% CI: 2.13–24.06,  $p = 0.002$ ), suggesting a significant association between academic average and AI use. (Table 3)

Table 3. Factors associated with the use of artificial intelligence

| Variable                     | Category   | AI Use n (%) | No AI n (%) | COR<br>CI)            | (95%<br>p-value |
|------------------------------|------------|--------------|-------------|-----------------------|-----------------|
| Residence                    | Rural      | 99 (80.5%)   | 24 (19.5%)  | 1.00                  | —               |
|                              | Urban      | 135 (86.5%)  | 21 (13.5%)  | 1.56<br>(0.82–2.96)   | 0.23            |
| Cycle of study               | Bachelor's | 165 (84.6%)  | 30 (15.4%)  | 1.00                  | —               |
|                              | Master's   | 69 (82.1%)   | 15 (17.9%)  | 0.84<br>(0.42–1.65)   | 0.736           |
| Academic<br>average<br>(GPA) | < 6.0      | 10 (47.6%)   | 11 (52.4%)  | 1.00                  | —               |
|                              | 6.0–6.9    | 66 (84.6%)   | 12 (15.4%)  | 6.05<br>(2.11–17.36)  | <0.001          |
|                              | 7.0–7.9    | 111 (90.2%)  | 12 (9.8%)   | 10.18<br>(3.59–28.88) | <0.001          |
|                              | 8.0–8.9    | 39 (86.7%)   | 6 (13.3%)   | 7.15<br>(2.13–24.06)  | 0.002           |
|                              | 9.0–10.0   | 8 (66.7%)    | 4 (33.3%)   | 2.20<br>(0.50–9.61)   | 0.290           |

Table 4. Impact of artificial intelligence on learning outcomes (N=234)

| Item                         | 1 – No influence | 2 – Low influence | 3 – Moderate influence | 4 – High influence | 5 – Very high influence |
|------------------------------|------------------|-------------------|------------------------|--------------------|-------------------------|
| Understanding lectures       | 52 (22.2%)       | 49 (20.9%)        | 84 (35.9%)             | 43 (18.4%)         | 6 (2.6%)                |
| Exam preparation             | 45 (19.2%)       | 54 (23.1%)        | 93 (39.7%)             | 39 (16.7%)         | 3 (1.3%)                |
| Academic performance         | 81 (34.6%)       | 54 (23.1%)        | 81 (34.6%)             | 15 (6.4%)          | 3 (1.3%)                |
| Time-saving while studying   | 60 (25.6%)       | 66 (28.2%)        | 60 (25.6%)             | 30 (12.8%)         | 18 (7.7%)               |
| Understanding clinical cases | 36 (15.4%)       | 39 (16.7%)        | 87 (37.2%)             | 45 (19.2%)         | 27 (11.5%)              |
| Nursing care                 | 87 (37.2%)       | 39 (16.7%)        | 78 (33.3%)             | 21 (9.0%)          | 9 (3.8%)                |
| Self-confidence              | 117 (50.0%)      | 42 (18.0%)        | 48 (20.5%)             | 18 (7.7%)          | 9 (3.8%)                |
| Critical thinking            | 84 (35.9%)       | 57 (24.4%)        | 69 (29.5%)             | 15 (6.4%)          | 9 (3.8%)                |
| Communication skills         | 99 (42.3%)       | 39 (16.7%)        | 60 (25.6%)             | 24 (10.3%)         | 12 (5.1%)               |
| Empathy toward patients      | 126 (53.8%)      | 33 (14.1%)        | 54 (23.1%)             | 15 (6.4%)          | 6 (2.6%)                |

**3.4 Students' perceptions of the impact of AI:** Data analysis showed that AI tools had a varying impact on different aspects of learning and professional preparation for nursing students. Specifically, a moderate impact (Likert 3) was reported in understanding lectures (35.9%) and exam preparation (39.7%). Likewise, a moderate impact was reported for understanding clinical cases (37.2%). On the other hand, AI was reported to have a low impact on academic performance by 34.6% of students, and also on saving study time by 28.2%.

The impact of AI proved limited in practical and social skills. According to the results, students reported no impact (Likert 1) on nursing care (37.2%), self-confidence (50%), critical thinking (35.9%), communication skills (42.3%), and empathy toward patients (53.8%). (Table 4).

**3.5 Students' perceptions of AI use:** Students' perceptions of the use of artificial intelligence (AI) are presented in Table 5. Most students considered AI to be a useful tool, with 43.6% expressing a neutral attitude and 24.8% agreeing or strongly agreeing with its usefulness. Likewise, 35.9% held a neutral attitude regarding the improvement of learning quality, while 28.2% expressed agreement. However, more than half of the participants (55.2%) perceived AI to have a low impact on their professional preparation, while 42.8% reported a low impact on their critical thinking. As for the risk of dependency, 39.7% did not consider AI a factor that creates dependency. On the other hand, almost half of the participants (47.4%) agreed or strongly agreed that information obtained from AI is not always reliable. (Table 5)

Table 5. Participants' perceptions of AI use (N=234)

| Statement                                         | 1 (Strongly disagree) | 2 Disagree | 3 Neutral/Mod erate | 4 Agree    | 5 (Strongly agree) |
|---------------------------------------------------|-----------------------|------------|---------------------|------------|--------------------|
| AI is a useful tool                               | 39 (16.7%)            | 35 (15.0%) | 102 (43.6%)         | 40 (17.1%) | 18 (7.7%)          |
| AI improves the quality of learning               | 39 (16.7%)            | 45 (19.2%) | 84 (35.9%)          | 51 (21.8%) | 15 (6.4%)          |
| AI helps in preparation for professional practice | 54 (23.1%)            | 75 (32.1%) | 78 (33.3%)          | 15 (6.4%)  | 12 (5.1%)          |
| AI negatively affects critical thinking           | 39 (16.7%)            | 61 (26.1%) | 72 (30.8%)          | 39 (16.7%) | 23 (9.8%)          |
| AI may create dependency                          | 66 (28.2%)            | 27 (11.5%) | 75 (32.1%)          | 42 (17.9%) | 24 (10.3%)         |
| Information from AI is not always reliable        | 33 (14.1%)            | 6 (2.6%)   | 84 (35.9%)          | 60 (25.6%) | 51 (21.8%)         |

## Discussion

This study identified a high level of artificial intelligence use among nursing students in various aspects of their studies, with 83.9% of participants reporting that they were AI users. This result is consistent with the study by (Han et al., 2025) which reports a high level of AI use (92%) in university education. In our study, only a portion of students used AI on a daily basis, suggesting that its integration remains more functional, aimed at meeting specific academic needs, rather than being fully embedded in the learning process (Johnston et al., 2024).

The dominance of virtual assistants, especially ChatGPT (78.2%), indicates a global trend toward the use of generative AI as a primary source of information and education, confirming that AI facilitates the understanding of concepts and student learning (Arkan et al., 2025; BaiDoo-Anu & Owusu Ansah, 2023; Gonzalez-Garcia et al., 2025; Saatçi et al., 2024). However, the fact that the main use of AI among participants was for information searching, and less for academic and clinical skills, suggests that AI is perceived more as a means of quick access to information than as an educational tool (Zgambo et al., 2025).

Regarding perceptions of the use of artificial intelligence tools, the results of this study showed that participants held a neutral attitude regarding the role of AI in understanding lectures or preparing for exams. This suggests that students perceive AI more as a supportive and auxiliary tool than as a primary factor influencing their academic performance. These results contrast with those of studies by (Khlaif et al., 2025; Shen et al., 2025; Vieriu & Petrea, 2025) which reported a more pronounced impact of AI on improving academic performance.

n the other hand, a high percentage of students reported no impact of AI on practical and social aspects such as self-confidence, empathy, or communication ability. These findings reinforce the concept that AI can help in the learning process and in understanding concepts, but its impact on the development of interpersonal competencies is limited. AI cannot replace the human components of nursing practice (Gülirmak Güler & Şen Atasayar, 2025; Ronquillo et al., 2021)

Likewise, students' attitudes regarding the impact of AI on critical thinking were low, in line with other studies, suggesting that excessive reliance on AI may reduce active information processing and clinical judgment (Dagcan Sahin & Yildirim, 2026; Dodson et al., 2025).

The findings also showed that students were skeptical regarding the reliability of information obtained from AI and believed that there may be a risk of dependency on these technologies, findings which are also consistent with evidence from other studies (Farghaly Abdelallem et al., 2022; Mersal et al., 2026; Thomson et al., 2024), indicating that a large proportion of students have a high level of critical awareness.

The findings of the study showed that academic average is an important factor associated with the use of artificial intelligence among nursing students. Specifically, students with higher academic averages were more likely to use AI. These findings are also consistent with other studies (Bakarman et al., 2025; Gonzalez-Garcia et al., 2025) suggesting that academic performance stimulates interest in innovative technologies and the integration of digital tools (El Arab et al., 2025)

On the other hand, place of residence was not found to be a factor affecting AI use, suggesting that access to technology is similar among students living in urban and rural areas.

Likewise, no association was found between AI use and study cycle, indicating that the use of artificial intelligence technology is similar across different academic levels. AI use is influenced more by exposure to technology and individual attitudes toward it (Han et al., 2025; Zeng et al., 2026).

## **Conclusions**

The findings of this study showed that nursing students had a generally positive attitude toward the use of AI and perceived it as a supportive tool in the learning process. However, its impact was greater in the theoretical aspect, whereas its impact on their professional and interpersonal skills was more limited. These results emphasize the need for a more advanced integration of AI into nursing education. Training, experience, the development of digital competencies, and a supportive academic environment are essential for these tools to be used effectively.

## **Study limitations**

This study has several limitations. First, since data collection was based on self-reporting, this may be associated with subjectivity in students' assessment of impact or perception. In addition, because the questionnaire was distributed online, it may have favored students who were more interested in or more familiar with technology. On the other hand, the use of a cross-sectional method and the limitation of data collection to a single center did not allow us to assess cause-and-effect relationships, which limits the generalizability of the results. Therefore, future studies should use more advanced and qualitative methods, such as interviews, to better understand nursing students' perceptions of and the impact of AI.

## Abbreviations

AI – Artificial Intelligence  
GPA – Grade Point Average  
COR – Crude Odds Ratio  
SD – Standard Deviation  
N – Number of participants

## Acknowledgements

We would like to thank all nursing students from the Faculty of Medical Sciences in Elbasan who participated voluntarily in this study and contributed to the data collection

### Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

### Conflicts of Interest

The authors declare no conflicts of interest.

## References

- [1]. Abuadas M, Albikawi Z, Rayani A. The impact of an AI-focused ethics education program on nursing students' ethical awareness, moral sensitivity, attitudes, and generative AI adoption intention: A quasi-experimental study. *BMC Nursing*. 2025;24(1):720. doi:10.1186/s12912-025-03458-2
- [2]. Arkan B, Dallı ÖE, Varol B. The impact of ChatGPT training in the nursing process on nursing students' problem-solving skills, attitudes towards artificial intelligence, competency, and satisfaction levels: Single-blind randomized controlled study. *Nurse Education Today*. 2025;152:106765. doi:10.1016/j.nedt.2025.106765
- [3]. BaiDoo-Anu D, Owusu Ansah L. Education in the Era of Generative Artificial Intelligence (AI): Understanding the Potential Benefits of ChatGPT in Promoting Teaching and Learning. *Journal of AI*. 2023;7(1):52–62. doi:10.61969/jai.1337500
- [4]. Bakarman SS, Al-shammari A, Aboshaiqah A. Nursing Students' Perception of and Readiness for Artificial Intelligence in SAUDI ARABIA. *Nursing Open*. 2025;12(12):e70386. doi:10.1002/nop2.70386
- [5]. Buchanan C, Howitt ML, Wilson R, et al. Predicted Influences of Artificial Intelligence on Nursing Education: Scoping Review. *JMIR Nursing*. 2021;4(1):e23933. doi:10.2196/23933
- [6]. Cucci F, Marasciulo D, Romani M, et al. The Contribution of Artificial Intelligence in Nursing Education: A Scoping Review of the Literature. *Nursing Reports*. 2025;15(8):283. doi:10.3390/nursrep15080283
- [7]. Dagcan Sahin N, Yildirim M. Nursing Students' Experiences With Artificial Intelligence: A Qualitative Study on Education, Clinical Practice, and Future Expectations. *Journal of Evaluation in Clinical Practice*. 2026;32(2):e70413. doi:10.1111/jep.70413
- [8]. Dodson TM, Thompson-Hairston K, Reed JM. Nursing students' AI literacy and ethical understanding of AI in nursing education. *Teaching and Learning in Nursing*. 2025;20(4):390–394. doi:10.1016/j.teln.2025.07.004
- [9]. El Arab RA, Alshakihs AH, Alabdulwahab SH, et al. Artificial intelligence in nursing: A systematic review of attitudes, literacy, readiness, and adoption intentions among nursing students and practicing nurses. *Frontiers in Digital Health*. 2025;7:1666005. doi:10.3389/fdgh.2025.1666005
- [10]. Farghaly Abdelallem S, Dator W, Sankarapandian C. The Relationship between Nursing Students' Smart Devices Addiction and Their Perception of Artificial Intelligence. *Healthcare*. 2022;11(1):110. doi:10.3390/healthcare11010110
- [11]. Fernandes F, Shinnars L, Mota M, et al. Contributions of Artificial Intelligence to Decision Making in Nursing: A Scoping Review. *Nursing & Health Sciences*. 2026;28(1):e70308. doi:10.1111/nhs.70308

- [12]. Fung TCJ, Chan SL, Lam CFM, et al. Effects of generative artificial intelligence (GenAI) patient simulation on perceived clinical competency among global nursing undergraduates: A cross-over randomised controlled trial. *BMC Nursing*. 2025;24(1):934. doi:10.1186/s12912-025-03492-0
- [13]. George Pallivathukal R, Kyaw Soe HH, Donald PM, et al. ChatGPT for Academic Purposes: Survey Among Undergraduate Healthcare Students in Malaysia. *Cureus*. 2024. doi:10.7759/cureus.53032
- [14]. Glauberman G, Ito-Fujita A, Katz S, Callahan J. Artificial Intelligence in Nursing Education: Opportunities and Challenges. *Hawai'i Journal of Health & Social Welfare*. 2023;82(12):302–305.
- [15]. Gonzalez-Garcia A, Bermejo-Martinez D, Lopez-Alonso AI, et al. Impact of ChatGPT usage on nursing students education: A cross-sectional study. *Heliyon*. 2025;11(1):e41559. doi:10.1016/j.heliyon.2024.e41559
- [16]. Guirguis M, Fotsing S, Fevry J, et al. Artificial Intelligence in Health Professions Education: Qualitative Study of Student Experiences. *Journal of Medical Internet Research*. 2026;28:e82432. doi:10.2196/82432
- [17]. Gülirmak Güler K, Şen Atasayar B. The relationship between nursing students' attitudes toward artificial intelligence and their creative personality traits. *International Nursing Review*. 2025;72(1):e70008. doi:10.1111/inr.70008
- [18]. Han S, Kang HS, Gimber P, Lim S. Nursing Students' Perceptions and Use of Generative Artificial Intelligence in Nursing Education. *Nursing Reports*. 2025;15(2):68. doi:10.3390/nursrep15020068
- [19]. Johnston H, Wells RF, Shanks EM, Boey T, Parsons BN. Student perspectives on the use of generative artificial intelligence technologies in higher education. *International Journal for Educational Integrity*. 2024;20(1):2. doi:10.1007/s40979-024-00149-4
- [20]. Khlaif ZN, Salameh N, Ajouz M, et al. Using Generative AI in nursing education: Students' perceptions. *BMC Medical Education*. 2025;25(1):926. doi:10.1186/s12909-025-07416-z
- [21]. Labrague LJ, Aguilar-Rosales R, Yboa BC, et al. Student nurses' attitudes, perceived utilization, and intention to adopt artificial intelligence (AI) technology in nursing practice: A cross-sectional study. *Nurse Education in Practice*. 2023;73:103815. doi:10.1016/j.nepr.2023.103815
- [22]. Labrague LJ, Al Sabei S, Al Yahyaei A. Artificial intelligence in nursing education: A review of AI-based teaching pedagogies. *Teaching and Learning in Nursing*. 2025;20(3):210–221. doi:10.1016/j.teln.2025.01.019
- [23]. Lane SH, Haley T, Brackney DE. Tool or Tyrant: Guiding and Guarding Generative Artificial Intelligence Use in Nursing Education. *Creative Nursing*. 2024;30(2):125–132. doi:10.1177/10784535241247094
- [24]. Le Lagadec D, Jackson D, Cleary M. Artificial intelligence in nursing education: Prospects and pitfalls. *Journal of Advanced Nursing*. 2024;80(10):3883–3885. doi:10.1111/jan.16276
- [25]. Lifshits I, Rosenberg D. Artificial intelligence in nursing education: A scoping review. *Nurse Education in Practice*. 2024;80:104148. doi:10.1016/j.nepr.2024.104148
- [26]. Lund B, Mannuru NR, Teel ZA, et al. Student Perceptions of AI-Assisted Writing and Academic Integrity: Ethical Concerns, Academic Misconduct, and Use of Generative AI in Higher Education. *AI in Education*. 2025;1(1):2. doi:10.3390/aieduc1010002
- [27]. Martinez-Ortigosa A, Martinez-Granados A, Gil-Hernández E, et al. Applications of Artificial Intelligence in Nursing Care: A Systematic Review. *Journal of Nursing Management*. 2023;1–12. doi:10.1155/2023/3219127
- [28]. Mersal FA, Mersal NA, Ibrahim NM, et al. Nursing students' trust in artificial intelligence (AI) clinical recommendations: A multicenter cross-sectional study of risk-benefit perceptions across Saudi Arabian universities. *DIGITAL HEALTH*. 2026;12:20552076261429670. doi:10.1177/20552076261429671
- [29]. Montemayor C, Halpern J, Fairweather A. In principle obstacles for empathic AI: Why we can't replace human empathy in healthcare. *AI & Society*. 2022;37(4):1353–1359. doi:10.1007/s00146-021-01230-z
- [30]. Pailaha AD. The Impact and Issues of Artificial Intelligence in Nursing Science and Healthcare Settings. *SAGE Open Nursing*. 2023;9:23779608231196850. doi:10.1177/23779608231196847
- [31]. Ronquillo CE, Peltonen L, Pruinelli L, et al. Artificial intelligence in nursing: Priorities and opportunities from an international invitational think-tank of the Nursing and Artificial Intelligence Leadership Collaborative. *Journal of Advanced Nursing*. 2021;77(9):3707–3717. doi:10.1111/jan.14855
- [32]. Rony MKK, Ahmad S, Das DC, et al. Nursing Students' Perspectives on Integrating Artificial Intelligence Into Clinical Practice and Training: A Qualitative Descriptive Study. *Health Science Reports*. 2025;8(4):e70728. doi:10.1002/hsr2.70728

- [33]. Saatçi G, Korkut S, Ünsal A. The effect of the use of artificial intelligence in the preparation of patient education materials by nursing students on the understandability, actionability and quality of the material: A randomized controlled trial. *Nurse Education in Practice*. 2024;81:104186. doi:10.1016/j.nepr.2024.104186
- [34]. Shen M, Shen Y, Liu F, Jin J. Prompts, privacy, and personalized learning: Integrating AI into nursing education—a qualitative study. *BMC Nursing*. 2025;24(1):470. doi:10.1186/s12912-025-03115-8
- [35]. Sriram A, Ramachandran K, Krishnamoorthy S. Artificial Intelligence in Medical Education: Transforming Learning and Practice. *Cureus*. 2025. doi:10.7759/cureus.80852
- [36]. Sun GH, Hoelscher SH. The ChatGPT Storm and What Faculty Can Do. *Nurse Educator*. 2023;48(3):119–124. doi:10.1097/NNE.0000000000001390
- [37]. Thomson SR, Pickard-Jones BA, Baines S, Otermans PCJ. The impact of AI on education and careers: What do students think? *Frontiers in Artificial Intelligence*. 2024;7:1457299. doi:10.3389/frai.2024.1457299
- [38]. Vieriu AM, Petrea G. The Impact of Artificial Intelligence (AI) on Students' Academic Development. *Education Sciences*. 2025;15(3):343. doi:10.3390/educsci15030343
- [39]. Wei Q, Pan S, Liu X, et al. The integration of AI in nursing: Addressing current applications, challenges, and future directions. *Frontiers in Medicine*. 2025;12:1545420. doi:10.3389/fmed.2025.1545420
- [40]. Wynn MO. Beyond Competency: Developing Critical Digital Capabilities in Nursing Students Through Freirean Pedagogy. *Nursing Inquiry*. 2025;32(2):e70011. doi:10.1111/nin.70011
- [41]. Zeng Q, Zhu J, Wang Y, et al. Artificial intelligence self-efficacy and attitudes among nursing students: A multicenter network analysis of educational stratification. *BMC Medical Education*. 2026;26(1):299. doi:10.1186/s12909-026-08685-y
- [42]. Zgambo M, Costello M, Buhlmann M, et al. Artificial intelligence and academic integrity in nursing education: A mixed methods study on usage, perceptions, and institutional implications. *Nurse Education Today*. 2025;153:106796. doi:10.1016/j.nedt.2025.106796