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Artificial Intelligence Utilization and Clinical Competence Among Nursing Students: The Mediating Role of Self-Regulated Learning

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Abstract: Artificial Intelligence (AI) has emerged as a valuable educational tool that supports nursing students' learning processes, clinical preparation, and independent learning. However, the mechanism by which AI use contributes to the development of clinical competence remains underexplored. This study aimed to determine the mediating role of self-regulated learning in the relationship between the use of artificial intelligence and clinical competence among nursing students. The study was conducted among Bachelor of Science in Nursing students enrolled during Academic Year 2025–2026 at a higher education institution in Western Mindanao, Philippines. An explanatory sequential mixed-methods design was utilized. The quantitative phase involved 252 nursing students selected through simple random sampling, while the qualitative phase involved eight (8) purposively selected participants who participated in semi-structured interviews. Data were collected using three researcher-adapted questionnaires measuring AI utilization, self-regulated learning, and clinical competence, along with an interview guide for the qualitative component. Quantitative data were analyzed using Jamovi software, including frequencies, percentages, means, standard deviations, Pearson product-moment correlations, and mediation analyses. Qualitative data were analyzed using thematic analysis through HyperResearch to identify emerging themes from participants' experiences. Results revealed that nursing students demonstrated high levels of AI utilization (M = 3.57), self-regulated learning (M = 4.07), and clinical competence (M = 3.98). Significant positive relationships were found between AI utilization and both self-regulated learning and clinical competence. Mediation analysis revealed that self-regulated learning significantly mediated the relationship between AI utilization and clinical competence, accounting for 74.4% of the total effect. This indicates that AI contributes to clinical competence primarily by strengthening students' ability to regulate their learning through goal setting, self-monitoring, and self-reflection. Qualitative findings supported the mediation results, revealing four themes: AI as a Cognitive Learning Support System, AI as a Catalyst for Self-Regulated Learning, AI as a Facilitator of Clinical Competence Development, and Responsible AI Use: Balancing Convenience and Professional Judgment. The study concludes that artificial intelligence enhances nursing students' clinical competence primarily by fostering self-regulated learning behaviors. Nursing education programs should integrate AI-supported learning strategies while intentionally strengthening students' self-regulation, critical thinking, and professional judgment.

Keywords: *Artificial Intelligence, AI Utilization, Clinical Competence, Mixed-Methods Study, Nursing Education, Nursing Students, Self-Regulated Learning.*

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I. INTRODUCTION

Artificial intelligence (AI) has transformed educational practices by providing learners with adaptive, accessible, and personalized learning support. In nursing education, AI technologies such as intelligent tutoring systems, virtual simulations, and clinical decision-support applications have created opportunities for students to enhance knowledge acquisition, clinical preparation, and independent learning. These technologies provide immediate feedback, simplify complex concepts, and allow students to engage in learning experiences beyond traditional classroom boundaries. In nursing education, simulation tools powered by AI help students get better at making decisions, staying engaged, and feeling confident on the job (Zawacki-Richter et al., 2021; Shorey et al., 2021).

Although AI has been recognized as a valuable educational innovation, its contribution to the development of nursing competence does not depend solely on the availability of technology. The effectiveness of AI may depend on how students engage with these tools and regulate their own learning processes. Thus, self-regulated learning (SRL) becomes an essential mechanism that may explain how AI utilization translates into improved clinical competence. These tools offer real-time feedback, engaging learning

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experiences, and exposure to future clinical scenarios that are often unavailable in traditional settings (Holmes et al., 2022; Ouyang et al., 2022).

Self-regulated learning (SRL) is crucial for student success as students plan, track, and reflect on their learning without constant guidance (Zimmerman, 2002). Research shows that such students perform better and handle clinical challenges more easily (Panadero, 2017). AI platforms enhance SRL by providing tailored guidance and feedback (Viberg et al., 2020). Self-regulated learning is when students set goals for themselves, track their progress, and reflect on what worked (Zimmerman, 2002). Researchers have found that digital learning tools effectively support this process by providing students with constant feedback and opportunities to self-check (Viberg et al., 2020). You see these features a lot with AI platforms.

Clinical competence is central to nursing, involving knowledge, skills, and decision-making. Traditional training faces challenges such as limited case diversity and limited practice opportunities. AI simulations offer a safe, consistent way for students to repeatedly practice and refine their skills without the unpredictability of real-world settings (Foronda et al., 2020). Being clinically competent means applying knowledge, performing skills, and making sound decisions in real situations. Simulation-based learning is valued because it allows mistakes and learning without risking patients (Foronda et al., 2020). AI makes these simulations more lifelike and interactive. Studies show that AI influences clinical competence, sometimes directly and sometimes by helping students self-regulate their learning. Those who set goals and track progress with AI tend to perform better (Panadero, 2017). However, research on how self-regulated learning and AI together affect clinical competence is limited.

According to Miles (2017), a research gap exists when literature is unexplored or inadequately studied. This study highlights methodological, empirical, and population gaps. Prior research on AI in education mainly focuses on academic performance, technology acceptance, or learning outcomes, with limited attention to AI's impact on nursing students' self-regulated learning and clinical skills. Although previous studies have documented the benefits of artificial intelligence in enhancing learning outcomes, academic performance, and technology acceptance, limited research has examined the mechanisms through which AI contributes to the development of clinical competence among nursing students. Existing studies have largely employed quantitative approaches and have focused on educational outcomes rather than the underlying learning processes that explain how AI influences competence development. Furthermore, there is a scarcity of mixed-methods studies examining the mediating role of self-regulated learning in the relationship between AI use and clinical competence, particularly among nursing students in developing-country contexts. Consequently, a significant empirical and contextual gap remains regarding how AI supports clinical competence by enhancing self-regulated learning behaviors. Additionally, nursing students in local and developing contexts are underrepresented. Despite the increasing use of AI in education and healthcare, few studies have examined the relationship among AI utilization, nursing self-regulated learning, and clinical competence using mixed methods. Most focus on acceptance or academic outcomes, leaving a gap in understanding nursing students' personal AI experiences and their impact on learning autonomy and clinical practice. Addressing this is crucial to ensure AI enhances, not hinders, the holistic development of future nurses.

Anchored in the Technology Acceptance Model of Davis (1989), Zimmerman's Self-Regulated Learning Theory (2002), and Benner's Novice to Expert Theory (1984), this study examined whether self-regulated learning explains the relationship between the utilization of artificial intelligence and clinical competence among nursing students.

This study aimed to investigate how the use of AI mediates the relationship between self-regulated learning and clinical competence among nursing students. Using a mixed-methods approach, this research will provide a comprehensive analysis of how AI use can serve as a bridge to enhance self-regulated learning and clinical competence. This study aims to fill these gaps using a mixed-methods approach to provide both measurable data and a deeper understanding of AI's role in nursing education. The findings from this research will have practical implications for educational institutions, enabling them to refine their support systems and foster an environment conducive to the proper use of artificial intelligence.

This study aimed to examine the influence of artificial intelligence on nursing students' clinical competence and to investigate the mediating role of self-regulated learning in this relationship. Using an explanatory sequential mixed-methods design, the study further explored nursing students' experiences with AI to support self-regulated learning and the development of clinical competence. Specifically, this study sought to answer the following questions: (1) What is the level of artificial intelligence utilization among nursing students in terms of academic learning support, clinical simulation use, and self-directed learning enhancement; (2) What is the level of nursing students' self-regulated learning in terms of goal setting, self-monitoring, and self-reflection; (3) What is the level of nursing students' clinical competence in terms of clinical knowledge application, clinical skills performance, clinical decision-making; (4) Is there a significant relationship between Artificial Intelligence utilization and nursing students' self-regulated learning; (5) Is there a significant relationship between Artificial Intelligence utilization and nursing students' clinical competence; (6) Does self-regulated learning significantly mediate the relationship between Artificial Intelligence utilization and clinical competence among nursing students; (7) What are the lived experiences of nursing students on self-regulated learning and clinical competence when using artificial intelligence?

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II. METHODS

➢ *Research Design*

This study employed a mixed-methods explanatory sequential design. Quantitative data were collected from 252 nursing students via a structured questionnaire, followed by qualitative interviews to explore students' lived experiences with AI use. The study began with the quantitative phase, in which numerical data were collected and statistically analyzed to determine relationships and significant associations among the variables. The findings from the quantitative phase served as the basis for the subsequent qualitative phase, which aimed to provide deeper explanations and understanding of the results. After identifying these links, the researchers dug deeper through interviews and other qualitative methods to understand why those connections exist (Creswell, 2011). The quantitative part of the study examined a significant relationship between AI utilization, self-regulated learning, and clinical competence. The qualitative phase further explored the experiences of AI utilization, self-regulated learning, and clinical competence as described by the nursing students' feedback.

➢ *Settings*

The study was conducted at a higher education institution in Western Mindanao that offers three health-related academic programs. Among these is the nursing program, which integrates classroom instruction, clinical exposure, and technology-assisted learning strategies to enhance students' academic and clinical experiences. The institution provides a conducive learning environment equipped with educational technologies, simulation activities, internet access, and digital learning resources that support the integration of artificial intelligence into nursing education. Furthermore, the nursing program emphasizes developing clinical competence, critical thinking, and independent learning among students, making the institution an appropriate setting for investigating the influence of artificial intelligence on nursing self-regulated learning and clinical competence.

➢ *Respondents*

For the quantitative phase of the study, 252 nursing students enrolled during the Academic Year 2025–2026 were selected using simple random sampling. This sampling method ensured that all eligible participants had an equal chance of being chosen, thereby minimizing selection bias and improving the representativeness of the sample (Creswell & Creswell, 2018).

To qualify for participation, students had to be officially enrolled in the Bachelor of Science in Nursing program and have completed or participated in a Related Learning Experience (RLE) or clinical duty. These criteria ensured that participants had sufficient exposure to both academic and clinical environments in which the use of artificial intelligence and self-regulated learning is relevant. The inclusion of students with RLE experience was important because clinical exposure contributes significantly to the development of clinical competence, reflective practice, and independent learning behaviors (Benner, 1984). Furthermore, students engaged in clinical training are more likely to demonstrate self-regulated learning behaviors such as goal setting, self-monitoring, and self-evaluation, which are essential in technology-enhanced learning environments (Zimmerman, 2002; Panadero, 2017).

➢ *Instrumentation.*

Three questionnaires were used to collect data. The Artificial Intelligence Utilization Questionnaire. It assessed the level of artificial intelligence among nursing students. This questionnaire used a five-point Likert scale ranging from "5 – Strongly Agree" to "1 – Strongly Disagree". It included 15 items across three constructs: academic learning support, clinical simulation use, and self-directed learning enhancement.

Level of Self-Regulated Learning Questionnaire. It assessed the level of self-regulation associated with the use of artificial intelligence for goal setting, self-monitoring, and self-reflection, using 15 items on a five-point Likert scale.

Level of Clinical Competence Questionnaire. It assessed the level of clinical competence in clinical knowledge application, clinical skills performance, and clinical decision-making, using 15 items on a five-point Likert scale.

This instrument was used to collect data on the correlation between self-regulated learning, AI use, and clinical competence.

For the qualitative phase, a semi-structured interview guide with open-ended questions was used to gather deeper insights into participants' experiences with AI utilization, self-regulated learning, and clinical competence. This provided detailed explanations and contextual understanding of the quantitative findings (Creswell & Plano Clark, 2018).

To ensure content validity, the questionnaire was evaluated by experts in nursing education, research, and educational technology. A pilot test was also conducted among nursing students who were not included in the final sample. The instrument demonstrated acceptable reliability, with a Cronbach's alpha of at least 0.77, indicating good internal consistency (Taber, 2018).

➢ *Data Collection*

Data collection will adhere to rigorous ethical standards, beginning with approval from the University Ethics Committee and formal permission from the Dean of the Graduate School. The quantitative component involved an online survey via Google Forms that included a consent form and structured questionnaires. The survey was distributed to 252 randomly selected nursing students. For the qualitative phase, a purposive subset of participants will be invited to participate in semi-structured interviews to gain deeper insights into their experiences with artificial intelligence. These sessions will be conducted at mutually convenient times, audio-recorded with permission, and transcribed verbatim for analysis. Data collection is expected to span

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approximately one to two months. All qualitative data will be coded in Microsoft Excel and analyzed using descriptive and inferential statistical techniques, while qualitative data will be analyzed following Moustakas' transcendental phenomenological approach.

➢ *Ethical Consideration*

This study takes ethics seriously, especially when it comes to protecting the rights and dignity of participants involved. Before anyone joins, the participants get a clear consent form explaining what the study is about, what is involved, any possible risks or benefits, how their information stays private, and what rights they have. The respondents or participants were not required to take part; if a participant decided to say no or wanted to quit halfway through, that was entirely fine and would not affect their standing at school or elsewhere. Everything that the participants shared would stay confidential. Instead of names, the researcher used codes or pseudonyms, and no personal details will show up in reports or publications. When conducting the interviews, the researcher ensured they were private, either in a quiet room or in a secure online space, so nobody could overhear or sneak a look at the information. The study does not put participants at any real risk.

There was no pressure, force, or shady tricks to get people involved. The goal was to help nursing education grow, especially with how artificial intelligence fits into teaching and clinical work. Everyone gets a fair shot to join. No discrimination, and all eligible nursing students are welcome. As for the data, all electronic files remain on password-protected devices, and all paper records are kept in a locked cabinet. The researcher will keep the data only as long as the school requires, then ensure it is properly destroyed.

➢ *Data Analysis*

Quantitative data were analyzed using Jamovi, with frequency and percentage calculations for faculty rank and performance. The mean and standard deviation were calculated to assess faculty development programs and institutional support, and an analysis of variance identified differences in teaching performance by rank. The Pearson product-moment correlation coefficient was used to explore relationships among faculty development, support, and performance, and stepwise multiple regression was used to identify predictors of teaching performance. The general linear model mediation model was used to examine faculty development's mediating role in the relationship between institutional support and performance.

HyperResearch was used in the qualitative component to systematically organize, code, and retrieve interview data; however, the analysis was not conducted exclusively in the software. Thematic analysis (Braun & Clarke, 2013) was conducted manually using HyperResearch, enabling the researcher to interpret patterns and themes while preserving human-centered insights. The six-phase analysis included (1) data familiarization, (2) initial coding, (3) theme identification, (4) theme review, (5) theme refinement, and (6) theme definition. Two independent coders analyzed transcripts over two coding rounds, reconciling differences through consensus. Finalized themes were synthesized into a cohesive narrative and illustrated with representative excerpts from participants.

III. RESULTS AND DISCUSSION

➢ *Level of Artificial Intelligence Utilization Among Nursing Students*

Table 1 presents the level of artificial intelligence (AI) utilization among nursing students across academic learning support, clinical simulation, and self-directed learning. The results indicate that the overall level of AI utilization among nursing students is High (M = 3.57). This suggests that students frequently use AI technologies to support various aspects of their learning and clinical preparation.

Among the dimensions assessed, Clinical Simulation Use has the highest result, interpreted as High (M = 4.09, SD = 0.588). This finding suggests that nursing students extensively use AI-powered simulation platforms and virtual clinical environments to enhance their clinical knowledge, decision-making skills, and practical competencies. The relatively low standard deviation indicates consistent perceptions among respondents regarding the usefulness of AI in clinical simulations.

The second-highest dimension was Self-Directed Learning, also interpreted as High (M = 3.97, SD = 0.582). This result suggests that students frequently rely on AI tools to support independent learning, such as searching for information, reviewing nursing concepts, clarifying difficult topics, and reinforcing their understanding of course materials. The low variability among responses further suggests that AI has become a common learning resource among nursing students.

Meanwhile, Academic Learning Support had the lowest score among the three constructs (M = 3.57, SD = 0.708) but remained within the High category. This finding indicates that students regularly use AI technologies to support academic tasks such as completing assignments, generating study materials, and accessing educational resources. However, compared with clinical simulation and self-directed learning, students appear to rely less on AI for direct academic support.

Zawacki-Richter et al. (2021) also found that AI in colleges creates more adaptive learning environments, tailors lessons to students' needs, and provides quick feedback to help them learn faster. Shorey and team (2021) noted that AI-driven tools effectively build students' confidence and prepare them for real clinical work.

All of these align with the Technology Acceptance Model (Davis, 1989), which holds that people are more likely to use new technology if it is helpful and easy to use. Taken together, it is clear that AI is not just a fancy add-on in nursing education; it is woven into how students learn, especially in practice and independent study. Overall, the findings show nursing students view AI technologies as valuable educational tools. High ratings across all areas suggest AI

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boosts academic learning, encourages autonomous behaviors, and improves clinical readiness. These results indicate AI is now a vital part of modern nursing education, supporting the development of essential knowledge, skills, and competencies.

Table 1 Level of AI Utilization Among Nursing Students

Constructs	*M*	*SD*	*Remarks*
Academic learning support	3.57	0.708	High
Clinical Simulation use	4.09	0.588	High
Self-directed learning	3.97	0.582	High
Overall AI utilization	3.57	0.708	High

Note: Scale: 4.21-5.00 (Very High), 3.41-4.20 (High), 2.61-3.40 (Moderate), 1.81-2.60 (Low), 1.00-1.8 (Very Low)

➢ *Level of Nursing Students' Self-Regulated Learning*

Table 2 presents the level of nursing students' self-regulated learning across goal setting, self-monitoring, and self-reflection. The findings revealed that the overall level of AI utilization was High (M = 3.57, SD = 0.708), indicating that nursing students frequently use AI technologies to support their educational and clinical learning.

Among the three dimensions, Clinical Simulation Use had the highest result (M = 4.09, SD = 0.588), placing it in the High category. This result suggests that nursing students extensively use AI-powered simulation tools to enhance clinical skills, decision-making, and patient-care scenarios. The relatively low standard deviation indicates consistency among respondents in their use of AI in clinical simulations.

The Self-Directed Learning dimension also showed high utilization (M = 3.97, SD = 0.582). This finding suggests that students actively use AI applications to support independent learning, including seeking information, reviewing concepts, monitoring academic progress, and reinforcing their understanding of nursing concepts. The low variability in responses indicates a shared perception among students of AI's usefulness for self-regulated learning.

Meanwhile, Academic Learning Support recorded a result of 3.57 (SD = 0.708), which is likewise interpreted as High. This indicates that students commonly use AI tools for academic purposes, including completing assignments, clarifying complex topics, accessing learning resources, and supporting classroom learning. However, compared with the other dimensions, this construct had the lowest mean score, suggesting that while AI is widely used for academic support, its application is more prominent in clinical simulation and self-directed learning contexts.

This aligns with Zimmerman's 2002 idea that self-regulated learning involves actively setting goals, monitoring progress, and reflecting. Panadero (2017) supports this, noting that students with strong self-regulation are better learners and tend to perform well academically. According to Viberg and colleagues (2020), digital and AI-driven tools provide students with continuous feedback and enable them to assess their own progress. This explains why these nursing students are so good at reflection and monitoring; they receive support that pushes them to think, check, and grow. Overall, the findings show that nursing students have heavily integrated AI into their learning. High usage across various areas indicates AI is a vital educational tool, supporting academic success, clinical readiness, and independent learning. These results suggest AI is a key part of modern nursing education, helping develop knowledge, skills, and lifelong learning for future practice.

Table 2 Level of Nursing Students' Self-Regulated Learning

Constructs	*M*	*SD*	*Remarks*
Goal setting	3.96	0.691	High
Self-monitoring	4.00	0.629	High
Self-reflection	4.29	0.652	Very High
Overall Self-Regulation	4.07	0.589	High.

Note: Scale: 4.21-5.00 (Very High), 3.41-4.20 (High), 2.61-3.40 (Moderate), 1.81-2.60 (Low), 1.00-1.8 (Very Low)

➢ *Level of Nursing Students' Clinical Competence*

Table 3 presents the level of clinical competence among nursing students across clinical knowledge application, clinical skills performance, and clinical decision-making. The results revealed an overall mean score of 3.98 (SD = 0.580), interpreted as High, indicating that nursing students generally demonstrate a strong level of clinical competence in applying knowledge, performing nursing skills, and making appropriate clinical decisions during patient care.

Among the dimensions assessed, Clinical Skills Performance had the highest mean score (M = 4.10, SD = 0.607), placing it in the High category. This finding suggests that nursing students demonstrate a high level of proficiency

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in performing nursing procedures and clinical tasks. The result indicates that students are confident in their ability to perform essential nursing skills, adhere to clinical standards, and deliver safe and effective patient care. The relatively low standard deviation further suggests consistency in respondents' perceptions of their clinical skills performance.

Clinical Knowledge Application ranked second, with a mean score of 3.98 (SD = 0.636), which is also interpreted as High. This result suggests that nursing students are generally capable of applying theoretical knowledge and evidence-based concepts to real-world clinical situations. It reflects their ability to integrate classroom learning with practical experiences, enabling them to provide appropriate nursing interventions and patient-centered care.

Meanwhile, Clinical Decision-Making had the lowest mean score among the three dimensions (M = 3.85, SD = 0.667), yet it remained within the High category. This finding indicates that nursing students frequently demonstrate sound judgment and critical thinking in clinical situations. However, compared with knowledge application and skills performance, decision-making appears to be the area with relatively greater room for improvement. This may be attributed to the complexity of clinical environments, where students are still developing confidence and experience in making independent clinical judgments.

Foronda and colleagues (2020) found that this type of simulation training significantly improves clinical reasoning, hands-on skills, and decision-making. Shorey et al. (2021) found the same: technology in learning boosts clinical performance and competence. Overall, nursing students demonstrate high clinical competence across all areas, indicating they are well-prepared to apply knowledge, perform procedures, and make informed decisions. These skills are vital for quality healthcare and show effective nursing education. The results highlight the need for continuing clinical exposure, simulation, and reflective learning to improve decision-making and overall competence.

Table 3 Level of Nursing Students' Clinical Competence

Constructs	*M*	*SD*	*Remarks*
Clinical knowledge application	3.98	0.636	High
Clinical skills performance	4.10	0.607	High
Clinical decision-making	3.85	0.667	High
Overall Clinical Competence	3.98	0.580	High

Note: Scale: 4.21-5.00 (Very High), 3.41-4.20 (High), 2.61-3.40 (Moderate), 1.81-2.60 (Low), 1.00-1.8 (Very Low)

- *Test of Significant Relationship Between AI Utilization and Self-Regulated Learning*

Table 4 presents the correlation matrix showing relationships between the dimensions of AI utilization (Academic Learning Support, Clinical Simulation Use, and Self-Directed Learning Enhancement) and the dimensions of self-regulated learning (Goal Setting, Self-Monitoring, and Self-Reflection) among nursing students.

The findings show that all correlations were positive and statistically significant ($p < .001$), indicating that greater AI use is associated with higher levels of self-regulated learning among nursing students. This suggests that students who frequently use AI technologies for academic and clinical purposes tend to demonstrate stronger abilities to set learning goals, monitor their progress, and reflect on their learning experiences.

Among the AI utilization dimensions, Self-Directed Learning Enhancement showed the strongest relationships with the self-regulated learning dimensions. Specifically, it exhibited a moderate positive correlation with Goal Setting ($r = 0.463$, $p < .001$), indicating that students who use AI to support independent learning are more likely to set clear learning objectives and plan their academic activities effectively. Similarly, Self-Directed Learning Enhancement demonstrated moderate positive relationships with Self-Monitoring ($r = 0.395$, $p < .001$) and Self-Reflection ($r = 0.361$, $p < .001$), suggesting that AI use helps students track their learning progress and evaluate their performance.

Academic Learning Support also showed significant positive correlations across all dimensions of self-regulated learning. The strongest relationship was observed with Self-Monitoring ($r = 0.392$, $p < .001$), followed by Self-Reflection ($r = 0.383$, $p < .001$) and Goal Setting ($r = 0.376$, $p < .001$). These results indicate that students who use AI for academic purposes tend to be more engaged in monitoring their understanding, evaluating their learning outcomes, and organizing their learning goals.

Likewise, Clinical Simulation Use showed significant positive correlations with Goal Setting ($r = 0.390$, $p < .001$), Self-Monitoring ($r = 0.366$, $p < .001$), and Self-Reflection ($r = 0.314$, $p < .001$). Although these relationships are weaker than those observed for Self-Directed Learning Enhancement, they remain meaningful and suggest that AI-assisted simulation experiences positively contribute to students' ability to regulate their learning.

Furthermore, strong positive correlations were observed across the self-regulated learning dimensions. Goal Setting

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was strongly correlated with Self-Monitoring (r = 0.736, p < .001) and with Self-Reflection (r = 0.631, p < .001), and Self-Monitoring was strongly correlated with Self-Reflection (r = 0.738, p < .001). These findings suggest that the components of self-regulated learning are closely interconnected, with students who effectively set goals also more likely to monitor their progress and engage in reflective learning practices. Overall, the results show AI use is linked to self-regulated learning in nursing students. The positive correlation suggests increased AI engagement may boost their ability to manage, monitor, and evaluate learning. Thus, the null hypothesis of no relationship is rejected. The findings support AI as a valuable tool that fosters essential self-regulated learning behaviors for academic and professional growth.

Table 4 Results of the Test of the Relationship Between AI Utilization and Self-Regulated Learning

		Academic Learning Support	**Clinical Simulation Use**	**Self-Directed Learning Enhancement**	**Goal Setting**	**Self-Monitoring**	**Self-Reflection**
Academic Learning Support	*r*	—					
	p	—					
Clinical Simulation Use	*r*	0.679***	—				
	p	<.001	—				
Self-Directed Learning Enhancement	*r*	0.692***	0.754***	—			
	p	<.001	<.001	—			
Goal Setting	*r*	0.376***	0.390***	0.463***	—		
	p	<.001	<.001	<.001	—		
Self-Monitoring	*r*	0.392***	0.366***	0.395***	0.736***	—	
	p	<.001	<.001	<.001	<.001	—	
Self-Reflection	*r*	0.383***	0.314***	0.361***	0.631***	0.738***	—
	p	<.001	<.001	<.001	<.001	<.001	—

Note. * p < .05, ** p < .01, *** p < .001

Note: Ha: There is a significant relationship between AI Utilization and Self-Regulated Learning.

➢ *Test of Significant Relationship Between AI Utilization and Clinical Competence*

Table 5 presents the correlation matrix showing the relationships between the dimensions of AI utilization (Academic Learning Support, Clinical Simulation Use, and Self-Directed Learning Enhancement) and the dimensions of clinical competence (Clinical Knowledge Application, Clinical Skills Performance, and Clinical Decision-Making) among nursing students.

The findings indicate that all correlations between AI utilization and clinical competence dimensions were positive and statistically significant (p < .001). This suggests that higher levels of AI utilization are associated with greater clinical competence among nursing students. In general, students who make greater use of AI technologies tend to demonstrate stronger abilities in applying clinical knowledge, performing nursing skills, and making sound clinical decisions.

Among the AI utilization dimensions, Self-Directed Learning Enhancement exhibited the strongest relationships with all aspects of clinical competence. It showed a moderate positive correlation with Clinical Knowledge Application (r = 0.435, p < .001), indicating that students who use AI to support independent learning are better able to integrate theoretical knowledge into clinical practice. Likewise, Self-Directed Learning Enhancement was moderately correlated with Clinical Decision-Making (r = 0.417, p < .001) and Clinical Skills Performance (r = 0.389, p < .001), suggesting that AI-assisted self-learning contributes to the development of practical skills and critical clinical judgment.

Clinical Simulation Use also demonstrated significant positive relationships with all dimensions of clinical competence. The strongest correlation was observed with Clinical Knowledge Application (r = 0.372, p < .001), followed by Clinical Skills Performance (r = 0.351, p < .001) and Clinical Decision-Making (r = 0.341, p < .001). These findings suggest that AI-supported simulation experiences provide opportunities for students to practice clinical scenarios, strengthen procedural skills, and improve decision-making abilities in a safe learning environment.

Similarly, Academic Learning Support was positively correlated with Clinical Knowledge Application (r = 0.343, p < .001), Clinical Skills Performance (r = 0.315, p < .001), and Clinical Decision-Making (r = 0.287, p < .001). Although these relationships are relatively weaker than those in other AI utilization dimensions, they remain statistically significant and indicate that AI tools used for academic purposes can contribute to students' clinical competence by enhancing knowledge acquisition and understanding.

Moreover, strong positive correlations were observed among the dimensions of clinical competence themselves. Clinical Knowledge Application demonstrated a strong relationship with Clinical Skills Performance (r = 0.770, p < .001) and Clinical Decision-Making (r = 0.742, p < .001). Likewise, Clinical Skills Performance was strongly correlated with Clinical Decision-Making (r = 0.751, p < .001). These results suggest that nursing students who effectively apply clinical knowledge are more likely to perform clinical skills competently and make appropriate clinical decisions, highlighting the interconnected nature of clinical competence. Overall, the findings provide evidence

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that AI utilization is significantly associated with clinical competence among nursing students. The positive and significant correlations indicate that AI technologies can serve as valuable educational tools that support the development of knowledge application, clinical skills, and decision-making abilities. Therefore, the null hypothesis stating that there is no significant relationship between AI utilization and clinical competence is rejected. The results suggest that integrating AI into nursing education may enhance students' clinical competence and readiness for professional nursing practice.

Table 5 Results of the Test: Relationship Between AI Utilization and Clinical Competence

		Academic Learning Support	Clinical Simulation Use	Self-Directed Learning Enhancement	Clinical Knowledge Application	Clinical Skills Performance	Clinical Decision Making
Academic Learning Support	*r*	—					
	p	—					
Clinical Simulation Use	*r*	0.679***	—				
	p	<.001	—				
Self-Directed Learning Enhancement	*r*	0.692***	0.754***	—			
	p	<.001	<.001	—			
Clinical Knowledge Application	*r*	0.343***	0.372***	0.435***	—		
	p	<.001	<.001	<.001	—		
Clinical Skills Performance	*r*	0.315***	0.351***	0.389***	0.770***	—	
	p	<.001	<.001	<.001	<.001	—	
Clinical Decision Making	*r*	0.287***	0.341***	0.417***	0.742***	0.751***	—
	p	<.001	<.001	<.001	<.001	<.001	—

Note. * p < .05, ** p < .01, *** p < .001

Note: Ha: There is a significant relationship between AI Utilization and Clinical Competence.

- *Test of Mediation Analysis on the Significant Influence of Self-Regulated Learning on the Relationship Between Artificial Intelligence Utilization and Clinical Competence*

Table 6 shows that the mediation analysis tested whether self-regulated learning mediates the relationship between AI use and clinical competence, revealing that it does. The model was significant, indicating that self-regulated learning is key to how AI use relates to clinical skills. The overall effect of AI on competence was strong (Estimate = 0.3592), with a confidence interval from 0.2685 to 0.450, confirming a positive association. When self-regulated learning was included as a mediator, the indirect effect remained highly significant (Estimate = 0.2674), with a confidence interval from 0.1965 to 0.3380. The findings revealed that self-regulated learning significantly mediated the relationship between AI utilization and clinical competence, accounting for 74.4% of the total effect. This indicates that AI's influence on clinical competence operates primarily by enhancing students' self-regulatory learning behaviors. AI technologies appear to facilitate goal setting, self-monitoring, and reflective learning, thereby strengthening students' ability to apply clinical knowledge, perform nursing procedures, and make sound clinical decisions. These findings support Zimmerman's Self-Regulated Learning Theory, which posits that learners who actively regulate their learning processes achieve superior educational outcomes. The results further suggest that the educational value of AI extends beyond information delivery, serving as a catalyst for autonomous learning that ultimately contributes to the development of competence.

AI tools improve students' organization, planning, and self-regulation, leading to higher clinical competence. Self-regulated learning mediates most of the benefits, highlighting AI's role in fostering skills that enhance clinical performance and competence growth.

Table 6 Mediation Analysis on the Influence of Self-Regulated Learning on the Relationship Between AI Utilization and Clinical Competence

				95% Confidence Interval						
Effect			**Label**	**Estimate**	**SE**	**Lower**	**Upper**	**Z**	**P**	**% Mediation**
Indirect			a x b	0.2674	0.0362	0.1965	0.338	7.40	<.001	74.4
Direct			c	0.0918	0.0390	0.0154	0.168	2.35	0.19	25.6
Total			c + a x b	0.3592	0.0463	0.2685	0.450	7.77	<.001	100.0
AI Utilization	→	Self-Regulated Learning	a	0.3961	0.0460	0.3060	0.486	8.62	<.001	
Self-Regulated Learning	→	Clinical Competence	b	0.6750	0.0468	0.5833	0.767	14.42	<.001	

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AI Utilization	→	Clinical Competence	c	0.0918	0.0390	0.0154	0.168	2.35	.019	

➢ *Self-Regulated Learning as the Mediator of AI Utilization and Clinical Competence*

The figure illustrates how Self-Regulated Learning, AI Utilization, and Clinical Competence are connected. Arrows link the three, with numbers showing the strength of those links. First, Self-Regulated Learning has a path coefficient of 0.73 to Clinical Competence. That is a strong connection. Students who manage and guide their own learning tend to develop stronger clinical skills. In other words, the more you take charge of your learning, the better you get at clinical work. Then, there is a weaker but still positive coefficient of 0.23 from Clinical Competence to AI Utilization. So, if someone is strong in clinical competence, they are more likely to use AI tools effectively or more often. However, this effect is not nearly as big as the others. Meanwhile, Self-Regulated Learning also connects directly to AI Utilization, with a path coefficient of 0.40. That is moderate, so students who are proactive about their own learning also tend to use AI more in their studies or clinical practice. Taken together, the model puts Self-Regulated Learning right at the center. It is the biggest factor, especially in improving clinical competence, but it also encourages students to use AI more. Clinical competence does relate to using AI, but not as much. What does this all mean in real life? Basically, if we help students build their self-regulation skills, they will likely become more clinically competent and more comfortable with AI tech. For nursing education and practice, that is a win on both fronts.

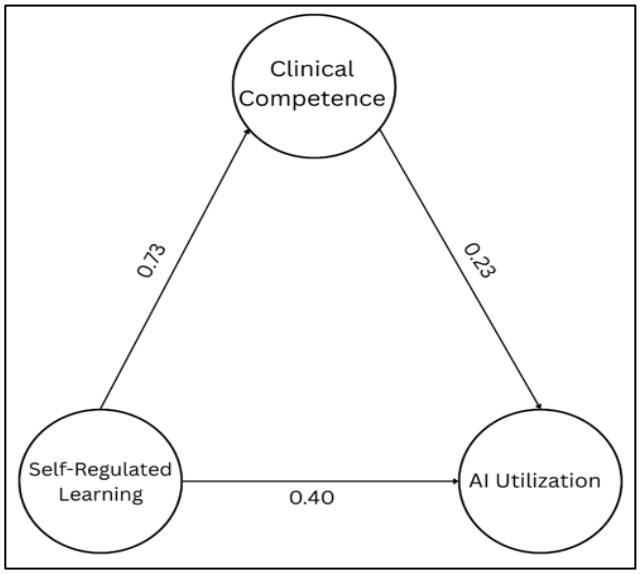

Fig 1 Mediation Model of Self-Regulated Learning Linking AI Utilization and Clinical Competence

➢ *Experiences of Nursing Students in AI Utilization and Its Influence on Self-Regulated Learning and Clinical Competence*

The study involved nursing students with experience using artificial intelligence (AI) as a learning support tool during their academic and clinical preparation. The participants were students with varying levels of exposure to AI technologies. They shared their experiences using AI to support their learning, self-regulated learning behaviors, and the development of clinical competence. Their responses reflected diverse perspectives on the benefits, applications, and challenges of AI use in nursing education and clinical preparation.

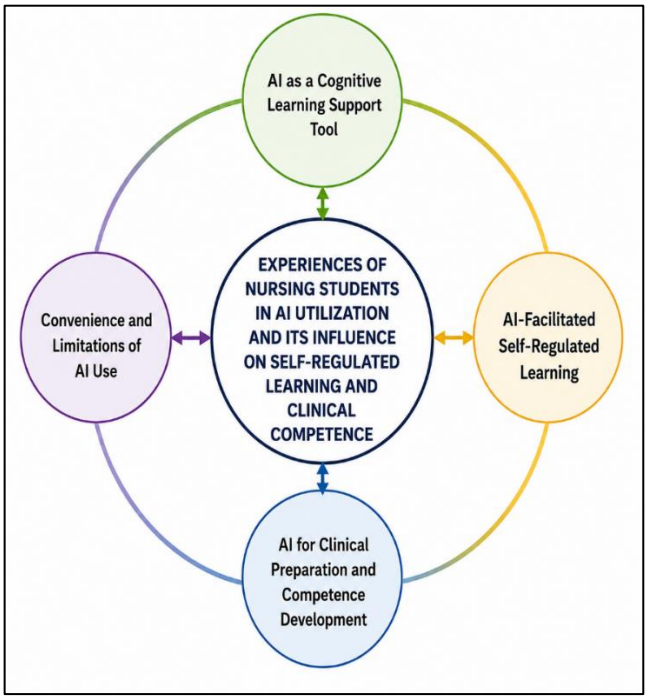

Fig 2 Schematic Diagram

The schematic diagram presents nursing students' experiences with artificial intelligence (AI) and how these experiences influence their self-regulated learning and clinical competence. At the center of the diagram is the main phenomenon, "Experiences of Nursing Students in AI Utilization and Its Influence on Self-Regulated Learning and Clinical Competence." This central concept reflects participants' collective experiences with integrating AI into their academic and clinical learning activities.

Surrounding the central phenomenon are four interconnected themes that emerged from the participants' narratives. The arrows connecting each theme to the center indicate that these themes directly contribute to and shape students' overall experiences with AI. Together, these themes provide a comprehensive understanding of how AI influences nursing education and clinical preparation.

➢ *AI as a Cognitive Learning Support System*

Participants consistently described AI as a valuable learning resource that supports their understanding of nursing concepts and academic requirements. Many shared that they rely on AI when they encounter topics that are difficult to understand, particularly during independent study and preparation for clinical duties. Through simplified explanations and organized information, AI helps them

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process complex concepts more effectively and enhances their overall learning experience.

Several participants emphasized that AI makes learning more manageable by breaking down complex nursing topics into simpler, more understandable information. They explained that AI assists them in reviewing lessons, organizing study materials, and clarifying concepts that were not fully understood during classroom discussions. For these students, AI serves as an accessible source of academic support that complements traditional learning methods.

"It helps me understand lessons faster and organize my nursing tasks." (P1)

"AI helps me organize information, simplify difficult concepts, and review procedures before entering the clinical area." (P3)

"It has been helpful regarding elaborating certain concepts that I did not understand the first time during class." (P5)

Participants also highlighted the convenience of having immediate access to explanations whenever questions arise. Unlike classroom settings, where some students may hesitate to ask questions, AI provides a private, judgment-free environment that encourages learners to seek clarification. This was particularly important for students who described themselves as shy or reluctant to speak during class discussions.

"When it comes to things I do not understand, and I need further explanation, I am shy to ask; that is why I use AI to explain it further." (P10)

The responses further revealed that AI promotes independent learning by allowing students to study at their own pace and according to their learning needs. Participants described using AI to generate summaries, review key concepts, create practice questions, and reinforce previously learned information. These strategies help them prepare more effectively for academic and clinical responsibilities while strengthening their confidence in their knowledge and skills.

"I use AI as a study aid to review concepts, clarify difficult topics, practice clinical scenarios, and generate questions for self-testing, which helps me prepare more effectively for clinical duty" (P12).

"Using it to review disease conditions, medications, and nursing interventions." (P15)

Students also appreciated AI's ability to transform complex technical nursing information into simpler explanations. By reducing unfamiliar terminology and presenting information more clearly, AI enables learners to focus on comprehension rather than memorization alone. Participants noted that this approach not only improves their understanding but also enhances their confidence when applying knowledge in clinical settings.

"AI helps me simplify things by breaking them down into clear, easy steps… making it much easier to memorize and perform safely." (P16)

Overall, participants viewed AI as more than a technological tool. They perceived it as a supportive learning companion that facilitates understanding, encourages independent learning, and provides continuous academic assistance. Through its ability to simplify information, offer immediate clarification, and support individualized learning, AI contributes positively to students' educational experiences and helps them become more confident and prepared nursing learners.

- *AI as a Catalyst for Self-Regulated Learning*

Participants described AI as a useful tool that supports their independent learning and study habits. They shared how they use AI to review lessons, generate summaries, create quizzes, and clarify concepts that they find difficult to understand. Through these activities, students become more actively involved in managing their own learning and academic preparation.

"I use AI as a supplementary learning tool to help me prepare for clinical duties and academic requirements in nursing school." (P2)

"It also allows me to study more efficiently, especially when reviewing diseases, nursing interventions, and patient care procedures." (P3)

"AI helps me review lessons quickly and understand the topics quickly. I use it to make summaries and ask questions." (P11)

Several participants highlighted how AI helps them organize information and study more efficiently. They appreciated its ability to provide immediate explanations, summarize content, and generate learning materials that support their review and preparation. These experiences enabled students to identify areas for further improvement and focus on their individual learning needs.

"AI makes my clinical prep faster by simplifying hard terms, providing quick summaries of nursing steps, and creating quizzes for dosages." (P4)

"I use AI as a study aid to review concepts, clarify difficult topics, practice clinical scenarios, and generate questions for self-testing, which helps me prepare more effectively for clinical duty." (P12)

Participants further described AI as a learning companion that encourages them to take initiative in their studies. Rather than relying solely on classroom discussions, they use AI to seek additional explanations, reinforce understanding, and evaluate their knowledge of nursing concepts. Through this process, students become more engaged in monitoring their own academic progress and preparing for clinical responsibilities.

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They also emphasized that AI enables them to learn at their own pace and according to their individual needs. By providing instant feedback and accessible learning support, AI helps students develop greater confidence in their ability to study independently and manage their learning experiences effectively.

The findings suggest that AI can promote self-regulated learning among nursing students by encouraging independent study, self-monitoring, and active engagement in the learning process. Through features such as instant feedback, content summarization, and self-assessment activities, AI helps students take greater responsibility for their learning and preparation for clinical duties. These findings highlight the potential of AI to support the development of lifelong learning skills that are essential for continuous professional growth in nursing practice.

- *AI as a Facilitator of Clinical Competence Development*

Participants described AI as a valuable resource that helps them prepare for clinical duties and develop their clinical competence. Many shared that they use AI to review nursing procedures, disease conditions, medications, and nursing interventions before entering the clinical area. They viewed AI as a convenient source of information that helps reinforce classroom learning and prepares them for real-life patient care situations.

"AI helps me organize information, simplify difficult concepts, and review procedures before entering the clinical area." (P3)

"Using AI has significantly supported my learning and preparation for clinical duty. One of my main experiences with AI is using it to review disease conditions, medications, and nursing interventions." (P15)

Several participants emphasized how AI helps them understand clinical expectations and prepare for unfamiliar situations. They explained that AI provides quick explanations and practical guidance, allowing them to review important concepts and procedures before clinical exposure. This preparation helped them feel more knowledgeable and ready to perform their responsibilities in the clinical setting.

"It has actually helped a lot, like asking what they actually do in this area, what to prepare." (P13)

"I use AI as a study aid to review concepts, clarify difficult topics, practice clinical scenarios, and generate questions for self-testing, which helps me prepare more effectively for clinical duty." (P12)

Participants also highlighted how AI contributes to their confidence during clinical preparation. By simplifying complex information and providing opportunities to practice clinical scenarios and patient communication, AI helps reduce uncertainty and allows students to approach clinical duties with greater assurance.

"AI makes my clinical prep faster by simplifying hard terms, providing quick summaries of nursing steps, and creating quizzes for dosages. It also lets me practice patient communication, which saves me time and helps me feel much more confident and prepared for my duty." (P4)

"AI helps me simplify things by breaking them down into clear, easy steps. It removes the jargon and focuses on the 'why' and 'how,' making it much easier to memorize and perform safely." (P16)

Students viewed AI as a bridge between theoretical knowledge and clinical application. By providing accessible information, procedural guidance, and practical explanations, AI supports their readiness for patient care responsibilities. The experiences shared by participants suggest that AI enhances their preparation for clinical exposure by strengthening their knowledge, improving their confidence, and helping them develop competencies necessary for nursing practice. However, participants also recognized that AI serves as a supplementary resource and should be used alongside clinical supervision, evidence-based references, and hands-on experiences to ensure safe and effective patient care.

The findings imply that AI can serve as a valuable support tool in preparing nursing students for clinical practice. By providing accessible information, procedural guidance, and opportunities to review clinical concepts, AI helps students strengthen their knowledge, enhance their confidence, and improve their readiness for patient care responsibilities. The use of AI in clinical preparation may contribute to the development of clinical competence by bridging the gap between theoretical learning and practical application. However, AI should be used alongside clinical supervision, evidence-based resources, and hands-on experiences to ensure the development of safe, effective, and competent nursing practice.

- *Responsible AI Use: Balancing Convenience and Professional Judgment*

Participants generally described AI as a convenient and accessible tool that makes academic tasks easier and more manageable. Many appreciated its ability to provide quick information, simplify complex concepts, and assist with various learning activities. For these students, AI served as a practical resource that enhanced efficiency and reduced the time needed to complete academic requirements.

"AI has helped in ways that made every task easier." (P2)

"Using AI makes things easy and research easy." (P8)

"It can make difficult to simple." (P9)

Participants also shared that AI provides immediate support whenever they encounter difficulties in their studies. Some students valued the opportunity to ask questions freely and seek additional explanations without feeling embarrassed

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or judged. This accessibility made AI a useful companion for learning and academic preparation.

"For me, my experience is that when it comes to things I do not understand and I need further explanation, I am shy to ask; that is why I use AI to explain it further." (P10)

"Using the AI really makes it easier for me when I need to ask a question." (P14)

Despite these advantages, several participants acknowledged potential limitations associated with AI use. While they recognized its usefulness, they also expressed concerns about becoming overly dependent on technology. Participants noted that excessive reliance on AI may discourage learners from developing their own ideas, analyzing information independently, and engaging in deeper critical thinking.

"It is accessible and convenient, but I think using AI can also become a disadvantage because you are relying on it too much that you become too lazy to make your own thoughts." (P6)

Students emphasized the importance of maintaining a balance between utilizing AI and developing their own knowledge, judgment, and problem-solving abilities. They viewed AI as a supplementary learning resource rather than a replacement for independent learning. While AI offers convenience and efficiency, participants recognized that critical thinking, reflection, and professional judgment remain essential skills that must be cultivated throughout nursing education.

Overall, participants appreciated the benefits that AI provides in supporting their academic learning while remaining aware of the need for responsible use. Their experiences reflect the importance of integrating AI as a supportive educational tool while continuing to foster independent thinking and sound clinical judgment.

The findings imply that while AI provides convenience, accessibility, and efficiency in learning, its use should be guided by responsible and critical engagement. Nursing students can benefit from AI as a supplementary learning resource; however, overreliance on technology may hinder the development of critical thinking, independent learning, and clinical judgment. Therefore, nursing education should promote the balanced use of AI, encouraging students to verify information, reflect on their learning, and integrate professional judgment with technological support.

IV. CONCLUSION

This study reveals that nursing students demonstrate high levels of AI utilization, self-regulated learning, and clinical competence. The findings show significant positive relationships between AI utilization and both self-regulated learning and clinical competence. Results also indicate that self-regulated learning significantly mediates the relationship between AI utilization and clinical competence, suggesting that AI influences clinical competence both directly and indirectly through its contribution to students' ability to manage and regulate their own learning.

The qualitative findings support these results, showing that nursing students perceive AI as a valuable cognitive learning tool. Students describe AI as helpful in improving understanding, facilitating independent learning, enhancing clinical preparation, and increasing confidence in performing nursing-related responsibilities. At the same time, they acknowledge the importance of using AI responsibly and maintaining critical thinking and professional judgment to prevent overreliance on technology.

The study demonstrates that the use of artificial intelligence contributes positively to nursing students' clinical competence, primarily by enhancing self-regulated learning. While AI directly supports learning and clinical preparation, its strongest contribution lies in fostering goal setting, self-monitoring, and reflective learning behaviors that translate into improved clinical performance. The findings highlight self-regulated learning as a critical mechanism through which AI facilitates competence development. Consequently, the effective integration of AI into nursing education may be accompanied by strategies that cultivate autonomous learning, critical thinking, and professional judgment to prepare competent, future-ready nursing professionals.

RECOMMENDATIONS

Nursing educators may integrate AI-assisted learning activities, virtual simulations, and other AI-supported tools into classroom and clinical teaching to enhance students' learning experiences and support the development of clinical competence. By providing appropriate guidance on the use of AI, educators may help students maximize its benefits while continuing to develop critical thinking, clinical reasoning, and sound decision-making skills. Nursing schools and academic institutions may strengthen the integration of AI into nursing education by developing guidelines and offering training opportunities that promote the ethical, responsible, and evidence-based use of AI. Providing access to AI-enhanced learning resources may further support students' academic learning and clinical preparation. Nursing students may use AI as an additional learning resource to assist with studying, clinical preparation, and self-directed learning. However, active engagement in reflection, independent thinking, and critical analysis remains important to ensure that learning extends beyond simply obtaining answers from technology. Future researchers may conduct studies involving participants from different institutions and larger populations to gain a broader understanding of AI utilization among nursing students. Further research may also explore the long-term effects of AI on professional development and clinical performance and examine factors such as digital literacy, critical thinking, technological self-efficacy, and learning engagement to understand better how AI influences clinical competence. Nursing education programs are recommended to integrate artificial intelligence-supported learning strategies that intentionally promote self-regulated

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learning among students. Educators should guide students in using AI not only to access information but also to develop goal-directed learning, reflective practice, clinical reasoning, and independent decision-making, thereby maximizing AI's contribution to clinical competence.

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