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Research Article

AI anxiety, AI self-competence, AI literacy, and AI self-efficacy among nursing students: A parallel mediation analysis

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ABSTRACT

Artificial intelligence (AI) is a trending topic in the educational field today, so it is also vital to understand how it affects nursing education. This study utilized a descriptive cross-sectional research design with a parallel mediation analysis to assess the levels of AI literacy (AIL), AI self-efficacy (AISE), AI anxiety (AIA), and AI self-competence (AISC) among 255 purposively chosen nursing students from a higher education institution in Olongapo City, Philippines, during the academic year 2024-2025. Data was collected through an online survey distributed from September to October 2024. The study adopted two standardized instruments, one for AIA and another for AIL, AISE, and AISC constructs. Statistical analysis included descriptive statistics and Hayes' process macro model 4 for mediation analysis using IBM SPSS version 23. Findings revealed direct relationships between AIL and AISE, with AIA mediating this association. Additionally, AISC was found to mediate the link between AIL and AISE also. The study contributes valuable insights to the field of AI research, shedding light on the complex interplay among AIL, AIA, AISE, and AISC in the context of nursing education.

Keywords: AI literacy, AI, self-efficacy, AI anxiety, AI self-competence, parallel mediation analysis, nursing education

INTRODUCTION

In the contemporary healthcare landscape, the incorporation of artificial intelligence (AI) technologies is reshaping the way medical professionals approach patient care and healthcare delivery. As AI continues to play an increasingly significant role in healthcare, it is crucial for nursing students to develop a comprehensive understanding of AI concepts and applications to thrive in their future roles.

The existing literature provides valuable insights into nursing students' attitudes and readiness towards AI technologies. Kwak et al. (2022) emphasized the pivotal role of a positive attitude in predicting nursing students' intention to engage with AI-based healthcare technology, underscoring the importance of fostering a supportive mindset towards technological advancements in healthcare. Complementing this, Abou Hashish and Alnajjar (2024) highlighted that nursing students have demonstrated commendable knowledge and positive attitudes towards digital transformation services, indicating receptiveness to technological advancements in healthcare education and practice.

Moreover, studies by Simsek-Cetinkaya and Cakir (2023), Syafriati (2024), and Srinivasan et al. (2024) highlight many benefits of integrating AI technologies into nursing education. These include enhanced student satisfaction, increased interest in learning, improved critical thinking, heightened creativity, and greater engagement and motivation. Such findings underscore AI's potential to revolutionize nursing students' learning and prepare them for a technologically advanced healthcare landscape.

Building on this foundation, research by Khaled and Elborai (2024) and Abd El-Maksoud (2024) found that many nursing students possess moderate AI knowledge and positive attitudes towards AI technologies. Taskiran (2023) highlighted the importance of AI education, demonstrating that an AI nursing course improves students' readiness to use medical AI tools. O'Connor et al. (2023) and Glauberman et al. (2023) advocated integrating AI tools into nursing programs to equip students with the skills to leverage AI, enhance patient outcomes, and meet evolving healthcare demands.

Locally, studies in the Philippines discuss AI's perceived benefits and trust in AI (Almalki et al., 2025), as well as general attitudes toward AI (Cruz et al., 2024). Innovative clinical nursing practice teaching has also been explored (Deng, 2025). These studies establish some basic premises regarding nursing students' views on AI. Tuppal et al. (2025) highlighted increased research output among local nursing researchers in AI knowledge, perception, and attitudes. Torreciba and Alieto (2025) argued that attitudes, anxiety, and literacy shape AI

acceptance. They highlighted the importance of integrating AI into education. Villarino (2025) emphasized the need to create clear institutional guidelines for AI use and develop programs for AI literacy (AIL).

Previous studies have shown that AI can have different effects on students. They have identified reliable links and determinants that predict nursing students' behavioral attributes towards AI. However, no study has investigated the mediating effects of AI anxiety (AIA) and AI self-competence (AISC) on the relationship between AIL and AI self-efficacy (AISE) among nursing students. This gap motivated the present study.

This research examines how AIA and AISC mediate the relationship between AIL and AISE among nursing students. The goal is to provide a deeper understanding of factors that shape nursing students' perceptions and abilities regarding AI. These insights can help educators and policymakers design targeted strategies to better prepare students for an AI-driven healthcare future.

To better understand the study's context, this study examined these hypotheses:

H1. AIL significantly predicts the AISE of nursing students.

H2. AIA significantly mediates the relationship between AIL and AISE of nursing students.

H3. AISC significantly mediates the relationship between AIL and AISE of nursing students.

H4. AISC exerts a stronger mediating effect, compared to AIA, on the relationship between AIL and AISE of nursing students.

H5. The indirect effects of AIA and AISC significantly mediate the relationship between AIL and AISE among nursing students.

LITERATURE REVIEW

AIA Among Nursing Students

Kwak et al. (2022) found lower AIA scores among 3rd and 4th year students than among 1st and 2nd year students. This suggests that as students progress in nursing education, they may become more familiar and comfortable with AI. This could lead to decreased anxiety levels.

Another article also highlighted the effects of AIA on nursing students' attitudes towards AI. Higher AIA is linked to more negative attitudes about using AI in healthcare. This shows the need to address these anxieties to build a positive outlook on AI in healthcare (Kwak et al., 2022). Tarsuslu et al. (2024) reported low to medium levels of AIA in many participants. This suggests AIA exists, but its intensity varies across groups.

Nasreldin Othman et al. (2021) found that many nurses in medical and critical care units experienced varying levels of anxiety about AI before training. This demonstrates the need to address AIA so professionals can confidently use these tools. In AI-assisted simulation learning, Simsek-Cetinkaya and Cakir (2023) noted that students found the learning method satisfactory, but it still raised anxiety levels. This shows the importance of considering both benefits and challenges when bringing AI into education.

These studies highlight the need to understand and address AIA among nursing students and professionals. By addressing these concerns, educators and institutions can help individuals adapt to and use AI tools to improve patient care and outcomes.

AISC of Nursing Students

There is some literature that collectively provide a comprehensive view of the relationship between technical competency among nursing students. For instance, Rahman et al. (2025) highlighted the significant impact of students' technical competency on their AI capability. This underscores the importance of strong technical skills for effectively engaging with and using AI technologies in healthcare settings. Building technical competency can enhance students' ability to navigate and leverage AI tools for improved patient care and healthcare outcomes. In a related study, Lu and Lin (2025) asserted that AISC plays a crucial role in predicting the application of AI technologies. Nursing students who possess a high level of AISC are more likely to effectively utilize AI applications in their practice, showcasing the importance of developing self-efficacy in using AI tools among healthcare professionals.

On the other hand, Abdellatif et al. (2024) found that AI-driven assessments enhance students' self-competence. By engaging with AI-driven assessment tools, students can develop a better understanding of AI applications and improve their confidence in utilizing AI technologies in educational and clinical settings. Consequently, Thompson (2025) emphasized the importance of understanding how and why AI can support learning. This knowledge enables students to apply critical thinking skills when using AI tools, ensuring that they leverage these technologies effectively while upholding academic integrity standards. Understanding the rationale behind AI applications can empower students to make informed decisions and utilize AI tools responsibly.

Regarding AI knowledge among nursing students, Abd El-Maksoud (2024) found that a significant proportion had limited knowledge, with a considerable number describing their knowledge as basic. This underscores the need for educational interventions to enhance nursing students' understanding of AI concepts and applications in healthcare. Additionally, Bhargava and Choudhary (2024) underscored the effectiveness of educational interventions in improving nursing students' knowledge of AI in healthcare. By providing targeted educational programs, institutions can equip students with the necessary skills and knowledge to effectively engage with AI technologies in clinical practice. Then, Martzoukou et al. (2025) shared insights into nursing students' digital competencies, noting that these competencies were at an intermediate level, with younger and first-year students self-assessing at higher levels. This highlights the importance of assessing and developing digital competencies among nursing students to ensure they are well-prepared to navigate the increasingly digital healthcare landscape.

Collectively, these studies underscore the significance of technical competency, AISC, AI knowledge, educational interventions, and digital competencies in preparing nursing

students to effectively engage with AI technologies in healthcare settings. By enhancing these competencies and understanding, students can leverage AI tools to improve patient care, enhance learning outcomes, and advance healthcare practices.

AIL Among Nursing Students

There is also literature offering valuable insights into the significance of AIL, its impact on nursing students, and its implications for education and healthcare settings. Like that of Chen et al. (2024), who investigated the integration of generative AI tools in education and emphasized the importance of AIL for educators. Their study identified gaps in existing frameworks, highlighting the need for tailored approaches that address the specific requirements of teaching and learning contexts. This underscores the importance of educators developing AIL skills to effectively leverage AI tools in educational settings.

On the other hand, El-Sayed et al. (2025) found moderate levels of AIL among nursing students, suggesting room for improvement in students' understanding of AI concepts and applications in healthcare. Developing higher levels of AIL among nursing students is crucial for preparing them to effectively engage with AI technologies in clinical practice and education. Also, Koo and Kang (2024) found a significant association between nursing students' AIL and their problem-solving process. This underscores the importance of fostering AIL skills among students to enhance their ability to navigate complex healthcare scenarios and make informed decisions using AI technologies. Then, Sumengen et al. (2025) emphasized that strengthening AIL can foster positive attitudes among nursing students, increase awareness, and reduce negative attitudes towards AI. By enhancing AIL skills, students can develop a deeper understanding of AI technologies and their potential applications in healthcare, fostering a more positive mindset towards AI integration in nursing practice.

Additionally, Porter and Foronca (2024) discussed the opportunities AI offers to expand teaching and learning methods for nursing students. However, they also highlighted emerging ethical issues that need to be addressed in the implementation of AI in educational settings. Ethical considerations are crucial as AI technologies become more prevalent in healthcare education, ensuring that students are trained to use AI tools responsibly and ethically. But Kimiafar et al. (2023) reported low levels of preparation, knowledge, and literacy among healthcare students in the studies they reviewed. This context underscores the need for comprehensive educational programs that enhance AIL and prepare healthcare students, including nursing students, to effectively use AI technologies in their future practice.

These studies collectively underscore the importance of developing AIL skills among nursing students, educators, and healthcare professionals to leverage AI technologies effectively in clinical practice and education. Enhancing AIL can lead to improved problem-solving abilities, positive attitudes towards AI, increased awareness, and ethical considerations, ultimately preparing students for the evolving healthcare landscape characterized by AI integration.

AISE of Nursing Students

Regarding the role of AISE among nursing students, El-Sayed et al. (2025) observed a moderate level of self-efficacy regarding AI. Self-efficacy, an individual's belief in their ability to successfully accomplish a specific task or goal, plays a crucial role in how individuals approach and engage with new technologies such as AI. Consequently, Abuadas and Albikawi (2025) also highlighted the predictive power of self-efficacy in influencing nursing students' behavioral intentions to use AI. Individuals with higher self-efficacy are more likely to exhibit positive attitudes and behaviors towards adopting and using AI technologies in their practice. Interestingly, Bozkurt et al. (2024) reported positive outcomes associated with AI in fostering engagement, self-efficacy, and confidence among nursing students. Exposure to AI technologies can enhance students' self-belief in their ability to use these tools effectively, leading to increased confidence and engagement in their educational and professional endeavors. Moreover, Obenza et al. (2023) found that students exhibited a high level of AISE, indicating a strong belief in their capabilities to utilize AI technologies. High levels of self-efficacy can empower students to overcome challenges, adapt to new technologies, and succeed in utilizing AI tools effectively in healthcare settings. And then, Creighton et al. (2024) demonstrated that nursing students' self-efficacy in AI use for academic work improved through the implementation of an academic integrity digital serious game. Educational interventions that target self-efficacy can enhance students' confidence in utilizing AI technologies responsibly while upholding academic integrity standards.

On the other hand, Chang et al. (2021) revealed that the application of mobile chatbots for learning can enhance nursing students' learning achievement and self-efficacy. Interactive tools like chatbots can boost students' confidence in their learning abilities and provide personalized support, thereby improving educational outcomes and self-efficacy. Also, Rodriguez-Ruiz et al. (2025) emphasized the association between self-efficacy and the use of AI to address students' daily doubts. Self-efficacy plays a crucial role in empowering students to proactively seek solutions using AI tools, fostering a sense of competence and autonomy in their learning and problem-solving processes.

These vital findings underscore the role of self-efficacy in shaping nursing students' attitudes, behaviors, and capabilities regarding AI technology. Enhancing self-efficacy can empower students to embrace AI tools with confidence, engage effectively in learning experiences, and leverage AI technologies to enhance their educational and professional outcomes in the healthcare field.

The Mediation Framework

Previous work has sought to understand the mediating effects of AIA and AISC across various settings. These studies shed some light on the intricate relationships among various factors in the context of AI among nursing students. For instance, in the article by Cho and Seo (2024), they identified anxiety about AI as a mediator in the relationship between AI perception and intention to use AI. This suggests that students' perceptions of AI can influence their willingness to use AI technologies, with anxiety playing a significant role in

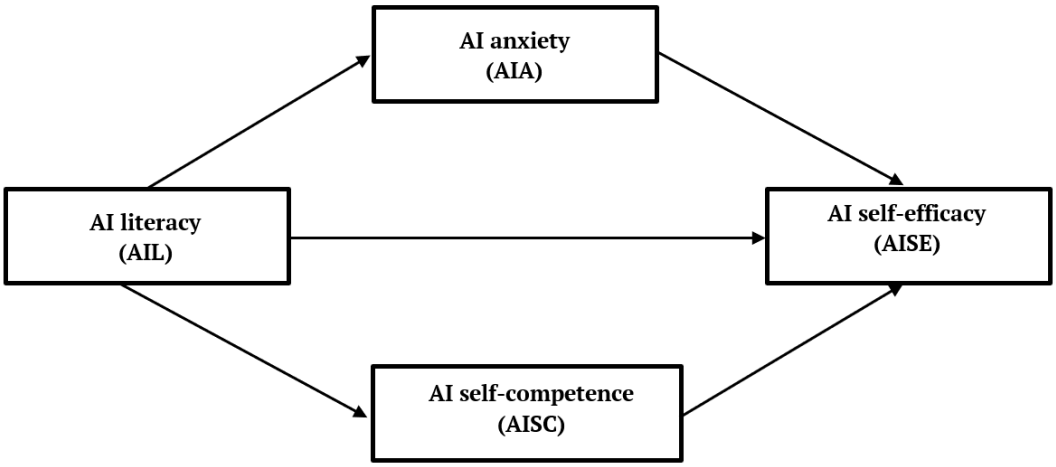

Figure 1. Proposed conceptual framework (Source: Author's own elaboration)

mediating this relationship. Addressing anxiety about AI is crucial to fostering a positive attitude towards its adoption and use. However, Obenza et al. (2023) highlighted that AI trust acts as a mediator in the association between AISE and attitudes toward AI. Trust in AI technologies plays a vital role in shaping individuals' attitudes towards AI, with self-efficacy influencing their trust in AI systems. Building trust in AI tools can enhance individuals' attitudes towards AI adoption and utilization. Moreover, Bewersdorff et al. (2025) also demonstrated that AI usage and positive attitudes towards AI predict interest in AI. Additionally, alongside AIL, they enhance students' AISE. This suggests that engaging with AI technologies, developing positive attitudes, and improving AIL can collectively enhance students' confidence in using AI tools effectively.

However, in their paper, Hwang and Wu (2025) showed that AI positively influences students' innovative thinking, with self-efficacy and reduced anxiety acting as mediators. Embracing AI technologies can stimulate students' innovative thinking, with self-efficacy and reduced anxiety playing crucial roles in mediating this relationship. Enhancing self-efficacy and reducing anxiety can facilitate students' creative and innovative use of AI tools. And then, Zhang et al. (2025) indicated that AIL enhances self-efficacy in AI learning and decreases classroom anxiety, which serve as mediators in the association between AIL and students' willingness to communicate. Improving AIL can boost students' confidence in learning AI concepts and applications, reduce anxiety, and enhance their willingness to engage in communication related to AI.

Overall, these studies underscore the multifaceted nature of students' interactions with AI technologies, highlighting the interconnectedness of factors such as anxiety, trust, attitudes, usage, literacy, self-efficacy, and innovative thinking. Understanding these relationships can inform educational strategies to promote positive attitudes, enhance self-efficacy, reduce anxiety, and foster creativity and innovation in students' engagement with AI tools and technologies.

Shown in **Figure 1** is the proposed framework of the study, where the intricate relationships of each of the variable played some interesting roles.

METHODOLOGY

Design

In this investigation, the study employed a descriptive cross-sectional research design employing a parallel mediation analysis. Ihudiebube-Splendor and Chikeme (2020) stated that such a design provides data for describing the status of a phenomenon or associations between phenomena at a given point in time.

On the other hand, a mediation analysis is a statistical method that can provide insights regarding the intermediary processes by which an intervention or exposure affects a given outcome (Schuler et al., 2025). This investigation used this research design because the primary purpose of the study was to assess the AIL, AISE, AIA, and AISC of nursing students. By assessing the levels of each study variable it will establish definitive or general characteristics of the sample being investigated, thus providing a descriptive analysis of the given sample population.

Furthermore, to acquire a more in-depth understanding of the phenomena, a parallel mediation analysis will determine the intricate relationships of each variable in the investigation.

Participants

The study was able to obtain a total of 255 participants, who responded to the online Google form survey that the investigators distributed from September to October 2024. According to Memon et al. (2020), a modest sample of 160-300 valid observations is already well-suited for multivariate statistical computations. The researcher also employed a purposive sampling technique to gather the appropriate sample for the study. The participants are from the BS in Nursing program at a higher education institution in Olongapo City, Philippines. They comprised students from first to fourth year who matriculated at the institution for the 2024-2025 academic year.

Prior to data collection, the study obtained informed consent from each participant, and participation in the survey was voluntary and conducted in accordance with general ethical considerations.

Table 1. Descriptive analysis of the variables

Variables	Mean	Standard deviation	Cronbach's alpha	1	2	3	4
AIL	2.97	0.668	.939	1	.659*	.206*	.320*
AISE	2.93	0.765	.907		1	-0.010	.419*
AIA	3.16	0.760	.952			1	.124*
AISC	3.62	0.807	.893				1

Note. N = 255 & *p < .05

Measures

This study used two major components to obtain the necessary data for computation and analysis. The first one was a previous study by Wang et al. (2024) that assessed nursing students' AIA levels. It has 21 items, including *"learning to understand all of the special functions associated with an AI technique/product makes me anxious"* and *"taking a class about the development of AI techniques/products makes me anxious."* Based on the previous article, its reliability coefficient ranges from 0.917 to 0.974, with an overall alpha coefficient of 0.964.

For the second instrument, the study patterned it after Carolus et al.'s (2023) previous paper, which used the AIL, AISE, and AISC constructs. For the AIL, it comprised of 19 items, which include some items like *"I can operate AI applications in everyday life"* and *"I can use artificial intelligence meaningfully to achieve my everyday goals."* For AISE, some statements include: *"I can rely on my skills in difficult situations when using AI,"* and *"I can also usually solve strenuous and complicated tasks when working with artificial intelligence well."* And for the AISC, it includes items like *"I don't let AI influence me in my everyday decisions"* and *"I can prevent an AI from influencing me in my everyday decisions."* Both the AISE and competency have six items each. Based on the previous tool, the internal consistencies for the subscales of AIL, AISE, and AISC ranged from 0.70 to 0.90, which is within the acceptable range for instrument reliability. Taber (2018) claimed that a rule-of-thumb for the Cronbach's alpha should reach 0.70 for an instrument to have an acceptable level of consistency.

Statistical Analysis

The statistical analysis employed descriptive statistics, such as the mean and standard deviation, to assess the general perspectives of nursing students regarding AIL, AISE, AIA, and AISC. At the same time, to establish the links of each of the variables from one another, the inferential statistics used a Pearson-r moment of correlation for the relationships among the variables and Hayes' process macro model 4, a type of linear regression calculation for models in order to establish the mediating effecting of AIA and AISC to the link between AIL and AISE of nursing students. To accomplish the statistical task, the calculation used software, the IBM SPSS version 23. Lastly, all of the responses of the nursing students were from a five point Likert scale measure wherein a score of five is the highest and a score of one is the lowest.

RESULTS

The main purpose of this investigation is to determine the underlying mediating effects of two variables, namely, AIA and AISC, on the relationship between AIL and AISE. The following tables and an illustration summarize the results and findings of this study.

The descriptive analysis presented in **Table 1** provides insights into the variables related to AIL, AISE, AIA, and AISC. The mean scores across the variables range from 2.93 to 3.62, with standard deviations ranging from 0.668 to 0.807. Internal consistency reliability estimates, indicated by Cronbach's alpha coefficients, are notably high, ranging from .893 to .952. Significant correlations are also observed among the variables: AIL positively correlates with AISE (r = .659) and AIA (r = .206), and AISE positively correlates with AIA (r = .419). Additionally, AIA shows a positive correlation with AISC (r = .124). These results suggest interrelations among the variables, highlighting the importance of understanding AIL, AISE, AIA, and AISC among nursing students (**Figure 2**).

In **Table 2**, the direct effect of core work values on organizational commitment is demonstrated through the path from AIL to AISE, with a significant path coefficient of .7051 (SE = .0543, t [255] = 12.995, p = .000). This result indicates a strong positive relationship between AIL and AISE in influencing organizational commitment. The 95% confidence interval for the coefficient ranges from 0.5983 to 0.8120, further underscoring the robustness and reliability of the relationship. Notably, the findings suggest that proficiency in AIL plays a crucial role in enhancing individuals' self-efficacy in AI-related tasks, which in turn impacts their level of commitment to the organization.

In **Table 3**, the indirect effects of AIL on AISE are mediated through work AIA and work AISC.

The mediation analysis is based on 5,000 bootstrap samples and revealed that the path AIL ➔ AIA ➔ AISE (**H2**) shows a Beta coefficient of 0.2343 (bootstrap SE = 0.0700) with a 95% confidence interval ranging from 0.0965 to 0.3722, indicating a significant indirect effect of AIL on self-efficacy through anxiety (see **Figure 1**). This result points out that 4.24% of the total effect of AIL on AISE, emphasizing the significant role in the relationship. This result further implies that AIA among nursing students is a key factor that may impact their AIL and AISE, and that these factors may be linked to future remedies for institutions to consider and awareness measures.

Similarly, the path AIL ➔ AISC ➔ AISE (**H3**) exhibits a Beta coefficient of 0.3863 (bootstrap SE = 0.0719) with a confidence interval (95%) from 0.2447 to 0.5280, highlighting the substantial indirect impact of AIL on self-efficacy via self-competence. The computation reveals that AISE accounts for 10.23% of the total effect of AIL on AISE, underscoring its significant role in the relationship. It further implies that AISC is a critical ingredient for nursing students to possess to adapt to the fast-paced technological changes they face.

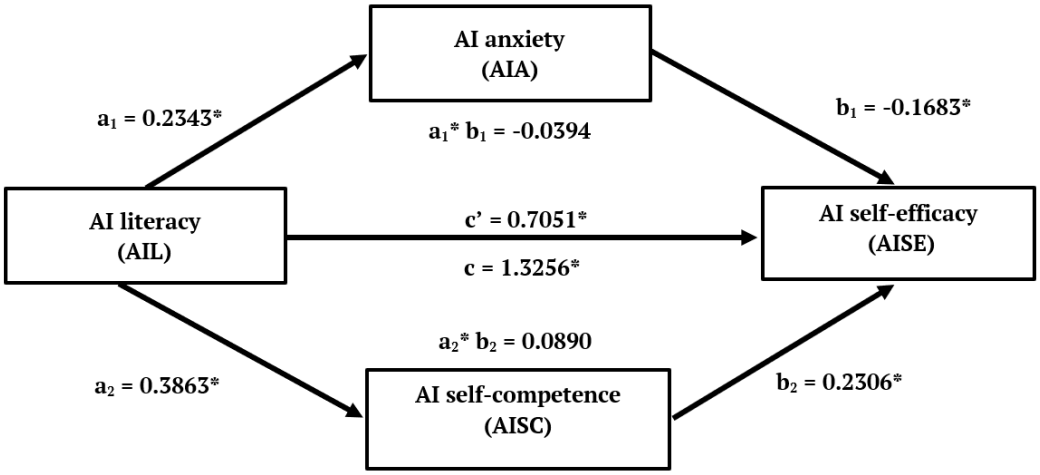

Figure 2. A parallel mediation model that analyzed how the AIL influences AISE through two mediators: The AIA and AISC (c' = Direct effect of AIL on AISE & c = Total indirect effect [indirect effect via AIA (a_1 * b_1) + indirect effect via AISC (a_2 * b_2)]) (Source: Author's own elaboration)

Table 2. Direct effect of core work values on organizational commitment

Path	Coefficient (β)	SE	*t* (255)	*p*	95% confidence interval	
					Lower level	Upper level
AIL → AISE	.7051	.0543	12.995	.000	0.5983	0.8120

Table 3. Indirect and total effects of AIL on AISE

Effect	Path	Coefficient (β)	Boot SE	95% confidence interval	
				Boot lower level	Boot upper level
Via AIA	AIL → AIA → AISE	0.2343	.0700	0.0965	0.3722
Via AISC	AIL → AISC → AISE	0.3863	.0719	0.2447	0.5280
Total indirect effect	-	0.6205	.0337	-0.0145	0.1184
Total effect	AIL → (AIA + AISC) → AISE	1.3256	-	-	-
Proportion mediated	-	0.0374	-	-	-

Note. Total effect = Direct effect (β) + total indirect effect (β); Proportion mediated = Total indirect effect (β)/total effect (β); A number of bootstrap samples for bias-corrected bootstrap confidence interval = 5,000; & Boot SE = Bootstrap standard error

For the fourth hypothesis of the study, the total indirect effect is calculated as 0.6205 (bootstrap SE = 0.0337) with a confidence interval (95%) from -0.0145 to 0.1184, implying the combined influence of AIL through anxiety and self-competence on self-efficacy. However, the study predicted that the indirect effect through AISC (Beta = 0.3862) is greater than that of AIA (Beta = 0.2343). It only means that the AISC accounts for 62.2% of the indirect effect, making it a stronger mediator than AIA which accounts for only 37.8% of the total indirect effect.

Lastly, the total effect of AIL on AISE, considering both direct and total indirect effects, is 1.3256. The proportion mediated, representing the ratio of the total indirect effect to the total effect, is calculated as 0.0374. These results emphasize the intricate relationships among AIL, AIA, AISC, and AISE, shedding light on the mechanisms by which AIL influences individuals' self-efficacy in the workplace.

DISCUSSION

The main focus and objective of this investigation is to determine the intricate relationships between AIL, AIA, AISC, and AISE. At the same time, determine the mediating effects of AIA and AISC in the relationship between AIL and AISE.

The first hypothesis of the study sought to determine whether AIL predicts AISE among nursing students. Statistical analyses indicated that AIL significantly predicts AISE among nursing students. Therefore, the study provided substantial evidence that AIL predicts AISE among nursing students. It further implies that if nursing students have sufficient AIL–knowledge, awareness, or skills about AI–then their self-efficacy is also relevant and predominant. This result somewhat aligns with the research findings of Ji et al. (2025), who indicated that AIL influences a learner's creative self-efficacy, especially in innovative activities. Becirovic et al. (2025) also reported that AIL positively influences AISE among university students, a finding that aligns with the current result. Also, the groups of Bewersdorf (2025) and Zhang et al. (2025) found that AIL influences and improves AISE among students.

As for the second hypothesis of the investigation, the study seeks to determine whether AIA mediates the relationship between AIL and AISE. Again, based on the result of the computation, AIA significantly mediates the relationship between AIL and AISE in the study. Thus, the study has proven that their hypothesis is acceptable and noteworthy. The result

further indicates that AIA among nursing students affects the relationship between AIL and AISE to some extent. In the paper by Cho and Seo (2024), they noted that anxiety about AI mediates the relationship between AI perception and the intention to use AI. Since the study also found a similar effect, one can conclude that AIA plays a significant role. Another study by Tarsuslu et al. (2024) also depicted that AIA indirectly affects the relationship between digital leadership and AI attitude among nurses. Nevertheless, Wang et al. (2024) argued that AIA is important, especially for guiding course design in an AI learning environment.

The third hypothesis examines the mediating role of AISC in the relationship between AIL and AISE. Looking at the statistical results, they provide significant evidence to support the previous claim that AISC mediates the association between AIL and AISE. Hence, the investigation established that the AISC of nursing students plays a vital role in the link between the two major variables of the study. Interestingly, Olea et al. (2025) recently considered self-efficacy a crucial mediator. Another recent study by Lu and Lin (2025) also found that AISC mediated the relationship. Both studies, in some ways, supported the claim of the current study, namely that AISC has a mediating effect on relationships among variables, especially in the context of AI.

For the fourth hypothesis in the investigation, the study found that AISC has a stronger mediating effect than AIA among nursing students. The result indicates that self-competence is given more attention than anxiety among nursing students. In a past study by Chang et al. (2021), they acknowledged that having an AI (mobile chatbot) in nursing training and learning can enhance students' achievement and self-efficacy. In a scoping review by Buchanan et al. (2021), they also claimed that AI influences both nursing education in academic institutions and clinical practice. Additionally, in a comparative study, an AI nursing course was found to positively affect students' readiness for medical AI (Taskiran, 2023).

And as for the last hypothesis of the study, computation revealed that AIA and AISC indirectly mediate the relationship between AIL and AISE among nursing students. This finding displayed the intricate role of the two mediating factors in the relationship between AIL and AISE for nursing students. In a recent paper by Varol (2025), it was found that higher self-efficacy is associated with lower AIA. It also implies that both AIA and AISC are vital factors that can contribute to the overall well-being of nursing students, thereby improving their AIL and AISE in their learning experience at the tertiary level. Rodriguez-Ruiz et al. (2025) also added that self-efficacy is associated with the use of AI in solving daily doubts and doing academic tasks.

In summary, this study's comprehensive exploration of the multifaceted relationships and mediating factors underlying AIL and AISE in nursing education provides valuable insights to the field, emphasizing the critical importance of addressing AIL, AIA, and AISE to empower students to use AI technologies effectively in healthcare settings.

CONCLUSION

The study found interesting findings that contributed to the ever-growing literature on AI. First, the study found a direct relationship between AIL and AISE. Drawing on the first hypothesis, the current investigation provided evidence for this claim. Secondly, the study also found that AIA mediates the relationship between AIL and AISE. Thus, the second hypothesis of the study was proven. Thirdly, the investigation also indicated that AISC affects the relationship between AIL and AISE; hence, we accepted the third hypothesis of the study. As for the fourth hypothesis, the study found that AISC has a stronger mediating effect than AIA on the relationship between AIL and AISE. Lastly, the current paper also provided substantial evidence that both AIA and AISC have an indirect effect on the association between AIL and AISE.

Implication of the Study

Based on the findings of this paper, the investigator hereby identifies some relevant implications.

1. The institution should consider enhancing students' AI knowledge and skills to boost their confidence in using AI tools effectively in healthcare settings and in their learning experience.
2. Nursing education should provide practical opportunities for students to develop AI skills and hands-on experience, ultimately enhancing their self-efficacy in applying AI tools in clinical practice.
3. Educational programs should focus on strategies to mitigate AIA, fostering positive attitudes and intentions towards AI utilization among nursing students.
4. Educational programs should prioritize developing students' self-competence in AI to empower them to effectively utilize AI technologies in nursing practice.
5. Educational interventions should consider the interplay among these factors and tailor programs to address both anxiety and self-competence, while also enhancing AI knowledge and skills.

Limitation of the Study

Like any other research in the field, this particular study also has several limitations. First, the participants: this study focused only on nursing students. Therefore, future researchers can explore other alternative participants. Secondly, the locale of the study: this research was conducted at one nursing school; hence, replicating it in other schools of nursing would benefit future investigations as well. Third is the sampling technique, wherein the current study employed non-probability sampling for various reasons. Future researchers can use random sampling to adopt a more appropriate sampling technique. Fourth, the study's variables; future researchers can add other variables, such as academic achievement or performance among student participants, to examine the effect of AI on students' learning. Lastly, to gain a much deeper insight, a mixed-methods approach can also be a choice for future researchers to enrich the current findings of the study.

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