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# Current status and associated factors of digital literacy among academic nurse educators: a cross-sectional study

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## Abstract

**Background** In the backdrop of the ongoing global digital revolution in education, the digital literacy of teachers stands out as a pivotal determinant within the educational milieu. This study aims to explore the current status and associated factors of digital literacy among academic nurse educators.

**Methods** A cross-sectional design study utilizing an online questionnaire platform (Wenjuanxing) to collect data from August to October 2023. A total of 157 academic nurse educators members from 10 nursing colleges and universities across 5 provinces in China participated in the study. The digital literacy level of academic nurse educators was evaluated using the self-developed Teacher Digital Literacy Questionnaire. Multiple linear regression analysis was employed to examine the factors associated with the digital literacy of academic nurse educators.

**Results** The average digital literacy score was  $125.27 \pm 11.41$ , with the average scores for five dimensions from high to low by rank as follows: digital application ( $46.73 \pm 5.38$ ), digital social responsibility ( $27.22 \pm 3.94$ ), digital awareness ( $20.28 \pm 3.17$ ), professional development ( $19.88 \pm 2.76$ ), and digital technology knowledge and skills ( $11.16 \pm 2.03$ ). Multiple linear regression analysis revealed that age, years of teaching experience, awareness of digital advancements, and use of digital technologies (e.g. ChatGPT) (all  $p < 0.001$ ) were significantly associated with the level of digital literacy among academic nurse educators.

**Conclusion** Our findings suggest a need to design tailored digital education programs that address different age groups. For younger academic nurse educators, the focus should be on how to incorporate digital technology into their teaching practices to enhance educational diversity. For older academic nurse educators, training should prioritize building confidence in using digital tools and developing foundational digital skills to ensure they can effectively integrate technology into their instructional approaches. Therefore, supporting their needs and enhancing teaching competence towards sustainable nursing digital literacy.

**Keywords** Nurse educators, Academic, Digital literacy, Teaching experience, Education

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## Background

The inaugural World Conference on Digital Education, convened in Beijing in February 2023, advocated for “the advancement of the integration and development of digital technology within the realm of traditional education, to foster innovative educational concepts, methods, and forms, with the ultimate goal of harnessing digital technology to empower education and better serve the fundamental essence of human learning” (p.1) [1].

The rapid evolution of digital technology has far-reaching implications, necessitating an accelerated digital transformation in education. A key imperative is the comprehensive enhancement of teachers’ digital literacy, marking a critical and pressing trend [2, 3]. Teachers, as direct practitioners in the digitalization of teaching and learning, play a pivotal role. Digital literacy for educators extends beyond mere technological application; it encompasses their capacity to process, analyze, and critically evaluate digital information [4, 5]. Over the past two decades, the field has witnessed rapid strides in the informatization and digitization of education, resulting in substantial achievements across policy frameworks, hardware infrastructure, and software development [6, 7]. These advancements have laid a robust foundation, setting the stage for a higher-level exploration into the progression of teachers’ digital literacy.

Within the context of nursing education, it is imperative to align with contemporary trends and ensure that academic nurse educators possess the requisite digital literacy to effectively prepare future nursing professionals while they are in a tertiary nursing education program [8]. This imperative underscores the need for academic nurse educators to not only embrace digital tools but also cultivate an evidence-based understanding of their utilization in the dynamic landscape of nursing education and diverse healthcare settings. Therefore, the findings of this study may guide academic nurse educators in creating relevant courses and programs that embed and translate digital literacy in nursing education. As a result, there is a sustained transmission and translation of digital literacy to their students, who will become future professional nurses working in a digitally integrated healthcare environment, ultimately future-proofing patient safety outcomes.

## Literature review

The digital transformation of education is intricately tied to a country’s future competitiveness [9]. In recent years, global competition has spurred nations to formulate development strategies that seamlessly integrate digital technology across the entire field of education, extending into economic and social development [10–12]. Tertiary education served as the final frontier in training educators and learners for digital literacy. Educators in higher

learning institutions, such as academic nurse educators, must be digitally literate to prepare future workers for productive career in digitally integrated workplaces.

Teacher digital literacy encompasses the awareness, capability, and responsibility of educators to effectively utilize digital technology in acquiring, processing, managing, and evaluating digital information and resources. It extends to their proficiency in discovering, analyzing, and solving educational and teaching challenges, as well as optimizing, innovating, and instigating change in educational activities [12, 13]. The digital literacy level of academic nurse educators holds significant sway over nursing education, impacting both the quality of education and the development of students’ clinical skills and nursing knowledge [14].

In nursing education, digital technologies play a crucial role in simulated clinical scenarios, electronic medical record management, and remote health monitoring. These applications enhance the learning experience for nursing students and empower educators to effectively explain and demonstrate complex nursing concepts [15, 16]. By leveraging digital technology tools, academic nurse educators can elevate the quality of nursing education, enabling students to master digital tools and systems pertinent to modern healthcare practices. This preparation equips them to meet the challenges of real-life healthcare environments [17]. The integration of digital literacy among academic nurse educators not only enhances the overall educational process but also contributes to the adaptability of students in navigating contemporary healthcare landscapes.

The omnipresent Chat Generative Pretrained Transformer (ChatGPT) affects nursing education [18–20]. It uses Open AI’s language model architecture. OpenAI claims that GPT-4 performs at the human level on professional and academic criteria, including passing a simulated bar exam in the top 10% [21]. ChatGPT’s capacity to respond as well as, if not better, than the average person has caused concerns about cheating on exams or finishing schoolwork [22]. ChatGPT can create student papers, research publications, and more. Some contend that ChatGPT is only effective on the data it was trained on, therefore humans must always confirm the result [21]. These issues call for more ChatGPT training for teachers and students in schools, while others suggest it should be an essential technology used in classrooms [18–20]. However, USA Today reported that several schools have banned ChatGPT [23], although the American Psychological Association advises schools to educate teachers and students about the appropriate and ethical use of ChatGPT [24]. In nursing education, it is crucial to examine academic nurse educators’ ability to use this technology to improve their teaching and learning practices,

hence developing nursing students that will thrive in a digitally integrated healthcare workplace [18–20].

The establishment and formulation of digital literacy standards are pivotal for enhancing educators' digital literacy proficiency [25]. Both domestically and internationally, extensive exploration and research have been conducted on the definitions and standards of digital literacy for teachers [26, 27]. The International Society for Technology in Education (ISTE) has developed widely accepted standards for educational technology and digital literacy. These standards outline requirements for educators' skills, knowledge, and pedagogical practices in the digital age [28]. Similarly, the Organization for Economic Co-operation and Development (OECD) has established standards for digital literacy in education, emphasizing core skills and literacy for both students and educators in the digital realm. This guides global education reforms [29], particularly influencing China and its nursing programs.

In China, the Ministry of Education issued an industry standard for Digital Literacy for Teachers on November 30, 2022. This standard establishes an indicator system with five primary dimensions (digital awareness, digital technology knowledge and skills, digital applications, digital social responsibility, and professional development), 13 secondary dimensions (e.g., digital cognition, digital teaching design, digital academic assessment), and 33 tertiary dimensions (e.g., recognizing challenges and opportunities in applying digital technology to education, creating digital educational resources, leveraging digital technology resources for mental health education) [30]. This standard not only summarizes teachers' existing information technology competence but also imposes a stringent requirement for the standardization and systematization of teachers' digital literacy. Consequently, nursing programs aligns its curricula and nurse academic educator development to this digital literacy standards.

In summary, within the context of the global digital transformation of education, teachers' digital literacy emerges as a critical factor in the educational landscape. This study's primary objective is to address the existing gap in digital literacy research within the field of nursing. It aims to comprehend the current status of digital literacy among academic nurse educators and propose targeted improvement strategies. The overarching goal is to optimize the quality and effectiveness of nursing education to better align with evolving healthcare needs and educational requirements. This study aspires to provide scholarly and logically sound support for the digital transformation of nursing programs, contributing both knowledge and practical insights to the future of nursing education.

## Research questions

This study addressed the following research questions:

1. What are the digital literacy levels among academic nurse educators with different demographic characteristics?
2. What are the digital literacy scores of academic nurse educators?
3. What are the associated demographic factors of digital literacy among academic nurse educators?

## Materials and methods

### Study design

A cross-sectional design was used for this study. This design captures a comprehensive snapshot of digital literacy levels among academic nurse educators at a specific point in time, enabling an effective assessment of current status and associated factors without the need for longitudinal tracking [31].

### Participants, settings, and sampling

Purposive sampling was used to recruit participants ( $n=157$ ) from 10 nursing colleges and universities across 5 provinces in China. Inclusion criteria encompassed individuals who: (1) Hold a bachelor's degree or higher qualification, (2) currently employed as full-time nursing educators in a nursing college or university, (3) aged between 20 and 60 years, (4) have good health and the capacity to independently complete the questionnaire, and (5) willing to participate in the study. Individuals on temporary leave due to personal health reasons or vacation were excluded from participating. Utilizing the Soper online sampling size calculator, with anticipated effect size of 0.15, statistical power level of 0.85, and probability level of 0.05, the minimum sample size is 140. Hence, our sample size demonstrated statistical power because it satisfied the minimum sample size.

### Measures

The questionnaire comprised of two sections and took approximately 15 to 20 min to complete. The questionnaire was chosen as the primary data collection instrument because it efficiently gathers standardized data from a large sample of academic nurse educators. Additionally, it enables the assessment of multiple dimensions of digital literacy and engagement with digital technologies in a structured and easily analyzable format. This tool reflects the digital literacy agenda of China, hence it is culturally and semantically appropriate and reliable.

### Section A: general information

This segment comprised demographic variables and six questions assessing participants' familiarity and opinions regarding digital education technology. Demographic

variables such as gender, age, years of teaching experience, educational level, professional title, and school classification. Additionally, participants were queried about their engagement with digital education technology developments: (1) Have you followed and participated in the latest developments in digital education technology? (2) Have you heard of ChatGPT? (3) Have you used ChatGPT or similar natural language processing tools in educational endeavors? (4) Do you think ChatGPT has potential in education? (5) Do you think ChatGPT is perceived to have a positive impact on students' learning experiences? (6) Do you think schools or organizations should provide more digital literacy training and support to help teachers better integrate digital technologies into education? These six questions were answered by "yes" or "no."

### Section B: academic nurse educators' digital literacy questionnaire

This self-developed questionnaire (see Supplementary file) was based on the five dimensions of digital literacy: digital awareness, digital technology knowledge and skills, digital application, digital social responsibility, and professional development (Fig. 1) [32, 33]. The questionnaire comprised of five dimensions with 33 items. Dimension 1: digital awareness (5 items), Dimension 2: digital technology knowledge and skills (3 items), Dimension 3: digital application (14 items), Dimension 4: digital social responsibility (6 items), and Dimension 5:

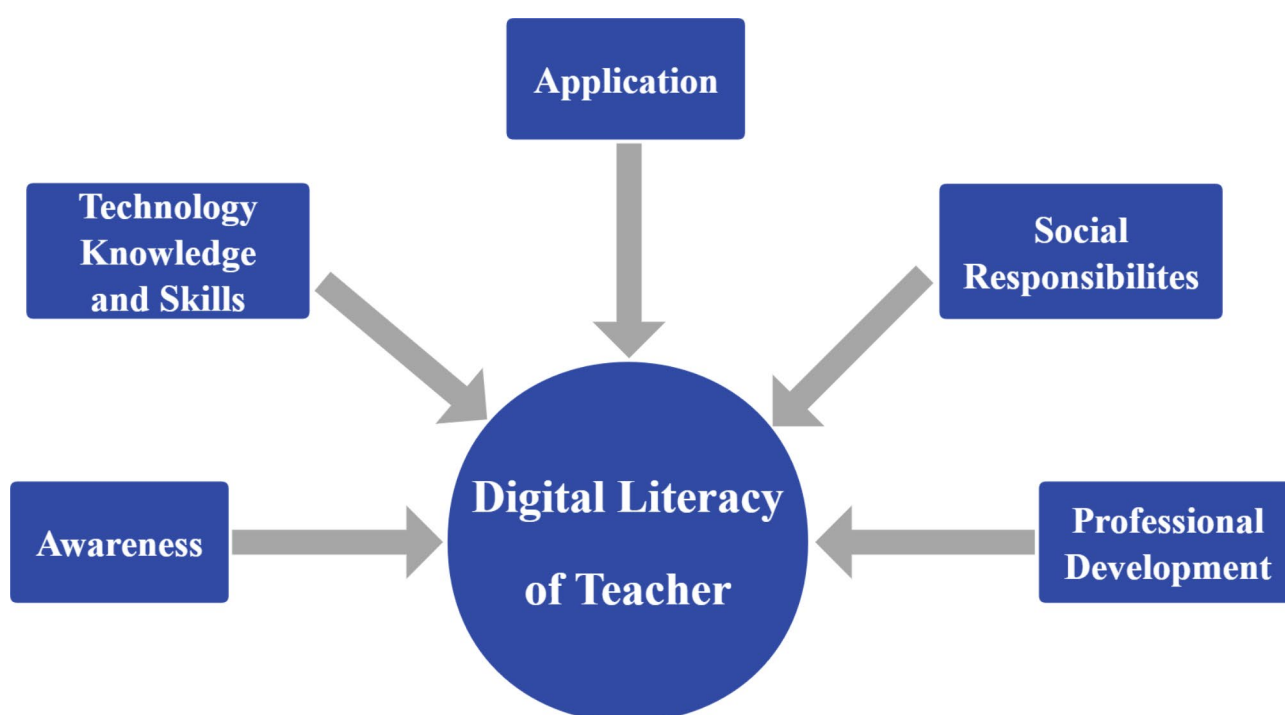
professional development (5 items). Each item was rated using a 5-point Likert scale ranging from 1=strongly disagree to 5=strongly agree. Total scores ranged from 33 to 165, with higher scores indicating a higher level of digital literacy among academic nurse educators.

### Questionnaire performance

The questionnaire's reliability was assessed via pilot testing among 10 academic nurse educators. For the six questions about engagement with digital education technology developments, the Cronbach's alpha was 0.90, and for the 33-item academic nurse educators' digital literacy questionnaire, the Cronbach's alpha was 0.88. Both scales showed good reliability.

### Data collection

Data collection started after ethical approval was secured. We collected data from August to October 2023. The digital literacy questionnaire was administered anonymously via the Wenjuanxing online questionnaire platform. The questionnaire was distributed using a QR code and shared within personal networks, including among colleagues and alumni groups of academic nurse educators from the 10 nursing colleges. Participants completed the questionnaire independently, and data were retrieved by the investigator through the platform's backend. Data validation checks were conducted to exclude invalid responses (e.g., incomplete demographic data and questionnaire response). Only the researchers had



**Fig. 1** Framework of academic nurse educators' digital literacy

access to the collected data that was stored in a password encrypted laptop dedicated for the study.

### Data analysis

Statistical analyses included t-tests and one-way ANOVA for comparing measurement data, SNK-q tests for multiple comparisons, and analysis of variance for comparing count data. Multiple linear regression analyses were employed to explore factors influencing the digital literacy of academic nurse educators. Statistical significance was set at  $\alpha=0.05$ , and data were analyzed using IBM SPSS 22.0 software.

## Results

### Demographics

A total of 157 academic nurse educators, representing 10 nursing schools across five provinces, participated in this study, yielding a questionnaire response rate of 92.35% (157/170). The sample predominantly comprised females, accounting for 94.27% ( $n=148$ ), while males constituted 5.73% ( $n=9$ ) of the participants. Within the age distribution, approximately 39.49% ( $n=62$ ) fell within the 31–40 years old bracket. Regarding teaching experience, 41.40% ( $n=65$ ) of participants had accumulated 6–15 years in the field. The majority of participants held a master's degree (68.79%,  $n=108$ ), with nearly two-fifths possessing an intermediate professional title (38.85%,  $n=61$ ). Affiliation with Second-level universities was predominant, encompassing 60.51% ( $n=95$ ) of the participants. Further demographic details are presented in Table 1.

### Comparison of digital literacy levels among academic nurse educators with different demographic characteristics

Statistical differences ( $p<0.05$ ) were observed in the comparison of digital literacy levels among academic nurse educators with varying age, years of teaching experience, awareness of digital advancements, and use of digital technologies (e.g. ChatGPT). Details are presented in Table 1.

### Digital literacy scores of academic nurse educators

Table 2 illustrates that the total digital literacy score of academic nurse educators was  $125.27 \pm 11.41$ . The average scores for the five dimensions, ranked from high to low, were as follows: digital application ( $46.73 \pm 5.38$ ), digital social responsibility ( $27.22 \pm 3.94$ ), digital awareness ( $20.28 \pm 3.17$ ), professional development ( $19.88 \pm 2.76$ ), and digital technology knowledge and skills ( $11.16 \pm 2.03$ ).

### Multiple linear regression analysis of digital literacy among academic nurse educators

From Table 3, multiple linear regression showed that age ( $\beta=0.164$ ,  $p<0.001$ ), years of teaching experience ( $\beta=0.446$ ,  $p<0.001$ ), awareness of digital advancements,

measured by the statement 'have you followed and participated in the latest developments in digital education technology' ( $\beta=0.115$ ,  $p<0.001$ ), and use of digital technologies (e.g. ChatGPT), measured by the statement 'have you used ChatGPT or similar natural language processing tools in educational endeavors' ( $\beta=0.164$ ,  $p<0.001$ ) were significantly associated with the level of digital literacy among academic nurse educators.

## Discussion

This research investigated the digital literacy of academic nurse educators to promote their development. This study showed that the total digital literacy score of academic nurse educators was at a moderate level which is similar to findings from previous studies [12, 34, 35]. While academic nurse educators exhibited a certain level of digital literacy, opportunities for enhancement remain. Notably, entries within the digital social responsibility dimension scored the highest, indicating a high commitment to digital ethics and security among academic nurse educators. Furthermore, the digital awareness dimension garnered the second highest mean score, suggesting high knowledge of digital technologies. This could stem from nurse educators' exposure to diverse teaching technologies in their colleges or experiences with technologies from external sources. However, their lack of confidence in implementing digital teaching practices, coupled with insufficient guidance and knowledge resources, which may limit innovation in teaching methodologies [36].

Scores for digital technology knowledge and skills, digital application, and professional development dimensions all fell below 4, indicating moderate levels, with digital application exhibiting the lowest mean score. This result underscores widespread inadequacy in digital application proficiency among academic nurse educators, with substantial room for improvement in digital technology knowledge and skills and professional development. Most academic nurse educators are able to master digital technology resources (digital devices, software, platforms, etc.) commonly used in the teaching process and solve some basic technical problems [37, 38]. While educators may possess proficiency in commonly used digital tools, there appears to be a gap in understanding the underlying principles of digital technology utilization. Many academic nurse educators are adept at navigating digital resources but lack the theoretical comprehension necessary for effective utilization, leading to challenges in selecting appropriate digital resources for specific teaching scenarios and inhibiting innovation [20].

Digital application, which encompasses digital instructional design, implementation, evaluation, and collaborative teaching, is the cornerstone of teachers' digital literacy [39]. However, our findings indicate a significant inadequacy in the digital application proficiency of



**Table 1** Comparison of digital literacy levels among academic nurse educators with different demographic characteristics (Mean  $\pm$  SD)

Variables	n	%	Score of Digital Literacy	t/F	P
Gender					
Male	9	5.73	126.91 $\pm$ 11.62	0.450	0.654
Female	148	94.27	125.17 $\pm$ 11.25		
Age group (y old)					
20–30	46	29.30	121.26 $\pm$ 11.15	32.260	< 0.001
31–40	62	39.49	133.44 $\pm$ 12.30		
41–50	40	25.48	127.19 $\pm$ 11.67		
51–60	9	5.73	94.73 $\pm$ 10.74		
Years of teaching experience					
$\leq 5$	58	36.94	124.14 $\pm$ 12.06	22.291	< 0.001
6–15	65	41.40	132.06 $\pm$ 13.12		
16–25	28	17.84	118.24 $\pm$ 11.27		
> 26	6	3.82	95.44 $\pm$ 10.05		
Education attainment					
Undergraduate	12	7.64	121.74 $\pm$ 10.84	0.045	0.721
Master's	108	68.79	125.74 $\pm$ 11.76		
Doctorate	6	3.82	124.33 $\pm$ 11.07		
Doctorate student	31	19.75	125.18 $\pm$ 11.23		
Professional title					
Unclassified/Junior	46	29.30	107.95 $\pm$ 10.42	54.900	< 0.001
intermediate	61	38.85	137.74 $\pm$ 13.04		
Senior	50	31.85	124.08 $\pm$ 11.91		
School classification					
Vocational college	58	36.94	121.42 $\pm$ 10.68	7.500	< 0.001
Second level university	95	60.51	127.02 $\pm$ 11.79		
First level university	4	2.55	139.47 $\pm$ 13.24		
Have you followed and participated in the latest developments in digital education technology					
Yes	132	84.08	127.61 $\pm$ 12.47	5.497	< 0.001
No	25	15.92	112.91 $\pm$ 11.04		
Have you heard of ChatGPT?					
Yes	129	82.17	125.44 $\pm$ 11.58	0.396	0.693
No	28	17.83	124.49 $\pm$ 11.12		
Have you used ChatGPT or similar natural language processing tools in educational endeavors					
Yes	21	13.38	131.28 $\pm$ 13.10	2.444	0.016
No	136	86.62	124.34 $\pm$ 11.96		
Do you think ChatGPT has potential in education?					
Yes	119	75.80	125.41 $\pm$ 11.74	0.040	0.959
No	7	4.45	125.28 $\pm$ 11.33		
unsure	31	19.75	124.73 $\pm$ 11.09		
Do you think ChatGPT is perceived to have a positive impact on students' learning experiences					
Yes	145	92.36	126.72 $\pm$ 11.56	5.490	< 0.001
No	12	7.64	107.75 $\pm$ 10.74		
Do you think schools or organizations should provide more digital literacy training and support to help teachers better integrate digital technologies into education					
Yes	151	96.18	125.44 $\pm$ 12.05	0.889	0.376
No	6	3.82	120.99 $\pm$ 11.36		

academic nurse educators, particularly in applying digital technology to problem-solving and teaching innovation. Previous studies reported that the overwhelming workload associated with integrating digital technology into their disciplines as a major barrier [20, 36]. Additionally,

they expressed challenges in adapting their established teaching styles to incorporate digital tools due to time constraints and energy limitations. Professional development plays a crucial role in enabling teachers to foster continuous personal growth and collective advancement

**Table 2** Total score and items' average score of Digital literacy (Mean  $\pm$  SD)

Dimensions	Items	Average Score	Average Score of Items
Digital Awareness	5	20.28 $\pm$ 3.17	4.06 $\pm$ 1.02
Digital Technology Knowledge and Skills	3	11.16 $\pm$ 2.03	3.72 $\pm$ 0.72
Digital Application	14	46.73 $\pm$ 5.38	3.34 $\pm$ 0.65
Digital Social Responsibility	6	27.22 $\pm$ 3.94	4.54 $\pm$ 1.13
Professional Development	5	19.88 $\pm$ 2.76	3.97 $\pm$ 0.84
Digital Literacy	33	125.27 $\pm$ 11.41	3.79 $\pm$ 0.71

**Table 3** Multiple linear regression analysis of digital literacy among academic nurse educators

Variables	$\beta$	$S_x$	Standard- ized Partial Regression Coefficient	t	P
Age group (y old)					
20–30 (reference)					
31–40	0.624	0.186	0.164	3.355	< 0.001
41–50	0.492	0.163	0.149	3.018	0.003
51–60	-0.216	0.084	0.077	2.571	0.010
Years of teaching experience					
$\leq 5$ (reference)					
6–15	0.546	0.156	0.446	3.500	< 0.001
16–25	-0.371	0.112	0.296	3.313	< 0.001
> 26	-0.198	0.069	0.105	2.870	0.004
Have you followed and participated in the latest developments in digital education technology					
No (reference)					
Yes	0.522	0.126	0.115	4.143	< 0.001
Have you used ChatGPT or similar natural language processing tools in educational endeavors					
No (reference)					
Yes	0.641	0.172	0.164	3.727	< 0.001

with the aid of digital technologies and resources [40]. While many academic nurse educators engage in thematic seminars, webinars, and other forms of professional development to stay abreast of digital teaching and learning advancements, some exhibit a low level of recognition of digital literacy-related training. This is primarily attributed to the dominance of theoretical content in training programs, coupled with a lack of practical application, which hinders their effectiveness [41–43]. In summary, the digital literacy of academic nurse educators requires improvement, particularly in two key areas. Firstly, while educators demonstrate a sense of digital social responsibility and awareness, their limited ability to integrate digital technology and resources into nursing teaching inhibits innovation and hampers the development of digital literacy. Therefore, their students' digital competencies may be affected, adversely impacting students' capacity to integrate in healthcare settings with integrated digital technologies (e.g., artificial intelligence integrated healthcare settings). Secondly, the impetus for professional development among academic nurse educators, especially in acquiring digital technology knowledge and skills, remains insufficient. Addressing these challenges is essential for enhancing the digital literacy

of academic nurse educators and fostering innovation in nursing education. As a result, nursing students will benefit from academic nurse educators' high levels of digital literacy, which they communicate in their methods of instruction.

This study conducted a detailed analysis of the factors influencing the digital literacy of academic nurse educators and identified associations with age, teaching experience, engagement with the latest developments in digital educational technology, and utilization of ChatGPT or similar natural language processing tools in educational contexts. Our findings reveal notable variations in digital literacy levels across different demographic groups. Specifically, academic nurse educators aged 31–40 exhibited the highest digital literacy levels compared to other age cohorts, while those aged 51–60 demonstrated the lowest levels. Similarly, academic nurse educators with 5–15 years of teaching experience demonstrated the highest digital literacy levels, whereas those with over 25 years of experience exhibited the lowest levels. This disparity can be attributed to the evolving landscape of education in the digital age, more specifically the generational gap in utilizing digital technologies [44, 45]. The emergence of the “Internet+education” teaching mode

has underscored the limitations of traditional teaching methods, particularly as online education becomes more prevalent in higher education institutions [46, 47]. The nursing education was not spared from teaching and learning innovations and transformation, whilst the nurse educators need to adapt to these changes [20]. Younger academic nurse educators tend to display greater receptiveness to new technologies and are more inclined to proactively acquire digital skills to enhance their digital literacy [20, 48]. In contrast, older academic nurse educators who are accustomed to traditional teaching methods may face challenges in adapting to digital teaching tools and technologies due to limited experience in digital pedagogy, resulting in lower levels of digital literacy [20, 49].

Our study also found that academic nurse educators who actively engaged with the latest developments in digital educational technology and utilized ChatGPT or similar tools demonstrated higher levels of digital literacy. This heightened proficiency may stem from their keen interest in digital technology, which facilitates the development of their digital literacy skills and enables them to effectively integrate digital tools into teaching and learning processes. Consequently, this group exhibits a more pronounced advancement in digital literacy levels [50, 51].

The digital literacy of academic nurse educators is moderately proficient, particularly in areas such as digital technology knowledge and skills, digital applications, and professional development, which warrant further enhancement. Age, teaching experience, engagement with the latest developments in digital education technology, and utilization of ChatGPT or similar natural language processing tools emerge as significant factors influencing the digital literacy of academic nurse educators. Therefore, institutions must prioritize the enhancement of educators' digital literacy by establishing a comprehensive digital literacy framework and fostering an optimal digital teaching environment. This necessitates the implementation of regular training programs focused on digital technology, ensuring educators attain proficiency in digital technology knowledge and skills to develop their own digital literacy. Moreover, institutions should cultivate educators' digital awareness, fostering a culture of lifelong learning and self-innovation to better address the challenges and opportunities presented by educational digital transformation. By equipping educators with digital literacy and promoting a proactive approach towards digitalization, institutions can effectively navigate the evolving landscape of education.

### Limitations

This study is subject to several methodological and data limitations. Firstly, our study design, cross-section, cannot establish causality. Secondly, the sample consisted

solely of academic nurse educators from a specific school of nursing. Thirdly, while the questionnaire was self-developed based on relevant research, it may not cover all dimensions relevant to digital literacy, potentially overlooking certain factors. Additionally, because it is a self-report questionnaire, it is susceptible to social desirability bias. Therefore, these limitations may restrict the generalizability of our findings. Future research endeavors should aim to explore this relationship more comprehensively. The sample size may include more academic nurse educators to increase the external validity of the study and explore the effectiveness of additional digital literacy enhancement strategies, such as online training, collaborative learning, and feedback mechanisms to establish causality. Thus, offering valuable insights into optimizing digital literacy initiatives in nursing education.

### Conclusions

This study emphasizes the importance of enhancing digital literacy among academic nurse educators. While educators recognize the value of digital technology, gaps in digital knowledge and skills remain, highlighting the need for targeted training programs. These programs should focus on not only improving technological proficiency but also developing effective digital pedagogical strategies that can be integrated into teaching practices.

Furthermore, the correlation between age and digital proficiency underscores the greater strengths of younger educators in digital pedagogy, further emphasizing the need for ongoing professional development across all educator age groups. Future research should explore innovative pedagogical approaches to digital literacy training, ensuring that training strategies are adaptable to the evolving demands of digital education. By focusing on practical teaching applications, these strategies will help educators integrate digital tools into their pedagogical practices, ensuring education systems are equipped to meet the challenges and opportunities presented by the digital age.

### Abbreviations

NETP	National educational technology plan
GFMR	The German federal ministry of education and research
ISTE	The International Society for Technology in Education
OECD	The Organization for Economic Co-operation and Development

### Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12909-024-06624-3>.

Supplementary Material 1

Supplementary Material 2

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## Author contributions

LP: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Writing - original draft, Writing - review & editing. MY: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Supervision, Validation, Visualization, Writing - review & editing. RT & TY: Investigation, Methodology.

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## Data availability

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

## Declarations

### Ethics approval and consent to participate

The protocol of this study was reviewed and approved by Xiangnan University Ethics Committee (2023YXLL101). Written informed consent was secured from all the teachers prior to their participation in the study. All research procedures that were undertaken for this study were adherent to the ethical principles enshrined in the Declaration of Helsinki and other relevant local guidelines and regulations.

### Consent for publication

Not applicable (no media or patient records were collected).

### Competing interests

The authors declare no competing interests.

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