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A comparative study of AI-empowered blended teaching and traditional teaching in geriatric nursing education

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Abstract. To compare the effectiveness of an AI-empowered blended teaching model with that of the traditional teaching model in geriatric nursing education through an anonymous questionnaire survey. Results: The overall teaching effectiveness of the AI-empowered blended teaching model (3.79 ± 0.90) was significantly higher than that of the traditional teaching model (3.02 ± 1.08) ($p < 0.05$). In terms of comprehensive competence in community-based practice, the AI-blended teaching group also reported a significantly higher total self-assessment score (3.80 ± 1.17) than the traditional teaching group (2.81 ± 1.23) ($p < 0.05$). Students expressed positive attitudes toward the role of AI tools in supporting self-directed learning, particularly recognizing their value in objectively evaluating the strengths and weaknesses of their own care plans. Conclusion: The AI-empowered blended teaching model demonstrates superior educational outcomes compared with the traditional teaching model in geriatric nursing courses and is worthy of broader adoption in geriatric nursing education.

Keywords: Artificial Intelligence (AI), blended learning, geriatric nursing

1. Introduction

According to projections, China's older adult population will increase from 326 million to nearly 400 million over the next five years, while the number of older adults requiring long-term care is expected to exceed 40 million. However, the nationwide shortage of geriatric nursing assistants has already surpassed 5 million, and the number of qualified professionals trained by vocational colleges falls far short of meeting this enormous demand [1]. Against this backdrop, accelerating the cultivation of highly qualified, interdisciplinary geriatric nursing professionals has become an urgent challenge for vocational education.

Traditional geriatric nursing education has long been constrained by several persistent problems, including a disconnect between theoretical instruction and clinical practice, limited teaching approaches, and one-dimensional evaluation methods [2]. These shortcomings have hindered both the quality and efficiency of workforce development in geriatric care. In recent years, the rapid advancement of Artificial Intelligence (AI) technologies has created new opportunities to address these challenges. At the national level, a series of policy documents, including the *Notice on Strengthening the Development of Higher Vocational Programs in Medical and Elderly Care and Management*, have called for accelerating the training of geriatric nursing

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professionals and promoting the deep integration of digital technologies into practical skills training [3]. Consequently, AI-empowered blended teaching has gradually been introduced into geriatric nursing education. On the one hand, AI technologies enable highly realistic simulation-based training and immersive empathy-oriented learning environments. On the other hand, blended learning effectively integrates conventional classroom instruction with modern digital learning platforms, combining the strengths of both online and face-to-face teaching [4].

Against this background, the present study takes the geriatric nursing course as its research context and selects second-year nursing students from a higher vocational college as the study participants. A controlled comparison was conducted between an AI-empowered blended teaching model and a traditional teaching model. The two approaches were systematically evaluated across multiple dimensions, including theoretical knowledge acquisition, practical nursing skills, learning satisfaction, and overall professional competence. Specifically, this study seeks to determine whether the AI-empowered blended teaching model outperforms the traditional approach, identify the areas in which its advantages are most evident, and explore its future development prospects. The findings are expected to provide empirical evidence for the reform of geriatric nursing education while offering practical guidance for the deeper integration of AI technologies into nursing education for older adults.

2. Materials and methods

2.1. Participants

The study recruited students from two parallel classes of the 2024 cohort of the Nursing program (Geriatric Care Track) at a higher vocational college. The two classes were comparable in terms of age, gender, prior academic performance in nursing courses, and practical training experience, with no statistically significant differences between them. Each class consisted of 45 students, yielding a total sample of 90 participants.

2.2. Experimental design

The course comprised a total of 32 instructional hours. During the first 16 hours, students received traditional practical skills training, which served as the control group (Group A). In this phase, the instructor demonstrated nursing procedures during class, after which students practiced in small groups. Outside the classroom, students participated in community-based practice, collected real-world cases, and developed individualized care plans. During the subsequent 16 hours, students received AI-empowered blended instruction in geriatric nursing, which served as the experimental group (Group B). Before class, students completed online learning activities to acquire foundational knowledge. During class, geriatric care scenarios were presented, and AI tools were used to assist students in case analysis and the development of care plans. The instructor and students jointly discussed and refined the proposed plans before students carried out practical nursing procedures under the instructor's supervision. After class, students completed online knowledge exercises and participated in community-based practice, where they collected authentic cases and used AI tools to develop appropriate evidence-based care plans.

2.3. Questionnaire design

The questionnaire was developed by the research team based on expert consultation. It consisted of four components: evaluation of the teaching effectiveness of the two practical teaching approaches, comparison of comprehensive practical competence, overall comparison of the two teaching models, and open-ended

questions. Data were collected using the Wenjuanxing online survey platform. The first questionnaire, administered after the initial 16 instructional hours, assessed students' perceptions of the effectiveness of the traditional teaching model and their comprehensive competence in community-based practice. The second questionnaire, administered after the subsequent 16 instructional hours, evaluated the AI-empowered blended teaching model, students' comprehensive competence in community practice, and their self-assessment following the use of AI tools. All closed-ended items were rated on a five-point Likert scale, where 1 indicated *strongly disagree* and 5 indicated *strongly agree*.

2.4. Statistical analysis

Statistical analyses were performed using SPSS software. Overall questionnaire scores and standardized scores for each questionnaire dimension were analyzed. Continuous data are presented as mean ± Standard Deviation (SD). Differences between the experimental and control groups were examined using independent-samples t-tests. A p value of < 0.05 was considered statistically significant.

3. Results

A total of 85 valid questionnaires were collected, yielding a valid response rate of 94%. The results of the anonymous questionnaire are presented below.

3.1. Students' evaluation of teaching effectiveness under different teaching models

The overall evaluation score for the traditional teaching phase was 3.02 ± 1.08, whereas that for the AI-empowered blended teaching phase was 3.79 ± 0.90. The difference between the two teaching models was statistically significant ($p < 0.05$). The anonymous questionnaire included six evaluation items, as shown in Table 1.

Table 1. Students' evaluation of teaching effectiveness under different teaching models

Anonymous questionnaire item	Group A (n = 85)	Group B (n = 85)
Helped me understand the physiological, psychological, and social characteristics of older adults	3.02 ± 1.24	3.80 ± 1.05
Helped me master common diseases among older adults	2.8 ± 1.09	3.02 ± 0.93
Helped me acquire core geriatric nursing skills	3.36 ± 1.16	3.86 ± 1.00
The instructor's demonstrations were standardized, clear, and easy to follow	2.86 ± 1.02	3.73 ± 1.02
Overall, I was satisfied with the teaching during this phase	3.02 ± 1.08	3.79 ± 0.90
Enhanced my professional identity in geriatric nursing	2.9 ± 1.02	3.66 ± 1.10

Statistically significant differences ($p < 0.05$) were observed in students' ratings regarding understanding the physiological, psychological, and social characteristics of older adults, acquiring core geriatric nursing skills, the clarity and standardization of instructors' demonstrations, overall teaching satisfaction, and enhancement of professional identity in geriatric nursing. These findings indicate that the AI-empowered blended teaching model produced superior educational outcomes compared with the traditional teaching approach. By contrast, no statistically significant difference was found in students' mastery of common diseases among older adults. This suggests that both teaching approaches were similarly effective in facilitating the acquisition of theoretical knowledge through conventional classroom instruction.

3.2. Students' self-evaluation of comprehensive competence in community-based practice

Following the traditional teaching phase and the AI-empowered blended teaching phase, students completed self-assessments of their comprehensive competence in community-based practice. The overall self-assessment scores were 2.81 ± 1.23 and 3.80 ± 1.17, respectively, with a statistically significant difference between the two groups ($p < 0.05$).

As shown in Table 2, students in the AI-empowered blended teaching group reported significantly higher self-evaluation scores than those in the traditional teaching group across all dimensions, including authentic community case collection, health assessment of older adults, development of individualized nursing care plans, communication and empathetic interaction with older adults and their family members, emergency response to unexpected care situations, and overall practical competence in geriatric nursing ($p < 0.05$). These findings indicate that the AI-empowered blended teaching model effectively enhanced students' comprehensive practical competence.

Table 2. Self-evaluation of comprehensive competence in community-based practice

Anonymous questionnaire item	Group A (n = 85)	Group B (n = 85)
My ability to collect authentic community-based cases has improved	2.79 ± 1.12	3.76 ± 1.16
My ability to conduct health assessments of older adults has improved	2.88 ± 1.28	3.99 ± 1.02
My ability to independently develop individualized nursing care plans has improved	2.52 ± 1.17	3.67 ± 1.22
My communication and empathetic interaction with older adults and their family members have improved	3.07 ± 1.26	4.02 ± 1.18
My ability to respond to emergencies during geriatric care has improved	2.72 ± 1.3	3.45 ± 1.16
I believe my overall practical competence in geriatric nursing has improved	2.81 ± 1.3	3.55 ± 1.26

3.3. Students' self-evaluation after using AI tools

As shown in Table 3, the mean scores for all questionnaire items ranged from 3.22 to 3.94, indicating an overall positive evaluation of AI tools and suggesting that students generally recognized their value in supporting self-directed learning. The highest-rated item was "AI-assisted data analysis enabled me to evaluate the strengths and weaknesses of my nursing care plans more objectively", indicating that AI tools were particularly effective in promoting objective self-assessment. Two items received the second-highest ratings: "The nursing care plans generated by AI were well-structured, clearly organized, and easy to read and understand", and "I believe I will be able to use AI proficiently as a decision-support tool in future geriatric nursing practice". These findings reflect students' confidence in both the quality of AI-generated outputs and the future application of AI in professional nursing practice.

The lowest-rated item was "Compared with traditional teaching, using AI encouraged me to think more actively about why each step was necessary rather than simply imitating procedures", which also exhibited the largest standard deviation. This suggests that although AI tools were successfully integrated into classroom teaching, some students remained focused primarily on procedural operation, and their higher-order critical thinking skills require further cultivation.

Overall, AI tools demonstrated clear advantages in helping students objectively evaluate their own nursing care plans, producing standardized and well-organized outputs, and strengthening students' confidence in applying AI in future clinical practice. However, additional instructional strategies may be needed to further promote deeper reflection and encourage students to actively revise and refine their nursing care plans.

Table 3. Students' self-evaluation after using AI tools

Anonymous questionnaire item	Group B (n = 85)
AI tools were easy to use and did not increase my learning burden	3.56 ± 1.05
AI tools increased my interest in learning and learning initiative	3.48 ± 1.11
The nursing care plans generated by AI were well-structured, clearly organized, and easy to read and understand	3.78 ± 1.00
Compared with traditional teaching, AI encouraged me to think more actively about *why* each step was necessary rather than simply imitate procedures	3.22 ± 1.52
AI tools enhanced my clinical nursing judgment and made me feel more confident when managing complex geriatric care cases	3.73 ± 1.01
AI-assisted data analysis enabled me to evaluate the strengths and weaknesses of my nursing care plans more objectively	3.94 ± 1.10
After using AI tools, I became more willing to revise and improve my nursing care plans proactively	3.38 ± 1.00
I believe I will be able to use AI proficiently as a decision-support tool in future geriatric nursing practice	3.78 ± 1.20

4. Discussion

The AI-empowered blended teaching model for geriatric nursing integrates artificial intelligence technologies with both online and face-to-face instructional resources. This approach facilitates the development of students' self-directed learning habits, clinical decision-making abilities, and overall professional competence, while effectively addressing longstanding limitations of traditional geriatric nursing education, including insufficient authentic practice scenarios, limited case resources, and inadequate individualized guidance. In recent years, this model has gradually been explored and applied in vocational education programs such as geriatric nursing and community nursing [5]. In the present study, a controlled comparison between the AI-empowered blended teaching model and the traditional teaching model demonstrated that the AI-supported approach significantly outperformed conventional instruction across multiple dimensions, particularly in students' understanding of geriatric care, acquisition of practical nursing skills, comprehensive competence in community-based practice, and professional identity.

4.1. Advantages of the AI-empowered blended teaching model in geriatric nursing education

First, the AI-empowered blended teaching model substantially enhances students' systematic understanding of the characteristics of older adults. Traditional geriatric nursing instruction relies primarily on textbook-based teaching supplemented by static images or simple teaching models. Consequently, students' understanding of age-related physiological changes, psychological characteristics, and social role transitions often remains conceptual rather than experiential. AI-based instructional platforms can integrate a variety of digital learning resources, including simulations of cognitive impairment, sensory decline, and chronic disease progression.

These immersive learning experiences enable students to develop a more comprehensive understanding of older adults, thereby providing a stronger cognitive foundation for subsequent nursing care planning.

Second, the AI-empowered teaching model effectively facilitates the acquisition of core geriatric nursing skills. In traditional practical training sessions, students typically observe a single instructor demonstration before practicing in small groups. Mastery of procedural skills therefore depends heavily on students' observational accuracy and memory retention. When procedures involve numerous complex steps or technical details, students often struggle to achieve proficiency within a limited period. AI-supported instructional systems address these challenges through three-dimensional animations, step-by-step demonstration videos, and real-time AI-assisted error correction. These resources allow students to review demonstrations repeatedly at their own pace, reducing procedural errors caused by insufficient observation and improving both the accuracy and standardization of practical skills, while simultaneously enhancing students' confidence and sense of achievement.

Third, the AI-empowered blended teaching model significantly improves students' comprehensive competence in community-based practice. One of the primary educational objectives of geriatric nursing is to prepare students for comprehensive care delivery in authentic community settings, which requires competencies in case collection, health assessment, individualized care planning, empathetic communication, and emergency response [6]. The AI-supported blended learning model establishes a complete instructional cycle consisting of pre-class online learning, AI-assisted case analysis during class, and AI-supported post-class care plan refinement and reflection. This integrated process—linking theoretical learning, AI-assisted decision-making, practical application, and intelligent feedback—effectively promotes students' progression from knowledge acquisition to comprehensive clinical application.

Fourth, the AI-empowered blended teaching model contributes to strengthening students' professional identity in geriatric nursing. The geriatric nursing profession has long faced challenges related to limited social recognition and insufficient occupational attractiveness. Students' identification with the profession directly influences both their motivation to learn and their willingness to pursue careers in geriatric care [7]. By creating diverse and authentic geriatric care scenarios, the AI-supported teaching model enables students to appreciate the professional value and social significance of geriatric nursing at an early stage. At the same time, exposure to AI technologies allows students to recognize the potential of modern digital technologies to improve the quality of elderly care, thereby increasing their confidence in and commitment to the profession.

4.2. The irreplaceable value of the traditional teaching model

The findings indicate that systematic theoretical instruction delivered by experienced instructors, together with textbook-based learning, remains highly effective in helping students acquire foundational knowledge of common diseases among older adults. This suggests that traditional face-to-face instruction continues to possess important advantages in constructing coherent and systematic knowledge frameworks. Therefore, AI should be regarded as an enhancement and complement to traditional teaching rather than a complete replacement. Furthermore, qualitative feedback collected through the open-ended questionnaire revealed that many students considered the emotional interaction, immediate feedback, and peer communication available in conventional classrooms to be learning experiences that current AI technologies cannot fully replicate. Geriatric nursing is inherently a person-centered profession, and interpersonal interaction among students, instructors, and peers constitutes an essential component of professional socialization. Consequently, while promoting AI-enabled educational reform, educators should preserve and further strengthen the interpersonal advantages of traditional classroom teaching. The findings also suggest that some students remain at the stage of accepting AI-generated results rather than engaging in reflective thinking about the underlying clinical

reasoning. The development of deep learning and critical thinking therefore requires additional instructional support. AI itself does not automatically foster higher-order thinking. Instead, instructors should incorporate targeted pedagogical strategies, such as requiring students to compare AI-generated care plans with their own independently developed plans and justify any revisions before submitting their final work. Such activities transform human–AI interaction into a process of critical reflection, ensuring that AI serves to enhance students' thinking rather than replace it.

4.3. AI-empowered blended teaching represents the future direction of geriatric nursing education

The integration of online and face-to-face instruction through AI-enabled blended learning combines the strengths of both teaching approaches and substantially improves the effectiveness of geriatric nursing education. AI-assisted teaching offers several distinct advantages, including contextualized learning experiences, unlimited access to instructional materials for repeated review, and intelligent real-time feedback, all of which enhance the efficiency of pre-class preparation and the depth of post-class reflection [8]. Through online learning platforms, students can acquire essential knowledge of geriatric care, observe standardized nursing procedures, and conduct preliminary AI-assisted case analyses before attending practical training sessions. This preparation allows students to approach classroom learning with a solid conceptual foundation. During face-to-face practical training, authentic nursing procedures and direct instructor–student interaction provide valuable opportunities to develop hands-on clinical skills, problem-solving abilities, and interpersonal communication competencies. In community-based practice, students collect authentic cases and use AI tools to assist in developing and refining individualized care plans, which are subsequently improved through instructor feedback and peer evaluation. Together, these components establish a spiral learning pathway characterized by online learning, face-to-face practical training, community practice, intelligent assessment, and continuous iterative improvement.

5. Conclusion

Both the AI-empowered teaching model and the traditional teaching model possess distinct strengths and limitations. Rather than representing competing approaches, they should be viewed as complementary instructional strategies capable of mutually reinforcing one another. The meaningful integration of AI technologies into geriatric nursing education not only strengthens students' practical nursing competencies but also promotes the development of clinical reasoning, self-directed learning abilities, and professional identity, thereby contributing to the continuous improvement of talent cultivation in geriatric nursing. As generative artificial intelligence, digital humans, and Extended Reality (XR) technologies continue to evolve, AI-empowered geriatric nursing education is expected to become increasingly integrated with intelligent assessment systems, virtual standardized older patients, and smart elderly-care simulation platforms. Such developments will help establish a more comprehensive ecosystem for intelligent nursing education and provide a strong talent foundation for the high-quality development of geriatric care services in China.

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