

Research on AI-Enabled Dynamic Adjustment and Curriculum System Reconstruction of Nursing Major in Private Universities

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Abstract: Driven by both digital healthcare and educational intelligence, nursing majors in private universities are confronted with the core contradiction between talent cultivation and clinical needs. Taking the application of artificial intelligence (AI) technology as the entry point, this study analyzes the existing deficiencies in nursing education of private universities and combines practical cases from Yongzhou Vocational and Technical College, Shandong Xiehe College, etc. It constructs a “demand perception–intelligent decision-making–dynamic optimization” professional adjustment mechanism, proposes a “three-stage and three-dimensional” curriculum reconstruction system, and discusses the implementation guarantee paths. The research results show that with the empowerment of AI, the matching degree of nursing professional courses can be increased by 37%, and the excellent rate of students’ clinical decision-making ability can be improved by 42%, which provides a practical example for the digital transformation of nursing education in private universities.

Keywords: Artificial intelligence; Private universities; Nursing major; Dynamic adjustment; Curriculum system reconstruction; Intelligent nursing education; AI-simulated patients; Medical-educational collaboration

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1. Introduction

Amidst the dual momentum of digital healthcare advancement and educational intelligence reform, nursing education in private universities encounters a critical challenge: a widening gap between conventional training models and the evolving, technology-driven demands of clinical practice. This disconnect, characterized by rigid curricula, limited practical training, and outdated evaluation methods, underscores the urgent need for systemic transformation. Artificial intelligence (AI) emerges as a pivotal enabler to bridge this gap, offering innovative pathways to dynamically align professional education with real-world healthcare needs. Drawing upon practical implementations from institutions such as Yongzhou Vocational and Technical College and Shandong Xiehe College, this study constructs an AI-facilitated mechanism for dynamic program adjustment and proposes a

reconstructed curriculum framework. It aims to demonstrate how intelligent technology can enhance the precision, relevance, and effectiveness of nursing education, thereby providing a scalable model for cultivating competent nursing professionals equipped for the era of smart healthcare.

2. Research background and problem proposal

2.1. Policy orientation and industry demand

The 2024 World Digital Education Conference clearly advocated the construction of a new “Teacher-Machine-Student” ternary teaching model to promote the transformation of education from a knowledge-imparting model to a competency-development model. China’s *14th Five-Year Plan for National Medical Security* points out that the precision and intelligent construction of nursing talent cultivation should be strengthened ^[1]. With the deepening of population aging, the clinical demand for compound nursing talents with intelligent equipment operation capabilities and data analysis capabilities has been increasing year by year, with an annual growth rate of 18%. However, the adaptation rate of talents trained by the traditional model is only 53% ^[2].

2.2. Practical dilemmas of nursing education in private universities

As an important position for nursing talent cultivation, private universities currently face three major contradictions: Firstly, the professional setting is rigid. The curriculum systems of nursing majors in 78% of private universities have not undergone substantial changes in the past five years, making it difficult to adapt to the updated requirements of smart medical equipment. Secondly, practical teaching is relatively weak. The coverage rate of traditional simulated patient training is less than 40%, resulting in insufficient clinical emergency response capabilities of students. Thirdly, the evaluation system is relatively single. 92% of courses still use theoretical examinations as the main evaluation method, making it difficult to effectively quantify practical abilities ^[3]. A survey of a private university shows that the pre-job training duration of its graduates in the operation of intelligent monitors, AI diagnostic assistance systems, and other equipment averages 21 days, which fully indicates a serious disconnection between talent cultivation and job requirements ^[4].

2.3. Feasibility and inevitability of AI empowerment

AI technology provides key support for resolving the above dilemmas: Intelligent simulation systems can reduce training costs by 60%, learning analysis technology can realize the accurate push of personalized teaching paths, and virtual simulation technology can construct high-fidelity clinical scenarios ^[5]. After introducing AI-simulated patients, Yongzhou Vocational and Technical College increased the students’ interest in the “Nasogastric Feeding Nursing” course from 75.8% to 95.6%, and the average score of operation assessment increased by 14.6 points, which fully confirms the practical significance of technology empowerment ^[6].

3. Construction of an AI-enabled dynamic adjustment mechanism for majors

3.1. Core logic of dynamic adjustment

Construct a closed-loop mechanism of “data perception–algorithm decision-making–iterative optimization”: Take clinical demand data as input, generate professional adjustment plans with the help of AI algorithms, and conduct continuous optimization after verification through teaching practice to achieve real-time matching between professional settings and job requirements ^[2].

3.2. Construction of key support systems

3.2.1. Demand perception system

Integrate three major data sources. Firstly, jointly build a “clinical demand database” with 23 cooperative hospitals to collect real-time data such as the frequency of intelligent nursing equipment use and nursing job competency requirements. Secondly, rely on AI crawler technology to capture nursing job recruitment information from platforms such as Zhaopin.com and Dingxiangyuan. Thirdly, collect students’ learning behavior data with the help of learning analysis systems. Shandong Xiehe College used this system to find that the demand for courses such as Alzheimer’s care and intelligent rehabilitation equipment operation showed a significant growth trend, and then added relevant modules in a timely manner.

3.2.2. Intelligent decision-making system

Develop a professional adjustment algorithm model, which includes three core modules. The job competency mapping module converts clinical needs into 128 competency indicators; the course matching module calculates the degree of fit between existing courses and competency indicators; the plan generation module outputs specific suggestions, such as course addition/deletion and credit adjustment ^[2]. After a private university applied this system, the matching degree between professional courses and job requirements increased from 58% to 95% ^[3].

3.2.3. Effect verification system

Construct a “three-dimensional evaluation system,” which uses AI to simulate human assessment of practical abilities, uses intelligent question banks to evaluate theoretical knowledge, and relies on cooperative hospitals to provide feedback on job adaptability. The system generates adjustment reports every quarter to provide references for the next round of optimization ^[4].

4. AI-driven curriculum system reconstruction path

4.1. Reconstruction framework of the curriculum system

Construct a “three-stage and three-dimensional” reconstruction model. The “three stages” are the basic layer (intelligent technology foundation), the core layer (AI-empowered professional courses) and the expansion layer (interdisciplinary integrated courses); the “three dimensions” include the knowledge dimension (intelligent nursing theory), the competency dimension (practical operation skills) and the literacy dimension (professional ethics and norms) ^[3]. This framework should comply with the core requirements for nursing talent cultivation in the *National Standards for Teaching Quality of Nursing Majors (2024 Edition)* to ensure the compliance of the reconstruction direction ^[8].

4.2. Specific design of hierarchical courses

4.2.1. Construction of basic layer curriculum system

Add courses such as Fundamentals of Nursing Artificial Intelligence and Medical Data Analysis, adopting a “theory + practice” teaching model. Introduce AI technologies such as ChatGPT to assist teaching, and students can use intelligent question-and-answer systems to solve problems in programming, data analysis, and other fields in a timely manner ^[5]. The pass rate of this course in a private university increased from 72% to 94%, and the compliance rate of students’ basic intelligent equipment operation reached 100% ^[2].

4.2.2. Innovation of core layer courses

Embed AI technology modules with professional core courses as carriers. For example, integrate AI-simulated patient training into Basic Nursing Science. This training includes three links: pre-class self-test (AI generates personalized preview tasks), in-class practical operation (intelligent means to monitor the standardization of operations), and after-class extended learning (virtual case review)^[6]; Pharmacology adopts a “four-stage case chain” model, and the AI agent “Pharmacy Nurse Case Master” pushes gradient cases in the order of “admission assessment–medication execution–observation and monitoring–education and guidance” to cultivate clinical thinking ability^[7].

4.2.3. Development of expansion layer courses

Set up interdisciplinary courses such as Intelligent Nursing Ethics and Application of Medical AI Products, and cooperate with computer majors to jointly develop nursing data visualization projects. Organize students to participate in the design of AI-assisted home care systems to cultivate students’ innovative abilities^[2]. The course content should refer to medical AI ethics norms to avoid privacy leakage risks that may occur in the process of technology application.

4.3. Innovation of the practical teaching system

4.3.1. Virtual-real integrated training platform

Construct a “VR simulation + AI-simulated patient” dual-track training center, covering nursing scenarios such as internal medicine and surgery. After students complete basic operation training in the VR environment, they use AI-simulated patients to carry out complex case handling. The simulated patients can present 32 emergency situations, such as a sharp drop in blood pressure and arrhythmia, and their intelligent feedback system can mark operation deviations in real time and provide improvement suggestions^[4]. The construction of this platform should comply with the configuration standards of nursing practical teaching equipment to ensure the training effect^[8].

4.3.2. Clinical collaborative practice base

Cooperate with hospitals to build an “intelligent nursing practice center” equipped with AI monitors, telecare systems, and other equipment. Students conduct rotating training in different departments through the AI case assignment system, and clinical teaching teachers provide real-time feedback on training through the intelligent evaluation platform^[3]. The operation of the base should comply with the “medical-educational collaboration” construction requirements in the *Outline of China’s Nursing Career Development Plan (2021–2025)*^[1].

4.4. Reconstruction of the evaluation system

Construct a “four-in-one” intelligent evaluation system, including student self-evaluation (AI generates operation reflection reports), peer evaluation (blockchain-based evaluation system), teacher evaluation (intelligent scoring assistance tools), and machine evaluation (AI simulated patients automatically generate operation scores)^[5]. After Shandong Xiehe College applied this system, the excellent rate of students’ clinical decision-making ability increased from 31% to 73%. The evaluation indicators should correspond to the core competencies of nursing positions to ensure that the evaluation results are consistent with job requirements^[2].

5. Implementation guarantee and effect prospects

5.1. Key guarantee measures

5.1.1. Faculty team construction

Implement the “AI + Nursing” dual-teacher training program, carry out intelligent teaching tool training in collaboration with technology enterprises, and require teachers to complete no less than 40 hours of technical study every year. Construct an “AI teaching tutor database” and hire experts from the nursing information department of hospitals to teach part-time^[3]. Faculty training should refer to the nursing education faculty competency standards to ensure that teachers have both nursing professional literacy and AI technology application capabilities^[8].

5.1.2. Resource guarantee mechanism

Use the “government subsidy + school-enterprise co-construction” model to raise funds, focusing on investing funds in the construction of training platforms and curriculum resource research and development. A private university introduced 8 sets of high-end AI-simulated patients and developed 32 virtual training modules through this model, and the total investment was reduced by 45% compared with the pure self-financing model^[4]. The use of funds should comply with the relevant norms of educational fund management, and priority should be given to ensuring the construction of practical teaching resources^[1].

5.1.3. Quality monitoring system

Develop an AI teaching quality monitoring system to track 16 indicators in real time, such as curriculum update frequency and training equipment utilization rate. When an indicator is lower than the preset threshold, the system will automatically trigger an early warning mechanism. Industry experts are organized to conduct review work every semester to ensure that the curriculum system is synchronized with clinical practical needs^[2]. The monitoring indicators should be combined with the nursing education quality evaluation standards to realize dynamic supervision of the whole teaching process^[8].

5.2. Prediction of implementation effects

After three years of practice, it is expected to achieve three major effects: In the professional field, the annual update rate of the curriculum system will reach 25%, and the matching degree with job requirements will exceed 90%^[3]; at the student level, the compliance rate of intelligent equipment operation ability will be 100%, the employment rate will increase to 98%, and the employer satisfaction will reach 92%^[2]; in terms of teaching, teachers’ lesson preparation efficiency will be improved by 40%, and the proportion of practical teaching hours will increase from 52% to 68%^[4]. Effect evaluation should use multi-dimensional data collection methods to ensure the objectivity and credibility of the results^[5].

6. Conclusion

The essence of AI empowering the dynamic adjustment and curriculum system reconstruction of nursing majors in private universities is to achieve the precise connection of “demand–cultivation–position” through technical means^[2]. The “Teacher-Machine-Student” integration model of Yongzhou Vocational and Technical College and the “case chain + AI” model of Shandong Xiehe College have both confirmed the feasibility of this path^[6,7]. There are two major issues to be solved in the future: One is the standardized construction of AI teaching resources to prevent the further expansion of inter-university gaps^[8]; the other is ethical risk prevention and control, which requires

strengthening the content related to privacy protection and responsibility definition of AI nursing in courses.

With the development of generative AI, digital twins, and other technologies, the application of “personalized learning robots” can be explored in the future to realize the transformation from “standardized cultivation” to “customized cultivation,” thereby cultivating more high-quality nursing talents that meet the needs of the smart medical era^[5]. Technology application should always focus on the goal of nursing talent cultivation, and avoid the deviation of teaching from its essence due to technology alienation.

Disclosure statement

The author declares no conflict of interest.

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