

Innovative Research on AI Technology-Driven Medical Mixed Teaching Mode from the Perspective of Integration of Production and Education

Qi Liu*

Shandong College of Traditional Chinese Medicine, Yantai Shandong, 264199, China

*Corresponding author: Qi Liu

Copyright: 2025 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY-NC 4.0), permitting distribution and reproduction in any medium, provided the original author and source are credited, and explicitly prohibiting its use for commercial purposes.

Abstract: As the core link of cultivating medical talents, medical education is facing many challenges, such as rapid knowledge updating, strict practice requirements, uneven distribution of teaching resources and so on. The traditional medical teaching mode has been difficult to meet the needs of modern medical development and industry. Under the background of the integration of production and education, AI technology provides a powerful impetus for the innovation of medical mixed teaching mode. This paper expounds the significance of the integration of production and education and AI technology to medical education, analyzes the shortcomings of traditional medical teaching mode, and puts forward the innovative path of medical mixed teaching mode driven by AI technology from the aspects of building multiple teaching spaces, developing intelligent curriculum system, innovating teaching implementation methods and perfecting comprehensive evaluation system, aiming at improving the quality of medical education and cultivating medical talents that meet the needs of the industry.

Keywords: Integration of Production and Education; AI Technology; Medical Mixed Teaching; Mode Innovation

Published: Sept 14, 2025

DOI: <https://doi.org/10.62177/jetp.v2i3.643>

Introduction

With the rapid development of science and technology, artificial intelligence (AI) technology has been widely used in medical imaging diagnosis, disease prediction, drug research and development and other medical fields, which has profoundly changed the mode and quality of medical services. At the same time, the integration of production and education, as the key direction of vocational education reform, emphasizes the deep cooperation between schools and industry, and strives to achieve a seamless connection between talent training and industrial demand. In this context, with the help of AI technology, it is of great significance to innovate medical mixed teaching mode in the environment of integration of production and education, which can improve the quality and efficiency of medical education and cultivate high-quality medical talents with innovative spirit and practical ability. It can not only promote medical education to move towards intelligence, personalization and precision to adapt to the development trend of modern medicine, but also promote the deep integration of medical education and industry, make medical personnel training more suitable for actual needs, and enhance graduates' employment competitiveness and occupational adaptability.

1.the integration of production and education and the importance of AI technology in medical education

1.1 The importance of integration of production and education for medical education

The integration of production and education is an inevitable choice for medical education to adapt to industrial development. Medicine is a highly practical subject, and its development closely depends on the progress of medical technology and the needs of clinical practice. Traditional medical education often focuses on the teaching of theoretical knowledge, which is out of touch with clinical practice and industrial needs. Through the integration of production and education, schools can establish close cooperative relations with hospitals, pharmaceutical enterprises and other industrial institutions, introduce industrial needs into the teaching process, enable students to get in touch with the latest medical technology and clinical cases, and enhance their practical ability and innovative consciousness. At the same time, industrial institutions can also participate in the school's professional construction, curriculum development and personnel training programs, provide practical teaching bases and teacher support for schools, and realize resource sharing and complementary advantages^[1].

1.2 the importance of AI technology to medical education

AI technology has brought new opportunities and changes to medical education. First of all, AI can realize personalized learning. By analyzing students' learning behavior, grades and other data, AI can provide students with personalized learning plans and teaching resources to meet the learning needs of different students and improve learning effects. Secondly, AI can simulate the real clinical environment. Using virtual reality (VR), augmented reality (AR) and other technologies, AI can build a virtual clinical scene, allowing students to practice in a virtual environment, improve their skills and shorten the gap with the actual clinical needs. In addition, AI can also assist teachers in teaching management, such as automatically correcting homework and analyzing students' learning situation, so as to reduce teachers' workload and improve teaching efficiency.

2.the limitations of traditional medical teaching mode

2.1 Teaching content update lag

The medical field can be called a "high-speed track" for knowledge renewal. Its development is changing with each passing day, and new types of diseases are constantly being discovered, such as infectious diseases caused by new viruses in recent years; Brand-new treatment methods are emerging one after another, such as the application of gene editing technology in the treatment of some rare diseases; Cutting-edge technologies are constantly emerging, and the wide application of artificial intelligence-aided diagnosis in the field of medical imaging is typical. However, the traditional medical teaching model seems to be "stumbling" in textbook compilation and curriculum update. Textbook compilation needs to go through rigorous research, writing, auditing and other processes, and curriculum updating also involves many links such as teacher training and teaching plan adjustment, and the cycle is often long. This leads to the fact that most of the knowledge students have learned is "past tense", which is obviously different from the ever-changing "present tense" in actual clinical application, so that students need to spend a lot of time to re-learn and adapt after entering the clinic^[2].

2.2 single teaching methods

Traditional medical teaching mostly adopts a single teaching mode of "teachers talk and students listen". In the classroom, teachers take the dominant position and instill knowledge endlessly, while students passively sit in their seats and take notes. This lack of interactive teaching method, like mechanical "knowledge transmission", is easy to make students feel bored, gradually produce fatigue and boredom, and the enthusiasm and initiative of learning are greatly reduced. Moreover, each student has unique learning needs and learning styles. Some students are good at understanding knowledge through practical operation, while others are more inclined to explore learning independently. However, it is difficult for traditional teaching methods to take into account these differences, to provide students with personalized learning support, to stimulate students' innovative thinking, and to effectively cultivate students' practical operation ability, which makes students often at a loss when facing practical problems.

2.3 Limited practical teaching resources

Medical practice is a key bridge for medical education from theory to practice, and it is very important for cultivating students' clinical thinking and operational skills. However, under the traditional teaching mode, practical teaching resources are stretched. On the one hand, the number of clinical teaching bases in hospitals is limited, and with the continuous

expansion of medical education, the number of students is increasing, while the internship positions that hospitals can provide are relatively fixed, which is difficult to meet the internship needs of a large number of students. Many students have to wait in line for internship opportunities, and even some students can only browse through the limited internship time and cannot participate in clinical work in depth. On the other hand, the investment cost of practical teaching equipment and simulation scenes is high, such as advanced surgical simulation equipment and realistic clinical simulation wards. Due to the limitation of funds and other factors, it is difficult for schools to provide sufficient and advanced practical teaching conditions, which leads to insufficient practical opportunities for students and serious restrictions on the cultivation of practical skills.

3. AI technology-driven innovation path of medical blended teaching mode from the perspective of integration of production and education

3.1 Construction of “online+offline+industry” multiple teaching space

In the process of continuous innovation of medical education, it is a key measure to improve the quality of education and cultivate high-quality medical talents to build a multi-teaching space with the trinity of online, offline and industry. Online teaching space relies on the Internet and AI technology to build an online teaching platform, and integrates a large number of high-quality teaching resources, covering video courses, online tests, virtual experiments and case bases. Students can break through the constraints of time and space and carry out autonomous learning according to their own rhythm and needs. The platform can also accurately record students' learning behaviors and achievements, provide teaching feedback for teachers, help teachers master students' learning situation, and then realize personalized teaching guidance to meet the learning needs of different students.

The offline teaching space focuses on face-to-face interaction and practical operation. Teachers can stimulate students' in-depth thinking and communication by organizing various activities such as group discussion, case analysis and clinical skills training, and strengthen their ability to understand and apply knowledge. The school established a simulated clinical laboratory, equipped with advanced simulation equipment and software, to create a realistic clinical practice environment, so that students can practice repeatedly in safe and controllable scenes, improve their practical skills, and lay a solid foundation for future clinical work^[3].

Industrial teaching space emphasizes close cooperation with hospitals, pharmaceutical enterprises and other industrial institutions to build an off-campus practice teaching base. Students have the opportunity to practice in industrial institutions and participate in project practice, get in touch with actual medical work and scientific research projects, keep abreast of the cutting-edge trends of the industry and the application of advanced technologies, and effectively improve their practical ability and professional quality. At the same time, experts from industrial institutions participate in school teaching activities, provide practical guidance and career planning suggestions for students, help students to define their career direction and enhance their employment competitiveness.

3.2 Development of AI-enabled intelligent curriculum system

In the innovative construction of medical education curriculum system, colleges and universities can promote the curriculum from three levels: foundation, specialty and practice, and realize the comprehensive upgrade of the curriculum. First, the intellectualization of basic courses is the key to consolidate the medical foundation. With the help of AI technology, the deep reform of basic medical courses can greatly improve the teaching effect. For example, by using 3D modeling and animation demonstration technology, the abstract and complex human anatomical structure and physiological process can be presented intuitively, and the knowledge that was originally difficult to understand becomes vivid and vivid, so that students can better understand and remember it. Intelligent tutoring system is a close study partner of students, which can provide students with learning support in real time. No matter the confusion in concept understanding or the problem of solving problems, it can answer questions in time, effectively improve learning efficiency and make basic learning more solid and efficient.

Second, the integration of production and teaching of professional courses closely meets the needs of the industry. By developing professional courses integrating production and education, enterprise experts and clinicians are invited to deeply participate in curriculum design and teaching, and vivid cases and thorny problems in practical work are introduced into the classroom. Taking the course of medical imaging diagnosis as an example, real hospital imaging data and diagnosis cases are

introduced, so that students can practice analysis and diagnosis in real clinical situations, effectively exercise their clinical thinking ability, and make professional teaching seamlessly connect with the forefront of the industry.

Thirdly, the combination of virtualization and reality of practical courses is an effective way to improve students' practical ability. Using VR, AR and other cutting-edge technologies to build a virtual practice environment, students can carry out practical training such as surgical operation and disease diagnosis in the virtual scene, which not only reduces the practice cost, but also avoids potential risks. At the same time, students are arranged to carry out real project practice in cooperative enterprises, and the accumulated experience of virtual practice is applied to actual scenes, so as to realize the combination of reality and reality, comprehensively improve students' practical ability and ability to deal with practical problems, and make full preparations for joining the medical cause in the future^[4].

3.3 Innovative teaching implementation methods

In today's wave of educational innovation, the integration of various teaching modes is becoming the key path to improve teaching quality and effect. We can start from the following three aspects: first, combine the flip classroom with the mixed teaching to build a flexible and diverse learning ecology. Using the flip classroom model, students learn the course content independently with the help of online platform before class, and initially construct a knowledge framework. In class, teachers focus on guiding students to discuss in depth, answer questions and carry out practical operations, and further deepen students' understanding and application of knowledge through teacher-student interaction and student-student communication. At the same time, the hybrid teaching method organically integrates online teaching and offline teaching, flexibly arranges online and offline teaching time and methods according to the characteristics of teaching content and students' learning needs, and realizes the maximum utilization of learning resources. Second, project-based learning and problem-oriented learning complement each other, focusing on cultivating students' comprehensive ability. Teachers are guided by actual projects and problems, and put forward challenges or project tasks in real work. In the form of group cooperation, students use what they have learned to make in-depth analysis and try to solve problems, so as to exercise their communication skills, stimulate innovative thinking and improve their practical application ability in team cooperation. Taking the course of drug research and development as an example, teachers put forward the task of new drug research and development projects, students divided into groups to carry out market research, drug screening, clinical trial design and other work, and finally formed a project report, realizing the leap from theory to practice. Third, intelligent teaching assistants and teachers cooperate in teaching, injecting scientific and technological strength into education. With the help of AI technology, an intelligent teaching assistant system is developed to assist teachers in teaching management and student counseling. Intelligent teaching assistants can automatically correct homework, accurately analyze students' learning situation, and provide personalized learning suggestions, effectively reducing teachers' workload. Teachers can work closely with intelligent teaching assistants to dynamically adjust teaching strategies and methods according to the data and analysis results provided by them, so as to teach students in accordance with their aptitude and improve teaching quality in an all-round way.

3.4 Building a multi-evaluation system of AI empowerment

With the continuous innovation of medical education, it is very important to construct a scientific and reasonable evaluation system for improving teaching quality and cultivating high-quality medical talents. We need to integrate the concepts of diversified evaluation indicators, process and summative evaluation and joint evaluation between enterprises and schools, and build a comprehensive, dynamic and accurate evaluation system with the help of AI technology. First of all, diversified evaluation indicators are the cornerstone of comprehensively measuring students' comprehensive quality. With the help of AI technology, an evaluation index system covering students' learning process, achievements, practice and innovation ability is established. In addition to traditional test scores, AI can accurately track students' online learning participation, such as the duration of watching courses and the number of discussions; In the offline practice session, the details of students' practical operation are recorded through intelligent equipment, and their practical performance is evaluated; For the project results, AI can analyze the innovation, completeness and practicability of the project report; In teamwork, use intelligent analysis tools to evaluate students' communication and cooperation ability. In this way, the learning effect and comprehensive quality of students are evaluated from all directions and angles^[5].

Secondly, the combination of process evaluation and summative evaluation can grasp the students' learning dynamics in time. AI technology provides a strong support for process evaluation. By collecting online learning records, classroom performance data, homework completion and other information, AI can analyze students' learning progress and problems in real time, providing a basis for teachers to adjust teaching strategies. Summative evaluation tests students' phased learning results through final exams and project defense. AI can also dig deep into summative evaluation data, find the weak links of students' knowledge, and point out the direction for subsequent teaching improvement.

Finally, enterprises and schools jointly evaluate, so that the evaluation results are closer to the actual needs. Invite enterprise experts to participate in the evaluation and integrate enterprise standards and requirements into the evaluation system. AI can collect students' performance data in internship programs, such as work efficiency, problem-solving ability, professionalism, etc., and enterprise experts can evaluate them accordingly. This evaluation method can make students adapt to the requirements of the workplace in advance and enhance their employment competitiveness. To sum up, the integration of AI technology makes the medical education evaluation system more intelligent, efficient and accurate, and provides a strong guarantee for cultivating high-quality talents to adapt to the development of modern medicine.

4. Conclusion

This study focuses on the integration of production and education, and deeply explores the innovative path of AI technology-driven medical mixed teaching mode. Through a series of measures, such as building "online+offline+industry" multi-teaching space, developing AI-enabled intelligent curriculum system, innovating teaching implementation methods and improving comprehensive evaluation system, the shortcomings of traditional medical teaching mode are effectively made up, the quality and efficiency of medical education are improved, and strong support is provided for cultivating medical talents who meet the needs of industry. Looking forward to the future, with the continuous progress of AI technology and the deep expansion of the integration of production and education, the innovation of medical mixed teaching mode not only welcomes many opportunities, but also faces many challenges. Teachers need to further tap the deep application potential of AI technology in medical education, such as using deep learning algorithm to achieve more accurate personalized learning recommendation, and using natural language processing technology to develop intelligent teaching assistants. In addition, we should also attach great importance to ethical and legal issues in medical education, effectively protect students' privacy and data security, so as to promote the innovative, stable and sustainable development of medical mixed teaching mode.

Funding

no

Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

Reference

- [1] Li, A. M., & Wang, R. K. (2024). Exploration on the application of online and offline mixed teaching mode in medical college education and teaching. *China Grassroots Medicine*, 31(7), 1086–1089.
- [2] Li, F. Y., & Chen, Y. J. (2021). Exploration and research on the mixed teaching mode of integration of production and teaching and integration of theory and practice based on the concept of AICUM+-taking the course of biopharmaceutical analysis as an example. *China Educational Technology and Equipment*, (6), 132–134.
- [3] Li, W. W., Li, X. L., & Zhao, Y. H. (2019). Research status of blended teaching mode in domestic medical education. *China Medical Education Technology*, 33(5), 545–549.
- [4] Wu, L. M., Zhang, T. Y., & Chen, W. (2024). The frontier trend of the integration of artificial intelligence and medical education. *Clinical Education of General Practice*, 22(12), 1109–1111.
- [5] Yang, J., Ma, F. F., Zhou, L. B., et al. (2024). Research and practice of innovative mode of integration of production and teaching in higher vocational colleges. *Continuing Medical Education*, 38(12), 55–58.