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Artificial Intelligence in Diagnostics of Traditional Chinese Medicine

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Abstract: With the rapid development of science and technology, the application of artificial intelligence (AI) technology in medical education has become increasingly widespread in the digital age, bringing new opportunities and challenges to China's higher education of traditional Chinese medicine (TCM). In the context of digital education, it is of great significance to construct a teaching model that integrates AI technology with the characteristics of the diagnostics of traditional Chinese medicine, in order to improve the quality of curriculum teaching in the future. This article aims to introduce how to organically integrate AI technology with diagnostics of traditional Chinese medicine teaching based on the characteristics of the discipline, to achieve teaching mode reform, therefore to improve the teaching quality of traditional Chinese medicine education, and cultivate high-quality TCM talents that meet the needs of the new era.

Keywords: Diagnostics of traditional Chinese medicine; Artificial intelligence; Teaching reform; Traditional Chinese medicine

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1. Introduction

The 2024 National Conference on Traditional Chinese Medicine (TCM) Education and Management pointed out the need to build a high-quality talent team and inject strong impetus into the inheritance, innovation, and development of TCM. At the 2024 World Conference on Digital Education, Minister of Education Huai Jinpeng [1] pointed out that the digitalization of education is an important breakthrough for opening up new tracks and shaping new advantages in educational development. As teachers of TCM universities in this digital era, it is necessary to closely monitor the development trends of artificial intelligence (AI) technology in education and teaching, and actively explore teaching models that combine AI technology based on digital education concepts. Only in this way can we cultivate TCM talents that meet the needs of the people, the country, and the times, and contribute to the modernization of TCM.

2. Current status of the application of AI technology in medical education

Through the application of digital technology, medical education has spurred digital transformation and reform in areas such as theoretical teaching, practical teaching, and textbook reform. Research has shown that medical students who have received AI-assisted teaching and training will be more advantageous in transitioning into roles such as medical researchers, clinical doctors, or nurses after graduation. With the advent of the digital education era, a large number of medical educators have begun to explore new models of integrating AI with medical education. Wang and colleagues constructed a tongue diagnosis training and assessment platform based on artificial intelligence, which stimulated students' interest in learning and achieved good application results. Cai [2] and others found that the scores of acupoint test, acupuncture and moxibustion operation test, and theory test in the AI-assisted teaching group were significantly higher than those in the traditional teaching group, which greatly improved the teaching effects. Zhang and colleagues used an AI-assisted self-directed learning method to enhance students' clinical practice abilities. Chen found that the AI-assisted teaching group had better theoretical scores, report writing speed, and report scores than those in the traditional PACS teaching group, which helped consolidate students' theoretical knowledge and comprehensively improve the effectiveness of pulmonary nodule imaging teaching. All the reported cases show that the application of AI-related technologies in medical course teaching is inevitable and advantageous. Medical colleges should actively seek integration with AI technology to improve the ability of medical students to adapt to future medical development, and eventually achieve the goal of cultivating high-quality medical talents.

3. Current status of diagnostics of traditional Chinese medicine teaching

Diagnostics of traditional Chinese medicine is the core course in the professional curriculum system of students majoring in TCM university, and is a bridge course between theoretical basis and clinical disciplines, which has the characteristics of a close combination of theory and practice and is tightly related to other core courses. In response to these characteristics, a large number of educators have carried out diversified teaching reforms, including incorporating the BOPPPS teaching model into the teaching of diagnostics of traditional Chinese medicine [3], implementing differentiated and personalized teaching of diagnostics of traditional Chinese medicine under the credit system background [4], utilizing big language models for personalized coaching, virtual case generation, and simulated diagnostic training [5]; a small but precise analysis of misdiagnosis cases that correspond to the key and difficult points of the textbook were introduced [6]. A large number of teaching reforms based on the characteristics of diagnostics of traditional Chinese medicine have achieved good results in teaching effectiveness and student satisfaction, but there are still some problems, such as the low correlation between teaching content and clinical practice, and students' superficial learning that lacks in-depth exploration. How to empower traditional Chinese medicine teaching and inheritance innovation with digital technology in this digital education era has become an urgent issue for TCM university teachers to consider.

4. Strategies for the integration of AI technology and diagnostics of traditional Chinese medicine teaching

In the digital era, the "Internet plus + TCM" model has greatly enriched and expanded TCM teaching resources. Based on the characteristics of the diagnostics of traditional Chinese medicine and the existing problems in the teaching mode, the following reform ideas for the teaching mode of diagnostics of traditional Chinese medicine based on the integration of AI technology were proposed in this manuscript.

4.1. Construction of the course knowledge graph

With the innovation of educational concepts and the popularization of digital technology, curriculum knowledge graphs have been widely applied in medical teaching [7–9]. Diagnostics of traditional Chinese medicine has the characteristics of numerous knowledge points and a close connection with the preceding and following courses. However, due to the barriers between courses and the inability to connect them, students face difficulties in learning and find it difficult to achieve coherence between the preceding and following knowledge. The course knowledge graph is based on AI technology, with knowledge points as anchor points, breaking down course barriers, establishing a network structure of relationships between different course knowledge points, and forming a structured learning experience of course content visualization. It is conducive to helping students build knowledge systems and frameworks and cultivate TCM thinking. In the future, based on the knowledge of diagnostics of traditional Chinese medicine, through in-depth interpretation of the professional talent training program, guided by job competency, AI technology will be used to identify and refine standardized knowledge systems through manual correction. A relatively complete and logically rigorous knowledge map framework will be constructed for the knowledge points of this course and related fields, and corresponding teaching resources will be associated to form a course knowledge map with professional characteristics, visualization, and systematization, which will provide strong support for improving teaching quality.

4.2. AI course construction

AI courses are a product of actively exploring artificial intelligence and higher education in the digital age. The establishment and implementation of AI courses such as “Pathology” at Jilin University and “Medical English Terminology” at Capital Medical University reflect a new stage of exploration and practice in teaching new forms of courses. The construction of AI courses cannot be separated from a complete course knowledge graph. In the future, based on the construction of the knowledge graph of diagnostics of traditional Chinese medicine, AI intelligent teaching assistants, AI intelligent lesson preparation assistants, and AI intelligent grading tools will be formed by combining AI technology, providing students with personalized learning paths based on AI and greatly improving teaching quality.

4.3. Construction of AI-based virtual simulation teaching platform

At present, AI technology is widely used in the field of diagnostics of traditional Chinese medicine, including expert systems for observation and inquiry, sensors and intelligent hardware for olfactory diagnosis, palpation, etc. [10,11]. The field of AI-assisted objectification of diagnostics of traditional Chinese medicine is in a booming stage of development. In the future, the objective research results of the Four Diagnostic Diseases can be used as a driving force, combined with AI technology, to carry out the construction of an AI-based intelligent standardized patient teaching system and virtual simulation system. The design of a standardized patient joint scenario simulation teaching mode in the Four Diagnostic Diseases teaching can break down the barriers between theoretical and practical teaching courses, and cultivate TCM talents with a deep theoretical foundation and strong clinical practice.

5. Conclusion

With the rapid development of digital technology, especially the unprecedented nationwide online teaching during the epidemic, and the explosive popularity of ChatGPT, DeepSeek technology in recent years, educators, healthcare professionals, the education industry, and students are increasingly realizing that the reform of AI-

based teaching models is inevitable for the development of medical education. However, in order to achieve the organic integration of diagnostics of traditional Chinese medicine and AI technology, a series of challenges need to be overcome: (1) Integration of AI technology and teaching: it is necessary to take carefully designed classroom content and teaching strategies as the basic mainline, it is vital that we can keep in mind that AI is an auxiliary technology rather than the center of teaching; (2) Ethical issues in the use of AI technology: Studies have shown that research on ethics of AI teaching in medical education is currently rare [12], but in the digital age, AI will have a significant impact on medical education, making ethics of AI teaching an indispensable part of medical education and bringing new challenges to educators; (3) Education quality improvement for teachers and adaptability training for students: Teachers need to establish a lifelong learning concept, constantly strengthen their educational quality with new knowledge and technology as opportunities, so as to better adapt to the digital education era. At the same time, students should also strengthen their understanding of digital technologies such as AI, accept the changes in the mode of integrating AI technology into teaching, and fully utilize these digital tools to carry out more efficient, convenient, and interesting learning.

With the deep integration of AI technology and medical education, there will be profound changes in the teaching mode and evaluation of the diagnostics of traditional Chinese medicine. Under the guidance of the OBE concept in the future, exploring the establishment of an educational model that is in line with the characteristics of the diagnostics of traditional Chinese medicine and adapted to AI technology will help improve the quality of course teaching, enhance the clinical thinking ability of medical students, cultivate traditional Chinese medicine thinking, and become talents in the new era of traditional Chinese medicine.

Disclosure statement

The authors declare no conflict of interest.

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