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AI-Empowered Cultivation of Research Innovation and Practical Abilities of Public Health Graduate Students under the New Medical Education

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Abstract: *With the rapid development of artificial intelligence (AI) technology, AI-enabled blended teaching models have gradually been introduced into higher medical education. By deeply integrating online and offline learning and utilizing intelligent teaching methods, this model provides a new pathway for improving education quality and enhancing students' overall literacy. This approach not only demonstrates advantages in teaching resource allocation and personalized learning support, but also offers new support for cultivating the research thinking and practical skills of public health graduate students. In this context, this paper focuses on public health graduate students, reviewing the current status and issues in the cultivation of research innovation and practical abilities. It explores the mechanism of AI-enabled blended teaching and aims to provide theoretical references and practical pathways for improving the quality of public health graduate education under the background of the new medical disciplines.*

Keywords: *AI Empowerment; Blended Teaching; Public Health; Research Innovation and Practical*

1. Introduction

Against the backdrop of the continuous advancement of the "Healthy China" strategy and the construction of new medical disciplines, medical education is undergoing profound transformation. The field of local medical education in China is facing a series of urgent problems that need to be solved, such as relatively lagging teacher team construction, incomplete curriculum system, and relatively scarce intelligent teaching resources. These issues have to some extent constrained the improvement of teaching quality. The new medical disciplines emphasize the deep integration of medicine with multiple disciplines, highlighting the cultivation of research innovation and practical abilities. Particularly in the field of public health, graduate students are required to possess comprehensive skills to address complex health issues. The rapid development of artificial intelligence (AI) technology has provided new tools and models for higher education[1]. The scientific exploration of cognitive process simulation and spatial expansion through AI technology can enhance the key role of machine learning, deep learning and other algorithms in public health event handling and decision assistance.In addition, with the help of AI data analysis technology, a comprehensive student ability map can be constructed to showcase students' strengths and weaknesses in clinical thinking ability, and provide personalized matching learning resources that better meet students' specific needs and facilitate the transition from "knowledge imparting" to "ability cultivation".

AI-enabled blended teaching integrates online intelligent platforms with offline interactive teaching, helping to break the limitations of traditional teaching methods and stimulating students' active learning and research thinking. Therefore, exploring the deep integration of "medicine+AI" teaching mode has become a new path to promote innovation in local medical talent training mode. This study takes the relevant teaching practices of Guilin Medical University as an example to explore the introduction of AI enabled blended learning and propose corresponding reform suggestions. It is expected to provide new theoretical and practical models for promoting the reform of medical graduate education models and the high-quality development of professional and technical talents in local universities.

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2. Application of AI-Enabled Blended Teaching under the New Medicine

AI-enabled blended teaching refers to the integration of artificial intelligence technology into the traditional online-offline blended teaching model, utilizing methods such as intelligent recommendations, personalized learning path planning, and automated assessment and feedback, to achieve the intelligent upgrade of teaching content, methods, and resources[2].

In public health education, AI-enabled blended teaching has gradually become an important tool for promoting teaching innovation and improving the quality of talent development. This model combines the intelligent analysis and decision-support capabilities of artificial intelligence, overcoming the traditional limitations of time, space, and content organization, making teaching more flexible, efficient, and personalized. Currently, more and more universities are introducing AI technology into public health courses, utilizing intelligent teaching platforms for pre-class resource recommendations, real-time classroom interaction analysis, post-class learning path optimization, and research skills training.

The new medical teaching system of "Medicine+AI" optimizes the talent cultivation mode, which can assist in the deep integration of artificial intelligence technology that has been applied in the medical field, such as identification of adverse health status, disease prediction, and health management, into the curriculum and teaching of public health majors. It focuses on cultivating students' interdisciplinary thinking and ability to solve complex clinical problems. For example, natural language processing technology is used to assist in text training, and big data modeling platforms are employed to conduct epidemiological simulation exercises, enhancing students' data analysis and research design abilities. At the same time, AI can assist teachers in providing personalized guidance, automatically generating evaluation reports based on students' learning behavior data, identifying learning blind spots, and enhancing the focus and effectiveness of teaching.

3. Current Situation of Cultivating Research Innovation and Practical Abilities for Public Health Graduate Students

Currently, universities in China have gradually begun exploring the cultivation of research innovation and practical abilities for public health graduate students. Although a basic framework for cultivating research and practical abilities has been established, there is still significant room for improvement in terms of overall depth and effectiveness.

In terms of research innovation capabilities, graduate students generally receive systematic basic research training, with course content covering epidemiology, health statistics, research methods, and other areas, which helps to establish a basic academic thinking framework. Some universities encourage students to participate in research projects led by their mentors, providing them with opportunities for thesis writing, data analysis, and other practical experiences, thereby fostering preliminary independent thinking and project design skills. However, most graduate research activities are limited to classroom assignments and small projects, with little exposure to real-world research projects. As a result, innovation awareness and interdisciplinary research abilities are still in the early stages.

Regarding practical abilities, most institutions offer internship and research components, where graduate students can visit disease control centers, community health service organizations, and other institutions for on-site learning to understand the basic public health service processes. However, these practical activities are often short in duration and have limited tasks, serving more as supplementary components to the teaching process. Some graduate students also gain experience by participating in course-related practical projects or professional competitions, but a systematic and continuous practical training mechanism has not yet been widely established.

4. Problems in Cultivating Research Innovation and Practical Abilities for Public Health Graduate Students

4.1 Single Focus of Research Training

Currently, research training for public health graduate students is mainly focused on traditional course teaching and participation in mentor-led projects, which results in relatively narrow content and lacks systematic design. Although fundamental courses such as research methods and statistics are

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offered, they tend to be theory-based with limited hands-on opportunities, making it difficult to help students establish a complete understanding of the research process[3]. Furthermore, course content updates are slow and disconnected from the rapidly developing research hot topics in the public health field, such as big data health analysis, artificial intelligence applications, and environmental health modeling. This leads to a lack of innovation in students' topic selection, methodologies, and technological approaches.

Most graduate students are limited to replicating existing models or methods and lack the ability to independently identify problems and design solutions. Additionally, uneven distribution of research resources is a significant issue. In some universities or departments, research platforms are weak, and students struggle to obtain sufficient experimental conditions and guidance support. This fragmented, outdated research training model, which fails to meet practical demands, restricts the expansion of students' research horizons and the effective enhancement of their innovation capabilities.

4.2 The Formalization of Practical Components

Public health programs emphasize a practice-oriented approach, yet there is a noticeable trend of formalization in the practical training components for graduate students. Many of the practical activities organized by universities mainly involve visits, short-term internships, or field research, which are limited in time and involve clear but shallow tasks. Students are more involved in "observing" and "listening" rather than "doing" and "thinking." In actual participation, graduate students often play the role of observers or assistants, lacking opportunities to take on core responsibilities in real public health settings. This low level of engagement and challenge in the practical activities makes it difficult to develop students' adaptability and comprehensive problem-solving skills when facing complex health issues.

At the same time, practical tasks generally lack systematic planning and fail to form a complete cycle from problem identification, data collection, intervention design, to outcome evaluation. This makes it difficult to effectively connect course theory with real-world application[4]. Additionally, with limited time and energy from practical supervisors, some projects lack follow-up feedback and reflection, causing practical teaching to become merely formal and preventing it from effectively developing students' practical abilities.

4.3 Disconnection between Research and Practice

Research and practice should mutually support and complement each other, but in the training of public health graduate students, the two often operate independently, lacking organic integration. In research training, students focus primarily on writing research topics, literature reviews, and statistical analyses, with few opportunities to apply research findings to real-world problems. In contrast, practical activities often emphasize daily administrative tasks or health education, without the involvement of a research perspective[5]. This disconnection makes it difficult for students to form a "problem identification in practice, followed by research-based solutions" thought process.

After completing internships, some graduate students are unable to transform what they have observed in practice into research topics or ideas for improvement. Similarly, research work fails to address the needs of practice, diminishing the practical value and applicability of the research. Moreover, there is a lack of integrated course modules or platform support that combine research and practice, making it challenging for graduate students to develop interdisciplinary integration skills throughout their learning process. This fragmented training system is detrimental to the development of a well-rounded public health talent pool.

5. Strategies for Cultivating Research Innovation and Practical Abilities for Public Health Graduate Students through AI-Enabled Blended Teaching

Based on the background of the new medical construction era, the transformation and development of medical education in universities need to closely connect with regional medical needs and accelerate the process of empowering medical education with artificial intelligence technology. This study systematically reviews the current situation of medical education in local universities in Guangxi, aiming to reveal the key role of the "medicine+AI" integration model in building an intelligent, diversified, and application-oriented talent training model and achieving the transformation of medical education. Local medical universities should focus on the development positioning of "locality" and

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"application-oriented", deepen the integration of theoretical and practical teaching with advanced teaching technology, and promote the construction and improvement of an intelligent education ecosystem. Only by implementing the Healthy China strategy and cultivating public health professionals who meet the needs of the new era can we provide strong support for the development of regional public health undertakings.

5.1 Enhancing the Systematic Nature of Research Training through Intelligent Resource Integration

AI-enabled blended teaching can effectively address the issues of narrow and outdated content in traditional research training[6]. With the help of artificial intelligence technology, teaching platforms can intelligently recommend cutting-edge research literature, the latest research tools, and hot topics based on students' interests and learning behavior data. This expands students' academic horizons and enhances the innovation and scientific nature of their topic selection. Additionally, AI can facilitate the construction of research knowledge graphs, organically integrating content such as theoretical courses, data methods, and research cases, providing students with a structured and systematic research training path.

Online learning platforms enhance the interaction between theory and practice through visual interactions, intelligent Q&A, virtual experiments, and other formats, improving student participation and engagement in research training, making it more engaging and interesting[7]. Moreover, AI can assist mentors in managing research progress by tracking students' projects development and feedback on challenges, improving the accuracy and efficiency of research guidance, thereby creating a more efficient, cutting-edge, and systematic research ability cultivation model.

5.2 Strengthening Practical Teaching through the Integration of Virtual and Real Components

To address the formalization of traditional practical components, AI-enabled blended teaching utilizes technologies such as virtual reality (VR), augmented reality (AR), and digital twins to create highly realistic public health practice environments. This allows students to undergo immersive training in scenarios such as simulated epidemic emergency response, environmental health interventions, and community survey analysis, thereby enhancing the authenticity and depth of practical experience. AI systems can also automatically generate evaluation reports based on students' performance in simulation exercises, helping teachers identify students' weaknesses and adjust teaching strategies, thereby providing personalized practical guidance[8].

Moreover, AI platforms can connect to real public health databases, such as disease surveillance data and health resource allocation information, enabling students to perform tasks such as data analysis, policy evaluation, and intervention planning in virtual environments, overcoming time and space limitations. The blended practical arrangements, linking online platforms with offline institutions, allow students to engage with real-world issues while enhancing their sense of involvement and problem-solving skills with AI assistance, thereby improving the effectiveness and depth of practical teaching.

5.3 Connecting Research and Practical Education through Intelligent Platforms

AI-enabled blended teaching provides strong support for the integration of research and practice. The intelligent teaching platform can link the practical case database with the research task system, allowing public health issues discovered in practice to be directly transformed into research topics[9]. Through the platform, students can complete the research process, including data collection, modeling, and analysis validation, truly realizing the concept of "research promoting learning, learning promoting application."

AI can analyze practice reports and survey records through natural language processing technology, assisting students in refining issues, constructing hypotheses, and generating research ideas, thereby improving the efficiency of transitioning from practice to research. The platform can also simulate various real-world scenarios, allowing students to continuously perform virtual intervention experiments or policy simulation assessments during the research process, enhancing the relevance of the research to real-world situations. At the same time, the blended teaching model, combining online AI platforms with offline teacher guidance, facilitates the organic connection between research training and practical teaching, forming a unified education system[10]. By leveraging AI technology, real-time

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feedback and mutual promotion between research and practice can be achieved, providing strong support for the development of public health graduate students with systematic thinking and comprehensive abilities.

6. Conclusion

Against the backdrop of the continuous advancement of new medical disciplines, the cultivation of research innovation and practical abilities in public health graduate students is facing new opportunities and challenges. There are still prominent issues in the current training process, such as the narrow focus of research training content, the formalization of practical components, and the disconnection between research and practice, which hinder the effective enhancement of graduate students' comprehensive abilities. AI-enabled blended teaching offers a new pathway to address these problems. Through intelligent resource integration, it promotes the systematization and modernization of research training, enhances the realism and depth of practical teaching through the integration of virtual and real components, and bridges the gap between research and practice, establishing a new mechanism for collaborative education. The deep integration of AI technology and blended teaching models not only enriches teaching content and formats but also drives the transformation and upgrading of educational concepts and methods. With the continuous improvement of the intelligent teaching system, AI-enabled blended teaching will play an increasingly pivotal role in the cultivation of public health talent, helping to train high-level public health professionals with comprehensive skills.

However, on the other hand, it should be noted that medical schools generally have deficiencies in AI related ethical risks, awareness of data privacy protection, and access permission management. Meanwhile, there may be regional differences in AI evaluation algorithms, which can have an impact on the fairness of educational evaluation. Therefore, it is necessary to refer to advanced experiences at home and abroad, develop specific educational and teaching plans based on regional characteristics, promote the close integration of regulations and educational practices, and build a comprehensive planning and supervision system that includes ethical norms and technological applications, strengthen the control of data security and effectively prevent and control risks while stimulating the cultivation of innovation capabilities.

Author Contributions

Conceptualization, X.Y.; methodology, R.L., Y.S. and Y.O.; validation, X.Y. and X.H.; formal analysis, X.H. and Y.O.; data curation, C.Y. and Y.O.; writing—original draft preparation, R.L. and Y.S.; writing—review and editing, X.Y.; funding acquisition, X.Y. and Y.O. All authors have read and agreed to the published version of the manuscript.

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Informed Consent Statement

Not applicable.

Data Availability Statement

The research data for this survey can be obtained by contacting the corresponding author.

Conflicts of Interest

The authors declare no conflicts of interest.

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