

Research on Teaching Reform of Pathology Courses in Colleges and Universities under the Background of “Internet plus New Medical Science”

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Abstract: With the advent of the era of “Internet plus New Medical Science,” the teaching mode for pathology courses in colleges and universities faces unprecedented opportunities for transformation. In this context, a pathology teaching model centered on theoretical explanations alone can no longer fully meet the demands of modern medical education. Therefore, it is essential to study and explore pathways for reforming pathology teaching in higher education within the framework of “Internet plus New Medical Science.” Research reveals a series of issues in current pathology teaching in universities, such as the uneven distribution of teaching resources, limited teaching methods, a disconnect between theory and practice, and incomplete evaluation systems. To address these challenges, universities should adopt a series of measures: optimizing resource allocation, innovating teaching methods and approaches, strengthening the integration of theory and practice, enhancing evaluation systems, and building robust teaching teams. These reforms aim to stimulate students’ interest in learning and improve the effectiveness of pathology instruction.

Keywords: Internet plus New Medical Science; Universities; Pathology; Teaching model

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1. Introduction

The *Opinions on Deepening the Reform of Undergraduate Education and Teaching and Improving the Quality of Talent Cultivation*, issued by the Ministry of Education, emphasizes the importance of “actively developing ‘Internet plus education,’ exploring new forms of intelligent education, and promoting a revolution in classroom teaching”^[1]. Pathology, a critical component of medical education, serves as a bridge between basic and clinical medicine, introducing students to disease recognition and providing foundational knowledge essential for lifelong medical practice. Consequently, the quality of pathology teaching directly influences students’ clinical

diagnostic skills and their capacity for scientific research and innovation. Traditionally, pathology instruction has relied on classroom lectures and laboratory sessions; however, this model alone no longer meets the needs of modern medical education due to rapid technological advancements. The broad application of Internet technology has introduced new perspectives and tools for pathology instruction, diversifying and personalizing the teaching model. Particularly in the context of the development of new medical sciences, the teaching mode for pathology courses in colleges and universities must evolve with the times, leveraging Internet technology to optimize teaching resources and foster innovation in teaching methods.

2. Existing problems in the teaching of pathology courses in universities

2.1. Uneven distribution of teaching resources

In the traditional pathology teaching model, there is often an imbalance in the allocation of teaching resources. Variations in geographical location, funding, and faculty strength among universities lead to disparities in pathology resources. For example, some universities may lack advanced experimental equipment and sufficient teaching samples, limiting students' practical opportunities in the learning process. Additionally, disparities exist in the availability of highly qualified teachers, with some institutions struggling to attract and retain experienced pathology instructors. This imbalance ultimately impacts teaching quality and student learning outcomes.

2.2. Single teaching method

Traditional pathology teaching often centers around a teacher-led, lecture-based approach with minimal student engagement. This one-way teaching method makes it difficult to stimulate students' interest and motivation, resulting in a lack of enthusiasm and creativity in learning ^[2]. Furthermore, due to the complex and specialized nature of pathology content, a single teaching approach does not accommodate the diverse learning needs of students, which hinders comprehension for some and reduces learning effectiveness.

2.3. Disconnect between practice and theory

In traditional pathology teaching, a significant gap often exists between theoretical instruction and practical application. Students find it challenging to fully apply theoretical knowledge gained in class to laboratory practice, creating a disconnect between learning and real-world application ^[3]. This gap limits students' understanding of pathology and reduces their ability to solve practical problems. Laboratory exercises are often restricted to a limited number of specimens and equipment, making it difficult to cover the broad field of pathology and to adequately prepare students for complex and varied clinical scenarios.

2.4. Incomplete evaluation system

The evaluation system in pathology courses strongly influences students' learning motivation and teachers' instructional methods. However, traditional evaluation systems tend to be overly simplistic, often relying solely on final exam scores to assess student performance. This approach neglects students' progress throughout the course and does not emphasize the development of practical skills, leading students to focus excessively on exam results while overlooking the practical applications of pathology knowledge ^[4]. Additionally, the evaluation system lacks assessments of students' innovation and critical thinking skills, making it difficult to accurately reflect their actual competencies.

3. Teaching reform path of pathology courses in colleges and universities under the background of “Internet plus New Medical Science”

3.1. Optimize the allocation of teaching resources

In the context of “Internet plus New Medical Science,” colleges and universities should leverage digital resources and network platforms to enhance the distribution and utilization of pathology teaching resources. By establishing a comprehensive online pathology resource library, high-quality teaching materials can be shared effectively, narrowing the gap in resource allocation among universities. For instance, institutions can develop virtual laboratories that allow students to perform simulated experiments online ^[5]. This approach not only compensates for the limitations of physical lab resources but also provides a more flexible and convenient learning experience. Utilizing online platforms for remote pathology instruction allows renowned experts, both domestic and international, to deliver lectures and teach online ^[6]. This enriches the curriculum content and provides students with access to the latest pathology knowledge and research. This model enables students to overcome geographical barriers, thereby receiving a higher quality of education and improving overall teaching effectiveness. Additionally, this approach helps foster students’ self-learning and information technology skills, laying a solid foundation for their future careers in the medical field.

3.2. Innovative teaching methods and tools

To keep pace with the “Internet plus New Medical Science” trend, colleges and universities need to innovate the teaching methods and tools used in pathology courses. First, a flipped classroom model can be adopted, where students learn the fundamentals of pathology independently on online platforms before class, while in-class time is used for discussions, case analyses, and experimental operations. This model increases student engagement, fosters enthusiasm and initiative, and cultivates critical thinking and problem-solving skills ^[7]. Additionally, virtual reality (VR) and augmented reality (AR) technologies can enhance the learning experience by providing more intuitive and vivid insights ^[8]. For example, in studying structural organization and pathological processes, VR technology allows students to explore a 3D virtual space to observe and analyze various pathological changes, making these concepts more accessible than traditional 2D images and text. AR can present abstract concepts and complex structures in an augmented format, aiding students in understanding and retention ^[9]. Moreover, by leveraging big data and artificial intelligence, universities can analyze students’ online learning behaviors to provide personalized recommendations for resources and learning advice. This approach tailors the content and teaching methods to meet students’ specific needs, improving learning efficiency.

3.3. Strengthen the integration of theory and practice

Under the “Internet plus New Medical Science” framework, pathology courses in colleges should prioritize the integration of theory and practice to enhance students’ clinical application abilities. First, a virtual simulation platform can bridge theoretical knowledge with clinical practice, allowing students to perform practical operations in a simulated clinical environment. This method enables students to practice and reinforce their knowledge without time and space constraints, improving both clinical reasoning and technical skills ^[10]. Furthermore, universities can collaborate with hospitals to establish clinical pathology practice bases, giving students the opportunity to participate in real case analyses and diagnostic processes. Through interaction with clinical practitioners, students gain a deeper understanding of how pathological knowledge is applied in clinical diagnosis, which strengthens their grasp of theoretical concepts ^[11]. Additionally, universities can facilitate

online case discussions and remote pathology diagnostics, enabling students to engage in real case analyses. Through collaborative discussions and exchanges, students enhance their clinical thinking and problem-solving abilities. These activities allow students to not only bridge theoretical knowledge with practical cases but also develop teamwork and communication skills.

3.4. Improve the teaching evaluation system

In the context of “Internet plus New Medical Science,” the evaluation system for pathology courses in colleges and universities should be reformed and enhanced to align with the new teaching modes and training objectives. First, a diversified evaluation system should be established, incorporating not only traditional final exams but also comprehensive assessments of student’s practical skills, case analysis, group discussions, online learning progress, and quality of work. This diversified evaluation approach allows for a more comprehensive reflection of students’ learning outcomes and practical application abilities ^[12]. Additionally, formative assessments should be introduced to continuously track students’ progress throughout the teaching process, using regular assignments, quizzes, lab reports, and classroom performance. Formative evaluation helps identify issues students may face during learning and provides targeted guidance and support to promote continuous improvement. Furthermore, universities can leverage big data and artificial intelligence to analyze students’ online learning behaviors and outcomes, thereby offering personalized feedback and suggestions ^[13]. This method helps students better understand their learning status, adjust their strategies in a timely manner, and improve learning outcomes. Finally, universities should encourage self-evaluation and peer evaluation among students to foster self-reflection and critical thinking. These evaluations help students recognize their strengths and weaknesses, enabling them to make targeted improvements in future learning.

3.5. Strengthen the construction of the teaching staff

In the “Internet plus New Medical Science” context, pathology curriculum reform requires not only advanced resources and methodologies but also a high-quality teaching team. Universities should prioritize training pathology teachers, enhancing their ability to integrate modern information technology into teaching, and enabling them to effectively use tools like online platforms, virtual reality, and augmented reality. Additionally, teachers should continuously update their professional knowledge to stay aligned with the latest developments in pathology, ensuring that students receive cutting-edge knowledge ^[14]. Universities can also engage experienced clinicians as part-time instructors or guest lecturers to bring real cases from clinical practice into the classroom, enriching the relevance and vividness of teaching. These part-time instructors can provide practical insights and career guidance, helping students understand the real-world applications of pathology. Furthermore, universities should encourage interdisciplinary collaboration among faculty to integrate pathology with other medical fields, cultivating students’ comprehensive analytical abilities and interdisciplinary thinking ^[15]. Through teamwork, faculty can collaboratively develop new teaching modules and courses, ensuring pathology education aligns more closely with clinical needs. Finally, universities should establish incentive mechanisms to encourage teachers in their efforts toward instructional reform and innovation. Through teaching awards and research funding, universities can stimulate teachers’ enthusiasm and creativity, promoting continuous improvement and development in pathology instruction. These measures help universities cultivate more pathology professionals with strong theoretical foundations and practical skills, ultimately contributing to advancements in the medical field.

3.6. Promote interdisciplinary cooperation and exchange

In the “Internet plus New Medical Science” era, reforming pathology curricula in universities should also focus on fostering interdisciplinary cooperation and exchange to promote knowledge integration and innovation. Universities can establish interdisciplinary teaching and research platforms, encouraging pathology educators to collaborate with experts from other fields, such as medical disciplines, computer science, and bioinformatics. Through these partnerships, they can jointly develop course content and teaching projects that integrate knowledge from multiple fields, offering students a broader knowledge base and diverse problem-solving perspectives. Additionally, universities should encourage students to participate in interdisciplinary research projects, helping them develop comprehensive analytical skills and innovative problem-solving abilities through hands-on work and teamwork. These interdisciplinary collaborations and exchanges make pathology courses in universities more diverse and adaptable to the evolving needs of the medical field.

4. Summary

In summary, in the context of “Internet plus New Medical Science,” reforming the pathology curriculum in colleges and universities is essential and urgent. Universities should innovate teaching methods and approaches, strengthen the integration of theory and practice, improve the evaluation system, and enhance the development of the teaching faculty. These efforts aim not only to improve the quality and effectiveness of pathology education but also to cultivate students’ clinical application abilities, stimulate their interest in learning, and enhance their critical thinking and problem-solving skills. Ultimately, these reforms will help develop medical professionals with comprehensive, well-rounded qualities.

Disclosure statement

The author declares no conflict of interest.

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