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Innovative Exploration of Case-Based Teaching in Pathology Curriculum under the Background of New Medical Education

Ziwei Hong*

Xi'an FanYi University, Xi'an 710105, Shaanxi, China

**Author to whom correspondence should be addressed.*

Abstract: Against the backdrop of rapid advancements in medical technology and shifting societal demands for medical talents, the construction of new medical education has emerged as a key focus of medical education reform. Traditional teaching modes in pathology fail to meet the requirements for talent cultivation in this context. This study focuses on the innovative application of case-based teaching in the pathology curriculum under the background of new medical education. By analyzing the current application status, issues such as case selection, teaching organization, teacher capability, and evaluation system have been identified. In response, innovative explorations have been carried out, starting from case selection and design, optimization of the teaching process, and enhancement of teachers' professional competence. Additionally, a multidimensional evaluation index system has been established, and various evaluation methods have been adopted for effectiveness assessment. These efforts aim to improve the quality of pathology teaching and students' clinical thinking ability, providing new ideas and practical experiences for pathology teaching reform. This study holds significant importance for cultivating medical talents that meet the requirements of new medical education.

Keywords: New medical education; Pathology; Case-based teaching; Innovative exploration

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1. Introduction

In the context of rapid global technological development and evolving societal needs, the field of medical education is undergoing profound changes. The emergence of new medical education has become a pivotal force driving innovation and development in this sector. New medical education emphasizes interdisciplinary integration, underscores the combination of basic and clinical medicine, and aims to cultivate innovative, internationally-minded medical talents capable of addressing future health challenges [1–3]. Pathology is a crucial foundational discipline in medical education, serving as a bridge between basic and clinical medicine, and playing a pivotal role in the medical system [4]. Pathology primarily investigates the occurrence and development of diseases, elucidating the essence of diseases. The study of morphological and functional metabolic changes

in diseased organisms provides important theoretical bases for the diagnosis, treatment, and prevention of clinical diseases. Case-based teaching, as a problem-oriented teaching method, possesses unique advantages and importance in pathology education. By introducing authentic clinical cases, it integrates abstract pathology knowledge into specific case scenarios, stimulating students' interest and initiative in learning [5]. This transforms students from passive knowledge recipients into active learners, enabling them to deeply understand and grasp the theoretical knowledge of pathology in the process of analyzing and solving practical problems. Therefore, the introduction of case-based teaching in pathology curricula holds great significance.

Under the background of new medical education, the in-depth exploration of innovative applications of case-based teaching in pathology curricula is of great practical importance for enhancing the quality of pathology teaching and cultivating medical talents that meet the demands of the new era. On the one hand, it helps improve students' learning effects and application abilities regarding abstract pathology knowledge, strengthens the connection between basic and clinical medicine, and facilitates students' transition from basic medical knowledge to clinical practice. On the other hand, through innovative practice in case-based teaching, it cultivates students' innovative thinking and comprehensive qualities, equipping them with the ability to tackle complex problems in future medical fields and providing robust talent support for the development of the medical and healthcare industry.

2. Adaptability analysis of case-based teaching in the pathology curriculum

In traditional pathology teaching, the teacher primarily lectures while students passively receive knowledge. This teaching method limits students' learning initiative and enthusiasm to a certain extent [6]. The interaction between teachers and students in the classroom mainly consists of a question-and-answer mode, with questions often being simple recall questions based on textbook content, lacking inspiration and thought-provoking elements. Under this teaching mode, students cannot think and solve problems independently, making it difficult for them to combine the pathology knowledge they have learned with clinical practice. This is detrimental to cultivating students' clinical thinking ability and innovation capability.

Case-based teaching takes real clinical cases as the starting point, incorporating abstract pathology knowledge into specific case scenarios, making the learning content more vivid and imaginative, thereby effectively stimulating students' interest in learning [7]. At the same time, during the case analysis process, students need to apply the pathology knowledge they have learned to comprehensively and deeply analyze and judge the condition in the case, combining theoretical knowledge from class with clinical practice. This allows students to better understand the nature and development of diseases, thereby forming a systematic framework of clinical thinking. In addition, when analyzing clinical cases, students need to comprehensively utilize knowledge from multiple disciplines, such as anatomy, physiology, pathology, and diagnostics. This helps students integrate knowledge from different disciplines to form a systematic medical knowledge system. These advantages make case-based teaching an important direction for pathology teaching reform under the background of new medical education.

Case-based teaching guides students to integrate knowledge from clinical scenarios and solve practical problems through real clinical cases, aligning with the practical needs of pathology as a "bridge discipline"[8]. Its flexibility and interactive features can compensate for the deficiencies of traditional teaching, especially in areas such as disease diagnosis logic, morphology, and function connections, and clinical reasoning. Through classroom practice, it has also been found that case-based teaching can improve students' learning enthusiasm and

participation, enhancing their understanding and memory of pathology knowledge. Although case-based teaching has achieved certain results in the application research of pathology courses, there are still some deficiencies.

2.1. Issues with case quality

In the development and sharing of case resources, there is a lack of unified standards and norms, resulting in varying case quality. Some cases are outdated, have incomplete information, or do not match teaching objectives, making it difficult to meet teaching needs. Some cases fail to reflect the latest medical research results and clinical diagnostic progress promptly, leading to a disconnection between what students learn and practical applications. High-quality clinical cases require the collection of complete clinical history data, laboratory test reports, and other information, which is time-consuming. Additionally, although some institutions obtain real clinical cases through cooperating hospitals, issues involving patient privacy and ethics limit the widespread use of these cases.

2.2. Insufficient teacher guidance capability

Case-based teaching requires teachers to have a profound reserve of professional knowledge in pathology, which includes not only proficiency in traditional pathology knowledge but also timely understanding of the forefront dynamics and latest research results of the discipline. Teachers need to have a deep understanding of the pathological changes, pathogenesis, and related molecular biology, cellular biology, and other knowledge of various diseases to accurately guide students during case analysis. During the teaching process, some teachers do not provide timely or appropriate guidance in case discussions, lacking effective teaching strategies and methods. Some teachers cannot effectively control the discussion pace, leading to discussions being too long or too short. Some teachers cannot guide students promptly when discussions deviate from the topic, affecting students' learning outcomes. These occurrences prevent clinical cases from fully playing their role and impact teaching effectiveness.

2.3. Uneven student participation

Differences in students' learning foundations and abilities are important factors leading to uneven participation. Pathology courses are generally scheduled in the sophomore year of college. At this stage, students have systematically studied courses such as human anatomy, physiology, biochemistry, and histological embryology. Some students have laid a solid foundation in previous studies and possess strong self-learning and problem-analyzing abilities. They can actively think and speak up in case discussions, presenting their insights. On the other hand, some students have a relatively weak foundation, with an insufficient grasp and understanding of pathology knowledge. They find it difficult to engage in case analysis, lack confidence, and dare not actively participate in discussions; instead passively listen to the opinions of other classmates.

Differences in learning attitudes and interests are also important factors affecting student participation. Some students have a strong interest in pathology and the medical profession. They actively participate in case-based teaching, viewing it as an opportunity to enhance their professional abilities and clinical thinking. They demonstrate high enthusiasm and activity in case discussions. However, other students have a lower interest in the profession, hold an incorrect learning attitude, lack learning initiative and self-consciousness, and exhibit a passive attitude in case-based teaching. They are unwilling to participate in discussions and may even engage in activities unrelated to learning during discussions. Some students may lack motivation in the learning process due to unclear future career planning and a weak sense of identity towards the medical profession, leading to

insufficient attention to case-based teaching.

2.4. Imperfect teaching evaluation system

The traditional teaching evaluation system mainly focuses on final exam scores, lacking evaluation of students' learning process, such as their performance in group discussions and enthusiasm for self-directed learning. This evaluation method ignores students' progress during the learning process and the cultivation of practical operating abilities [9], causing students to excessively focus on exam scores and neglect the practical application of pathology knowledge. Therefore, it is difficult to comprehensively assess the effectiveness of case-based teaching during the instruction process.

3. Innovative exploration of case-based teaching under the new medical education context

3.1. Innovation in case design

Strengthen close cooperation with clinical practices, regularly collect and update cases to form a stable case collection network, ensuring the case library reflects the latest developments in clinical practice [10,11]. Establish a rigorous case review mechanism by organizing professional teachers and clinicians to jointly review cases, ensuring their accuracy, timeliness, and alignment with teaching objectives. Priority is given to selecting cases with clear pathological diagnoses, complete clinical data, and clear disease progression records. These cases can comprehensively reflect the occurrence and development of diseases, providing students with authentic and vivid learning materials. Interdisciplinary integration is employed to construct a diversified case library. By introducing multidisciplinary perspectives such as clinical medicine, basic medicine, and imaging, comprehensive cases are designed to simulate real medical scenarios.

The cases are designed in layers and levels of progression based on students' knowledge and abilities at different learning stages, meeting students' individualized learning needs and gradually enhancing their comprehensive abilities. At the basic stage, for students who are new to pathology courses, simple and intuitive cases are designed, mainly focusing on helping students grasp the basic concepts of pathology and typical pathological changes of common diseases. As students accumulate knowledge and enhance their abilities, moderately difficult and somewhat comprehensive cases are designed at the intermediate stage. At the advanced stage, for students with a solid grasp of knowledge and stronger abilities, complex and challenging cases are designed, emphasizing the cultivation of students' clinical thinking and innovative abilities.

3.2. Strengthening teacher training and professional development

To enhance teachers' professional competence and teaching skills, enabling them to better adapt to the requirements of case-based teaching, teacher training and professional development should be strengthened. Schools can regularly organize teachers to participate in training on pathology expertise, inviting renowned domestic and foreign experts and scholars to hold lectures and seminars to share the latest pathology research achievements and clinical practice experiences, thereby broadening teachers' knowledge and horizons[12]. Strengthen the connection between teachers and clinical practices to improve teachers' clinical practice abilities. Training courses on frontier fields such as molecular pathology and tumor immune pathology are conducted to enable teachers to understand the latest developments in the discipline and master new theories and technologies to guide students to focus on frontier issues in the discipline during case-based teaching [13].

Specialized training on case-based teaching is conducted to enhance teachers' abilities in instructional design, guiding discussions, and evaluating students. The training content can include principles and methods for case writing, how to select appropriate cases based on teaching objectives and student characteristics, and how to design thought-provoking questions to guide students' thinking. Teachers can also observe excellent demonstration classes of case-based teaching to learn from others' teaching experiences and improve their teaching abilities.

3.3. Strategies to inspire student participation

To increase student participation, establishing an effective incentive mechanism is crucial. In terms of course assessment, the proportion of case analysis in assessments is increased to make students recognize the importance of case studies. In case analysis assessments, students are not only evaluated on their mastery of pathology knowledge but also on their abilities to analyze and solve problems, as well as their comprehensive qualities such as teamwork and communication skills [14]. This approach guides students to actively participate in case studies and discussions, enhancing their learning enthusiasm and initiative. Activities such as case analysis competitions can also be conducted to stimulate students' interest and enthusiasm for participation. Students are organized to participate in case analysis competitions in groups, providing them with a platform to showcase their abilities. Through competition activities, not only can students' learning enthusiasm and participation be enhanced, but their innovative thinking and team collaboration spirit can also be cultivated, improving their comprehensive qualities. Furthermore, attention is paid to individual differences among students, with more encouragement and guidance provided to introverted students and those with weaker foundational knowledge, offering personalized learning support to help them overcome difficulties and actively participate in teaching activities.

3.4. Improving the teaching evaluation system

A diversified teaching evaluation system is established. In addition to setting case analysis questions in final exams to examine students' clinical thinking abilities, specialized clinical case analysis tests can also be organized. In these tests, students are provided with a series of real clinical cases and are required to use their learned pathology knowledge to diagnose diseases, conduct differential diagnoses, and formulate treatment plans based on the information in the cases. In the teaching evaluation system, not only is students' mastery of pathology theoretical knowledge evaluated, but also their abilities to analyze and solve problems, as well as their comprehensive qualities, such as teamwork and communication skills. Furthermore, students are introduced to conduct self-evaluations and peer evaluations, cultivating their self-reflection and critical thinking abilities [15]. Through self-evaluation and peer evaluation, students can better recognize their strengths and weaknesses, thereby making more targeted improvements in their future learning.

4. Conclusion and reflection

This study analyzes the current application status of case-based teaching in pathology education, proposes innovative strategies to address existing issues, and provides useful insights for the reform of pathology education. By introducing real clinical cases, students' learning enthusiasm is stimulated. At the same time, teachers' professional competence is enhanced, and the teaching evaluation system is improved, thereby enhancing teaching quality and providing strong support for cultivating high-quality medical talents that meet the demands of new medical education. Overall, case-based teaching offers new ideas for the reform of pathology

education and is of great significance in improving the quality of medical education.

In the future, it is still necessary to strengthen cooperation with clinical practices, broaden case collection channels, and gather more cases of rare diseases, difficult-to-diagnose diseases, and diseases with special clinical characteristics to further improve the case resource library. The application of case-based teaching in pathology courses should be continuously developed and refined through the teaching process. Lessons learned and problems encountered should be summarized and addressed to continuously promote teaching reform and innovation, thereby improving the quality of pathology education and driving the development of medical education.

Disclosure statement

The author declares no conflict of interest.

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