

Innovative Application and Effect Evaluation of Participatory Teaching in Pathophysiology

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Abstract

Pathophysiology, as a bridge discipline connecting basic medicine and clinical medicine, occupies an important position in medical education. Traditional teaching of pathophysiology has certain limitations, such as overly emphasizing the imparting of theoretical knowledge and imprisoning students in a state of separation between teaching and learning, as well as between learning and application. Participatory teaching is student-centered, emphasizing interaction between teachers and students, as well as communication and cooperation among students. It can improve students' abilities to utilize information, express themselves, and analyze comprehensively, cultivate their teamwork spirit, help break the limitations of traditional teaching, and improve the quality of pathophysiology teaching.

Keywords

Participatory Teaching, Pathophysiology, Reform, Implementation, Talent Training

1. Introduction

As a bridge discipline connecting basic medicine and clinical medicine, pathophysiology occupies an important position in medical education [1]. It not only allows students to master the laws and mechanisms of disease occurrence and development, but also needs to cultivate students' clinical thinking and ability to solve practical problems [2] [3]. However, traditional pathophysiology teaching has certain limitations. Traditional teaching methods put too much emphasis on the teaching of theoretical knowledge and confine students to the state of separation between teaching and learning, learning and using. For example, in the traditional pathology experiment teaching, due to the rapid expansion of enrollment in recent years, the number of students increased significantly, and some typical specimens failed

to increase, resulting in a serious lack of teaching resources. At the same time, due to the limitation of ordinary light microscope, students can only observe tissue sections by single person, which makes it inconvenient for teachers to communicate with students, limiting the communication and discussion between teachers and students. These problems make students lack initiative and enthusiasm in the learning process, and it is difficult to truly understand and master the knowledge of pathophysiology. Therefore, the introduction of participatory teaching is particularly necessary. Participatory teaching is student-centered and emphasizes the interaction between teachers and students as well as the communication and cooperation between students [4] [5]. It can improve students' ability to use information, self-expression and comprehensive analysis, cultivate students' teamwork spirit, help break the limitations of traditional teaching, and improve the quality of pathophysiology teaching.

This study aims to explore the application effect and innovative strategies of participatory teaching in pathophysiology. Through the practice and research of participatory teaching methods, it is expected to stimulate students' interest in learning, improve students' learning enthusiasm and initiative, and cultivate students' clinical thinking and ability to solve practical problems. At the same time, the discussion of innovative strategies of participatory teaching provides new ideas and methods for pathophysiology teaching reform and promotes the continuous development and progress of pathophysiology teaching.

2. Theoretical Basis

2.1. Concept and Characteristics of Participatory Teaching

Participatory teaching is a new teaching concept that emphasizes students' autonomous learning and teachers provide guidance and help for students. Originating in Britain, it was initially a sociological theory and later introduced into the field of education and teaching to form a self-contained teaching method.

Participatory teaching has the following advantages: first, it can fully mobilize the enthusiasm of learners and cultivate their innovative spirit. Compared with traditional teaching, participatory teaching pays more attention to the dominant position of students and allows students to actively participate in all aspects of teaching. Secondly, participatory teaching emphasizes interaction and cooperation and cultivates students' teamwork and communication skills through group cooperation, classroom discussion and other ways. Finally, participatory teaching can improve students' comprehensive analysis ability and the ability to solve practical problems, so that students can better adapt to the future clinical work.

The differences between participatory teaching and traditional teaching are mainly reflected in the following aspects: traditional teaching is teacher-centered, teachers are knowledge imparters, and students are passive recipients. While participatory teaching is student-centered, teachers are guides and promoters of learning, and students are active learners. Traditional teaching pays attention to knowledge inculcation and emphasizes memory and examination; participatory teaching focuses

on students' experience and practice and emphasizes the application and innovation of knowledge. Traditional teaching adopts a single teaching method, such as teaching method; The participatory teaching adopts a variety of teaching methods, such as group discussion, case analysis, role play, etc.

Participatory teaching highlights the dominant position of students and regards students as the center of teaching. In participatory teaching, teachers should respect students' personalities and differences, pay attention to students' needs and interests, and provide students with personalized learning support. Teachers should encourage students to actively participate in teaching activities, let students take their subjective initiative in the learning process, explore knowledge independently, and improve their learning ability. For example, in pathophysiology teaching, teachers can design different teaching cases and problems according to students' professional backgrounds and interests, so that students can discuss in groups and solve problems independently. This can stimulate students' interest in learning and improve their learning enthusiasm and initiative.

Participatory teaching emphasizes interaction and cooperation and promotes students' learning and development through teacher-student interaction and student-student interaction. In participatory teaching, teachers should establish a good teacher-student relationship with students, create a relaxed and happy learning atmosphere, and let students dare to ask questions and express their views. Teachers should organize students to carry out cooperative learning in groups, so that students can communicate with each other, cooperate with each other and make common progress in groups. For example, in the experimental teaching of pathophysiology, teachers can organize students to carry out group experiments, so that students can cooperate with each other and complete experimental tasks together during the experiment. This can cultivate students' teamwork ability and communication ability and improve students' experimental skills and comprehensive quality.

2.2. Demands and Challenges of Pathophysiology Teaching

Pathophysiology is a discipline that studies the laws and mechanisms of disease occurrence and development with the characteristics of knowledge complexity and abstraction. The knowledge of pathophysiology involves many disciplines, such as physiology, biochemistry, pathology, etc., students need to have solid basic knowledge and comprehensive analysis ability. At the same time, the knowledge of pathophysiology is abstract, which requires students to have strong logical thinking and imagination ability. These characteristics have brought great challenges to pathophysiology teaching.

The complexity and abstraction of pathophysiology knowledge are mainly reflected in the following aspects: first, pathophysiology knowledge involves many disciplinary fields, and students need to have solid basic knowledge and comprehensive analysis ability. For example, when learning the pathophysiological mechanism of heart failure, students need to master the heart structure and function in

physiology, energy metabolism in biochemistry, myocardial lesions in pathology and other knowledge in order to understand the occurrence and development mechanism of heart failure. Secondly, the knowledge of pathophysiology is abstract, which requires students to have strong logical thinking and imagination ability. For example, when learning the pathophysiological mechanism of acid-base balance disorder, students need to analyze the changes of acid-base indicators in the blood and imagine the regulation process of acid-base balance in the body, so as to understand the occurrence and development mechanism of acid-base balance disorder.

Pathophysiology is a bridge discipline connecting basic medicine and clinical medicine, and its teaching content is closely related to clinical practice. However, in actual teaching, there is a certain gap between pathophysiology teaching and clinical practice. On the one hand, the teaching content of pathophysiology is relatively abstract and lacks the support of clinical practice cases, making it difficult for students to combine theoretical knowledge with clinical practice. On the other hand, clinical practice teaching resources are relatively limited, and students lack practice opportunities, making it difficult to apply theoretical knowledge to practical clinical work. These problems have brought great challenges to pathophysiology teaching. In order to solve these problems, we need to strengthen the connection between pathophysiology teaching and clinical practice, and introduce clinical practice cases into pathophysiology teaching, so that students can understand the problems and needs in clinical practice while learning theoretical knowledge and improve students' clinical thinking and ability to solve practical problems. For example, students can combine theoretical knowledge with clinical practice to improve their comprehensive quality and practical ability by organizing students to carry out clinical case discussion and clinical practice.

3. Application of Participatory Teaching in Pathophysiology

3.1. Implementation of Students' Micro-Lecture Teaching

Students' micro classroom is an effective practical way of participatory teaching in pathophysiology [6] [7]. For example, in the teaching of the chapter "shock", the teacher grouped the students in advance and assigned tasks. The students in each group learn by themselves before class, and have a preliminary understanding of the concept, etiology, pathogenesis, clinical manifestations and treatment of shock by consulting teaching materials, literature and using online teaching resources. In the class, each group selects representatives to give 5 - 10-minute knowledge points. The students vividly elaborated the characteristics of different types of shock, such as hypovolemic shock and septic shock, by making exquisite ppt.

In the process of group self-study, the students worked together, some were responsible for collecting data, some were responsible for sorting and summarizing, and some were responsible for making ppts. This way gives full play to students' subjective initiative and cultivates students' teamwork ability. During the

lecture, the students not only exercised their language expression ability, but also deepened their understanding of knowledge points. For example, a group of students, when preaching septic shock, combined with actual clinical cases, analyzed the process of patients from infection to shock, so that the students had a more intuitive understanding of the occurrence and development of septic shock.

Teachers play an important guiding role in students' micro classroom. The teacher listened carefully to the propaganda content of the students, commented on and supplemented the content of the students' statement. On the one hand, teachers help students to clarify and point out the key contents, so that students can grasp the knowledge points more accurately. For example, after the students explained the treatment of shock, the teacher emphasized the focus on different types of shock treatment, such as hypovolemic shock, which is primarily to supplement blood volume, while septic shock requires comprehensive treatment while fighting infection. On the other hand, teachers further stimulate students' thinking by asking questions and guiding discussion. For example, the question raised by the teacher: "how to identify shock patients early in clinical practice?" triggered a heated discussion among the students, deepening the students' understanding of the clinical diagnosis of shock.

3.2. Construction of Diversified Teaching Platform

Participatory teaching needs the support of diversified teaching platforms. Tencent conference, QQ group and other platforms have their own unique functions, providing a strong guarantee for participatory teaching [8] [9].

Online teaching resources provide rich micro-lesson videos and question banks, and students can use these resources to preview and review. For example, before learning the chapter "acid-base balance disorder", students can watch the video of micro-lecture on acid-base balance to understand the basic concept and regulation mechanism of acid-base balance. Tencent conference is mainly used for live broadcast of teaching courses. Teachers can display PPT, pictures, videos and other teaching materials through screen sharing and other functions, so that students can more intuitively understand knowledge points. QQ group provides convenience for answering questions after class. Students can ask teachers questions at any time in QQ group, and teachers can also reply to students' questions in time to solve students' doubts.

The combination of offline teaching activities and online platforms further enhances the effect of participatory teaching. For example, in classroom teaching, teachers can choose the appropriate time to embed micro-lesson videos according to the teaching content and progress to help students understand difficult knowledge. At the same time, teachers can also organize group discussion, case analysis and other activities, so that students can deepen their understanding of knowledge points in the interaction. After class, teachers can assign homework and discuss topics through QQ group to guide students to study and think independently. For example, the teacher published a case about "acid-base balance disorder in patients

with respiratory failure” in QQ group, and asked the students to analyze the types and causes of acid-base balance disorder that may occur in the patient and put forward the treatment plan. In the process of completing their homework, the students not only consolidated their knowledge, but also improved their ability to analyze and solve problems.

3.3. Innovation of Teaching Methods

Participatory teaching encourages the innovation of teaching methods to better stimulate students’ interest and enthusiasm in learning.

Case analysis is an important method in participatory teaching. Teachers can choose representative clinical cases to guide students to analyze and discuss. For example, when explaining the chapter “heart failure”, the teacher introduced a case of a patient with heart failure and asked the students to analyze the patient’s clinical manifestations, diagnostic basis and treatment plan. The students put forward their own views and suggestions through group discussion and combined with the pathophysiology knowledge they learned. During the discussion, the students not only deepened their understanding of the pathophysiological mechanism of heart failure, but also improved their clinical thinking ability.

Problem guided teaching is also an effective method in participatory teaching. Teachers guide students to think and explore by asking a series of questions [10]. For example, when explaining the chapter of “respiratory failure”, the teacher asked the following questions: “what is respiratory failure? What are the causes of respiratory failure? What are the clinical manifestations of patients with respiratory failure? How to treat respiratory failure?”, these questions stimulated students’ interest in learning and prompted students to actively consult materials and think about problems. In class, teachers organize students to discuss and let students share their answers and thinking process. In this way, students have a deeper understanding of the knowledge of renal failure.

4. Effect Evaluation of Participatory Teaching in Pathophysiology

4.1. Improvement of Students’ Academic Performance

Through comparative experiments, the influence of participatory teaching on students’ performance is demonstrated.

Studies have shown that the students in the observation group who used participatory teaching had significantly higher scores on case analysis questions than those in the control group who used traditional teaching methods. For example, in the pathophysiology teaching experiment of our medical college, two classes were selected as the observation group and the control group respectively. Under the same teaching duration and teaching content, the average score of the participatory teaching group students on the case analysis question reached 83.6 points, while the average score of the control group students was only 72.5 points (**Table 1**). This difference in performance is mainly due to the fact that the participatory

teaching method allows students to have a deeper understanding of the knowledge of pathophysiology, and through the analysis of actual cases, it improves students' ability to use knowledge to solve problems. In participatory teaching, students have a more comprehensive understanding of cases through group discussion, case analysis and other activities, and can analyze problems from different angles, so as to perform better on case analysis questions.

Table 1. The performance between control group and participatory teaching group.

Group	No.	Average score	t	P
Control group	212	72.5 ± 5.6	-15.985	<0.001
Participatory teaching group	84	83.6 ± 4.8		

Participatory teaching can also significantly improve the students' total score. In the above experiment, the total score of the observation group was significantly higher than that of the control group. This is because participatory teaching not only pays attention to students' mastery of theoretical knowledge, but also improves students' comprehensive ability through a variety of teaching activities, such as autonomous learning ability, team cooperation ability, etc. The improvement of these abilities is reflected in all aspects of usual performance, such as group lecture performance, slide production performance, classroom question-answering performance, knowledge competition performance, etc. At the same time, participatory teaching enables students to have a deeper understanding of knowledge and achieve better results in the final examination. Therefore, participatory teaching can comprehensively improve students' total scores.

4.2. Cultivation of Students' Comprehensive Ability

This paper expounds the effect of participatory teaching on the cultivation of students' comprehensive ability.

Participatory teaching has greatly improved students' autonomous learning ability. In participatory teaching, students need to conduct self-study before class and have a preliminary understanding of the teaching content by consulting materials and watching micro-class videos. For example, when learning the chapter "fever", students actively use the resources on the learning platform to preview and understand the basic concept and regulation mechanism of fever. In this process, students learned how to acquire knowledge independently and improved their ability for autonomous learning. At the same time, in group discussion and case analysis, students need to conduct in-depth research on the part they are responsible for, which further exercises their autonomous learning ability.

Participatory teaching also cultivates students' independent thinking and communication ability. In group discussion and case analysis, students need to put forward their own views and suggestions and communicate and discuss with group members. In this process, students not only learned to think independently, but also learned how to listen to others' opinions and how to communicate effectively

with others. For example, when discussing the “treatment plan for patients with heart failure”, students expressed their opinions. Some students believed that drug treatment should be given priority, while others believed that it should be combined with rehabilitation treatment. Through the discussion, the students not only had a deeper understanding of the treatment of heart failure, but also improved their independent thinking and communication skills.

5. Conclusions and Prospect

5.1. Summary of Research Conclusions

The application of participatory teaching in pathophysiology has achieved remarkable results. In terms of the application effect, the students’ academic performance has been significantly improved, and the students in the participatory teaching group were higher than those in the control group, both in the case analysis questions and the total score. This shows that participatory teaching can help students better grasp the knowledge of pathophysiology and improve their ability to use knowledge to solve practical problems. At the same time, participatory teaching also cultivates students’ comprehensive abilities, including autonomous learning ability, independent thinking and communication ability. In terms of innovation, the implementation of students’ micro classrooms, the construction of diversified teaching platforms and the innovation of teaching methods have brought new vitality to pathophysiology teaching. Students’ micro classroom makes students become the protagonists of teaching activities, giving full play to their subjective initiative; the diversified teaching platform integrates online and offline resources, providing a strong guarantee for participatory teaching [11]-[13]; innovative teaching methods such as case analysis and discussion, and problem-based teaching have stimulated students’ interest and enthusiasm in learning.

5.2. Future Research Directions

In the future, participatory teaching in pathophysiology can be further developed from the following aspects. First, continue to optimize teaching resources. With the continuous progress of science and technology, more advanced teaching technologies and means, such as virtual reality (VR) and augmented reality (AR), can be used to provide students with a more intuitive and vivid learning experience [14] [15]. For example, when explaining complex pathological processes in pathophysiology, VR technology allows students to intuitively observe the occurrence and development of diseases as if they were inside the human body. Secondly, strengthen teacher training. Participatory teaching has higher requirements for teachers. Teachers should not only have solid professional knowledge, but also master effective teaching methods and guidance skills. Therefore, it is necessary to strengthen the training of teachers and improve their teaching level and ability. Thirdly, expand the teaching evaluation system. In addition to the traditional evaluation of examination results, more diversified evaluation methods can also be introduced, such as students’ self-evaluation, group mutual evaluation, practical ability

evaluation, etc. In this way, we can have a more comprehensive understanding of students' learning situation and comprehensive ability and provide a more accurate basis for teaching improvement. Finally, strengthen interdisciplinary cooperation. Pathophysiology involves many disciplines. In the future, we can strengthen cooperation with other disciplines and jointly carry out participatory teaching activities. For example, cooperate with clinical medicine, biology, information technology and other disciplines to develop interdisciplinary teaching cases and projects and cultivate students' comprehensive quality and innovation ability. In conclusion, participatory teaching has broad prospects in pathophysiology. Through continuous exploration and innovation, it will make greater contributions to the cultivation of high-quality medical talents.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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