Preliminary Study on the Teaching Reform of *Pathogenic Biology and Immunology*

Lianying Zhang*, Fenfang Qi, Guolan Xian
Department of Basic Education, Zunyi Medical and Pharmaceutical College, Zunyi, Guizhou, China
**Corresponding Author.*

Abstract: *Pathogenic biology and immunology* is an elementary medical course with many contents, difficulties, and scattered specialties. It is also a compulsory course for clinical medicine majors in higher vocational colleges. This course is highly theoretical, especially the immunology part is abstract and difficult to understand. In the past, the teaching method of this course is difficult to stimulate students' interest in learning, and the teaching effect is not ideal. Therefore, it is necessary and urgent to reform the course of *pathogen biology and immunology*. Based on the present situation and existing problems in the teaching of *pathogen biology and immunology*, this paper analyzes the situation, puts forward some solutions, and explores some reforms in the teaching of *pathogen biology and immunology* theory and experiment. This study is helpful to reveal the teaching status of the composite course of *pathogen biology and immunology*, and find an effective way to stimulate students' learning interest and motivation, improve teaching quality and efficiency.

Keywords: ***Pathogenic Biology and Immunology*; Teaching Reform; Higher Vocational College; Teaching Quality; Teaching Status**

1. Introduction

The *pathogenic biology and immunology* course consists of three parts: medical microbiology, medical immunology, and human parasitology. It is a bridge to connect basic medicine and clinical medicine, this course has strong theoretical and practical components and is closely related to the diagnosis, treatment, and prevention of diseases [1]. The course covers a wide range of knowledge and is highly relevant to medicine, chemistry, and life science. It is also a compulsory course for students majoring in clinical medicine, nursing, stomatology, and imaging. The teaching content of this course is abstract and difficult to understand. The traditional teaching style is adopted. The classroom atmosphere is dull. Students have a low interest in learning and lack subjective initiative in study [2]. To adapt to the development of medicine in the new century, improve the teaching effect, mobilize students' subjective initiative in learning, improve students' independent learning ability and comprehensive quality, and train talents with strong practical ability and innovative spirit, it urgently needs to carry out the teaching reform of pathogenic biology and immunology course.

2. Problems in the Teaching of *Pathogenic Biology and Immunology*

2.1 The Teaching Hours of Theory and Practice are Less

Pathogenic biology and immunology involve a wide range of fundamental theoretical knowledge, and the teaching content is relatively abstract. The total class hours of this course are 72, the theoretical teaching is 62, and the experimental teaching is 10. The theoretical teaching hours usually account for a large proportion of the total class hours, while the practical teaching hours are relatively small. The disconnection between theoretical teaching and practical operation makes it difficult for students to apply theoretical knowledge to practical situations, which affects the learning effect [3]. Lack of practice hours limits the cultivation of students' hands-on ability, but this is a key problem for the medical discipline which needs a lot of experimental operation.

2.2 Students' Low Interest in Learning

For teaching *pathogenic biology and*

immunology in our higher vocational colleges, students' low interest in learning is a prominent problem, which has much to do with students' matter and the characteristics of the course. In higher vocational colleges, students generally have unsatisfactory scores in cultural knowledge and low learning efficiency. In addition, the *pathogen biology and immunology* course, as one of the basic knowledge of medical majors, is highly professional such that the course becomes quite a bit difficult to understand, and teaching also seems a little boring, which will lead to a decrease in students' learning enthusiasm [4-6].

2.3 The Experimental Equipment is Not Perfect

Most of the experimental equipment required for the practice course of pathogen biology and immunology is relatively professional and expensive. In addition, students are prone to damage the experimental equipment due to non-standard operation processes and other problems in the experiment process. All these lead to imperfect experimental equipment for practice courses in the teaching of *pathogen biology and immunology* in higher vocational colleges. Many students have no chance to conduct experiments, which is not conducive to cultivating students' practical and operational abilities.

2.4 Single Teaching Method

The teaching process is a "two-way interaction" process, in which the teachers should play the leading role and the students should act as subject-role. The traditional teaching style overemphasizes the "leading" role of teachers but neglects the subjective initiative of students' learning, so the teaching effect is not ideal [7-9]. Especially in the case of more teaching content, due to a wide range of knowledge, the teaching process is slow, and can not be integrated into the forefront of curriculum development in the teaching process, so to a certain extent, students' interest in learning is reduced.

2.5 The Course Assessment Method is Single

At present, the assessment methods of pathogen biology and immunology courses are relatively simple, and the scores mainly consist of the usual assessment, homework assessment (including practical training reports) and the scores of the final exam papers of the course, etc., and the evaluation of students' learning process is not combined with the final evaluation.

3. The Exploration of *Pathogen Biology and Immunology* Course Teaching Reform

3.1 Theoretical Teaching Reform

3.1.1 Make a reasonable teaching plan

When carrying out the teaching reform, the teachers should first develop a reasonable teaching plan, have a comprehensive understanding of the teaching content, mark the key content, and explain the key knowledge in the teaching process to strengthen students' understanding and mastery of the key knowledge [10]. In the process of teaching, teachers also need to recognize the key quality required by students' development, that is, the operational ability of students. Therefore, before teaching, reasonable teaching plans should be formulated according to students' practical abilities. In the teaching process, step by step should be made to help students grasp basic experimental skills.

3.1.2 Carefully prepare before class

The preparation mainly helps the teachers to master the teaching syllabus, conduct in-depth research on the textbook, repeatedly prepare lessons, be very familiar with the content, think deeply, grasp the whole, distinguish key and difficult points, and be proficient in each part of the content. At the same time, the textbooks are divided, selected, simplified, and expanded according to professional needs, and the textbooks are reorganized and carefully arranged. In addition, it is necessary to integrate theory with practice, unify clinical practice with curriculum, incorporate seasonal epidemics and emerging diseases, purposefully teach, and gradually form one's teaching characters to be able to play with ease, use with ease, distinguish difficult points, highlight key points, and give thorough lectures.

3.1.3 Improve students' interest in learning

Pathogenic biology and immunology is an elementary medical course that is difficult to understand. Immunology is difficult to understand, and microbiology is numerous and

miscellaneous. If students' enthusiasm can not be aroused, it will have a profound impact on their learning. American psychologist Bruner proposed: "The best stimulation of learning is to have a strong interest in the relevant content." How to improve students' enthusiasm and interest when they study has become particularly important. The introduction is the most important part of a book, which is the concentration of all the chapters. A good introduction can enhance students' interest in learning the course. In addition, when talking about microorganisms, from making vinegar and wine to the discovery of penicillin, from virulence changes to drug resistance variations, from Pasteur to Liszt, from experience to practical, from home to abroad, we must attract students and be fascinating, so that we can not only make the learning atmosphere relax but also enhance everyone's learning interest. Therefore, each chapter should be carefully studied and designed to fully mobilize students' enthusiasm and subjective initiative in learning this course.

3.1.4 Combine a variety of teaching methods to cultivate students' innovative thinking

In the reform of the teaching of *pathogen biology and immunology*, teachers need to improve teaching methods. In the teaching process, attention should be paid to establishing students' main learning status, while teachers mainly play a guiding and supporting role. They should find ways to improve students' hands-on ability, improve students' ability to analyze and solve problems, and improve their teamwork ability. During the process of teaching, the application of new teaching technologies and methods is also one of the key steps. Teachers can adopt group learning, cooperative inquiry learning, video teaching, participatory teaching, and some other methods to let students effectively participate in learning activities as they are taught in class, what's more, which will improve the enthusiasm, participation, and quality of learning. In the teaching process, teachers can also fully use multimedia technology to assist in teaching. For some relatively abstract knowledge and content, they can help students understand by showing pictures, videos, and animations.

3.1.5 Adopt scientific assessment methods

Taking account of the importance of *pathogen biology and immunology* courses in the major, it is usually taken as an exam subject and assessed mainly in a closed-book form. This assessment method can test the learning effect of students' theoretical knowledge well, but it deviates from the nature of the curriculum that emphasizes practical ability [11]. Therefore, it is necessary to reform the assessment method of the curriculum. In the process of teaching evaluation reform, the course score is divided into three parts: classroom performance (mainly to assess students' attendance, question asking, question answering, learning attitude and homework, etc., accounting for about 20%); Practical training performance (including comprehensive practical training, mainly examining students' experimental preview, experimental attitude, experimental process assessment, experimental results, and experimental reports, accounting for about 20%); Final exam paper scores (about 60%). Through multiple value and multi-channel value students' learning enthusiasm, learning efficiency, learning ability, and experimental skills have been greatly improved. This shows that the teaching reform evaluation system has played a good role in promoting students' learning.

3.2 Experimental Teaching Reform

3.2.1 Add exploratory experiments to develop creative thinking

Exploratory experiments can not only cultivate students' ability to proactively discover, analyze, and finally solve problems, but also facilitate the improvement and development of college students' creative thinking. Therefore, in daily teaching, relevant experts call for the appropriate reduction of confirmatory experiments and the addition of exploratory experiments. Exploratory experiments and independent experimental design should occupy most of the experimental projects. The process of experiment is transformed into the process of students exploring problems so that students can experience the fun and form the thinking habit of research. This mode will benefit students for life.

3.2.2 Comprehensive experiment and design experiment as the main line of the assessment mode

The ideal experimental assessment system can stimulate students' initiative and enthusiasm in learning, develop students' innovative spirit,

and create space for independent thinking, but also reasonably evaluate students' basic skills and relatively objectively assess the students' comprehensive experimental ability. After the specific adjustment in the establishment and planning of experimental projects, the new assessment mode takes the new comprehensive experiment and designed experiment as the core content, and conducts the assessment step by step according to experimental modules, focusing on the exam of medical students' hands-on ability. The assessment content is divided into two parts: experimental module (accounting for 70%) and pathogen morphological identification assessment (accounting for 30%).

3.2.3 Establish a virtual experiment network platform to create a strong learning and communication atmosphere

With the continuous development of science and technology, computers, and networks have unknowingly entered everyone's life, and network resources have been gradually introduced into teaching. The fundamental purpose of curriculum reform is to change the way students learn, which is suggested to develop network resources reasonably and establish a virtual experiment network platform. The application of the open experiment platform is a strong support for changing students' learning styles.

3.2.4 Optimize practical projects to develop students' basic skill**s**

Pathogen biology and immunology is a course with high practical requirements, which must pay attention to students' skill training and practical ability cultivation. In the teaching process, we fully consider the training objectives and employment directions of the pharmacy majors and optimize practical teaching projects. Select some classic basic experimental skills, such as microscope use, observation of bacterial morphology, aseptic operation, Gram staining, preparation of immune serum, culture medium preparation, microbial isolation, culture and inoculation, drug sensitivity test, etc., and add some exploratory experiments (students can also choose the topics according to their interests, the school provides experimental verification conditions). Cultivate students' ability to proactively discover, analyze, and finally solve problems [12]. At the same time, in the implementation of all practical training projects, formative assessment, and final evaluation are carried out, including the total score of the course.

4. Conclusion

In short, the development of *pathogen biology and immunology* is rapid, and the content is constantly enriched. For clinical medical students in higher vocational colleges, only continuous teaching reform of *pathogen biology and immunology*, various teaching methods, and continuous enrichment and adjustment of teaching content can fully mobilize students' learning enthusiasm, make them actively participate in learning, and improve teaching efficiency. Cultivate high-quality, with strong comprehensive ability, innovation ability and practical ability of compound talents.

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