The Application Effect of Flipped Classroom in Pathogen Biology

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Keywords: Flipped Classroom, Pathogen Biology.

Abstract. Flipped Classroom is a new teaching mode in recent years, which has become the focus of the world. In this paper, according to the characteristics of pathogen biology course the teaching content is complicated, pathogenic mechanism and prevention principle are more, knowledge point and memory are difficult to understand and so on, the function of flipped classroom in pathogen biology teaching is discussed.

First, Flipped Classroom

Flipped classroom also known as reverse classroom or flipped instruction\cite{1}. It is a student-oriented form of class that refines the time inside and outside the classroom. It change the decision-making power of learning from teachers to students. The students decide how to learn and when to learn. The basic idea of flip classroom teaching is the use of network information technology to upside down the traditional teaching process "classroom impart knowledge, after-school homework". Students complete the pre-class exercises before the classroom teaching by watching the teaching video, find information and online exchange; In the classroom, teachers use a lot of classroom time to interact with students, participate in classroom activities, ask questions, analyze problems and guide students to complete classroom tasks\cite{2-3}.

This course format was derived from Woodland Park High School, 2007 in Rocky Mountain, Colorado, USA. Two chemistry instructors recorded instructional videos combined with real-time tutorials and PPT presentations, then sent videos online to help students who missed classes make up classes. He two teachers let the students watch the recording of teaching videos at home, complete the assignments in class, and explain the problems encountered in the students' learning. This teaching method has aroused strong repercussions from students. Their innovative attempt, widely welcomed by students, has led the way for an innovation that has changed the traditional teaching model-turning the classroom upside down(flipped classroom)\cite{4-5}. Flipped classroom create a student-centered learning environment\cite{6}. Teachers no longer teach knowledge, but a guide to learning, to provide support for student learning, answering questions. Teachers provide personalized guidance to students\cite{7}. Under the impetus of information technology, because of its unique teaching mode to promote students' self-learning and good teaching effects, the teaching mode of "flipped classroom" has gradually entered the classrooms of Chinese colleges and universities and has become a hot spot of education researchers in recent years.

Second, The Pathogen Biology

Pathogen biology is a science that studies the biological etiology or pathogen biology in human diseases. It is formed by the merger of medical microbiology and human parasitology according to the instruction of the Degree Office of the State Council\cite{6}. The research contents include the biological characters, pathogenicity, community, microbiological examination and prevention and cure principles of disease-related pathogens. It is a basic medicine course which is very important to
connect preclinical medicine and clinical medicine, and be related closely to immunology, molecular biology, internal and external medicine, Infectious diseases and other disciplines. It is the main course to the medical students. However, students generally believe that the knowledge point of pathogen biology is complex, difficult to remember, and students are confused easily with other knowledge points for the past two courses related concepts or pathogenic mechanism of pathogens.

Pathogens can cause a wide range of infectious diseases and pose a serious threat to human health. According to the World Health Organization, in recent years, more than 17 million people die of infectious diseases globally every year. In recent 20 years, nearly 30 new pathogens have been reported to can cause various diseases such as Ebola virus, HIV and various new hepatitis viruses and so on. In addition, there are some signs of resurgence of infectious diseases that have been well controlled in the past, such as tuberculosis and dengue fever. Some new and recurrent parasitic diseases have become an important public health issue that not only poses a serious threat to people's health and life safety but also may have a significant impact on economic construction and national security. Some opportunistic protozoal diseases, traveler's diseases, zoonoses caused by pets and food, have even caused group infections and local epidemics. Pathobiology is a long way from being a basic medical course that studies the prevalence and control of the causes of infectious and communicable diseases and their associated diseases.

It is imperative to reform the teaching methods of pathogen biology in order to adapt to the characteristics of pathogen biology courses, fully mobilize the enthusiasm, initiative and creativity of students, better develop students' self-learning ability and the ability of analyze and solve problems independently. According to the characteristics of different teaching contents, different teaching methods are adopted to simplify complex problems and visualize and abstract abstract problems. It can help students understand and accept the knowledge they learned and improve teaching efficiency and teaching quality[9].

Third, The Application of Flipped Classroom in the Teaching of Pathogen Biology

Flipped classroom provides a new idea for the reform of college teachers' teaching and learning in our country, but how to achieve the desired results by flipped classroom can be the question that the majority of educators should think and solve. The ideal flipped classroom has the following four characteristics: the active learning state of students, the teaching style of individual guidance, the effective interaction between teachers and students, between students and students, the achievement of the multi-dimensional goal of classroom teaching[10].

Pre-class Preparation. The quality of micro class video is the key in the flipped classroom. It is especially important that you make and choose your favorite teaching videos. According to the author's accurate understanding of the learning content, to produce micro-video or on the network to collect all kinds of interesting teaching videos in accordance with the requirements of learning objectives. For example, at the time of teaching Plasmodium, three independent Microsoft videos were made for the intra-erythrocytic erythrocytic phase and erythrocytic phase of Plasmodium, the life history of Plasmodium and pathogenicity, and arranged the homeworks: (1) Students are required to draw on the paper the morphology of the different developmental stages of Plasmodium. (2) Let students think about how to develops about Plasmodium in the human body? What is the difference between the development of hepatocytes and erythrocytes? How does malaria parasite enter mosquito and develop in mosquito? During the experiment teaching "inoculation and cultivation of bacteria and disinfection and sterilization", three micro-videos of "Preparation of Culture Medium", "Methods of Inoculating Bacteria" and "Factors Affecting Bacteria Growth" are taken. These videos not only cover the corresponding demonstration of experimental operation, but also involve the basic theoretical knowledge of bacteria physiology and sterilization, which can be used in theory and experiment teaching at the same time. In addition to their own video production, A lot of interesting online video are collected by the network for teaching, such as the life cycle of Plasmodium, schistosomiasis typical symptoms, Ebola virus and so on.
Students' autonomous learning is the key to the success of the flipped classroom before class. It is directly related to the smooth progress of classroom activities. For example, when learning a section of malaria parasite, because of the changes in the morphology of the parasites and the complicated life history, students do not advance course preview, it is difficult to implement knowledge in the classroom interaction and achieve good learning results. In addition, because the teachers cannot grasp the extracurricular learning of the students in time, students may encounter the problems which they do not know how to use the learning resources to study independently. Therefore, when the implementation of the flipped classroom, teachers can design learning task sheets, clarify the contents, objectives and methods of autonomous learning, and provide corresponding learning resources, arrange learning tasks and give notice of class learning forms. So the students can study autonomously according to their own learning rhythm follow the guidance of teachers.

The mini-video and pre-class learning task sheets a week in advance can be released by the teachers by the WeChat platform or QQ group. The students can truly control the learning time autonomously and use their mobile phones anytime, anywhere to maximize the use of spare time learning. To the teacher, teachers can also see that how many video is watched by the students, how long has it been, the completion of the homework, and to remind the backwardness students through the micro-channel or QQ promptly. In this process, students will inevitably encounter problems, which should be timely feedback to teachers. It can also initiate discussions through the WeChat group, or QQ group to interact with students and solve problems. The problems that cannot be solved are included in the stage of classroom knowledge internalization.

The Classroom Internalization. Since students have already conducted self-study before class, students should be exposed as subjects in class and teachers as guides to organize students to explore, discuss, interact, expand and improve. Teaching in this session is a major activity in flipped classrooms. Teachers must be carefully designed the teaching activities in the classroom. The high-level cognitive goals can complete the use of, analysis, synthesis and evaluation by the students. For example, in the teaching of Mycobacterium tuberculosis, students who have made use of teacher-produced mini-video videos of biological characteristics of mycobacterium tuberculosis, pathogenicity of mycobacterium tuberculosis, tuberculin test, pathogenic examination methods and principles of prevention and treatment of Mycobacterium tuberculosis have a basic understanding of the basic knowledge. But the students do not have practical experience, it is difficult to analyze and diagnose tuberculosis disease by the knowledge learned. Therefore, analysis of the case of tuberculosis is mainly in classroom teaching which we designed the teaching activities. Students in each group are required to diagnose and give treatment principles by analyzing symptoms, signs and laboratory tests. During this process, students will use the knowledge they have learned to analyze, summarize the case, and come to a conclusion finally. They may also ask new questions in the analysis process and get answers in exchange with other students or teachers.

While teaching trematodes, the students have completed pre-class micro-video learning and pre-class homework discussions. The worm morphologies, life cycle and pathologies have been sensitized through the morphological experiments on trematodes. Therefore, this part cannot be simply repeated in class. We have designed some difficult questions such as how to identify the morphogenesis of eggs and adults of different flukes such as Clonorchis sinensis, Grifola fritillaryus, Paragonimus westermanni, and Schistosoma japonicum, and the similarities and differences in the intermediate host, parasitic sites, infection stage, pathogenic stage of different flukes? The students differentiate and diagnosis the morphology of different fluke and design life history flow chart. The students are required to conduct a comprehensive high-level analysis. It includes that to analyze the different of the morphology of these flukes, the selection of host in the process of the life cycle. The students must sum up the method which can be used to identify fluke species such as morphological methods and so on. To some new knowledge which has not been learned yet students may need to solve the problem by looking up the material or by reading the relevant textbook in advance.

After the problem is solved, the teacher can also lay out the hard task of knowledge of the extension task. Finally, the teachers summarize it and strengthen the internalization of heavy and difficult points. Teachers have the opportunity to talk with each student in the classroom, can do one-on-one
guide students, and assess the status of each student's learning. Color figures are welcome for the online version of the journal. Generally, these figures will be reduced to black and white for the print version. The author should indicate on the checklist if he wishes to have them printed in full color and make the necessary payments in advance.

**After-school Consolidation.** Systematically through and explain, and knowledge points to strengthen, focus and difficult to guide, answer the questions which are still doubtful for students be carry out by the teachers at the end of the contents of this lesson. Teachers conduct a comprehensive and objective evaluation based on the students' classroom performance. So the students can validate what they have learned and revisit previously formed opinions and views. The actual teaching process is summarized by the teachers. The excellent learning resources, key learning contents and ductile learning resources which are evaluated by the students are made into MOOC again in order to review after class and expand their study for students.

**Fourth, The Conclusion**

The application of flip classroom in the teaching of pathogenic biology is the need of the development of the times. These new educational concepts have far-reaching significance for the reform of the teaching of pathogenic biology. It have undergone tremendous changes both teaching methods and teachers' teaching ideas, which has greatly promoted the enthusiasm and initiative of students, achieved good teaching results and comprehensively enhanced students' autonomous learning ability and knowledge and skills. These abilities will make teachers and teachers Students benefit for life.

**Acknowledgement**

This research was financially supported by the Heilongjiang Provincial Institute of Higher Education Key Project "The innovative research and practice of teaching mode based on Massive Open Online Course on medical biochemistry and molecular biology"16Z052.

**References**


