Study of MOOC and Flipped Classroom in Biochemistry Teaching

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Abstract. Massive Open Online Course and Flipped Classroom is a new teaching mode in recent years, which has become the focus of the world. In this paper, we discuss the role of Massive Open Online Course and Flipped Classroom in the course of biochemistry according teaching content, concept, mechanism, understanding of theoretical knowledge and poor memory, etc.

Massive Open Online Course
Massive Open Online Course (MOOC) is a large-scale open online courses. MOOC is a new educational model developed from the United States in 2011. It can upload videos from courses to a specific network platform so that people can listen to many famous universities all over the world through the internet, MOOC is an emerging online curriculum development model, which is the product of open courseware and open education resources [1].

MOOC is a kind of teaching process, which is carried out by the teacher who is in charge of the lecture. It is characterized by Internet support, large-scale crowd participation, application of lectures video, homework exercises, BBS activities, notification mail and test elements intertwined [2].

At present, the construction of university curriculum in China is mainly based on the independent promotion of colleges and universities. The teaching mode of MOOC currently has three kinds: (1) activities complete network learning and joint online virtual learning community; (2) network course, combining students' self-study and face-to-face interaction; (3) network courses, participate in teaching by local university professor depth [3].

Flipped Classroom or Inverted Classroom
Flipped Classroom also can be translated as Inverted Classroom. It is a student-centered class form, namely to re adjust the inside and outside the classroom time, will determine the right of learning from the teacher to students, let students to decide how to learn and what time to learn. In this form, teachers record teaching videos with real-time explanations and PPT presentations, and send videos to the web to help students miss classes. Students can also watch videos at home and finish their homework in class, and the teacher explained the problems encountered in the study. This innovative attempt teaching method aroused a strong response and widely welcomed by students, and it has led an innovative style to change the traditional teaching mode[4,5].

Flipped classroom is the reverse of the traditional classroom teaching mode. The basic idea is: learning before teaching, teaching by learning, teaching and learning together. By means of the existing information technology, such as network video, pictures and courseware re planning before class, and after class teaching arrangements, through knowledge transfer, knowledge internalization, strengthen the knowledge arrangement of [6] flip upside down to achieve the role of teachers and students in traditional teaching.

Flipped classroom to create a student centered learning environment [7]. The teacher is no longer the teacher of knowledge, but the guide of learning, providing support for students' learning, answering questions, and providing individualized guidance to students [8]. Students really become the main body of learning, play a major role in the learning process [9].
Biochemistry

Biochemistry is a basic life science for studying the chemical composition and structure of living substances and the chemical changes in life processes. At present, in order to explain the diverse functions of biological macromolecules and their specific structural relationships. Researchers are analyzing important biological macromolecules (such as proteins, nucleic acids, etc.) by using spectral analysis, isotope labeling, X ray diffraction, electron microscopy, and other physics, chemical technology, etc.

Biochemistry mainly deals with the molecular basis and regulation of molecular structure and function, metabolism and regulation of organisms, and inheritance of genetic information. The profound impact of Biochemistry on other biological sciences is first reflected in areas closely related to it, such as cell biology, microbiology, genetics, physiology, etc. Through in-depth study on the structure and function of the biological macromolecules, revealing many mysteries, including biological metabolism, energy conversion, genetic information transmission, muscle contraction, nerve conduction, hormone, and immune cell communication, make people recognize the essence of life leap to a new stage.

As a professional core courses, compulsory courses in many universities become a biochemistry graduate entrance examination. However, there are many contents, abstract concepts and mechanisms in biochemistry course, It is difficult to understand and memorize theoretical knowledge, and it is difficult to integrate theory with practice, It makes it difficult for students to understand and master the knowledge points of the course effectively in the course of [10], So that students lack enthusiasm and interest in biochemistry course learning. Therefore, the emphasis of biochemistry teaching method reform is how to promote students' learning enthusiasm.

The Application of Micro Class and flipped Classroom in Biochemistry Teaching

In 2017, the Qiqihar Medical School will work online education as an important strategy of school development, the construction of higher education resource sharing platform based on network, to promote the teaching reform of higher education deepening "Internet plus" era, and improve the working mechanism, the introduction of relevant policies. 4 courses, including biochemistry and molecular biology, are designed for the pilot course of mixed teaching based on MOOC class. The research group takes this as an opportunity to strengthen the online curriculum construction with "school online" as the carrier.

MOOC and flipped classroom is a product of the rapid development of educational technology, although the MOOC class can help the students autonomous learning in the classroom, but due to the biological chemistry curriculum system features large, MOOC and cannot be used as the main way of learning, the MOOC class should also is a kind of auxiliary teaching tool in biochemistry. The problems that students find in the process of learning MOOC class can be solved through the interaction with the teacher in the classroom teaching, this way is also consistent with the nature of the flipped classroom [11].

The effective combination of MOOC class and flipped classroom reflects the high integration of information technology and curriculum teaching, and the two are similar and complementary. Flipped classroom makes the concept of "personalized learning" extended, And MOOC class for the implementation of the flipped classroom to provide more high-quality video resources before class, its ultimate goal is to improve the teaching level and classroom effect [12]. The application of the two in biochemistry teaching is as follows:

Preparation before Class

Make clear the teaching objectives, make teaching videos, perfect the teaching resources on the network platform, and build MOOC courses. The curriculum design should be vivid, meaningful, creative and deeply thinking [13]. According to the teaching arrangement of biochemistry course, the teacher selects the teaching key parts according to the teaching arrangement of biochemistry course,
and determines the content of the course according to the difficult knowledge that the students cannot understand and the obscure knowledge point that the teacher cannot explain in class.

And set up tasks for the MOOC class, publish the "task list", guide students to complete the set of teaching tasks within the specified time. According to the "task list", students watch the video, participate in online Q & A, discussion and other links, to test the learning effect, and find problems and feedback problems in time.

In the chapter of protein chemistry, the spatial conformation of protein is abstract. It is difficult for students to imagine its specific spatial conformation and distinguish advanced structures, especially the three and four structures. Therefore, the Group intends to make micro class.

In order to help students understand and distinguish the advanced structures of proteins, and to clarify the relationships among various high-level structures; One of the names is that “the micro class of the relationship between the high-level structures of proteins” will be recorded into micro lessons.

Enzyme chemistry is a transitional chapter linking static biochemistry and dynamic biochemistry. There are many difficult points in the section of enzyme reaction kinetics, and it is difficult for teachers to tell the students clearly and understand it very hard. To help students refine knowledge points and build a knowledge point framework, so that the original sense of scattered knowledge points in this section of knowledge content system to find specific positioning, We're going to make multiple micro lessons, including “reversible inhibition of enzyme inhibition””, “How temperature and pH affect the rate of enzymatic reaction” and so on.

Teachers can check the students to complete the task list and student feedback problems that students encounter the difficulties in the learning process, and design rational teaching plan in advance, in order to help students understand and master in the classroom. Students find problems before class, so that students can study in the classroom and improve the learning effect [14].

When learning the influencing factors of oxidative phosphorylation, Carbon monoxide poisoning may provide a case study that allows students to explain the phenomenon and provide therapeutic measures using the theory of respiratory chain inhibitors; In addition, two nitro phenol can be used as a weight loss drug and cause poisoning cases are analyzed and discussed, Let the students use the principle of uncoupling agents to analyze.

The research group also intends to make "respiratory chain and ATP, uncoupling of oxidative phosphorylation and inhibition, pyruvate can go", "the conversion of glycerol and other micro courses, these micro fabrication and application of course video can effectively help students sort out the knowledge, improve the learning efficiency.

In order to further integrate the theory and practice of Biochemistry, and enhance the students' interest in learning, many knowledge points with practical value of production and life practice and practical application have become excellent micro class production resources. Such as in the protein colloid and precipitation reaction part of the preparation of "heavy metal poisoning how to do" and other [14]. When we study the catabolism of sugars, we propose a micro video to determine the effect of exercise on blood lactate concentration.

In the teaching of glycolysis, students should be taught before the class to study the basic content of glycolysis. Then, in the video data about the effect of exercise on blood lactate concentration, the following questions are put forward: Why does the concentration of lactic acid decrease after resting after exercise? Why is the concentration of lactic acid at resting state equal to zero? These questions play an important role in understanding the physiological significance of glycolysis, so these questions will be discussed as a key issue for students to discuss, The specific chemical reaction process in glycolysis is neither as the focus of teaching nor as the focus of the discussion, but students can conduct individual guidance.

Classroom Internalization

Flipped classroom to introduced the humanized teaching learning strategies, teachers in the classroom discussion, PBL teaching method and TBL teaching method, case teaching method and other flexible teaching methods to guide students to solve problems and solve problems
independently of students is the process of learning and communication, can fully exercise the ability of self-study, students feel the importance of study and find the sense of presence [15], can effectively improve the students' learning effect. After the problem is solved, the teacher can also arrange the difficult task of the difficult point. Finally, teachers summarize and strengthen the internalization of heavy and difficult points. Teachers in the classroom have the opportunity to talk with each student, and can do one to one guidance of students, evaluation of each student's learning state.

Consolidate after Class
According to the students' classroom performance, teachers make a comprehensive and objective evaluation, so that students can verify their knowledge again through evaluation, and correct the views and opinions formed earlier. Teachers summarize and summarize the actual teaching process. In order to review and expand the study, so as to teach students in accordance with their aptitude, the teacher once again made MOOC class according to the student evaluation of excellent learning resources, the focus of learning content, scalable learning resources.

Summary
The application of MOOC class and flipped classroom in biochemistry teaching is the need of the development of the times. These new educational ideas are of profound and lasting significance to the reform of Biochemistry teaching. Whether the teaching mode and teaching ideas of teachers have a great change, greatly promote the students' learning enthusiasm and initiative, to achieve good teaching effect, improve students' autonomous learning ability and knowledge skills, these skills will make life-long benefit of teachers and students.

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References


