

# Study in Biochemistry Flipped Classroom Based on Mobile Internet

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**Abstract.** With the rapid development of Mobile Internet technology, mobile learning has been becoming a research hotspot in field of education and teaching. This study discussed the feasibility of the dynamic integration of mobile learning and flipped classroom based on Mobile Internet, and applied the flipped classroom teaching mode supported by mobile Internet into biochemistry teaching combined with the characteristics of Biochemistry. The results showed that the flipped classroom supported by Mobile Internet could effectively improve learning efficiency of learners. Furthermore, this study put forward the sustainable improvement of biochemistry teaching mode, and provided references for flipped classroom teaching supported by mobile learning.

**Keywords:** *mobile internet, higher education, biochemistry, flipped classroom, teaching model*

## 1. Introduction

Biochemistry is one of the frontier subjects in the field of life science, and it is also an important basic course in medicine and other life sciences. The content of the course is complex, the amount of knowledge is large, and it is abstract and difficult to be understood. How to impart abstract and profound theoretical knowledge to students has always been a problem that the biochemistry teaching researchers have been exploring.

Flipped classroom is a kind of teaching mode originated in the United States. In a flipped classroom, students learn coursework and lectures online, while engaging in practice or projects in the classroom with the guidance of a mentor outside the classroom. Its main purpose is to pay attention to the differences of student learning levels; Learning autonomy. Relevant research data shows that flipped classroom teaching can improve the quality and effectiveness of classroom teaching, and improve the learning ability and interests of students.[1][2]

In recent years, with the rapid development of mobile Internet technology and the popularity of mobile devices, more and more people have attempted to carry out learning activities with the help of mobile Internet. Some people defines this kind of learning method as mobile learning. Mobile learning emphasizes that learners can use mobile devices to carry out personalized learning at any time and at any place. Mobile learning has such some advantages as mobility, wireless, portability, resource sharing, etc., and has largely made up for the weakness of traditional learning. [3] To a large extent, mobile learning has met the needs of learners who would intend to take advantage of fragmented time on study outside the classroom according to their own circumstances. [4] This paper attempts to apply the teaching mode of combining mobile learning and flipped classroom to biochemistry teaching, in order to better achieve the teaching goals of biochemistry course, and provide reference for carrying out flipped classroom teaching supported by mobile learning.

## 2. Construction of Flipped Classroom Supported by Mobile Internet

### 2.1 Theory Support of Flipped Classroom Supported by Mobile Internet

The construction of flipped classroom supported by mobile Internet is based on constructivism learning theory and blended learning theory. Constructivist learning theory advocates that learners are the main body of learning process, and focuses on learners' active exploration, discovery and construction of knowledge.[5] Constructivism emphasizes that learning is internalized into knowledge skills through participation in the process, that is, social interaction of learning. The mobile learning can build a good personalized learning environment for learners, so that they can

learn more effectively according to their own learning background and knowledge system. At the same time, the contextualized learning and interactive learning emphasized in the classroom teaching part of the flipped classroom are also consistent with the "interaction" and "collaboration" of the learning process advocated by the constructivists.

Blended learning first appeared in the "2000 American Educational Technology White Paper". [6] He Kekang et al think that blended learning is an organic combination of the new learning mode relying on the Internet and the traditional learning mode, so that it can develop their own advantages in the learning process, that is, in the learning process, we should not only emphasize the student's subjective status, let students play the main role in the learning process, but also reflect the teacher's leading role in the teaching process. Meanwhile, the blended learning develops the design and guidance of teachers, monitoring function.[7] Flipped classroom based on mobile Internet realizes the combination of mobile learning and classroom learning. As a new type of blended learning form, it conforms to the basic laws and methods of blended learning. It can not only further guide the implementation process of flipped classroom based on mobile learning, but also provide the possibility to enrich the methods and contents of blended learning.

## **2.2 Construction of Flipped Classroom Supported by Mobile Internet**

Combined with the teaching characteristics of flipped classroom, this study believes that the flipped classroom based on the mobile Internet should enable learners to access more high-quality learning resources, establish closer learning partnerships, improve learning motivation, actively carry out personalized learning, and simultaneously help learners in time when they encounter difficulties in the self-study process, break through learning obstacles, and maximize learner learning performance. Based on the above understanding, this study, which is guided by constructivism learning theory and blended learning theory, combined with practice and research of existing flipped classrooms, and relying on WeChat social software, has constructed a flipped classroom teaching model supported by mobile Internet.

The flipped classroom teaching model is divided into three parts: before class, in class and after class. (1) In the pre class stage, the teacher needs to complete the teaching design, record the micro class video, make and sort out the learning materials with pictures and texts, and build a mobile learning environment based on the WeChat platform. Learners use WeChat to personalize self-directed learning and group discussion and exchange of learning content before class, and realize the transfer of basic shallow knowledge through mobile Internet. (2) In the classroom teaching stage, teachers organize various forms of teaching activities according to the teaching objectives and learning contents, such as group discussion, case analysis, scenario simulation, etc., and complete the assessment of learning contents through classroom questioning, content display and submission of assignments. (3) The after-class stage mainly completes knowledge transfer and teaching feedbacks, which is convenient for teachers to make appropriate adjustments and optimization of teaching activities. According to the progress of classroom teaching and students mastering situation, teachers can reasonably set up after-class inquiry learning tasks, so that students can reasonably complete the meaning construction of knowledge. This part of content is also completed with the help of social software "WeChat".

## **3. Teaching Practice of Flipped Classroom Based on Mobile Internet**

### **3.1 Teaching Practice**

At the beginning of the semester, the teachers applied for the WeChat public account of the biochemistry flipped classroom, and created the "biochemistry flipped classroom communication" WeChat group to establish an interactive mobile learning platform. Before class, the teacher would publish the teaching design scheme, micro-class courseware and other relevant graphic materials of each class through the WeChat public account, and assign learning tasks and self-test questions before class. For example, in the "Plasma lipoprotein metabolism" section, the instructor provided students with self-produced micro-classes such as "Structural features of plasma lipoproteins" and

“Classification and function of plasma lipoproteins” through WeChat public accounts; flash animations such as “High-density lipoprotein metabolism”, and courseware, etc. Furthermore, 20 test questions would be reserved for students to complete the related self-test.

After acquiring relevant learning resources through WeChat, students can complete independent learning of relevant knowledge at their own pace according to their own circumstances. In this process, students can discuss the problems and doubts which they have encountered during the learning process with their classmates through WeChat communication groups, or directly send messages to the instructors for personalized guidance. After completing the course content, students can test the learning effect through “self-assessment questions”, analyze the learning performance, and judge whether the learning effect meets the expected requirements.

In class, students sat close to each other belonging to the same study group. According to the content of this section, the instructor introduced a case: a case of “hypercholesterolemia”, and put forward a class discussion topic of “Use what you have learned to explain the doctor's diagnosis, analyze the patient's pathogenesis, and give a treatment plan”. Each study group discussed and studied around the prepared problem exhibition (about 15 minutes), during which students could be allowed to use their mobile phones to access the Internet to search for relevant information. In this process, teachers gave personalized guidance to groups or students to help them better complete the inquiry task. After the completion of collaborative learning, each group selected a representative to publicly present results of group discussion (about 15 minutes). Finally, the teacher commented on the learning achievements of each group, sorted out the key points and difficulties of the knowledge in this section, explained the issues discussed in the WeChat group, so as to help students better realize the meaning construction of knowledge.

In the after-school period, teachers guided students to complete knowledge transfer through mobile learning. Take the “Plasma lipoprotein metabolism” section as example. Here, teachers put forward the discussion topic of “combining the learned knowledge to explore the relationship between cholesterol and atherosclerosis” in WeChat group, and encouraged everyone to start a discussion after class. At the same time, the instructor encouraged students to put forward relevant opinions and suggestions on “flipped classroom” based on their own learning experience, and then adjusted and optimized the teaching activities appropriately.

### **3.2 Analysis of Teaching Effect**

At the end of the semester, the researcher investigated the students’ evaluation of the biochemistry flipped classroom supported by the mobile Internet through questionnaires. The results showed that 79% of the respondents believed that this learning mode could improve learning efficiency and promote the learning more effectively; 63% believed that it could enhance the learning exchange with other students, and was conducive to build a good style of study; 53% believed that it could obtain more learning resources. It can be seen that the mobile learning mode supported by the mobile Internet is helpful for students to use mobile devices to take advantage of fragmented time to carry out learning at any time and at anywhere. Furthermore, WeChat’s real-time communication function and public account provide a good learning communication channel between teachers and students and between students, and further facilitate the sharing of learning resources. The results also showed that 81% of the respondents believed that flipped classroom was helpful to the improvement of self-study ability; 65% believed that it was helpful to the enhancement of collaboration ability. The above shows that the self-study before class in flipped classroom can improve students’ self-study ability; in the process of classroom teaching, students can cultivate students’ cooperation ability through cooperative learning, communication and discussion. However, the survey results of “which teaching mode is preferred between flipped classroom and traditional teaching mode” showed that 59% of the respondents chose “traditional teaching mode” or “indifferent”, and only 40% could complete all the learning tasks assigned by teachers. Through further interviews, it is found that the main reason has been lying in the students’ dependence and obedience to the traditional teaching mode. Due to the individual laziness or lack of

self-study ability and learning concept, they have become tired of the long-term adherence to the process of “self-study before class+ communication in class + migration after class”.

#### **4. Conclusion**

The biochemistry flipped classroom teaching model based on mobile Internet constructed in this study is a kind of blended teaching model which takes flipped classroom as the main body and combines mobile learning and micro video as the auxiliary. The teaching mode enables students to make full use of fragmented time for autonomous learning, while using rich learning resources to build a personalized learning environment. At the same time, it has changed the teaching organization form of teacher-centered teaching traditional biochemistry teaching. Through flipped classroom, students have become the main body of the classroom, while students’ self-learning ability and collaboration ability are cultivated. In this teaching mode, through continuous interaction and exchange and discussion between teachers and students, mutual cooperation in the learning process can be achieved, and students can receive personalized guidance from teachers, which can stimulate students’ interest on learning, expand students’ learning ideas, and be more conducive to knowledge Internalization and migration. However, the existence of problems such as students are easily distracted when they use smart phones to study, or students fail to keep up with the pace of the class because they fail to complete pre-class learning tasks, cannot be ignored.

All in all, the biochemistry flipped classroom teaching reform under the background of mobile Internet has achieved certain success, which provides a new channel for the teaching reform in Colleges and universities.

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