

Research on the practice of flipped classroom based on the teaching mode of inter school study

——Taking physical optics as an example

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Abstract: In June 2019, it was mentioned in the book that teaching methods should be optimized, mainly including: focusing on heuristic, interactive and inquiry teaching, Integrating traditional and modern technology, Carry out research-based and cooperative learning, Accurately analyze the learning situation, pay attention to differentiated teaching and individualized guidance. The opinions accurately put forward the common problems existing in the teaching process of modern colleges and universities, and give some constructive suggestions. However, what plans and strategies should be adopted in the implementation of these opinions? This is a practical topic that every college teacher constantly explores and studies in his teaching career.

Key words: Inter school credits; Flipped classroom; Physical optics course

Liaoning Province is one of the provinces that put forward the construction of the inter school study credit project earlier. It has published a series of excellent course resources on the website of Kuxue Liaoning, and has cooperated with learning pass, rain class and other platforms to build courses. This provides good basic conditions for interactive and inquiry teaching. Through the integration of traditional and modern technology, it provides a “place” for both teachers-students’ and students-students’ research and cooperative learning. Combined with stage assessment and other means, teachers can accurately analyze the learning situation, and pay attention to differentiated teaching and monitor students’ learning in real time. Flipped classroom is a new teaching mode recognized by college teachers in recent years. Its essence is to transfer part of the content in the classroom to the online. The students can find their problems after autonomous learning, and then solve the problems during the class. In this paper, taking the physical optics course of University of science and technology Liaoning as an example, the practice research of flipped classroom under the teaching mode of inter school study is carried out.

1. Introduction to physical optics

The school running philosophy of Liaoning University of science and technology is “innovation first, quality building, talent strengthening and characteristics prospering”. Physical optics is a professional core course of Optoelectronic Information Science and Engineering. It is a required professional course for the postgraduate entrance examination of optical engineering. Both professional engineering certification and national engineering standards put forward high requirements for the setting and teaching content of this course.

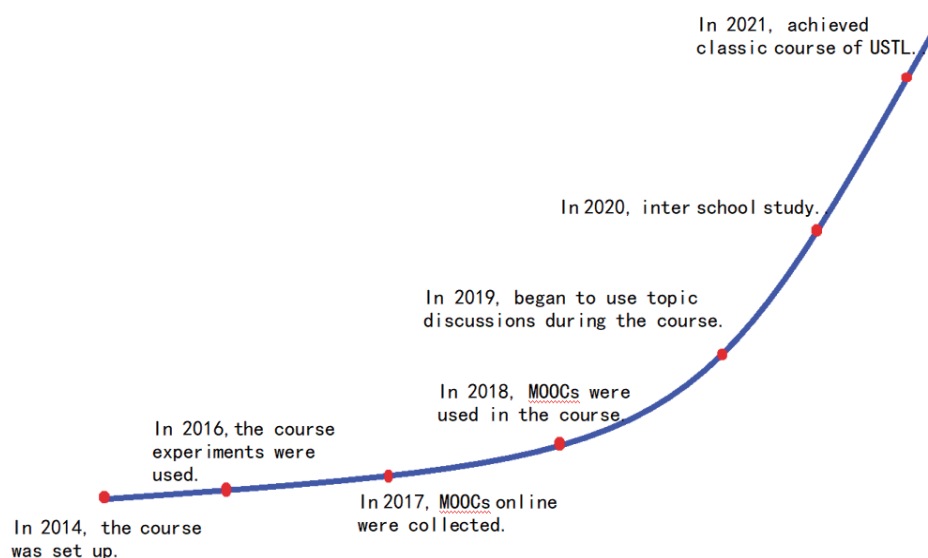


Figure 1. The development of physical optics course.

At the beginning of the course, traditional teaching methods such as lecture, demonstration experiment and classroom discussion are

mainly adopted. With the introduction of professionals, we have gradually established a curriculum team. In 2018, we studied and screened the golden courses related to “optics” on the Internet, and tried to introduce some contents into the course. In 2020, we adopted the optical course of Guijuan Yang, a teacher of Dalian Ocean University, to carry out the reform and innovation of Cross University credits for physical optics. This flipped classroom mode has been widely praised by students. In 2021, the course of physical optics was rated as the first-class course by Liaoning University of science and technology.

2. Construction of inter school study and flipped classroom teaching mode

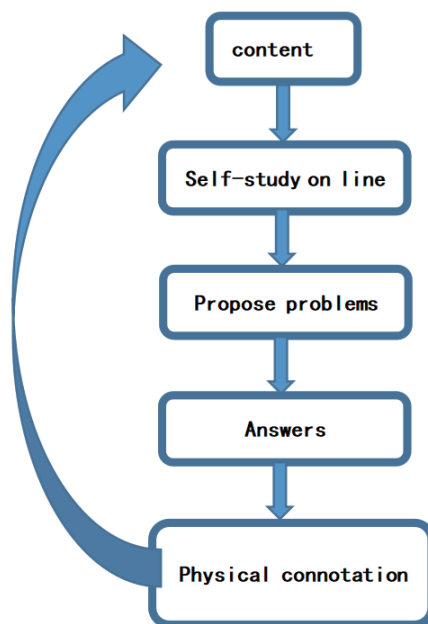


Figure 2. Setting up of the teaching mode.

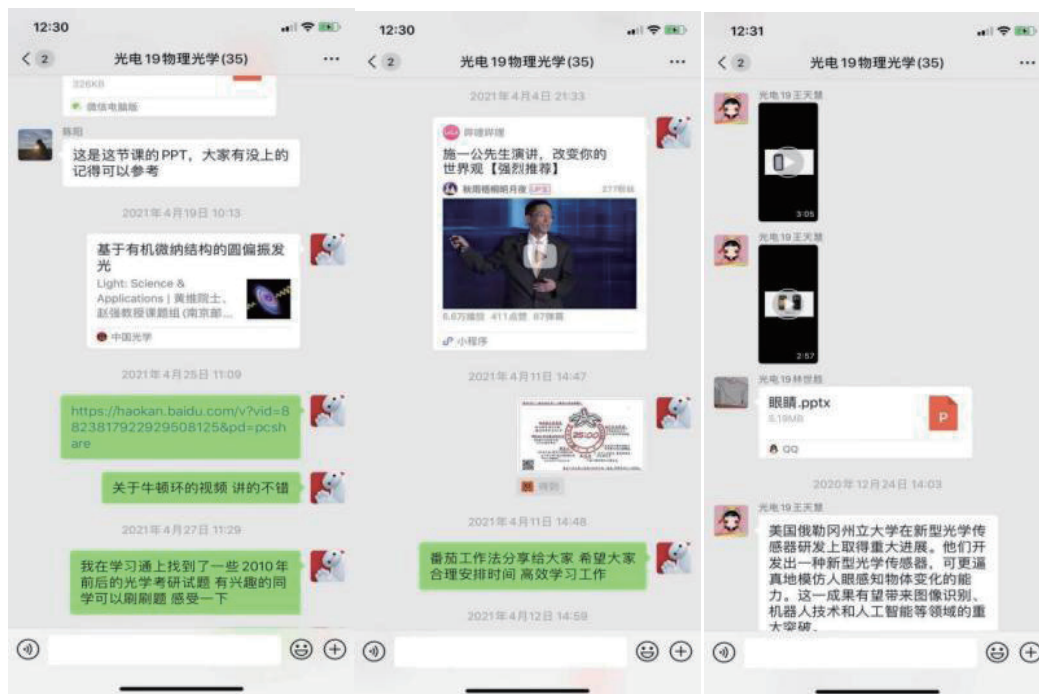


Figure 3. Interactions online

The online course resources of physical optics can expand students' learning time and space. Students who have spare power can obtain rich extracurricular resources and expand their horizons, The students with poor foundation can consolidate their professional knowledge and improve their academic performance through multiple studies. The problems found in the process of online autonomous learning are transferred to the offline, and the teachers lead the way to answer questions in the way of discussion, breaking the boring state of the

traditional classroom, and improving the students' learning enthusiasm, initiative and learning effect.

Figure 2 shows the teaching mode of the course. First of all, we extract the basic knowledge (what is it) and its application (what to do) of the course, so that students can learn independently online, and complete the teacher's questions at the same time to ensure that students understand the key points and difficulties of the course. In class, students are encouraged to ask questions found in the process of autonomous learning, and guide them to answer questions step by step, so as to stimulate students' initiative and exercise their logical thinking ability. Then, you can choose some "good questions" to spread appropriately, guide students to understand the application of some optical knowledge in life, production and scientific research, and understand the deeper physical connotation of physical optics, as shown in Figure 3. Finally, the key points and difficulties of the course content are summarized.

3. Curriculum assessment and evaluation system

The traditional way of curriculum inspection is based on closed book examination, which can only inspect students' memory ability, understanding and calculation ability, and it is difficult to reflect students' innovative ability of rational use of knowledge. In order to evaluate students in a diversified and all-round way, we adopt a combination of classroom interaction, daily homework, stage test, online learning and final exam. Students can complete tasks according to their own conditions and receive timely evaluation feedback.

Combined with the optical problems in the field of optoelectronics, we will organize students to carry out "project review" and "defense" in stages, and submit the project report of relevant scientific research topics, as shown in Figure 4. The oral defense will be conducted in groups, and the rest of the students will be the expert judges of the oral defense. They will ask questions and score the project book of the oral defense group, and the score will eventually be included in each student's usual score. Through this way of simulation project defense, students' team cooperation ability, organization ability, language expression ability and professional quality can be trained, and students' confidence in independent research and problem solving can be established.



Figure 4. Students' speech in the class.

4 Effectiveness of curriculum reform



Figure 5. The award certificates of students.

Academic achievement is the most direct means to test the learning effect. Since the implementation of mixed teaching reform, the pass rate of students has increased to 100%, and the excellent rate has also increased steadily. The enthusiasm of students to participate in various competitions and scientific research activities has been improved. The proportion of students participating in undergraduate innovation and entrepreneurship competition, national optoelectronic design competition, provincial physics experiment competition and provincial physics academic competition has increased significantly, and they have achieved good results in the competition, as shown in Figure 5.

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