Study on Analog Circuit Teaching Based on Flipped Classroom Mode

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Keywords: Analog Circuit; Flipped Classroom; Hybrid Teaching

Abstract. Compared to traditional teaching models, the flipped classroom has updated the model structure and realized knowledge transfer. Based on the characteristics of Analog Circuit and related theories of Flipped Teaching, this article proposes a flipped classroom mode that is suitable for online teaching. It also conducts teaching practice, from the construction of resources, teaching and learning activities to the development of stereoscopic interactions, teaching effect analysis and other aspects to promote the implementation. Practice has proved that flipped teaching mode has a significant role in promoting students' academic performance and enhancing their interest in learning.

Introduction

The rapid development of information technology nowadays and the constant renewal of various smart mobile terminals have caused more than a ripple of astonishment in the education sector. Concepts such as "Micro-curriculum", "Micro-video", "Massive Open Online Course", and "Flipped classroom" are rapidly coming to people's attention while various hybrid teaching modes are gradually becoming important ways for students in the information age to learn knowledge.

At present, there are mainly four types of hybrid teaching: circular mode, flow mode, self-adjustment mode, and flipped classroom mode. The flipped classroom mode is currently the mainstream form of hybrid teaching. In recent years, many literature have introduced the origins, definitions, characteristics, current teaching experiments, and the comparison of traditional teaching and flipped classrooms. In addition, elementary, middle and high schools as well as colleges have introduced this new hybrid teaching mode to carry out local flipped classroom teaching practice while referring to their own condition. Under the general trend of rapid development of information technology, Nanchang Institute of Technology has introduced MOOC and has accumulated rich practical experience in the hybrid teaching mode. This article takes advantages of Chaoxing MOOC to construct a flipped teaching mode to our school based on the current condition of students. Moreover, it also takes Analog Circuit to carry out practice.

Teaching Status of Analog Circuit

The Analogue Circuit course is a major course for students majoring in Electronic Information Science and Technology, Electronic Information Engineering, Electrical Engineering and Automation. It has developed rapidly with a wide range of applications, and has strong practicality. What's more, it plays a pivotal role in constructing students' basic theories of electronic technology, basic skills and innovation ability. The concept of the course is abstract, the theoretical focus is complex, the unit circuit is numerous, and the scope involved is wide which make it difficult for students to understand. If the teaching model is not properly selected and the teaching design is not well done, the students are likely to gradually lose interest in learning because of the difficult theories. In traditional "analog circuit" teaching, teacher is the focus and the teaching is always about face to face, blackboard, multimedia and fixed location as well as time while student learning is ignored, which makes it difficult to let students play their own roles. Furthermore, teachers pay

attention to knowledge explanation, neglecting the goal of cultivating students' ability to analyze problems, solve problems, and practice, failing to fully explore students' innovative potential; there is also a shortage of interaction between teachers and students; in accordance with their aptitude, students' individual differences are ignored.

Flipped Teaching Mode Design Based on Chaoxing MOOC

The so-called flipped classroom is about stundents' self-study by using the digital materials such as audio, video, and electronic teaching materials distributed by teachers before class, and participation in the interactive activities of peers and teachers in the classroom, including disambiguation, and inquiry. In flipped classroom teaching, students amd self-study are the focus. The learning process has become pre-class and post-teaching, which also changes the traditional classroom teaching structure. In order to construct a flipped classroom, the following resources are necessary: (1) Professional teachers with abundant knowledge and information technology abilities, who can formulate teaching objectives, extractknowledge points, and provide corresponding micro video and teaching courseware for the course; (2) A network teaching platform: the network teaching platform is a carrier for students to learn, teachers should carefully plann the course content in advance, students can obtain pre-class after-class teaching resources through the platform, and conduct learning exchanges. In addition, there must be a flexible teaching environment. This article uses the "Analog Circuit" class to construct a flipped classroom teaching model suitable for student learning in the university, as shown in Figure 1.

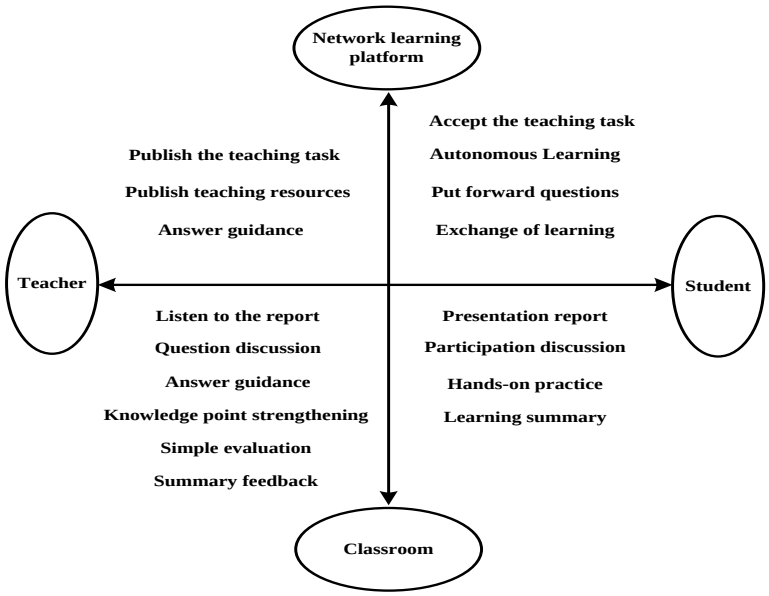

Figure 1 Flipped Classroom Teaching Design Based on Chaoxing MOOC

Practice of Flipped Classroom Teaching

Taking "Analogue Circuit" as an example, the subject of the lecture is 1-4 classes of the 2016 enrolled undergraduates from Electrical and Information Engineering majors. Class 1 and 2 is the experimental group using flipped classroom mode, which carries out activities combing online and offline hybrid methods; Class 3 and 4 is the control group, using traditional teaching mode.

Prepare Teaching Resources Carefully

Concerning the online learning mode, different teaching methods are used according to different knowledge focus. For example, for abstractions such as the movement of microscopic particles in analog circuits, the formation of PN junctions, BJT, and the movement of carriers inside FETs, etc., Flash Animation can be adopted to explain. Or, we can use multimedia technologies such as three-dimensional, virtual simulation based on MultiSim, and practical operations to make abstract or incomprehensible knowledge appear in micro video. The video is generally short and refined,

and can also be combined with text description, background music, etc. for students to understand and deepen their knowledge in a good mood so as to stimulate their interest in learning.

Teaching Effect Analysis

We can refer to the curriculum reporting function of Chaoxing MOOC to know the usual performance of students, which fully demonstrate students' activity records and visit frequency. These can be considered as important reference points for process evaluation and should be creative teaching approaches, which can stimulate students to think critically, solve problems and master interpersonal communication skills.

In order to compare the effects of teaching, a comparative experiment is conducted. The number of experimental classes is comparable to that of the control class, but students of experimental class have a weaker foundation compared to control class. The final grades of the students in the experimental class and the control class are divided into five fractional segments, and the number of fractional segments is counted. The statistical distribution of their scores is shown in Fig. 2. The horizontal axis is the fractional segment and the vertical axis is the corresponding number. It can be seen that in the 80-89/90-100 fractional segment, the number of students in the experimental class is significantly more than that in the control class; while the control class students are obviously concentrated in the 70-79 fractional segment; the difference in the number of students in the 60-69 and 0-59 fractional segments is almost the same, indicating that this model is suitable for students with strong self-learning ability.

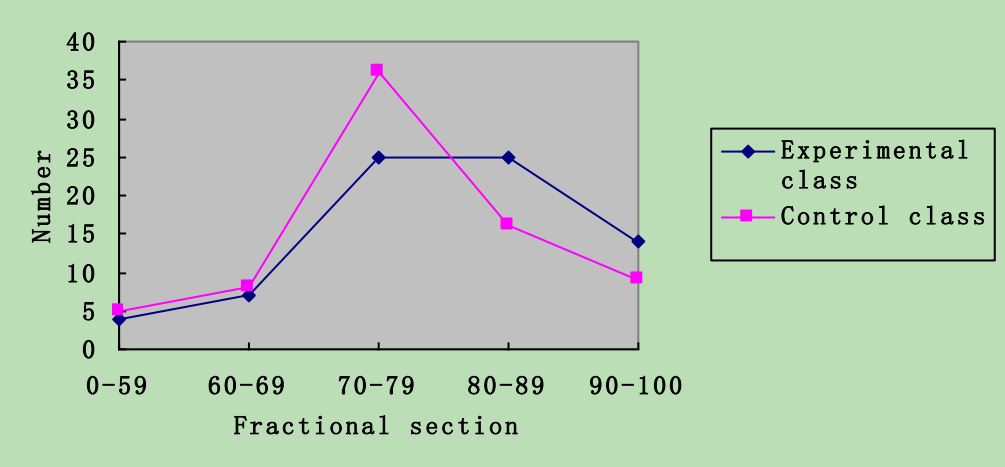

Figure 2 Result Performance Comparison Chart

Conclusion

In conclusion, the application of the flipped classroom teaching model based on Chaoxing MOOC to Analog Circuit Course can enrich the teaching resources and make strong interactions as well as effective learning supervision, perfect the evaluation methods, integrate theory and practice and make the limited classroom unlimited. In the teaching practice, the contrastive experiment method and the questionnaire survey method are used to analyze the learning effect. The practice proves that the flipped classroom teaching mode can not only greatly mobilize the enthusiasm and initiative of the students, but also improve the students'academic performance enhance their interest in learning and make them qualified talents in the internet era.

Acknowledgement

Project funding:Nanchang DME Photoelectric Engineering Key Laboratory (No.NCZDSY-004)

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