

# **The Teaching Method Reform of "Students' Choice" Based on Online Open Courses**

## **-- Take the Course "Analog Electronic Technology and Application" as An Example**

Chunyue Pan

Wenzhou Polttechnic, Zhejiang 325035, China.

### **Abstract**

Using the online open course teaching platform, combining with the software and hardware teaching resources, we will implement the teaching method reform of students' choice, give students full freedom, and make independent choice of the content and quantity of teaching modules, learning methods, learning places and assessment methods. The result of teaching practice shows that the teaching method reform of students' self selection can give full play to students' enthusiasm and initiative in learning and improve the quality and effect of learning to the greatest extent.

### **Keywords**

Online open Courses, Analog Electronic Technology, Teaching reform, Students' choice.

## **1. Introduction**

"Analog electronic technology" as the basic course of electrical specialty in higher vocational education, has been implementing project teaching, case teaching, work oriented teaching, etc. based on online open courses, online hybrid teaching is promoted. However, no matter what kind of teaching method is adopted, the pre-set teaching method of "before class, during class and after class" is always maintained, which has the disadvantages of students' lack of autonomy and individuation. Based on the online open course, a variety of functional modules are designed. Through students' independent choice, independent learning and independent testing, teachers take students' self-study process and online self-test data on the learning platform as the assessment basis of the course, The reform of teaching method from teachers' plan to students' choice can improve students' learning enthusiasm and realize individualized teaching.

## **2. The Problems of Teachers' Plan Teaching Method**

### **2.1. Teacher's Plan Teaching Method**

Teachers design the whole teaching and unit teaching, draw up the teaching plan, design the teaching content and assessment plan, and implement the teaching process; students participate in learning and assessment according to the plan and content set by teachers.

### **2.2. Disadvantages of Teachers' Plan Teaching**

The students of higher vocational education include general high school students, secondary vocational school students and five-year consistent system students, The professional basis of students from different sources is quite different. General high school students have no professional basic knowledge of analog electronic technology, Secondary vocational school students and five-year consistent system students have some basic knowledge of analog

electronic technology, but there are great differences. Different secondary vocational schools have different learning contents, At the stage of higher vocational education, if all students follow the same teaching plan again, For some students, it is equivalent to "fried rice with cold sauce". Their enthusiasm for learning is not high, If the students no longer continue to study and the basic knowledge is weak, it will affect the development of the follow-up courses.

### 2.3. Improvement Measures

Based on the online open curriculum, it is a very useful attempt to carry out the reform of students' optional teaching method, that is, teaching at different levels, to improve students' learning enthusiasm and teaching effect.

## 3. Reform of Teaching Method of Students' Choice

### 3.1. Online Open Course Construction

The course of "analog electronic technology and application" focuses on six work items, and organizes teaching through activities such as simulation of electronic circuits, practical operation and analog production of electronic products, Therefore, all related knowledge points and skill points are connected in series, and students are encouraged to learn while doing, learn and do in one, test and consolidate in time, and gradually develop their learning ability and professional ability. The basic learning content of the course includes six items, and the teaching design is as follows.

Item 1 is diode application circuit. Including(1)Diode test. (2)Diode application circuit analysis. (3)Diode application circuit test. Item 2 is triode amplifier. Including(1)Transistor test. (2)Analysis of common emitter amplifier circuit. (3)Analysis of common collector and common base amplifier circuit. (4)Analysis of FET amplifier circuit. (5)Analysis of multistage amplifier circuit. (6)Discrimination and selection of feedback types. (7)Performance analysis of negative feedback amplifier. Item 3 is integrated operational amplifier application circuit. Including(1)Structure and performance analysis of differential amplifier. (2)Analysis of basic arithmetic operation circuit. (3)Application circuit design of integrated operational amplifier. (4)Analysis of active filter circuit. (5)Installation and test of application circuit of integrated operational amplifier. Item 4 is signal generating circuit. Including(1)Analysis of RC bridge oscillator circuit. (2)Analysis of LC oscillator circuit. (3)Analysis of quartz crystal oscillation circuit. (4)Circuit analysis of voltage comparator. (5)Analysis of square wave and triangle wave oscillation circuit. (6)Assembly and debugging of signal generating circuit. Item 5 is power amplifier circuit. Including(1)OCL,OTL circuit analysis. (2)Integrated power amplifier application. (3)Analysis and design of power amplifier circuit. (4)Assembly and debugging of power amplifier circuit. Item 6 is DC regulated power supply. Including(1)Block diagram design of low voltage and low power DC stabilized power supply system. (2)Application of 78, 79 series three terminal voltage stabilizing source and adjustable output three terminal voltage stabilizing source. (3)Assembly and debugging of DC stabilized voltage power supply.

In view of the great difference of students' basic knowledge, we designed six extended learning modules.

Item 1:(1)Diode volt ampere characteristic test.(2)Special diode applications. Item 2:(1)Carrier motion in transistor.(2)Transistor characteristic test.(3)Graphic method and distortion analysis of amplifier circuit.(4)Structure and working principle of FET.(5)Frequency response of amplifying circuit.(6)Estimation of amplification of deep negative feedback circuit.Item 3:(1)Differential amplifier circuit calculation.(2)Calculation of integral and differential operation circuit.(3)Active filter circuit calculation.(4)Analysis of active rectifier circuit.Item 4:(1)Other RC oscillator.(2)Circuit analysis of sawtooth wave generator.(3)Circuit analysis of integrated function generator.(4)Application of voltage comparator.(5)Integrated voltage comparator.

Item 5:(1)Safe operation of power amplifier.(2)Performance index of integrated power amplifier.Item 6:(1)Voltage doubling rectifier.(2)Design of series voltage stabilizing circuit.(3)Performance index test of DC regulated power supply.

On the online open course platform, there are teaching micro video, multimedia courseware, pre class preview question set, after class homework question set, Online self test question set, simulation experiment case, test question bank, etc. Therefore, it meets the requirements of online and offline hybrid teaching.

The simulation experiment case is designed as follows: diode parameter test, analysis of diode rectifier circuit,analysis of diode bidirectional limiting circuit, LED application circuit simulation, transistor characteristic simulation test,test of single tube common emitter amplifier circuit, test of common collector amplifier circuit, simulation of negative feedback amplifier circuit, simulation of proportional operation circuit, add and subtract circuit simulation test,simulation test of integral operation circuit,simulation test of frequency characteristics of active filter circuit,simulation test of RC bridge oscillation circuit, simulation test of three-point oscillation circuit,simulation of square wave generator and triangle wave generator,simulation test of power amplifier circuit,simulation test of DC stabilized voltage supply circuit.

### 3.2. Online Open Course Construction

As shown in Figure 1. In addition to the basic teaching content, the expanded content can be divided into several optional modules, which can be theoretical modules or practical modules. Students choose some expansion modules according to their learning ability. If you choose the theoretical module, you can learn independently through the excellent online open courses, or you can choose the individual guidance of teachers,if practice module is selected, operation can be completed through training room and machine room. Then choose the assessment method independently,students can choose online self-test or practical operation assessment, and teachers integrate the scores of online test and offline practice with the students' basic module learning results.

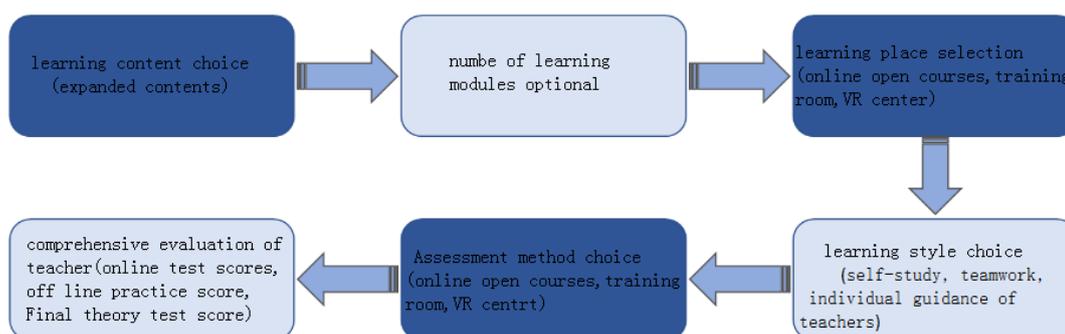


Fig 1. The teaching method reform of "students' choice"

### 3.3. Design of Learning Content Choice

In principle, students are required to study all 28 basic modules shown in Table 1, and complete all relevant pre class preview, homework and online test contents on the online open course platform. Then choose 0-5 items by yourself according to the 24 expanded contents, and complete the learning tasks through different learning ways.Students can also learn the expansion module independently, pass the examination and replace the basic module, and one expansion module replaces one basic module.

### 3.4. Design of Learning Style Choice

The learning mode can be self-study, teamwork, individual guidance of teachers, etc. Team work is suitable for 2-3 people, The selected project should be relatively difficult, and the division of labor and learning report should be provided after learning.

### 3.5. Assessment Method Design

Comprehensive evaluation pays attention to process assessment and advocates self selection assessment. The overall scheme design is shown in Table 1.

**Table 1.** assessment scheme design

Numble	Project content name	Evaluation score
1	Usual online score	20
	Foundation module Usual practice score	20
	Final theory test score	40
2	Expansion module	20
3	Total score	100

The students can choose the assessment mode of the expansion module by themselves. They can use the online platform to carry out theoretical tests, complete simulation experiments in the computer room, and complete operations and tests in the training room, The assessment can be completed independently or team work can be selected.

## 4. The Effect of the Teaching Reform of Students' Choice

Compare the learning situation of the students in grade 17 and grade 18, that students of grade 18 who use teaching method reform of "students' choice". The teaching reform of "analog electronic technology and application" course based on online open course, because of the adoption of students' self selection in the teaching process and assessment mode, makes students more active in learning and improves the teaching quality significantly. The survey of teaching satisfaction is shown in Table 2.

**Table 2.** teaching satisfaction survey (analog electronic technology and application, survey object: electronic 1801 and 1821 students, 82 in total)

Numble	Survey items	Satisfied	Basic satisfaction	Dissatisfied
1	Are you satisfied with the way of preview before class?	75	7	0
2	Are you satisfied with the classroom teaching method?	80	2	0
3	Are you satisfied with your homework?	80	2	0
4	Are you satisfied with the course module setting and selection?	73	9	0
5	Are you satisfied with the online test method?	79	3	0
6	Are you satisfied with the way of self selection assessment?	81	1	0

#### 4.1. Student Evaluation of Teaching

The mid-term teaching Forum by students shows that the teaching reform of students' choice is very popular among students. Students with good foundation think that they can improve and learn better, while students with poor foundation think that they can keep up with and achieve something.

#### 4.2. Peer Teacher Evaluation

According to the teacher who is in charge of the teaching task of "analog electronic technology and application", after trying the teaching method of students' choice, the phenomenon of one-third of the students can keep up, one-third can't keep up, and one-third think it's simple has been eliminated. With the improvement of students' enthusiasm and teachers' sense of achievement, "students are happy to learn and teachers are happy to teach" has become the norm.

#### 4.3. Teaching Effect Comparison

Through the comparison of the results of the theoretical examination and the practical ability examination between the students of grade 17 and grade 18 (implement teaching method reform of "students' choice"), the results are shown in Table 3, so teaching method reform of "students' choice" is conducive to improving students' learning enthusiasm, practical ability and ability to solve practical problems.

**Table 3.** Comparison of teaching effect before and after the teaching method reform of "students' choice"

Whether to implement teaching method reform of "students' choice"	Theoretical assessment results			Assessment results of practical ability		
	Excellent rate /%	Pass rate /%	Rejection rate /%	Excellent rate /%	Pass rate /%	Rejection rate /%
grade 18 (82 person)	14.6	85.4	0	41.5	58.5	0
grade 17 (86 person)	9.3	84.9	5.8	17.4	82.6	0

### 5. Conclusion

Based on the online open course "analog electronic technology and application", although the teaching method reform of "students' choice" has achieved some results, there are still some problems. For example, the number of teaching micro videos is not enough, which is not conducive to self-study. When students choose their own learning style, the teachers will be insufficient. When choosing the learning place, it puts forward the corresponding requirements for the opening of the training room. We will continue to improve and perfect in the future teaching practice.

### References

- [1] YAN Xiao-mei, GAO Wen-hua, WANG Zhi-she: Teaching Reform of Analog Electronic Technology Based on the Micro Assistant, Journal of Electrical & Electronic Education, Vol. 40(2018) No. 5, p.75-78.
- [2] YU Ping, FANG Jie, WU Cong-bing, YANG Ting, XU Yu-bao: Teaching and Research in "Analog Electronic Technology", EDUCATION TEACHING FORUM, (2019) No. 8, p. 259-260.

- [3] PAN Chunyue: Project-based Teaching Reform of "Simulated Electronics Technique" Course in Vocational Colleges, Journal of Wenzhou Vocational & Technical College, Vol. 9(2009) No.4, p.91-93.
- [4] WANG Yu-han,ZENG Zi-qiang,CHEN Hong-yan,CAO Yang,ZHANG Jie: Talking about the Classroom Teaching Method of Analog Electronic Technology Course, Journal of Electrical & Electronic Education ,Vol. 41 (2019) No. 3, p.80-83.
- [5] ZHANG Aihua,YU Zhongdang,ZHANG Zhiqiang: Teaching mode of research and practice based innovation education and professional education deeply integrated——For "Analog Electronic Technology", Journal of Bohai University (NATURAL SCIENCE EDITION), Vol. 40(2019) No. 2, p.167-172.
- [6] LI Aiqiu, PAN Chunyue: Experimental teaching of analog electronic technology based on Multisim7, China Modern Educational Equipment,(2018) No. 11, p.100-101.