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Research on Curriculum Reform and Practice of "Signal and System"

Hui Lan*, Hui Qi, Shunxi Wang

School of Artificial Intelligence, Jianghan University, Wuhan, Hubei,430056, China
* **Corresponding author:** Hui Lan (Email: hlanblue@foxmail.com)

Abstract: The Signal and System course has many and abstract teaching content, with strong theoretical nature, complex mathematical formula derivation, and high requirements for mastering differential and integral. The experimental content of this course is also difficult to understand and master for students. To solve these problems in the teaching process of this course, this paper carries out teaching practice and reform on the signal and system experimental course from the construction of online teaching mode and the implementation of mixed teaching mode. After two semesters of mixed teaching practice, it is shown that the teaching method of combining online and offline experiments can give full play to students' learning subjectivity, improve students' hands-on ability and engineering application, and help improve the teaching effect of "signal and system experiment" course.

Keywords: "Signal and system experiment"; Online experiment; Teaching reform.

1. Introduction

In the Electronic Information discipline, the Signal and System course is an important professional basic course, which plays a connecting role in the whole course arrangement. The course itself has the characteristics of abstract content, complex teaching process, strong theoretical nature, and practical application ability [1]. When teaching such courses, some students have poor foundation, low learning initiative and low learning efficiency, which seriously affect the teaching quality.

Although this course will arrange experiments, most of the experiments are confirmatory experiments, which are simple and boring. They simply connect signals for observation and analysis, and are not very clear about the structure of the circuit [2-4]. When doing hardware experiments, by changing a certain parameter, the impact on the results cannot be accurately recorded, which will result in large errors. How to enable students to master the basic theories and methods of the signal and system course, cultivate and improve students' practical application ability of the knowledge of the signal and system course, and promote students to transfer from the domain of time domain analysis of circuits to the domain analysis of the combination of time domain and frequency domain of signal processing and transmission has become a key problem to be solved.

Therefore, this paper explores the online and offline experimental teaching mode of "Signal and System Experiment" course, combines the virtual simulation experiment with the help of Internet technology and computer software technology, studies the teaching content and teaching methods, and establishes a hybrid teaching mode to stimulate students' learning interest, improve students' learning enthusiasm, and also cultivate students' hands-on ability and improve teaching quality.

2. The construction of online teaching of "Signal and System experiment"

Offline teaching equipment and online teaching resources are the basis for the mixed teaching of "signal and system experiment". Online teaching is based on the syllabus and constructed from the following aspects:

2.1. The construction of "i.chaoxing" course resources

The "i.chaoxing" self-learning platform has perfect functions and can meet the requirements of curriculum resource construction. The teacher uploaded the "online experiment guide book" prepared in advance to the "materials" module of the Learning Communication, and recorded the "online experiment operation video" corresponding to the offline experiment items one by one. Each video material was set with task points. After watching more than 90% of the content, the online simulation experiment could be carried out. The online experiment requires students to complete in advance and upload the results of the online experiment to the "homework" module. During the offline experiment, the teacher will check the screenshots of the students' online experiment to prevent plagiarism and copying, so that students can complete the online experiment independently. At the same time, in the "discussion" module, the teacher will issue corresponding questions for each experiment, inspire students to think independently, and enable students to complete the experiment with questions. After the completion of the students' compulsory online experiment project, a questionnaire is launched in the "activity" module to understand the teaching effect of the "Signal and System experiment" mixed teaching, so as to facilitate the continuous improvement of the course.

2.2. Construction of online experiment platform

The "Signal and System online experimental platform" fully equipped with the existing offline experimental box is used for students to conduct online simulation experiments for free. The offline experiment project is completely corresponding to the online experiment project. If students have spare time, they can do some extended experiments

independently after completing the required online experiment project.

3. Implementation of mixed experimental teaching

After the completion of the construction of the online experiment, the offline experiment stage can use the experimental teaching equipment such as the experimental box, probe, spectrum analyzer, signal generator, computer, etc. to carry out the specific experiment wiring, debugging, error correction, drawing, writing the actual report, etc. according to the offline experiment handout provided by the teacher. At the same time, the following specific measures have been formulated when carrying out mixed teaching.

3.1. The requirements of online learning

In order to enable students to master the experimental principles and operating specifications, the recorded teaching video has set up the task point and anti-drag function, which requires students to watch in full and answer the preset questions [5]. In order to facilitate the students to preview and understand the experimental principles and related basic knowledge, the new experimental handouts are supplemented with preview thinking questions, so that students can watch the video with questions and give conclusions purposefully and thoughtfully.

3.2. Online supervision and assessment

In order to cooperate with the offline experiment, the online experiment should be completed before the offline experiment. The experimental results are uploaded to "i.chaoxing" in the form of "homework". The online experimental results are included in the total experimental results of students in a certain proportion. In order to consolidate and supervise students' online preview, the online experiment link accounts for 50% of the total evaluation results, which not only ensures the objectivity and fairness of the examination and evaluation of the experiment process, but also stimulates students' initiative and enthusiasm. At the same time, the submission of online experimental data and student mutual evaluation on this platform greatly reduces the workload of experimental teachers, and student mutual evaluation can learn from other students' experimental process, which is conducive to learning from each other's strengths and complementing each other's weaknesses.

3.3. Reform the examination method

Adjust the proportion of ordinary performance, for example, to 35%~40%. The proportion of attendance should be weakened in the usual performance, and the proportion of classroom performance should be appropriately improved, and students should be encouraged to participate actively in the classroom. At the same time, chapter tests and mid-term tests can be added to fully understand students' mastery of knowledge points. Compared with the original assessment method, it can understand the students' learning situation in the whole process, focus on the weak links, and mobilize the students' learning enthusiasm at ordinary times. The following figure shows the framework of hybrid teaching research, as fig.1.

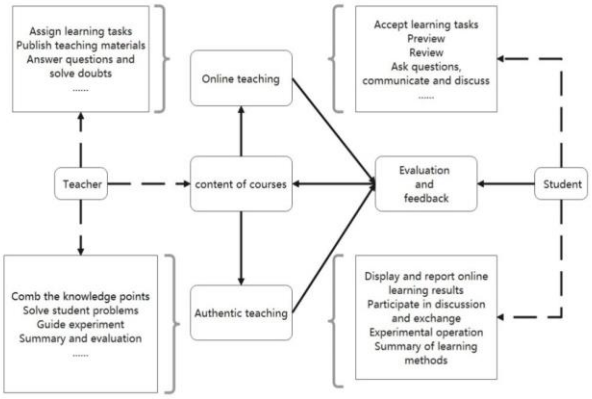


Fig. 1 The diagram of mixed teaching mode of "Signal and System Experiment" course

In addition, we also conducted an anonymous questionnaire survey on the students who carried out this course practice, as shown Fig.2. It shown that although nearly 10% of the students cannot adapt to the mixed teaching mode well, and it is difficult to complete the study of professional knowledge independently, resulting in a decline in their grades, most of the students accept the online and offline mixed teaching mode, and believe that this teaching mode can improve their academic performance.

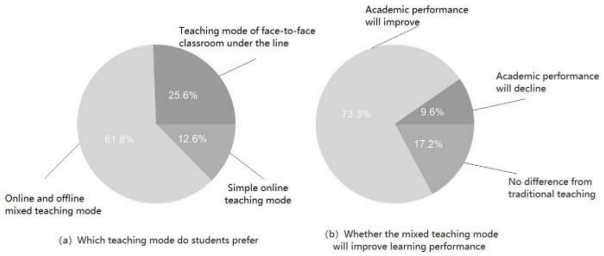


Fig.2 Anonymous questionnaire results of mixed teaching mode

4. Conclusion

Through the exploration of the two-semester hybrid teaching mode, compared with the traditional teaching mode, the excellent rate of the final exam score under the hybrid teaching mode has increased by 4.65%, the passing rate has increased from 85% to 86%, and the average score has increased from 68 points to 73 points. It can be seen that the application of the online and offline hybrid teaching mode in professional courses is conducive to improving the overall performance of the class. Through online teaching, students acquire the basic theoretical knowledge of professional courses, understand the advanced technology frontier and development prospects, expand their professional horizons, make full use of online time, improve their interest in learning, and develop good learning habits. The internalization of knowledge through offline classroom teaching not only enhances the understanding of knowledge, but also improves the comprehensive ability of hands-on practice, analysis and application. Under this mixed teaching mode, students with different learning levels can acquire different levels of professional knowledge, so that professional courses can achieve personalized teaching and teaching according to their aptitude, which not only makes up for the lack of comprehensive coverage of professional course knowledge in the traditional teaching mode, but also conforms to the modern teaching concept of "student-centered".

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