

Study on the Blended Teaching Mode of Analog Electronic Technology Based on Chaoxing Learning Platform

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Keywords: Chaoxing Learning Platform; Analog electronic technology; Teaching mode

Abstract: With the emergence of online teaching platforms, online and offline blended teaching has rapidly become a hot spot in education research. Based on the teaching practice of "Analog Electronic Technology" course, this paper refines the online and offline teaching design of the course with the powerful functions of Chaoxing Learning Platform, organically combines the online and offline teaching dynamics, and discusses the assessment and evaluation criteria of the course. The application of the online and offline blended teaching mode based on Chaoxing Learning Platform is conducive to the common development of students at different levels, the overall improvement of students' subjective initiative, the integration of students' learning into teachers' teaching design, and teachers' teaching behavior to serve students more precisely, thus improving the teaching quality and teaching effect of the simulation e-course.

1. Introduction

Under the background of engineering certification and new engineering construction, the theoretical teaching hours of college courses are greatly reduced. In order to keep in line with the course standard and the theoretical teaching workload, many teachers have to adopt the cramming teaching model in their class which brings negative effect to quality of teaching. In order to solve this problem, it is necessary to explore an online and offline blended teaching mode. The implementation of online and offline blended teaching mode allows students to acquire knowledge from offline to online MOOC resources of excellent teachers and learn the same knowledge content repeatedly on their own; part of the teaching content is transferred to online independent learning, which can give full play to students' initiative, save time for offline classroom teaching, and facilitate teachers to carry out goal-oriented teaching activities in the classroom. It is beneficial for teachers to carry out goal-oriented teaching activities and various teaching methods in classroom teaching [1]. The goal-oriented engineering education concept requires effective closed-loop teaching and effective evaluation system, and Chaoxing Learning Platform can monitor the learning status before, during and after class to effectively carry out teacher-student interaction and achieve the organic combination and positive feedback of "teaching" and "learning".

2. The Teaching Status of Analog Electronic Technology Class

Analog Electronic Technology is a professional foundation course for electrical engineering and its automation, automation, electronic information engineering and other majors, and is also a professional extension course for other engineering majors. The theoretical teaching chapters of *Analog Electronic Technology* require many hours, mainly spent on introducing the basic principles of analog electronic circuits, while the practical nature of the course is also very strong, requiring students to master the basic skills of electronic circuit design through continuous hands-on circuit building and debugging. However, due to the different needs of different majors and the differences in students' individual abilities and professionalism, the teaching effect of the traditional offline teaching mode is not satisfactory. Through investigation, analysis and research, the following problems are summarized in the teaching of *Analog Electronic Technology*: Firstly, the theory teaching adopts the cramming mode during the class. In order to carry out the new engineering construction, the new round of training program has compressed most of the teaching hours of theory classes, increasing the teaching hours of experiments and practical classes. Therefore, to complete the knowledge requirements of the curriculum, teachers have to focus on cramming knowledge to the students and students with weak foundation often attain lower goal achievement. Secondly, students' active learning ability is weak, and their improvement in theory and practical skills is slow [2]. The single way of theory teaching does not give students enough time for thinking. Therefore, students cannot fully participate in the class and their subjective initiative of learning is weak. Teaching interaction in the classroom is difficult to happen in the class and the atmosphere in the class is not active. Meanwhile, the students remain weak in their comprehensive electronic design. Thirdly, the modularity of experimental and practical teaching cannot fully cultivate the ability of students to analyze and design circuits. Most of analog electronic experiments in the universities are adopt the teaching mode of the test box. Students complete the experiments for the experiments sake, and eventually they learn nothing but do wiring jobs. Therefore, it is necessary to improve the way of practical teaching.

3. Online and Offline Blended Teaching Implementation Based on Chaoxing Learning Platform

3.1. Pre-preparation Stage

3.1.1. Chaoxing Learning Platform

The vast amount of resources accumulated by Chaoxing Learning Platform for more than 20 years can be accessed to the platform with one click, and the easy-to-use self-service course construction tools can be used for the construction of online courses, micro courses, video public courses and high-quality courses, powerful learning process management, and support for various online teaching modes. Teachers can design their courses on Chaoxing Learning Platform from the following dimensions: "syllabus", "course standard", "course instructional knowledge breakdown video", "course experiment teaching video", "extended teaching materials", "teaching cases", "assessment methods", "exercise library", "homework library", and "test bank". After teachers finish their arrangement of the class on Chaoxing Learning Platform, students can make full use of the client-side of the Chaoxing Learning Platform to learn independently online anytime and anywhere and can establish interaction with the teacher, thus effectively realizing the closed loop of teaching.

3.1.2. Chaoxing Course Teaching Resource Library Construction

The goal-oriented talent training mode requires that the training objectives of the course should be adapted to the employment needs of students, so the construction of the course can be improved through the tracking survey of graduates. Through the Chaoxing Learning Platform, the teaching resource base of the course *Analog Electronic Technology* is constructed as follows: set up online "teaching resource library", "material library", "and test library", "discussion area" and other functional sections. Online teaching is mainly based on "teaching resource library" which includes teaching courseware, course teaching video, course experimental teaching video, teaching cases, and so on. The teaching module is constructed according to the function module of analog electronic technology teaching unit, and the teaching objectives and key points and difficulties are formulated accordingly. Each teaching unit module is designed according to the teaching before, during and after class, and teaching links such as expansion and interaction are added in all sessions [3]. The material library contains new research, new products, new applications and new developments related to electronic technology, as well as tutorial materials related to electronic design competitions in recent years. Students are able to study independently according to their own interest. The "Test Library" contains a variety of types of practices such as multiple choice, judgment, short answer, application and design, and exposition questions, which are used to issue pre-class quizzes, in-class exercises, post-class assignments and quizzes. The "discussion area" is focused on the important and difficult points of learning, on the application of electronic circuits in practice, and on how to design and analyze electronic circuits.

3.2. Teaching Implementation Stage

3.2.1. Pre-class Teaching Activity Planning

The teacher prepares the task points for each lesson each week before the lesson, and divides the number of videos for each task point according to the knowledge points. Usually, there is one knowledge point with one video, and the length of the video is probably no more than twenty minutes. If one knowledge point is complex and difficult, it can be split into a maximum of two videos. By assigning limited knowledge to students in each video, students' learning enthusiasm can be stimulated. The content of the two lessons is usually prepared two to three knowledge points for pre-course pre-reading. At the same time, the teachers upload and publish independent learning handouts, interactive questions before class, and assign pre-class discussion tasks and chapter independent tests. Two days before the class starts, students are notified to complete the pre-class preview and study on their own. The process of preview of the class contents aims to cultivate student's self-learning ability. Students should watch the video first and try to complete the test questions. If they have any questions, they can watch the video again and again and jump to the specific knowledge point to study, so as to achieve the purpose of integration. If the video cannot answer their questions, they can ask the teachers in the class. Though this method the effect of the class can be greatly improved. At the same time, at the beginning of the class, the teacher should log on to the Learning Platform, check the discussion area and the question feedback area, and collect the common "problems" encountered by students during their pre-study process to prepare for more detailed explanations in class. For individual problems that are not representative, a mixed online and offline Q&A approach can be used to solve them one-on-one.

3.2.2. Implementation of in-Class Teaching Activities

In the first ten minutes of offline classroom teaching, the teacher logs into the cell phone Chaoxing Learning Platform, selects the class, casts the screen to the classroom multimedia terminal, and

releases the "sign-in" function to grasp the students' attendance. The functions of "sign-in" include QR code, gesture, and location so that the students can only sign the attendance for themselves. At the beginning of the class, the teacher ends the sign-in function to grasp the students' attendance, and if some students do not have their cell phones with them, the teacher can help them sign in in their client-side. At the beginning of the course, teachers can issue a pre-class quiz with not too many questions, and spend a few minutes to understand the students' independent learning dynamics. The Chaoxing Learning Platform can provide good statistics on the quiz so that teachers can make a comprehensive analysis based on the learning dynamics collected before class and the results of the classroom quiz to prepare for the classroom teaching to be implemented. In order to liven up the classroom atmosphere and provide good teacher-student interaction, the "random roll call" function of Chaoxing can be used to let students answer the corresponding questions, and the teacher can give corresponding scores according to the students' answers, which can effectively improve the students' learning enthusiasm and enhance the classroom teaching effect. In the teaching process, according to the students' mastery of the knowledge points, the teachers can focus on explaining the problems that students generally have doubts about, and at the same time, set the key problems as discussion topics, so that students can participate in group discussions. At the end of the course, the teacher releases the exercises for the class, so as to dynamically grasp the teaching effect that can be achieved through the offline teaching of the class.

3.2.3. Post-class Teaching Activity Tracking

After class, the teachers upload and post their handouts and reference version of answers of the questions discussed in the class via the Chaoxing Learning Platform so that students can engage further with the topic under discussion and engages in in-depth think about the questions. Teachers can post relevant notifications to guide students to complete relevant post-class assignments [4]. The teacher can release the homework after class through Chaoxing Learning Platform, and can send a notification to all students as a first reminder; the homework released by the teacher has a time point. In order to motivate students to complete the homework in time after class, the teacher can make a second and third reminder by releasing the homework after the homework is released, the reminder can be set at the half of the homework time, eight hours before the homework deadline respectively. Also, teachers can inform students that if they encounter problems in the homework, they can use the instant "message" function in the platform to communicate with them by text or voice so that they can answer questions timely. After each class, teachers should issue relevant self-test assignments, including single-choice, multiple-choice, and judgment questions. After the students finish answering, the Chaoxing Learning Platform can give the corresponding grades; when the test is over, the system will give the corresponding answers, and the students can check and fill in the gaps according to the answers, find out their own shortcomings, and strengthen the learning of some knowledge points. During the process, students can consolidate what they have learned. As to the objective assignments, teacher can check their works online by themselves. In order to prevent some students from plagiarizing, they can check the similarity of students' work to determine whether they have plagiarized. For students who do not submit their assignments, teachers can send individual notices to remind them and implement off-class warnings so that they do not miss the next assignment. With the help of Chaoxing Learning Platform, teachers can accurately grasp the learning dynamics of each student, and also have a common understanding of the whole, achieving the organic combination of individual and universal and effectively improving the quality of the course.

3.3. Assessment and Evaluation Stage

In order to break the single assessment method and give full play to the advantages of Chaoxing Learning Platform, a process assessment model based on Chaoxing Learning Platform is established [5, 6]. The usual grades consist of two parts: "classroom grades" and "homework grades". Among which classroom grades include: sign-in, chapter task points, chapter quizzes, and discussions; "homework grades" include pre-study and after-class assignments. These assessments can be carried out in the learning platform which are issued by the teacher and completed by students. The platform can give feedback to the teacher about the degree and quality of the students' assignments so that the teacher can appropriately change the teaching schedule and teaching capacity to ensure students can have a better understanding and mastery of the learned capacity and can be used in practical engineering applications. The grade of the final examination is composed of the closed-book examination. The reason for taking the closed-book exam is that the closed-book method can fully attract the students' attention and enable them to understand and apply some of the knowledge points repeatedly, so that they can achieve the purpose of mastery, have theoretical reference in the process of circuit design and application in the future, and be able to deal with the written test topics of relevant enterprises and units in the future employment. The teachers can use the automatic record and statistical function of Chaoxing Learning Platform to open the online course assessment system in a transparent way, as shown in Table 1. The normal performance grades are obtained from online-learning and off-line performance during the class. Through their own independent study and interaction with teachers, they can grasp their own learning achievements, check the gaps and improve their own learning methods in a timely manner. All the grades on the Chaoxing platform are transparent and open. The assessment system of the normal performance grade has the following features. First, it can effectively avoid the subjective arbitrariness of teachers' evaluation of classroom grades, and all of them are completed automatically by Chaoxing Learning Platform. Second, teachers can set a comprehensive, reasonable and personalized grade scale evaluation system by combining course standards and feedback from online teaching.

Table 1 Diversified online course assessment system with "analog electronic technology" as an example

Grade Type and Proportion		Scoring criteria		Evaluation Form
Normal score 50%	Class score 50%	Sign-in 20%	Normal check-in: 1 time + 1; full score is obtained when the number of check-ins reaches 16	Chaoxing automatic statistics
		Chapter task point 30%	The score shall be calculated according to the number of completion points, and full score will be obtained when all the tasks are completed.	Chaoxing automatic statistics
		Chapter test 30%	Average score by all chapter quiz type task points	Chaoxing automatic statistics
		Discussion 20%	Reply 1 time + 10, get 1 bonus + 5, full score 100 points	Chaoxing automatic statistics
	Performance	Self-directed learning	The homework shall be submitted separately after self-study and evaluated according to the scoring standard of the assignment. The full score for each time is 10 points,	Chaoxing automatic statistics

	ce 50%	homewor k score 60%	totally 60 points	
		After-clas s homewor k score 60	Open assignments left by teachers to students after class, assessed by four parties, with a full score of 40	Teacher assessment, intra-group mutual assessment, inter-group mutual assessment and self-assessment
Final Exam Score 50%			Closed-book assessment, evaluated according to the answer standard of each test question, with full score of 100 points	Off-line checking by teachers

4. Conclusion

Compared with the traditional offline teaching mode, the online and offline blended teaching mode based on Chaoxing Learning Platform has a lot of room for exploration and development at present. Teachers of analog electronic technology courses can use the Chaoxing Learning Platform to build a learning platform according to the requirements of the training program, so that they can give full play to the advantages of online and offline teaching and expand the time and space dimensions of teaching and learning. With the help of Chaoxing Learning Platform, the design and implementation of course can be carried out in an effectively way, and a more comprehensive and reasonable course assessment and evaluation system can be formed so that the ability of students to solve engineering application problems can be improved comprehensively.

Acknowledgements

Supported by Guangdong Province Higher Education Teaching Research and Reform Project Construction and Practice of a New Model of "First-Class Courses" in Electrical Information

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