Application Research of Flipped Classroom Teaching Mode Based on Mobile Learning

—Taking the Webpage Design Course as an Example

Ling Zhang *
Department of Information Technology,
Chengdu Agricultural Science and Technology Vocational
College
Chengdu, China
pazhangling@163.com

Jianguo Chen
Department of Mechanical and Electrical Engineering,
Chengdu Agricultural Science and Technology Vocational
College
Chengdu, China

Kelan Fu
Department of Information Technology,
Chengdu Agricultural Science and Technology Vocational College
Chengdu, China

Abstract—**Under the connotation of ubiquitous learning, the flipped classroom based on mobile learning has attracted more and more attention of educators, but its effectiveness in higher vocational teaching practice is still lacking of sufficient realistic data support. In view of the learning habits of Higher Vocational students, combined with the latest educational technology, this paper takes "Web Design" course as an example to carry out an empirical study on the teaching mode of flipped classroom. Through data analysis, it finds out the obstacles to improving students' learning performance and puts forward corresponding countermeasures.**

Keywords—Flipped classroom; Teaching mode; Learning resources; Interactive platform

I. INTRODUCTION

Flipped classroom teaching model is a teaching model that is completely different from the traditional classroom. The basic idea is to put the learning process of new knowledge under the class, and the class is used to answer questions, report discussions, and complete assignments. The use of flipped classroom teaching models helpful to stimulate students' initiative and enthusiasm for learning, it is one of the key points of classroom teaching reform [1-3]. Flipped classroom teaching model can teach from multiple dimensions and multiple stages. According to time, it is divided into three stages: pre-course stage, classroom stage and after-class; from

the perspective of space, it is divided into three stages: online, offline and online; from the perspective of knowledge, it is divided into knowledge memory, internalization and deepening internalization stages [4]. It truly realizes the learning philosophy of U-Learning. With the deep integration of information technology and education, the flipped classroom teaching model based on mobile learning has a huge impact on the education industry as a new teaching model based on information technology. Many institutions and experts at home and abroad have conducted a lot of research on the flipped classroom teaching model. However, according to the survey, most of the literature on the flipped classroom teaching model still aims at theoretical research. There are not many empirical studies on system model construction and complete instructional design and put into practice, and the teaching effect needs further research [5]. Therefore, this topic is based on the research and application of the flipped classroom teaching model of mobile technology, and the teaching practice in the "web design" course of higher vocational education to verify the teaching effect the Background of the Reform of Classroom Teaching in the Course of Web Design.

II. THE BACKGROUND OF THE REFORM OF CLASSROOM TEACHING IN THE COURSE OF WEB DESIGN

"Web Design" is a professional course offered by computer and e-commerce design majors in higher vocational colleges. The course is characterized by fast content update and cross-integration of multidisciplinary knowledge. The traditional teaching is to explain and demonstrate the teaching materials and practice cases in the classroom. After the students finish listening, they will practice after class according to their own memories and understandings. Throughout the process, students passively accept, can't interact with teachers in real time according to individual circumstances, can't choose to control their own learning progress, so that students lack interest in the classroom, especially today's college students are

basically "post-95s", they live in the information society. In the era of fierce scientific and technological changes, traditional media and new media are changing with each passing day. Especially the Internet has a profound impact on their lives. Students who bury their heads in the classroom have become the biggest challenge in traditional classroom teaching [6]. Students need a more self-directed learning environment to meet individual needs. The rapid development of Internet technology provides a guarantee for the reform of the curriculum. According to preliminary research, the WIFI coverage rate of higher vocational colleges in Sichuan has reached 91%. In today's campus network wireless network coverage is increasing, providing free traffic to students is fully achievable. For example, in the micro-lesson platform entrance, the campus wireless network is used by login method, and the student watching video does not count towards the traffic usage range [7]. Higher vocational colleges' excellent course, high-quality resources courses, online courses, micro-curriculum, continuous construction of MOOC resources and continuous opening of public curriculum resources provide conditions for the flipped classroom teaching model.

III. "WEB DESIGN" FLIPPED CLASSROOM TEACHING MODEL DESIGN

The curriculum design of flipped classroom teaching model requires that the course content be dispersed and then reorganized to form a task-driven project task teaching module. The constructivist education concept of psychologist J. Piaget can be used to design the learning resources of each project and guide students to construct their own knowledge framework, learning in multiple dimensions of time and space [8]. In this study, the content of the "Web Design" course was reorganized into six progressive projects. Theoretical and technical knowledge points are refined and integrated in each project teaching, and the hierarchy is gradual. The specific content is shown in Table 1. Among them, each project is divided into three modules: theoretical knowledge, skill operation, and practical application. The theoretical knowledge and skill operation module allows students to watch learning resources such as micro-course videos before class. Correction, discussion and teacher-student interactions are conducted in the classroom, and students need to pay attention to the knowledge points with high error rates in the preview. In the classroom, teachers also demonstrate skill operation methods and organize students to communicate and discuss in the classroom. After class, the instructor will guide students through the mobile platform terminal to further summarize the knowledge, publish excellent work, excellent industry works, and award-winning competition works. Students can complete the summarization that they have learned under the guidance of the teachers.

TABLE I.   THE DESIGN OF TEACHING CONTENT FOR WEB DESIGN

	Pro.1	Pro.2	Pro.3	Pro.4	Pro. 5	Pro.6
Project name	Create a site	Layout design	Edit content	Style design	Form production	Website production
Theoretical knowledge (knowledge transfer)	Concept, process and management	Slices, tables, frames and DIV layouts	Various element editing	CSS style editing	Form production	Site integration
Skill operation (Internalization of knowledge)	Create a business website	Page Layout	Edit content	CSS style optimization	Login registration form	Business website integration
Application practice (Re-internalization)	Expand application	Expand application	Expand application	Expand application	Expand application	Expand application

IV. DESIGN OF THE TEACHING MODE OF "WEB DESIGN" COURSE FLIPPED CLASSROOM

A. Introduction to the classic flipped classroom teaching model at home and abroad

In order to improve the effectiveness of the flipped classroom teaching model, it is necessary for researchers to find a model suitable for specific conditions through practical exploration. The initial flipped classroom teaching model was proposed by Professor Robert Talbert of Franklin College in the United States. Based on the operation process of the flipped classroom teaching model and his own teaching experience, Professor Robert Talbert summarized the structural model of the flipped classroom teaching model from the two stages before and during the course; in China, Zhang Jinlei, Wang Ying, Zhang Baohui of Nanjing University Based on the Robert Talbot model, combined with the connotation of the flipped classroom teaching model, constructivism and systematic teaching design, the earliest provided a perfect flipped classroom teaching model; later, Zhang Xinming, He Wentao, Li Zhenyun based on this, using QQ Groups and tablets built an Internet-based flipped classroom teaching model.

B. Exploring the Teaching Mode of "Web Design" Course

Flipped classroom

Combining the characteristics of the "Web Design" course, learning from the campus WIFI, interactive flipping classroom cloud platform, online course resources and students' actual situation, and drawing on the advantages of the classic flip classroom teaching mode at home and abroad, we have improved the existing flip classroom teaching mode. Before the class, the teacher completes the teaching preparation, guides the students to complete the knowledge preparation on the online interactive platform, and tests the preview effect. In the formal classroom learning, the teacher can design the teaching tasks, guide the students to complete the tasks, carry out the teaching activities, and complete the knowledge. After that, the teacher evaluates the student's homework and shows excellent homework for everyone, and the students compare and improve their homework. The above is the teaching mode design of the teaching reform shown in Fig. 1.
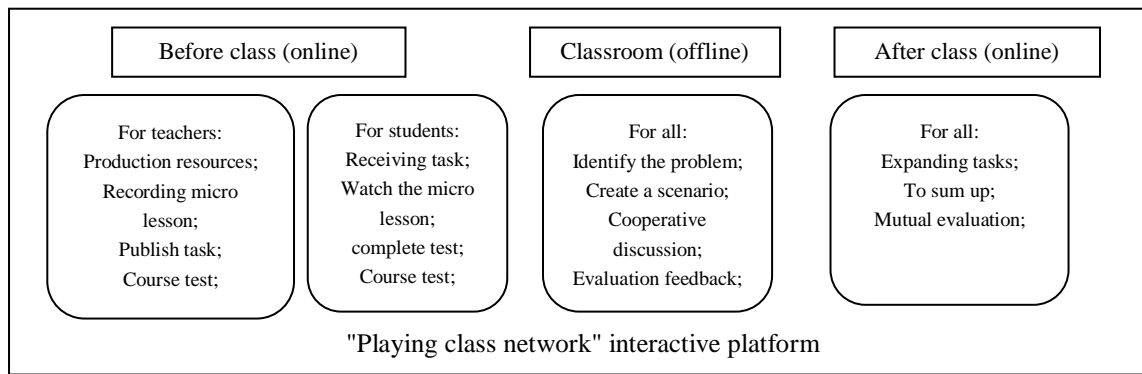
Fig. 1.   Teaching mode design

C. Course design description

Before the class, we use the "playing class network" platform to learn the pre-class theoretical knowledge. In the process, we follow the principle of teacher-led and student-centered and during this time, teachers prepare for teaching, including making teaching resources, publishing learning tasks, guiding students to pre-learn knowledge points before class, watching micro videos, learning courseware, and completing preview tests. The teaching platform supports rich media technology so that teachers can produce detailed and vivid courseware, videos and other resources and teachers can push them to students to help them complete their knowledge. During the study period, teachers and students can communicate in real time through the social group of the course and the results of the pre-school test can enable the teacher to master the student's preparations.

The classroom completes difficult knowledge point teaching through teacher-student interaction. In the classroom, the teacher first corrects the knowledge points of the students with high error rate in the preview, and analyzes the corresponding cases to help students consolidate the knowledge. In addition, teachers create learning situations and are guided by actual projects. Based on the corporate workflow, students are guided to complete new curriculum tasks; classroom learning activities are designed to adhere to meaningful principles that enable learners to gain knowledge in their learning activities. In order to promote the effective development of learning activities, according to the needs of the curriculum, design learning activities suitable for teamwork, through group discussions, role-playing and other forms, to complete the comprehensive practical tasks of the new curriculum, students can do middle school and develop learning ability [9]. Finally, in the group as a unit, through the multimedia presentation, scene performance and other forms to demonstrate the completion of the task, the teacher to comment. The whole process adheres to the principle of teacher-led and student subject.

After the class, the teacher publishes the expansion task through the online platform to require the students to comprehensively apply the knowledge they have learned, and further strengthens the knowledge they have learned in combination with the case to form their own abilities. Teachers will continue to improve the teaching resources of the curriculum platform to help students learn better in the future.

The evaluation of the students after class includes the test scores of the students in the preview stage, the performance scores of the classroom group and the comprehensive assessment of the completion of the post-class expansion tasks. The test scores in the preview stage are automatically generated and submitted by the platform; the results of the group are obtained by the teachers according to the works displayed by each group representative on the classroom; the post-class expansion results are evaluated by the students. Supervise and encourage students' learning through a process-wide evaluation method.

V.   RESEARCH ON APPLICATION EFFECT OF "WEB DESIGN" FLIPPED CLASSROOM TEACHING MODEL

This flip classroom teaching model has be applied to the 2017 "Web Design" course for computer majors, with a class size of 50 people. The study mainly used questionnaires and data analysis methods. Through questionnaires, we have mastered the effectiveness of the flipping classroom teaching model, the effect of student preparation, the participation of students in classroom activities and tasks, and the classroom preferences of students. In data analysis, we mainly use the data provided by the background of the "Play class network" platform to statistically analyze the number of visits to the student platform, the number of online exchanges and the length of the micro-course [10].

A. Analysis conclusion

Students are less motivated to learn before class. In the course of teaching this course, the teacher will post the next week's course preparation after flipped classroom . Through the analysis of the number of visits, it is found that few people visited during the first 4 days, and the number of visits increased sharply two days before class. It is not difficult to see that most students are passive before class, and the awareness of active learning is not strong enough to adapt to the flipped classroom teaching model.

Students' participation and completion in classroom teaching vary widely. In the teaching process, five students form a group, each student plays a different role, and the degree of student participation becomes a decisive factor in the teaching effect. In the course of the research, the tracking analysis of students' classroom performance showed that

students participated in the project activities in different degrees and showed polarization, as shown in Table 2 below.

TABLE II. CLASSROOM ACTIVITY PARTICIPATION STATISTICS

Activity	Active participation	Passive participation	Not my business
Team leader election	21%	38%	41%
Team discussion	16%	27%	57%
Project Practice	20%	45%	35%
Achievement display	9%	17%	74%

From the study data statistics, students watch courseware and micro-course videos and other course resources totaling 936 minutes. In the 728-minute micro-course video, the theoretical explanation is 21%, the actual operation demonstration is 79%; the average rumination rate by students is 270 %. The reason why 10% of students repeatedly watch is because of problems in the network, 67% of students because the video time is too long, and the remaining students are because of the difficulty of knowledge points. Use the SPSS tool to analyze the correlation between video length and student final grade and as a result, there was no significant correlation between the length of time the student watched the video and the final grade, as shown in Table 3 (significance of 0.08, greater than 0.05, indicating no correlation).

TABLE III. CORRELATION ANALYSIS BETWEEN PERFORMANCE AND WATCHING VIDEO DURATION

	Final grade	Video viewing time
Grade Pearson related significance (two-tailed) N	1 50	0.338[*] 0.080 50
Video Viewing time Pearson related significance (two-tailed) N	0.338[*] 0.080 50	1 50

VI. CONCLUSION

From the research of this course, it is seen that in the flipped classroom teaching model, online learning consumes a lot of students' time, especially the micro-course video. Therefore, it is necessary to streamline and optimize the design and production of the micro-course video. According to the study of attention theory, the duration of adult attention should not exceed 15 minutes. It is better to design for 1-3 difficult points for 8-10 minutes. It is necessary to consider the serialization of knowledge points to form a holistic knowledge chain. In addition, new interactive technologies such as VR virtual reality technology, html5 interactive technology, and "live broadcast technology" can provide more implementations for course resources, such as adding interactive buttons to videos and increasing the effect of panoramic video and so on. Compared with traditional media, participatory interactive experiences are more likely to attract students, make it easier for students to understand the knowledge points, and make learning easier for students [11].

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