

Analysis on Online and Offline Blended Teaching Design

Taking "Engineering Survey" Course of Non-surveying and Mapping Engineering Specialty as an Example

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Abstract—With the rapid development of engineering surveying technology, colleges and universities are facing great challenges in the training of applied surveying talents of non-surveying engineering specialty. Aiming at the problems existing in the teaching of "engineering surveying" of non-surveying and mapping engineering specialty in private colleges and universities, this paper probes into the online and offline blended teaching model which integrates pre-class, in-class and after-class based on Superstar Learning APP. In order to improve the teaching quality of engineering surveying and make it a "golden course", this paper elaborates the design of assessment mode based on the combination of formative evaluation and summative evaluation of blended teaching mode, and provides the method and path.

Keywords—*flipped classroom; online and offline blended teaching; superstar learning; personalized learning*

I. INTRODUCTION

Under the tide of constructing the world-class universities and first-class disciplines, the university the author works for has been approved as the unit of constructing "world-class university" in Shaanxi province. The construction period of the project is from 2018 to 2020. The path of "constructing the world-class universities and first-class disciplines" cannot follow other units' steps. It is necessary to absorb advanced construction experience, follow the law of education and build a private university with local characteristics. World-class colleges are supported by first-class disciplines, and first-class disciplines need to be supported by first-class courses. Otherwise, the "double first-rate" construction is a castle in the air. Curriculum is the core element of personnel training, and the most direct, core and effective way for students to benefit from university is curriculum [1]. The methods to design and carry out teaching determine the quality of students' knowledge internalization and further determine the quality of courses. This paper attempts to design the course "Engineering Survey" from the perspective of online and offline blended teaching, and explores the online and offline blended "golden course" path of "Engineering Survey" course of non-surveying and mapping engineering specialty.

"Engineering Survey" refers to a variety of surveying work carried out in the stage of engineering construction investigation, design, implementation and management. It is a basic work to provide basic data and drawings for engineering construction. All personnel involved in engineering construction should have relevant surveying knowledge and skills. For engineering management, engineering survey refers to constructional engineering survey, which is a highly practical professional basic course. Based on the successful experience of predecessors, this paper explores a new teaching model for "engineering survey" course of non-surveying and mapping engineering specialty. At the same time, we should cultivate students' ability of self-learning, solidarity and cooperation, hardship and endurance, and the ability to solve practical problems, and cultivate applied talents with sustainable competitiveness.

II. THE CONNOTATION OF ONLINE AND OFFLINE BLENDED TEACHING

Online and offline blended teaching is to integrate online learning and face-to-face teaching organically by adopting the strategy of learning from strengths to complement weaknesses. This organic combination can lead learners' learning from shallow to deep. It is helpful to cultivate applied talents with innovative thinking to realize the transformation from "teacher-centered" indoctrinating teaching mode to "teacher-centered, student-centered" exploratory active learning mode. Blended teaching mode creates an open teaching environment based on the integration of knowledge, ability and quality [3]. Teaching location, teaching links and teaching evaluation are flexible, and are no longer limited to a single mode. Under the background of full coverage of campus network and open laboratory system, students can effectively use fragmented time to enrich themselves, study freely and independently at anytime and anywhere, and realize knowledge imparting, ability training and value shaping.

Online and offline blended teaching has four characteristics. (1) It is an indispensable link in teaching activities to carry out teaching from two ways of "on-line" and "off-line". (2) Offline teaching is developed based on the results of online learning. (3) There is no unified model for

blended teaching reform, but the pursuit is unified. (4) Teaching has the characteristic of flexibility, and the time and space of traditional teaching have been expanded.

III. PROBLEMS IN THE TEACHING OF ENGINEERING SURVEYING COURSE

A. Less Class Hours and More Teaching Content

In response to the call of the Ministry of Education to increase the class hours of general education, the professional class hours have been compressed more or less under the premise that the total class time remains the same. The "Engineering Survey" course of engineering management specialty has been compressed from the original 64 class hours to 48 class hours. According to the teaching mode of traditional classroom, the total class hours are divided into two parts. 24 class hours are used for theoretical teaching, and 24 class hours are used for practical teaching. The class hours are only used for teaching students the basic knowledge and methods of "engineering survey". With the development of science and technology, new technologies, new methods and new instruments of surveying and mapping emerge in endlessly. In order to enable students to have a sustainable development based on their work positions, traditional teaching has been unable to achieve its goals, and the reform is imperative.

B. Limited Types of Measuring Instruments

Surveying and mapping technology and instruments update quickly. There are many kinds of surveying and mapping instruments and limited college funds. As it is non-surveying and mapping engineering specialty, the investment in surveying instrument and equipment is relatively limited. It is impossible to purchase all instruments on the market. Different surveying and mapping units will choose and purchase urgently needed surveying instruments according to their own economic basis and work needs. It is very difficult for students to get started as soon as possible in the measuring post only through the training of measuring instruments in the "engineering measurement" laboratory. Therefore, it is necessary to familiarize students with as many measuring instruments as possible through online means.

C. The Assessment Method Does Not Reflect the Process

The examination results of the course "Engineering Survey" consist of three parts. The first is the results of in-class training report, the second is the usual results, and the third is the final theoretical examination results. In the case of the plagiarism population, the first part of the performance is not fair. The second part of performance mainly depends on students' attendance, homework completion, classroom performance, etc. Its shortcomings lie in that each class attendance check wastes too much classroom time, and there is plagiarism in homework. The classroom performance requires teachers to take time to make the record every time. The third part is the final theoretical examination results. For the highly practical "engineering survey" course, it is unreasonable to only assess the theoretical knowledge. If the

instrument operation is added to the assessment at the end of the term, it will need to invest a lot of manpower, instruments and time. The assessment coverage is not too wide, and it cannot check the real measurement strength of students.

D. The Teaching Process Does Not Reflect "Individualized Teaching"

It is a non-surveying and mapping engineering specialty. With the limited class hours, the practical projects are basically set by teachers in advance, and the tasks of each surveying group are basically the same. Most of the projects belong to the confirmatory training projects, which is not conducive to the cultivation of students' innovative abilities. The teaching of surveying for students is equal, and the teachers don't provide the promotion platform for the students who have a strong interest in surveying to stimulate their potential.

E. Problems in Traditional Classroom Teaching

At present, there are several common phenomena in the classroom. (1) The students do not like learning, or being active; (2) the students are often late, and like to sleep; (3) the students do not open their mouth in class, and play mobile phones all the time. Teachers are always singing monologues by themselves, and students have finished one lesson after another without knowing what one is about, which makes it difficult to achieve the desired teaching effect.

IV. FEASIBILITY OF IMPLEMENTING ONLINE AND OFFLINE BLENDED TEACHING MODE IN THE COURSE OF "ENGINEERING SURVEY"

A. Technical Feasibility

Superstar Fanya Platform was introduced into the college where the author works for. Teachers and students download "Learning" APP on mobile phones. Teachers could establish courses through "learning" App and upload teaching resources. Against the background of all coverage of campus WIFI, students can learn independently at anytime and anywhere. The "learning" app automatically records the students' learning traces and pushes the exercises in a targeted way. In classroom teaching, the functions of check-in, voting, testing, topic discussion, questionnaire survey and scoring can be used to enable students to participate in teaching activities by using the "learning" app on mobile phones. Teachers will no longer need to work hard to develop APP, or design online teaching web pages. They just need to concentrate on teaching design.

B. Resource Feasibility

The premise of developing blended teaching is the construction of online teaching resources. For the course of "Engineering Survey", teaching resources mainly include micro-video, teaching courseware, measuring instrument simulator, teaching calendar, syllabus, latest periodical papers of surveying and mapping industry, among which

micro-video is the most important resource to support online teaching activities. The author can skillfully use Fraps and Camtasia Studio recording software to complete the micro-video recording work, and use the format factory to process the micro-video in terms of sound effect, editing and so on. This ensures the feasibility of online and offline teaching from the perspective of resources.

V. TEACHING DESIGN OF ENGINEERING SURVEYING COURSE

The general idea of teaching design is based on the course design of working process, project-oriented and task-driven design form. According to the investigation on surveying posts and quality, knowledge and ability, the course contents are organized by leveling, angle measurement, distance measurement, control measurement, large-scale topographic map mapping, topographic map application, point mapping, etc. The students learn micro-videos by themselves before class, complete practical tasks, share achievements in class, and listen to the solution of

difficult problems by teachers. After class, the students continue to exercise the integrated teaching method of pre-class, in-class and post-class, achieving the transformation of "teacher-led and student-oriented" method. This online and offline blended teaching method effectively integrates the methods of flipped classroom, discussion-oriented teaching, case-oriented teaching and classroom teaching, highlights the skills, and organizes teaching according to the requirements of each link of large-scale topographic mapping on the principle of moderate theory and emphasizing practice. Students carry out practical tasks through self-regulated learning, and achieve knowledge internalization through sharing and negotiating the results in class. Teaching evaluation combines process evaluation with result evaluation, and pays attention to the double assessment of basic knowledge and measuring skills, aiming at improving students' comprehensive quality. Teaching design takes learning tasks as the main line, and takes knowledge and skills, quality training as the hidden line. The teaching mode of integrating the obvious line and hidden line is carried out, as shown in "Table I".

TABLE I. TEACHING DESIGN OF ONLINE AND OFFLINE BLENDED MODEL OF "ENGINEERING SURVEY" COURSE

	<i>pre-class preparation</i>	<i>in-class implementation</i>	<i>post-class promotion</i>
Main line	Teachers' preparation Updating the miro-video to the "learning" app Grouping the students and determining the Group leader Student preparation Checking the task list Viewing the miro-video Implementing the tasks	The students share measuring results Topic discussion Common problem of teachers' Explanation Exercise test	assigning post-class task, making the students perfect the implementation plan of project and exercising practical projects
Hidden line	Knowledge and Skills, Quality Training		
	Professional ability	Method ability	Social competence
	Map Recognition Ability of Topographic Maps Application Ability of Topographic Mapping Lofting capacity of building construction Building settlement observation capability	information consultation ability and self-learning skills the ability to formulate a plan innovation ability the ability to analyze and solve practical problems	cooperation ability organization and management ability the ability to bear hardships and stand hard work

A. Having Pre-class Preview and Clearing Objectives

The course of "Engineering Survey" is a highly practical course. When the teachers making teaching design, they can draw lessons from the results-oriented model and divide the course content into several project modules. Each project module can be handled by several small groups. Before class, teachers record the knowledge content of the task into micro-videos. At the end of the video, practical tasks are arranged, including two tasks. One is a task that must be completed. That is to say, the general teaching is accomplished by a group of 4-5 students, reflecting the general teaching. The other is a personalized task. Students decide whether to do it or not according to their knowledge level and interests. This task-driven teaching method is helpful to improve students' self-study ability and innovation ability. The teaching resources needed by teaching are uploaded to the "learning" app before class, which gives students sufficient learning time for self-study, practice, designing and completing practical projects. At the same time, the teaching method

should set up corresponding topics for students to leave messages.

B. Making Classroom Interaction and Interpreting Common Problems

Through taking carefully designed classroom teaching activities as a carrier, students are organized to consolidate and flexibly apply the basic knowledge learned online. The meeting between teachers and students can be used to achieve some more advanced teaching objectives. And then, the students have more opportunities to participate in learning at the cognitive level. The specific implementation scheme is as the followings. The pre-class preparation ensures that every student enters the classroom with the corresponding knowledge base and practical results. In the classroom, representatives of each measurement team share the practical task results through PPT from four aspects, such as measurement ideas and division of labor, field operation photos, interior work data result table, existing problems and solutions. After completing the report, all students grade the

team's work as part of the assessment of the team's performance on the "learning" app. Teachers set up corresponding discussion topics for specific projects, encourage students to brainstorm, express their opinions through "learning" app, and display the common problems backed from students' online learning process on the projection screen through the function of projecting screen and generating point cloud data. And the teachers give targeted in-depth explanations. At the end of the explanation, exercises can be set for key and difficult points to test students' mastery of knowledge. The test results of each exercise will be displayed on the big screen in the form of pie chart, which is clear at a glance. Finally, the teacher combs the knowledge of the class, reiterates the key points and difficulties, and summarizes the knowledge.

C. Taking Post-class Review and Consolidating Knowledge

Post-class is the extension of the classroom. According to the improved measurement scheme in class, students continue to use measuring instruments to practice operation in campus, check for omissions and fill in gaps. When confronted with doubts, they can review the micro-video or other teaching resources on the "learning" app, or interact with teachers and students, so as to solve problems in time. The students continuously improve themselves in the process of knowledge internalization.

D. Course Assessment

Course assessment consists of formative and summative evaluation, as shown in "Table II":

TABLE II. COMPOSITION OF EXAMINATION ACHIEVEMENTS OF ENGINEERING SURVEY COURSE

Individual Final Achievements of Students						
Formative performance (50%)						Summative performance (50%)
Team performance		Attendance record	self-assessment	the performance of team member evaluation	Teacher performance evaluation	
Quality of achievements in each practice task	Number of additional spontaneous innovative experiments and number of large-scale projects	5%	5%	10%	online Test results + discussion activity	Offline: Classroom Performance
60%					20%	
						Final theoretical assessment performance

VI. CONCLUSION

Online and offline blended teaching mode is to use micro-video and online platform. It adopts strategies and methods such as flipped classroom, discussion-oriented teaching, task-oriented teaching, lecturing and so on, subverts the traditional teaching mode in which teachers inculcate students with seemingly incomprehensible listening and speaking, and transforms the "teacher-centered" teaching mode into a "teacher-led, and student-centered" new teaching mode, aiming at cultivating students' subjective initiative and independent innovation ability. According to the strong practicality of the course "Engineering Survey" and the problems existing in the current curriculum of private college students, this paper analyzes online and offline blended teaching mode, and creates a "golden course" in private colleges and universities against the background of "double first-fate" trend. The teaching effect has been greatly improved by applying this mode to the students majoring in engineering management of 2017.

Students are no longer intoxicated with playing games, updating microblogs, sleeping and falling in love every day. However, they are busy with post-class practical tasks, shuttling around campus with measuring instruments.

The teaching mode realizes "general teaching" and "individuality teaching", highlights individual students who

have strong interest and potential in measurement, and declares several provincial and even national innovative projects. The students actively participates in teachers' scientific research, and sacrifices the vacation to practice in school-enterprise cooperation enterprises, such as China Railway Engineering Corporation and Chexplore resources exploration technology co. LTD, and apply the knowledge learned to the actual project.

The phenomenon of teachers playing monologues in class has ceased to exist. Teachers have become the organizers and leaders of classroom activities. Students have become the main activists in the classroom. Students participate in classroom activities through "superstar learning" app, such as check-in, voting, topic discussion, scoring, and get corresponding scores, which constitute their assessment results.

In the future, building the golden course of "Engineering Survey" can be considered from the perspective of virtual simulation teaching. By using the virtual training platform to practice the modules of national competitions and basic practice projects, introducing VR technology, the students can experience the measurement environment and training steps in real time, which solves the problem of limited funds for laboratory construction. The students can simulate the operation of various instruments through the virtual platform. It is more realistic than instrument simulator.

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