Exploration on the Mixed Teaching Mode of Information Science Major Based on OBE Concept

Jia-Qing Song [1], Rong-Quan Zhang [1], Jing Lei [2]

Office of Educational Administration, Taishan University, Tai'an 271000, China [1]
School of Mathematics and Statistics, Taishan University, Tai'an 271000, China [2]

Abstract—**In the context of "Internet plus", with the rapid development of online teaching cloud platform and mobile APP, in order to make scientific use of information-based teaching methods and provide diversified learning services, a hybrid teaching model combining online and face-to-face teaching for courses of information science is proposed. Based on the results oriented learning theory, determine the teaching objectives and content, develop and use the student centered professional information teaching resources, organize and guide students' "autonomy cooperation inquiry", online and offline teaching activities, and establish a comprehensive evaluation system to stimulate students' interest in learning, improve the intelligent level of professional curriculum teaching, and promote independent, ubiquitous and personalized learning under the network conditions.**

Index Terms—**Information-based teaching, mixed teaching, OBE, result oriented**

I. INTRODUCTION

In the context of the development of "Internet plus higher education", it is imperative to use modern information means to improve teaching methods. Education informatization innovates teaching methods, improves teaching flexibility, and eliminates time and space constraints. It can not only meet the needs of different students, but also provide personalized learning for students. It can truly achieve high-quality teaching services, so that students at different levels can be promoted. At present, the Internet, cloud computing, and big data technologies have developed very maturely. The school should make full use of these new technologies to carry out the online and offline hybrid teaching mode, combine the advantages of traditional classroom teaching and online teaching, and deeply integrate them, and expand the limited classroom to the new teaching mode of wireless network. The emergence of various teaching APPs has made tablet computers and smartphones even more powerful, and the classroom has been further activated, making the hybrid teaching at anytime, anywhere and at will a reality. The courses of the major of information science are highly operational and require students to have a high ability of hands-on operation and innovative practice. The OBE concept is the principle of "results oriented design", which is used to reform and practice the teaching mode from the ultimate goal. First of all, we will divide the selected classic textbooks into the comprehensive abilities that students need to master, break the shackles of traditional ways and set goals at different levels with tasks, and cultivate students' comprehensive abilities from simple to difficult. The specific content of teaching design is to combine the quality training direction, ability and knowledge points, and adopt a hybrid teaching method that combines offline, face-to-face and online teaching platforms. With the role of clarifying the expected learning goals, it can be transformed into specific teaching task points that can be implemented, and give an objective evaluation of students' learning.

II. ANALYSIS OF THE CURRENT SITUATION OF THE TEACHING OF THE COURSES OF INFORMATION SCIENCE

The traditional teaching mode cannot teach students in accordance with their aptitude. The same teaching design is used to teach the whole class. The students can't keep up with the teacher's teaching progress, and many problems arise:

(1) In the process of on-site operation demonstration of practical teaching, teachers are surrounded by students in three layers. Among so many students, only the students at the innermost layer can see the entire demonstration operation process. Other students cannot see the operation steps of the teacher's demonstration at all, let alone the mastery of knowledge points. Many students will constantly seek the help of teachers or students with better learning in the class during group training.

(2) Some students can basically master their skills only through one-to-one tutoring by teachers.

(3) Some students give up directly, and they have no desire to learn. They are unable to cope with the tasks assigned by teachers in class. Another small group of students have average learning ability and are waiting for the help of other students. Their skills are slow to operate.

(4) After class, the communication between teachers and students and between students is basically zero, and teachers cannot supervise students to learn.

(5) The teaching evaluation method is only limited to the performance of students in class, homework, mid-term and final exams.

Based on these problems, this paper proposes to carry out the exploration of classroom teaching reform. Based on the results oriented theory, we should carry out a hybrid teaching mode that combines online and face-to-face teaching, increase the flexibility of teaching, let students move, think and evaluate independently, and let students develop in a diversified way.

III. EXPLORATION OF MIXED TEACHING MODE FOR INFORMATION SCIENCE MAJOR BASED ON OBE CONCEPT

College students generally have some problems, such as weak theoretical basis, poor practical ability, and lack of enthusiasm for learning. In addition, individual differences are also obvious. Different students have different learning bases, learning habits, learning attitudes and learning methods. Teachers should carry out classroom reform practice, innovate teaching methods, based on the results oriented theory, rely on online learning platforms and online teaching resources, promote mixed teaching mode, form a new pattern of teaching and learning combining online and offline, promote independent, ubiquitous and personalized learning under the network conditions, and try to meet the needs of students for personalized learning, characteristic development and multi-path growth.

A. Overview of OBE

Outcomes Based Education (OBE) has received extensive attention internationally because it has promoted the reform and renewal of Education, and has been implemented in the United States, Canada, New Zealand and other countries. OBE education concept is a structural model of organizing, implementing and evaluating education centering on the expected learning output. Educators must have a clear idea of the ability and level that students should achieve when they graduate, and then seek to design an appropriate education structure to ensure that students achieve these expected goals. The OBE concept has been recognized by the American Engineering Accreditation Committee (ABET) and has been applied throughout the engineering education certification standards. ABET has issued and implemented the EC2000 certification standard that attaches importance to student output, focuses on defining the quality of engineering graduates, carries out teaching activities around the expected learning output, and strengthens the evaluation of students' learning output, so as to promote continuous professional improvement as the ultimate goal of certification. In essence, OBE education

concept is developed around the main line of "defining expected learning output-realizing expected learning output-evaluating learning output", realizing the fundamental transformation of education paradigm from "content oriented" to "student oriented". In June 2016, China became a signatory to the Washington Agreement. Therefore, it is of practical significance to guide the reform of engineering education in China with the OBE concept of results oriented education. In order to implement the "student centered, output oriented" and continuous improvement education philosophy of the Washington Agreement, more and more colleges and universities have carried out the teaching reform of undergraduate professional certification of engineering education to improve students' ability to analyze problems and solve practical engineering problems.

B. Teaching Mode Reform

The OBE concept emphasizes what students have learned rather than what teachers have taught, the output rather than the input of teaching, the research teaching rather than the indoctrination teaching, and the individualized teaching rather than the unified teaching. Based on the OBE teaching concept, the curriculum teaching needs to be student-centered, say goodbye to the traditional indoctrination teaching, not only pay attention to the leading responsibility of teachers, but also pay attention to the dominant position of students. In the past, classroom teaching was often taught by teachers, students wrote down below, and received knowledge indoctrination in a one-way way. The learning effect of students needed to be improved, which could not achieve the ideal teaching effect. The initiative of students to explore problems, acquire knowledge, analyze problems, and solve problems was ignored, which was not conducive to the cultivation of students' practical ability and cultural quality, and there was still a certain gap with the training goal of application-oriented talents. In terms of teaching methods, the classroom teaching mode is used only. Modern teaching methods have not been used properly, and mainstream information cannot be presented to students in time.

In order to better achieve the teaching objectives, promote students to achieve their learning achievements, and provide an appropriate teaching environment, learning software can be used to make courseware based on teaching videos that meet the teaching objectives to assist teaching, establish a hybrid online and offline teaching mode, track the data of students' learning, and timely adjust according to students' learning. In order to enable students to carry out targeted learning in class, teachers will assign learning tasks in advance, summarize the teaching content into several questions, and let students think about learning with questions. In the classroom, the teacher, as a guide, teaches and analyzes the key and difficult points of the course, mainly expands the depth and breadth of knowledge, combs the learning context for students, and integrates heuristic, teaching, inquiry and other teaching modes into the whole classroom. After class, students can consolidate and review through learning software. The platform has added teaching PPT of relevant chapters, test questions, exercise questions,

simulation experiment questions, and cutting-edge issues related to the course, etc. In the process of students' self-test, they can timely check and fill the gaps according to the key points, difficulties and mistakes in the course. Students will also learn the program design course, have certain programming ability, and can arrange corresponding experimental exercises in the course. For the problems encountered by students in programming, teachers can establish QQ groups to answer questions and solve questions for students at any time, so that students can successfully complete the experiment, deepen the understanding of the course content, and adjust the teaching content through the results of the experimental exercise feedback to perfectly link up with the subsequent teaching courses. In teaching, flipped classes are occasionally conducted. From searching materials to preparing lecture notes for a class to preparing PPT design teaching activities, students can thoroughly understand what they have learned in the process of preparing a lively course. Teachers should encourage students to carry out cooperative learning. Through teamwork, collaborative learning and other ways, students with stronger learning ability will become stronger, and those with weaker learning ability will be promoted. Students will no longer passively accept knowledge, but have the ability to learn independently, guide and assist students to achieve the expected results, and improve teaching quality.

C. Exploration of Teaching Practice

(1) Teaching preparation

The primary task of classroom teaching is to help students establish appropriate learning objectives. For students, only when they meet their own needs can they mobilize their enthusiasm and interest in learning. Therefore, before the mixed teaching, we can conduct a thorough investigation on the students in the class, and communicate with some students online and offline by means of questionnaires. The purpose is to understand the students' learning habits, their current mastery of basic professional knowledge, their cognition of the course and their own career planning. On this basis, the questionnaire is analyzed, the problems are summarized, the teaching resources are purposefully created, and the training objectives and teaching requirements in the curriculum standards of the major courses of information science are designed and broken down, including the reform and design of the overall training plan, the preparation of the teaching plan, the preparation of the training plan, the reform and design of the assessment plan, and the reform and design of the evaluation method.

(2) Implementation process of mixed teaching

First, teachers release learning resources through the online learning platform, including preview tests, course content, objectives, tasks, analysis examples, etc. Teachers should clarify the whole process of completing the curriculum tasks, and also interact with students on the platform, so as to timely understand the preview of students, guide students to collect information related to the curriculum, especially focus on those students with poor foundation. In addition, teachers should guide students to understand the curriculum requirements and conduct

information analysis; At this time, the students' tasks are to read the course tasks, analyze the materials, read the guide copy, consult the relevant learning resources, learn the methods of collecting materials and information analysis, discuss the relevant information of the course in groups, and conduct preview tests. Teachers explain the key points and difficulties of the course through "online+offline", listen to the decision-making opinions of each group, and guide students to analyze materials, preview courses, programming exercises, case studies, etc.

Second, the teacher's simulation software demonstrates the operation method of the simulation experiment, and at the same time, the online and offline questions and answers for the problems encountered by students in the process of previewing the simulation experiment. The simulation experiment can deepen the understanding and familiarity of the course content. The teacher guides students to make preparations for the experiment, correct and guide students' non-standard operations and coding errors in the simulation experiment, and cultivate students' good professional quality. Students will conduct simulation experiments on the prepared program simulation software, test and debug repeatedly until the program simulation is verified to be correct, summarize the experimental process, draw experimental conclusions, and summarize the results into a group discussion.

Third, simulation experiment class. The teacher conducts tour guidance in the process of students' operation, timely guides and helps the problems encountered in the operation process, pays attention to the students' operation specification teaching, gives play to the students' abilities of teamwork, practical application, analysis and problem solving, and cultivates the students' craftsmanship spirit of excellence and perseverance, and improves the students' comprehensive ability.

Finally, after the experiment, the teacher organized students to summarize the experiment and course content, and each student filled in his or her own experiment content and process on the experiment report. In addition, the teacher organized students in each group to conduct self-examination and mutual comments, and organized students to discuss, analyze and summarize online and offline simultaneously, put forward suggestions for improvement, and evaluate each group; Students fill in the out of tolerance experiment report, summarize the whole experiment operation process, propose improvement methods, team students evaluate the results mutually, team leaders summarize the report, and other members supplement, and present their team results to the whole class. The whole report process is in any form, and students can present it in video, PPT and other forms. This kind of mixed communication and learning activity allows each student to participate in it and perform his or her own duties, forming a good virtuous circle. Not only has the student's sense of teamwork been enhanced, but also their enthusiasm for learning and teaching effectiveness have been improved. [7] discussed that according to the observations in this paper, an existing mathematical model of banking capital dynamics should be tweaked. First-order ordinary differential equations with a "predator-pray" structure make up the model,

and the indicators are competitive. Numerical realisations of the model are required to account for three distinct sets of initial parameter values. It is demonstrated that a wide range of banking capital dynamics can be produced by altering the starting parameters. One of the three options is selected, and the other two are eliminated. The model is generalized taking into account fractional derivatives of the bank indicators for time, reflecting the rate of their change. Based on numerical calculations, it is established that reduction of the order of derivatives from units leads to a delay of banking capital dynamics. It is shown, that the less the order of derivatives from the unit, the more delay of dynamics of indicators. In all analyzed variants indicators at large times reach their equilibrium values. [8] examined the development and refinement of possible mathematical models for the intellectual system of career guidance. Mathematical modeling of knowledge expression in the career guidance system, Combined method of eliminating uncertainties, Chris-Naylor method in the expert information system of career guidance, Shortliff and Buchanan model in the expert information system of career guidance and DempsterSchafer in the expert information system of career guidance method has been studied. The algorithms of the above methods have been developed. The set of hypotheses in the expert system is the basic structure of the system that determines the set of possible decisions of the expert system. This set, which is crucial in decision-making, should be sufficiently complete to describe all the possible consequences of situations that arise in the subject area. Therefore, it is important to improve the mathematical models of the intellectual system of career guidance.

IV. THE SIGNIFICANCE OF MIXED TEACHING MODE FOR INFORMATION SCIENCE MAJORS

Compared with the traditional class based classroom teaching, teachers cannot consider the individual differences of students, and adopt the "spoon feeding" teaching method to teach uniformly. Students can only accept passively. Because the amount of knowledge and information explained by teachers is large, students' learning effect is not good. The results oriented hybrid teaching mode combines the offline teaching and learning and online network teaching to form a teaching mode with students as the main body and teachers as the main guide. With the development of information technology, students' self-consciousness has been enhanced. A new teaching mode, the mixed learning mode, has come with the times. It changes the original teaching mode, gives play to the students' dominant position in learning, and presents more diversified forms of knowledge to adapt to the personalized needs of different students.

The mixed teaching mode based on OBE concept for the professional courses of information science is a teaching mode that takes students as the main body, reversely designs, takes the goal as the starting point, and combines the online learning method with the offline face-to-face classroom teaching of teachers and students with the help of the advanced technical means of "Internet plus" education. The

implementation of this model is a supplement to traditional teaching. While ensuring face-to-face communication between offline teachers and students, it also allows each student to carry out personalized learning and receive teacher guidance by means of information technology without being limited by time and place. At the same time, this teaching model not only solves the problem of insufficient in-depth communication between teachers and students and between students in traditional teaching, but also greatly improves the quality of classroom teaching. Through repeated teaching practice, it has been proved that this model can more effectively help students to carry out independent learning, give play to their teamwork ability, explore and analyze problems, and cultivate their comprehensive ability, so as to help students use the knowledge they have learned and powerful network resources to consult information, and gradually achieve the predetermined learning goals in the process of constantly improving their professional skills, thus improving their learning enthusiasm, Train students' abilities of teamwork, practical application, analysis and problem solving, cultivate students' spirit of striving for perfection, and achieve the comprehensive development of students' comprehensive abilities.

V. CONCLUSION

The exploration of the mixed teaching mode of information science major courses based on OBE concept is to take cognitive theory and constructivism theory as the guiding ideology, reverse thinking to design the knowledge and skills that students need to master through this course, then decompose these knowledge and skills into many small task points, and then formulate the ability points that students need to master or understand in each task point, Teachers carry out mixed teaching for students at different levels. The mixed teaching mode is a reform of traditional courses. First of all, the role of teachers has changed. Teachers have changed from the original classroom main role to the role of organization, coordination and guidance. Students were originally passive recipients of knowledge, but now they have changed to the initiative, explorer and exhibitor of learning knowledge, and become the main body of the classroom. In the class of mixed learning mode, the teacher, in order to better exercise the students' team cooperation ability and self-exploration ability, grouped the students in the class and carried out teaching in groups. The students received the tasks set by the teacher in advance, and the team members worked together to give full play to the advantages of team cooperation. They were using information technology to find relevant knowledge and corresponding solutions of relevant task points on the Internet, Members exchange ideas, discuss and solve task problems, give play to innovation and learning ability, and finally complete the task

points assigned by teachers in the classroom. Students are the center of the whole classroom. Teachers pay attention to the performance of each student and process evaluation. Students conduct mutual evaluation and self-evaluation. The difficulties and focuses of learning are solved one by one in the process of students' classroom learning.

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Jia-Qing Song received the Bachelor from Shanghai University of International Business and Economics in 1991. He is an experimenter at Taishan University. His research interests include educational administration, teaching management. Email: jiaqing_song@126.com.
Rong-Quan Zhang received the Master of Education in English major from Shandong Normal University in 2009. He is an experimenter at Taishan University. His research interests include educational administration, teaching management. Email: 492449131@qq.com.
Jing Lei (corresponding author) received the B.S., M.S., and Ph.D. degrees from Ocean University of China, in 2003, 2007, and 2010, respectively. She is a professor at Taishan University. Her research interests include educational administration, teaching management. Email: elizabethia@126.com.