The Innovation Research of Mixed "SPOC+ PAD Class" Secondary Vocational Information Technology Course

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Abstract. The dual advantages of PAD (Presentation-Assimilation-Discussion) class combined with lecture class and discussion class can effectively solve the disadvantages of traditional classroom filling, and pay attention to improving the teaching quality. SPOC is student-centered and teaches students according to their aptitude to improve the classroom teaching effect. Combining with the characteristics of information technology courses in secondary vocational schools, SPOC is combined with PAD class to construct a mixed teaching model, including multi-dimensional and multi-angle evaluation mechanism in three stages: before, during and after class.

Keywords: SPOC; PAD class; Secondary vocational information technology; Mixed teaching mode;

1   Introduction

In response to the active advocacy of vocational education by the state policy, many vocational schools have shown their keen interest and eagerness to reform the current status quo of vocational education and teaching. Among them, secondary schools, as an important force on the road of reform and optimisation of vocational education, are actively involved in this process.

2   Current Situation and Dilemma of Information Technology Curriculum

The information technology course in secondary vocational and technical schools is a compulsory public foundation course for secondary computer application and related majors, which mainly involves knowledge of computer hardware and software, network technology and information security. The goal of the course is to help secondary students master the computer and its basic applications, the application of network technology and information security-related knowledge, enhance the students' ability to use computers and other technical means to solve practical problems, improve information

awareness and develop computational thinking, and set up correct values and sense of responsibility of the information society. The teaching process of secondary information technology course requires students to emphasize both theoretical knowledge and practical ability, which not only requires better logical thinking and understanding but also requires students to have strong innovative and practical ability, which is difficult to master.

Under the traditional teaching mode of the curriculum, teachers mainly teach and students passively learn, which is a one-way process of instilling knowledge. Traditional classrooms have high requirements for teachers' knowledge reserve and explanation ability, but boring lectures make it difficult for students to keep their attention. When the difficulty of knowledge deepens, students' interest generally declines. This traditional teaching style of secondary vocational classroom teaching will face the following problems:

i. Teachers filled the classroom with indoctrination, the whole process of students in a mechanical state of acceptance, students rarely take the initiative to think and solve problems. Unable to implement the "student-centered" leading idea.

ii. With the rapid development of the Internet and the rise of intelligent teaching platforms and short videos, the channels for students to acquire knowledge have become diversified and interesting, and traditional classrooms are less attractive to students.

iii. Lack of interest makes secondary vocational students unable to focus on the spirit, usually 20 minutes will appear the situation of distraction, and small short video knowledge fragmentation is more suitable for keeping students' attention, interesting.

iv. The evaluation method is too simple. Most of the traditional teaching mode adopts the final evaluation, pays little attention to the process assessment of students, and neglects the cultivation of students' emotions, attitudes, values and practical ability.

Due to the influence of multiple factors, the classroom teaching effect is not good, and the traditional teaching mode is not suitable for the learning of current secondary vocational students. In order to improve the teaching quality of secondary vocational classrooms, it is urgent to reform the existing teaching mode to meet the needs of career development in the new era. The teaching of information technology courses is also facing the same confusion.

3   Design of Blended Teaching Mode of "SPOC+ PAD Class"

In order to alleviate the dilemma of information technology curriculum, it is necessary to break the mechanical nature of the traditional classroom, but we can not abandon the teacher-taught classroom completely, nor can we directly let students learn by themselves. Considering the particularity of secondary vocational students and the characteristics of information technology courses, after comparing and analyzing several typical and practical teaching modes, the mixed teaching mode of "SPOC+ paired classroom" is chosen. The concepts and characteristics of several typical modern teaching modes are shown in Table 1.

Table 1. The core ideas and characteristics of relevant teaching methods

Teaching mode	Core idea	Main feature
SPOC	Small, limited online classes that combine MOOCs with face-to-face classes.	Small scale, small number, set threshold, combined with online teaching and classroom teaching, can meet the needs of personalized education.
PAD class	Power and responsibility are divided. Absorbing the advantages of the teaching method and the discussion method, the learning is divided into three processes: teaching (P), internalization and absorption (A) and discussion (D), referred to as PAD classroom.	Put forward to overcome the disadvantages of teaching method. Neither too much emphasis on the dominant position of teachers, nor completely leave students free to arrange.
Mixed teaching mode	With the help of modern information technology and interactive teaching software, the teaching method combining online teaching and traditional face-to-face teaching is used to complete the teaching task and achieve the established teaching objectives.	It is not a simple mix of teaching resources, but a comprehensive mix of teaching concepts, teaching subjects and teaching resources, including the teacher-centered and learning-centered mix, as well as the mix of online and offline teaching resources and methods.

3.1   Summary of the Teaching Modes

SPOC

"Small Private Online Course (SPOC) is a kind of small-scale restricted online course proposed by Professor Armand Fox of the University of California, Berkeley [1]. SPOC has the characteristics of small scale, small number of students, and certain learning threshold. It is close to the teaching of basic courses of secondary vocational majors. The core of SPOC is "student-centered", teaching students according to their individual conditions [2], which can make teachers return to the classroom and enhance students' learning motivation, so as to improve the classroom teaching effect.

PAD Class

PAD class is a teaching model proposed by Professor Zhang Xuexin of Fudan University. It is based on the basic model of " Presentation + Assimilation + Discussion"[3][4][5]. The class time is divided into two parts, with the first half of the class period allocated to the teacher. The second half is left for students to internalize. For separate classes, the growth of students in the process can be achieved through classroom teaching[6] which not only retains the advantages of traditional teaching by teachers, but also

does not completely allow students to study on their own, so that teachers and students are in a dynamic balance between teaching and learning. There is also some development of PAD class in foreign countries.Li et al. elaborated the practical process of PAD class teaching mode in the teaching of Logistics Management in the 3rd ISSGBM International Conference[7].Sun et al. introduced and promoted the PAD class mode in the 6th ICPCSEE International Conference, which combines the cloud class with the PAD class teachin PAD classg mode[8].

Mixed Teaching Mode

Mixed teaching mode is a teaching mode that changes learning from generic standardized knowledge acquisition to personalized knowledge independent construction and creative knowledge generation[9], and a new teaching paradigm of "five in one" composed of teachers' mixed online and offline interactive teaching and students' coherent learning before, during and after class[10][11]. Hybrid teaching is not a simple mix of teaching resources, but a comprehensive mix of teaching concepts, teaching subjects, and teaching resources, including both the teacher-centered and learning-centered mix, as well as the mix of online and offline teaching resources and methods [12].

3.2   Teaching Design of "SPOC+ PAD " Mixed Information Technology Course

Combined with the current learning situation of secondary vocational students and the characteristics of information technology courses, the advantages of SPOC and peer-to-peer classroom are fully integrated, and curriculum teaching is reformed. The design of "SPOC+ peer-to-peer" mixed teaching mode is shown in Figure 1. In the teaching process, on the basis of teaching (P), internalization and absorption (A), discussion (D), the link of review and learning (R) is added. After the reconstruction of teaching mode, teachers' teaching is no longer limited to offline classes, but is divided into two parts: online teaching and offline teaching. Each teaching chapter includes five parts: P-A-R-D-P. In order, the teacher first recorded the video and then posted it on the online platform (P), the students independently learned and internalized it (A), the students made a class summary in groups (R), carried out class discussion (D), and the teachers summarized the important and difficult points of this chapter (P). Through the practice of these five links, a closed loop of teaching and learning is formed, so that both online and offline classes can achieve the dynamic balance of teaching and learning and realize the separation of rights and responsibilities. To achieve the best teaching results, teachers should spend a lot of time and energy on preparing pre-class materials, designing course content and organizing class discussions. Before the beginning of the course, students should also be fully prepared before the class, and only after the knowledge reserve has reached a certain degree can the class discussion achieve a good effect.
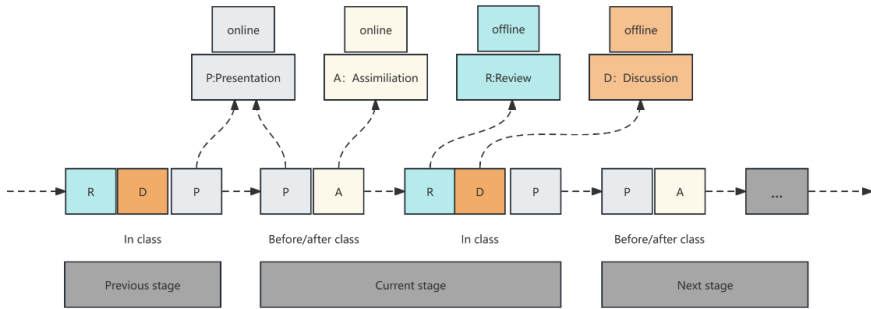
Fig. 1. Teaching design of "SPOC+ PAD " mixed information technology course

4 A Study of Curriculum Innovation in a Hybrid "SPOC + Split Classroom" Program

4.1 Pre-course Online SPOC Solo Learning Phase

The pre-course solo learning stage consists of two parts: lecture and internalization and absorption. Students first complete online self-study by watching the SPOC video pushed by the teacher, and the traditional paired classroom does not emphasize allowing students to pre-study in advance, but the blended teaching model requires students to pre-study before the class, and in the process of pre-study, students are able to clearly define the objectives of the course, and form a goal-oriented consciousness for the subsequent learning.

At the end of online self-study, students practice tests for internalization and absorption, through which they can deepen the memory of knowledge points and test the results of self-study. The solo learning stage helps to cultivate students' self-learning ability and improve students' initiative in learning. In order to improve the teaching effect of online solo learning, the following teaching strategies are formulated.

i. Optimising online teaching content and clarifying course objectives.

ii. Adoption of smart teaching tools to monitor the process of student solo learning.

4.2 Offline PAD Class Group Learning and Mutual Learning Phase

The offline group learning and mutual learning stage consists of two parts: revision and expansion and discussion and exchange. In the process of revision and expansion, teachers firstly answer questions and solve puzzles on students' easy-to-error points and difficulties in the self-study stage, then tell the important and difficult points in the SPOC video, perfect the systematic coherence of knowledge online and offline, and pave the way for the discussion and exchange session through case studies and quizzes. The revision and expansion session is also a group learning stage for teachers and students, focusing on solving the difficult and easy-to-error points in the course, helping

students consolidate the establishment of the knowledge tree, and making theoretical preparations for group discussions and teacher-student discussions.

4.3   After-school Mutual Learning Phase

The task of the inter-learning phase at the end of the course is to complete the design application of the programme based on the previously identified ideas and content of the programme and to complete the online submission of the practical assignment at the specified time. To make the course more challenging, students are required to submit their practical assignments in the form of a work of art.

4.4   Innovative Evaluation System Under Mixed Teaching Mode

In order to break the disadvantages of the traditional teaching mode using the final evaluation, this course chooses to adopt the multi-dimensional and diversified evaluation system. Teachers no longer only pay attention to students' final grades, but add video learning, online tests, in-class quizzes, student reports, student mutual evaluation, teacher evaluation and other aspects of performance into the evaluation system, so as to facilitate a more comprehensive and objective assessment of students' comprehensive ability. Students' comprehensive score is composed of online performance and offline performance, and students' comprehensive score is the score that combines the usual score and the final score. The usual score consists of three parts: online preview and test, offline class attendance, and offline class practice. The final score consists of offline unit test, student mutual evaluation, and teacher evaluation. The course evaluation system is designed as shown in Table 2.

Table 2. Evaluation table design under mixed teaching mode

Grade composition	Evaluation link	percentage	Evaluation content
Normal performance（50%）	Online learning	17%	Online preview, preview quiz, online discussion, etc.
	Offline learning	15%	Offline classroom attendance, interactive discussion, answer questions.
	Classroom test	18%	Homework 1（9%）、Homework2（9%）
Final grade（50%）	Process evaluation	20%	Computer test (7%)、Interim test (13%)
	Teacher evaluation	15%	The teacher grades the students' overall performance in a semester
	Student evaluation	15%	Group evaluation, individual evaluation

i. Strengthen the process evaluation. Strengthening the process evaluation can effectively avoid the chance of only the score theory, reduce the proportion of final exam results and reduce the pressure of students at the end of the semester, so that more time

can be devoted to the cultivation of practical ability and innovative ability, which is conducive to the cultivation of students into all-round development of morality, intelligence, physical beauty and labor. At the same time, strengthening the supervision of the learning process can also improve the achievement of curriculum objectives.

ii. Establish a multi-dimensional and multi-angle evaluation system. The multi-dimensional and multi-angle evaluation system can more comprehensively examine the comprehensive application ability of students, and better demonstrate that the goal of the course is to impart knowledge, cultivate comprehensive ability and lead the cultivation of values, and at the same time improve the objectivity of the curriculum evaluation system.

4.5   The Practical Effect of Mixed Teaching Mode

In the control group experiment adopted in this practice, the experimental Class (E Class) adopts the mixed teaching mode, while the control class (C Class) adopts the traditional teaching mode. After one semester of teaching, the final scores of the two classes are shown in Table 3.

Table 3. Statistical table of final grades of experimental class and control class

Class	N	Mean	Standard deviation	Maximum value	Minimum value
E Class	40	73.10	6.012	96	69
C Class	40	64.47	6.000	90	61

As can be seen from Table 3, with the same number of classes, the average score of 73.10 in the experimental class is higher than that of 64.47 in the control class, and the overall data is better than that in the control class. Therefore, the mixed teaching mode is conducive to the learning of information technology courses for secondary vocational students and the improvement of teachers' teaching and teaching quality.

5   Conclusions

For the current industrial changes and the needs of industry talents, the teaching content and teaching methods of secondary vocational courses should conform to the social development and keep pace with The Times, and carry out deepening reform. The mixed teaching mode of "SPOC+ divided classroom" is introduced into the course of "secondary vocational information Technology". Under the mixed teaching mode, the closed loop of teaching, learning and application is formed in the stage of independent learning, group learning and mutual learning, which improves the quality of classroom teaching and improves the comprehensive ability of students.

The purpose of curriculum reform is to improve students' learning drive, develop students' creative thinking and cultivate students' lifelong learning ability. This paper innovates the teaching problem, teaching content, teaching mode and evaluation mechanism of information technology course in secondary vocational schools by using the mixed teaching mode of "SPOC+ PAD class".

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