



# Research on the Application of Mixed Teaching Mode Based on SPOC Concept

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**Abstract.** With the progress of teaching technology and the development of education concept, the mixed teaching mode has been more and more concerned and recognized by people. Its advantages lie in expanding the teaching time and space, enhancing the attraction of teaching, stimulating the learning enthusiasm and autonomy of learners, opening up the teaching and learning in the e-era, bringing new opportunities and challenges to the reform and development of education and teaching, and promoting the content, methods, the mode and teaching management system have undergone profound changes. Based on the intelligent learning platform, this paper designs a mixed teaching mode for the online course of Aviation Material Storage Management, realizes the main teaching functions of the online course - resource sharing, communication and interaction, feedback and evaluation, and deeply analyzes its role in cultivating students' self-study ability, improving students' thinking ability, and improving students' information literacy, which is of great significance for promoting students' in-depth learning.

**Keywords:** mixed teaching mode · online courses · SPOC · deep learning

## 1 Introduction

With the continuous popularization of the concept of education informatization, the integration of modern information technology and subject teaching has shown the characteristics of universality and depth. The basic application of technology means has slowly developed to the direction of deep integration. College courses also face and accept the opportunities and challenges brought by the information technology revolution. Information education has broken through the boundaries of time and space, integrated unlimited high-quality learning resources, and expanded the open space of curriculum learning. SPOC teaching mode came into being, and SPOC online courses in colleges and universities have gained rapid development in recent years. SPOC online course is a mixed teaching mode combining traditional classroom and online education. It makes the way for students to obtain knowledge more convenient and fast, which not only greatly enriches classroom teaching, but also is an effective supplement and extension of classroom teaching. SPOC online courses can meet the needs of hierarchical teaching to a certain extent. The depth and duration of teaching can be extended infinitely. Online and offline supplement each other, forming an organic whole of teaching [1, 2].

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## **2 Current Teaching Situation and Existing Problems of Air Material Storage Management**

Air Material Warehouse Management is a major compulsory course for the major of air material management. The course has a wide range of knowledge, large chapters, and strong practicality. The knowledge system includes three modules, thirteen knowledge units, and eight practical subjects, involving many management concepts, operating procedures, and implementation methods. The content seems simple, but it is difficult to master in depth. At present, there are mainly the following problems in the teaching of Air Material Storage Management [3, 4].

### **2.1 The Course Teaching Mode is Single and the Learning Initiative is Relatively Lacking**

At this stage, the traditional face-to-face teaching mode dominated by teachers is mainly adopted in the course teaching. Its single teaching mode is difficult to effectively mobilize the initiative and enthusiasm of students, and students are prone to distraction and low participation, which leads to such problems as a dull classroom atmosphere, and cannot give full play to the imagination and creativity of students, affecting the formation of students' independent thinking and independent learning ability.

### **2.2 Limited Classroom Teaching Time and Poor Knowledge Absorption Effect**

Due to the complex structure of aviation material storage management knowledge and the large amount of teaching space and knowledge content involved, teachers can only focus on key knowledge points in class, and students cannot fully understand and digest the knowledge learned in class, which makes it difficult to achieve the expected teaching objectives.

### **2.3 Lack of High-quality Teaching Resources and Practical Teaching Links**

Aviation Material Storage Management is a subject with strong practicality. In the past, the practice teaching links were mostly case studies, which failed to form an effective knowledge transformation process, resulting in poor performance of students in management decision-making, expression and communication and team cooperation, and even less accumulation and summary of practical experience. Figure 1 is a comparison between traditional and mixed teaching modes.

## **3 Establishment of SPOC Platform**

### **3.1 Instructors Create and Manage SPOC Courses Using Intelligent Learning Platform**

The mixed teaching based on SPOC is a process of teaching and learning, which focuses on "learner centered" teaching and learning, with the curriculum resources as the teaching content. The instructor first creates the course of Air Material Storage Management,

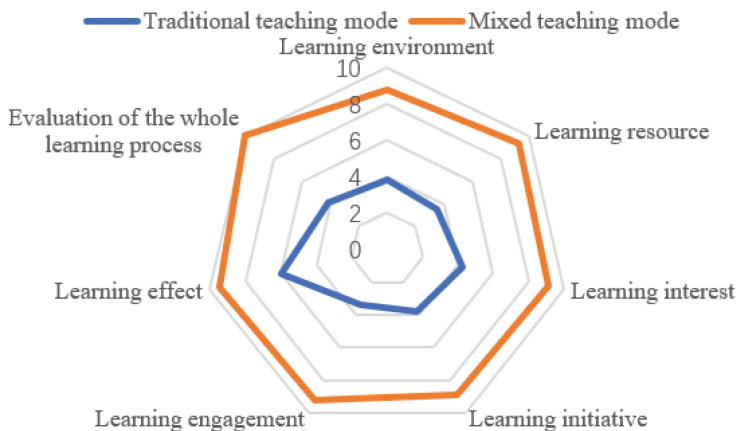


Fig. 1. Comparison between traditional and mixed teaching modes

including course name, course cover, course introduction, course introduction video, specialty category, class hours and credits, teaching methods, teaching conditions, teaching effects, reference materials, course evaluation, teaching resources, course chapters, and news notice. The structure of SPOC platform includes several parts, such as course content, course information, homework tests, question and answer notes, teaching analysis, teaching evaluation feedback and group teaching.

### 3.2 Students Log in and Use SPOC Courses with the Help of Intelligent Learning Platform

The activities that students can participate in include video watching learning, online practice testing and homework, learning performance feedback and evaluation statistics. Students can independently watch the micro lesson video, browse the learning resources, participate in the designated learning tasks and online testing exercises released by the instructor. The automatic scoring function in the course platform will detect the learning progress of students and give them corresponding learning points [5].

The teaching video must be well made, the content explained from simple to deep, and the forms of expression are rich and colorful. The video is short and concise, about 5–15 min, as shown in Fig. 2. The teaching video is the core of the whole course. For example, various forms of air material stacking can be displayed through animation, which is vivid, intuitive and visual impact, as shown in Fig. 3. Students can learn online as if they were in the scene and watch it repeatedly until they learn it.

## 4 The Construction and Implementation of the Mixed Teaching Mode based on SPOC

Combined with the characteristics of hybrid learning mode and the functional characteristics of intelligent learning platform, a hybrid learning teaching mode based on SPOC platform is constructed, as shown in Fig. 4.



Fig. 2. Screenshot of operation video of plastic manual packer

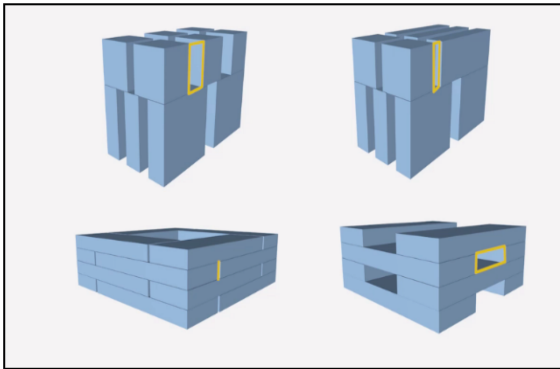


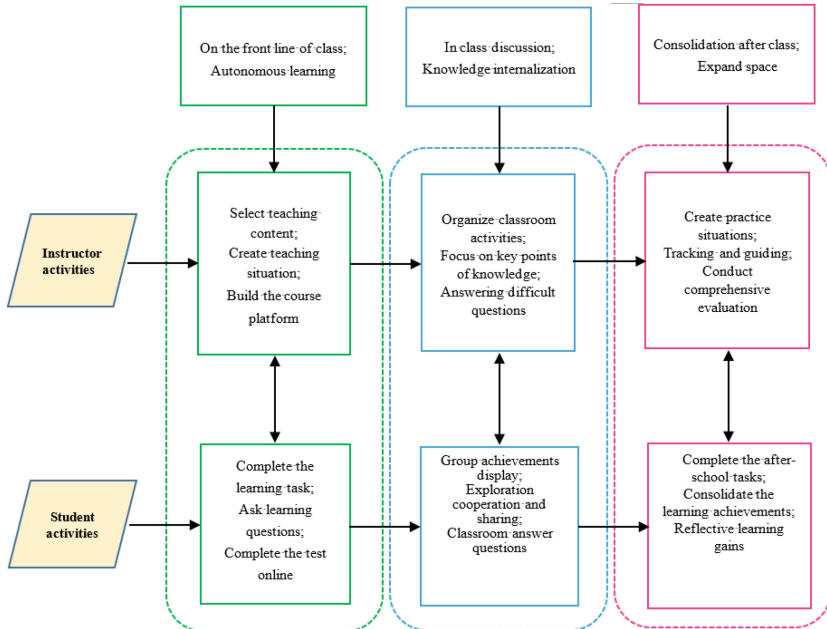
Fig. 3. Animation screenshot of basic form of air materials stacking

#### 4.1 Self Study on the Front Line of Class

Under the support of online and offline hybrid teaching mode of SPOC platform, the instructor releases learning tasks with the help of SPOC course platform, sets up in class tests, unit tests and homework after class, and the students complete video learning and homework within the time limit of the platform, and conduct a pre class self-test. The students complete online independent learning activities through MOOC platform, collect and sort out the difficult problems encountered in the course of independent learning, and complete the independent learning preparation activities [6].

#### 4.2 Internalization of Knowledge Discussed in Class

Classroom teaching is the core component of the mixed teaching mode. After the students have formed a preliminary understanding of the course content in combination with the pre class independent learning, the teachers should do a good job in the classroom teaching guidance activities in the course teaching, so that the confusion encountered by the students in independent learning can be effectively handled.



**Fig. 4.** Mixed teaching mode based on SPOC intelligent learning platform

First, develop group cooperation and promote cooperative exploration. In the detailed teaching guidance in the classroom, the teacher should pay attention to consciously developing the group cooperative learning mode. The teacher should guide the students to analyze the problems encountered in the process of independent learning before class, and gradually solve the problems through active inquiry and mutual help in the group, so as to train the students' autonomous learning ability and problem analysis ability. Secondly, the teacher provides targeted guidance, focusing on answering questions and solving doubts. In the process of constructing the online and offline mixed teaching mode, only by giving full play to the role of targeted guidance of teachers can we help students answer questions and solve doubts, so that students can deepen their understanding of the course knowledge, train their learning ability of warehouse management course knowledge, and thus improve their comprehensive learning effect of course knowledge [7].

**4.3 Consolidate and Expand Space after Class**

In the teaching practice after class, according to the requirements of SPOC mixed teaching, teachers can also combine the basic situation of course teaching in teaching practice to develop online consolidation training courses, broaden the learning space of students on the course platform, so that students can actively explore the application of knowledge with the support of the platform, and try to apply the knowledge of warehouse management to carry out practical verification activities, the students' knowledge application ability and practical exploration ability will be targeted [8].

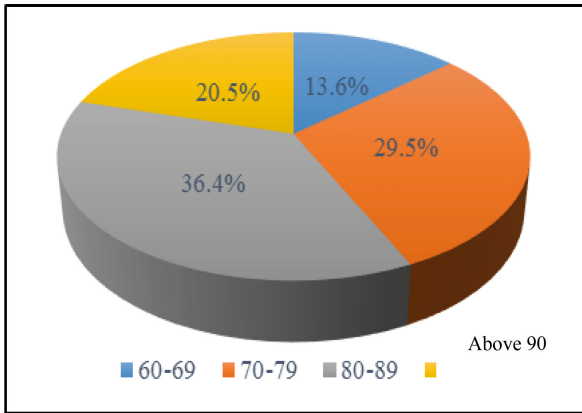
**4.4 Evaluate the Design Inspection Effect**

The teaching evaluation design of the course is mainly composed of two parts: process assessment and offline assessment.

Among them, the process assessment and evaluation includes the pre class chapter test of the students, the group’s evaluation of the work completed in each learning task, the teacher’s evaluation of the work, and the students’ learning in the learning platform (including the length of video watching, the completion of exercises, the interaction in the discussion area, etc.). The examination mainly includes the examination of key and difficult knowledge of the course. The combination of process evaluation and offline assessment and evaluation can mobilize students’ enthusiasm for learning and cultivate students’ autonomous learning ability. Figure 5 shows the distribution of students’ test scores after the mixed teaching reform. Compared with previous years, the excellent rate has increased from 39.7% to 56.9%, and the teaching effect has been significantly enhanced.

SPSS statistical software was used to analyze the students’ scores before and after the reform, and independent samples t-test was used to further prove the advantages of SPOC concept in teaching effect.

Table 1 is the test of normality of the two groups of students’ score samples before and after the reform. Because the sample size is less than 50, it tends to be based on



**Fig. 5.** Schematic diagram of student score distribution proportion

**Table 1.** Normality test of the two groups of students’ scores before and after the reform

Group	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Before Grades	.125	37	.156	.972	37	.463
After Grades	.136	44	.240	.949	44	.349

a. Lilliefors Significance Correction

the results of the S-W test. The Sig values of the two groups of students' score samples are 0.463 and 0.349 respectively, both of which are greater than 0.05, indicating that the scores of the two groups are consistent with normal distribution [9].

The purpose of Levene's test in Table 2 is to test the hypothesis of the homogeneity of the variance of the scores of the two classes before and after the application of the SPOC teaching model. We can see that Sig = 0.769 > 0.05, that is, the variance of the two classes is homogeneous. T-test for equality of means can obtain the t-value, degree of freedom and 95% confidence interval of the scores of the two classes. The Sig value is 0.005 < 0.05, which can be considered that the scores of the two classes have significant differences, and the results are statistically significant.

By comparing the average scores of the two classes in Table 3, it can be fully proved that the mixed teaching mode based on SPOC concept can effectively promote the ability cultivation and quality improvement of students and achieve the final teaching objectives of the course [10].

**Table 2.** Independent samples t-test of the two groups of students' scores before and after the reform

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence interval of the Difference	
								Lower	Upper
Grades Equal variances assumed	.087	.769	-2.887	79	.005	-6.090	2.109	-10.288	-1.891
			-2.858	72.903	.006	-6.090	2.131	-10.336	-1.843
Equal variances not assumed									

**Table 3.** Group statistics of the two groups of students' scores before and after the reform

Group	N	Mean	Std. Deviation	Std. Error Mean
Before Grades	37	74.86	10.036	1.650
After Grades	44	80.95	8.942	1.348

## 5 Conclusions

The construction and use of SPOC course platform for Air Material Storage Management has realized the organic integration of online teaching on the platform and offline teaching in the classroom, made up for the lack of tracking and monitoring the learning process of students in the traditional classroom due to time and space constraints, and solved the problems of delayed learning feedback and evaluation. The rich and diversified learning resources, hierarchical teaching content, diversified classroom activities, multimodal communication channels, and automatic evaluation system of SPOC courses based on intelligent learning platform make up for the lack of traditional management classroom teaching resources, monotonous teaching content, poor interaction and feedback evaluation. The combination of online platform learning and offline classroom teaching has changed the traditional course learning, the mode of testing and assessment, lightened the burden on teachers, improved the ability of students to communicate and learn independently, and promoted the process of information reform of warehouse management course.

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