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Research on Blended Teaching Design of UAV Survey Course

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Abstract: In this paper, a hybrid teaching model for this course has been designed by analyzing the current situation of drone survey course construction, combined with the classification and characteristics analysis of online teaching resources. The application of blended learning can enhance students' initiative in learning, stimulate innovation awareness, and improve the quality of course teaching.

Keywords: Drone Survey; Blended Teaching; Course Design; Teaching Research.

1. Introduction

The drone survey course is an important course for cultivating drone surveying talents in higher education institutions and military academies, including drone basic knowledge, field data collection, and indoor data processing. For the study of drones, students need to have more autonomy, diverse learning pathways, and the learning content also needs to consider students' acceptance ability and research hands-on ability. Simple traditional teaching methods can no longer meet such needs. The hybrid online and offline teaching model based on "Internet plus" is proposed and applied. This model breaks the limitations of traditional teaching venues and learning time, and online teaching content adopts different forms of resources, aiming to stimulate students' enthusiasm for self-directed learning. At the same time, it puts forward higher requirements for students, emphasizing that they should independently complete some teaching tasks without supervision after class, otherwise it will affect the normal development of offline teaching. In this mode, how to reasonably design online teaching resources without increasing the burden on students, how to coordinate and connect online and offline teaching, and what assessment methods can be more conducive to guiding the improvement of students' abilities have become key issues. This article will take the unmanned aerial vehicle survey course as an example to discuss the exploration and implementation process of blended teaching methods in the course.

2. Current Situation of UAV Survey Course Construction

2.1. With Contradiction between the Learning Foundation and the Course Duration

The teaching content of the course "Unmanned Aerial Vehicle Survey" involves relevant knowledge in multiple fields such as sensors, navigation and control, computer vision, etc. These teaching contents require a large amount of basic knowledge in various fields as support, which is unrealistic for students in a certain major. Therefore, it is necessary to supplement relevant basic knowledge in the classroom, which leads to a difficult balance in the allocation of class hours between technology and application within the limited duration of the entire course. Firstly, the application must be based on a solid grasp of relevant technologies; Secondly, the demand for drone talents in job positions is mainly focused on application, which is a prominent problem in the traditional teaching mode of drone survey courses at present.

2.2. With Contradiction between Ability Development and Teaching Methods

The demand for drone talents in job positions is based on the standard of application-oriented talents, which requires students to have a strong sense of initiative to achieve post-employment goals. Digest and sublimate theoretical knowledge in practice, improve the comprehensive application of professional knowledge to solve problems. The purpose of practical problem-solving skills in application. However, in the past, the teaching method of this course was still mainly based on traditional teaching methods, with the classroom being led by teachers and students only being one-sided. Accepting knowledge. How to better handle the gap between knowledge transfer and student ability development. The relationship between knowledge transfer and catalytic ability cultivation is the focus of classroom teaching in this course A difficult problem to solve.

2.3. Difficulty in Balancing the Depth and Breadth of Classroom Teaching Content

The drone technology updates rapidly, and the entire drone system involves multiple cutting-edge fields. While considering the breadth of classroom teaching content, it is difficult to dig deeply into the latest achievements in relevant fields within the class hour. In previous teaching, it has also been found that students in a class often have their own interests and are willing to invest energy in long-term tracking, in-depth exploration, and participate in related subject competitions in these directions. However, the current teaching of this course is difficult to meet students' needs in this regard: firstly, the breadth of teaching content is not enough, making it difficult for students to discover their interests; The second issue is that the current teaching model, which is mainly based on lectures, is difficult to consider both breadth and depth, making it difficult to stimulate students' enthusiasm for innovation.

3. Analysis of the Development Status of Online Teaching Resources for UAV Survey Course

According to the method of knowledge transfer, the current mainstream online teaching resources can be divided into six categories: MOOCs, open classes, self-media, live streaming, online experiments, and communities. As a representative of online teaching resources, MOOC has typical products such as Chinese University MOOC and School Online. Its advantage is that the course system is relatively complete, but the time and energy required for learning are relatively large. At the same time, the content is more theoretical and focuses less on cutting-edge, application, and practice. The other five types of online teaching resources can supplement MOOC in three aspects: cutting-edge, practical application, and practical operation.

Open classes represented by TED (Talking EveryDay) have content advantages of cutting-edge, low learning threshold, and strong infectivity, but the content is mostly focused on popular science, insufficient in depth; Bilibili, Zhihu columns and other forms of self-media resources vivid, professional, and cutting-edge, but with a large amount of data and varying quality; Focus on live streaming resources such as Gate Venture Capital and Deep Blue Academy, with professionalism and cutting-edge content strong operability, but almost all high-quality content falls under the category of charging; Github and other online code repositories can provide experimental code, environment, professionalism srong cutting-edge, but high threshold for learning and operation; Knowledge societies such as Zhihu and CSDN. The district can conduct high-quality multi-party discussions, but the quality of the content varies, requiring screening and screening with a certain threshold of knowledge. Therefore, one way to solve the problems in teaching is to integrate diverse online teaching resources into course teaching.

4. Design of Blended Teaching Mode

4.1. Utilizing Online Teaching Resources to Supplement Basic Principles Teaching

By combining pre professional courses with students' learning foundation, and practicing through multiple teaching classes; Summarizing the following basic principles is the weak link for students in this major to learn this course: basic concepts of aerodynamics; Principles of Satellite Global Navigation System; Principles and characteristics of inertial measurement devices; Basic principles of automatic control; Basic principles of computer vision. In previous lectures, this knowledge needed to be explained in the form of special topics for 3 to 5 class hours. Firstly, due to the limitations of class hours, it was difficult to achieve good learning outcomes; The second reason is that it occupies the already tight teaching time of the course. Through research, it has been found that these basic principles have good teaching resources available on online teaching platforms, such as Tsinghua University, Xi'an Jiaotong University, Northwest University of Technology, and other well-known domestic universities that have launched relevant MOOC resources on mainstream MOOC platforms. Therefore, in the teaching of basic principles mentioned above, a teaching model is adopted where students use MOOCO to learn independently before class, and engage in content sharing and targeted Q&A during class. Through this measure, the teaching hours for basic principles in the latest class have been reduced from 3 to 5 hours to 1 to 2 hours, which to some extent alleviated the situation of more course content and less class hours. And students report a stronger grasp of basic theories and a higher degree of learning freedom.

4.2. Relying on Online Teaching Resources to Carry out Flipped Teaching

Flipped classroom will implement the student-centered concept into teaching, advocating for students to become the center of the stage in classroom teaching. It can cultivate the habit of students' active learning and stimulate their awareness of active thinking, exploration, and action. The prerequisite for conducting flipped teaching is for students to complete self-learning on most of the teaching content before class and be able to provide their own opinions or form their own viewpoints according to the requirements. In previous teaching, due to insufficient support from teaching resources, it was difficult to ensure the effectiveness of students' self-learning, resulting in difficulty in proposing high-quality topics in flipped teaching and greatly reducing the teaching effectiveness.

To address this issue, we will fully leverage the online public teaching resources of renowned teachers from prestigious schools, establish a pre class learning resource directory, compile pre class learning guides, and conduct pre class questionnaire surveys to ensure that students have a considerable understanding of the teaching content during flipped teaching classes. Classroom time is student-centered, with a focus on discussing and solving difficult problems. At this point, the focus of classroom teaching is no longer on requiring students to master the knowledge points, but on enabling students to independently discover the internal connections between the knowledge points through discussion, and to establish a correct and complete knowledge system through independent thinking. Practice has shown that in flipped teaching, students' learning initiative is greatly improved, and their understanding and mastery of teaching content are also more solid.

4.3. Using Online Teaching Resources to Assist Students in Expanding and Innovating

Due to the fact that drone systems involve multiple related technologies in various fields, previous classroom teaching mainly focused on the integrity of the theoretical system of the course, which means the width of the teaching content, making it difficult to balance the depth of the teaching content. To alleviate this contradiction, we will promote cutting-edge MOOC resources in related fields to students after classroom teaching. According to research, internationally renowned universities such as Massachusetts Institute of Technology, Stanford University, and Carnegie Mellon have established open course resources or expert lectures in the forefront of drone exploration. Lecture websites such as TED also have master lecture resources in the field of drone applications. By selecting such resources and promoting them to students, students can learn according to their own interests and combine them with their actual needs, providing students with expanded horizons and innovative knowledge support for those who have spare energy in learning. Through this measure, multiple students have gained training and development in drone design, drone control, drone image processing, and participated in multiple technological innovation competitions, achieving good results.

5. Conclusion

Based on the analysis of learning situation and online teaching resources, a hybrid teaching mode for the course of "UAV Survey" has been designed by introducing online teaching resources into basic principles teaching, conducting flipped teaching, and assisting students in expanding innovation. This enables students to develop their own interests and strengths while mastering the basic principles of drone systems, thereby improving the quality of course teaching. The next main task is to carry out more targeted online teaching resource construction based on the actual situation and training goals of students in this major, and further improve the effectiveness of blended teaching.

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