Original Paper

Research and Practice of Blended Teaching Mode Based on Network Teaching Platform—Taking Engine Principles as an Example

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Abstract

With the development of Internet information technology, a new educational model of "Internet + education" has emerged[1],It has promoted the reform of the university teaching classroom, and the hybrid teaching mode based on the online teaching platform will also enter the university classroom. In this paper, taking the engine principle course as an example, combines the school situation, teaching situation and learning situation of our school, and builds a hybrid teaching mode based on the online teaching platform. The construction and implementation of blended teaching mode are completed through the analysis of teaching content, teaching environment, teaching situation and teaching evaluation. It breaks the traditional teaching mode of teacher's one-man show, realizes the dominant role of students and the leading role of teachers, stimulates students' interest in learning, improves their independent learning ability, and ensures the quality of teaching.

Keywords

engine principle, blended teaching, online and offline, network teaching platform, resource database

1. Blended Teaching Background and Significance

In the 21st century, information technology has developed rapidly and continuously penetrated into the field of education. New teaching modes such as online teaching, MOOC, SOPC and flipped classroom have emerged. The traditional teaching mode in colleges and universities is facing shocks and challenges. Colleges and universities should accept new ideas, apply new means and develop new methods, and cultivate diversified and multidisciplinary applied talents.

Through searching relevant references, we learned that as early as 2013, Professor He Kekang of Beijing Normal University first put forward the concept of mixed teaching in China, He believes that

the blended teaching mode organically combines the traditional teaching and the network teaching, and gives full play to the leading role of teachers in the teaching process and the main role of students in the learning process. Chen Suanrong also believed that blended teaching is a kind of integration, integrating online and offline teaching. It is a hybrid mode formed by face-to-face classroom and online interactive assisted teaching. It is a gradual form between complete traditional classroom teaching and complete online teaching, and a kind of teaching with complementary advantages of the two.

Under the normalization of COVID-19 pandemic, online teaching accounts for an increasing proportion of teaching activities. It has become the trend of the teaching reform and development of higher education to implement the information mixed teaching mode by using the network teaching platform. This paper will take the course of "Engine Principles" as an example to design a hybrid online and offline teaching mode based on the network teaching platform.

2. Problems in the Teaching of Engine Principles

"Engine Principles" is a compulsory professional course of vehicle engineering, automobile service engineering and energy and power engineering, which plays an important role in the training plan of vehicle engineering professionals. "Engine Principles" course involves the comprehensive advanced courses of engineering thermodynamics, chemistry and advanced mathematics. It mainly involves the performance and cycle of the engine; the engine fuel, combustion, and ventilation process; the matching between the engine characteristics and the whole vehicle, so the course is difficult and abstract and difficult to understand. We currently face the following problems

2.1 The Course Content is Difficult and Lack of Credit Hours

"Engine principle" course based on multiple basic courses, including engineering thermodynamics, automobile structure, chemistry, etc., the engine principle course content, theoretical knowledge obscure, knowledge fragmentary and complex, leading to the course comprehensive, theoretical and practical are strong, engine combustion content is abstract, such as: the formation of combustion mixture and combustion process, engine characteristics and emissions cannot intuitive image to students, cause students cannot fundamentally understand the content. Due to the compression of class hours, the teaching syllabus of "Engine principle" is allocated to 32 teaching class hours, and the class hours are relatively insufficient, so the content and knowledge points can not be carried out in deep and detailed detail. The specific knowledge framework is shown in Figure 1.
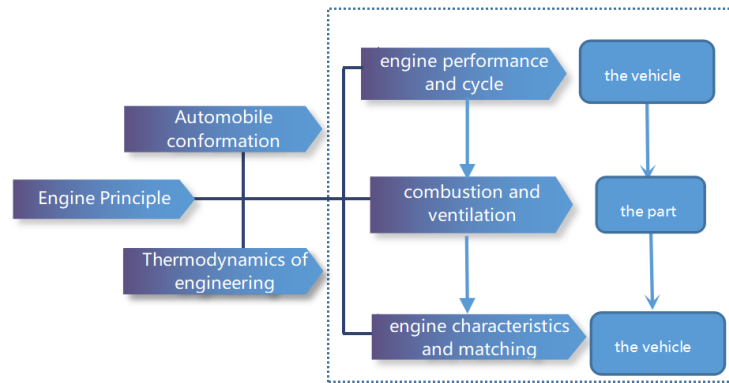
Figure 1. Engine Principle Knowledge Framework Diagram

2.2 Lack of Initiative and Autonomy in Learning

Taking vehicle engineering as an example, the core professional courses are still mainly classroom teaching, and teachers are the leading role in the classroom. In many cases, teachers are singing one-man shows. The classroom teaching process is boring, and the lack of prior substitution teaching means cannot mobilize students' subjective initiative and their enthusiasm for learning. In addition, due to the epidemic, teaching activities are carried out online, with teachers and students across the screen, unable alone ensure the learning status and learning effect of each student. Then it is urgent to design a guiding teaching method to improve students' subjective initiative, take students as the center and teachers as the main body.

2.3 Lack of Learning Resources and a Single Evaluation Method

Current students' learning resources are limited to courseware, textbooks and related reference books, etc. online resources are rich, have teaching videos (Micro-lecture、MOOC etc.), simulation animation, advanced technology, innovative methods, etc., but also exist the disadvantages of quality, content, difficulty, uneven, students have no patience one by one to find, screening and learning. Did not give full play to the advantages of information technology and network teaching platform. The current evaluation method is the usual results + the final exam results, the lack of evaluation of the whole learning process, can not reflect the students' independent learning ability, problem-solving ability, a test paper result is too one-sided.

3. The Basis of the Blended Teaching Model

3.1 Application of Network Teaching Platform

Online teaching is not simply to complete the teaching activities through the online teaching platform, focusing on how to ensure the quality of students' learning. This paper uses the rain classroom network teaching platform, and makes full use of the platform's class check-in, random roll call, pre-class task release, problem online discussion and data statistics and other functions. Students can obtain rich teaching resources on the online teaching platform and conduct independent learning.

3.2 Construction of Teaching Resource Database

Based on the network teaching platform, aiming to improve students' learning enthusiasm and enthusiasm, and based on the teaching content and teaching environment of the "Engine principle" course, we expand and integrate the existing teaching resources, and design an online teaching resource library of "four libraries and one network".

The "four databases" include test question bank, teaching video library, learning database and advanced case library. The construction of the test question bank is based on the teaching content of the course, the concept, definition, classification and calculation points related to the engine principle are mainly objective questions, the principle analysis, technical application and practical operation are mainly subjective questions or group discussion; the teaching video library includes MOOCs and micro lessons, and the teachers of the major will also record teaching videos meeting professional characteristics and students; the learning database mainly includes teaching plan, syllabus, courseware, etc.

"One network" refers to the website related to the engine structure, principle, control technology and application, and the students can browse at any time, as an extension of learning beyond the classroom teaching. The establishment of teaching resource database is convenient for the development of teachers 'teaching activities, the release of learning tasks, statistics and statistical feedback of the learning status, which makes up for the lack of theoretical credit hours, meets the needs of students at different levels, and improves students' learning motivation.

4. The Construction and Application of Blended Teaching Mode

4.1 The Construction of Blended Teaching

4.1.1 Teaching Content Design

The "Principles of the Engine" course theory course is 32, involving the engine cycle, performance index, combustion and ventilation and engine characteristics, etc., the course is highly professional, many knowledge points and abstract and difficult to understand. According to the difficulty of the content, this paper divides the knowledge points into three types: concept definition, principle computation and analysis and derivation. According to the type of knowledge, teachers reasonable layout teaching tasks and teaching plan, teaching video, teaching courseware, teaching materials and other resources released to the rain classroom platform, guide students to complete independent learning, online testing, teachers in the rain classroom platform can understand the students of knowledge, found common problems, offline teachers, combined with the principle of animation, teaching video, focus on common problems, problems. The design of the teaching content is shown in Figure 2.
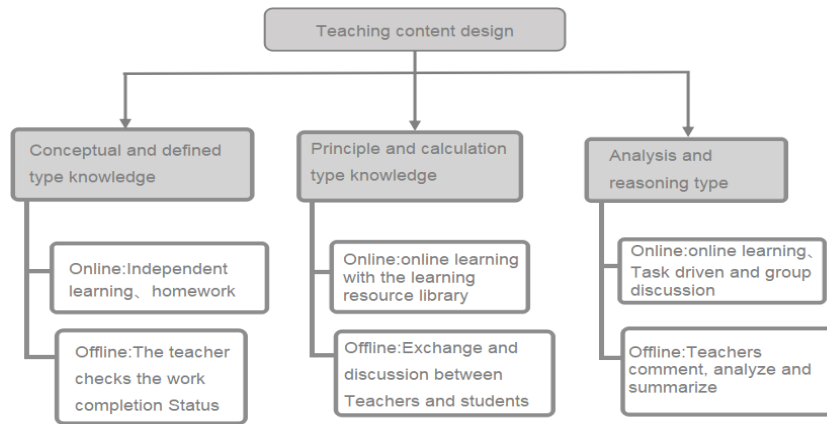
Figure 2. Structure and Form of Teaching Content

4.1.2 Teaching Environment Design

This paper adopts the rain classroom network teaching platform. Before class, teachers can upload learning materials packages on the rain classroom platform and issue a notice to students to guide students to complete the online teaching tasks. Students can log on to the rain classroom network teaching platform through the student number, obtain learning materials, and carry out independent learning by preview the teaching courseware, teaching video, and principle animation; they can also use the network platform for group interactive learning, and complete online homework, testing and other tasks. Students can find difficult problems, and teachers can also understand the students' online learning situation.

In classroom teaching, teachers adjust the teaching content in time according to the students' online learning effect. For example, in the characteristics of the engine, they carefully explain the relationship between dynamic index and economic index with the speed and load, and analyze the change law of the engine characteristic curve to help students establish a complete structural system. The rain classroom network teaching platform provides a good teaching environment for the mixed teaching, expands the students' learning space, arouses the enthusiasm of the students, and helps the students to build the engine principle knowledge system.

4.1.3 Teaching Evaluation Design

Teaching evaluation is an important link of teaching activities, which reflects the students "learning effect and teachers" teaching quality. The evaluation of the hybrid teaching mode based on the network teaching platform adopts the multidimensional and whole-process course evaluation combining online and offline. In terms of teachers, teachers should timely update the teaching resource database in the rain classroom network platform, and the teaching videos, principle animation, teaching courseware, teaching materials and exercise database should be cutting-edge and complete. In the teaching process, by participating in students 'interactive question answering, online test results, correcting homework, timely grasp students' learning situation, combined with peer evaluation, supervision and students' teaching activities, so that teaching activities can achieve a spiral virtuous cycle.

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The evaluation of students' learning effect includes the login and sign-in of the rain classroom platform, the use of online teaching resources, online test results, and group discussion participation, and the student group discussion participation, cooperative learning ability and practical application ability, which make the evaluation process run through the whole course learning process, and form a multidimensional and whole-process evaluation method.

4.2 The Implementation of Blended Teaching

The implementation of blended teaching takes the network teaching platform as the link to realize the immediate interaction between teachers and students. Before the course began, the teacher uploaded the course introduction, teaching syllabus, assessment standards and teaching schedule to the rain classroom network platform. The students would pay more attention to the nature of the course by checking the nature of the course, the allocation of class hours and the assessment standards. Before class, publish teaching tasks on the rain classroom platform, and upload teaching resources packages such as teaching courseware, teaching videos, test questions, etc. Students can receive notifications in time through the mobile terminal, preview them combined with online learning materials, watch video explanations, demonstration animations and auxiliary materials, guide students to learn independently, find problems, think independently, and pave the way in the following classroom learning.

In the process of classroom teaching, teachers should make a thorough understanding of the completion of students 'online teaching tasks, and find out the common problems of students through the online test results of students, students' participation in the communication and discussion in the comment area, so as to carry out targeted classroom teaching. Taking the knowledge points of the load characteristics of the gasoline engine as an example, using the rain classroom platform, the gasoline engine working principle, economic index, power index related videos, demonstration animation and test questions are uploaded before class. Determine the teaching design of the knowledge point by reviewing the students' test results and the discussion in the comment section.

In the classroom teaching, roles can be exchanged, with students as the main body to discuss the factors affecting the effective fuel consumption rate and the load change law of the gasoline engine; the effective fuel efficiency and fuel consumption curve are analyzed in the load characteristic diagram, and each group selects a representative to report. The teacher led the students in the discussion process and reported the results, focus on common problems, and strengthen students' mastery of basic knowledge.

After class, arrange offline homework reasonably, strengthen knowledge points, and complete students independently; assign some practical extended homework online, such as how to drive the best economy, comparative analysis of gasoline engine and diesel engine, etc. Students can communicate and group cooperation to complete the homework, so as to meet the needs of students at different levels.

Through the implementation of mixed teaching, students have a large space for learning, which can promote the effective communication between teachers and students, and between students and

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students, build an interactive classroom, stimulate students' enthusiasm for learning, and improve students' ability to find problems, analyze problems and solve problems.

5. Epilogue

This paper takes the core professional course of vehicle engineering "Engine principle" as an example, relies on the rain classroom online teaching platform, designs the online and offline blended teaching mode, realizes the organic integration of classroom teaching and network teaching, breaks through the limitations of traditional teaching in terms of time and place, and realizes the learning freedom.

At the same time, an online teaching course resource library should be developed, and an interactive platform between teachers and students should be built to guide students to use the online resource database to learn independently, find problems, check the omissions and fill in the gaps, and strengthen and consolidate. It stimulates students' enthusiasm for learning, improves their subjective initiative, and improves the ability of independent thinking, innovation and teamwork, so as to improve the quality of engine-related professional teaching and the training quality of vehicle professionals.

The reform of the hybrid teaching based on the network teaching platform has a long way to go. The teaching resources, teaching content and teaching environment should be constantly updated, supplemented and adjusted. Only through unremitting practical exploration can the hybrid teaching in a real sense be realized.
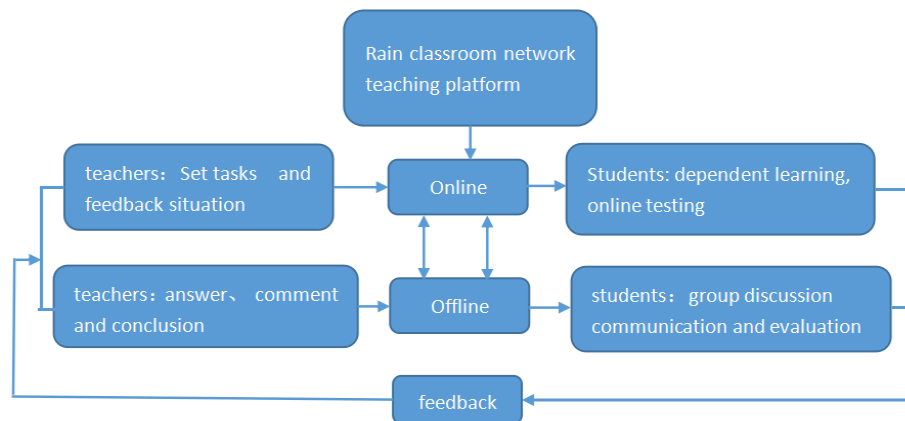
Figure 3. Implementation Plan of Blended Teaching

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