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Teaching reform measures of environmental engineering specialty with mixed teaching method

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Abstract: *With the rapid development of information technology, the development and application of modern educational technology with multimedia technology, computer and network technology as its core, especially the network teaching platform, has become the need of current multimedia education development. After half a century's development and construction, the teaching scale of environmental art design in China has been developing from small to large, and now it has spread all over the country's major comprehensive and art colleges, forming a unique environmental art education system. As a core and backbone course of chemical engineering major in higher education, the content of chemical reaction engineering course not only involves a wide range of theoretical knowledge, but also covers many engineering practices, which plays a very important role in cultivating students' engineering analysis ability and engineering practice ability. Through comparative experiment, student questionnaire and teacher interview, the teaching effect and student satisfaction of this model are verified. The results show that the teaching effect of the class using the mixed teaching mode is obviously better than that of the class using the traditional teaching mode, and the students and teachers are satisfied with the mode.*

Keywords: *Mixed teaching method; Environmental Engineering; Reform in education*

1. Introduction

Education informatization is the need to deepen education reform and comprehensively promote quality education, and is the only way to realize education modernization. In view of the development requirements of environmental engineering education informatization, this topic aims to design and develop a web-based teaching platform for environmental engineering based on resource library [1]. The major of environmental engineering has received extensive attention in recent years, and the number of college students in this major continues to grow. Many colleges and universities in our province have environmental majors, but teaching resources are scattered and can not be effectively shared, resulting in a waste of teaching resources [2]. Moreover, in the teaching of environmental engineering major, especially in the course design and paper design, students have poor interaction with teachers. When querying design materials and engineering cases, similar materials and schemes cannot be found for reference. The teaching effect of teachers is greatly reduced, and students' learning enthusiasm is also affected [3]. At the same time, the teaching mode of environmental art design also has a variety of problems that are incompatible with social development and social needs. Among them, the teaching of cartography is seriously divorced from practice. If you want to mobilize and stimulate students' enthusiasm for learning, you must introduce cases, practice teaching and keep pace with the times; The course of cartography was redesigned and arranged with the industry as the standard and employment as the guidance, so as to change the teaching methods and ideas [4].

Environmental engineering is an elective course of agricultural biological environment and energy engineering. Environmental engineering course is one of the basic courses for students majoring in agricultural engineering to learn and train engineering knowledge, and it is also the basic course for cultivating outstanding innovative talents in agricultural engineering [5]. Blended teaching combines advanced educational concepts, high-quality teaching resources, effective teaching strategies and different evaluation methods, realizes student-centered and teacher-led, and combines traditional teaching with online teaching. It has been widely used in many teaching fields and achieved good teaching results. The practical application and effect of blended teaching has always been the focus of educational researchers and practitioners. The hybrid online learning model, which combines collaborative learning, problem-based learning and independent learning, can improve learners'

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motivation and promote students' active self-study and interactive cooperation by designing supportive collaboration and project-oriented activity teaching [6]. As a comprehensive new discipline, the specialty course of environmental engineering is characterized by strong practicality and high comprehensiveness. However, the traditional college classroom teaching methods and means obviously can't meet the new requirements of the society for the innovative ability and high quality of the required talents. Therefore, under the environment of mixed teaching method, it has become the key of engineering teaching reform to reform the traditional teaching mode of engineering and explore a mixed teaching mode of chemical reaction engineering course that adapts to the development of the times [7]. Through systematic study and training of this course, students will be trained to use drawing tools correctly; Enable students to master projection theory and have certain spatial thinking ability; Master the basic knowledge of engineering drawings, and have the skills of drawing recognition and drawing.

2. Resource Library of Environmental Specialty and Network Teaching Platform

2.1. Research on Teaching Reform of Environmental Engineering Specialty

The continuous enrollment of environmental engineering major in recent years, on the one hand, shows that the government and the educational community have accepted more and more students' publicity and attention to environmental protection, and on the other hand, shows that economic and social development has an increasing demand for environmental protection teaching and professional talents in China [8]. Many colleges and universities in the province have environmental majors, including environmental engineering and environmental science. However, teaching resources are scattered and cannot be effectively shared, resulting in a waste of teaching resources. So far, colleges and universities in the province have not built a "resource pool for environmental engineering majors", which has greatly affected the improvement of teaching quality and talent training quality [9]. Many online courses emerge in endlessly, realizing the complementary sharing of high-quality educational resources, accelerating the integration of various disciplines in higher education, and promoting the continuous integration and updating of the contents of various disciplines. Not only that, new scientific research achievements and knowledge in various disciplines can be timely integrated into the curriculum knowledge through the Internet and shared with students for their exploration or learning. With the rapid updating of environmental protection technology, Environmental Engineering, as an applied and academic course, its teaching content also needs to be constantly updated and expanded. On the basis of guaranteeing the teaching of basic principles and methods, how to teach students more and more effectively new technologies and methods, and how to improve the ability to solve practical engineering problems, are the challenges facing the teaching of Environmental Engineering [10]. At present, the traditional teaching is still dominated by classroom PPT teaching, with many boring teaching contents, poor timeliness and lack of attraction to students. According to "Modern Educational Technology of Colleges and Universities in Guangdong Province, Engineering Construction Standard", the resource database of environmental specialty involves three main courses. It consists of four sub-databases, namely, the database of environmental laws and standards, the database of environmental engineering examples, the database of courseware and lesson plans, the database of examination questions, the database of multimedia, the database of papers and achievements, the database of simulation experiments and the database of online courses. Among them, four sub-databases, namely, environmental laws and standards database, environmental engineering example database, papers and achievements database and simulation experiment database, are our characteristics. One of the characteristics of this resource library is that the main courses cover the key courses of environmental engineering, environmental science, water supply and drainage, bioengineering, environmental biotechnology and other majors. The specific content structure is shown in Figure 1.

Reorganize, separate and restore the materials in the existing courseware or other software. Some materials in courseware or software are compiled by application programs, packaged and embedded in software programs, and can only be seen and heard at runtime, but can not be directly selected. For such materials, you can "grab" them for your own use through some "screen capture" tools. For some pictures and characters appearing on the screen, you can use the screen capture tools "screen thief", "screen capture", that is, screen capture experts. Each basic module is composed of a number of units with its own characteristics. According to the different stages of students' ability formation, the whole system gradually completes the transition from theory to practice to ability from the formation of basic experimental ability, the expansion of professional knowledge and the improvement of practical ability, and promotes the coordinated development of students' knowledge, ability and quality.

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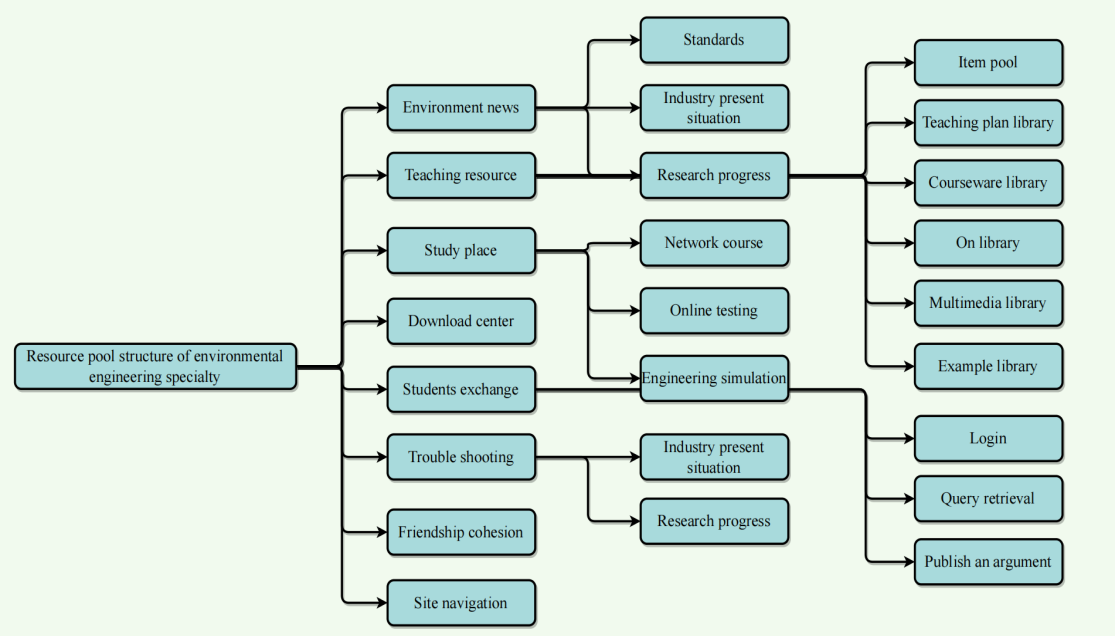

Figure 1: Web page structure of environmental engineering professional resource pool

2.2. New constructivist learning theory

The new constructivist learning theory was put forward by Professor Wang Zhuli in response to the two challenges of information overload and knowledge fragmentation faced by learning in the network age. Its core idea is to emphasize knowledge innovation. It believes that education is a process of knowledge "grafting", that is, learners can directly take the knowledge obtained by predecessors and integrate it into their existing knowledge system to achieve the expansion and extension of their own knowledge. First of all, we copy and paste a large number of knowledge fragments in the network into "integrable ware". When the "integrable ware" reaches a certain level, we will have a preliminary understanding of the knowledge of these fragments, and conduct "personalized rewriting" based on our own understanding to integrate them with our original knowledge system. However, the knowledge fragments that cannot be effectively integrated into the original knowledge system will construct a new knowledge system through "integrable ware" and "rewriting" to achieve "creative reconstruction". Gradually optimize the course content, forming three special topics of water treatment, air pollution and agricultural waste treatment. During the teaching process, set online and offline modules as well as pre class, in class and after class modules according to the teaching content, and integrate the teaching content with diversified teaching methods. According to the theory of connectionism, the process of learning is the process of connecting knowledge nodes, that is, pre class autonomous learning is to master fragmented and basic knowledge points (nodes), and then integrate them into their own knowledge system by establishing connections with learned knowledge points. Therefore, the design of mixed teaching process should focus on interactive design to promote the dynamic generation of curriculum knowledge.

Online autonomous learning activities pay attention to the instant communication and interaction between students and platforms, knowledge, peers and teachers, supplemented by certain exercises and tests, so as to promote students to find key nodes in dynamic network nodes and realize the transformation and circulation of knowledge; Offline classroom teaching activities can promote the efficient interaction of classroom teaching based on collaborative inquiry, discussion and exchange, knowledge contest, project cooperation and other links, and promote the deep interaction and understanding between learners and key nodes, thus promoting the effective occurrence of learning. On the one hand, it can expand students' thinking and enrich teaching content, so that students can actively participate in classroom teaching. On the basis of understanding the principle, technology and present situation of technology, they can grasp the development trend of technology more deeply and learn to solve problems with their own knowledge. On the other hand, through group discussion, students from different backgrounds can cooperate, discuss and complement each other, and enhance division of labor and teamwork. Compared with the simple download mode, this streaming mode of downloading and playing multimedia files not only greatly shortens the startup delay, but also greatly reduces the

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demand for system cache capacity. The streaming mode has a specific real-time transmission protocol, which avoids the disadvantage that users have to wait for the whole file to be downloaded before viewing.

3. Implementation ways of practical teaching methods in environmental engineering course

3.1. Analysis on the Effect of Teaching Reform

The network examination system for environmental engineering specialty adopts B/S structure, which is composed of a three-tier distributed structure of client browser, Web server and database server, such as the examination question database. Due to the adoption of Internet related technologies, B/S structure has the advantages of convenient system maintenance and upgrading, cross platform operation, good openness, expandability and system security. Due to the large number of courses involved in the environmental engineering major, in order to facilitate teachers and students' on-demand broadcasting, the current system divides the courses of the environmental engineering major into environmental engineering, environmental science, environmental microbiology, environmental chemistry, environmental monitoring, environmental quality assessment, environmental ecology and environmental informatics. Teachers can classify videos according to their content and input them into different courses. Moreover, the system has a search function. Enter keywords, and search the database by calling the system's search statements. The results are displayed in the system's search list. From the perspective of physical characteristics, the concept of hybrid teaching is a teaching situation based on mobile communication equipment, network learning environment and classroom discussion; From the perspective of teaching characteristics, it is a new student-centered learning experience. The mixed teaching discussed in this study is more inclined to Professor Feng Xiaoying's theory and key points. The comparative analysis of traditional teaching, online teaching and mixed teaching is shown in Table 1.

Table 1: Comparison of traditional teaching, online teaching and mixed teaching

Traditional teaching	Online teaching	Blended teaching
Focus on teaching with teachers	Focus on students' learning	Emphasis on "double-main type" teaching
Class centralized teaching	Individual autonomous learning	The combination of online autonomous learning and offline classroom teaching
Give priority to knowledge teaching	Give priority to developing students' self-study ability.	Pay equal attention to knowledge and ability training.
Textbook +PPT courseware	Network course resources	Pay equal attention to the cultivation of knowledge and ability, and combine books, teaching materials and online course resources

In traditional teaching, teachers allocate a lot of classroom time to low-level goals for students' memory and understanding of knowledge, but spend a little time on students' application, analysis, evaluation and creation, which is obviously not conducive to the development of students' high-level cognitive level. For students, there is no doubt that the memory and understanding of knowledge is very important. However, under the environment of Internet+education, the application, analysis, evaluation and creation of knowledge have become the basic requirements of the talents needed by the society in today's times. Therefore, we should focus on the cultivation of students' high-level cognitive ability in teaching. In the discussion area, teachers, students or learners can express their views on academic, academic or other issues of interest, and have a relaxed and fruitful discussion. For example, learners discuss a certain problem for a period of time and put forward their own views. Teachers regularly collect and sort out the learners' discussions, and then provide targeted guidance. For example, in the way of, relevant teaching institutions can divide bulletin boards, symposiums and Q&A areas according to the courses, and open regular and irregular symposiums and seminars for each course. Learners can participate in one or more symposiums and seminars according to their interests or needs. Teachers can post notices, assign homework, publish information or answer common questions of learners on the bulletin board of each course, or provide individual tutoring and answering questions to learners through the question answering area.

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3.2. Evaluation of mixed teaching effect

This survey focused on the content and proportion of mixed teaching. After students experienced the mixed teaching reform, they listed the expected online and offline teaching content and the proportion of online and offline teaching. Nearly 67% of students hope to systematically learn complex knowledge through offline teaching. They believe that classroom teaching has more advantages in the process of teaching complex knowledge, and students can easily understand and communicate face to face; More than 20% of students think that case analysis, process comparison and selection, problem analysis and communication and discussion are more suitable for classroom teaching. Learners' learning self-consciousness directly affects their autonomous learning effect. As can be seen from Figure 2, about half of the students are average in consciousness, and about 11% are poor in consciousness. It shows that learners' awareness of autonomous learning is not very high, and most students only complete autonomous learning tasks or homework after class under the supervision and guidance of teachers. Therefore, the design of online autonomous learning activities in blended teaching should focus on stimulating students' curiosity and enthusiasm for learning, so that they can actively participate, experience their sense of self-responsibility and self-efficacy, and enhance their confidence and enthusiasm for learning. In addition, we should pay attention to the timely tracking and evaluation of students' learning dynamics, so as to urge students to follow up the collective progress and make timely self-adjustment. As shown in Figure 2.

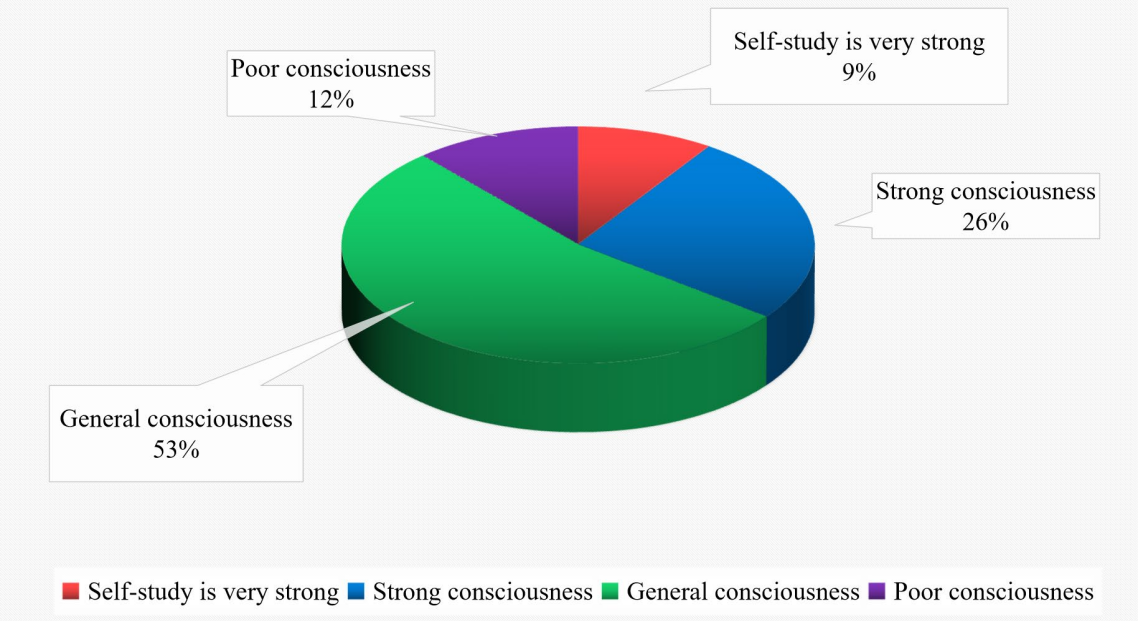

Figure 2: Learners' self-study awareness

Compared with other resources, text resources can make students calm down and read carefully, and deeply understand the knowledge content between the lines; Video resources dynamically present rich course contents by combining text, sound, images and other information, mobilize students' senses and enhance the efficiency of teaching, so it also attracts many students' interest and preference. Therefore, in blended teaching activities, we should pay attention to reasonable questioning based on students' ways and abilities to solve problems, and we should not only have well-structured problems that students can solve, but also promote the development of students' ability to acquire resources and think independently. It is also necessary to promote the development of students' cooperation, discussion, brainstorming and creative thinking. In the selection and presentation of mixed teaching resources, we should pay attention to the organic connection between PPT courseware, video resources and textbooks, make full use of PPT courseware, enhance the teaching effect, reasonably present video resources to realize the high efficiency of teaching, and focus on returning to textbooks to realize the fundamental nature of teaching. Evaluation system is one of the most concerned contents of students. In this questionnaire survey of teaching effect, the open subjective question and answer method is used to make statistics on this content. The results show that the students highly approve of the diversified scoring system, and think that it can be more reasonable, fair and scientific to examine the students' comprehensive ability from multiple perspectives. In addition, students mentioned that participating in scoring can improve their enthusiasm, which is more conducive to learning others' strengths and

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finding their own shortcomings, and can also be more positive to think about and improve themselves. This evaluation method is more suitable for the postgraduate teaching and training model in the current education and teaching reform.

4. Conclusion

In the process of blended teaching reform of environmental engineering, some achievements and results can give students more knowledge and all-round cultivation in a limited time. Students have recognized the course content, teaching methods and teaching effects, and increased their time and enthusiasm for the course. Teachers' practical level and experience are the key to the implementation of practical teaching method of environmental engineering. Therefore, only by constantly improving the position of practical teaching method in the teaching system and improving the cognition and understanding of departments and teachers can the practical teaching method of environmental engineering specialty be better implemented. This paper systematically discusses the design and construction of the resource library of environmental engineering specialty, clarifies the position and significance of the resource library on the network teaching platform, deeply discusses the architecture, overall design and implementation methods of each subsystem in the network teaching platform, further points out the scientific selection and reasonable distribution of the overall design of the platform system, and realizes the basic function of sharing environmental teaching resources in terms of function. Teachers can use this system to directly read teaching resources from the teaching resource library, and then use the platform's forum system to upload the teaching resources to the forum after processing the teaching resources through the production tools, so as to realize the sharing of teaching resources.

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