Design of Online and Offline Hybrid Teaching System based on Network Information Technology

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Abstract. Hybrid teaching is widely used in colleges and universities in the network teaching platform, can effectively make up for the shortcomings of traditional classroom teaching in colleges and universities at present, but because of the network teaching lack of the guidance of system theory and teaching practice, teaching in colleges and universities network platform will inevitably be in the application of some technical problems, so you need to take the design of the new teaching system. The purpose of this paper is to design a mixed online and offline teaching system based on network information technology, and to provide technical Suggestions for the optimization of mixed teaching methods. This paper designs a hybrid teaching system based on information technology and conducts an empirical study through teaching experiment. The experimental subjects were sophomores in a certain university, and two classes were randomly selected for the teaching experiment. The results showed that the students in the experimental group generally had a high evaluation on the teaching platform, and 93.1% of the students thought the teaching system was very useful. From the results, the design of the new system can help improve the online and offline hybrid teaching system.

Key words: Hybrid Teaching Method, Network Teaching Platform, Teaching Activities, Information Technology

1. Introduction

With the rapid development of information technology, teaching methods have been constantly updated in this process, and teaching reform has also been deepened [1]. In the information age, every educator needs the help of modern information technology to change the traditional teaching methods, break through the limitations of the original teaching methods, and explore and summarize new
teaching models and methods [2-3]. The purpose of the teaching and teaching reform is that students and teachers can have more learning methods and get better learning results through the mixed teaching model, which is also reflected in the fundamental purpose of the education and teaching reform [4].

A lot of nursing education is moving online, and teachers must learn to deliver content and communication in different ways. The hybrid model of conceptual development offers the possibility of understanding and expressing insight into the existence of teachers' online care. Mastel - Smith Beth revealed a number of related concepts and conducted six qualitative interviews with the nursing school, including one with the doctor who taught the course online. Four topics can be drawn from the interview data: online teaching experience; The similarities and differences between online teaching and face-to-face teaching; Online presence; Online care is presented [5]. Interactions between teachers and learners and learners' abilities in relation to objective outcome content or skill areas, as well as broader outcomes in higher education such as critical thinking, problem solving, and communication. Maureen Snow Andrade proposed a framework for teacher training in network teaching and outlined specific strategies for community building and teacher response, aiming at developing learner autonomy [6]. Teachers often have different levels of experience, skills and self-efficacy in online teaching. To address these issues, Jason Rhode designed and implemented a self-assessment of online instructional readiness. The tool includes three aspects: online teaching experience and attitudes, learning management system capabilities, and technical acquisition. Self-assessment is distributed via a web-based survey tool to teachers who are determined to develop new online courses [7].

The study in this paper combines the characteristics of mixed teaching and CIPP evaluation model, and constructs a learning evaluation model for mixed teaching from four dimensions: learning objectives, learning effects, comprehensive abilities and learning attitudes [8-9]. On the basis of the existing research results, this study, combined with the author's analysis of the social talent ability needs, curriculum objectives and the characteristics of mixed teaching, completed the task of constructing the evaluation index of blended teaching-oriented learning [10].

2. Programs Method

2.1. Mixed Teaching

Hybrid teaching is a teaching model that integrates the advantages of traditional online teaching and single online teaching. In the mixed teaching mode, not only the social interests of teachers and students are fully considered, but also the value status of giving full play to the leading role of students and teachers. Moreover, the concept of blended learning is also a research result of deep reflection on the previous teaching methods and continuous summary of innovation, and its essential requirement includes the optimal path selection of the optimal information transmission channel. In a word, the mixed teaching mode not only effectively makes up for the deficiency of traditional face-to-face teaching and single online teaching, but also closely follows the requirements of the current educational reform and realizes the perfect integration of online and offline learning with the help of excellent educational resources and intelligent learning platform.

2.2. Algorithm of Building Teaching Platform
The obtained sample \( g(x,y) \) is then detected by operator edge, which can reduce the interference of part of the noise. The result obtained by convolving the original reference index with the gaussian function and then differentiating the convolution is equivalent to the result obtained by first differentiating the gaussian function and then convolving it with the original index, that is:

\[
\nabla^2 G(x,y) = \left( \frac{x^2 + y^2 - \sigma^2}{\sigma^4} \right) e^{-\left(\frac{x^2 + y^2}{2\sigma^2}\right)}
\]

(1)

The accuracy of operator detection is determined by the smoothness of sample input. The size of the gaussian smoothing filter depends on the size of the scale, and is not adaptive. When value is small, more edge points can be obtained, but the noise suppression is insufficient. When sigma is large, it smooths the noise, but it also widens the edges and reduces the detail. Suppose the one-dimensional gaussian function is \( g(x) \), and \( g(x) \) is used to filter the signal function \( f(x) \) with noise, and \( s(x) \) is obtained. The expression is:

\[
s(x,\sigma) = f(x) \otimes g(x,\sigma)
\]

(2)

3. Experiments

3.1. Experimental Background

In the process of blended learning, learners can not only communicate with their peers in class, but also communicate with each other anytime and anywhere through online calling. In addition, students with different learning progress can flexibly arrange their own learning arrangements. Students with fast learning progress can preview some of the untaught courses online, while students with slow learning progress can repeatedly learn the contents of the last lesson after class, so as to further consolidate the learning content. With the development of network education, it has become a consensus in the current international educational technology evaluation to complement the advantages of traditional learning and network learning so as to achieve a better learning effect. In short, blended teaching is becoming one of the most popular forms of education reform.

3.2. Experimental Design

In constructing information system needs to choose the appropriate technology, this topic from online teaching requirements, and on the basis of synthesizing various technical characteristics, select J2EE + SQL Server2012 + B/S combination of technology, the technology can solve the difficulties facing the system build process, can be successful build online teaching system, the technical basis for the implementation of online teaching system. Based on this, many maintenance difficulties will arise when the system is scaled up and used for a long time, so using SSH architecture is a good method. This experiment is conducted by myself to track the teaching progress and the teaching tasks according to the teaching syllabus of a university. The experimental class and the control class both use the same teaching content to conduct the comparative teaching experiment. The evaluation results are shown in Table 1.

| Table 1. Evaluation results |
|-----------------------------|

3
4. Discussion

4.1. Analysis of Online and Offline Hybrid Teaching System based on Network Information Technology

As shown in Figure 1, based on the statistics of the two groups of students' normal learning conditions under the teaching platform, it can be seen that the teaching system can provide more flexible assessment methods and options. The examination adopts the method of random sampling, and the question bank adopts the method of random sampling. The types of questions are composed of two forms: first, random selection, each candidate's answer questions are different; Second, the questions are the same, but each examinee's question number is different. The test paper will be randomly generated and the deadline will be set. In order to prevent students from plagiarizing each other, we can take the form of increasing response to students who have finished the response earlier, so that they are in a hurry and have no time to assist other students to complete the cheating. The form of the test questions can also be transformed into multiple forms. Some of the multiple-choice questions can be changed into judgment questions or fill-in-the-blank questions flexibly. The system will be shut down immediately after the timing of the test, and all candidates will be forced to withdraw from the system to maintain the fairness of the test. The system will transfer the examinee's test papers to the test bank and automatically assign them to the marking teacher for correction.

| The dimension                          | Comparative classes | Experimental classes | T   | P   |
|----------------------------------------|---------------------|---------------------|-----|-----|
| The practicability of teaching system  | 43.94               | 50.76               | -1.882 | 0.069 |
| The reaction rate of the teaching system | 31.76               | 32.24               | -0.232 | 0.818 |
| The accuracy of the teaching system    | 30.88               | 29.82               | 0.558 | 0.582 |
| Student involvement in teaching        | 27.88               | 29.89               | -0.856 | 0.398 |
| Students' attention to their major     | 16.35               | 16.76               | -0.225 | 0.824 |

(P > 0.05, no significant difference, P < 0.05, significant difference, P < 0.01, very significant difference)
Figure 1. Variation of students' scores between the experimental group and the control group

At the end of the exam, the questions judged by the system can be set to automatically present the score, so that the marking teacher can have a macro grasp of the overall response quality of the examinee. At the same time, the practice of informing students of part of their scores immediately after the exam helps students to immediately understand their learning deficiencies, strike while the iron is hot, and timely check for gaps. This form also helps to prevent students from falling into the mentality of excessive freedom and indulgence after exams. Students can also check their learning effects through the establishment of class records query, class assignments query, test results rankings and other ways to achieve. In particular, it is necessary to guard against the authenticity of the identity information of online examinees and prevent the behavior of substitute examinees and substitute examinees, which need to be assisted by more strict technical means, such as capturing the profile picture information of the examinees during the exam, or establishing a video monitoring system during the whole process. In addition, the degree of difficulty of the test is a very important subject. Order to produce a moderate degree of difficulty, the appropriate score rate of the test is a test of the professional ability of the teacher. By setting questions online, teachers can see the comprehensive scores of each question in other universities and even other regions, which is very helpful for the teacher to choose questions suitable for the students. For those with low scoring rate, they can be used as the focus of further intensive learning to fill in the gaps.

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As shown in Figure 2, the paired sample T-test was used after the experiment to compare the overall performance of students before and after the experimental class and the control class, and the t-value and p-value were obtained through comparative analysis. Therefore, it can be known that the application of the teaching system has a significant impact on the overall performance of students. The fun and versatility of the teaching system itself is easier to attract students to use it, and the attendance rate also increases significantly. Therefore, it is expected that the performance of students in the experimental group will increase. It is worth noting that after the functional test and unit test of the online teaching system, the online teaching system basically has the functional criteria in the design outline. When the number of users is small, the system can achieve the expected tasks relatively stably, and show a good performance space and operation efficiency. However, when the online user exceeds the index value of 200, the system is faced with the dilemma of low efficiency and slow operation. This is due to the combination of the finitude of threads and the complexity of the traffic. To ensure the stability and efficiency of the system operation, consider increasing the connection pool with a sufficient number of connections to meet the requirement of allowing 1000 people to operate online at the same time. The system originally had a limit of 800 connections, but the reason to redefine it to 1000 is to completely solve the thread tension and reserve buffer space.

![Figure 2](image_url)

**Figure 2.** Test results of the two groups of students after the experiment

Through the operation of the mixed teaching model, the students' learning enthusiasm in the experimental class has been significantly improved, not only their ability to understand the professional knowledge has been improved, but also their interest and enthusiasm in learning have
been unprecedentedly high. Interest is the best teacher. After students develop their interest in learning, they have great enthusiasm and motivation for learning their major. Maslow's theory of self-value realization believes that the realization of college students' self-value in school learning is the best motivation for them to improve their business ability and expand their learning field. Therefore, with the help of the new teaching mode, we can more effectively improve students' learning enthusiasm, stimulate their learning motivation, and effectively improve their learning efficiency and academic performance.

4.2. Suggestions on the Mixed Online and Offline Teaching System based on Network Information Technology

Teaching goal pointed out the direction for the teaching activity, so the teaching system design analysis of the teaching goal in the first place, in the network teaching platform mix in the design of teaching mode of teaching, to set goals, students learn by using the network teaching platform, students can master the knowledge of computer technology, can skilled use of a variety of software technology, can be a variety of information data collection, summary, processing and analysis, so as to improve students' ability of using the network teaching platform independent study, so as to improve the teaching effect.

To some extent, the scientific evaluation method also determines the autonomy and enthusiasm of students in learning. The reform of examination should liberate students from rote memorization, cultivate their independent learning ability, and comprehensively consider students' performance in various aspects at ordinary times. Examination can be divided into comparative economics, an open-book exam performance three way, request for examination in accordance with the requirements of the syllabus student understanding of knowledge and application ability, in extracurricular expand training, put forward the theory with practical application question, lets the student study with questions, will greatly improve the enthusiasm of students in the classroom.

5. Conclusions

Based on the network information technology, this paper constructs a mixed teaching system combining online and offline, and studies the mixed teaching model through its application in teaching. The results of the evaluation of teaching implementation show that students are satisfied with the application of mixed teaching mode in their learning process, which can effectively improve students' learning efficiency and professional level. Increase the utilization of learning resources. This proves the feasibility and plasticity of the mixed teaching model.

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