Design and Development of Digital Teaching Resource Platform for Calculus Course in Colleges and Universities Based on Web

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Abstract. Under the background of technological development, higher education has been continuously integrated with digital electronic technology, and a higher education system based on network platform has been constructed. Calculus, as the teaching foundation of higher mathematics, should take this opportunity to improve teaching methods and enhance teaching effectiveness. Based on this background, this paper constructs a web-based digital teaching resource platform for calculus courses in colleges and universities with electronic information technology as the development support and computer as the development carrier. The overall development of the platform takes Windows 10.0 as the development operating system, B/S architecture as the system development framework, and C# as the program development language. Then, with the layered advantage of MVC, the contents of each part are deployed in layers, and the system functions of the teaching module are refined to ensure the teaching effectiveness of calculus in colleges and universities. The measured results of fuzzy comprehensive evaluation model show that the construction of digital teaching resource platform of calculus course in colleges and universities provides a more effective way to fill the teaching content of calculus.

Keywords: calculus · Digital teaching resource platform · Web technology · MVC mode

1 Introduction

With the release of China's 14th Five-Year Development Plan and the 2035 Vision Goal Outline, "building a high-quality education system" has not only become an education development goal to be adhered to at present and even in the future, but also marks the modernization reform in the field of education officially entered the fast track. [1] With the rapid development of digital electronic technology, the integration of higher education and Internet technology has been further improved. Among them, calculus teaching is a typical representative. Calculus is a practical course, and both its theoretical system and formula algorithm have laid a foundation for other in-depth research and study. This paper applies information technology to the teaching of calculus in colleges and universities, and constructs a digital teaching resource platform of calculus course

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in colleges and universities based on web. The platform carries out detailed functional planning for the problems of abstract definition, fuzzy model and difficult teaching in calculus teaching, and makes these obscure definitions and models vivid and intuitive by using functional models, thus arousing students' interest in learning. [2] The construction of this platform can not only make full use of high-quality educational resources in calculus teaching, but also promote the reform of calculus teaching mode in colleges and universities and improve the problems existing in traditional calculus teaching [3].

2 Development Environment

According to the introduction of the above-mentioned related technical contents, the configuration and deployment of the development environment of digital teaching resource platform for calculus courses in colleges and universities based on web are completed. In order to improve the resource browsing function of the platform, the whole module will be constructed by using web and other related technologies. Visual Studio 2019 is selected as the bottom development tool, Windows 10.0 is used as the development basis for the operating system, B/S architecture is used as the system development framework, and C# is used as the programming language. With the layered advantages of MVC, all parts of the content are layered and deployed. [4] SQL server 2019 is selected as the data storage tool, and IIS 10.0 version is selected as the web server to improve the overall running ability of the online teaching system. Through the description of the above key technologies, the overall framework of the development of digital teaching resource platform for calculus courses in colleges and universities based on web is roughly planned, and the feasibility of establishing the teaching resource platform is clarified.

3 Functional Implementation

3.1 Teacher Side

Resource-Sharing Module

The system divides users into teachers and students, and provides corresponding system functions according to different roles. In order to maintain the security of users' personal information and reduce the risks and problems caused by VPN account theft, the system will use account input and code scanning to log in. [5] The login QR code of the page will be refreshed after 2 min to ensure the security of the user's account.

In view of the problems of single content and outdated resources in calculus teaching in colleges and universities, this paper specially sets up a resource sharing module for teachers to learn and refer to. In this module, teachers and users can use the platform function to add and upload courseware. [6] After uploading, teachers and users can use Course Display.aspx to display the uploaded courseware in their personal space. Teachers and users can also browse other people's courseware in the resource center and discuss with the help of the comment function. Young teachers can learn teaching methods by observing excellent teachers' courseware, correct their teaching attitude and

promote the development of professional knowledge and ability. Course resource upload code is as follows:

```
// Manual implementation process
private void upload(HttpServletRequest request) throws IOException,
  UnsupportedEncodingException {
 /*
 request.getParameter(""); // GET/POST
 request.getQueryString(); // Obthe data submitted by get
 request.getInputStream(); // Get the data submitted by post */
```

Online Evaluation Module

After uploading the resources, teachers and users need to plan the tasks of students' online learning to ensure the effectiveness of online learning. In the central module in the background, teachers and users can conduct data surveys on students' schoolwork completion, homework completion and the use of question bank, and the data results will be used as a reference for grading students' grades. [7] After students complete online learning, teachers and users need to adopt multiple evaluation methods to comprehensively evaluate the achievements of the learning subjects. According to the actual application, the system will construct the evaluation standard of learning effect and conduct simulation test, as shown in Table 1. In the simulation test, 10 students and 5 teachers were selected as the evaluation subjects, and the system was simulated and scored. The scoring results are shown in Table 2. According to the scoring results, the system uses the coefficient of variation algorithm to determine the weight of each observation point, and finally completes the final score. The calculation formula of variable coefficient is shown in Formula 1, where A_j is the standardized mean, S_j is the standardized mean square deviation, and V_j is the coefficient of variation. The weight calculation formula is shown in Formula 2, and λ is the weight value [8].

$$V_j = \frac{\sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(r - A_j\right)^2}}{\frac{1}{n}\sum_{i=1}^{n} r} \tag{1}$$

$$\lambda = \frac{V_j}{\sum_{j=1}^{n} V_j} \tag{2}$$

3.2 Student Side

In the student-side learning module, student users need to carry out follow-up learning according to the learning tasks assigned by teachers in advance. Because of the difficulty in learning some knowledge of calculus and the strong connection between knowledge

Table 1. Learning effect evaluation system

No.	Observation point	Grading standards
1	A1: Learning time	Excellent: 5 points Good: 3 points General: 2 points Poor: 1 point
2	A2: Course content	
3	A3: Number of interactions	
4	A4: Answering exercises	
5	A5: Homework completion	

Table 2. Final scoring results

	A1	A2	A3	A4	A5
Student S1	5	5	3	2	3
Student S2	3	5	5	3	2
…					
Student S10	5	3	3	3	2
Teacher T1	3	5	3	2	2
…					
Teacher T5	3	3	5	2	2
Standardized mean	3.375	3.750	4.000	2.875	2.875
Standardized mean variance	1.060	1.035	1.069	0.991	1.457
Variable coefficient	0.314	0.276	0.267	0.344	0.506
Weighted value	0.183	0.161	0.156	0.201	0.296

theory and knowledge theory, it is difficult for students to ensure the teaching effect by autonomous learning. Therefore, the platform will make a detailed linear planning for the course learning order of student users and adopt a spiral course organization form to start teaching. [9] For example, after understanding the content of the theorem, learn the differential calculus of unary function and the integral calculus of unary function, and then learn the ordinary differential equation on the basis of understanding the previous content. This simple learning method can better arouse students' interest in learning and consolidate their basic theoretical knowledge.

After learning, student users can use the question bank function of the platform to test their knowledge. In the question bank, students can choose their own test or practice mode. The test mode mainly focuses on examination paper, while the practice mode focuses on exercise simulation, and students can get corresponding credits after completing the answer. The wrong questions of student users will be automatically included in the wrong question set, which can be viewed in the exercise section under my center [10].

4 Conclusions

This paper takes the teaching situation of calculus in colleges and universities as the main research object, and puts forward a more comprehensive application solution in view of the new requirements of building a high-quality comprehensive subject system and the new orientation of the training goal of innovative technical talents in the new period. The construction of digital teaching resource platform not only improves the effectiveness of course teaching, but also takes into account students' independent learning and comprehensive and balanced growth. At the same time, it also promotes the transformation of teaching mode, makes the teaching system of calculus more perfect, and further makes a favorable attempt for the information construction of resource platform of higher education.

The first-class course "Calculus" at school level (2020. No. 41).

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