Design and Application of Online Teaching Platform in Colleges and Universities under the Background of Internet Plus Vocational Education

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Abstract. At present, the mode of "Internet Plus Vocational Education" has become an important engine to promote the high-quality and characteristic development of vocational education. In this regard, this paper takes the current educational model of higher vocational colleges as the research object, and based on the many shortcomings faced in the process of education and teaching, puts forward a design scheme of online teaching platform, and constructs a new educational ecology that meets the training needs of high-quality vocational and technical talents in the new period. The platform is a standard Web application, and the front-end interface includes login, display and various interactive operation functions, while the back-end server is responsible for the deployment and control of system functional logic. During the construction of the platform, the actual needs of students and teachers will be fully considered, and the network and digital transformation of teaching process will be realized from the aspects of teaching content, teaching form and assessment. The simulation test results of the platform show that each function runs smoothly and the data analysis and processing are accurate, which effectively improves students' learning efficiency and enhances their practical operation ability, and promotes the application of online teaching in teaching practice.

Keywords: Internet Plus Vocational Education; Online teaching platform; Web technology; Computer software application

1   Introduction

At present, the rapid development of digital information technology is leading all industries in China to accelerate the completion of digital transformation and upgrading. The innovative form represented by "internet plus" will emphasize the all-round changes in production, work and lifestyle brought by Internet technology. [1] Among them, in the field of vocational education in China, the innovation of the Internet can

set off a subversive change in informatization, touch the deconstruction and recon-struction of traditional education models, and be conducive to the informatization construction and integrated application of vocational education in China in the new era. With the deepening of the Implementation Plan of National Vocational Education Reform, it is the only way for colleges and universities at all levels to actively prac-tice the concept of high-quality development of vocational education in the new era to build a "internet plus Vocational Education" model that meets their own characteris-tics and needs. In view of the shortcomings of traditional teaching mode, such as lack of teaching innovation, outdated content, fixed form and one-sided evaluation, how to really give full play to the practical advantages of "internet plus" technology to solve the pain points in the process of education and teaching practice is the top priority of current work in colleges and universities. [2] In view of this, this paper holds that the construction of "internet plus Vocational Education Model" in colleges and universi-ties is bound to be based on the online teaching platform, and the place, mode, evalu-ation and organization of teaching and learning will be networked and digitized. [3] The design and implementation of online teaching platform will also fully consider the actual needs of students, teachers and users, and integrate the application ad-vantages of Web technology, database technology and computer software technology, with function realization as the core, promote the adjustment and optimization of teaching process, improve teaching service and management mechanism, and make contributions to the modernization of vocational education.

2   Development process

The overall design and implementation of online teaching platform in colleges and universities will go through many links, such as goal planning, demand analysis, product design, program development, simulation testing, deployment and operation. [4] Among them, program development, as a key step in the overall development process, mainly involves two technical lines: front-end interface and back-end server. First of all, the front page is built with jQuery framework as the core and Ajax asyn-chronous refresh technology, aiming at improving the visual display effect of the system and creating a key channel for user interaction. Secondly, the development of the back-end server needs to use the mature Web framework to complete the deploy-ment and regulation of various business logics, and also needs to clarify the connec-tion and interaction mode of the database and front-end pages. Conventional Web frameworks mostly focus on "request/response" mode, and reduce the coupling be-tween modules according to MVC specification to realize agile development on the server side. [5]

The basic development environment of online teaching platform in colleges and universities will be configured according to the "J2EE" system, which mainly in-cludes the underlying operating system, development toolkit, language environment, integration tools and database. [6] In terms of version selection, the operating system is Windows 10.0 x86-64bit, the development language is Java, JDK version 1.8.0_251, the Web server is Apache Tomcat 9.0, the database is Oracle 11g, and the

integrated development tool is Eclipse Neon 4.6.2. Under Eclipse, according to SpringMVC framework, corresponding Java files are created, which are Controller layer, Dao layer, Service layer and entity layer respectively, and the corresponding configuration is completed in turn, forming the basic framework of platform functional modules. [7] Figure 1 shows the execution flow of Spring MVC, which involves several components such as DispatcherServlet, HandlerMapping, HandlerAdapter, Handler, ViewResolver and View.
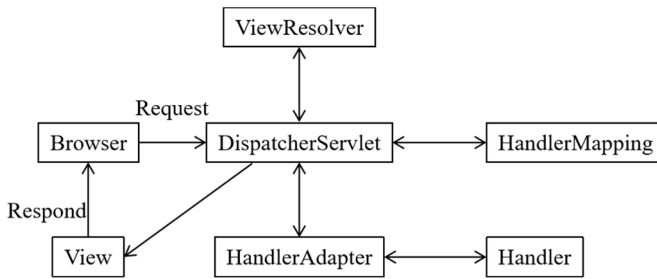

Fig. 1. The execution flow of Spring MVC

When the functional modules are designed, all the files are packaged and published on the server, and all the public interfaces are set up to facilitate users' remote login and access. Through the introduction of the above key technical theories, the overall environment of system development, the configuration of related software and tools are determined, and the technical feasibility of the overall project of online teaching platform in colleges and universities is also clarified.

3 Functional implementation

3.1 Student side

a. Online learning

The platform has a unified login interface, and student users can enter a unique account and password for identity authentication and complete the login and use of the platform. Under this module, the platform will upload video courses, ppt courseware materials, micro-courses, after-school exercises, simulation tests and other forms of teaching content in advance according to the actual curriculum arrangement, so as to facilitate students to complete online learning. In addition, the platform will also cover extensive teaching resources such as ideological and political education, cultural accomplishment, innovation and entrepreneurship, mental health and so on, forming a multi-dimensional and three-dimensional curriculum system, which is beneficial to improving students' learning autonomy and making up for the lack of classroom teaching content. [8]

b. Simulation practice

Vocational education aims at cultivating high-quality professional skills talents, and a large number of experimental and practical courses will be involved in the teaching practice. Under the traditional teaching mode, practical teaching is not highly valued, and it is easily restricted by factors such as space, equipment and teachers. [9] In this regard, the platform can integrate a large number of dynamic graphics, video images and Flash animations, build a large number of simulation scenes, help students to quickly integrate into actual cases, and further deepen their understanding of theoretical knowledge with immersive and experiential teaching methods, so as to broaden their horizons and stimulate their interest. More effectively strengthen the students' practical ability and innovation ability.

3.2   Teacher side

Under the online teaching platform in colleges and universities, the functional authority of teacher users is mainly composed of three parts: student management, resource management and teaching management. Among them, the resource management module can support teachers and users to add, delete, query and modify various types of online teaching resources. When a teacher user uploads resources online, the platform will obtain the user's request through the MultipartHttpServletRequest interface, and transform the request into a type object matching the interface. [10] After the resources are uploaded successfully, they will be automatically saved in the database of the platform. Table 1 shows the design table of teaching resources.

Table 1. Teaching resource design table in the database

Field name	Data type	Restrain	Description
Resource ID	int	PRIMARYKEY,AUTO_ INCREMENT	Unique identification
Resource name	varchar(50)		
Type ID	int		
Form	varchar(10)		
Filesize	int		
Source	varchar(50)		
Contributor	varchar(50)		
Upload time	Datetime		
Resource profile	varchar(100)		

As an important part of teaching management, assessment is an important criterion for judging the effect of online learning for students. The platform can capture the complex learning behavior data generated by student users in the platform in real time, and construct the evaluation system standard of learning effect. Table 2 shows the evaluation standard of online learning effect.

Table 2. Evaluation system of online learning effect

Primary index	Secondary index	Grading standards
Learning attitude C_1	Study duration C_{11}	$\geqq$ 3 hours/time: 5 points $\geqq$ 1 hours/time: 3 points $\leqq$ hours/time: 1 point
	Login frequency C_{12}	$\geqq$ 7 times/week: 5 points $\geqq$ 5 times/week: 3 points $\leqq$ 5 times/week: 1 point
Learning process C_2	Practice completion rate C_{21}	$\geqq$ 80%: 5 points $\leqq$ 80%: 3 points $\leqq$ 60%: 1 point
	Resource learning rate C_{22}	$\geqq$ 90%: 5 points $\leqq$ 90%: 3 points $\leqq$ 70%: 1point
Learning out-come C_3	Examination performance C_{31}	$\geqq$ 90: 5 points $\leqq$ 90: 3 points $\leqq$ 60: 1 point
	Usual performance C_{32}	$\geqq$ 30: 5points $\leqq$ 30: 3 points $\leqq$ 10: 1 point
	Practice performance C_{33}	$\geqq$ 85: 5 points $\leqq$ 85: 3 points $\leqq$ 60: 1 point

The platform compares each index value in pairs to determine its importance, and completes the construction of judgment matrix according to the provisions of comparative quantized values, as shown in Formula 1. According to the judgment matrix, the elements of each row are normalized by the AHP hierarchical analysis method and then summed, and the obtained row vector is normalized twice to get the ranking weight vector W, and the corresponding weight λ_{max} is calculated by the sum-product method, as shown in Formula 2. [11] After the weight of each index value is determined, the platform automatically calculates the teaching effect score.

In order to verify the running status of the evaluation function of the platform, the platform uses the actual use data of 50 students to carry out simulation tests. The test time is 1 week, and the final platform simulation test results are shown in Table 3. The simulation test results show that the platform can conveniently and quickly complete the evaluation of teaching effect, correct the one-sidedness of the traditional evaluation methods, and then clarify the influence degree of various learning behaviors on grades, which provides a basis for improving the effectiveness of vocational education and teaching.

$$C = \begin{bmatrix} C_{11} & C_{12} & C_{13} \\ C_{21} & C_{22} & C_{23} \\ C_{31} & C_{32} & C_{33} \end{bmatrix} \tag{1}$$

$$\lambda_{max} = \sum_{i=1}^{n} \frac{(CW)_i}{nW_i} \tag{2}$$

Table 3. Evaluation results of online learning effect

	Primary index	Secondary index	Weighted value	Item score	Average score
Learning effect score	Learning attitude C_1	Study duration	C_{11}=0.051	3.78	80.36
		Login frequency	C_{12}=0.101	3.66	
	Learning	Practice completion rate	C_{21}=0.073	4.02	

	process C_2	Resource learning rate	C_{22}=0.070	3.94	
	Learning	Examination performance	C_{31}=0.161	87.2	
	outcome C_3	Usual performance	C_{32}=0.097	25.3	
	...	...	...		

4   Conclusions

In order to promote the reform of teaching mode in vocational education colleges, this paper puts forward a design scheme of online teaching platform based on many shortcomings in the process of education and teaching. The platform reshapes the whole process and all aspects of teaching activities, and creates a new ecology of online teaching of vocational education in colleges and universities from the aspects of teaching innovation, teaching content, teaching form and assessment. In the follow-up research, the platform should further enrich the interactive operation forms of users, strengthen the realism of simulation practice, and make an attempt for the modernization and intelligent construction of higher education.

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