

Design and Implementation of Teaching Resource Platform for Higher Vocational Institute

Taizhi Lv^{1, a}, Xuejun You^{1, b} and Jun Zhang^{1, c}

¹School of Information Technology, Jiangsu Maritime Institute, Nanjing 211170, China.

^alvtaizhi@163.com, ^b68151247@qq.com, ^c1052871890@qq.com

Abstract

Teaching resources construction is one of the main contents of “double high construction” for higher vocational institute. The main goal of the resource base platform is to integrate and develop high-quality teaching resources of various majors on the one hand, on the other hand, to introduce and absorb the resources of relevant majors and related industries at home and abroad. The development of teaching resource database platform uses the current mainstream Java EE framework. In the implementation, the mainstream framework of S2SH is adopted. According to the CMMI3 specification, the teaching resource platform is developed and implemented in seven stages, including requirements, planning, design, coding, integration, testing, implementation and maintenance.

Keywords

Teaching Resource Platform, Java EE, S2SH Framework, MVC model, AJAX, Jfreechart, CMMI3.

1. Introduction

Whether globally or nationally, there is an imbalance in resources. In the field of education, the same is true. There is a serious imbalance between teachers' resources and teaching materials' resources [1]. As a university, it has the responsibility and obligation to improve the quality of the whole people. By building an open teaching resource bank, it can better play its educational role. For our country, it can make up for the imbalance of teaching resources, so that high-quality teaching resources can be used by students in more areas and the people, and improve the cultural quality of the whole people.

China's higher vocational colleges are in a period of rapid development. Creating a platform for teaching resources in higher vocational colleges is one of the main contents of the construction of National Demonstrative Higher Vocational Colleges. It is different from the construction of key institutions of higher learning. In order to meet the needs of students' autonomous learning and build a public platform for the cultivation of high-skilled talents and the construction of lifelong learning system, the elements of process system, teaching content, experimental training, teaching guidance and learning evaluation are included.

2. System Design

The main goal of the platform is to integrate and develop the high-quality teaching resources of all the specialties in the school on the one hand, but also to introduce and absorb the resources formed by the relevant specialties and industries at home and abroad. Universities should pay special attention to the development of original resources with independent intellectual property rights and the introduction of advanced and mature teaching resources at home and abroad. In the construction scheme, we should fully consider the principles of openness,

sharing, scalability and high reliability of the system, focusing on the technical architecture design, functional module design, resource development interface design, network teaching application module design, resource inter-school sharing module design, resource management module design. In terms of interface requirements, it is necessary to have excellent human-computer interaction characteristics.

2.1. Functional Design

In the design of system processing function, every module has a strong cohesion, and the coupling between modules is low. This information management system is composed of two functional modules: front-end display and back-end management. The main functions of the system are shown in Table 1.

Table 1. Background-end Function Module

Module	Functional Description	Sub Module
User Management	Realizing the Management of Platform User Information	Information Management
		privilege Management
		Log In
		Log Out
Department Management	Implement the Management of Secondary Colleges and Departments	Information Management
		Speciality Management
Speciality Management	Implement detailed professional information management	Information Management
		Talent Training Plan Management
		Professional Management
Course Management	Provide detailed school courses, so that users can clearly see	Information Management
		Resource Management
Notice Management	Release the latest notice of the school	Notice Browse
		Notice Management
Teacher management	Users have a clearer understanding of the basic information of school teachers	Teacher Browse
		Information Management
Index Management	Make the homepage richer and clearer	Index
		Context Management
Module and Layout Management	Make the homepage module more refreshing and enrich the platform pages	Module Management
		Layout Management
Resource Collection Management	Complete the collection of relevant teaching resources	Crawler

2.2. Architecture Design

The platform adopts B/S structure. B/S structure is divided into three levels: Web browser, middle layer and background database server [2]. The middle layer refers to the software that runs in the server and connects the Web browser with the background database server. The

middle layer of the platform adopts a three-tier structure solution based on Java EE, and the database server adopts My SQL database. The communication between middle layer and database layer adopts JDBC technology and database buffer technology [3]. The development of the middle layer adopts MVC mode, and uses a new web application framework - Sstruts2 + Spring + Hibernate [4]. JFreeChart is used in data presentation. Ajax can improve system performance and get a good user experience [5]. Ajax technology is used in many places on the platform .

The platform of teaching resource database in higher vocational colleges is developed according to CMMI 3. According to the CMMI3 specification, the platform is developed and implemented from seven stages: demand, plan, design, coding, integration, testing, implementation and maintenance.

2.3. Database Design

In the establishment of database, the platform of teaching resource database uses MySQL database, because it is short, concise and easy to operate [6]. The requirement of platform data is fully considered. The database mainly contains the following parts: (1) basic information, including department table, professional table, teacher table, student table, dictionary table and other basic data; (2) resource database table, including curriculum schedule, curriculum outline table, video resource table, courseware table, e-book table, sample book table, experimental training table and other resource data. (3) Interaction table, including interactive data such as course forum table, teacher blog table and student homework table.

2.4. UI Design

The platform of shared teaching resource database in higher vocational institute abides by the following interface design principles as much as possible:

- (1) Information Minimum Principle. The interface is simple and easy to use, and each page should have its own function as far as possible.
- (2) User Principles. The basic principle of sharing teaching resources in higher vocational colleges is user-friendly.
- (3) the principle of prompting. Shared teaching resource database platform in higher vocational colleges can give user's operation commands humanized hints.

3. System Implementation

The management platform of teaching resource database is developed by MVC mode. Following is a layered introduction to the implementation of the platform in accordance with MVC pattern.

3.1. Model

Business model design can be said to be the most important core of MVC. This layer deals with business-related logical requests. Because the business logic of this platform is not very complex, the model layer mainly includes entity classes and database operations.

Entity class is a mapping of a table in a database. Each table in the database has its corresponding entity class. The database operation is mainly accomplished by the persistence layer of Spring and Hibernate integration [7].

3.2. Controller

Controller can be understood as receiving requests from users, matching models with views, and completing user requests together. The role of dividing the control layer is also obvious. It clearly tells you that it is a distributor, what kind of model to choose, what kind of view to choose, and what kind of user request can be completed.

- (1) Action

The platform adopts Struts2 framework, and the control layer is composed of core controller FilterDispatcher and user-written business controller. FilterDispatcher, the core controller, is the basis of Struts 2 framework, which includes the internal control process and processing mechanism. Business Controller Action and Business Logic Components are implemented by users themselves. Users need to write configuration files for core controller FilterDispatcher while developing action and business logic components.

The struts.XML file is the core of the whole Struts2 framework. The core configuration file of Struts 2 framework is struts.XML configuration file, which is mainly responsible for managing the business controller action of Struts 2 framework. The control of the whole project is configured in the whole file. The main task of struts 2 is to configure and write actions [8].

(2) Interceptor

Interceptor is the core of Struts 2 framework. AOP (Face-Oriented Programming) is realized through interceptor. Using interceptors can simplify some applications in Web development. This system uses the privilege interceptor to realize the privilege checking in Web application. The implementation of the interceptor is divided into two steps: 1) First, write the Java class of the interceptor, which inherits from AbstractInterceptor, and rewrite the intercept method to complete the permission check. The verification process is as follows:

- 1) If the request is LoginAction, go to step 5. Otherwise, go to step 2.
- 2) Interpret whether the user has logged in or not, and if he has logged in, proceed to the next step; otherwise, the page jumps to login.jsp and the process ends.
- 3) Call the Dao class to determine whether the user has permission to operate the Action. If you have permission, proceed to the next step. Otherwise, the prompt does not have operation permission, returns to the previous page, the process ends.
- 4) Record the log. The information recorded includes the type and time of the user's operation. Continue the next step.
- 5) Transfer the request to the next interceptor and the process ends.

3.3. View

View represents user interface. For Web applications, it can be summarized as HTML interface, but it may be XHTML, XML and Applet. With the complexity and scale of applications, interface processing has become challenging. An application may have many different views. The processing of views in MVC design pattern is limited to the collection and processing of data on views and user requests, not to the processing of business processes on views. The platform uses JSP to implement the view layer without any business logic code in JSP. By using Struts2 tag library, it simplifies the difficulty of JSP development, solves the problem of avoiding using Java code in JSP pages, and greatly simplifies page development.

4. Conclusion

Facing the needs of teachers, students, enterprises and social scholars, an open network platform for sharing teaching, learning and using materials of cloud computing technology and application is set up. The platform can serve the construction of specialty, the development of curriculum, the improvement of students'abilities, the training of professionals and enterprises, and the self-improvement of social self-learners.

Acknowledgements

This work was financially supported by the funding of the vocational education research project of industrial and information (2018-2019-57), the higher vocational scientific research subject of computer national computer basic education institute (2018-AFCEC-265), the funding of

Jiangsu QingLan outstanding young teacher project and the funding of professional leader high level study project for Jiangsu higher vocational institute teachers.

References

- [1] Zhang W, Shuai Z, Guo S, et al. Concurrent optimal allocation of distributed manufacturing resources using extended Teaching-Learning-Based Optimization[J]. International Journal of Production Research, 2017, 55(3):718-735.
- [2] Xu X, Yu Z. Logging-On System Integrated B/S and C/S Based on RSA Asymmetrical Encryption and Web Service[J]. Advanced Materials Research, 2010, 129-131:1444-1450.
- [3] Pereira A L, Raoufi M, Frost J C. Using MySQL and JDBC in New Teaching Methods for Undergraduate Database Systems Courses[C]// International Conference on Data Engineering & Management. 2012.
- [4] Zhang Z Y, Zhao, Zi Qi, Cao, Zhi. Dynamic Integration System for Heterogeneous Database Based on S2SH[J]. Advanced Materials Research, 2014, 756-759(756-759):1403-1407.
- [5] Marchetto A, Tonella P, Ricca F. ReAjax: a reverse engineering tool for Ajax Web applications[J]. Iet Software, 2012, 6(1):33-49.
- [6] Linksvayer T, Mikheyev A. Data tables from MySQL database for gene expression analysis[J]. Development, 2015, 130(25):6221-31.
- [7] Yan Z, Jia C, Wang M. Design and Implementation of Middle Layer for Off-line Query Based on JSF and Hibernate Framework[J]. Journal of Software, 2012, 7(2):341-346.
- [8] Roughley I. Practical Apache Struts2 Web 2.0 Projects[J]. Tailieu Vn, 2008, 89(1):77-81.