



Design and Implementation of Web-Based Remote Open College Teacher Training System

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Abstract. Colleges and universities have been looking for appropriate ways to improve teacher training, hoping to find a new way of teacher training through the Internet and emerging technologies. Firstly, the author analyzes the problems existing in the training of college teachers, and develops a long-distance and open training system for college teachers in order to further improve their teaching level and comprehensive quality, and improve their training work. Based on the B/S development structure and MVC design pattern, this paper uses Java development language, Spring, Spring MVC and mybatis framework to build the overall structure and functional modules of the system, and uses mysql as the database of the system to store all kinds of information. The whole college teacher training system mainly realizes the functions of investigating the training needs of college teachers, registering before training, distance training and assessment practice. Teachers' training system adopts advanced architecture in the process of construction to meet the needs of future development, which not only meets the needs of current teachers' training, but also has a flexible design, and each functional module can be modified according to the later needs. The development of this system provides a feasible reference for the training of college teachers, and promotes the reform of teacher training system.

Keywords: remote open · Java language · SSM framework · teacher training system

1 Introduction

In order to further promote the policy of building double-first-class universities, all universities must strengthen training and teachers' comprehensive quality, which is also one of the ways to improve the comprehensive strength of universities [9]. At present, with the expansion of enrollment in colleges and universities, the demand for teachers has increased and the number of teachers has increased rapidly. With the development of teaching level and the expansion of students in colleges and universities, the requirements for professional quality and theoretical level of college teachers are getting higher and higher. Teachers with high comprehensive quality play a vital role in the development and cultivation of students. Teachers' professional ability comes from their accumulated experience, skills and knowledge in the long-term study, work and

teaching process. However, this accumulation among teachers is quite different due to different qualifications and environments, which leads to uneven teaching level and professional ability of teachers [4]. By training teachers in stages, the gap between teachers can be gradually eliminated, and teachers' professional ability and overall quality can be comprehensively improved. In order to implement the national education policy, ensure the practical improvement of the comprehensive quality of teachers, and build a large-scale, high-level and balanced development of teachers, colleges and universities must optimize and perfect the current teaching and training system [8]. The basic condition for the development of colleges and universities is to have good teaching quality and high-quality teacher resources. Therefore, the implementation of scientific and effective methods to manage and train college teachers can effectively improve the comprehensive teaching level of colleges and universities while improving the management level of colleges and universities. In the process of training, college teachers can learn new teaching methods, learn more professional knowledge and improve their teaching strength. At present, the forms of teacher training in colleges and universities mainly adopt two modes: unified offline training and teachers' self-training. Both modes have some defects, such as inflexible training time and place, inadequate training content, imperfect training information management system, insufficient combination of theory and practice, and high training cost. In the traditional training system, there is a lack of correlation between modules, and the sharing of training resources is not really realized. The data information and high-quality teaching resources in the system cannot be completely shared with each other, so that a complete network training system cannot be formed [7]. Many teachers take part in training with high repetition, so they can't carry out hierarchical and spiral training, which can't reflect the effectiveness of teacher training results. At the same time, when the school arranges the training, it does not consider whether the specialty and teaching content are consistent with the actual needs of teachers, so that the training can't meet the needs of trainees to improve their personal teaching level and comprehensive ability. If colleges and universities continue to use the existing training system to carry out teacher training, teachers' enthusiasm for training will be reduced, which will have a serious negative impact on the improvement of the overall teaching level of colleges and universities. If it continues, colleges and universities will eventually be unable to develop to a higher level [1]. For colleges and universities, it is a rigid demand to build a teacher training mechanism that closely links the training links. Therefore, colleges and universities need to design and establish a set of perfect teacher training system to solve the problems existing in the current teacher training work and implement the training mode of "teaching teachers according to their aptitude". Combining with the actual situation of teacher training, this paper will use Internet means combined with B/S architecture, and apply Java language and SSM framework set to realize a long-distance open training system, so that teachers can experience a good and targeted training experience at a low cost. They can not only get rid of the time and space constraints, but also conduct training practice assessment and discussion feedback online, so as to strengthen the construction of teachers and strive to improve the teaching quality and comprehensive quality of teachers.

2 Technical Overview

2.1 Java

Java is an object-oriented programming language, which is usually used to develop system application programs. Java has injected the unique characteristics of object-oriented languages such as classes, methods, interfaces and inheritance. In order to highlight the characteristics of simplicity, Java only supports single inheritance between classes, but supports multiple inheritance between interfaces, and supports the implementation mechanism between classes and interfaces (the key word is implements) [5]. Compared with C++ language, which only uses dynamic binding for virtual functions, Java language supports comprehensive dynamic binding.

When it comes to classes and methods, we must talk about method rewriting and method overloading in Java. In Java, method rewriting is mainly manifested in the inheritance relationship, that is to say, when subclasses inherit the parent class, subclasses will have all the characteristics of the parent class and all the methods and variables. We can rewrite the methods in the parent class to realize that the functions of the subclasses inherit the functions of the parent class while the functions of the subclasses have their own unique contents. In this way, the underlying functions of the parent class are followed, and the subclasses are defined differently. Note that the overridden method name and parameter list must be the same as the parent class, and the return value range, throw exception range and access modifier range must be greater than or equal to the parent class. If the parent class method access modifier is private, the child class cannot override this method. Method overloading refers to defining multiple methods with the same name in a class, but each method is required to have a different parameter type or number, as shown in Fig. 1, which is an example code of Java method overloading. Method overloading is usually used to create methods that accomplish a similar set of tasks, but have different parameter types, number or order. Java's method overload means that you can create multiple methods in a class. They can have the same name, but you must set different parameters, different number of parameters, or define different parameter types. When a method is called, it is decided which method to use by the different numbers, types of parameters passed to them and the order of incoming parameters.

2.2 SSM Framework

SSM framework is a collection of spring, spring MVC and mybatis frameworks. Spring's main job is to realize business object management, and spring MVC's main job is to forward requests and manage views. The workflow of springMVC is shown in Fig. 2, and mybatis's task is to provide persistence engine for data objects. The standard of SSM framework set design and operation is MVC mode, so the standard SSM framework is divided into four layers, namely dao layer, service layer, controller layer and View layer [3].

The functions of each layer are as follows: Dao layer, also known as data persistence layer, is mainly responsible for interacting with the database and encapsulating some database-related tasks. If you want to be a data persistence layer, you need to first set the interface connected to the database, then open the configuration file of Spring to add

```
public class Demo {  
    //An ordinary method with no parameters and no return value.  
    public void add(){  
        //method body  
    }  
    //Overload the above method with an integer parameter and no return  
value.    public void add(int a){  
        //method body  
    }  
    //Overloaded the above method, with two integer parameters, and  
the return value is int.  
    public int add(int a,int b){  
        //method body  
        return 0;  
    }  
}
```

Fig. 1. Method overloading sample code

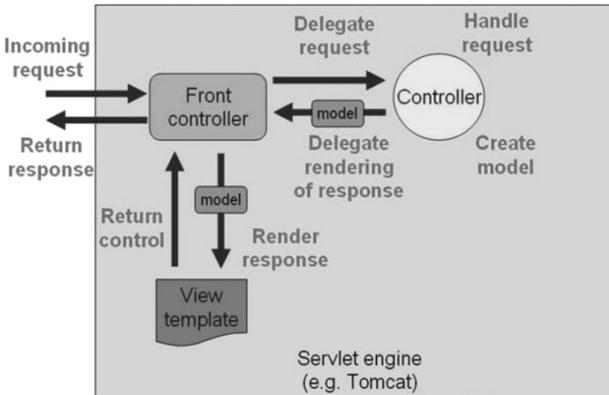


Fig. 2. Workflow of the springMVC

the class that implements the interface, and then open the corresponding module to call the set interface to handle data business. The configuration file of Spring is responsible for storing and configuring data sources and parameters related to database connection. Service layer is also the business layer. Its role is to design the logical application of business modules, first design interfaces, then define real classes, and finally configure the association of its implementation in the configuration file of Spring. The implementation of the business logic layer should be called to the defined Dao interface, so that the Service interface can be called in the application for business processing. The Controller layer (Handler layer) is the presentation layer, and its main job is to control and allocate specific business module processes. The configuration is the same as that of the Service layer and stored in the configuration file of Spring. When controlling the business process, you need to call the interface provided by the Service layer, and allocate the corresponding controller according to the business process. In the development of the project, the programmer can sort out and abstract the process according to the specific requirements, and design the reusable sub-unit process module. The role of View layer is closely

combined with the control layer, and it is mainly responsible for the representation of jsp pages in the foreground. After the Dao is established, the service layer is established. Because the service layer calls the interface of the Dao layer and provides the interface to the controller layer, the service layer is located below the controller layer. Each model has a service interface, and each interface encapsulates its own business processing method.

The relationship among the four layers: The data persistence layer and the business layer have a low coupling degree because of their different functions, and they are usually developed separately, so that this mode can be fully utilized in the development of large projects. Because the control layer and the view layer are highly coupled with each other, they must be combined in development. In this way, developers only need to know the definition of interfaces between different levels and call the designed interfaces to realize the corresponding logical unit application of the project.

2.3 Development Process

The development of this teacher training system is completed under Windows 10 operating system, and the development software used are JDK (including JRE and development kit), eclipse, Tomcat and MySQL. Next, install and deploy the development software

```

<dependencies>
  <dependency>
    <groupId>mysql</groupId>
    <artifactId>mysql-connector-java</artifactId>
    <version>8.0.22</version>
  </dependency>
  <!--mybatis-->
  <dependency>
    <groupId>org.mybatis</groupId>
    <artifactId>mybatis</artifactId>
    <version>3.5.1</version>
  </dependency>
  <dependency>
    <groupId>org.mybatis</groupId>
    <artifactId>mybatis-spring</artifactId>
    <version>2.0.1</version>
  </dependency>
  <!--spring-->
  <dependency>
    <groupId>org.springframework</groupId>
    <artifactId>spring-webmvc</artifactId>
    <version>5.2.0.RELEASE</version>
  </dependency>
  <dependency>
    <groupId>org.springframework</groupId>
    <artifactId>spring-jdbc</artifactId>
    <version>5.1.8.RELEASE</version>
  </dependency>
</dependencies>

```

Fig. 3. Key code for adding dependencies in pom.xml

environment. First, download and install jdk-8u92-windows-x64 version, add it to the system environment variables after installation, and enter javac in dos command line to test whether the installation is successful. Then download and install eclipse, Tomcat and MySQL, complete the connection configuration, integrate Spring, springMVC and mybatis frameworks in eclipse, start eclipse to create a new Maven project and add web support, import all required dependencies into pom.xml file, as shown in the figure, namely add the key code of dependencies, and then add Maven resource filtering in pom.xml. Establish the basic structure and configuration framework in the main directory, complete the configuration of spring and mybatis in the file spring-mybatis.xml, complete the configuration of Spring MVC in spring-mvc.xml, configure the database connection pool in jdbc.properties, and complete the configuration of log output in log-back.xml. Finally, write a index.jsp to start Tomcat for testing, and run the jsp page to show that the configuration is successful. On the basis of the deployment of the above development environment, it has good feasibility support for the development of teacher training system (Fig. 3).

3 Requirement Analysis

3.1 System Requirements Analysis

The system adopts B/S architecture, and users can use it in any access network environment through a browser without installing a client. According to the role of users, the system functions are divided into two clients, namely, the teacher client and the management client. The management client mainly realizes the recording and statistics of teachers' information by managers. The information is stored in the database according to a certain type and sequence, so that the data can be backed up and restored conveniently, without worrying about the loss of data, thus ensuring the integrity and security of teachers' information. Management can also find out which aspects of teachers are missing or need to be strengthened by analyzing the statistical results of the registration intention form filled out by teachers when they sign up independently. Differentiating and distributing the training content can strengthen the training of such skills in a targeted way. At the same time, it is necessary to meet the demand of quick query of data information in the system, so as to reduce the management workload of managers in training, improve work efficiency, and assess the training results of teachers, so as to test whether the training courses of teachers are applicable.

In the teacher end system, the training registration module has the questionnaire function to meet the differentiated training needs of teachers. Interaction and feedback are conducive to the achievement of training objectives. The teacher training system meets the needs of teachers who participate in training to obtain teaching resources in time. The system should have the functions of teaching, training and resource sharing, and can be assessed online to test its own training results. In this way, colleges and universities can meet teachers' individualized training needs, improve teachers' professional quality and build excellent teachers' team, thus improving the comprehensive development of colleges and universities.

3.2 Global Design

The teacher training system in this paper is designed based on B/S architecture. JAVA language and SSM framework are used to build the server of the system, and MySQL database is used to store the system data. The specific interaction process is as follows: the user sends the request to the server through the browser page, and the server parses it and sends it to the Controller. The controller calls the service layer to process the business logic, and the logic layer sends a request to the dao layer. The persistence layer correspondingly extracts the data from the database and sends the results back to the business layer, and the business layer logically forwards the processed data to the controller, which then calls the corresponding view template to display the data [6]. The calling sequence is: the web page sends a request to the web.xml (configure the front-end Controller) and then passes it to the applicationContext.xml to start annotation scanning, then calls the controller interface (@Resource injects Service, calls Service), the service injects dao, calls dao, and DAO starts the Mapper interface mapper to complete the specific database operation. Among them, the Service layer should not only call the interface of DAO layer, but also provide the interface to the class of Controller layer for calling. It is just in the middle layer, and each model has a Service interface, and each interface encapsulates its own business processing method.

4 Functional Implementation

4.1 Teacher End

Training registration module: Before receiving training, teachers log in to the system through their ID number and need to fill in the training demand intention questionnaire, which includes the current professional title, professor's major, training direction to be received, etc., and then can register online. After the registration is successful, the system will automatically send the successful registration information and the detailed information of the reported training courses to the teachers in time by SMS and email, and the teachers can log in to this module again to view the training details.

Online training module: The online training module is divided into two sub-modules of online teaching and resource sharing. After the teacher logs in to the system through authentication, according to his own training needs, he chooses the study subjects for training, and the training progress will be synchronized to the management side, and the management will supervise the training of the teachers throughout the process. In addition to watching teaching videos or teaching documents, teachers can also download high-quality resources published by others or upload their own high-quality courseware in the resource sharing sub-module, so as to learn from each other, realize resource sharing and improve the resource utilization rate of [10].

Evaluation module: The training teachers are assessed and evaluated through two sub-modules: online testing and practice assessment. Only through the assessment can the training be concluded. The online testing sub-module innovatively adopts the technology of "intelligent test paper generation", that is, the test paper is intelligently selected according to the prescribed standards and objectives instead of randomly selecting the test paper to evaluate the teachers, so as to realize the comprehensive evaluation of

the knowledge system and make the evaluation results more effective [2]. The practice examination sub-module is mainly for teachers to apply their learned skills to practical teaching and test their training results. Through live online video courses, students randomly selected by the system are remotely face-to-face in practice teaching. This examination form is scientific, objective, fair and just, and can improve teachers' professional level and practical teaching ability.

Interaction and feedback module: It is divided into three sub-modules: message board, forum and experience. In the message board, teachers can post their own opinions and suggestions on this system to help improve the training mechanism of this system. Enter the forum post to communicate with other teachers and share experiences. In the experience module, according to the requirements, every teacher who participates in the training needs to submit an experience after the training is completed, which will be published in this sub-module.

4.2 Administrator End

The system will automatically record the basic information of teachers, including teachers' names, mobile phone numbers, e-mails, qualifications and other information, and send them to the system management terminal in real time, so that managers can quickly count and know the current enrollment of training courses. The management staff is mainly responsible for arranging training tasks for teachers according to their different needs, uploading them to the system, and sending the training notice to each teacher's email and mobile phone message with one click. The administrator monitors the training progress of teachers during the training period, arranges online tests and online practices after the training to test the training effect of teachers, and analyzes the assessment results and teachers' feedback, considering whether the training content is in line with teachers' needs and teaching requirements, so as to adjust the training mechanism in time. Using advanced database technology, we can count, record and save a lot of teacher information, so as to ensure the accuracy and security of information.

5 Conclusions

In recent years, the state has paid more and more attention to the cultivation of students' comprehensive quality in colleges and universities, and put forward higher requirements for teachers' teaching ability and level. In order to implement the requirements of the state for higher education, colleges and universities must conduct regular professional training for teachers. Therefore, it is an inevitable trend for the information management of college teachers' qualification and professional training. The informatization construction of college teacher qualification training can not only improve the efficiency and quality of teacher qualification training itself, but also play a positive role in further promoting the overall reform of teaching methods and means in colleges and universities and improving the quality of talent cultivation in colleges and universities. Therefore, according to the requirements of college teacher qualification training, it is necessary to design a college teacher training system based on Web mode, which not only meets the requirements of current college teaching reform, but also meets the individualized training needs of teachers, and promotes the reform of college teaching and training.

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