The Construction of Online Teaching System of Computer Application Under the Flipped Classroom Mode

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Abstract: In order to improve the traditional education mode of computer teaching, which takes teachers as the main body, and strengthen students' innovation and learning autonomy, this paper studies the online teaching system of computer application under the flipped classroom mode. The system is an application of J2EE architecture, with Struts2 as the front-end development software, spring as the functional logic design software and hibernate as the ORM framework of the system. The server development language is Java, and the front page design language is css+HTML+JavaScript. This paper makes an in-depth analysis and introduction of the design of computer application online teaching system from three aspects: demand analysis, technical outline and function realization. The ports are designed according to the needs of students and teachers. Practice shows that the construction of this system can stimulate students' learning autonomy in computer science, improve students' learning interest, improve teachers' teaching quality, and play a positive role in promoting the teaching effect of computer science.

1 INTRODUCTION

With the rapid development of Internet technology, China has paid more and more attention to the education of Internet-related majors, and computer application teaching has become an indispensable key course in all major campus courses. However, the characteristics of computer application courses focus on the combination of theory and practice. Under the traditional mode, they are all conducted separately, with some courses of pure theory and others of pure practice. Often, the two courses tend to form class hours competition, resulting in poor integration effect of the two parts and insufficient effectiveness of the whole course. In addition, in the traditional computer teaching courses, from grammar to algorithm and even to the programming stage, students follow the teacher's unilateral ideas to conduct research and study, ignoring the most important innovative features of computer science. Moreover, because most students study in the same classroom, it is difficult for teachers to teach students in accordance with their aptitude and maximize their individual abilities. The characteristics of computer science force us to

improve the current computer teaching mode. Flipped classroom is a teaching mode with online preview, offline practice, online consolidation and homework, and online communication as the educational process. By adopting the mode of flipped classroom with students as the center, students' autonomous learning can be realized, and teachers' role can be brought into play to guide and assist, so that students can spontaneously construct their understanding of computer application design discipline knowledge. (Sun, 2021)

Through the analysis of the above contents, this paper thinks that we should deeply study the flipped classroom teaching model, and design an online learning application system for computer application education according to the characteristics of flipped classroom teaching model. This system is a network teaching platform that provides corresponding technical knowledge for reversing the classroom teaching mode. This system uses javaweb technology to develop major functional modules, including personal information management, teaching resource database, online courses, homework and interactive question and answer. The system also has the functions of user login and

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registration, learning state response, and homework evaluation. This system can better support online computer application teaching course learning based on flip classroom, and is suitable for basic education in computer application discipline.

2 TECHNICAL SUMMARY

2.1 Spring Framework

The inventor of Spring is Rod Johnson. Spring is a declaration cycle management container for bean components in J2EE, and it is also an open source J2EE lightweight application development framework, providing IOC, AOP, MVC and many other important functional components in developing web applications. Spring can reduce the complexity of the problems encountered in the development of enterprise applications. The important reason why Spring framework is widely used is that it can design the layered architecture of web application system development, and allow developers to select the required individual components to use when using this framework. At the same time, Spring also provides developers with an integrated framework for J2EE program development. Spring consists of seven modules, which constitute the core of Spring framework. Each module can be used independently or jointly. (Chen, 2022)

As the core container of Spring, Spring core has developed the core component BeanFactory to facilitate the comprehensive management of Java bean in J2EE. BeanFactory can realize the assembly of components by separating the configuration of application programs from the code of development programs. This function especially uses IOC control inversion technology. Spring context is a configuration file library, which can save all configuration file information and reduce the programming complexity of configuration file call information. Spring AOP is responsible for the security management services of log and transaction in application objects developed by Spring. Spring DAO provides an interface for applications to quickly access the server database, which reduces the amount of code writing tasks for developers to build the database. Spring ORM provides ORM object relationship management tools and inherits several ORM frameworks, including JDO, Hibernate and iBatis SQL Map. Springweb provides context checking function for application development.

2.2 Springmvc Pattern

Many enterprise-level application development is based on MVC pattern, and Spring MVC is a tool specially designed for MVC architecture pattern. It can decouple and divide the modules in the WEB application according to MVC, which can effectively improve the efficiency of system development and reduce the complexity of application system expansion and maintenance. The working principle of Spring mvc is shown in Figure 1. (Shen, 2020)

Send HTTP request from client to distributor. The distributor prime minister sends this request to the processor map, and the processor map looks up the responding controller according to the URL and returns it to the distributor. Then the controller processes the request from the client by calling the data model algorithm corresponding to the business logic and functions, and sends the generated model view to the view parser and model layer through the distributor. The distributor injects the model results into the view and then returns them to the client to complete, so as to realize various functions. In the SpringMVC request processing, the distributor is in the core control position.
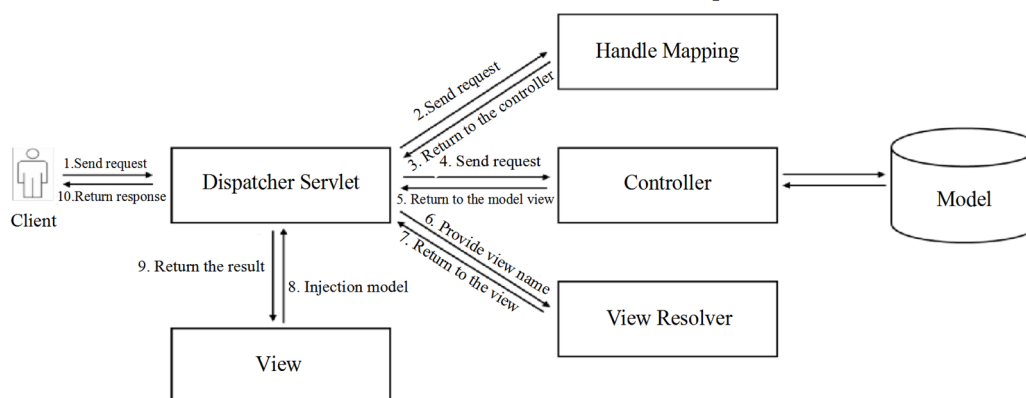

Figure 1. Schematic diagram of the Spring operation

2.3 Hibernate

Hibernate is an open source lightweight ORM framework, which is responsible for object relationship mapping in the DAO layer of the overall application architecture. ―JDBC, the method of JAVA program operating database, is encapsulated. In this way, developers only need to simply configure hibernate when configuring the operation functions of adding, deleting and checking the database, which further improves the development efficiency of the system. Hibernate has five core interfaces. Hibernate's startup method reads the Hibernate Configuration file through the configuration interface, and in this process, the SessionFactory object will be generated. Hibernate initialization is the responsibility of sessionFactory interface. The application needs to implement the session interface when operating data objects, such as load () loading method, save () saving method, update () updating method and delete () deleting method, which is the core functional interface of hibernate. Query interface can implement a series of queries of persistent objects. Transaction is responsible for managing all transactions and encapsulating the faulty operation of the underlying code in time. (Huang, 2019)

2.4 Development Environment

In this part, the related technologies developed and used in the online teaching platform of computer application are briefly introduced. This system is developed based on the framework of Structs 2.3+Spring Framework 5.3.2+Hibernate 5.3. The development environment is myeclipse9.0, the relational database is MySQL 8.0.28, and Navicat for MySQL is used to visualize the database. Choose Apache Tomcat 9.0 for server deployment.

First, open myeclipse and create a new Web Project project. Select jdk version 1.8, Tomcat version tomcat9, next－> next check the web.xml configuration file, and finish. Then you need to import the Jar package, import all the Jar packages into the lib folder, and then open the web.xml to configure Spring and Struts. Then, by configuring the application-Context.xml file, the transaction processor and configuration file of Hibernate are built. The last step is to configure JDBC as MySQL-connector-Java-bin.jar. At this point, the complete SSH framework has been built. The choice of system architecture and key implementation technologies is very important. According to the analysis of relevant technologies in the current era,

the author believes that it is technically feasible to build an online teaching system for computer applications based on the above technologies. (Gao, 2018)

3 REQUIREMENT ANALYSIS

3.1 Functional Requirements

In the flipped classroom mode, the online teaching system of computer application sets up two kinds of user ports: student client and teacher client. The function of the application system is divided into five main functional modules, including personal information management, teaching resource database, online courses, homework after class and interactive question and answer. For the student client, after logging in to the system, students can choose carefully needed courses from the online course library according to their needs, and add them to their personal collections for study. The teaching resource library can choose digital teaching resources such as text, code and various experimental packages, from which students can choose to download. When students have finished their studies, they can click to enter the homework module, check the homework assigned by teachers in each course and complete the submission within the specified time limit. When students encounter problems in their study, they can ask for help from teachers through the interactive question-answering module in the system. Teachers need to log in their employee number and corresponding password when logging in. Click on the teaching resource database, and teachers also have the function of selecting courses and adding new courses to the online course database. They can add, delete, modify and query all kinds of resources in the online courses and teaching resource database. Teachers can check the completion of students' after-school homework through the after-school homework module, and make corrections and evaluation.

3.2 Overall Design

The computer online teaching system is an enterprise application, so it is developed with J2EE mode and B/S architecture. The overall design diagram of the system is shown in Figure 2. The system adopts hierarchical architecture, which is divided into three parts: view display layer, business logic layer and data persistence layer. The view display layer includes javabean, action and

actionservlet in J22E program. It is developed by Struts2 tool, and the development language is CSS3+HTML5+JavaScript. Teachers and students send out various operation requests by accessing the function modules of the view display layer through their respective clients. After the client sends the request, it transmits the instruction to the business logic layer. The business logic layer is developed and designed by spring. The business logic layer is responsible for receiving the instructions from the client to perform all kinds of logical processing on the instructions. The business logic layer calls the

data through the data persistence layer, returns the results to the client after completing the relevant operation instructions, and displays the operation results in the view display layer. All kinds of data processing functions in the system need the help of data persistence layer, which is processed by hibernate ORM framework. Data persistence layer includes object-oriented idea, data query engine and DAO layer encapsulating JDBC. The system can only connect to MySQL database through hibernate. (Zhang, 2017)
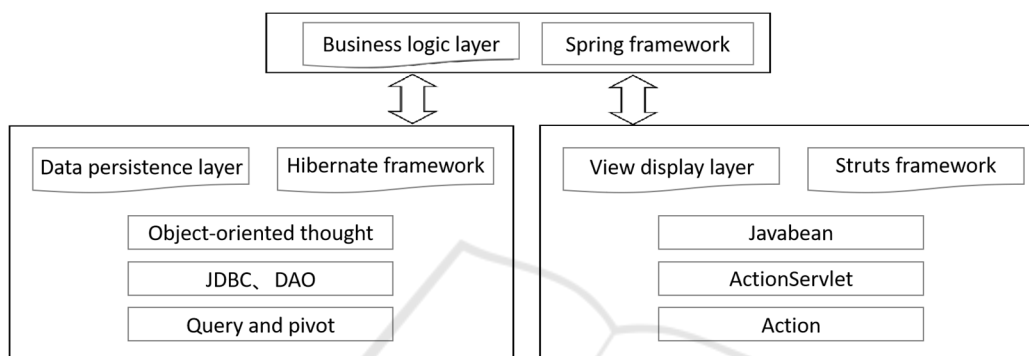

Figure 2: System overall framework diagram

4 FUNCTIONAL IMPLEMENTATION

4.1 Student Client

The curriculum learning module is designed for students to learn the course content and practice online. First of all, student users need to log in to the system to learn the relevant knowledge of the course in advance according to the course content of the teacher's online class, so as to enhance the learning efficiency of the offline class. Secondly, after class, students can choose the categories of computer courses according to their own needs, such as java courses, C++ courses and Python courses according to language. It can also be selected according to technology, such as database technology, front-end page development technology, data structure theory and other courses. Online courses will display a list of courses, click on the course name, and jump to the links of the introduction and chapters. Students can collect courses and study according to the class hours. (Xin, 2021) The video playback function provides pause and playback functions. Students can learn the knowledge points that are difficult to understand repeatedly to achieve better learning

results. This interactive question answering system is different from the offline classroom question answering. It adopts one-to-one communication mode, with students as the main body and teachers asking questions individually. Because many students have difficulty expressing their views in public. After the teacher replies, students can check the reply. The code of relevant functional modules of interactive question answering is shown in Figure 3. (Zou, 2021)

```
//Edit the problem
{
public String edit () .throws Exception(
String id ± super. getRequest (). getParameter ("id");
Map question0bj = QueryAssistant. getInstance() .query("select * from question where
id="+id+"");
pr intFormInfo (question0bj, "question");
return null;
//Save the problem
public String save() throws Exception {
Jsonobject js = new Jsonobject();
HttpSession session = super. getSession() ;
Map obj = (Map)session.getAttribute("user_obj");
if (question. getIdl)==nu1111"" . equals (question.getId{))){
Map tempObj = QueryAssistant. getInstance() . query("select*from question where name
="+question.getName()+" and isdel='No' andsid="+obj.get ("id"));
if (temp0bj==nu11){
Quer yAssistant. getInstance() .execute ("insert into question(sid, sname, name, remark, retime,
status, isdel)"+
"values ("+obj .get("id")+","""+obj .get("name")+"", ""+question. getName()+"", ""+question.
getRemark()+"",now(), 'No reply','No'");
js. addProperty("success", true);
js . addProperty("message", "");
}else{ js.addProperty("success", false) ;
js . addProperty("message""The name is duplicate, please fill it in again! ! !");
}
```

Figure 3: Function realization of the interactive Q& A module

4.2 Teacher Client

The curriculum module is an important part of the flipped classroom teaching model, and it is also the focus of the design and development of this system. Click on the online course function module, and teachers have the function of selecting courses and adding new courses to the online course database, and can add, delete, modify and query all kinds of resources in online courses and teaching resource database. Teachers need to upload video files for each course chapter by chapter to help students watch and learn, and upload the corresponding homework questions in each chapter's after-school exercise system. These files need to be uploaded into the system by teachers. The system will upload these files to the network server and distribute them to the student client according to the request instructions of the student client. The code for managing various files of online courses is shown in Figure 4. (Huang, 2022)

```
//Accept parameters page and rows
QueryAssistant q = QueryAssistant. getInstance();
HttpSession session = super . getSession() ;
Map obi = (Map) sess ion. getAttribute("user_ obj");
String numSql = "";
if (fid==nu11|| "" .equals (fid)) {
numSql = "select count (*) as num from section where isdel=' No ' and cid="+cid+" and fid is
null";
}else {
numSql = "select count (*) as num from section where isdel=' No' and cid="+cid+" and fid="+fid;
}
Map num = q. query (numSql) ;
int temp = row* (page-1) ;
String listSql = "";
if( fid==nu1l|| "".equals (fid)) {
listSql = "SELECT *from section where isdel=No and cid="+cid+" and fid is null l imit "+temp+",
"+row+" ";
}else {
listSql = "SELECT *from section where isdel=' No' and cid="+cid+" and fid="+fid+" limit
"+temp+", "+row+" ";
List<Map> plist = g.select(listSql) ;
printPageJsonInfo (Integer . parseInt (num. get ("num") . toString()).plist, Section.class) ;
return nu11;
```

Figure 4: Implementation of teaching course management function code

5 CONCLUSIONS

The computer application teaching system based on the flipped classroom designed in this paper is a flexible and powerful application program. The system is easy to operate and suitable for students and teachers to use in computer learning. In the research of this paper, due to the limited energy and ability, there are still many deficiencies in this system that need to be improved. It needs to be further improved in the future maintenance process to enrich the computer operation simulation related functions of the system. While improving the operating efficiency of the system, the stability and security of the system also need to be further improved and optimized.

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