Design and Implementation of Online Teaching System for Ideological and Political Courses in University Environment Under Web Environment

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Abstract. This study aims to design and implement an online teaching system for university ideological and political courses in a web environment to adapt to the trend of modern educational informatization and the demand for efficient teaching. By adopting both B/S and C/S frameworks, combined with advanced network technologies and educational philosophies, this system provides a highly interactive and resource-sharing online learning platform for both teachers and students. During the system development process, comprehensive functional and performance testing was conducted using Selenium, Apache JMeter, and OWASP modern testing tools to ensure the stability and reliability of the system. Test results indicate that the online teaching system not only enhances teaching efficiency and quality but also meets the requirements of instructional design, demonstrating its practical value and potential for promotion in university ideological and political course teaching.

Keywords: Web; online courses; teaching system

1 Introduction

In the traditional ideological and political education model, students mainly receive knowledge through teacher-led lectures, which often puts students in a relatively passive learning state. Teaching content is entirely determined by teachers, which may lead to poor student interest and actual effectiveness of learning. With the continuous advancement of computer and communication technology, the rapid development of network technology has greatly promoted the process of educational informatization, significantly improving the dissemination speed of teaching resources and the degree of sharing of educational resources, thereby effectively enhancing the efficiency and quality of teaching.

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2 System Design

2.1 System Architecture Design

Overall System Framework

This study adopts a development strategy combining the B/S (Browser/Server) and C/S (Client/Server) framework models, leveraging their respective advantages to enhance the system's accessibility, usability, and functionality. The overall architecture design aims to create a clear, interactive, and comprehensive online teaching platform structured into three main areas: the login interface, type selection, and functional module area, ensuring smooth user experience and efficient system operation[1]. The system's overall framework design is illustrated in Figure 1.

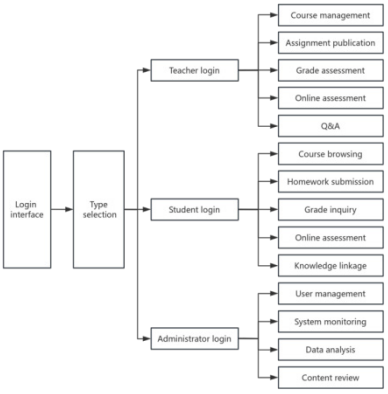

Fig. 1. Teaching System Overall Framework

Overall System Structure

The online teaching system for university ideological and political courses is designed using the B/S three-tier architecture model. This architecture model divides the overall system structure into the client layer, the application layer, and the data layer [2]. The specific structure is illustrated in Figure 2.

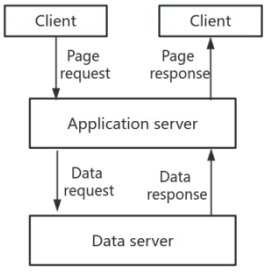

Fig. 2. System Structure Model

The online teaching system comprises three layers: the Client Layer uses web technologies for a responsive user interface; the Application Layer manages business logic with frameworks like Spring Boot; the Data Layer handles storage with relational databases and ORM technologies, ensuring data integrity and system maintainability[3].

2.2 System Functional Module Design

The online teaching system for university ideological and political courses includes network communication, data collection, content transmission, and dynamic content loading, among others. These components collectively form the system's framework, supporting various aspects of teaching activities[4]. The specific design is illustrated in Figure 3.

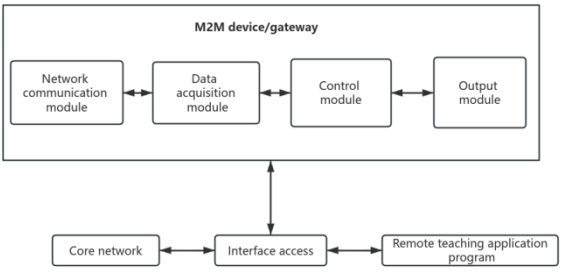

Fig. 3. System Functional Modules

The system uses 4G, Internet, and OpenStack for a network that stores, retrieves, and shares educational resources, enhancing teaching through real-time feedback. It incorporates diverse technologies for data collection, cloud computing, GPRS, and Web GIS to ensure secure, effective, and interactive content delivery even in bandwidth-limited environments[5].

2.3 Hierarchical Design of the System

The system adopts a hierarchical design structure to support efficient and flexible online teaching activities. This design structure aims to optimize system functionality deployment and resource management by clearly defining layers and modularizing them to meet the needs of different user groups. The system is primarily divided into two major subsystems: the user system and the backend management system, each of which includes data storage layers, user analysis layers, and log mining layers, providing comprehensive support for teaching activities and system management[6]. The hierarchical structure diagram of the system is illustrated in Figure 4.

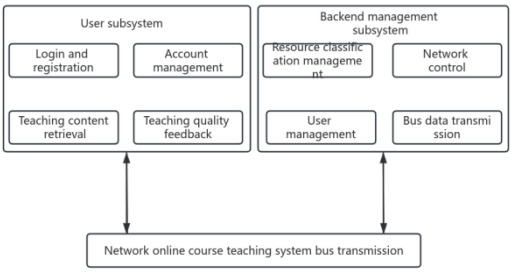

Fig. 4. System Hierarchical Structure

The user system, designed for teachers and students, provides role-based registration and login, resource browsing, feedback, and content management. The backend system enables data analysis and user monitoring, while the data storage layer secures critical information. User behavior and log mining layers analyze data to optimize content and system functionality, enhancing stability and security[7].

2.4 System Database Selection and Design

SQL Server 2005 supports the core data needs of teaching activities, storing critical information like teacher and student profiles, content, and scores. An Entity-Relationship (E-R) diagram is used to clearly depict data relationships and ensure consistency, illustrating connections like the teacher-student-course relationship[8]. The specific details of the E-R diagram are shown in Figure 5:

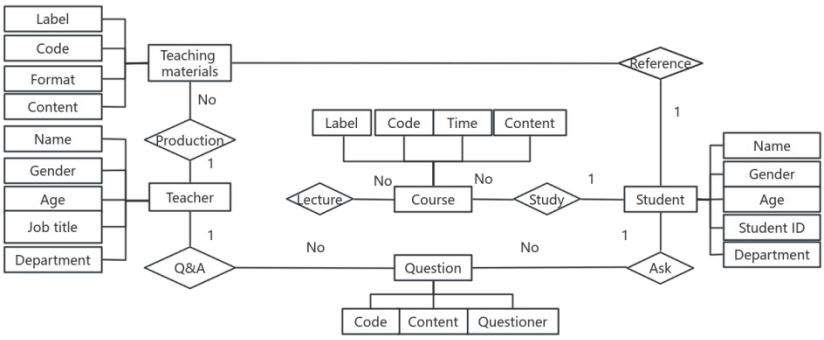

Fig. 5. E-R Diagram

3 System Testing

In this study, the Selenium automated testing framework was selected to simulate real users operating the system on different browsers and operating systems, ensuring that each functional module of the system, such as user registration, course browsing, and

homework submission, works as expected[9]. The flexibility and strong community support of Selenium make it an ideal choice for verifying the correctness of web application functionality. Additionally, the Apache JMeter tool was used, which can evaluate the system's response time and concurrent processing capacity under high loads by simulating large-scale user access[10]. Through JMeter, complex scenarios simulating real user behaviors such as login processes, resource downloads, and online quizzes can be constructed to comprehensively assess system performance.The system page operation diagrams are shown in Figures 6 and 7:

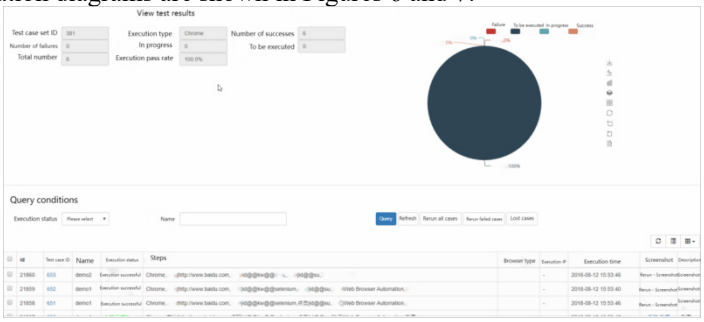

Fig. 6. Selenium Test Case Execution Interface Screenshot

Table 1. Functional Test Results

Functional Module	Test Cases	Passed	Failed	Pass Rate
User Registration/Login	80	78	2	0.975
Teaching Resource Upload/Download	60	58	2	0.967
Homework Submission and Feedback	50	48	2	0.96
Online Quiz	40	40	0	1
Q&A	30	29	1	0.967

Data Source：Selenium

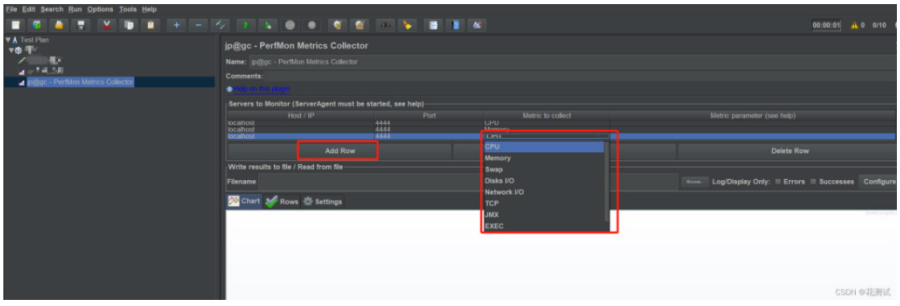

Fig. 7. JMeter Performance Monitoring Configuration Interface

Table 2. Performance Test Results

Test Type	Users	Average Response Time (s)	Maximum Response Time (s)	Success Rate
Teaching esource Download	200	2.1	5.4	99%
Page Loading	300	1.2	3.2	98.5%
Homework Submission	150	1.8	4.6	97%

Data Source：Apache JMeter

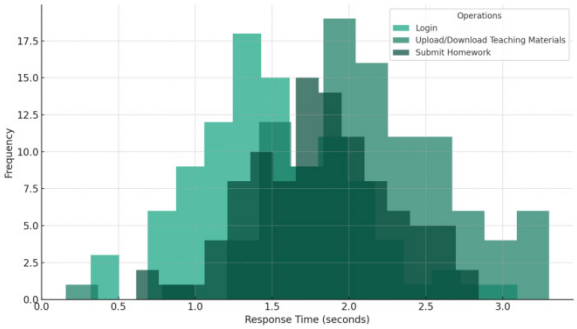

Fig. 8. System Response Time Distribution Chart

Test results indicate that the online teaching system demonstrates excellent functional completeness, performance, and security, meeting the requirements for online teaching of university ideological and political courses. Ongoing monitoring of system operations will continue, and user feedback will be used to further optimize the system, ensuring long-term stability. Table 1 shows that the user registration/login module has a pass rate of 97.5%, the teaching resource upload/download module has a pass rate of 96.7%, the homework submission and feedback module has a pass rate of 96%, the online quiz module has a pass rate of 100%, and the Q&A module has a pass rate of 96.7%, indicating high functional completeness. Table 2 shows that the average response time for teaching resource downloads with 200 concurrent users is 2.1 seconds, page loading with 300 concurrent users is 1.2 seconds, and homework submission with 150 concurrent users is 1.8 seconds, with success rates of 99%, 98.5%, and 97%, respectively, demonstrating good performance under high load. Figure 8 illustrates the response time distribution for different types of user operations, aiding in performance evaluation.

4 Conclusion

This university online teaching system leverages network, web, and database technologies to enhance ideological and political education. It features modules for

communication, data collection, content transmission, and dynamic loading, all tested using Selenium and Apache JMeter to ensure high efficiency, stability, and personalized teaching.

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