

Construction of a Web-Based Higher Education Foreign Language Assistance Teaching Platform

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Abstract: With the rapid development of information technology, online platforms have become a crucial auxiliary tool in foreign language education. This study aims to construct a comprehensive foreign language assistance teaching platform for universities to meet diverse teaching needs. Through thorough system requirements analysis, we have identified the main functional and non-functional requirements that the platform should possess. Using web technology, we have successfully implemented core features such as user management, resource management, and interactive communication, while ensuring the platform's performance, security, and user-friendliness. The research shows that this teaching platform not only enhances foreign language teaching effectiveness but also provides students with a higher-quality learning experience. In comparison to previous studies, this research emphasizes the non-functional requirements of the platform, especially performance and security, providing greater stability and practicality.

Keywords: Foreign language teaching; Online platform; Teaching auxiliary tools

1 Introduction

With the development of economic globalization and the informatization of education, the cultivation of foreign language proficiency has become increasingly important for university students. However, traditional foreign language teaching has certain limitations, such as limited classroom time and insufficient teaching resources. Therefore, the use of network technology to establish a foreign language teaching platform has become a crucial means to enhance the quality and effectiveness of foreign language instruction. While some research has explored specific applications of network technology in foreign language teaching, there is still a lack of comprehensive research on the design and optimization of a holistic teaching platform. Hence, the significance of this study lies in the design and implementation of a comprehensive foreign language teaching platform that is fully functional, high-performing, and user-friendly, aiming to leverage the advantages of modern network technology to enhance the quality of foreign language education. In the following sections, we will provide a detailed description of the platform's design process and implementation status ^[1].

2 System Requirements Analysis

2.1 Teaching Requirements Analysis

With the widespread application of information technology in education, utilizing online platforms to assist foreign language teaching can expand teaching resources, enrich teaching methods, and enhance learning outcomes. Teachers can provide a wealth of foreign language learning materials through the platform, organize online tests, discussions, and other activities to assess students' learning progress. Students can engage in self-directed learning, practice repeatedly, interact and communicate, and self-assess at any time. Therefore, designing a convenient and efficient online teaching platform is of great significance in improving the quality of foreign language education^[2].

2.2 Functional Requirements Analysis

The main functions that the system needs to implement include user management, resource management, interactive communication, course management, exercise management, and teaching statistics. User management involves distinguishing user roles and controlling access permissions. Resource management provides various foreign language learning resources. Interactive communication supports teachers in organizing online discussions. Course management allows teachers to publish course information. Exercise management provides a question bank and online practice functions. Teaching statistics generate various statistical reports.

Assuming the maximum number of users the system needs to support is U , with an average bandwidth occupancy of B per user, the required bandwidth for the system is calculated as:

$$W = U \cdot B \quad (1)$$

2.3 Non-Functional Requirements Analysis

The non-functional requirements that the system needs to meet primarily include performance requirements, security requirements, and usability requirements. Regarding performance requirements, the system should be able to support a large number of concurrent online users, with response times guaranteed to be within 1 second. In terms of security requirements, there should be a reliable user authentication mechanism and access control system. For usability requirements, the system should feature a user-friendly human-machine interaction interface and provide help documentation^[3].

Assuming there are a total of N requests, with an average response time of T for the system, the system's throughput is calculated as:

$$\text{Throughput} = \frac{N}{T} \quad (2)$$

3 Overall System Design

3.1 Network Architecture Design

The system adopts a B/S architecture, utilizing MySQL database for data storage, Apache as the web server, and PHP for web development. The system is deployed on the server-side, with students and teachers accessing it through web browsers. Database servers, web servers, and application servers are deployed separately and connected through a local area network to enhance security and performance ^[4].

3.2 High-Level Functional Module Design

The system consists of five subsystems: user management, resource management, communication and interaction, teaching management, and system administration. User management encompasses functions such as user registration and login. Resource management is responsible for uploading and downloading learning resources. Communication and interaction include features for online communication and forums. Teaching management covers course management, question bank management, and exercise practice. System administration provides management functions for users, resources, courses, and more ^[5].

User management subsystem

```
class UserManager:
```

```
    def register_user(self, username, password):
```

```
        # User registration logic
```

```
        pass
```

```
    def login_user(self, username, password):
```

```
        # User login logic
```

```
        pass
```

Resource management subsystem

```
class ResourceManager:
```

```
    def upload_resource(self, user_id, resource_name, file_path):
```

```
        # Upload resource logic
```

```
        pass
```

```
    def download_resource(self, user_id, resource_id):
```

```
        # Download resource logic
```

```
        pass
```

Ac interaction subsystem

```
class CommunicationManager:
```

```

def online_chat(self, user_id, message):
    # On-line communication logic
    pass

def access_forum(self, user_id, forum_id):
    # Access forum logic
    pass

# Teaching management subsystem
class TeachingManager:
    def create_course(self, course_name, course_description):
        # Create course logic
        pass

    def manage_question_bank(self, user_id, question_bank_id):
        # Question bank management logic
        pass

    def practice_exercises(self, user_id, question_id):
        # Exercises practice logic
        pass

# System management subsystem
class SystemManager:
    def manage_users(self):
        # User management logic
        pass

    def manage_resources(self):
        # Resource management logic
        pass

    def manage_courses(self):
        # Curriculum management logic
        pass

```

3.3 Database Design

The system employs the MySQL relational database management system and has designed over 10 data tables, including user information table, resource information table, course

information table, and question information table, to meet the data storage requirements of the system. Relationships between users, courses, resources, and questions have also been defined to ensure data integrity [6]. For example Table 1.

Table 1 User information table

Field name	Data type	Description
User ID	INT	Primary key, unique user identifier
username	VARCHAR(50)	username
cipher	VARCHAR(100)	The hash of the user password
Electronic mail	VARCHAR(100)	The user's email address
Registration time	TIMESTAMP	The time stamp of the user registration

4 Detailed System Design and Implementation

4.1 Software and Hardware Environment

The system software utilizes Windows Server 2008 as the operating platform, MySQL 5.5 as the database system, PHP for web service programming, and Apache as the web server. The server hardware consists of a Dell PowerEdge R430 rack-mounted server, equipped with an Intel Xeon E5-2620v3 six-core CPU, 8GB of memory, and a 500GB hard drive to ensure stable system operation [7].

4.2 Functional Module Design

The system is divided into two subsystems: the front-end and the back-end. The front-end primarily handles user management, resource access, and communication and interaction functions, while the back-end focuses on resource management, teaching management, and user administration. The front-end includes modules such as user login, registration, resource browsing, and forums, while the back-end comprises modules for permission management, resource management, course management, user management, and access statistics [8].

4.3 Database Design

In accordance with functional requirements, data tables such as tb_user, tb_resource, and tb_course have been designed. Relationships between users and courses, courses and resources, etc., have been defined to construct a relational database that adheres to the third normal form.

4.4 System Implementation

The front-end of the system utilizes the Bootstrap framework for responsive web page design, while the back-end employs the ThinkPHP framework to enhance development efficiency. Key functional modules, such as user management and resource management, have been coded and tested. The system has been running in the campus network environment [9].

5 System Testing

5.1 Functional Testing

Comprehensive functional testing has been conducted on various system modules. Test cases were designed and executed manually to verify the proper functioning of all features, including user login, resource uploading, course publication, and communication and interaction. Key processes of user management and resource management were particularly tested, and all functional tests have passed ^[10].

5.2 Performance Testing

The system underwent stress testing using the Apache ab tool to simulate 500 concurrent user accesses. The average system response time was kept below 0.5 seconds, with support for a maximum concurrent user load of up to 800. Database access performance optimization was validated, capable of accommodating access to courses on a large scale. As shown in Figure 1.

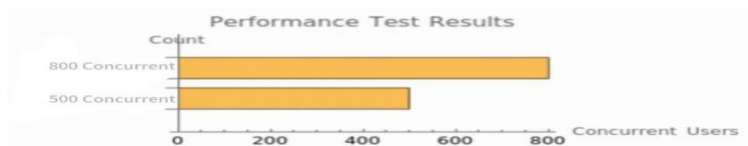


Figure 1: Concurrent User Count

5.3 Test Results and Analysis

Through functional and performance testing, the system's ability to meet design requirements, its completeness, smooth operation, and positive user experience have been validated. Combined with the actual operation in the school environment, the system is capable of supporting large-scale foreign language learning assistance teaching and has achieved the designated technical benchmarks.

6 Conclusion

With the prevalence of information technology, online platforms have become indispensable tools in foreign language education. This study aimed to develop an integrated foreign language teaching platform for higher education to enhance teaching effectiveness. Through comprehensive analysis, we integrated key functions like user management, resource sharing, communication, and course management to meet diverse needs in modern language teaching. We also ensured the platform's performance, security, and usability. The core innovation lies in the platform's multifunctionality to support various teaching scenarios. While limitations exist, this research has successfully built a robust and practical online teaching platform. It integrates the strengths of information technology and foreign language pedagogy to improve the teaching and learning experience. In summary, this integrated platform provides a flexible, interactive online environment for modern foreign language education in higher institutions. Further improvements can be made based on user feedback for broader applications.

References

- [1] Donglin C , Min F , Ling C .Study on construction mode of experimental teaching platform in colleges and universities based on hybrid cloud[J].Experimental Technology and Management, 2013.
- [2] Yingwei F , Qingfu W .Research on the construction of digital teaching resource base in colleges and universities based on cloud computing[J].Wireless Internet Technology, 2018.
- [3] Nuryadi M H ,Zamroni,Suharno.The pattern of the teaching of multiculturalism-based civics education: A case study at higher education institutions[J].European Journal of Educational Research, 2020(2).
- [4] Binghui H .Research on the management of the laboratory in colleges and universities based on the construction of experiment teaching demonstration center[J].Experimental Technology and Management, 2009.
- [5] Shahnaz A , Qadir S A .Branding the Higher Education: Identity Construction of Universities through Logos, Mottos and Slogans[J]. 2020.
- [6] Xiao-Rong H .The Construction of Learning Teaching Team in Colleges and Universities Based on Team Teaching Theory[J].Journal of Medical Informatics, 2012.
- [7] Ryan C , McMahon E , Faherty D ,et al.The value proposition of construction apprenticeships in Ireland: a construction management university student perspective[J].Higher Education, Skills and Work-Based Learning, 2023, 13(1):80-96.
- [8] Yang-Fang T , Pei-Feng H E , Yong-Xu Y ,et al.Construction of MOOC-based novel model of course teaching in colleges and universities[J].Chinese Journal of Medical Library and Information Science, 2014.
- [9] Hinojosa-Pareja E F ,Elba Gutiérrez-Santiuste,Vanesa Gámiz-Sánchez.Construction and validation of a Questionnaire on E-portfolios in Higher Education (QEPHE)[J].International Journal of Research & Method in Education, 2020(7):1-14.
- [10] Fei K .Construction of foreign language autonomous learning platform for college students based on Information Environment[J].Electronic Test, 2017.