

Design and Implementation of a College Teacher Training System Based on Client-Server Structure

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Yue Ma

Tianjin Chengjian University, Tianjin, China

zpmyh@163.com

Abstract—With the continuous develop of informatization, the traditional teacher training management mode can no longer satisfy the demand for information management. This calls for a new teacher training system that enhances the skills and competence of teachers and ensures the smooth implementation of teacher training. Facing the training demand of college teachers, this paper designs a college teacher training system based on client-server (CS) structure, which offers an online, remote and standard training mode. The system design covers three parts, overall design, detailed design and database design. The CS structure was adopted to adapt to the changes in the demand for system performance and in the training businesses. In the system, the database exchange module can perform database operations, and the interface module supports the creating, editing, and deleting functions in the training information interface. Finally, the effectiveness of the proposed system was tested and the results showed that the proposed system achieved the expected results. The research findings lay technical and theoretical basis for the construction of college teacher training systems.

Keywords—Informatization, teacher training system, client-server (CS) structure, database design, interface module

1 Introduction

The faculty is an important embodiment of the school's teaching level, and the improvement of the competence of college teachers will greatly promote the teaching level of colleges and universities [1]. Over the years, colleges and universities have trained a large number of academic and professional talents for the society, making important contributions to the construction of spiritual civilization in the country and the region. Every year, colleges and universities provide learning and training opportunities for teachers in different forms, and party building activities and academic exchanges are held regularly as well [2, 3]. Compared with the construction of teacher training systems in foreign countries, China's teacher training management systems started late. An effective teacher training system is not only an effective record of training information, but also a deep-level analysis and mining of information [4]. The traditional teacher training systems often adopt the traditional Excel management

information system, which can not effectively analyze the data. Moreover, the systems can be modified manually, and there are major deficiencies, so it is imperative to construct a new type of teacher training management system, which can identify the teachers' lacking skills in a certain stage and conduct targeted training [5].

Currently, the structure of software is mainly the Client/Server (CS) structure, which occupies less resources of the client machines, and the maintenance workload of the software system is greatly reduced. Therefore, the CS structure has become the first choice for the software structures [6]. The CS structure includes service providers, service requesters, and service registries. The design of college teacher training systems has the characteristics of low dependency, scalability, data consistency, and low redundancy [7]. For the construction of college teacher training systems, informatization is an inevitable trend. Via the systems, college teachers can participate in training and learning through computers at any time and place, which has important significance for further enhancing the competence levels of college teachers, perfecting the teaching methods, reforming teaching means and improving the quality of personnel training [8, 9]. Based on the CS structure, this paper designs a college teacher training system (including overall design, detailed design and database design), which achieved an online, remote and standard training mode, and then the proposed system has been tested.

2 Requirement Analysis of the College Teacher Training System

2.1 Requirement description of the training system



Fig. 1. Training information filing use case

The construction of the college teacher training system is to improve work efficiency. The main training system requirements include training information filing, training records query, training cost withdrawal amount filing and viewing, and personal training records query, etc. [10]. During the design, for different system re-

quirements, different permissions should be considered accordingly. Taking the training information collection and storage as an example, the personal information and training information interface should be taken into consideration, there're training specialists who are responsible for reviewing the training records query, training information filing, training cost withdrawal filing, training filing control, and training reports, etc.; the whole training process is reviewed and approved by all levels of leaders [11]. Figure 1 shows a use case for training information filing, after training reviewers have approved the training, it is passed to the training administrators to manage, including training information filing, training instructor filing, cost attribution annual filing and training processes, etc. Moreover, system non-functional requirements include system performance requirement analysis, system reliability requirement analysis, system security requirement analysis, and application data security requirement analysis, etc. [12].

2.2 Requirement analysis of the training system

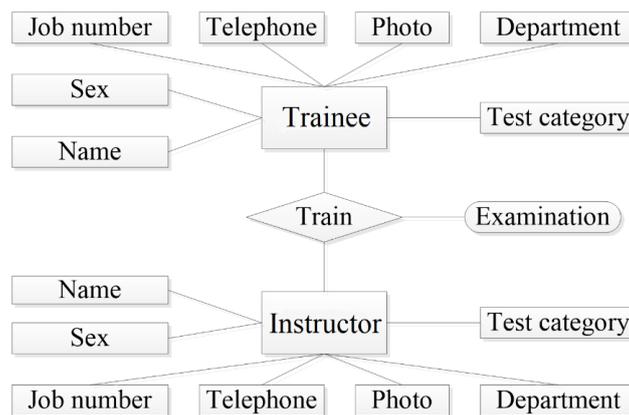


Fig. 2. Attribute relationship between students and teachers

The analysis of the college teacher training system includes system business requirement analysis, function requirement analysis, data requirement analysis and security requirement analysis. Wherein the business requirement analysis includes three parts: sign-in and registration, training and teaching, and final examination [13]. System function requirement analysis includes: training instructors and system administrators, containing the login interface, basic data maintenance and querying, enrollment management and online instruction, as well as system maintenance and management, etc. [14]. The system data requirement analysis includes user information, training work related information and exam related information. Figure 2 shows the attribute relationship between the trainees and the instructors. The system data requirement analysis of the trainees and the instructors the same, including name, gender, job number, telephone number, photo, department, and exam category. The security requirement analysis of the training system requires encryption of the data infor-

mation of the database and response to unpredictable disasters. The database system needs to be set to the mode of automatic backup by time.

3 Design of the College Teacher Training System

3.1 Overall design of the training system

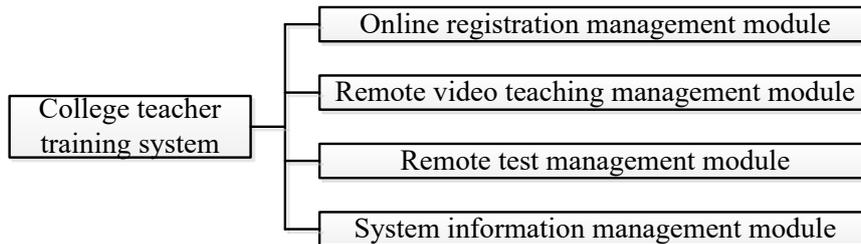


Fig. 3. Overall framework of college teacher training system

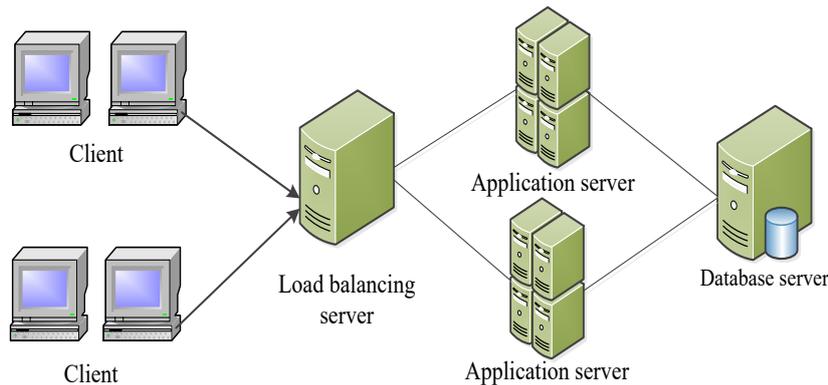


Fig. 4. Network structure of college teacher training system

The principle for the design of the college teacher training system is that it should be easy to use, stable, flexible, advanced, economic, compatible and scalable [29]. The overall design of the training system includes three parts: system physical architecture design, system software architecture design and system functional architecture design [30]. Figure 3 shows the overall framework of the college teacher training system, which includes four parts: online registration management module, remote video teaching management module, remote examination management module and system information management module. Figure 4 shows the network structure of the college teacher training system. The database server and application servers of the system are located in the internal LAN, and each client acts on the load balancing server. Figure 5 is a functional architecture diagram of the college teacher training system. The functional structure of the college teacher training system includes three

parts: training information filing, withdrawal amount filing and statistical analysis. Each function contains its corresponding management modules. The training information filing includes filing process management, training instructor management, training file management, and training class management, etc.; Statistical analysis includes training class statistics, training cost statistics, training personnel statistics and special reports for superior leaders.

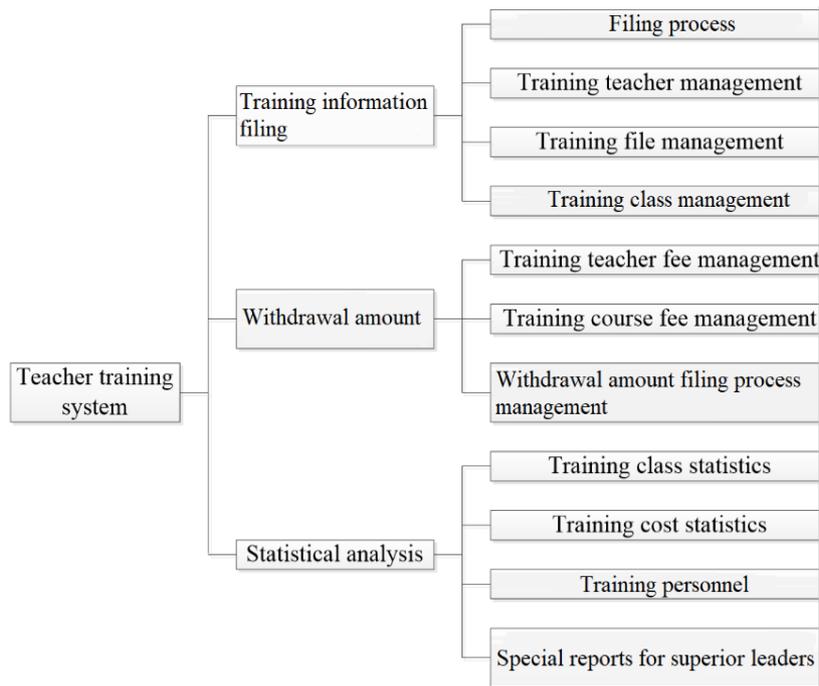


Fig. 5. Functional architecture of college teacher training system

3.2 Detailed design of the training system

The detailed design of the college teacher training system was carried out based on the overall architecture, including the detailed design of the development system and the detailed design of the system functional modules. CS structure is relatively simple, and the tag library can be applied, which greatly improves the efficiency of the development system. Moreover, application system with CS structure is similar in code when accessing the database, which is of high versatility. Accessing the database through the object-oriented programming idea can significantly improve the flexibility, maintainability and reusability of the code. The detailed design of the system functional modules includes: training information filing, training cost withdrawal amount filing, expatriate training filing and training situation statistics.

3.3 Database design of the training system

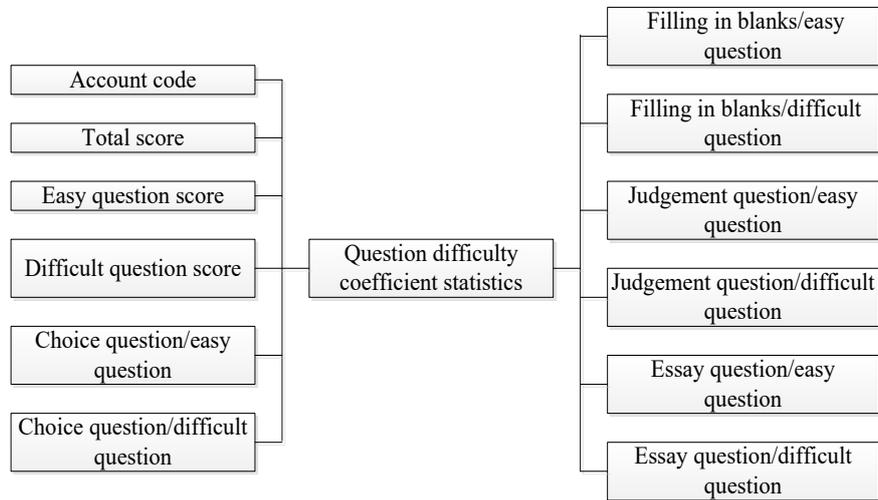


Fig. 6. Training question difficulty coefficients

Table 1. Training question difficulty coefficient table structure

Field name	Primary/Foreign Key	Width	Precision	Type
Account code	PK	10	1	Character
Choice question (easy)	—	60	1	Character
Choice question (difficult)	—	60	1	Character
Filling in blanks (easy)	—	60	1	Character
Filling in blanks (difficult)	—	60	1	Character
Judgement question (easy)	—	60	1	Character
Judgement question (difficult)	—	60	1	Character
Essay question (easy)	—	60	1	Character
Essay question (difficult)	—	60	1	Character
Easy question score	—	9	1	Numeric
Difficult question score	—	9	1	Numeric
Total score	—	12	—	Numeric

At present, college teacher training systems often adopt MySQL as the database. The design of the training system database focuses on conceptual model design. After the conceptual model design is completed, the conceptual model should be expanded to establish a physical model of the database. Training information, training cost withdrawal information and expatriate training information are interrelated. Figure 6 shows the difficulty coefficients of the training questions, the statistics of the question difficulty coefficients was classified, including subject code, easy and difficult questions of each question type, scores of easy questions, scores of difficult questions, and the total score. Table 1 shows the structure of the difficulty coefficients table of the training questions. The width and precision of each question type are the same. The output type of the score is a value, and the output type of other field names is code.

4 Implementation of the College Teacher Training System

4.1 Implementation of the training system

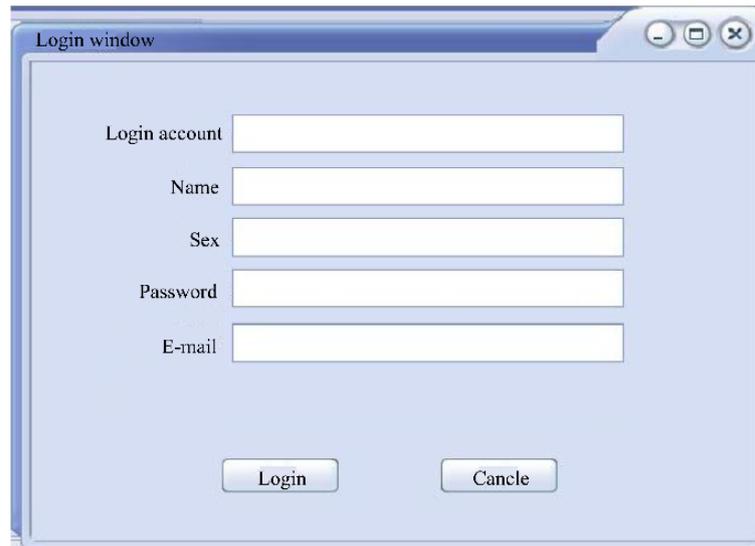
The image shows a screenshot of a web browser window titled "Login window". The window has a light blue background and a standard Windows-style title bar with minimize, maximize, and close buttons. Inside the window, there are five text input fields stacked vertically, each with a label to its left: "Login account", "Name", "Sex", "Password", and "E-mail". Below these fields, there are two buttons: "Login" on the left and "Cancel" on the right. The buttons have a light blue gradient and rounded corners.

Fig. 7. Training system login interface

Through the overall design, detailed design and database design of the training system, all function modules were realized, and the function implementation was described in detail. The three layers in the CS structure were encapsulated in the overall design and the communication was realized through interface. The database exchange module can perform database operations; the interface module can operate the training information creating, editing and deleting interface; and the Action form module is used to save the teachers' training information. Figure 7 shows the login interface of the training system. In the login interface, users can log in after entering the login account, name, gender, password and email address. After logging in, the interface will display the basic information of the user. Figure 8 shows the interface of the course approval function in the training system, after college teachers have filed the training course, the system administrators can click the course approval interface and query the unapproved course submitted by the teachers. The administrators can fill in the comment information and save the information into the course approval form. Figure 9 shows the teaching quality evaluation interface of the training system. The teachers can login to the system and click to enter the teaching quality evaluation interface. They can evaluate the unevaluated courses, and edit or delete the evaluated courses.

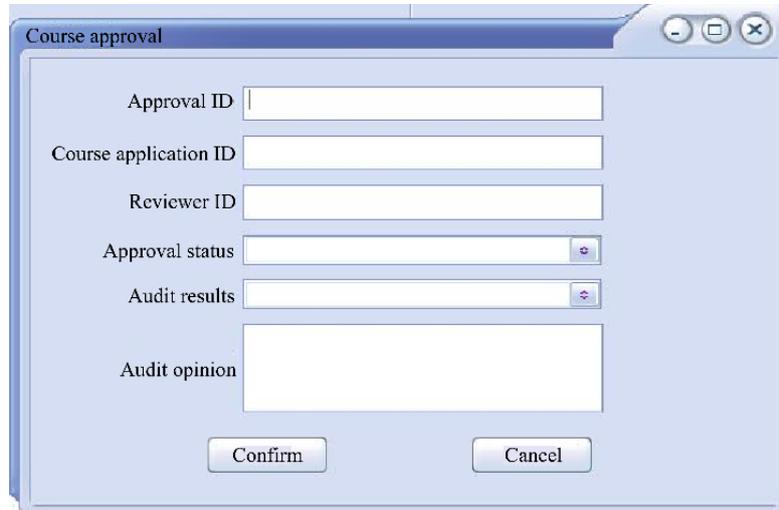


Fig. 8. Training system course approval interface

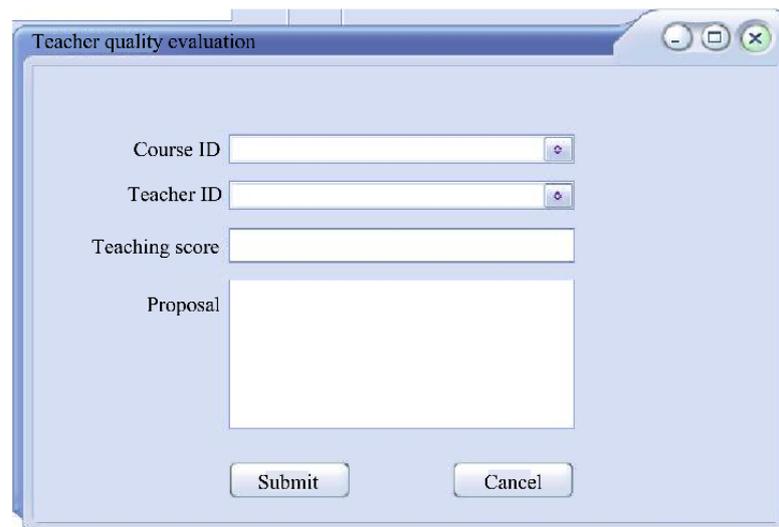


Fig. 9. Training system teaching quality evaluation interface

4.2 Testing of the training system

The testing of the proposed college teacher training system adopted the Window system, the database server was MySQL, and the installed supporting software included ImageMagick, Swftool, etc. The testing of the system had three parts: the unit testing, the integrated testing, and the validation testing. Wherein the unit testing is mainly to test the hardware environment and software environment of the system; the

integrated testing is to integrate the modules of the system into an integrated system for testing; and the validation testing is to test the integrity of the system. First, the college teachers log in to the system, check the personal information and enter the main interface of the training system, then click the course application interface to apply for the training course. After the system administrator has approved, the teachers can conduct online learning within a specified time and take exams; after passing the exams, the system will automatically feedback the exam information to the teachers, and they can also evaluate the course in the course quality evaluation interface. The training system designed in this paper had been tested and was consistent with the expected results.

5 Conclusion

Based on the CS structure, this paper designed a college teacher training system, and achieved an online, remote and standard training mode. The proposed system had been tested, and specific conclusions are drawn as follows:

1. The analysis of the college teacher training system includes system business requirement analysis, function requirement analysis, data requirement analysis and security requirement analysis. Wherein the system data requirement analysis includes user information, training work related information and exam related information.
2. The design of the college teacher training system includes overall design, detailed design and database design. The detailed design was carried out based on the overall architecture. College teacher training systems often use MySQL as the database. The database design of the training system focuses on the conceptual model design. After the design of the conceptual model is completed, the conceptual model should be extended to establish a physical model of the database.
3. College teachers can login to the system, check personal information and enter the main interface of the training system, then click the course application interface to apply for training courses. After the system administrator has approved, the teachers can conduct online learning within a specified time and take exams; after passing the exams, the system will automatically feedback the exam information to the teachers, and they can also evaluate the course in the course quality evaluation interface.

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8 Author

Yue Ma is a Chinese computer researcher at Tianjin Chengjian University in Tianjin, China. He is a Ph.D., graduated from China University of Mining and Technology (Beijing). His main research interests are teacher training systems and personnel information systems.

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