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Design of Online Examination Management System

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Abstract

With the outbreak of the new crown epidemic, many courses have begun to implement online teaching. The use of online exams for the final assessment of courses has become a demand for teachers of various subjects. Therefore, a Web online examination and marking system for teachers and students is designed and developed by using Java language as the scripting language and MySQL database according to the traditional examination process.

Keywords

Online Examination; Demand Analysis; Database Design; Online Evaluation.

1. Introduction

Affected by the global spread of the new crown epidemic, students in domestic primary and secondary schools and colleges and universities cannot return to school on time. In response to the call of the Ministry of Education to “Suspend classes but not stop teaching, suspend classes but not stop learning”, Various schools have begun to vigorously promote online classrooms. Various online teaching platforms are extremely popular, such as DingTalk, Rain Classroom, Tencent Classroom, Tencent Conference, etc. With the rapid development of online teaching, how to evaluate students' teaching effectiveness is put on the agenda. The online platform provides some daily attendance, tests, etc. to assess students. For professional courses in colleges and universities, it happens to be an opportunity to create a paperless examination environment.

At this stage, the traditional examination process is that the teacher sets up papers in advance, the Office of Academic Affairs arranges the examination time and the examination room, as well as arranges the invigilating teacher, and the students take the examination. After the examination, the teachers of professional courses will uniformly arrange for the review, and the teachers will enter it into the educational administration system after the completion of the review. Students can check their score through the educational administration system. Traditional examinations papers are mainly paper-based, teachers prepare questions make the original test papers, and then carries out storage, copying, transportation and other links, which has the risk of test paper leakage. Moreover, the printing costs are high, and a lot of copying is not good for environmental protection. At the same time, the marking of the test paper needs the cooperation of multiple teachers, which takes a long time and the accuracy is difficult to guarantee. The real-time performance is not high, and it is not convenient for students to check back when there are performance problems. Especially for some large-scale examinations with a large number of participants is difficult to concentrate, the setting of the exam room will take up a lot of manpower, financial resources, and space, and it can be replaced by an online examination system.

The article takes the online examination and automatic scoring of the database system introduction course as cases, analyzes the core functions of the system in detail, and uses Java

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language as script language and MySQL database to implement a web online examination system for teachers and students according to the traditional examination process.

2. System Core Function Design

Before implementing the online examination system, the course of Introduction to Database System was analyzed. Firstly, by investigating the teachers and students of this course, analyze the basic procedures and system requirements of the examinations. The system divides users into administrators, teachers and students, and analyzes the needs of different users[1].

For teacher users, they are necessary to add or delete courses according to the course schedule of each semester, and establish a question bank through manual input or template import under the corresponding course. Questions are extracted manually or automatically during the final exam. The difficulty of the questions needs to pay attention during the process of generating the test paper, and then release the examination information in time, including the name of the examination, the examination duration, start and end time, etc. After the examination, objective questions are automatically judged and scores are generated by the system, and the subjective questions are given the final score by the teacher. Finally, teachers should have the authority to view student scores, analyze the scores through the system, and generate an Excel file for export.

For student users, they can choose examination subjects after logging in to the system. The system allows students in the examination time to enter the examination page to answer questions, and ensure that each student can only participate once. After the examination begins, set a time reminder. If the examination time is exceeded, the examination paper will be compulsorily submitted. After the examination, students can view the examination results and deduct points. If they disagree with the examination results, they can apply for a review to the teacher.

For administrator users, they mainly complete the addition and deletion management of majors and courses, as well as students and teachers, and the management of user passwords. It is also necessary to manage the addition and deletion of test question types and templates.

According to the demand analysis, the function of the system is briefly designed, and the functional modules of the system are constructed to prepare for the subsequent development of the system [2]. The functional structure of the system is shown in Figure 1:

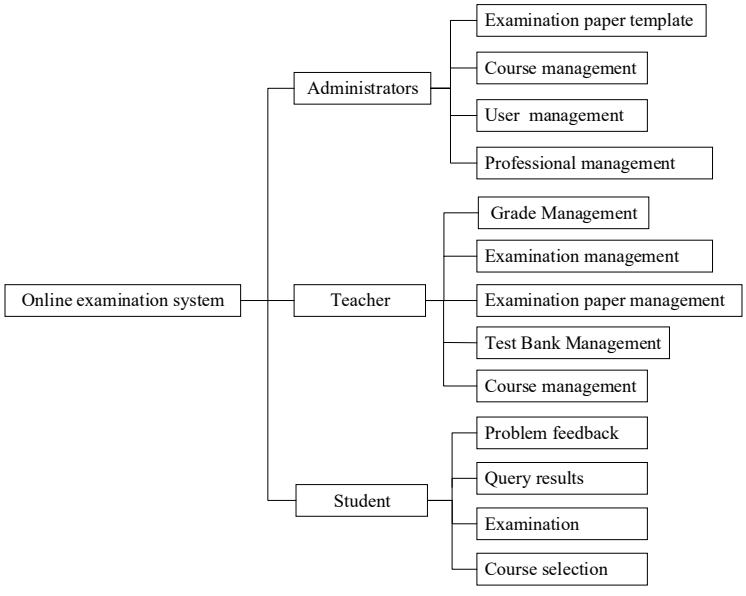

Fig 1. The functional modules of the system

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The administrator logs into the system, manages the information of specialty, curriculum, students and teachers according to the examination information, and sets the template for the type of examination questions. Teachers log in to the system to create new courses and question banks, and select different question types, such as judgment questions, choice questions, and subjective questions from the question bank to form examination papers, create new exams and arrange exams. Students log in to the system, participate in the course examination according to the course selection information, query the results. After the students' answers are completed, the system will complete the judgment of objective questions, and the teacher will complete the judgment of subjective questions [3, 4].

3. Database Design

The online examination system includes multiple entities, such as students, teachers, majors, courses, question banks, examinations, test papers, scores, etc. mastering all the attributes of these entities and the relationship between entities can help us correctly design the database and complete the code function. Figure 2 shows a simplified entity relationship diagram, such as the one to many relationship between majors and students, the many to many relationship between courses and teachers, the many to many relationship between courses and students, the many to many relationship between examinations and students, the one to many relationship between teachers and examinations, and the many to many relationship between teachers and question banks [5].

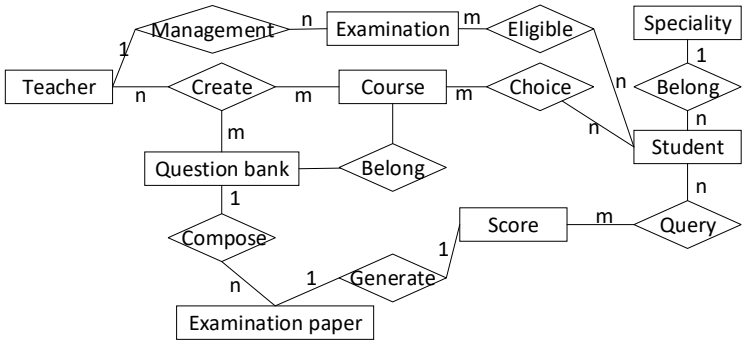

Fig 2. Simplified entity relationship diagram

In order to realize the functions of the system, a total of 16 data tables are designed. Among them, the teacher corresponds to the t_teacher table, which has fields such as id, name, account number, password, gender, age, and contact information, etc. Students correspond to the t_student table, which has fields such as contact information, age, password, gender, account number, student id, professional id, name, etc. The administrator corresponds to the t_admin table, which has fields such as administrator id, account number, and password, etc. The question bank corresponds to the t_questionbankt table, which has fields such as question bank id and name, etc. The question types correspond to different data tables. For example, the single-choice question corresponds to the t_choicequestion table, which has fields such as question, answer A, answer B, answer C, answer D, reference answer, analysis, question bank id, and difficulty, etc [6]. In addition, it has also designed examination table, examination paper table, data tables of different types of questions in the examination papers, score table, professional table, course selection table, and so on.

4. System Implementation

Through the function division and database design of the system, the overall architecture of the system is completed. Next, realize the main functional modules of the system.

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4.1. Registration and Login

The realization of registration and login function for students and teachers. Login gives different operation permissions to different identity categories. When logging in, it is verified according to different identities, and different users are assigned to enter the corresponding operation interface. When the account or password is wrong, the system should prompt "account or password error". If it is judged that the username and password is right, the authentication is successful, and then jump to the corresponding operation interface, and the error is to log in again. In order to ensure the basic authority of the administrator when registering, only students and teachers can be registered. For new users, the system should ensure that the user's data is correctly stored in the corresponding table according to the user category. When registering, the system must be able to check whether the user data has already been registered or exists.

4.2. Question Bank Management

This module mainly provides teachers with the function of managing examination questions [7]. Each teacher can create a question bank based on the course, or share the question bank with teachers of the same course. There are two ways to upload examination questions in the question bank: one is to upload manually, select the corresponding question type on the examination question interface, and manually input the questions into the corresponding question bank. The other way is to import by Excel template, which solves the situation that there are a large number of examination questions that need to be imported into the database. The template includes detailed questions, answers, analysis, difficulty level, etc. When importing, the ExcelUtil object is instantiated as a tool for reading and writing Excel, Judge the question type according to the first column of Excel, and insert it into different question databases according to different question types.

4.3. Examination Paper Management

This module mainly realizes examination paper management. There are two ways to organize examination papers in the system. The first is to manually organize examination papers. Teachers need to select question types and corresponding questions from the question bank to form a set of examination papers. The score of each question type and total score can be set in advance in the examination paper to determine whether the composition of the examination paper is meet the requirements. If it does not meet the requirements, teachers need to add or delete questions or change the score of the question type. The other is automatic examination paper formation [8], which randomly select questions from the question bank according to the score and difficulty set by teachers. When the difficulty level of the examination paper is simple, the sampling proportion of simple, medium and difficult questions is 7:2:1. When the difficulty level is medium, the sampling proportion is 4:4:2; when the difficulty level is difficult, the sampling proportion is 4:3:3.

4.4. Examination Management

This module provides students with the function of taking exams and teachers with the function of marking papers. The system can set the start time, end time, duration, and examination paper settings, etc. Students are required to take the examination at the scheduled time. When students exceed the specified time, they are not allowed to take the examination. The Beijing time in the system and the start time and end time of the examination are used to determine the status of the user's examination. There are two types of examination paper submission events. One is that students click the examination paper submission button to trigger the examination paper submission event, and the other is that the system will submit it automatically when the examination time arrives. After the exam, the objective questions are

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judged automatically based on the answers in the question bank, and the subjective questions need to be submitted by judgment of the teacher.

4.5. Score Management

This sub-module provides examination paper viewing and score query functions for teachers and students. Teachers can view the examination papers of classmates, including checking the answers and analyzing the results. Students can check the total score and deduct points, etc. If they have any questions about the score, they can communicate with the teacher through the system feedback.

5. Conclusion

By using Java language as script language and MySQL database, our paper designs and develops a web online examination system for teachers and students based on the traditional examination process. According to the traditional examination process, the core functional modules of the system are designed, and users are divided into administrators, teachers and students according to the results of demand analysis. The corresponding functional modules are designed for different users, realizing the all process from the establishment of examination question bank, examination paper combination, to examination management, examination paper judgment, score management and analysis. It can meet the management and application of ordinary subject examinations in colleges and universities. However, as an online examination system, the arrangement of examination flexibility still needs further design and improvement.

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