Design and Implementation of Digital Platform of Academic Test in Colleges and Universities

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Abstract. With the rapid development of Internet technology, academic testing in colleges and universities also ushered in changes. The disadvantages of a test paper are becoming more and more obvious. This paper expounds in detail the design and implementation process of the online academic test digital platform designed and developed by using Java development language and MySQL database and eclipse development tools. The test results show that the digital platform of academic test in colleges and universities is flexible in practical application, and it is convenient to group papers, test and mark papers, and data collection and analysis, which provides work efficiency.

Keywords: Subject, Academic Test, Digital Platform, JSP

1. Introduction

Academic testing in colleges and universities is an important part of teaching, and it is one of the means to test students' knowledge mastery and teachers' teaching results. Year after year, subject academic tests require a large number of different questions [1], but in fact, many subjects in colleges and universities do not realize data sharing because of the limitation of the number of teachers and the poor communication between colleges and universities. The assessment standards of different colleges and universities are not uniform. This is not only a waste of paper resources and inefficiency, but also causes teachers to make mistakes such as misjudgment and misjudgment. Above problems will not only affect students, but also mistakes in teaching work [2]. In order to better adapt to the high efficiency of the current high-tech era, reduce the repetition rate of test questions and reduce the workload of teachers' teaching, it will become an inevitable to use the big data question bank to construct the digital chemistry science industry test platform in the near future.

Compared with domestic, with the help of advanced technology, foreign countries have realized the big data digital platform early with the help of advanced technology [3, 4]. The earliest research on the subject academic testing library abroad is the CTSS (Classroom teacher support system) developed jointly by IBM Company and the Los Angeles School District in 1968 by the aided testing CAT (Computer Assisted testing) [5]. Later, California developed a system for 11 topic libraries. Besides
the United States, the online test and subject academic test library management system developed by the British QuestionMark Perception and Yi Fang Company has also been applied.

As early as 1986, the National Education Commission took the establishment of the subject academic test database management system as one of the important topics in the national "Seventh Five-Year Plan" education planning [6]. Now more famous: 12cnEdu century education —— online examination system and structural mechanics subject academic test database. The development trend is from single subject academic test database to network subject academic test database, from professional subject academic test [7, 8] database to general subject academic test database.

2. System Analysis and Design

2.1. System Analysis
The design of the digital platform of academic testing in colleges and universities should consider both timeliness and application, as well as the balance and difference of different colleges and universities. Subject testing should not only consider generality but also take into account specificity, but also pay attention to standard and convenience. The digital platform of academic testing in colleges and universities is divided into teachers, students and administrators according to the role authority. Among them, teachers mainly have examination questions, examination papers, examination scores, candidates, personal information management authority; students mainly have examination, examination scores view, personal information management authority; administrators mainly have college management, personnel management, curriculum, authority, personal information management authority [9-12].

2.2. Functional Module Analysis
The main function modules of the digital platform of subject academic test are teacher module, student module and administrator module. Users with different permissions have different module functions. Below with the teacher function module to do the analysis explanation. (a) Question bank management: including manual addition of questions, batch addition of questions, question bank management, question bank statistics, in which manual addition of questions can add multiple choice questions, fill in blank questions, complex, simple answer questions, and each question can give the corresponding correct score and explanatory information, multiple choice questions, fill in blank questions directly into the answer, comprehensive questions, short answer questions need to enter the main points of the answer, ideas and scoring criteria. (b) Examination paper information management: it includes two functions: test paper generation and examination task management. (c) Performance management: Viewing test scores is defined in this module. (d) Student management: a query for student information is defined in this module. (e) Personal information management: where personal information can be viewed, course information taught and personal passwords modified.

2.3. Function Module Design
According to the demand analysis and the practice of academic testing in colleges and universities, the digital platform of academic testing in colleges and universities is modularized, as shown in figure 1:
Digital Platform of Academic Test in Colleges and Universities

Teacher module
- Question bank management
- Performance management

Student module
- Personal Information Management
- Online examination

Administrator module
- Examination paper management
- Results Enquiry
- Course information management

Fig. 1 The functional structure of digital platform

The teacher realizes the data import and verification to the student information; has the examination question bank data compilation, the revision authority; realizes the examination question extraction, the composition paper and the design authority to the completed question bank; designates the examination student's subject test link. Students receive the teacher's subject test information; according to the test arrangement to achieve online examination; test after a period of time to query results. Administrator has subject academic testing department management, curriculum information management and role authority allocation management.

2.4. Database Design
The database selection MySQL of the digital platform of subject academic test is based on the lightweight characteristics of MySQL and the characteristics of low requirements for the system, less resources and stability. Digital platform database design has a number of tables, now the following description is an example of the choice questions table named T_t_xzt table. T_t_xzt table mainly stores the title number, title, options, correct answer, difficulty coefficient, score, subject number, grade number, teacher number and other relevant information, where the Th is the primary key ID, other attributes are required, as shown in the table below.

| Property | Data type | Length | Note |
|----------|-----------|--------|------|
| Th       | Int       | 11     | Title, Key |
| Tm       | Test      |        | Content |
| Xx A     | Varchar   | 300    | Options A |
| Xx B     | Varchar   | 300    | Options B |
| Xx C     | Varchar   | 300    | Options C |
| Xx D     | Varchar   | 300    | Options D |
| Da       | Varchar   | 2      | Answer |
| Ndxs     | Int       | 11     | Difficulty coefficient |
| Fz       | Float     |        | Value |
| Kmbh     | Int       | 11     | Subject Number |
| Njdh     | Int       | 11     | Year Number |
| Jsbh     | Varchar   | 20     | Teacher Number |
3. Digital Platform Implementation

3.1. Main Interface Login Implementation
Role according to the user and verification information after the implementation of login success prompts. Figure 2 below is the teacher user login interface. After the teacher logs in, the function modules of question bank management, examination paper management, student management and information management under the authority of the teacher match it, and can further display the relevant detailed functions through the menu.

![Digital Platform of academic test in colleges and universities](image)

**Fig.2** The main login interface

3.2. Add Questions
The big data of the subject academic test question bank is supplemented according to the characteristics of the subject.

The types of questions in the digital platform are mainly divided into multiple choice questions, blank questions, judgment questions, short answer questions and summary questions, covering the types of questions in most subjects' academic tests. In order to collect and analyze the data better, different difficulty coefficients can be set according to the degree of difficulty, which provides convenience for the subsequent examination papers, and is convenient for teachers to balance the test papers of the students' science industry.
Below to a common subject-multiple-choice questions as an example to achieve the addition of test questions. Multiple choice questions are mainly questions, options, scores and correct answers. In addition, the difficulty coefficient (simple, medium and difficult) is increased. Finally, the basic assessment information such as major and grade suitable for testing is set up and stored in the database to provide options for the extraction of test questions for subsequent academic tests. The effect diagram is shown in figure 3.

3.3. Academic Test Papers

The paper formation is the main link to realize the subject academic test, in which the information of the test paper can be preset before the test, the object of using the test paper is defined, the qualified score is determined, the method of forming the paper is formed, and the automatic paper formation is realized according to the algorithm of the paper formation. The automatic test paper has the function of intelligent test questions, and the manual test paper needs to set each test item according to the manual. The advantage of manual setting is that each option of test data can be well controlled, such as the number of different chapters and the difficulty coefficient, as well as the handling of conflicts, which will result in a large workload and reduced efficiency. The ideal subject academic test paper is the fusion of automatic paper and manual paper. After setting the test paper condition in advance, the automatic paper forming function is started, and then the manual paper examination is realized, and some test items are replaced moderately to ensure the rigor of the subject academic test. Figure 4 below is a preset for a subject.

In order to better realize the test of subject academic level, the specific question type can be set according to the need after the paper is preset, such as the multiple choice question can be set according
to the difficulty coefficient simple, moderate two difficulty coefficient 10 questions each, the other set in turn, the effect diagram is shown in figure 5 below. In fact, the setting of the test paper is to select the test paper condition, and the automatic test paper is to match the information automatically according to the algorithm and the test paper condition.

### Fig. 5 Add test paper condition

#### 3.4. Test Paper Generation
First set the total score of the test paper, according to which set the multiple choice score, fill in the blanks score, short answer score, comprehensive question score, so that it is equal to the total score of the test paper 100. The following is an example of multiple choice questions students to describe the test paper generation algorithm. Set the difficulty of multiple choice questions and the number of questions generated, the platform automatically calculates the scores of such questions (where the s is a multiple of the single question score), then filters out the corresponding difficulty coefficient questions and queries the total number of questions in the database n, generates a temporary linked list to store m random numbers from 1 to n, calls the random function in the linked list, multiplies the m with the score of the question s1, if the s1 is not equal to continuing the loop, Until the s1 is equal to the end of the s, cycle. Fill in the blanks, short answers; comprehensive questions and so on are implemented according to this algorithm. The following figure 6 is a summary of all kinds of questions after the test paper is generated.

#### Fig. 6 The effect of the generated test paper

#### 3.5. Marking and Publication of Scores
After the test paper is generated and published, the students in the corresponding class can log on to the student account to carry out the subject academic test at the scheduled time. For the responses submitted, automatic marking of papers will be done and the score will be estimated with the digital platform. Of course, the determination of final results also needs to be made after manual examination by teachers. In view of the short answer and summary questions and other subjective questions need manual examination of the marking teacher in order to give a fairer and more accurate score. After the results are determined through the digital platform release, students at any time login access.
3.6. Data Storage and Archiving

After the completion of the process of the digital platform of academic testing in colleges and universities, the teacher can back up the data according to the needs of the student class or teaching class. Backup data can be opened and printed in office software Word. Required archiving for better data integrity and services, the students' answers and References answers will be stored with Word Document Data. The convenience of teaching evaluation is realized.

At the same time, the digital platform of academic test in colleges and universities is also practical in the data collection and index. It can realize the statistical analysis of each data, including the rate of excellence, the passing rate, the comparison between different classes of difficulty coefficient of each topic score. In order to represent the data more intuitively, the column diagram and the broken line diagram represent different data values.

4. Conclusions

The digital platform of academic test in colleges and universities is reasonable according to the user's role, and the function module is relatively perfect, which solves the flexibility of the arrangement of the test questions and the intelligence of the test papers, and also has good functional performance in the analysis of the test papers, archiving and the display of the data visual map.

The design of the digital platform of subject academic tests in colleges and universities will adopt a better man-machine interface, which will facilitate the process of subject academic test in colleges and universities, reduce the waste of paper, reduce the work intensity of teachers, unify the examination paper management, personnel management, save cost, and improve the execution efficiency to some extent. It has a good application prospect for the perfection of subject academic test database and the unified establishment of evaluation standard.

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