

The Design and Implementation of A System for Analyzing Course Grades in Higher Education

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ABSTRACT

Course score analysis is an important means of teaching management in colleges and universities, which can accurately evaluate the teaching quality and the degree of achievement of course teaching objectives. In order to do a good job of college performance analysis conveniently and quickly, based on MySQL PHP, Layui and other technologies have developed a management system based on B/S architecture, which can calculate the quality of test papers and the degree of achievement of courses, classes, individuals and other data on the basis of information such as talent training programs, teaching syllabus, test papers, and exam scores, providing support for the continuous improvement of course teaching and professional certification.

KEYWORDS

Colleges and Universities; Program Quality; Achievement Analysis; Attainment

1. INTRODUCTION

The analysis of examination papers and grades of higher education courses is an important means to test the quality and effect of teaching, and an important basis to test whether the objectives of talent cultivation have been achieved. For the quality of test papers, it is mainly evaluated from four aspects of difficulty, differentiation, reliability and validity, and for the degree of achievement of the course, it is mainly calculated according to the value and score of each course objective in the assessment method, which requires the statistics of each student and each question. A complete and scientific management system can realize the efficient management of this process, provide accurate evaluation results for teachers and schools, and support the work of professional accreditation.

2. NEEDS ANALYSIS

In the teaching management system of colleges and universities, the talent training program determines the cultivation goal of a specialty, and the course syllabus determines the teaching content of a course, the course objectives, and the assessment and evaluation methods, etc., so as to achieve the cultivation goal through the continuous achievement of the objectives of the courses. At the same time, at the end of the semester, we need to review the assessment methods and test papers, and after the completion of the examination, we need to analyze the results and find out the problems and deficiencies in the test papers and teaching. This process requires recording and processing a large amount of data, and making accurate analysis and judgment on the data.

Based on the analysis of the process before and after the organization of teaching, it can be summarized that the main needs to be solved by the system are.

- 1) Manage the training program for each major and the syllabus for each course.
- 2) Manage the proportion of process and summative assessment, the value of each chapter in the assessment program and the students' scores and other information.
- 3) Generate statistical and analytical materials for test papers and grades.
- 4) Generate an attainment report for the course.

3. SYSTEM DESIGN AND IMPLEMENTATION

The system adopts the B/S architecture, the server side is the Linux platform, the Apache+MySQL software combination is used, and the programming language is PHP. This is a popular website design architecture at present, which has the advantages of high security, high efficiency, strong scalability, low cost, etc. The front end uses the JQuery library and the Layui framework. For small sites such as the University Score Analysis System, this technology combination has the characteristics of complete components, simplicity and ease of use, which can greatly shorten the development cycle. At the same time, the ECharts library is used for data visualization, which can intuitively view the results.

3.1. Functional Design

This system is mainly considered to be a summative assessment of the way the paper, customized by the teacher of the process of multi-form assessment of the course evaluation, the main functions to achieve the management of human training programs, syllabus management, evaluation methods and grades, as well as the management of the corresponding test papers, course analysis and so on. Achievement of the operation are: set the composition and proportion of the usual grades, and enter the student's scores; enter the course paper information, including the type of questions, scores, knowledge points in the chapter, the course objectives, etc.; enter the test paper scores of the questions; to generate the final grade statistics and course performance statistics and test paper analysis results; to generate the results of the course to achieve the degree of analysis. Part of the public information required in this system, such as teachers, classes, students, course schedules and other related data can be created in this site to deal with the corresponding data table, can also be obtained through the interface of the existing academic affairs system.

On the site architecture, use HTML templates to design function pages, access PHP files through Ajax technology to obtain data, return in Json format, and then load from the front page. The overall structure of the system is shown in Figure 1.

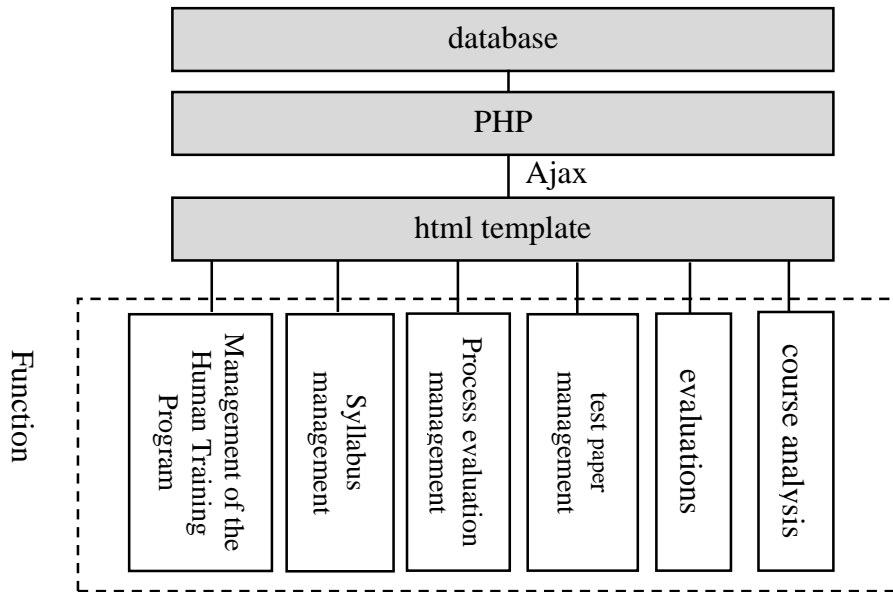


Figure 1. System structure diagram

3.2. Database

The key data stored and processed by the system are: usual grades, paper information, paper score information, course objectives and so on, to meet the third paradigm as a criterion to do the sub-table, and through the foreign key to be associated with the main data table information as shown in Figure 2.

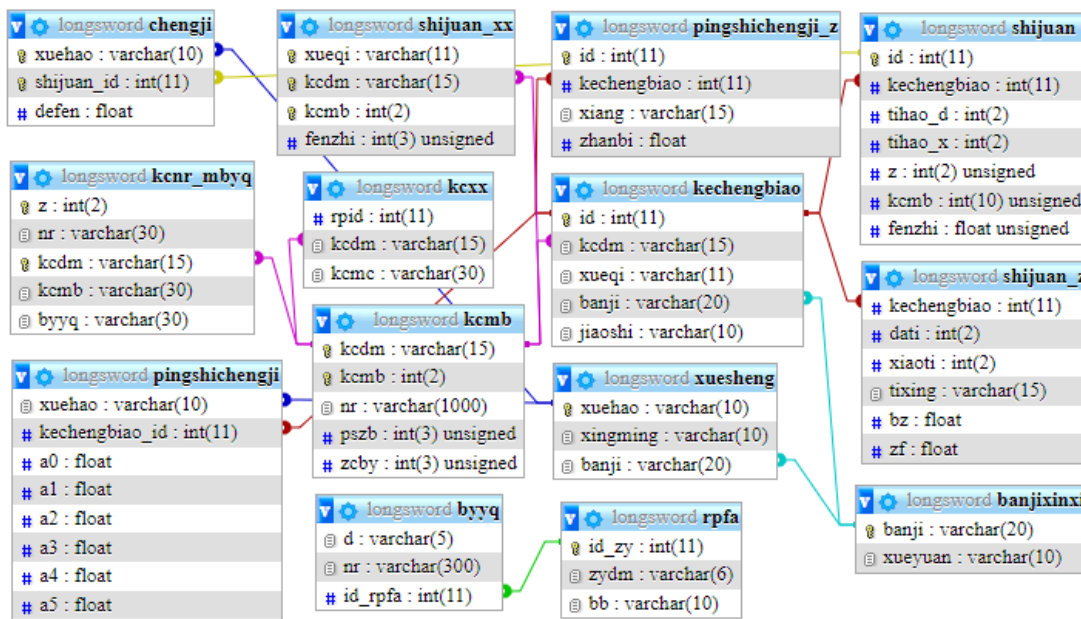


Figure 2. Diagram of the database model

3.3. Interaction Design

The system realizes interaction through various controls and user-defined buttons on the Web page. Taking setting the proportion of ordinary performance as an example, when entering the page, access the database to obtain the name and percentage of each item, and then output the corresponding content. When the user performs the "Add/Modify/Delete" operation and clicks the "OK" button, the front JQuery after Layui analyzes that the submitted content meets the basic requirements, it uses Ajax to send the information in the form to the server asynchronously. After the corresponding PHP

file processing completes the database operation, it feeds back the results, and then the front end updates the page and pops up a window prompt. The page and code for the deletion operation are shown in Figure 3.

Figure 3. Effect of deleting the usual grade items

3.4. Information on Examination Papers

The system requires the user to enter information such as the number and type of test questions, add the score of each question, the chapter number of knowledge points, the corresponding course objectives, and calculate the distribution of test scores of each chapter based on the syllabus. It can generate pre exam review materials such as examination paper review forms and two-way detailed lists. If it is necessary to archive materials, you can use the Word template to add data and generate files for users to download. The two-way list page is shown in Figure 4.

章次	内容	学时分布	考分分布	单选题		判断题		简答题		计算题	
				题量	分值	题量	分值	题量	分值	题量	分值
一	程序设计基础	4	48	2	8	2	6	3	21	1	13
二	类和对象	16	17	1	4	2	6	1	7	0	0
三	继承与派生	12	17	1	4	0	0	0	0	1	13
四	多态	10	14	0	0	0	0	2	14	0	0
五	Qt事件及绘图	10	0	0	0	0	0	0	0	0	0
六	数据I/O	12	4	1	4	0	0	0	0	0	0
合计		64	100	5	20	4	12	6	42	2	26

下载双向细目表

Figure 4. Bidirectional breakdown of effects

3.5. Analysis of Achievements

The analysis of the examination paper is realized in the following four dimensions: Difficulty examines the overall mastery of the students' knowledge points, and is calculated by the formula "1 - average score/total score". Differentiation examines the distribution of students' performance, calculated by the formula "high group difficulty - low group difficulty", and the proportion of groups selected in the system is 27%. Reliability examines the consistency and reliability of the results, and the system chooses half reliability, which is calculated after dividing the test questions according to

the principle that the total score and differentiation are basically the same. The validity examines the degree of validity of the test paper, and the system takes the scores of each question type and the total score as the calibration to test the other scores. The results of the calculation are shown in the form of a table, as shown in Figure 5.

试卷质量分析					
题号	一	二	三	四	
题型	单选题	判断题	简答题	计算题	
分值	20	12	42	26	
得分率	54.00%	60.63%	74.46%	72.69%	
区分度	0.545	0.455	0.286	0.325	
评判	好	好	差	较好	
最高分	最低分	平均分	难度	区分度	
99	37	68.25	0.682	0.368	
效度 (0.794)					
	单选题	判断题	简答题	计算题	总分
单选题	1				
判断题	0.450	1			
简答题	0.482	0.507	1		
计算题	0.466	0.545	0.498	1	
总分	0.784	0.748	0.819	0.783	1

Figure 5. Effectiveness of the results of the quality analysis of test papers

3.6. Visualization of Results

The assessment results are graphically displayed in ECharts database, mainly based on the statistics of individual scores and class scores, including the scores of each question type, each chapter, and each course goal, scoring rate, and the highest/lowest score, as shown in Figures 6 and 7. The system uses radar charts, bar charts, broken line charts, and other forms to display the score data of individuals and classes.



Figure 6. Individual Score Chart

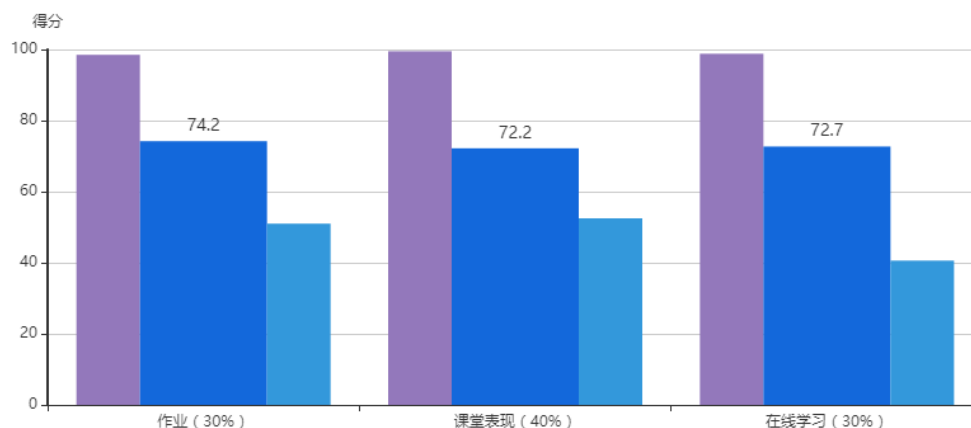


Figure 7. Chart of usual class performance

3.7. Reach Analysis

The degree of achievement of the course includes the degree of achievement of the objectives of the process evaluation and the degree of achievement of the objectives of the summative evaluation.

The formula for sub-target attainment is

$$D_i = p_i^1 \frac{A_i}{T_i^A} + p_i^2 \frac{B_i}{T_i^B} \quad (i = 1, 2, \dots, N)$$

Among them, N for course sub-objectives. p_i^1 and p_i^2 Percentage set for course sub-objectives. T_i^A and T_i^B is the course sub-target score. A_i and B_i is the score for the course sub-objective, the final course attainment D for all D_i The weighted average of the results can be calculated for each student's individual attainment and for the class as a whole.

4. DISCUSSION

Based on the information of human training program, syllabus, test papers and grades, etc., the system basically realizes the analysis of the teaching situation of the courses from the grades, which can do a good job in the management and maintenance of the basic data of teaching and strengthen the application of the results of the grades, provide the data support for the professional accreditation and other work, and provide the basis for the revision of the teaching and human training program. On the basis of the completed work, the system functions can be improved and strengthened in the following aspects.

- 1) Information input optimization. Considering that there are many data such as test papers and student scores, Excel templates can be used to quickly import data, improve efficiency and reduce the risk of errors.
- 2) Do a good job of interfacing with existing systems. Teaching management often has a number of systems co-existing, including the teaching system, question bank, teaching platform, etc., you can develop more flexible interfaces to realize data sharing and reduce redundancy.
- 3) Provide data interpretation function. Not all teachers are able to accurately understand the data analyzed, so the system can synthesize the results and give the problems in teaching and learning for reference.

4) Provide historical data analysis function. Teaching needs to be continuously optimized, and the characteristics of different teaching objects need to be considered. Through the comparative analysis of data from different grades of the same course, it can provide support for the improvement of teaching, and at the same time, through the analysis of the data of the course, it can also provide the basis for the analysis of the learning situation of the teachers of the latter courses, so that the teaching design can be more targeted.

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