Design and Research on Examination Performance Assessment System for College Student Course

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Abstract: In the process of designing college student course examination performance assessment system, with the current algorithm to design examination performance assessment system, only based on the theoretical view to assess the quality of qualitative course examination scores, results in the passive situation that student study only for exam and teachers teach for the exam. To this end, a method for designing college student course examination performance assessment system based on the analytic hierarchy algorithm is proposed. This method starts from the perspective of chemical engineering principles teaching, the theoretical teaching of chemical engineering principles and professional knowledge are combined as the main line, during the teaching process, chemical engineering principles course evaluation program combined of "process evaluation" and "final exam" is implemented, teaching focus is transferred from "results-based evaluation" to "process-based and results-based evaluation ", evaluation factors of college students chemical engineering principles course examination scores is clarified to establish indicator system of examination scores evaluation and mathematical model of examination scores evaluation for each indicator, so as to achieve a precise assessment of college students examination performance of chemical engineering principle. The simulation proved that the method for designing college student course examination performance assessment system based on the analytic hierarchy algorithm effectively stimulate student interest in learning the chemical principles major.

1 Introduction

Teaching evaluation is an important part of course teaching, which directly affects the setting of teaching content, selection of teaching methods, learning attitude and learning motivation of students [1.2.3]. Scientific assessment has played a crucial role in achieving curriculum objectives, optimizing teaching methods and improving the quality of teaching [4.5.6], has become the focus of the industry to research, has been widespread concerned, and there have been a lot of good methods [7]. At present, the commonly used methods include ant colony algorithm, normality algorithm and improved particle swarm optimization method. With the current algorithm to design examination performance assessment system, only based on the theoretical view to assess the quality of qualitative course examination scores, results in the passive situation that student study only for exam and teachers teach for the exam.

Aiming at the above problem, a method for designing college student course examination performance assessment system based on the analytic hierarchy algorithm is proposed. The simulation proved that the method for designing college student course examination performance assessment system based on the analytic hierarchy algorithm effectively stimulate student interest in learning the chemical principles major.

2 design principle of the method to optimize college students examination performance assessment system

2.1 Establishment of college student’s chemical engineering curriculum examination evaluation program

The theoretical teaching of chemical engineering principles and professional knowledge are combined as the main line. Specific programs are as follows:

(A) Final exam scores of Chemical Engineering Principles weights 60%, normal scores accounted for 40%, while usually results into four parts (5% attendance, classroom questions 5%, 10% homework, essays and discussion 20 %).

(2) At the beginning of the class, two classes are divided into four to five groups separately, based on snake division for chemical grouping principle course scores, the following processes are completed within the group. Among them:

1) Each time in the class, the group leader will report a list of absent students, indicating that the reasons of absence. Unexcused absences deducted 2 points once, three unexcused absences, the student is not allowed to take final exam. Being late for three times regards as absence for once; students of sick leave and leave of absence have to catch up the missing course, not penalized if passed the after class questioning.

2) the chemical principle lesson questions, content evaluation forms, and the gradual implementation of the "teach-based" to "science-based" conversion, improve chemical principles, "both inside and outside class combination of" strength, strengthen process management.

3) After the class, homework is graded, recording the grades and the student name of lower scores, so analyze the shortcoming of the student later; the helping group is formed, high-scoring student will explain the problem set to low-scoring students with assistance of teacher, score bonus is given to the helping group with increased ignition.

4) The chemical engineering major class is divided into five groups, the open project related to actual production is proposed, after preparing the materials by group, two people are selected from each group to present, question and answer section follows, each group is graded according to the teacher evaluation and assessment of classmates. Competition is introduced to improve students' sense of community and competition.

2.2 Implementation of college student’s course examination assessment optimization system

Establishment of indicator system of course examination scores evaluation system should follow the following basic principles:

(1) College students course examination assessment systemic principles. The assessment should include a variety of levels and in all aspects.

(2) Easily quantification principles. Assessment index should be concise, easy to understand and quantify.

(3) Combination of process evaluation and results evaluation, learning process assessment is the main principles. During the establishment of indicator system for assessing examination scores, three indicators can be used, including:

(1) Academic teacher evaluates the grades for students’ study and exam.

(2) Students evaluates themselves according to their learning and examination, etc., summarized inadequate in study and examination process and learning difficulties.

(3) Studying group, group studying improve students' observation ability and team spirit.

Chemical engineering principles exam assessment results graded with percentile scores. Therefore, scores for each evaluation index need to be assigned, the scores is calculated from the multiplication of weights of the evaluation index in the upper index and the fraction of the upper index. The index weight is obtained by using paired comparison of the analytic hierarchy method. x_i and x_j represents paired comparison,the relative importance of the values indicated by a_{ij}.

When n indicators are compared in pairs, positive reciprocal matrix $A_{n\times n}$ is obtained:

$$A_{n\times n}=\begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ 1/a_{12} & 1 & \cdots & a_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ 1/a_{1n} & 1/a_{12} & \cdots & 1 \end{bmatrix} \quad (1)$$

After standardizing feature vector of matrix $A_{n\times n}$, the index weight $(w_1, w_2, \ldots w_n)$ can be acquired. During assessment process, first to determine the weight of each layer indicator, so as to calculate

the fraction of each indicator:

$$X_i = \sum_{j=1}^{n} w_i x_{ij} \qquad (2)$$

In summary, the proposed design method can indeed effectively enhance students 'self-learning ability and stimulate students' enthusiasm.

3 Experiment and Simulation Analysis

There is the need to conduct the experiment to prove the validity of proposed method. Table 1 shows scores of three courses of 30 students in material chemistry majoring class, including principles of chemical engineering, chemical industrial technology, fundamental chemical engineering. Normalized results are shown in Table 2, respectively, 4,4,3 are utilized as weights of three course credits, the students are divided into five categories, with the traditional algorithm and improved algorithm to calculate, the results shown in Table 3. It can be seen from Table 3, No. 21 is lower than the lowest in the medium-scoring category, but only 2 points higher than the highest in just- pass category, so it should be regarded as just-pass category.

Table 1 the achievement of material chemistry major

Student number	Course 1	Course 2	Course 3
1	67	91	83
2	64	64	69
3	34	59	46
4	67	85	66
5	73	68	72
6	60	66	53
7	65	78	77
8	80	92	68
9	61	79	59
10	73	83	59
11	91	82	60
12	81	89	47
13	79	91	77
14	84	87	66
15	72	82	79
16	81	83	84
17	76	92	84
18	64	59	64
19	77	90	66

20	64	69	74
21	69	69	51
22	61	68	59
23	69	76	79
24	86	88	69
25	84	69	74
26	82	92	63
27	95	95	73
28	60	60	77
29	85	83	77
30	77	79	65

Table 2 the achievement after normalization

Student number	Course 1	Course 2	Course 3
1	-0.5	1.0	1.4
2	-0.7	-1.3	0.1
3	-3.1	-1.7	-2.0
4	-0.5	0.5	-0.1
5	-0.01	-0.9	0.3
6	-1.0	-1.2	-1.4
7	-0.68	-0.09	0.9
8	0.53	1.16	0
9	-0.99	0	-0.8
10	-0.02	0.36	-0.8
11	1.47	0.27	-0.75
12	0.61	0.9	-1.9
13	0.45	1.0	0.85
14	0.85	0.72	-0.18
15	-0.10	0.27	1.04
16	0.61	0.36	1.51
17	0.21	1.16	1.51
18	-0.75	-1.7	-0.3

19	0.29	0.98	-0.18
20	-0.75	-0.88	0.57
21	-0.36	-0.88	-1.6
22	-0.99	-0.97	-0.84
23	1.25	-0.26	1.04
24	1.01	0.81	0.09
25	0.85	-0.88	0.57
26	0.69	1.16	-0.47
27	1.73	1.43	0.85
28	-1.07	-1.69	0.47
29	0.93	0. 36	0.85
30	0.29	0	-0.37

Table 3 the comparison of improved algorithm and traditional algorithm according to achievement category

	Improved algorithm		Traditional algorithm	
Category	Student number	Average score explanation	Category	Student number
1	11，23，27	92.68 excellent	excellent ≥90	11，23，27
2	8，12，13，14，16，24，25，26，29	83.43 good	good（80~90）	8，12，13，14，16，24，25，26，29
3	5，10，15，17，19，30	76.67 middle	middle（70~80）	5，10，15，17，19，30，21
4	1，2，4，6，7，9，18，20，21，28，22	65.82 pass	pass（60~70）	1，2，4，6，7，9，18，20，28，22
5	3	35 failed	failed ≤60	3

These experiments can prove that the proposed design method can indeed effectively enhance students' self-learning ability, and assessment performance is comprehensive and accurate.

4 Conclusions

For the use of the current algorithm Chemical Principles Examination Evaluation system design, only from a theoretical perspective on the quality assessment of qualitative course test scores, student-led school exams, teachers teach passive situation exam questions raised A design method

based on the analytic hierarchy algorithm college student test scores course evaluation system. This method of teaching from the perspective of chemical engineering principles and taking the theory of teaching and professional knowledge of chemical principles combined as the main line through the implementation of the "process evaluation" + "final exam" in the process of teaching a combination of chemical engineering principles evaluation program will be teaching "results-based evaluation" to "process and outcome evaluation of the combination" conversion, chemical engineering principles specifically college students test scores to assess factors established evaluation system test scores and test scores for each indicator to assess math model, to achieve a precise assessment of college students test scores of Chemical Engineering Principle. The simulation proved that the algorithm based on the Analytic Hierarchy course exams assess student university system design approach effectively stimulate student interest in the chemical principles of professional learning.

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