Design and Research of College Students' Comprehensive Quality Evaluation System Based on Evolutionary Algorithm

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Abstract. This paper studies the design of College Students' comprehensive quality evaluation system based on evolutionary algorithm. The current evaluation system mainly focuses on quantitative evaluation, displays the results in the form of summary evaluation, and lacks qualitative evaluation and process evaluation. The comprehensive quality of college students has increasingly become the focus of social attention. Colleges and universities are important places for cultivating high-quality talents. Therefore, strengthening comprehensive quality education is not only the need of the times, but also the need of China's higher education reform. Combining evolutionary algorithm with college students' comprehensive quality evaluation, a college students' comprehensive quality evaluation system based on electronic archives is developed, which better unifies qualitative evaluation and quantitative evaluation, process evaluation and summary evaluation.

Keywords: Evolutionary algorithm · Evaluation system · Comprehensive quality of College Students

1 Introduction

The word "quality" is originally a physiological concept. In the field of higher education, quality can be understood as "the basic conditions necessary to complete a certain activity". Comprehensive quality is the subjective quality formed by the educated on the basis of innate genetic quality, through receiving education and participating in social practice. It is the systematic integration of human physiology, psychology, culture, ability and moral quality.

With the rapid development of social productive forces, the demand for talents from all walks of life is increasing day by day. How to comprehensively and evenly evaluate personal comprehensive quality and realize the needs of talents? How to cultivate high-quality and high-level talents requires comprehensive consideration of teaching quality and students' quality level evaluation. Therefore, for students' comprehensive quality evaluation, we need a comprehensive and targeted evaluation system. At present, most colleges and universities conduct comprehensive quality evaluation based on students' academic performance and school performance, but is the evaluation method appropriate,

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comprehensive and targeted? Whether the quality of talents screened through evaluation basically meets the requirements of units at all levels of society.

At present, most colleges and universities have initially implemented the comprehensive evaluation of college students. There are many differences in the content, procedures and methods of the evaluation. Some of the evaluation items are divided into excellent, good, medium and poor grades under the moral, intellectual and physical modules. Some of them take the form of evaluation regulations as the evaluation implementation method, and the evaluators and the evaluated give static judgment on each item with reference to their behavior; Some of them only display extended articles in the aspects of "morality, intelligence and physique"[1]. Characteristics of comprehensive evaluation method: the comprehensive evaluation is divided into moral, intellectual and physical parts, each accounting for a certain score proportion; Weighted average of academic performance of each course in academic performance, reflecting the proportion of different courses; Moral performance is changed from voting to scoring or students' scoring is adjusted; The performance of students in the school is reflected separately in the form of addition and subtraction or in the individual items of morality, intelligence and sports. Problems in comprehensive evaluation: the weight relationship of moral, intellectual and physical sub items is artificially determined, which is lack of scientific basis; Academic achievement only focuses on examinations and examination courses, which can not reflect the needs of the new employment situation; The scoring of moral evaluation is arbitrary, without definite basis, only based on personal impression; The daily performance bonus is not standardized, so that each proportion can not reflect the real behavior of the evaluated person.

Colleges and universities are the national garden for cultivating all kinds of specialized talents and the cradle for the growth and success of college students. It is the central task of colleges and universities to cultivate millions of college students into useful talents with high comprehensive quality and solid professional knowledge. To judge the quality of college students, we must use scientific methods to make a comprehensive evaluation of college students. This is not only an important part of college student management, but also the need for college students' evaluation and graduation assignment. Especially after the merger of colleges and universities, the graduation distribution of college students will implement independent job selection and two-way selection. Each employing unit will select talents suitable for the needs of its own department according to the nature of work and business content. To this end, schools have to provide employers with all kinds of information about students so that each student's strengths can be brought into play. This information is based on the evaluation of College Students' comprehensive quality.

2 Relevant Overview

2.1 Evolutionary Algorithm

First, it is necessary to establish a first-class weight system, and finally determine the number and name of weights by means of questionnaire survey, consulting materials and referring to the existing evaluation standards of colleges and universities. Each index of the primary weight system is subdivided, and each primary index is divided into a secondary weight system. Similarly, the secondary weight system is subdivided to finally form a tertiary weight system. The weight values of the whole tertiary weight system are confirmed by expert evaluation method to obtain a complete tertiary weight system, It is used for the comprehensive quality evaluation system of college students. Then, the student's performance is evaluated through the student's comprehensive quality evaluation algorithm based on three-level fuzzy comprehensive evaluation. The algorithm is comprehensively displayed in the form of B / s system. The evaluator inputs various data representing the student's level, the system calculates the secondary comprehensive quality level coefficient, and then calculates the secondary coefficient and the primary weight value, Finally get the comprehensive quality level of students [2].

At present, there are many software related to students' comprehensive quality evaluation system. The final function of the software is the same. The only difference is that the students' evaluation indexes and the quantitative analysis of each index are different, but their purpose is to more effectively reflect the students' comprehensive quality of the University. In order to realize the quantification of comprehensive quality, we need to base on the different characteristics of each evaluation index, At present, the more commonly used methods are AHP, fuzzy comprehensive evaluation method, etc. the system uses evolutionary algorithm to calculate the weight of each evaluation index, which is the uniqueness of the system. The evolutionary algorithm code is shown in Fig. 1 below.

```
P <- GenerateInitialPopulation()

Evaluate(P)

while

        termination conditions not metdo

         P’ <- Recombine(P)

         P” <- Mutate(P’)

         Evaluate(P”)

        P <- Select(P” U P)
```

Fig. 1. Evolutionary algorithm code

2.2 Evaluation Theory

System evaluation theory regards the evaluation object as a system, and the evaluation index, evaluation weight and evaluation method should operate according to the system optimal method.

(1) System behavior structure

Any system is a conversion mechanism, that is, it converts a certain input into a certain output, and then further feeds back to the input, so it operates repeatedly. In this way, all the activities of the system can be divided into four parts: input, operation, output and feedback. The structure description of "system behavior" is shown in Fig. 2 below:

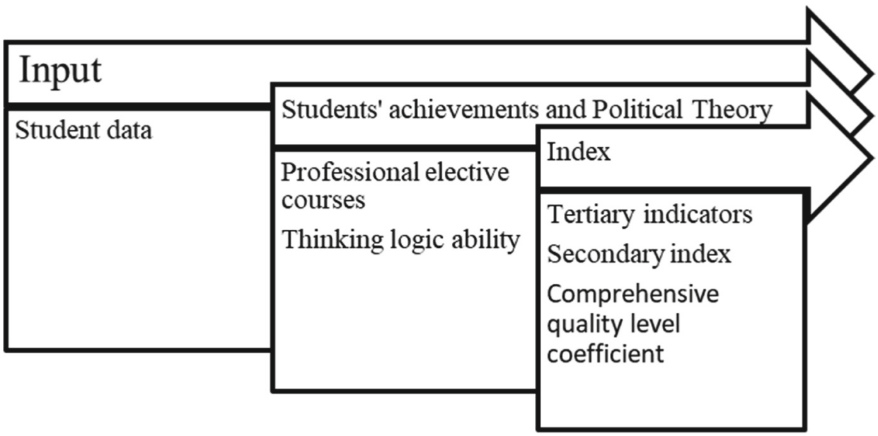

Fig. 2. Overall structure diagram

(2) Methods of systematic evaluation

As can be seen from the above description, there are many uncontrollable factors in the process of system conversion activities. It is difficult to deal with it directly, and the output of the system is the result of the established process. Different methods and means can be used to evaluate the system. Therefore, when evaluating the system, directly evaluate the output results rather than the conversion activity itself. On the other hand, the output result of the system is affected by two factors: the system environment and the internal state of the system, and the internal state of the system plays a decisive role, that is, it depends on the conversion ability and level of the input within the system, and finally depends on the optimization degree of the structure. In this way, through the evaluation of the output, it also indirectly evaluates various specific activities of the transformation work, so as to achieve the purpose of the evaluation work.

Evaluation is to evaluate the output of the system according to the principle of system integrity, not just one aspect or some parts of the work results. According to the principle of system optimization, the sum of the optimal individuals is not equal to the optimization of the system. The result of optimization is to establish the best combination of various elements, which is greater than the algebraic sum of parts, which requires a comprehensive evaluation process.

3 Design of College Students' Comprehensive Quality Evaluation System

According to the requirements of the system and combined with previous development experience, the system is designed into four subsystems: student daily performance management, comprehensive evaluation, intelligent analysis and interpretation subsystem and report, as shown in Fig. 3. Among them, the student daily performance management subsystem is divided into 11 modules: student basic information management, student status management, curriculum management, achievement management, reward and punishment management, community management, attendance management, student health status, outstanding event management, online record management, social practice management and so on; The intelligent comprehensive evaluation subsystem is divided into four modules: index system management, evaluation knowledge base management, evaluation knowledge base management, evaluation and comment generation [3].

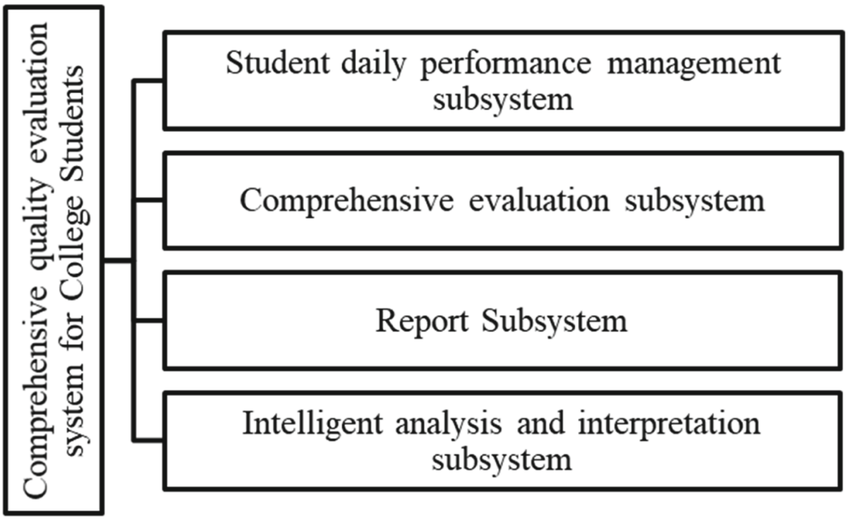

Fig. 3. System function structure diagram

4 Design of Comprehensive Quality Evaluation System Based on Evolutionary Algorithm

The design method of the index system of this system is: firstly, according to the requirements and characteristics of talent training objectives, on the basis of full investigation and research, carefully analyze the basic quality structure of all kinds of college students, extract the main aspects, and establish a more comprehensive and objective evaluation index set respectively. Secondly, Delphi is used to scientifically classify various indicators, establish a hierarchical structure, and determine the connotation and evaluation grade standard of various evaluation factors. Finally, on the basis of fully soliciting the opinions of all parties, the relative weight of each evaluation factor is calculated by Delphi.

Calculate relative weights:

According to the characteristics of the system, the following Delphi method is used to determine the relative weight a. Take the secondary indicators of ideology and morality as an example:

Set the corresponding weight of each index as a_1, a_2, a_3, a_4, that is, factor importance fuzzy subset a,

$$A = u_{11} + u_{12} + u_{13} + u_{14} \tag{1}$$

$$\sum\nolimits_{A_{\max}} = \max\left\{\sum A_1, \sum A_2, \sum A_3, \sum A_4\right\} \tag{2}$$

$$\sum\nolimits_{A_{\min}} = \min\left\{\sum A_1, \sum A_2, \sum A_3, \sum A_4\right\} \tag{3}$$

(1) The evaluation model is divided into three levels: intelligent single factor judgment, two-level fuzzy comprehensive evaluation and one-level fuzzy comprehensive evaluation.
(2) Single factor judgment uses the expert database in artificial intelligence to judge the impact of students' performance on each evaluation index. Usually, a student's performance record has an impact on more than one index of evaluation. For example, the first prize of the group in the student city mathematical modeling competition can at least show that students have strong mathematical application ability (belonging to the intellectual part) and strong teamwork ability (pioneering ability). Using the expert system, this influence relationship is stored in the system as expert knowledge, and mapped to the index system of the system when making single factor judgment [4].

    The knowledge in the evaluation knowledge base is used to associate the daily performance of students with the secondary indicators of evaluation. As mentioned earlier, the relationship between students' daily performance and indicators is not a one-to-one relationship, but a one-to-many relationship; In addition, students' daily performance is easy to change compared with the evaluation model. For example, a new reward category can be added as needed; The relationship between indicators and students' daily performance often changes according to the needs of evaluation. Based on the above considerations, enhance the function of the system, increase the recording activity of the system, and establish an evaluation knowledge base.

5 Conclusion

This paper is completed on the basis of the actual project of "College Students' quality intelligent comprehensive evaluation system". This system is an information management system. As one of its subsystems, intelligent comprehensive evaluation collects students' moral, intellectual, physical and aesthetic information from multiple channels to realize multi-directional analysis, query, statistics, evaluation, annual assessment Comprehensive evaluation, score report, Graduate recommendation form and other functions comprehensively include student education and management.

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