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AHP-BP fusion model based on university education evaluation model and proposal

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Abstract: *In this paper, through the study of the policy and frontier theoretical changes in the educational evaluation of students and teachers in colleges and universities in recent years, a comprehensive analysis is made to summarize the primary indicators about educational evaluation, and then subdivide the secondary indicators downwards to quantitatively analyze and evaluate their rationalization. In order to improve the accuracy and scientific of education evaluation, this study proposes an AHP-BP education evaluation rationalization model based on the fusion of hierarchical analysis (AHP) and BP neural network. Firstly, the hierarchical analysis method is used to construct an evaluation index system, construct a comparison matrix, and after the initial weights of the evaluation indexes are derived from a two-by-two comparison, they are used as the input of the BP neural network. Finally, the BP neural network simulation results are used, and the model quantifies the concept of teaching evaluation indexes into definite data as the input of the network, and the simulation comprehensive evaluation results are used as the output. The hierarchical analysis method has strong subjective factors, and the neural network, by simulating the working principle of the human brain, has functions such as autonomous learning and non-linear transformation, which can effectively exclude randomness and subjectivity, and is an innovation in conducting educational evaluation. Therefore, the learning simulation process of BP neural network eliminates most of the subjective factors of the hierarchical analysis method in the process of continuous iteration, and obtains satisfactory evaluation results It has wide applicability. Finally, we conducted a small sample simulation based on some of the data collected on the Internet, and the results obtained were relatively small in error and met expectations, and the educational evaluation model could be put into use. Based on the AHP-BP education evaluation rationalization model and the understanding of the current situation of education evaluation, three main suggestions are made: 1. Encourage university evaluation to pay more attention to the process, and eliminate utilitarian evaluation indicators should be more decentralized indicator scores; 2. Suggest that the state should supervise in the general direction, and the specific situation of specific schools is different, and make moderate adjustments to the evaluation model; 3. Vigorously support teacher and student co-education The policy of activities to create a corresponding educational atmosphere resonates with the community and can promote the healthy development of university education.*

Keywords: *hierarchical analysis, BP neural network, higher education*

1. Introduction

Education evaluation concerns the direction of education development, and should improve the institutional mechanism of moral education, reverse the unscientific orientation of education evaluation, resolutely overcome the stubborn miasma and chronic disease of score, promotion, diploma, thesis and hat, improve the ability and level of education governance, accelerate the modernization of education, build a strong education country, and run a good education to the satisfaction of the people. Educational evaluation should follow the pace of the times, and in order to achieve the purpose of education to deliver a continuous stream of talents to the society, improving the educational evaluation model is to improve the rationality of determining the comprehensive quality of talents in colleges and universities. In the model, according to the latest education evaluation standards, the teacher evaluation criteria should not only have factors such as personal teacher moral, academic contribution, academic achievement, and social contribution, but also consider the quality of teaching and student work participation. The student evaluation system, in addition to the basic academic criteria, increases the proportion of the assessment of moral, intellectual, physical, aesthetic and labor education both inside and outside the classroom, and evaluates the overall quality in a comprehensive and scientific manner. The issue of educational assessment has entered our vision, but with the development of the times, education has emerged with serious utilitarianism, unbalanced development of subjects and lack of humanistic care and spirit. In order

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to reverse the unscientific education evaluation and accelerate the modernization of education, the direction of education development requires us to implement the new curriculum standards and truly implement quality education. Education is not only about the transmission of knowledge, but also about the future of a country and a nation. Knowledge changes the destiny of people, education changes the development of the country, we investigated and searched for the evaluation of education in higher education [1].

In order to establish scientific goals of education and ensure the correct direction of development of education and to understand the evaluation of education in reform schools, we consulted relevant information through the Internet and identified the following problems: to give reasonable indicators of student and teacher evaluation, to build models of teacher and student evaluation indicators in conjunction with the evaluation indicators and to explain their rationality, and finally to draw conclusions and make reasonable recommendations through the models built this time [2].

2. Evaluation indicator system construction

The establishment of a scientific and reasonable evaluation indicator system is the premise of scientific evaluation. The establishment of evaluation indicators must follow certain principles to make the established indicator system more reasonable and convincing. The setting of indicators of the education evaluation system should follow five principles: (1) The principle of scientific. The setting of indicators should objectively reflect the nature, characteristics, internal relationships and change processes of the object of analysis itself. For teacher evaluation, the indicator system should reflect the dual connotation requirements of teachers' personal development and social contribution. For student evaluation, the indicator system should reflect the triple connotation requirements of students' theoretical learning, spiritual construction, and practical operation. (2) The principle of comprehensiveness. It should reflect the whole picture of the object from all angles as far as possible and prevent generalization. At the same time, grasp the key points and prevent losing the big ones for the small ones. A complete system of evaluation indicators should be established from a holistic perspective in order to facilitate the impartiality and authority of the evaluation results. The indicator system established should be able to reflect the characteristics of all aspects of the object in a comprehensive manner. (3) The principle of independence. The indicators at the same level should be able to illustrate a certain aspect of the object being evaluated, and the indicators should not overlap with each other or have a cause-and-effect relationship. (4) The principle of feasibility. As far as possible, the statistical data publicly available in the statistical system should be used to ensure the operability and openness of the evaluation and to improve the feasibility of the implementation and application of the indicator system in actual work. (5) Principle of human-centeredness. To promote the reform of the education evaluation system in the new era, it is important to evaluate for teachers or students and achieve the provision of advancing the quality of talents, so talents are an important part of education evaluation. Therefore, the selection and design of evaluation indicators should reflect the idea of valuing people, respecting people, loving people, and motivating people. The programmed requires five dimensions for reforming the teacher evaluation system, including (1) teacher ethics and style (2) actual performance in education and teaching (3) strengthening front-line student work (4) scientific research evaluation. The evaluation system of university teachers is often complex. The education and teaching of university teachers is the process of imparting advanced knowledge to students, that is, the synthesis of two materials. Scientific research is a process of knowledge discovery for teachers, and what teachers "process" is a kind of material, i.e., advanced knowledge, and it is easy to judge the extent of teachers' efforts in the "processing" process. Academic papers, academic monographs and research projects can directly reflect the results of processing profound knowledge, so we have formed an evaluation system based on academic papers, foundation projects and awards and honors when evaluating teachers [3].

How to crack the difficulties in teacher evaluation, highlight the quality orientation and better promote the professional development of teachers and students? The Ministry of Education's "Guiding Opinions on Deepening the Reform of the Teacher Appraisal and Evaluation System in Universities" requires that "the professional development of teachers should be incorporated into the appraisal and evaluation system." [4] In the "Program", it is mentioned that the evaluation of university teachers should highlight the quality orientation, focusing on the evaluation of academic contribution, social contribution, and support for talent cultivation. The evaluation of teachers' ability to create profound knowledge, which is what we usually call scientific research evaluation, is mainly based on the results of scientific research; for the "dual material processing" model, university teachers have to "process" both profound knowledge and students. "For this mode of work, it is necessary to evaluate not only the teacher's ability to impart advanced knowledge, but also the degree of value added by students after learning. The criteria for

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evaluating the overall quality of students are shown in Table 1, and the criteria for evaluating the overall quality of teachers' abilities are shown in Table 2.

Table 1: Criteria for assessing students' overall quality and competence

Evaluation objectives	Indicator code (xi)	Tier 1 indicators	Secondary indicators
Comprehensive Quality Assessment for Students in Higher Education	x1	Character Development	National Identity
	x2		International understanding
	x3		Social responsibility
	x4		Civic Literacy
	x5	Academic Development	Academic Performance
	x6		Learning about emotions
	x7		Learning ability
	x8		Information awareness
	x9	Physical and mental development	Scientific spirit
	x10		Cherish life
	x11		Sound personality
	x12		Self-management
	x13		Interpersonal
	x14	Cultural heritage	Sports Performance
	x15		Humanities
	x16		Aesthetic sensibility
	x17		Artistic expression
	x18	Innovations in practice	Labour awareness
	x19		Social Experience
	x20		Innovative performance
	x21		Technology applications

Table 2: Criteria for evaluating teachers' overall quality and competence

Evaluation objectives	Indicator code (xi)	Tier 1 indicators	Secondary indicators
Comprehensive Quality Assessment for Teachers in Higher Education	x1	Teacher moral and ethics	Ideological and political development
	x2		Civic Literacy
	x3		Social responsibility
	x4	Education and Teaching	Teaching attitude
	x5		Teaching content, quality
	x6		Teaching methods
	x7		Teaching effectiveness
	x8		Teaching and research activities
	x9	Student work	Involvement in student work
	x10		Academic Contribution
	x11	Scientific evaluation	Social contribution
	x12		The state of talent development

3. Results

3.1 The establishment of simulation model

As an evaluation model, it is necessary to determine the specific weights of the indicator system used in the model, therefore, in accordance with the specific indicators given in the table above, the initial weights of the indicators are solved by establishing a hierarchical analysis (AHP) model to provide input for the BP model simulation. The decision objectives, factors and objects are divided into target, factor, and programmed layers in accordance with the relevant relationships, and a two-layer evaluation model is established, so there are only two layers of structure, where the target layer is the comprehensive evaluation of students, and the factor layer is the first-level indicators of the indicator system. After obtaining the matrix of the dimensions of the first level indicators, the model uses the "consistency matrix method" to quantitatively establish the weight values of each indicator.

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BP Neural Network In 1943, W. S. McCulloch and W. Pitts introduced the concept of artificial neural network system, thus pioneering the history of artificial neural network research. 1986, Rinehart and McClelland et al. proposed the BP (Back Propagation) neural network [5], whose topology consists of NIU P. C. et al [6] proposed a method for evaluating teachers' teaching ability based on BP neural networks. Based on similar model building, for teacher and student education evaluation models, a template can be constructed to extract teacher and student information and build a knowledge base, and then a BP neural network can be used for comprehensive competency evaluation.

3.2 Analysis of experimental results

According to the implementation of MATLAB's AUP algorithm, the maximum characteristic root t=5 for this factor layer, the consistency of this matrix is acceptable and there is satisfactory consistency [7-8]. The above consistency test shows that the feature vector w can be used as the initial weight vector of the indicators, and then the above process can be implemented again based on the first level indicators to obtain the relative weights of the 21 specific indicators, normalized for the indicator assignment operation, giving the scores of the specific indicators to facilitate the input of the subsequent BP neural network, as follows in Table 3. See Table 4 for teacher indicator assignments.

Table 3: Student indicator assignment table

Tier 1 indicators	Assignment of points	Secondary indicators	Assignment of points	Secondary indicators	Assignment of points	Secondary indicators	Assignment of points	Secondary indicators	Assignment of points
Character Development	30	X1	7	X7	5	X13	2	X19	2
Academic Development	30	X2	7	X8	5	X14	10	X20	5
Physical and mental development	20	X3	8	X9	5	X15	4	X21	1
Cultural heritage	10	X4	8	X10	3	X16	3		
Innovations in practice	10	X5	10	X11	2	X17	3		
Total points	100	X6	5	X12	3	X18	2		

The MSE value of the validation sample is optimal after the 4th network training iteration, and the MSE value of the training sample is below 10-20 after the 9th iteration, and the training accuracy is close to 100%. In this paper, the epoch, gradient and validation check are set to a fixed value, and the network training will be stopped when any of the above three indicators is reached. In this paper, the maximum value of epoch is 1 000, the minimum value of gradient is 10-7, and the maximum value of validation check is 5, i.e., if the error does not decrease but increases after 5 consecutive training sessions, even if the network training does not training will also be forced to end if the expected performance is achieved. After the 9th network iteration, the gradient value is less than the set minimum, the validation check is 4, and the network training is terminated with the expected performance. R-value measures the correlation between the sample output value and the target expectation. An R-value of 1 indicates a tight relationship, while 0 indicates a random relationship.

Table 4: Teacher indicator assignment table

Tier 1 indicators	Assignment of points	Secondary indicators	Assignment of points	Secondary indicators	Assignment of points
Teacher moral and ethics	30	X1	10	X7	5
Education and Teaching	20	X2	5	X8	5
Student work	10	X3	5	X9	10
Scientific evaluation	40	X4	10	X10	10
		X5	5	X11	10
Total points	100	X6	5	X12	20

4. Conclusions

This paper is based on the AHP-BP rationalization model of educational evaluation and a study to understand the current situation of educational evaluation. Three main recommendations are made:

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educational authorities at all levels should change the criteria for educational evaluation and implement quality education. Reduce the influence of imperial examinations and examination-based education and create a favorable social atmosphere. Get rid of the influence of exam-oriented education and stay away from fill-in-the-blank education, which should be gradual and integrated with reality. Establish a scientific evaluation system for teachers' work and an evaluation system for teaching quality, so that the school evaluation system matches the direction of teachers' work [9]. We will insist on the establishment of moral education and a scientific view of education quality. The school will also adhere to the "Five Education Principles" and lay the foundation for the lifelong sustainable development of students. The new learning style of independent learning, cooperative learning and inquiry learning is advocated to enable students to take the initiative to discover, investigate and research in the learning process, so that they can gradually develop the ability to identify, analyses and solve problems in the learning process. Create a good educational atmosphere and break down the barriers of "points is to decide whether the child is good or bad". We need to dilute the selective role of examinations and enhance their function as an assessment of teaching and learning. Secondly, the number of examination questions should be reduced and the content should be scientific, with emphasis on students' abilities and levels. Instead of using exams as the only measure of students, focus on the overall development of students. Encourage the evaluation of universities to pay more attention to the process and eliminate utilitarian evaluation indicators should be more decentralized indicator scores; suggest that the state should be supervised in the general direction, the specific situation of specific schools varies and the evaluation model should be moderately adjusted; vigorously support the policy of activities for the co-education of teachers and students and create a corresponding educational atmosphere resonating with the social side, which can promote the healthy development of university education.

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