



Quality Evaluation Model of Mobile Internet Innovative Education Personnel Training Based on Fuzzy Analytic Hierarchy Process

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Abstract. Aiming at the problems of low accuracy and long evaluation time of traditional evaluation methods of mobile Internet innovative education talent cultivation quality, this paper proposes a fuzzy AHP based evaluation model of mobile Internet innovative education talent cultivation quality. According to the quality elements of mobile Internet innovative education personnel training, the system of mobile Internet innovative education personnel training is established. This paper uses the fuzzy analytic hierarchy process to construct the evaluation model of mobile Internet innovative education talent training quality, sets up the evaluation factor set and comment set, establishes the fuzzy evaluation matrix, determines the weight of each evaluation factor, calculates the fuzzy comprehensive evaluation vector and comprehensive evaluation value, and evaluates the mobile Internet innovative education talent training quality according to the principle of maximum membership. The experimental results show that the evaluation time of the method based on the fuzzy analytic hierarchy process is short, and it can effectively improve the quality evaluation accuracy of mobile Internet innovative education.

Keywords: Fuzzy analytic hierarchy process · Mobile social network · Mobile education · Personnel training · Quality evaluation

1 Introduction

At present, with the popularity of intelligent mobile devices and the improvement of functional scalability, people are beginning to use intelligent mobile devices to realize mobile office, mobile entertainment and mobile shopping. Various mobile applications are increasingly used in people's studies, work and life [1]. With the popularity of mobile devices, the rapid development of computer hardware and software technology, Internet technology, teaching mode and content need to be constantly updated and enriched, it is more and more difficult to achieve a higher level in the original teaching hours. However, traditional classroom teaching methods are limited by time and space, which can not change the current situation of teaching methods limited by time and space. The mobile internet teaching mode can better solve this problem. With the emergence, development and application of high and new technology, mobile Internet innovation education is an education mode adapting to the development of the knowledge economy

era [2]. Mobile Internet innovation education is a new education concept and mode, which aims at cultivating high-quality talents with innovative consciousness, innovative thinking, innovative ability and innovative personality suitable for the development of the new era, and helps college students establish innovative consciousness, stimulate innovative spirit, master innovative knowledge and improve innovative ability through multiple channels such as schools, governments and enterprises.

Teaching quality refers to the degree of students' development under the condition of education, and also the degree of education results. Students are the only carrier and evaluation object of education quality [3]. The quality standard of mobile Internet innovative education personnel training is the basic premise of quality evaluation. Knowledge, ability and quality are the basic concepts in the current quality education theory research, and also the basic indicators of mobile Internet innovative education personnel training quality evaluation. At present, some scholars have done some research on the evaluation of teaching quality, and have made some achievements. Reference [4] proposed a learning quality evaluation model based on neural network RBF algorithm. Based on the analysis of the main problems and complexity of the evaluation system of learning quality, this paper studies the evaluation system of College English teaching quality by using the RBF regularized network method and RBF neural network decision algorithm. The model can monitor the learning quality in real time, but the accuracy of educational quality evaluation is low. Based on the above background, the quality evaluation of mobile Internet innovative education personnel training is increasingly concerning, and the evaluation of training quality has become a problem that all educational institutions must face. In order to improve the quality evaluation accuracy of mobile Internet innovative education and shorten the quality evaluation time of mobile Internet innovative education, this paper proposes a quality evaluation model for mobile Internet innovative education based on the fuzzy analytic hierarchy process. According to the quality elements of education and training, the education personnel training system is established. Using the fuzzy analytic hierarchy process, this paper constructs the training quality evaluation model, determines the evaluation weight through the evaluation factor set and matrix, and evaluates the training quality of educational talents. This method can shorten the evaluation time and improve the accuracy of quality evaluation.

2 Construction of Talent Training System for Mobile Internet Innovation Education

2.1 Building the Functional Structure of Mobile Internet Teaching

Mobile Internet technology consists of computer programming, mobile network communication and computer network. In order to improve the quality of innovative talent training by using mobile internet teaching, the implementers should have the ability to use mobile applications and products, acquire information, transmit information, process information by using mobile devices, and use mobile Internet resources. The architecture of mobile internet teaching network is as Fig. 1.

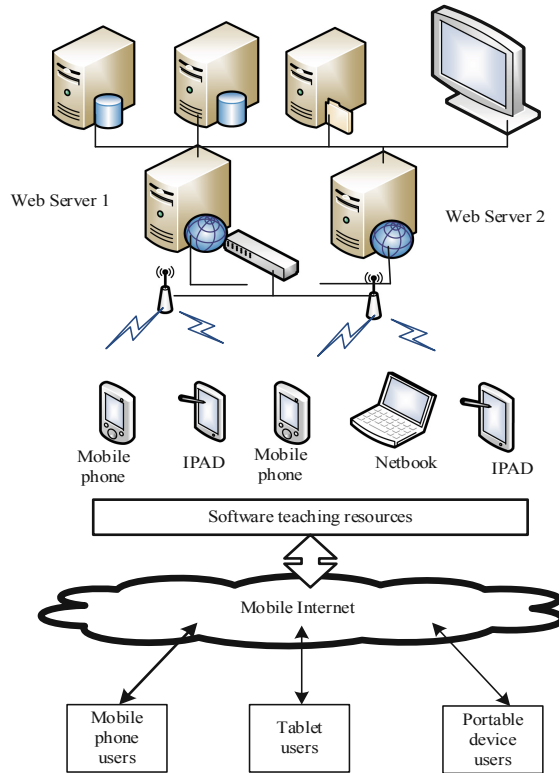


Fig. 1. Framework of mobile internet teaching structure

Teachers, students and administrators can connect to the web server through mobile phones, ipads and netbooks via wireless network, and the web server will apply for business processing to the DB server according to the user’s request [5]. Further put forward the implementation scheme of mobile internet teaching mode transformation for colleges and universities. As a mobile internet teaching, the management of teaching resources and teaching behavior is its most important function, and its specific functions are as Fig. 2.

Mobile internet teaching mode is a new teaching mode, which is a teaching activity carried out in the mobile Internet environment with computer software technology, mobile Internet technology and multimedia technology [6]. Through the mobile Internet and teaching resources, and through the role of load balancer, the user requests are distributed to different servers, so as to improve the responsiveness and performance of the system.

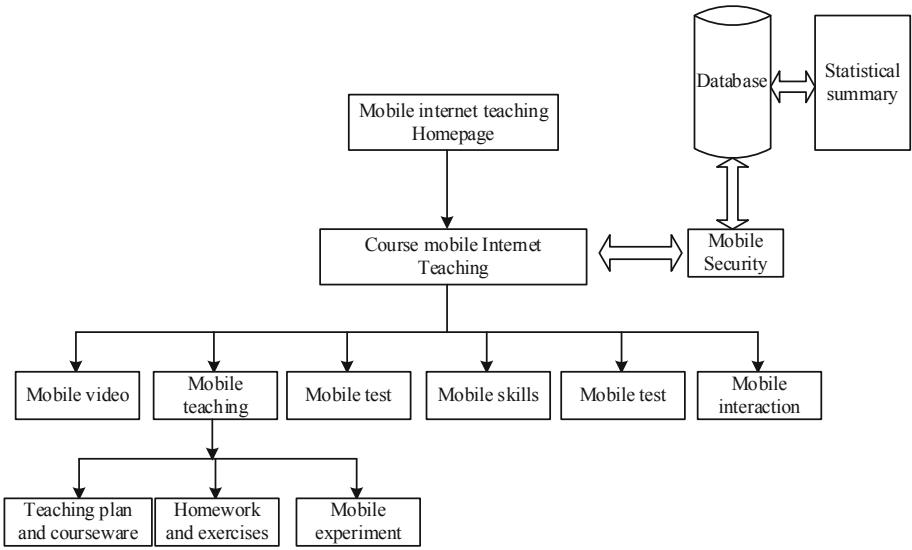


Fig. 2. The functional structure of mobile Internet Teaching

2.2 Construction of Mobile Internet Innovative Education Personnel Training System

In order to improve the quality of innovative personnel training in colleges and universities, it is necessary to clarify the elements of the quality system of personnel training. Clearly defined the training objectives, training specifications, curriculum system, teaching staff, teaching conditions, quality management and guarantee and other elements [7]. From a macro point of view, any factors that affect the process of personnel training can be regarded as elements in the model; from the perspective of colleges and universities, combined with the characteristics of innovative education focusing on practice, the

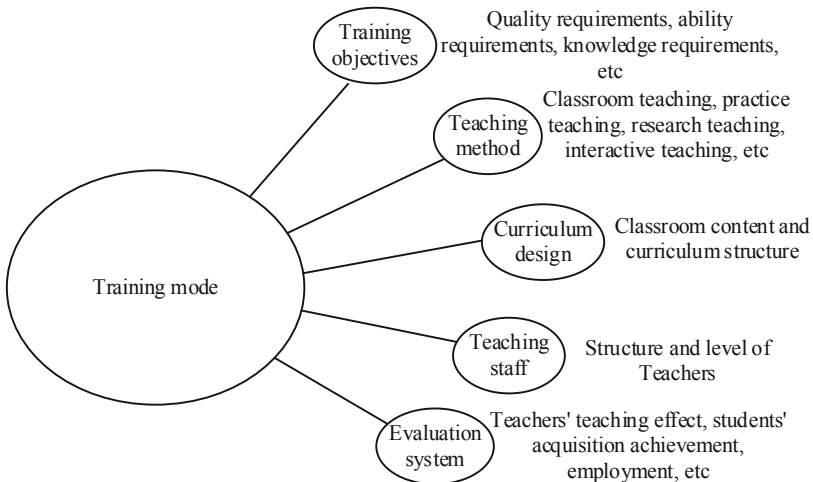


Fig. 3. Quality elements of talent cultivation

elements of innovative education quality mainly focus on training objectives, teaching methods, curriculum, teaching staff and evaluation system [8]. To sum up, the quality elements of talent training are summarized as Fig. 3.

Furthermore, the research contents of “theoretical curriculum system”, “practical teaching system”, “school enterprise cooperation” and “teacher team construction” are unified as a whole, and the training mode of mobile Internet innovative talents is established under the unified framework. The overall research scheme of innovative education personnel training system is as Fig. 4.

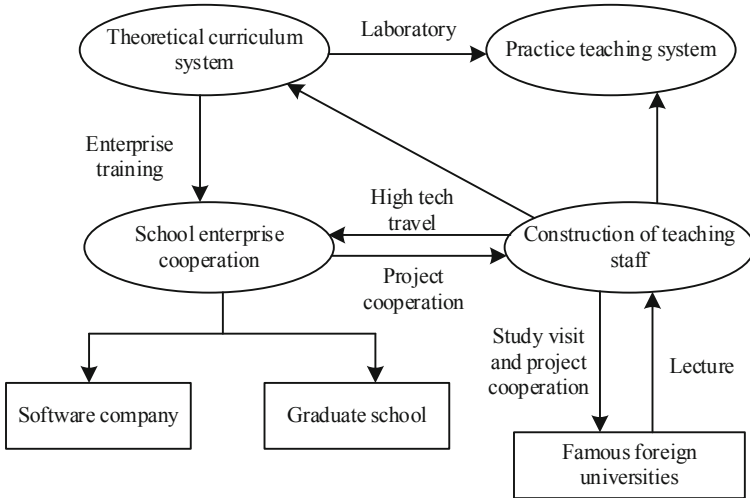


Fig. 4. Innovative education personnel training system

In the new theoretical curriculum system, the courses are classified into theory series, tool series, engineering series, other courses and special practice. With the continuous consolidation of students’ foundation, the theoretical courses are gradually refined according to different application directions [9]. So that students not only have a solid theoretical foundation, but also have strong professional basic knowledge, to lay a good theoretical foundation for practical training and enterprise training.

3 Quality Evaluation Model of Mobile Internet Innovative Education Personnel Training

3.1 Fuzzy Analytic Hierarchy Process

Fuzzy analytic hierarchy process is the application of analytic hierarchy process in fuzzy environment [10]. It decomposes decision-making problems and related factors into objectives, criteria and schemes. On this basis, it reasonably combines qualitative analysis and quantitative analysis, and carries out decision-making process according to human thinking and judgment rules [11]. The fuzzy comprehensive evaluation method is based on the determination of evaluation factors, evaluation grade standard and the weight of

each factor, using the principle of fuzzy set transformation, using membership degree to describe the fuzzy boundary of each index factor, constructing fuzzy evaluation matrix, and finally determining the object grade through multi-layer compound operation. The main steps are to set up the set of evaluation factors and comments, establish the fuzzy evaluation matrix, determine the weight of each evaluation factor, calculate the fuzzy comprehensive evaluation vector and comprehensive evaluation value, and analyze the results to get the evaluation conclusion. The quality evaluation process of mobile Internet innovative education personnel training based on fuzzy analytic hierarchy process is as Fig. 5.

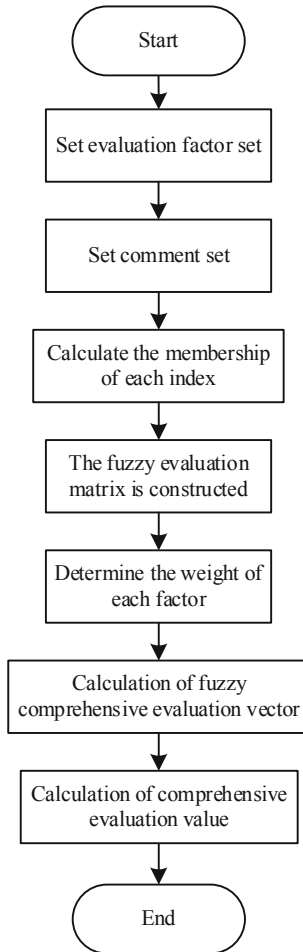


Fig. 5. Quality evaluation process of mobile Internet innovative education personnel training

3.2 Establishment of Fuzzy Evaluation Matrix

Applying the aforementioned combination weighting technology to the fuzzy comprehensive evaluation method, you will get a higher vocational education talent training quality evaluation model, set the mobile internet innovation education talent training quality evaluation factor set as: $Q = \{Q_1, Q_2, \dots, Q_m\}$, $Q_i = \{Q_{i1}, Q_{i2}, \dots, Q_{im}\}$, $Q_{ij} = \{Q_{ij1}, Q_{ij2}, \dots, Q_{ijm}\}$, adopt the popular five-level standard, set comments set, that is, $W = \{W_1, W_2, W_3, W_4, W_5\}$, the corresponding assignment is $E = \{100, 80, 60, 40, 20\}$.

The membership degree of each index is calculated. The membership degree of each three-level index is expressed by the proportion of the number of evaluators who choose each evaluation level to the total number of evaluators. The membership degree of the second level index and the third level index to each evaluation grade constitutes the fuzzy evaluation matrix:

$$A_{ij} = \begin{bmatrix} a_{ij11} & \cdots & a_{ij15} \\ \cdots & \cdots & \cdots \\ a_{ijk1} & \cdots & a_{ijk5} \end{bmatrix} \quad (1)$$

In formula (1), a_{ij11} , a_{ij15} , a_{ijk1} , a_{ijk5} is the membership degree of the k three-level index to each evaluation level in the factor set.

3.3 Determine the Weight of Each Factor

According to the aforementioned method for determining the subjective and objective combination weights [12], the weight vector $S = [s_1, s_2, \dots, s_m]^T$ of the first-level factor set, the weight vector $S_i = [s_{i1}, s_{i2}, \dots, s_{im}]^T$ of each second-level factor set, and the weight vector $S = [s_1, s_2, \dots, s_m]^T$ of each third-level factor set are respectively obtained.

3.4 Calculation of Comprehensive Evaluation Value

The weight vector of each factor set and the fuzzy evaluation matrix are subjected to the weighted average fuzzy synthesis operation to obtain the corresponding fuzzy comprehensive evaluation vector. This model needs to perform first-level fuzzy comprehensive evaluation first, and let D_{ij} be the fuzzy comprehensive evaluation vector of the factor set, then the formula is [13]:

$$D_{ij} = S_{ij}A_{ij} \quad (2)$$

Then use the fuzzy evaluation matrix A_i of the constituent factor set to perform the fuzzy operation with the corresponding weight vector S_i to obtain the secondary fuzzy comprehensive evaluation vector D_i as shown in the following formula:

$$D_i = S_iA_i \quad (3)$$

Then the fuzzy evaluation matrix A , which constitutes the factor set, is subjected to fuzzy operation with the weight vector S to obtain the first-level fuzzy comprehensive evaluation vector D as shown in the following formula:

$$D = SA \quad (4)$$

Finally, the comprehensive evaluation value Z is calculated as shown in the following formula:

$$Z = D A = (d_1, d_2, \dots, d_5)^T (100, 80, \dots, 20)^T \tag{5}$$

The fuzzy comprehensive evaluation vector D is normalized, and the result is analyzed according to the principle of maximum membership degree, and the evaluation conclusion is obtained.

4 Experimental Analysis

In order to verify the effectiveness of the quality evaluation model of mobile internet innovation education personnel training based on the fuzzy analytic hierarchy process, the experiment uses a computer with the configuration: Inter E 1400 2.0 GHz processor, 4.00 G memory, 400 G hard disk, and 32-bit Windows 7 operating system. Perform simulation experiment analysis in MATLAB R2013B environment. In this study, the fuzzy analytic hierarchy process is used to build the evaluation model of mobile Internet innovative education talent training quality, set the evaluation factor set and comment set, establish the fuzzy evaluation matrix, determine the weight of each evaluation factor, calculate the fuzzy comprehensive evaluation vector and comprehensive evaluation value, and evaluate the mobile Internet innovative education talent training quality according to the maximum membership principle. In order to improve the persuasion of the experimental results, 100 teaching samples were selected, and the control group and the experimental group were set up in the same environment, different testers evaluated the quality of mobile Internet innovative education personnel training through the evaluation model of mobile Internet innovative education personnel training quality based on fuzzy analytic hierarchy process. The basic information of the tester is as Table 1.

Table 1. Basic information statistics of testers

Item	Option	Frequency	Effective percentage
Gender	Male	51	34.5%
	Female	97	65.5%
Academic degree	Bachelor	7	4.7%
	Master	79	53.4%
	Doctor	62	41.9%
Title	Assistant	5	3.4%
	Lecturer	89	60.1%
	Associate professor	36	24.3%

(continued)

Table 1. (continued)

Item	Option	Frequency	Effective percentage
Major	Professor	8	5.4%
	Other	10	6.8%
	Communication (Journalism)	66	44.6%
	Advertising	26	24.3%
	Management	8	5.4%
	Art design	10	6.7%
	Other	28	18.9%

Based on the above information, further comparative analysis of the traditional method and this method of mobile Internet innovation education personnel training quality evaluation accuracy, the specific comparison results are as Fig. 6.

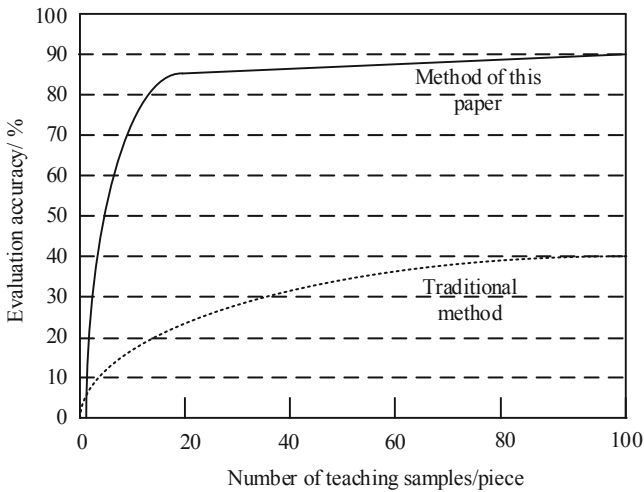


Fig. 6. Comparison results of evaluation accuracy of talent cultivation quality by different methods

According to Fig. 6, when the number of teaching samples is 100, the evaluation accuracy of the traditional method is 40%, while the evaluation accuracy of this method is 90%. Compared with traditional methods, the evaluation model of mobile Internet innovative education talent cultivation quality based on fuzzy analytic hierarchy process proposed in this paper has higher evaluation accuracy and better talent cultivation quality evaluation effect.

On this basis, in order to further verify the evaluation time of the proposed mobile Internet innovative education talent training quality evaluation model based on the fuzzy analytic hierarchy process, the traditional method is compared with the mobile Internet innovative education talent training quality evaluation time of this method, and the comparison results are as Fig. 7.

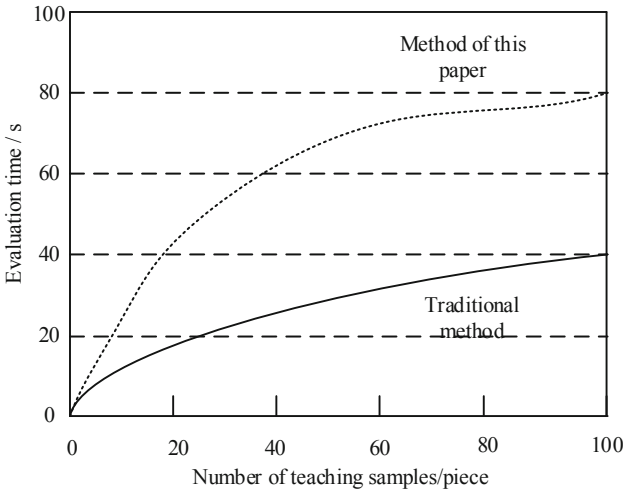


Fig. 7. Comparison results of talent cultivation quality evaluation time of different methods

According to Fig. 7, with the increase of the number of teaching samples, the evaluation time of talent cultivation quality with different methods increases. When the number of teaching samples is 100, the evaluation time of traditional method is 80 s, while the evaluation time of this method is 40 s. Therefore, the evaluation time of the model based on the fuzzy analytic hierarchy process is short.

5 Conclusion

In order to improve the quality evaluation accuracy of mobile Internet innovative education personnel training and reduce the evaluation time of mobile Internet innovative education personnel training, an evaluation model of mobile Internet innovative education personnel training quality based on Fuzzy Analytic Hierarchy Process is proposed. Through the mobile Internet innovative education personnel training system, the fuzzy analytic hierarchy process is used to establish the fuzzy evaluation matrix, determine the weight of each evaluation factor, calculate the fuzzy comprehensive evaluation vector, and realize the quality evaluation of mobile Internet innovative education personnel training. The model can accurately evaluate the quality of mobile Internet innovative education personnel training and shorten the evaluation time of mobile Internet innovative education personnel training quality.

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