

Design and Application of Intelligent Education Evaluation System

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Abstract: At present, there are only some theoretical research results in the evaluation of school intelligent education. And there is a lack of operable evaluation model and practical application cases. This paper proposes an evaluation model of school intelligent education based on analytic hierarchy process. The model designs 5 first-class indexes, 19 second-class indexes and 56 third-class indexes, and gives the calculation method of index scores at all levels. In order to avoid the one sidedness and incompleteness caused by a single method, the model comprehensively uses questionnaire survey, on-the-spot investigation, teacher-student discussion, skill test and other means to investigate the various indexes of school intelligent education. The model has been successfully applied to evaluate 90 primary and secondary schools in F city, and achieved good results, which has been valued and recognized by the education authorities and the evaluated schools.

1. Introduction

Intelligent education is the intelligentization of educational means. It integrates advanced information technology into all fields of education and teaching [1]. Based on educational informatization, it makes full use of information sharing technology, pays attention to innovation while developing existing information resources, and takes educational informatization as the main means to make education open, equal, scientific and creative. Intelligent education is driven by the growth of people, and uses advanced computer information technology to promote the reform of teaching and learning methods and modes. It enables the intelligent digitalization of education management, teaching and learning, including the ability of students' self-study, research, innovation, thinking, organization and management, as well as the cultivation of teachers' teaching, research and professional growth [2].

The construction of intelligent education level evaluation system in primary and secondary schools has the following significance:

(1) It is conducive to the optimal allocation of educational resources. The evaluation system can effectively evaluate the existing education resources and obtain a large number of statistical analysis data reflecting the allocation of resources. This will play a positive role in the rational use of various educational resources[3].

(2) It can promote the comprehensive and coordinated development of intelligent education[4]. Developing intelligent education is a long-term process. At different stages of development, we need to comply with the requirements of the scientific concept of development and achieve comprehensive, coordinated and sustainable development. The establishment of intelligent education evaluation system can be analyzed by systematic and scientific means, so as to have a clear understanding of the problems such as the lack of funds, equipment, personnel and scale among districts, towns and schools, so as to ensure that in the development process of intelligent education, the construction of weak links is strengthened, and promote the healthy and rapid development of intelligent education.

(3) It can play a guiding role in the development planning of intelligent education[5]. In the process of establishing the index system and developing the evaluation system, we will learn from and absorb the latest research results of education theory and information theory. At the same time, when the index system is used to implement the evaluation at different levels, the evaluation standards at different levels such as district level, town level and school level are formulated, which has a guiding role for the District, town and school to formulate the development plan of intelligent education.

2. Index System Design

2.1. Establishment Method of Evaluation Index System

The establishment of intelligent education evaluation index system is a complex system engineering, which needs comprehensive analysis from multiple levels. In the process of constructing the evaluation index system, there are often many problems, such as a large number of factors can not be expressed quantitatively, the importance of each factor is difficult to determine, and the correlation between each factor is difficult to quantify, which increases the difficulty of constructing the index system.

In this paper, the analytic hierarchy process (AHP) is used to construct the evaluation index system, which provides an effective way to establish measurement and make decision [6]. Analytic hierarchy process is essentially a decision-making thinking mode, which belongs to the decision-making method combining qualitative and quantitative factors. The analytic hierarchy process (AHP) can be used to decompose the complex evaluation index system into several sub-evaluation index systems. A large number of indexes that need to be evaluated are distributed in these sub-systems according to the correlation relationship, and the relative importance of each index in each sub-system is determined through pairwise comparison and judgment in its internal hierarchical structure, and then synthesized in the hierarchical structure, and finally the top-level index system is established.

2.2. School Intelligent Education Evaluation Index System

The basic framework of the school intelligent education evaluation index system designed in this paper consists of 5 first-level indexes, 19 second-level indexes and 56 third-level indexes. The specific composition of the index system is shown in Table 1. The data in brackets after the index name is the weight of the index. Each index can be quantified by a number between 0 and 1. 0 means the worst and 1 means the best. The weight setting is first set by experts according to experience, and then continuously adjusted after trial calculation [7]. The overall intelligent education index of a school is obtained by the weighted sum of five first-class indexes according to a certain weight; Each first level index is obtained by the weighted sum of several secondary indexes it contains according to a certain weight; Each secondary index is also obtained by the weighted sum of several tertiary

indexes it contains according to a certain weight; Each of the three-level indexes is obtained from several different types of questionnaires and field visits.

Table 1: School intelligent education evaluation index system.

First level index	Second level index	Third level index
Development strategy (0.14)	Importance (0.18)	Position proportion of intelligence in school development (0.50)
		Advancement and integration of intelligent construction (0.50)
	Development planning (0.18)	Scientific, reasonable and consistent planning (0.50)
		Effectiveness of planning (0.50)
	Organization (0.18)	IT Leadership (0.50)
		IT business unit (0.50)
	Funding guarantee (0.18)	IT funding budget (0.50)
		IT capital investment in recent three years (0.50)
	System guarantee (0.28)	Management system (0.50)
		Incentive system (0.33)
		Evaluation system (0.17)
Infrastructure (0.16)	Network facilities (0.46)	Campus network outlet connectivity (0.17)
		Internal structure of campus network (0.24)
		Wireless network (0.08)
		Network security (0.17)
		Intelligent radio and television system (0.17)
		Campus intelligent monitoring system (0.17)
	Computer facilities (0.27)	Man machine ratio (0.50)
		Ratio of teacher to machine (0.25)
		Genuine software (0.25)
	Teaching environment and facilities (0.27)	Classroom multimedia (0.43)
		Function field room (special classroom) (0.57)
Digital education resources (0.38)	Campus portal (0.07)	School portal (1)
	Education and teaching management platform (0.50)	School management system (0.27)
		Educational administration management system (0.34)
		Campus Internet of things system (0.13)
		Intelligent security management platform (0.13)
		Moral education system (0.13)
	Teaching resource platform (0.43)	Network teaching system (0.30)
		Mobile learning platform (0.12)
		Electronic lesson preparation system

		and teaching resource sharing system (0.30)	
		Network examination system (0.12)	
		Synchronous classroom system (0.16)	
Application effect (0.26)	Management application ability (0.12)	Efficiency improvement (0.60)	
	Management application ability (0.12)	Democratic decision making (0.40)	
	Artificial intelligence course offering (0.12)	Artificial Intelligence courses and extracurricular activities (1)	
	Teaching application ability (0.25)		Subject coverage of Artificial Intelligence and curriculum integration (0.30)
			Class hour coverage of AI and curriculum integration (0.30)
			Innovation degree of teaching mode (0.14)
			Teaching quality and learning atmosphere (0.13)
			Teaching reform and research topics related to artificial intelligence (0.13)
	Students' AI literacy (0.24)		AI awareness (0.20)
			Operation skills (0.20)
			Learning skills (0.20)
			Academic performance (0.20)
			Information Technology Awards (0.20)
	Teacher development (0.18)		AI emotion and consciousness (0.20)
			AI application capability level (0.20)
			Teaching level and quality (0.20)
			Teaching reform and teaching research ability (0.20)
			Awards (0.20)
	Social impact (0.09)		Impact on brother schools (0.34)
			Using artificial intelligence to provide educational services for communities (0.33)
Social reputation (0.33)			
Characteristics and innovation (0.06)	Features of Intelligent Education (0.50)	Features of Intelligent Education (1)	
	Intelligent education application innovation (0.50)	Application innovation of Intelligent Education (1)	

3. Intelligent Education Evaluation Index Calculation Model

The calculation of a school's intelligent education level needs to calculate the first level index, the second level index and the third level index respectively, and then calculate the weighted sum [7].

3.1. Overall Index Calculation Model

Let five first level index be expressed as $index[i]$ ($i=1..5$), and the weight corresponding to each first level index be expressed as $weight[i]$ ($i=1..5$), then the calculation formula of the overall index of the school is shown in Equation (1).

$$Index = \sum_{i=1}^5 index[i] * weight[i] \quad (1)$$

3.2. The First Level Index Calculation Model

Let 19 second level index be expressed as $index[i][j]$ ($i=1..5, j=1..6$), and the weight corresponding to each second level index be expressed as $weight1[i][j]$ ($i=1..5, j=1..6$) (Note: each first level index may have a different number of second level index, up to 6. If less than 6, the index and weight of the insufficient part are 0, the same below.), Then the calculation formula of the first level index $index[i]$ ($i=1..5$) is shown in Equation (2).

$$index[i] = \sum_{j=1}^6 index[i][j] * weight1[i][j] \quad (2)$$

3.3. Calculation Model of Secondary Index

Let n third level indexes be expressed as $index[i][j][k]$ ($i=1..5, j=1..6, k=1..6$), and the weight corresponding to each third level index be expressed as $weight1[i][j][k]$ ($i=1..5, j=1..6, k=1..6$) (Note: each second level index may have a different number of third level indexes, up to 6. If there are less than 6, the index and weight of the insufficient part are 0, the same below.), Then the calculation formula of the second level index $index[i][j]$ ($i=1..5, j=1..6$) is shown in Equation (3).

$$index[i][j] = \sum_{k=1}^6 index[i][j][k] * weight1[i][j][k] \quad (3)$$

3.4. Calculation Model of the Third Level Index

Each third level index is obtained by weighted summation of the third level index score calculated from the questionnaire and the third level index score scored by experts. Let the third level index score calculated from the questionnaire be expressed as $index[i][j][k][1]$ ($i=1..5, j=1..6, k=1..6$), and the corresponding weight be $weight[i][j][k][1]$ ($i=1..5, j=1..6, k=1..6$); The third level index score obtained by experts is expressed as $index[i][j][k][2]$ ($i=1..5, j=1..6, k=1..6$), and the corresponding weight is $weight[i][j][k][2]$ ($i=1..5, j=1..6, k=1..6$). Then the calculation formula of the third level index $index[i][j][k]$ ($i=1..5, j=1..6, k=1..6$) is shown in Equation (4).

$$index[i][j][k] = \sum_{l=1}^2 index[i][j][k][l] * weight[i][j][k][l] \quad (4)$$

4. Application Practice of Evaluation Index System

Based on the field survey, teacher-student discussion and questionnaire survey of 90 primary and secondary schools (M for middle school, P for primary school) in 5 districts of F City (marked as A, B, C, D, E), the evaluation model of this paper is used to evaluate the development level of intelligent education in the surveyed schools, and a large number of first-hand information and data

are obtained. See Table 2 for the total score of the evaluation results of the evaluated schools, which has been recognized by the education department and valued by the evaluated schools.

Table 2: Total scores of evaluation results of some schools in F City

No.	Region	School Type	Evaluation Results	No.	Region	School Type	Evaluation Results
01	A	M	68.448	46	C	P	79.0816
02	A	P	69.6188	47	C	M	80.3843
03	A	P	76.3072	48	C	M	78.0121
04	A	P	70.9621	49	C	M	71.2555
05	A	P	76.2243	50	B	P	48.1655
06	A	M	72.1102	51	D	M	73.0989
07	B	M	72.3002	52	D	M	60.2839
08	B	M	74.3436	53	D	M	66.9173
09	C	M	51.5247	54	E	M	76.7721
10	C	M	58.7594	55	E	M	72.3644
11	C	M	67.8373	56	E	M	71.8467
12	C	M	68.1666	57	C	M	71.5613
13	E	M	73.9403	58	C	M	66.825
14	E	P	73.6219	59	B	M	58.6259
15	E	M	76.8451	60	B	M	70.2679
16	E	M	79.8493	61	A	M	65.437
17	D	M	72.6095	62	A	P	77.4714
18	D	P	69.0804	63	A	P	72.0136
19	D	M	70.1781	64	A	M	80.0615
20	D	P	67.2483	65	A	M	75.55
21	E	M	76.8984	66	D	M	77.5606
22	E	M	69.6715	67	D	M	76.9667
23	B	P	77.7348	68	E	P	77.0045
24	B	M	77.2428	69	E	P	82.0132
25	B	P	76.7922	70	E	M	80.9993
26	B	P	82.2014	71	B	P	49.8037
27	C	P	74.2924	72	B	M	78.5051
28	C	M	75.9631	73	B	M	74.8039
29	C	M	68.8355	74	B	M	53.4032
30	B	M	70.5504	75	B	M	65.327
31	A	M	52.44	76	B	M	48.1702
32	A	P	55.8062	77	C	P	81.2232
33	A	M	72.6055	78	C	P	79.4289
34	B	P	54.108	79	C	M	78.4638
35	C	P	76.1313	80	C	M	71.5806
36	C	M	77.4012	81	B	M	51.1138
37	C	P	83.5051	82	D	M	71.4581
38	C	P	73.5054	83	D	M	71.2485
39	E	M	75.5182	84	D	M	73.8997
40	A	M	76.1382	85	E	M	76.9836
41	A	P	75.0362	86	E	M	72.9582
42	A	M	68.2058	87	C	M	72.6837
43	B	P	82.527	88	C	M	68.9041
44	B	M	77.8591	89	B	M	69.5309
45	B	M	49.8485	90	B	M	70.0547

It can be seen from the data in the Table 2 that the level of intelligent education in schools in F City is generally good, with 62 schools scoring more than 70, accounting for 68.9% of the assessed schools. There are only 8 excellent schools (more than 80), accounting for 8.9%. 12 schools scored less than 60, accounting for 13.3%. There is still much room to improve the level of intelligent education in F City, which needs further efforts.

5. Conclusions

The intelligent education evaluation system designed in this paper analyzes and calculates the development level of school intelligent education from different views. The collected data is relatively comprehensive, which can reflect all aspects of the school completely and quantitatively, and it improves the accuracy and scientificity of the evaluation. Its main disadvantage is that the process of collecting data needs more manpower, and requires the participation of school leaders, all teachers and some students. In the next step, we will further use appropriate mathematical models to analyze the relationship between various indicators based on a large number of data collected and the calculation results of primary, secondary and tertiary indicators, so as to more reasonably evaluate the development level of each school.

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