Research on the Evaluation Index System of Teaching Quality in Chinese Vocational Colleges from the Perspective of Teachers and Students

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Abstract. The information management of education is inseparable from the scientific and universal education evaluation index system. On the basis of analyzing the decisive influence of teachers and students on teaching quality and teaching effect of higher vocational colleges, this study constructs a teaching quality evaluation index system for higher vocational colleges in the new era from the perspective of teachers and students under the guidance of the latest national policies and documents. The index system includes two sub-index systems, the teacher evaluation index system and the student evaluation index system, and each sub-index system is composed of 5 first-level indicators and 18 second-level indicators. Then the Analytic Hierarchy Process (AHP) is used to determine the weight system of the indicator system. The weight determination methods, formulas and determination procedures of the teaching quality evaluation index system are introduced in detail. The index system and weight determination method are of great significance for the teaching reform of higher vocational colleges and the information management of education.

Keywords: Information Management · Education · Evaluation Index System · Analytic Hierarchy Process

1 Introduction

The main body of higher vocational education involves the administrative department of education, schools, teachers, students, families, enterprises, etc., but the most direct subject is still teachers and students. The teaching quality and teaching effect of higher vocational education are directly affected by the teaching level, teaching and research level of teachers and the teacher's morality and teaching style. The learning status, mental health, employability, learning ability and academic performance of students are also important embodiments of the quality of higher vocational education. In February 2019, the State Council issued the National Vocational Education Reform Implementation Plan, which put forward the task of 'teachers, teaching materials, and teaching methods'

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reform, aiming to improve the quality of talent training and social service capabilities in vocational colleges. Teachers are the main body of teaching reform and the key to the smooth implementation of the reform. In May 2022, the newly revised Vocational Education Law of the People's Republic of China proposed that vocational education should highlight employment orientation and cultivate more high-quality technical and skilled personnel for the society. Vocational school students shall abide by laws, regulations and student codes of conduct, develop good professional ethics, professional spirit and behavioral habits, study hard, complete prescribed learning tasks, participate in practical training in accordance with requirements, and master technical skills. Therefore, from the perspective of teachers and students in vocational colleges, the construction of a vocational education evaluation index system that conforms to the principles of science and the times is conducive to teachers diagnosing their own ability level and teaching effect, promoting the achievement of education and teaching goals, and further enhancing the recognition and public image of vocational education teachers from a macro perspective [4].

2 Research Status of Teaching Quality Evaluation

Although the research on education evaluation theory in China started late, since the 1980s, China's education evaluation theory and methods have made great progress, which has played a positive role in regulating, improving the role and effect of educational activities. However, for a long time, China's education evaluation has been carried out in the form of value judgment, and there is a lack of quantitative measurement based on a sound indicator system. And education evaluation has been mainly used by the education department for school management assessment and school internal management and governance, and less attention has been paid to the status of teachers and students in the education and teaching process. Therefore, it is of great significance to construct a complete education evaluation index system under the perspective of teachers and students, which is of great significance for quantifying the teaching level and teaching effect, and realizing the guiding function, monitoring function, incentive function, screening function and diagnostic function of education evaluation.

Li Xin draws on the construction ideas of the teaching quality evaluation system under the domestic CDIO model, based on the fourth generation evaluation theory and the effective teaching theory, puts forward the universal principles, methods and roadmaps for the construction of the flipped classroom teaching quality evaluation system, and points out that different student levels, different disciplines, and the evaluation index system are also different, but the evaluation index system is not constructed for the specific student level [2]. Yang Qiuyue et al. combined with the conceptual framework of technical literacy, constructed the evaluation index of technical literacy of students in vocational colleges and universities from the four dimensions of technical knowledge, technical ability, technical thinking and behavior mode, and technical attitude, but did not build an index system from the comprehensive development of students, nor did they build a teacher evaluation index system [5]. Yang Yuehan constructed the evaluation index system of innovation and entrepreneurship education in colleges and universities from the perspective of students [6]. Diao Junfeng et al. carried out research on the

construction of the evaluation index system of teaching ability of teachers in vocational education. These studies have not constructed a student evaluation index system from the comprehensive development of students in vocational colleges and universities, or these index systems cannot fully meet the requirements of higher vocational education for teachers' teaching level, teaching and research level, and teacher ethics and teaching style in the context of the new era [1].

3 Construction of Teaching Quality Evaluation Index System

3.1 The Principle of Construction of the Indicator System

The design of the index system for the evaluation of teaching quality in vocational colleges should follow the following principles.

The principle of consistency. It is necessary to make the evaluation indicators of higher vocational education consistent with the evaluation goals, and to make the indicators at the next level consistent with the indicators at the previous level.

The principle of measurability. The content specified in each indicator can be directly measured to obtain a clear conclusion.

The principle of comparability. The evaluation indicators of higher vocational education must reflect the common attributes of the evaluation objects, and the evaluation objects must be comparable.

The principle of independence. Indicators at the same level within the indicator system of higher vocational education must be independent, and indicators cannot overlap and contain each other.

The principle of completeness. The designed indicator system must be a complete and coordinated system that reflects the evaluation objectives in a comprehensive and non-exhaustive manner.

The principle of feasibility. The number of design evaluation indicators and the level of evaluation standards should be moderate, and practical and feasible quantitative methods can be used.

3.2 Preliminary Screening and Determination of the Index System

Vocational education is a type of education that has the same important status as general education, but compared with general higher education, vocational education has its own particularities, mainly manifested as vocational and practical. China's higher vocational colleges are mainly to cultivate moral and technical training, with good professional ethics and craftsman spirit, with new technology application ability of high-quality technical skills for the society. Therefore, the roles and functions of teachers and students in the education and teaching engineering of the two most direct subjects of higher vocational education are different.

In October 2020, the CPC Central Committee and the State Council issued the 'Overall Plan for Deepening the Reform of Education Evaluation in the New Era', which provides comprehensive policy guidance for the evaluation and research of teaching quality in vocational colleges. On the basis of fully considering the overall requirements

of the education evaluation reform in the new era for the education and teaching evaluation of higher vocational colleges, this study combines the existing research results, and evaluates 45 quality factors of teaching and learning from the perspective of teachers and students of higher vocational colleges as the initial index system, which not only reflects the macro goals of professional talent training in higher vocational colleges, but also reflects the micro goals of curriculum teaching, practical teaching, and students' comprehensive literacy cultivation [3].

3.3 Building the Final Indicator System

In this study, 13 education specialist were invited to judge the correlation, credibility and validity of 45 indicators in the initial index system and the evaluation results. Before the judgment, this study introduces the characteristics and functions of each indicator accordingly, and sends the relevant research results, the relevant national evaluation policies, the goals of higher vocational education talent training, educational concepts, teaching quality evaluation purposes and other background information in writing to the experts, and then asks the experts to make their own judgments. After 3 times of feedback, the expert opinions were basically the same, and after integration and screening, the 36 indicators most relevant to the quality of teaching were selected, as shown in Table 1.

Table 1. Teaching quality evaluation index system of higher vocational colleges from the perspective of teachers and students

Category	First-level indicators	Second-level indicators	Category	First-level indicators	Second-level indicators
Teacher evaluation index	Teacher's ethics	rigorous scholarship	Student evaluation index	Moral character	Love the country
		Care for students			Moral performance
		Love the job and dedication			Observe law and discipline
		Teach according to law		Cultural skills	Classroom performance
	Education and teaching achievements	Complete the basic teaching workload			Academic record
		Guide students to practice			Academic attitude
		Instruct the students to play various competitions			Practical training and social practice
		Experience as a head teacher, a counsellor, etc.			Learning ability, innovation ability

(*continued*)

Table 1. (*continued*)

Category	First-level indicators	Second-level indicators	Category	First-level indicators	Second-level indicators
	Teaching research	Participate in teaching and research activities		Sports, fine arts and labor quality	Living habits, sports habits
		Writing textbooks, teaching cases, etc.			Athletic performance
		Curriculum construction			Love labor
		Teaching reform projects and achievements			Hobby specialty
	Scientific research	Scientific research projects and achievements			Excellent personality quality
		Transformation of scientific research achievements		Professional quality	Sense of duty
		Community service			Communication and collaboration skills
	Other evaluation indicators	Student assessment			Acclimatization
		Evaluation of the student's parents		Other evaluation indicators	School evaluation
		School evaluation			Social appraisal

4 Determining the Weight of the Indicator System

In this study, the Analytic Hierarchy Process (AHP) was used to determine the weight of the teaching quality evaluation index system. Its determination process is shown in Fig. 1.

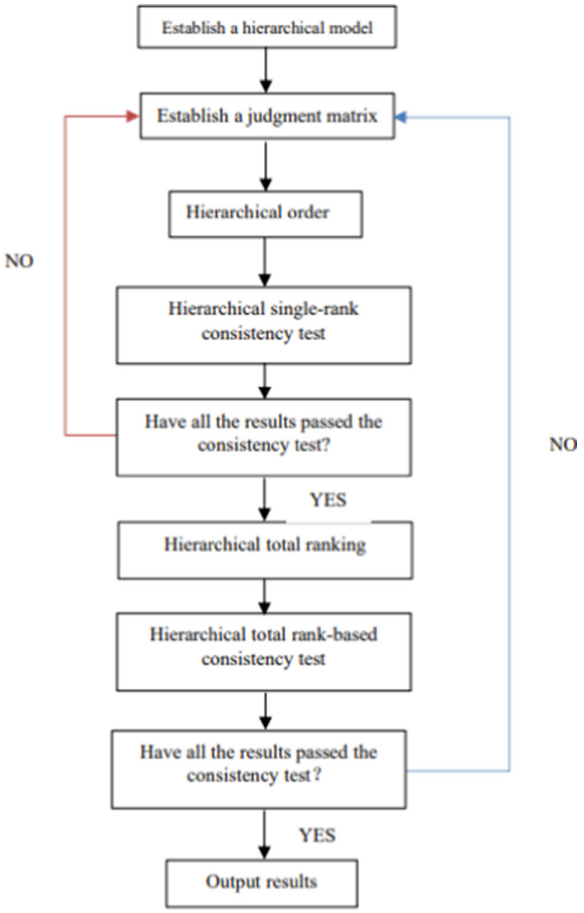

Fig. 1. Metric weight determination method and flowchart

4.1 Establish Hierarchical Model and AHP Evaluation Scale

The first-level indicators of teacher evaluation index and student evaluation index (5 indicators each) are taken as the first level, and the second-level indicators (18 specific indicators) are used as the second level, according to the correspondence between the indicators of the first layer and the indicators of the second layer, the hierarchy of the indicator system is constructed. This study uses a nine-level scale, two pairs of comparisons to establish an assignment table, the assignment scale is 1, 3, 5, 7, 9, and the values between them are 2, 4, 6, and 8. The AHP evaluation scale is defined as follows: "1" indicates that two projects are equally important; "3" indicates that one of the items is slightly more important; "5" indicates that one of them is quite important; "7" indicates that one of them is clearly important; "9" indicates one of these absolutely important; "2" indicates that the importance is between "1" and "3"; The scale meanings of "4", "6", and "8" are analogous. The meaning of the reciprocal of the above 9 values

is that if the item X is assigned a value of 1 to 9 when comparing with Y, then Y is assigned the reciprocal value of the value when comparing with X.

4.2 Establish a Judgment Matrix

This study, expert scoring was used to assign values to each indicator. On the basis of the detailed introduction of the content of the indicators and related backgrounds, each expert independently fills in the judgment form through two-to-two comparisons according to the above evaluation scale, and then takes the average value to establish a judgment matrix.

4.3 Calculate Hierarchical Single Ranking and Total Ranking

The root square method is used to calculate the weight values of each indicator corresponding to an item in each level corresponding to an item at the upper level. The first layer only calculates the hierarchical single rank, and the second layer calculates the total rank in addition to the hierarchical single sort. The calculation hierarchy single sort process is as follows: First, the product Mi of each row of the judgment matrix is calculated (i = 1, 2, …, 5). Secondly, calculate Mi's nth power root Ri (i = 1, 2, …, 5. n is the order of the matrix). Finally, the normalization process is carried out to obtain the weight value of each item corresponding to an item in the upper layer of the level. The calculation formula is as follows.

$$W_i = \frac{M_i}{\sum_{i=1}^{n} M_i}$$

In the formula, i = 1, 2, …, 5; n is the order of the matrix.

According to the above process, the hierarchical single rank of the judgment matrix (the weight value of each item) is calculated. Then, the second layer total rank is calculated.

4.4 Consistency Test

The judgment matrix is established after comparing the indicator items in two pairs, and people's judgment of things cannot be completely consistent, so there is a certain estimation error, and the higher the matrix order, the greater the error. The judgment matrix can only be accepted if the degree of consistency deviation is within a certain range.

In this study, the consistency index (C.I) and stochastic consistency ratio (C.R) were mainly used to determine the consistency of the matrix. The smaller the value of C.I, the smaller the degree of complete consistency of the judgment matrix deviation, because the order n of the judgment matrix is larger, the greater the value of the artificially caused deviation from the consistency indicator C.I, so when the judgment matrix order n is larger, it is also necessary to introduce the random consistency ratio C.R.When C.R. = 0, the judgment matrix is considered to have complete consistency, When $0 < C.R < = 0.1$, it indicates that the judgment matrix has satisfactory consistency, When C.R. >

0.1, it indicates that the judgment matrix is not consistent. After the consistency test, the weight of the evaluation index system are output.

This indicator system has a certain versatility, but when used by specific schools or education authorities, the weight of indicators may be different. Therefore, this study only gives the method and procedure for determining the weight of the indicators, and does not calculate the weight of the specific indicator.

5 Conclusions

This study discusses in detail the process and method of constructing the teaching quality evaluation index system from the perspective of teachers and students of higher vocational colleges, and takes the recent series of policies and documents on education reform and teaching evaluation of higher vocational colleges as the guide, and on the basis of drawing on relevant research results, constructs a teaching quality evaluation index system of higher vocational colleges in the new era from the perspective of teachers and students. The index system includes two sub-index systems, the teacher evaluation index system and the student evaluation index system, with a total of 36 specific indicators. Then the weight system of the indicator system are calculated by using the Analytic Hierarchy Process. The weight determination methods, formulas and determination procedures of the teaching quality evaluation index system are introduced in detail in this paper. The index system is scientific, epochal and universal, and has certain theoretical and practical significance for the reform of education and teaching in vocational colleges and the information management of education.

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