



Construction and Application of Fuzzy Comprehensive Evaluation System of Students' Legal Literacy in Higher Vocational Teachers' Perspective

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SUMMARY: *The research constructed the evaluation system of students' legal literacy, used the hierarchical analysis method to construct the judgment matrix of the importance degree, and completed the assignment of each index in the system. The evaluation system was applied in three vocational colleges and universities, and the data related to students' legal literacy were obtained through questionnaire research, and then combined with the fuzzy comprehensive evaluation to assess the level of students' legal literacy in the three colleges and universities. A total of five indicators for evaluating students' legal literacy, including legal knowledge, were identified from the perspective of senior teachers, with the highest indicator weighting of 0.343. The average scores of students in the three vocational high schools, A, B and C, on the evaluation indicators were distributed in the ranges of 3.00~3.59, 3.47~4.24 and 2.99~3.35, respectively. According to the principle of maximum affiliation, the results of the level of legal literacy of the students of all three institutions are “relatively conforming”, with the legal literacy of the students of Schools A and C belonging to the “medium level” and that of School B to the “good” level. Combined with the fuzzy comprehensive evaluation method, the legal literacy evaluation system constructed by the study can better assess the students' knowledge of law.*

KEYWORDS: *Hierarchical analysis; fuzzy comprehensive evaluation; maximum affiliation degree; legal literacy evaluation system*

1 Introduction

The talent training goal of higher vocational colleges and universities is to cultivate higher vocational and technical talents adapted to the needs of socialist construction [1]. In the increasingly perfect legal society, basic legal literacy has become an important characteristic of higher vocational and technical personnel [2]. Therefore, strengthening students' legal literacy education is an intrinsic demand for realizing the talent cultivation goal of higher vocational colleges and universities, and only by adapting to the development of this situation and the need for talent cultivation, changing concepts, strengthening education and deepening reforms can we lay a solid foundation for the improvement of the basic theoretical quality of students [3, 4]. However, higher vocational colleges and universities are facing serious challenges in the cultivation and evaluation of students' legal literacy, which seriously impedes the improvement of students' legal literacy [5].

Evaluation of legal literacy is closely related to the cultivation, and effective evaluation can help to find the deficiencies and adjust the teaching strategies, so as to improve the legal literacy

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[6, 7]. In fact, in the current cultivation of higher vocational colleges and universities, teaching resources are backward, teaching methods are single, and teachers are stuck in their ways [8]; in the evaluation, it is mainly based on teachers' subjective cognition, and the accuracy is not high, which results in students' weak legal awareness and lack of legal knowledge [9]. In such a context, it is of great significance for higher vocational teachers to construct a scientific, observable and comprehensive evaluation system of students' legal literacy. In the evaluation of students' legal literacy, the connotation of their literacy is rich, and the influencing and constraining factors are more complex and vague, which coincides with the concept of fuzzy comprehensive evaluation. The fuzzy comprehensive evaluation method sees the mutual influence between the indicators as a fuzzy set, adopts the concept of information quantity to quantify the degree of affiliation between the indicators, and transforms the degree of affiliation into weights, and then obtains the overall evaluation results [10-12]. By constructing a fuzzy comprehensive evaluation system to evaluate the main factors affecting students' legal literacy at all levels, so as to get the comprehensive evaluation results, the evaluation system can effectively overcome the shortcomings of traditional evaluation methods that can not deal with the fuzzy and uncertain information, and has good applicability [13-16].

In order to explore the effectiveness of the application of fuzzy comprehensive evaluation in the field of education, many scholars have carried out research in this regard, and involves the assessment of teaching quality, teaching effect assessment and the assessment of students' comprehensive literacy and other aspects. Literature [17], in response to the shortcomings of traditional classroom teaching assessment, applies the fuzzy comprehensive evaluation method, combines qualitative and quantitative analysis through the establishment of scientific indicators, and thus constructs a complete and effective teaching quality assessment system. Literature [18] constructed a comprehensive literacy assessment system for students in higher education based on the fuzzy comprehensive evaluation method, and by designing specific algorithms and applying them to actual cases, it verified that the model can scientifically assess students' literacy from multiple dimensions, overcoming the traditional assessment problems and enriching the theory and practice in the field of educational evaluation. Literature [19] used the fuzzy comprehensive evaluation method to assess the simulation teaching quality of the Basic Nursing course, and through the analysis of 94 students' data, the excellent affiliation degree of teaching quality was 0.6794, which verified the feasibility and effectiveness of the method in combining subjective and objective evaluation and improving the scientificity of assessment. Literature [20] designed a rehabilitation training teaching program for patients based on the fuzzy mathematical method, constructed the course module by integrating expert opinions and literature analysis, and implemented the teaching on the cloud platform, and used a multi-level questionnaire to assess the teaching effect and nursing staff satisfaction, which verified the effectiveness of the program in improving comprehensive nursing ability. Literature [21] for the fuzzy problem in the assessment of English translation teaching, designed a fusion of fuzzy comprehensive evaluation, hierarchical analysis and adaptive neuro-fuzzy inference system assessment algorithm, experiments show that the model can effectively improve the accuracy of assessment, to improve the quality of teaching to provide a scientific decision-making support. Literature [22] analyzed the general education competence of nursing majors based on the fuzzy comprehensive evaluation model, and explored the implementation strategy by constructing the assessment system, aiming to improve the quality of education and accelerate the cultivation of nursing talents with comprehensive competence.

Literature [23] analyzed the assessment system based on the fuzzy comprehensive evaluation model of nursing general education competence, and discussed the implementation strategies through the construction of the assessment system, aiming at improving the quality of education and accelerating the cultivation of nursing talents with comprehensive competence.

Literature [24] puts forward a new method based on fuzzy comprehensive evaluation for the problems of large weighting error and long calculation time in hybrid teaching quality assessment, determines the weights of indicators by integrating hierarchical analysis and dynamic weighting, and experimentally verifies its effectiveness in improving the calculation precision and efficiency. Literature [25] specifies the ambiguity of online teaching classroom experience, and takes the human resource management course as an example, and constructs a multi-level assessment model by using fuzzy comprehensive evaluation method, aiming at scientifically assessing students' experience and reducing the interference of subjective factors. Literature [26] constructed a two-level fuzzy comprehensive evaluation model based on the evaluation index system of secondary school mathematics classroom teaching quality, and verified its feasibility and high efficiency through examples and MATLAB programs, realizing the rapid assessment of multi-dimensional teaching effect. Literature [27] proposes a teaching reform assessment method that integrates fuzzy comprehensive evaluation and fuzzy cognitive mapping, and determines the weights of indicators through factor analysis and fuzzy entropy, and experiments show that it can effectively reduce the error and improve the comprehensiveness and accuracy of the assessment results. Literature [28] proposes a balanced assessment model of students' academic performance based on type II fuzzy sets, which improves the accuracy of assessment by separating the trend of performance rise and fall and analyzing the causes, and experiments show that it significantly improves the identification of high-performing students and reduces the assessment error compared with the traditional method, and enhances the fairness and adaptability of educational assessment. Based on the operation level of private colleges and universities, literature [29] selected 23 colleges and universities in Shandong Province and constructed an evaluation system covering 6 major indicators and 13 sub-indicators, using hierarchical analysis to determine the weights and establish a fuzzy comprehensive evaluation model, and realizing the comprehensive evaluation of multi-indicators and scientific ranking through the calculation of the affiliation matrix to validate the validity of this method in enhancing the objectivity of the assessment and the value of the application. Literature [30], for the needs of music teaching effect assessment in colleges and universities, combined information technology and fuzzy comprehensive evaluation method, designed and realized a set of assessment system, verified its operational stability and practicality, and emphasized the positive significance of the system in enhancing the efficiency and quality of teaching management. It can be seen that most of the existing researches focus on the evaluation of teaching quality, comprehensive literacy or specific courses, and lack the exploration of the construction and application of the fuzzy comprehensive evaluation system of students' legal literacy, and there is no systematic and effective combination of the fuzzy comprehensive evaluation method and the assessment of legal literacy.

In order to clarify the situation of legal literacy level of students in higher vocational colleges and universities, this paper constructs and applies the evaluation system of students' legal literacy. Several experts were invited to rate the importance of the index system, and then the weights of the indexes were determined using the hierarchical analysis method. Taking the students of A, B and C vocational colleges and universities as the research object, the evaluation system is applied to obtain the fuzzy comprehensive evaluation data of legal literacy and construct the fuzzy matrix. The comprehensive evaluation value of students' legal literacy was calculated by combining the weights of the indicators and the fuzzy matrix, and then the fuzzy evaluation grade of students' legal literacy was determined according to the principle of maximum affiliation.

2 System for evaluating students' legal literacy

The key to evaluating students' legal literacy is to evaluate the legal awareness that students themselves possess after they have been educated about the rule of law inside and outside the classroom. Legal literacy, as a form of social consciousness, is the sum of people's legal views and legal emotions. Its content includes views on the nature and role of law, requirements and attitudes towards existing laws, and evaluation and interpretation of laws. As a special part of the social group, students have their own unique legal literacy. For contemporary students, they have even more unique cognition, emotions, will and beliefs about the law and various other psychological characteristics that are different from those of other social groups. The study intends to analyze the degree of subjective grasp of the social and legal phenomena of the student group from the perspective of vocational high school teachers, for which a legal literacy evaluation index system is constructed as shown in Table 1, which mainly includes legal knowledge, legal ideals, legal will, legal evaluation and legal beliefs.

(a) Legal knowledge (A1)

Legal knowledge is the product of rational understanding of legal phenomena formed in the course of social practice activities, and it is the sum of people's knowledge about the historical process of the emergence and development of law and its essence and law, as well as the content and characteristics of the current laws of a country and region.

(b) Legal Ideals (A2)

Students' legal ideals are an important part of society's legal ideals, and students, as an important part of society's composition, play an important role in the structural system of legal consciousness in society as a whole.

(c) Legal will (A3)

Legal will is the subjective psychological basis of social subjects in order to safeguard the dignity of the law, the courage to fight against illegal and criminal behavior, it is the quality of the legal will of the social subjects, manifested in the subjects in any case are not afraid of violence, do not waver for coercion and temptation of the strong spirit of law-abiding and law-supporting character.

(d) Legal Evaluation (A4)

Legal evaluation is the social subject based on specific standards of the law and its operation process to make value judgments, reflecting the subject needs and the law between some kind of affirmative or negative relationship.

(e) Belief in Law (A5)

Faith in the law is the extreme belief of students in the law and the values embodied behind it, which they use as the goal of their life pursuit and to guide and regulate their behavior.

Table 1: Legal literacy evaluation index system

Index	Specific content
Legal knowledge(A1)	Understand the legal system(A11)
	The connotation of legal and legal rule(A12)
	Does the general rule of civil law understand(A13)
	Does the constitution understand(A14)
	Consumer and merchant law(A15)
	Do you know anything about illegal behavior(A16)
Legal ideal(A2)	Socialist rule of law(A21)
	The authority of the constitution and the law(A22)
	The view of the law now(A23)
	The idea of the law is against the act(A24)
	Attitude to law enforcement(A25)
Legal will(A3)	Willing to hand over stolen goods to court(A31)
	Will obey the rules when there is no traffic police(A32)
	It will use legal procedures to solve life problems(A33)
	You will ask the merchant for the invoice(A34)
	Cooperate with the police to conduct investigation(A35)
Legal evaluation(A4)	Is there any need for reform in the law of labor(A41)
	Are people involved in the process of legal development(A42)
	Are you satisfied with the law(A43)
	Is the law useful in life(A44)
	Does the law make sense(A45)
Legal belief(A5)	The criteria of judgment tend to be legal(A51)
	The dispute is settled through the law(A52)
	The status of the law in the heart(A53)
	The attitude of building the rule of law(A54)

3 Hierarchical analysis of evaluation indicator assignments

Through the survey conducted by the experts, the evaluation index system of students' legal literacy has been basically formed, and in order to avoid the evaluation being unquantifiable, the study adopts the hierarchical analysis method to calculate the weights of each index. The construction of the evaluation index system of students' legal literacy has been completed above, and the evaluation index system of students' legal literacy is taken as the guideline layer for decision-making, and the five factors of legal knowledge (A1), legal ideals (A2), legal will (A3), legal evaluation (A4), and legal beliefs (A5) are set as the guideline layer. The guideline layer is then divided into different indicator layers, which are often central to the realization of the overall goal.

By means of an expert questionnaire, 10 experts in the legal field were invited to score the relative importance of the indicators at each level in the evaluation system using a two-by-two comparison, and for each indicator, an expert judgment matrix was determined by the importance assignment of the indicator.

After the judgment matrix is constructed, the weight of each indicator can be calculated as follows:

(a) Summing up each row, the formula is:

$$\sum_{i=1}^n a_{ij} \quad (1)$$

(b) The weights assigned to each indicator were calculated using the formula:

$$W_i = \frac{\sum_{j=1}^n a_{ij}}{\sum_{i=1}^n \sum_{j=1}^n a_{ij}} \quad (2)$$

(c) Derive the maximum eigenroot value of the matrix, Eq:

$$\lambda_{\max} = \frac{1}{n} \sum_{i=1}^n \frac{AW_i}{W_i} \quad (3)$$

where the number of indicators is denoted by n , AW_i denotes the corresponding computational vector, and W_i denotes the weight of the corresponding indicator.

(d) Test the consistency of the matrix, the formula is:

$$CI = \frac{\lambda_{\max} - n}{n - 1} \quad (4)$$

Then, the average stochastic consistency index RI of the same order matrix is queried, and the values of the consistency index RI are shown in Table 2.

Table 2: The conformance indicator RI standard

Number	1	2	3	4	5	6	7	8	9
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45

Finally, the consistency ratio is calculated to test the consistency ratio:

$$CR = \frac{CI}{RI} \quad (5)$$

The matrix consistency test is acceptable when $CR < 0.1$. the matrix has full consistency when $CR = 0.1$. the matrix consistency is unacceptable when $CR > 0.1$.

In this round of survey, the questionnaire survey was still conducted on the 10 experts identified in the previous period, and based on the index importance assignment table, a two-by-two comparison was made between the relative importance between the same levels in the evaluation index system of students' legal literacy, so that the experts could assign values according to this table. Yaahp software was used to analyze the statistical data and calculate the weights of the indicators.

The judgment matrix, weights and consistency test results of the criterion level are shown in Table 3. The importance of legal knowledge (A1) relative to legal ideals (A2), legal will (A3), legal evaluation (A4), and legal beliefs (A5) is 1, 2, 2, and 5, respectively. The importance of legal ideals (A2) relative to legal knowledge (A1), legal will (A3), legal evaluation (A4), and legal beliefs (A5) is 1, 2, 1, and 3, respectively. The importance of legal will (A3) relative to legal knowledge (A1), legal ideals (A2), legal appraisal (A4) and legal beliefs (A5) are 1/2, 1/2, 1/2, 1. The importance of legal appraisal (A4) relative to legal knowledge (A1), legal ideals (A2), legal will (A3) and legal beliefs (A5) are 1/2, 1, 2, 2. The importance of legal Beliefs (A5)

relative to legal knowledge (A1), legal ideals (A2), legal will (A3), and legal evaluation (A4) were 1/5, 1/3, 1, and 1/2, respectively. 10 experts agreed that legal knowledge (A1) was the most important, followed by legal ideals (A2), then legal evaluation (A4), and that legal will (A3) and legal beliefs (A5) are close in importance. Therefore, the weights of legal knowledge (A1), legal ideals (A2), legal will (A3), legal evaluation (A4), and legal belief (A5) were obtained as 0.343, 0.250, 0.109, 0.203, and 0.095, respectively, and the CR of this judgment matrix = 0.0185, which passed the consistency test.

Table 3: Criterion layer judgment matrix, weights and consistency test results

	A1	A2	A3	A4	A5	w
A1	1	1	2	2	5	0.343
A2	1	1	2	1	3	0.250
A3	1/2	1/2	1	1/2	1	0.109
A4	1/2	1	2	1	2	0.203
A5	1/5	1/3	1	1/2	1	0.095
$\lambda_{\max}=5.083, CI=0.0207, CR=0.0185$						

4 Analysis of the application of the evaluation indicator system

The study takes students from three higher vocational colleges in a city, A, B and C, as the specific research object, and obtains and uses relevant survey data to measure and analyze the results of students' legal literacy. The survey data are collected by students filling out a questionnaire, which is characterized by simplicity, operability, and a wide range of surveys to ensure that students can express their meaning independently. The specific content of the questionnaire is the specific content of the evaluation index system above, and the questionnaire options adopt Richter's 5-level scale, i.e., [0,1] is classified as not conforming at all, (1,2] is classified as not conforming at all, (2,3] is classified as general, (3,4] is classified as conforming at all, (4,5] is classified as fully conforming, which is convenient for quantitatively counting the level of the legal literacy of the students. The survey data collected for the study were mainly for students in the three higher vocational institutions and were obtained using the sampling method. The study issued 100 questionnaires to each of the three higher vocational colleges and universities, completed by the students on the spot that is recovered, the questionnaire recovery rate is 100%.

The questionnaire data of the students of the higher vocational colleges were analyzed, and Figure 1 shows the scores of the legal literacy indicators of the students of School A. The average scores of the students of School A on legal knowledge (A1), legal ideals (A2), legal will (A3), legal evaluation (A4), and legal beliefs (A5) were 3.38, 3.26, 3.00, 3.59, and 3.21, respectively, with the scores of the legal evaluation indicators being higher than the scores of other indicators. The indicator scores achieved the highest scores compared to the other indicators, indicating that the majority of students believe that the law is authoritative and supreme and has a great influence on their lives.

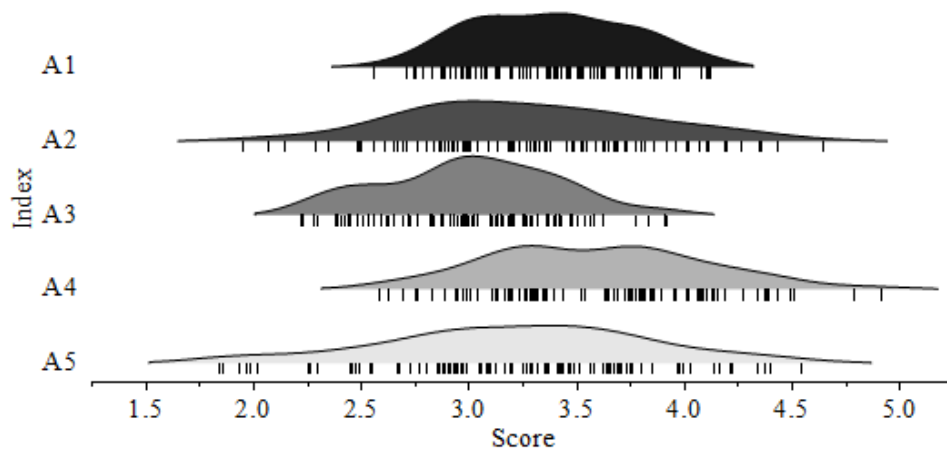


Figure 1: A student's legal literacy index scores

Figure 2 presents the score distribution of the legal literacy indicators for students of School B. The average score range of these indicators for the students of School B is between 3.47 and 4.24. The majority of the students chose the options "fairly consistent" and "completely consistent" in the questionnaire, which indirectly indicates that the legal literacy level of the students of School B might be relatively high.

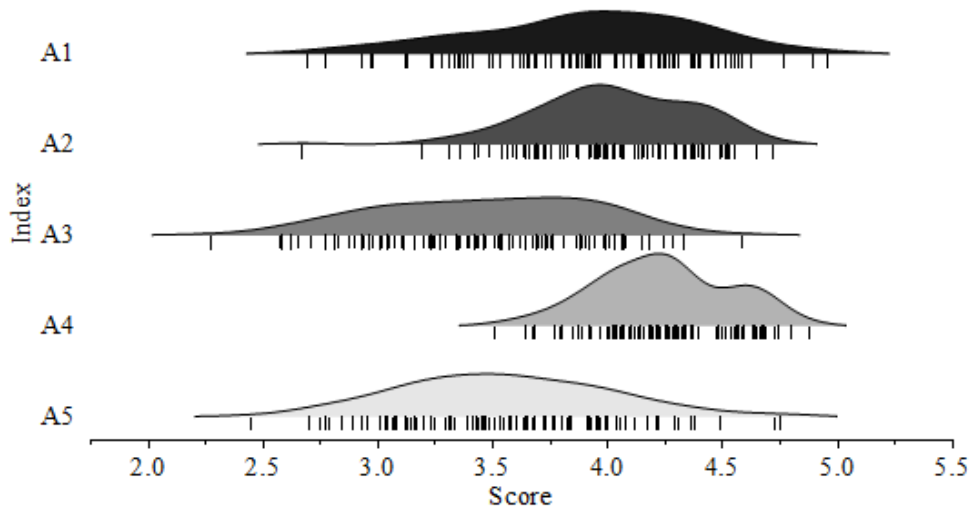


Figure 2: B student's legal literacy index scores

The scores of legal literacy indicators of students in School C are shown in Figure 3, the average scores of students in School C on legal knowledge (A1), legal ideals (A2), legal will (A3), legal evaluation (A4) and legal beliefs (A5) are 2.99, 3.22, 2.73, 3.33 and 3.35 respectively, it is not difficult to find out that the scores of the school's students on the level of legal knowledge are too low, which indicates that most of the students have a lack of legal knowledge. students' general knowledge of law is lacking, and they need to further improve their knowledge of law through legal popularization.

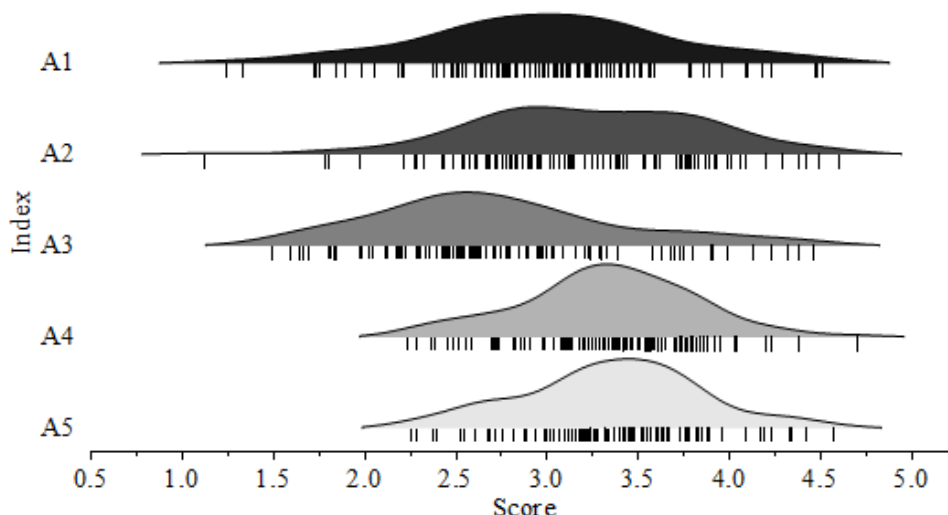


Figure 3: C student's legal literacy index scores

In this section, by organizing the questionnaire results of the five indicators of the three institutions and calculating the mean value of each indicator, the preliminary information on the legal literacy level of students in each institution is obtained and understood, so as to facilitate the data support for the application of the fuzzy comprehensive evaluation method in the following. Based on the relevant data obtained in this section, the following section will clarify the proportion of students on the interval of not at all compliant, relatively not compliant, average, relatively compliant, and fully compliant, and combine the weights of the five indicators to make a fuzzy evaluation of the legal literacy level of students in the three institutions.

5 Fuzzy comprehensive evaluation of legal literacy

Fuzzy comprehensive evaluation is a comprehensive evaluation method, which is based on the principles of fuzzy mathematics and transforms qualitative evaluation into quantitative evaluation. The method is based on the affiliation theory of fuzzy mathematics, which considers and analyzes each set of evaluation factors, and derives the weight value of each factor in the evaluation object and the relative importance of each factor by establishing an evaluation model. In this section, a fuzzy comprehensive evaluation of the legal literacy of students in three higher vocational colleges A, B and C is conducted.

(1) Establish the fuzzy comprehensive evaluation model

a) Determine the evaluation factors and grades

When determining evaluation factors, the m factors (indicators) evaluated are described by $U = \{u_1, u_2, \dots, u_m\}$, and the evaluation levels are described by $V = \{v_1, v_2, \dots, v_n\}$ describes, n is usually used to represent the number of evaluation levels.

b) Construct fuzzy matrix and determine the weights

A single evaluation indicator factor is represented by $u_i (i = 1, 2, \dots, m)$, and in determining the indicator u_i , the subordination degree r_{ij} of its basic grade $v_j (j = 1, 2, \dots, n)$ is used to make judgment. R is used to represent the fuzzy relationship from the indicator set U to the comment set V , and the evaluation matrix R consists of the evaluation sets of m indicators, and the final matrix is formulated as:

$$R = (r_{ij})_{m \times n} = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix} \quad (6)$$

where $i = 1, 2, \dots, m$ and $j = 1, 2, \dots, n$.

From the evaluation factor u_i , v_j is its affiliation degree, while the overall expression is replaced by r_{ij} in the formula. When constructing the evaluation index system, each evaluation factor has its role and is representative, i.e., the weights of individual evaluation indexes in the comprehensive evaluation are different. Therefore, A is used to represent the distribution set of weights, i.e., $A = (a_1, a_2, \dots, a_m)$, ($a_i > 0, \sum a_i = 1$). That is, the weights derived from the use of hierarchical analysis above.

c) Synthesis of matrix and weights

In order to get R this final result, it is necessary to integrate the weight vector A and calculate the corresponding fuzzy indicator system values for the overall evaluation result vector to be calculated and operated. In the selection of V , the fuzzy evaluation set of B is taken out, i.e., it is represented by $B = (b_1, b_2, \dots, b_n)$. In order to realize the fuzzy transformation, $B = A * R$ ($*$ is the operator symbol) through the weighted average type multiplication - bounded operator to realize the comprehensive evaluation system indicator weights reflected to get the final result. In the operation process if $\sum b_j \neq 1$, then it needs to do its normalization.

(2) Fuzzy comprehensive evaluation of cultivation quality

a) Establishment of evaluation factor set

The main criterion layer $A = \{A_1, A_2, A_3, A_4, A_5\}$, and A = Student legal literacy evaluation. A_1 = Legal Knowledge, A_2 = Legal Ideal Indicator Set, A_3 = Legal Will, A_4 = Legal Evaluation, and A_5 = Legal Beliefs.

b) Establishment of comment set

The results of the evaluation subject's evaluation of the indicators are used as a rubric set, and the rubric set in this study is denoted by $V = \{v_1, v_2, v_3, v_4, v_5\}$. V denotes the set of rubrics, v_1 denotes complete nonconformity, v_2 denotes less conformity, v_3 denotes fairness, v_4 denotes more conformity, and v_5 denotes full conformity.

c) Fuzzy comprehensive evaluation

Starting from the individual factors in the set of factors at the indicator level, the evaluation is carried out and the comprehensive evaluation value is calculated. Table 4~Table 6 shows the fuzzy matrix of students' legal literacy in three higher vocational colleges A, B and C in turn. For the students of school A and C, their comments on the legal literacy evaluation indexes are mostly concentrated on v_3 and v_4 , while for the students of school B, the distribution of comments on v_4 and v_5 is higher. The following section combines the weights of the indicators and the fuzzy matrix to make a fuzzy comprehensive evaluation of the legal literacy level of students in the three higher vocational colleges and universities.

Table 4: A school student legal literacy fuzzy matrix

	v_1	v_2	v_3	v_4	v_5
A_1	0.00	0.00	0.19	0.77	0.04
A_2	0.00	0.01	0.39	0.47	0.13
A_3	0.00	0.00	0.53	0.47	0.00
A_4	0.00	0.00	0.11	0.67	0.22
A_5	0.00	0.05	0.33	0.53	0.09

Table 5: B school student legal literacy fuzzy matrix

	v_1	v_2	v_3	v_4	v_5
A_1	0.00	0.00	0.06	0.50	0.44
A_2	0.00	0.00	0.01	0.48	0.51
A_3	0.00	0.00	0.18	0.69	0.13
A_4	0.00	0.00	0.02	0.18	0.80
A_5	0.00	0.00	0.10	0.74	0.16

Table 6: C school student legal literacy fuzzy matrix

	v_1	v_2	v_3	v_4	v_5
A_1	0.00	0.09	0.40	0.43	0.08
A_2	0.00	0.04	0.36	0.51	0.09
A_3	0.00	0.13	0.59	0.23	0.05
A_4	0.00	0.00	0.21	0.72	0.07
A_5	0.00	0.00	0.21	0.71	0.08

From the above results of assigning weights to legal knowledge (A1), legal ideals (A2), legal will (A3), legal evaluation (A4), and legal beliefs (A5), we get the weight vector of students' legal literacy, $w=[0.343,0.250,0.109,0.203,0.095]$, and we choose the weighted-average type of multiplicative-bounded algorithm to compute the students' The fuzzy comprehensive evaluation value of legal literacy is as follows:

$$\begin{aligned}
 C_A &= [0.343 \ 0.250 \ 0.109 \ 0.203 \ 0.095] \times \begin{bmatrix} 0.00 & 0.00 & 0.19 & 0.77 & 0.04 \\ 0.00 & 0.01 & 0.39 & 0.47 & 0.13 \\ 0.00 & 0.00 & 0.53 & 0.47 & 0.00 \\ 0.00 & 0.00 & 0.11 & 0.67 & 0.22 \\ 0.00 & 0.05 & 0.33 & 0.53 & 0.09 \end{bmatrix} \quad (7) \\
 &= [0.000 \ 0.007 \ 0.274 \ 0.619 \ 0.099]
 \end{aligned}$$

$$C_B = [0.343 \quad 0.250 \quad 0.109 \quad 0.203 \quad 0.095] \times \begin{bmatrix} 0.00 & 0.00 & 0.06 & 0.50 & 0.44 \\ 0.00 & 0.00 & 0.01 & 0.48 & 0.51 \\ 0.00 & 0.00 & 0.18 & 0.69 & 0.13 \\ 0.00 & 0.00 & 0.00 & 0.18 & 0.82 \\ 0.00 & 0.00 & 0.10 & 0.74 & 0.16 \end{bmatrix} \quad (8)$$

$$= [0.000 \quad 0.000 \quad 0.056 \quad 0.474 \quad 0.470]$$

$$C_C = [0.343 \quad 0.250 \quad 0.109 \quad 0.203 \quad 0.095] \times \begin{bmatrix} 0.00 & 0.09 & 0.40 & 0.43 & 0.08 \\ 0.00 & 0.04 & 0.36 & 0.51 & 0.09 \\ 0.00 & 0.13 & 0.59 & 0.23 & 0.05 \\ 0.00 & 0.00 & 0.21 & 0.72 & 0.07 \\ 0.00 & 0.00 & 0.21 & 0.71 & 0.08 \end{bmatrix} \quad (9)$$

$$= [0.000 \quad 0.055 \quad 0.354 \quad 0.514 \quad 0.077]$$

According to the principle of maximum affiliation, it can be seen that the proportion of students' legal literacy in the three higher vocational colleges and universities evaluated as "more in line with" is the largest, and the proportion of A, B and C higher vocational colleges and universities is 0.619, 0.474 and 0.514 respectively, so the final result of the students' legal literacy in the three higher vocational colleges and universities is "Comparatively conform". The fuzzy comprehensive evaluation set of students' legal literacy to assign a value of 90 points, 80 points, 70 respectively, 60 points, 50 points to deal with, to get the A school students' legal literacy score: $0.000 * 50 + 0.007 * 60 + 0.274 * 70 + 0.619 * 80 + 0.099 * 90 = 78.03$ points, and similarly to get the value of the legal literacy scores of the students of the B school and the C school, respectively, were 84.14, 76.13.

Based on the settings, the scores for each questionnaire item can be calculated. Among them, a score greater than 90 for each dimension is defined as "excellent", $80 \leq \text{score} \leq 90$ as "good", $70 \leq \text{score} < 80$ as "medium", $60 \leq \text{score} < 70$ as "qualified", and scores below 60 are defined as "fail". It can be seen that the legal literacy of students from School A and School C is at the "medium" level, while that of students from School B is at the "good" level. The legal literacy of students from the three schools is at an above-average medium level. The implementation of the task of imparting legal knowledge to students by the schools is relatively good, and it also demonstrates the effectiveness of the evaluation index system constructed in this paper. It has reference significance for conducting student legal literacy evaluations in schools.

6 Conclusion

The article designed the evaluation system of students' legal literacy, used the hierarchical analysis method to determine the weights of the system's indicators, and collected relevant data in vocational high schools and colleges, obtained the weights of the indicators and the relative importance between the indicators by the fuzzy comprehensive evaluation method, and divided the fuzzy grades of students' legal literacy based on the principle of the maximum degree of affiliation.

(1) In the evaluation system, the weights of the indicators of legal knowledge, legal ideals, legal will, legal evaluation and legal beliefs are 0.343, 0.250, 0.109, 0.203 and 0.095, respectively.

(2) There are differences in the average scores of the students of the three vocational colleges and universities on the indicators, in which the average score values of the students of School A on the above indicators are 3.38, 3.26, 3.00, 3.59 and 3.21 respectively, while the average scores of the students of School B are distributed between 3.47 and 4.24.

(3) The fuzzy comprehensive evaluation method obtained that the legal literacy scores of students in Schools A and C were 78.03 and 76.13, respectively, which belonged to the “medium” level, while the legal literacy score of students in School B was 84.14, which belonged to the “good” level.

The study conducted an empirical research on the fuzzy comprehensive evaluation of the legal literacy of students in vocational colleges and universities, and obtained comprehensive evaluation results, and the subsequent research can further construct a model of the influence factors of legal literacy in order to understand its influence factors.

About the Author

Juan Xi, a faculty member at Linyi Vocational College, holds a Master of Laws degree from Ocean University of China. Her teaching portfolio includes courses such as National Security Education, Civil Code, and Marriage and Family Law. Specializing in ideological and legal studies, she has published multiple papers in national-level academic journals and contributed as a co-author to the book *A History of the Dissemination of Yimeng Spirit*. She has participated in several research projects in Linyi City and led the 2023 Linyi Association for Science and Technology project, titled *Research on High-Quality Development Pathways and Strategies for Linyi's New Energy Vehicle Industry*, which received the Outstanding Achievement Second Prize. Additionally, she has been recognized multiple times as an Outstanding Communist Party Member by her institution.

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