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Assessment of High School Academic Performance Based on Intuitionistic Fuzzy TOPSIS Decision Making Method

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Abstract

In traditional summative assessment, according to the original score accumulation method, it is difficult to reflect the hierarchical nature of the questions under the same question type, and students often have the same score, which unilaterally reflects the real level of students and other defects. This paper adopts intuitionistic fuzzy TOPSIS. First of all, the weight set of corresponding indicators is determined by AHP, then the membership degree fuzzy matrix is determined by intuition fuzzy set through expert assessment, and the closeness degree is determined by TOPSIS decision-making method. Finally, students' scores are weighted. The feasibility of this method in educational assessment is verified by taking the mathematics quiz results of some students in a senior middle school in Jiangsu Province as an example. The results show that the calculation of intuitionistic fuzzy TOPSIS is simple and practical, and the assessment results are relatively consistent with the actual situation. In the future educational assessment, this method can be extended to the selection of talents in multi-disciplines or comprehensive disciplines.

Keywords

Summative assessment; Intuitionistic fuzzy set; TOPSIS; AHP.

1. Introduction

High school students' academic performance assessment has always been a hot topic concerned by colleges, parents and examinees. Due to the excessive emphasis on the score comparison of single dimension in education and teaching (the problem of the same type of questions with different difficulties, such as the same score), the utilitarianism of education is prominent.

Comprehensive quality assessment of promoting education workers to focus on students' study process, however, education is a process of changing, with a strong instability and timeliness, influenced by time and environment aspects, Zhang[1] pointed out that process assessment has high ethical risks, and improper use may lock students' growth and increase their academic burden. Such instability and timeliness should be avoided as far as possible in competitions such as selection. Therefore, it is still one of the most important ways to evaluate students through final scores.

From the selection of top talents to the examination of academic subjects, the competition is still the main task, focusing on the screening and selection of students. Therefore, summative assessment has its value in the past and in the future. This requires us to put forward the improvement strategies and innovations according to the actual needs, get rid of the disadvantages of the traditional summative assessment, and build a more scientific and reasonable assessment way.

The long-existing examination as the main way of assessment is difficult to reflect the "cultivation of all-round development of people". The proposal of key competency further reflects the inner connection between macro education concept, training objectives and specific education and teaching practice, and standardizes the performance and testing standards of

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teaching assessment. Therefore, under the guidance of core literacy, the existing assessment system should be integrated, reformed and optimized to implement the concept, connotation and requirements of core literacy into the traditional assessment model, so as to connect the assessment of core literacy with the summative assessment, and establish a set of academic quality assessment standards based on core literacy can effectively promote the implementation of core literacy, promote the innovation of educational assessment, break the assessment mode of the same question type, the same score and assessment, improve the student academic assessment system, improve the quality of decision-making, and promote educational equity.

At present, in the practice research of high school teaching management, the methods of comprehensive assessment of students' achievements mainly include original accumulation method and weighted scoring method, among which the weighted scoring method mainly includes factor analysis method[2], entropy weight TOPSIS method [3] and mathematical abstract analysis model[4] .In addition, Zhang[5] proposed the introduction of SOLO classification theory to predict a person's possible achievement in learning by his ability score, and the quantified score was used as the basis of summative assessment. Drawing on the enterprise IT Assessment model, Long [6] established the Floor Mode Assessment model. With the development of information technology, Li[7] designed and implemented an adaptive examination system based on item response theory, which greatly improved the examination efficiency and measurement accuracy. As shown in Table 1, the original score accumulation method covers the score differences between different difficulty levels of the same question type, so it is difficult to reflect students' abilities at different levels, and it is difficult to judge students' abilities under the same score. Factor analysis method adopts the idea of dimensionality reduction, mainly for the extraction of common indicators in different disciplines, or the extraction of investigation indicators in the same discipline, mostly used to determine the weight of a large number of indicators; Entropy weight TOPSIS method has great dependence on samples. With the change of sample value, the weight will fluctuate to a certain extent, which is prone to weight distortion. For example, the difficulty of topic selection is large, but the inspection dimension is small, the quality of topic selection is not high, and the weight is appropriately reduced; The process of mathematical abstract analysis model is complicated and abstract, which is difficult for school teachers to understand. But the computer test first needs to divide the weight according to a large number of data, the cost is high, secondly, in the computer test, the test and the test is not the same group of people, there is a certain error.

"Fuzzy assessment" has been widely used in various disciplines since it was put forward, and has become the main assessment method of decision-making assessment, such as financial management of small and medium-sized enterprises, supplier selection, bank risk assessment and so on. Considering that selection and academic ranking involve decision making, this paper tries to use the "fuzzy assessment" model to improve the scientific and rational decision making in the field of education and teaching.

In this paper, the analytic hierarchy process (AHP) is firstly proposed to determine the attribute weight, and then TOPSIS is extended to intuitionistic fuzzy set, and TOPSIS assessment method based on intuitionistic fuzzy set is proposed to determine the comprehensive assessment and ranking of student achievement.

The new assessment method organically combines the importance of core literacy with teaching assessment, avoids the subjectivity of weight setting, breaks the way of same question type, same score and assessment, more scientifically reflects the difference between topics, and makes the decision results reasonable, credible, reliable and usable. Secondly, TOPSIS method commonly used in multi-objective decision-making is integrated into teaching assessment to more accurately reflect the differences among students, reflect the real level of students, and make the distinction of grades more objective and reasonable.

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This paper aims at the defects of the traditional summative assessment method and the existing assessment model. This paper attempts to consider how to solve the two problems of academic assessment and merit-based examination:

(1)How to divide the weight of test questions reasonably in academic assessment and competition selection?

(2)How to judge the academic level of different students with the same score and improve the differentiation of students?

Table 1. Partial summative assessment model

summative assessment		characteristic	deficiency	usage scenario
original accumulation method		Easy to use and convenient.	It covers up the score difference between different questions under the same question type and lacks hierarchy.	Traditional grading.
weighted scoring method	factor analysis method	Multidimensional index extraction.	Conduct macro collation and concentration of data.	Extract subject or topic commonness analysis student study situation.
	entropy weight TOPSIS method	Reflect the discrimination ability of indicators, objectively evaluate the weight. The algorithm is simple and the practice is convenient.	It is easy to produce weight distortion due to its great dependence on samples.	Combining AHP to maximize the entropy weight method advantage, scientific scoring.
	mathematical abstract analysis model	Weight division is more scientific and accurate	Complex, abstract, difficult to understand, not strong extensibility.	According to the specific teaching requirements to choose the optimal weight.
	Floor Mode Assessment model	Follow the principle of human nature, hierarchy and operation.	To cover up the differences of questions at the same level, there are questions with higher cost performance in order to get high scores.	The questions are divided into 5 levels, and students or schools choose the question bank independently.
item response theory		Improve test efficiency and measurement accuracy through adaptive examination system.	1. Based on the large amount of data, high cost, and different test objects, there are errors. 2. Different schools have different hardware conditions.	Computerized adaptive testing.
SOLO classification theory		The curriculum standards will be refined and specific.	The qualitative assessment method described by grade is subjective and low extensibility	Take the test and explore the relationship between ability and performance.

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The concept of analytic hierarchy process (AHP) and TOPSIS based on intuitionistic fuzzy sets is proposed. In order to get rid of the disadvantages of traditional summative assessment, a more scientific and reasonable assessment method is constructed. It provides a new assessment model and quantitative data for modern educational management, and provides reference measures for promoting educational equity.

2. Theoretical Basis

In view of the above analysis, this paper introduces intuitionistic fuzzy TOPSIS into educational assessment, and constructs an intuitionistic fuzzy TOPSIS based high school mathematics academic performance assessment with the subject core accomplishment as the assessment index. Taking into full consideration the "integration of core literacy and summative assessment", "new perspective of education assessment" and "objective description of decision makers' subjective expression", and giving better play to TOPSIS's ranking advantages, this paper firstly analyzes relevant theories and concepts.

2.1. Analytic Hierarchy Process

The analytic hierarchy process (AHP) is a multi-criteria system analysis and decision making method combining qualitative and quantitative analysis proposed by Saaty[8]. Through pairwise comparison, the thought process of decision makers is systematized, mathematized and modeled. In relevant literature, Yu et al.[9] concluded that the research of AHP mainly focuses on "ranking", "weight" and "fuzzy AHP". It is scientific and reasonable to choose analytic hierarchy process to determine the weight of dimension attribute.

2.2. TOPSIS Assessment

When the weight of dimensions is known, we need to determine the scope and degree of dimensions involved in each topic and divide the weight of the topic, so as to determine the final score of students. Considering multi-objective decision making, TOPSIS is a very effective method to solve multi-objective decision making.

TOPSIS is an analysis method proposed by Hwang and Yoonl in 1981[10], which is suitable for comparison and selection of multiple schemes according to multiple indicators. Its full name is "Technique for Order Preference by Similarity to Ideal Solution ". The core idea is to construct positive and negative ideal values of n-dimensional attribute space, and then calculate the weighted Euclidean distance between each scheme and positive ideal value and negative ideal value, that is, the degree to which the scheme is close to the positive ideal solution and far away from the negative ideal solution, as a standard to measure the merits of the scheme[11].

Therefore, this paper chooses TOPSIS method to reorder students' scores in an attempt to improve the scientificity of the assessment criteria.

2.3. Intuitive Fuzzy Sets

In 1965, Professor L.A. Zadeh[12] first proposed the concept of fuzzy set, which uses a single scale (membership degree or membership function) to define fuzzy set, but cannot represent the neutral state (that is, neither support nor oppose state). On this basis, Professor K. T.Atanassov, a Bulgarian scholar, proposed the concept of Intuitionistic Fuzzy Set[13]. Intuitionistic fuzzy sets use two scales (membership degree and non-membership degree) to describe fuzziness, and can represent three states at the same time: for, against and neutral.

In this study, the subjective factors in the process of scoring problems there are, to some extent, but the proposed intuitionistic fuzzy sets of human subjective expression of objective description, the largest extent, overcome the limitations of "black or white" dichotomy, the objective phenomenon of natural attributes describe more exquisite and comprehensive, more flexible scientific data processing. At the same time, intuitionistic fuzzy number accords with

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the traditional Chinese philosophy which attaches importance to the intermediate state between two extremes.[14] Its definition is mainly as follows:

Definition 1[15,16] Let a set x be fixed, then an intuitionistic fuzzy set (IFS) A on x is defined as $A = \{\langle x, \mu_A(x), \nu_A(x)\rangle | x \in X\}$, where the functions

$$\mu_A : X \to [0,1], x \in X \to \mu_A(x) \in [0,1] \tag{1}$$

And

$$\nu_A : X \to [0,1], x \in X \to \nu_A(x) \in [0,1] \tag{2}$$

denote the membership and non-membership degrees of the element $x \in X$ to A respectively, with $0 \le \mu_A(x) + \nu_A(x) \le 1$ for any $x \in X$.

Furthermore, the function $\pi_A(x) = 1 - \mu_A(x) - \nu_A(x)$ is called the uncertainty (or hesitation) degree of x to A . Especially, if $\pi_A(x) = 0$, then A reduces to a fuzzy set.[12]

Definition 2[12] Let two intuitionistic fuzzy sets(IFS) $A = \{\langle x, \mu_A(x), \nu_A(x)\rangle | x \in X\}$ and $B = \{\langle x, \mu_B(x), \nu_B(x)\rangle | x \in X\}$, any $\lambda > 0$, operational relations of intuitionistic fuzzy sets are as follows:

(1) Sum of intuitionistic fuzzy sets:

$$A + B = \{\langle x, \mu_A(x) + \mu_B(x) - \mu_A(x)\mu_B(x), \nu_A(x)\nu_B(x)\rangle | \mathrm{x} \in X\} \tag{3}$$

(2) Product of intuitionistic fuzzy sets:

$$A \cdot B = \{\langle x, \mu_A(x) \cdot \mu_B(x), \nu_A(x) + \nu_B(x) - \nu_A(x)\nu_B(x)\rangle | \mathrm{x} \in X\} \tag{4}$$

(3) Product of Intuitive Fuzzy Sets and Numbers

$$\lambda A = \left\{\left\langle x, 1 - \left(1 - \mu_A(x)^{\lambda}\right), \left(\nu_A(x)\right)^{\lambda}\right\rangle | \mathrm{x} \in X\right\} \tag{5}$$

Based on the above analysis, this paper adopts analytic Hierarchy Process and intuitive fuzzy TOPSIS method to solve the problem of recalculating students' scores. The flow chart is shown in Figure 1:

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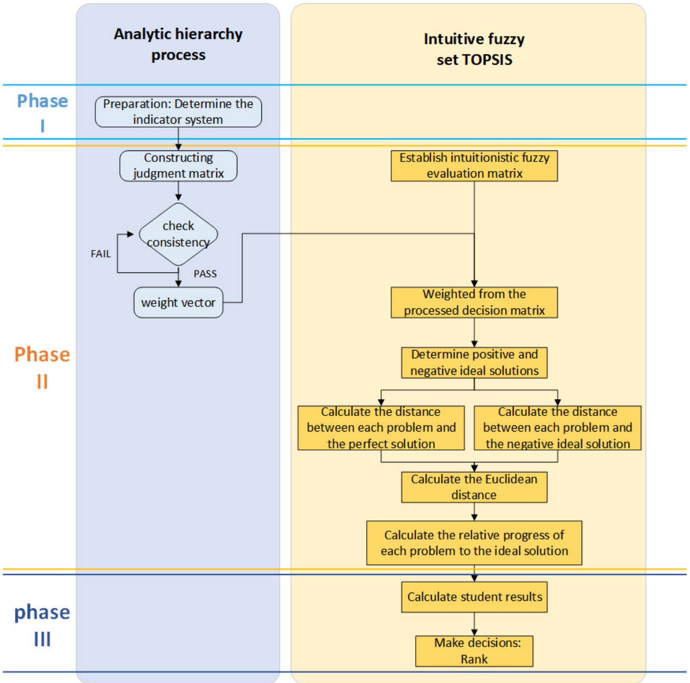

Figure 1. Flow chart

3. Decision- making Procedures

Set multi-index decision problem scheme set $X = \{x_1, x_2, \ldots, x_n\}$ and index set $C = \{c_1, c_2, \ldots, c_m\}$, $y_{ij}\left(i = 1,2,\ldots,m; j = 1,2,\ldots,n\right)$ represents the value of the schema pair and property. λ_j is the index weight, $\lambda_j \in [0,1]$ and $\sum_{j=1} \lambda = 1$.

Step 1 Normalized decision matrix

$$r_{ij} = \frac{y_{ij}}{\sqrt{\sum_{j=1}^{n}\left(y_{ij}\right)^2}}\left(i = 1,2,\ldots,m; j = 1,2,\ldots,n\right) \tag{6}$$

Step 2 Calculate the weighted decision matrix

$$\bar{r} = \omega_j \cdot r_{ij}\left(i = 1,2,\ldots,m; j = 1,2,\ldots,n\right) \tag{7}$$

Step 3 Determine the positive ideal solution and the negative ideal solution.

$$r^+ = \left(r_1^{\ +}, r_2^{\ +}, \ldots, r_m^{\ +}\right)^T \tag{8}$$

And

$$r^- = \left(r_1^{\ -}, r_2^{\ -}, \ldots, r_m^{\ -}\right)^T \tag{9}$$

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In the formul $r_i^+ = \max\left\{\overline{r_{ij}} \middle| j = 1,2,\ldots,n\right\}\left(i \in \Omega_b\right)$ or $r_i^+ = \min\left\{\overline{r_{ij}} \middle| j = 1,2,\ldots,n\right\}\left(i \in \Omega_c\right)$; $r_i^- = \min\left\{\overline{r_{ij}} \middle| j = 1,2,\ldots,n\right\}\left(i \in \Omega_b\right)$ or $r_i^- = \max\left\{\overline{r_{ij}} \middle| j = 1,2,\ldots,n\right\}\left(i \in \Omega_c\right)$. Ω_b , Ω_c are the benefit attribute set and the cost attribute set, respectively. In the student achievement, we only need to use the benefit attribute set.

Step 4 Determine the Euclidean distance of each scenario from the positive and negative ideal solutions. The Euclidean distance between the solution and the positive ideal solution and the negative ideal solution:

$$D_j^+ = \sqrt{\frac{1}{2}\sum_{i=1}^{m}\left(\overline{r_{ij}} - r_i^+\right)^2}\left(j = 1,2,\ldots,n\right) \tag{10}$$

and

$$D_j^- = \sqrt{\frac{1}{2}\sum_{i=1}^{m}\left(\overline{r_{ij}} - r_i^-\right)^2}\left(j = 1,2,\ldots,n\right) \tag{11}$$

Step 5 Compute the relative closeness of each alternative to the positive ideal solution:

$$C_j = \frac{D_j^-}{D_j^- + D_j^+}\left(j = 1,2,\ldots,n\right) \tag{12}$$

Step 6 Determine the ranking of the pros and cons of the solutions. According to the relative closeness from small to large, the weight of each test question is formed.

Step 7 Weighted calculation of student grades and sorting.

$$P = \sum_{i=1}^{m} C_j \cdot P_j \tag{13}$$

4. Case Analysis

In a high school math test, the teacher wanted to assign weights according to the different dimensions covered by the item and its degree. There are 8 questions in this test, $X = \left\{x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8\right\}$ represent 8 options. $C = \left\{c_1, c_2, c_3, c_4, c_5, c_6\right\}$ are the six decision attributes of each scheme, representing "mathematical abstraction", "logical reasoning", "mathematical modeling", "intuitive imagination", "mathematical operation" and "data analysis". Based on the six aspects of high school mathematics core literacy, experts give weights of different attributes by using AHP to form weight vectors $\omega = \left\{\omega_1, \omega_2, \omega_3, \omega_4, \omega_5, \omega_6\right\}^T$, and at the same time use intuitionistic fuzzy sets for each topic to give the assessment values of each topic under different attributes to form a decision matrix $R = \left(r_{ij}\right)_{8\times6}$. The goal of this decision problem is to recalculate and re-rank the scores of 46 students in a certain high school class in the mathematics quiz.

The whole analysis process is mainly divided into three parts, the analytic hierarchy process calculates the index weight, the intuitionistic fuzzy TOPSIS theory obtains the test question

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weight, and the weighted comprehensive score recalculates and ranks the students' academic performance. Build a hierarchical model as shown in Figure 2.

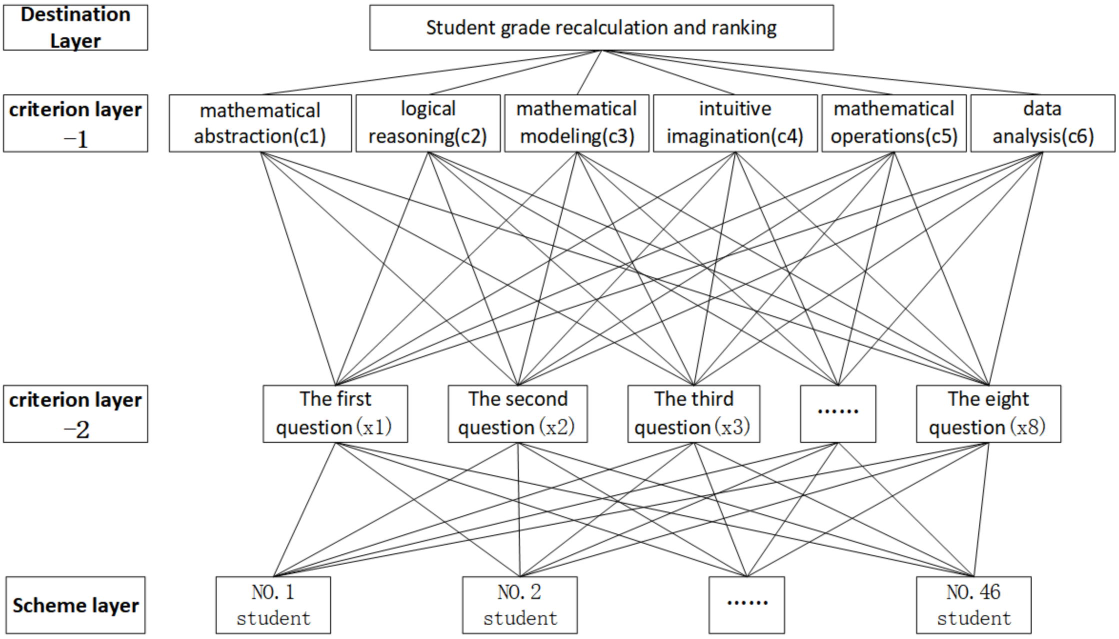

Figure 2. Hierarchical model

4.1. The Analytic Hierarchy Process (AHP) Is Used to Calculate The Index Weight

The main idea of AHP is to obtain a combined weight of the constituent elements in each hierarchical structure relative to the overall goal by clarifying the problem, establishing a hierarchical structure model, constructing a pairwise judgment matrix, and uniformly testing three basic steps.

4.1.1. Establish A Hierarchical Structure Model

Mathematics is the basic subject in senior high school education. The study of mathematics is not only about the understanding of knowledge, but also the comprehensive strength is shown by students in the application of mathematics knowledge. Core literacy mainly refers to the necessary characters and key abilities that students should have to meet the needs of lifelong development and social development. Therefore, core literacy education in senior high school is of unparalleled importance. In the "High School Mathematics Curriculum Standards" (2017 edition), it is clearly proposed that the core competencies of high school mathematics in my country include mathematical abstraction, logical reasoning, mathematical modeling, intuitive imagination, mathematical operations and data analysis.

4.1.2. Constructing the Judgment Matrix

The AHP method is used to determine the index weights of the core literacy of high school mathematics, mainly through the distribution of questionnaires, and according to the personal knowledge and experience of experts, the importance of each index is compared pair-wise, and the judgment matrix is constructed as shown in Table 2:

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Table 2. Six dimensions of core literacy

	mathematical abstraction(c_1)	logical reasoning(c_2)	mathematical modeling(c_3)	intuitive imagination(c_4)	mathematical operations(c_5)	data analysis(c_6)
mathematical abstraction(c_1)	1	1/3	3	5	3	1/3
logical reasoning(c_2)	3	1	3	3	4	1/3
mathematical modeling(c_3)	1/3	1/3	1	3	3	1/2
intuitive imagination(c_4)	1/5	1/3	1/3	1	1/3	1/5
mathematical operations(c_5)	1/3	1/4	1/3	3	1	1/5
data analysis(c_6)	3	3	2	5	5	1

4.1.3. Consistency Test

After constructing the reciprocal judgment matrix, it is necessary to verify the consistency of the judgment matrix.

Step 1: Get the feature vector.

$$\omega = \left\{0.171, 0.238, 0.117, 0.044, 0.066, 0.363\right\}^T$$

Step 2: Calculate the largest eigenvalue.

$$\lambda_{\max} = \frac{1}{n}\sum_{i=1}^{n}\frac{(A\omega_i)}{\omega_i} = 6.603$$

Step 3: Calculate the random consistency index based on the largest eigenvalue.

$$CI = \frac{\lambda_{\max} - n}{n-1} = 0.121$$

Step 4: Combining the indicators RI given in Table 3, you can calculate the indicators to verify whether the reciprocal judgment matrix satisfies the consistency CR.

$$CR = \frac{CI}{CR} = 0.096$$

Table 3. Average random consistency index

The matrix order	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.89	1.12	1.26	1.36	1.41	1.46	1.49

Calculate the consistency index to get $CR = 0.096 < 0.1$, meet the consistency requirements, so get the weight of the core literacy assessment index.

The intuitionistic fuzzy TOPSIS method calculates the weight of the test questions. Table 4 shows the assessment values of each question under different attributes given by experts according to the intuitionistic fuzzy set:

Table 4. The assessment value of decision makers on the topic dimension

title	c_1	c_2	c_3	c_4	c_5	c_6
x_1	<0.60,0.10>	<0.20,0.70>	<0.70,0.20>	<0.50,0.10>	<0.80,0.10>	<0.10,0.80>
x_2	<0.60,0.10>	<0.620,0.50>	<0.80,0.10>	<0.40,0.10>	<0.80,0.00>	<0.10,0.80>
x_3	<0.10,0.80>	<0.70,0.10>	<0.60,0.10>	<0.60,0.20>	<0.80,0.10>	<0.10,0.80>
x_4	<0.60,0.10>	<0.60,0.20>	<0.70,0.10>	<0.50,0.20>	<0.30,0.40>	<0.80,0.10>
x_5	<0.10,0.80>	<0.80,0.10>	<0.60,0.10>	<0.30,0.50>	<0.80,0.10>	<0.80,0.10>
x_6	<0.30,0.40>	<0.60,0.10>	<0.40,0.30>	<0.60,0.20>	<0.80,0.10>	<0.40,0.40>
x_7	<0.60,0.20>	<0.70,0.20>	<0.40,0.40>	<0.20,0.50>	<0.30,0.60>	<0.80,0.10>
x_8	<0.30,0.50>	<0.80,0.10>	<0.40,0.30>	<0.20,0.60>	<0.70,0.20>	<0.80,0.10>

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4.2. Intuitionistic Fuzzy TOPSIS Method to Calculate Test Weights

Step 1 According to the formula (5), the assessment information of each test item is weighted by the indicators, and the results are shown in Table 5:

Table 5. Item dimension weighted assessment value

title	c_1	c_2	c_3	c_4	c_5	c_6
x_1	<0.145,0.674>	<0.052,0.919>	<0.131,0.829>	<0.03,0.903>	<0.101,0.858>	<0.038,0.922>
x_2	<0.145,0.674>	<0.052,0.848>	<0.171,0.764>	<0.022,0.903>	<0.101,0.000>	<0.038,0.922>
x_3	<0.018,0.962>	<0.249,0.578>	<0.102,0.764>	<0.04,0.931>	<0.101,0.858>	<0.038,0.922>
x_4	<0.145,0.674>	<0.196,0.682>	<0.171,0.764>	<0.03,0.931>	<0.023,0.941>	<0.442,0.434>
x_5	<0.018,0.962>	<0.318,0.578>	<0.102,0.764>	<0.016,0.970>	<0.101,0.858>	<0.442,0.434>
x_6	<0.059,0.855>	<0.196,0.578>	<0.058,0.869>	<0.04,0.931>	<0.101,0.858>	<0.169,0.717>
x_7	<0.145,0.759>	<0.249,0.682>	<0.058,0.898>	<0.01,0.970>	<0.023,0.967>	<0.442,0.434>
x_8	<0.059,0.888>	<0.318,0.578>	<0.058,0.869>	<0.01,0.978>	<0.077,0.899>	<0.442,0.434>

Step 2 Calculate the positive and negative ideal solutions according to formulas (8) and (9), and obtain the positive ideal solution state as:

$r^+ = \{(0.145, 0.674), (0.318, 0.578), (0.171, 0.764), (0.040, 0.903), (0.101, 0.000), (0.442, 0.434)\}$ and the negative ideal solution state is:

$r^- = \{(0.018, 0.962), (0.052, 0.919), (0.058, 0.898), (0.010, 0.978), (0.023, 0.967), (0.038, 0.922)\}$

Step 3 Calculate the Euclidean distance between each scheme and the positive and negative ideal solutions according to formulas (10) and (11).

The Euclidean distance between each problem and the correct ideal solution:

$$D^+ = (1.021, 0.526, 1.008, 0.912, 0.899, 0.931, 0.949, 0.915)$$

Euclidean distance between each problem and negative ideal solution:

$$D^- = (0.286, 0.977, 0.336, 0.573, 0.570, 0.375, 0.534, 0.557)$$

Step 4 Calculate the closeness according to formula (12):

$$C_j = (0.219, 0.650, 0.250, 0.386, 0.388, 0.287, 0.360, 0.378)$$

To sum up, the comprehensive index ranking of each test question is as follows:

$$x2 > x5 > x4 > x8 > x7 > x6 > x3 > x1$$

4.3. Weighted Comprehensive Ranking

Table 6 shows the scores of some students in a certain class in the mathematics quiz.

The weighted grades of students are calculated according to formula (13) as shown in Table 7.

In summary, this paper first proposes the AHP method to determine attribute weights, and then extends TOPSIS to intuitionistic fuzzy sets, and proposes a TOPSIS assessment method based on intuitionistic fuzzy sets to determine the comprehensive assessment and ranking of students' grades, as shown in figure 3. In comparison with the original score, the following questions are obtained:

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Table 6. Part of the student transcripts and rankings

student	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	total score	initial ranking
1	5	5	6	0	6	0	4	3	29	14
2	2	5	1	0	6	0	4	7	25	27
3	5	5	6	6	6	0	3	0	31	11
4	5	5	6	6	2	0	4	0	28	15
5	5	5	6	6	4	0	4	3	33	7
6	2	5	1	0	1	0	2	3	14	43
7	5	4	6	3	4	0	0	0	22	33
8	5	5	5	6	6	0	4	0	31	11
9	5	5	6	3	6	0	2	0	27	17
10	5	5	6	6	5	6	4	3	40	1
11	5	5	6	6	3	0	3	0	28	15
12	5	5	6	6	6	6	2	0	36	5
13	2	5	0	0	6	0	3	0	16	39
14	5	2	1	0	6	0	0	3	17	38
15	5	5	2	0	6	0	2	3	23	32
16	5	5	6	3	5	0	3	0	27	17
17	5	5	6	6	6	0	4	8	40	1
18	5	5	0	0	1	0	4	0	15	41
19	5	2	6	4	1	0	0	0	18	37
20	5	5	6	6	3	0	0	0	25	27
21	5	5	6	6	6	6	4	0	38	3

Table 7. Some students' initial scores were compared with their weighted scores and rankings

studnet	initial score	initial ranking	new score	new ranking
1	29	14	10.75	14
2	25	27	10.35	17
3	31	11	11.57	12
4	28	15	10.37	16
5	33	7	12.29	9
6	14	43	6.18	38
7	22	33	7.90	33
8	31	11	11.68	11
9	27	17	10.05	19
10	40	1	14.40	2
11	28	15	10.40	15
12	36	5	12.93	6
13	16	39	7.09	36
14	17	38	6.11	41
15	23	32	9.03	32
16	27	17	10.02	22
17	40	1	14.95	1
18	15	41	6.17	39
19	18	37	5.83	42
20	25	27	9.32	31
21	38	3	13.65	3

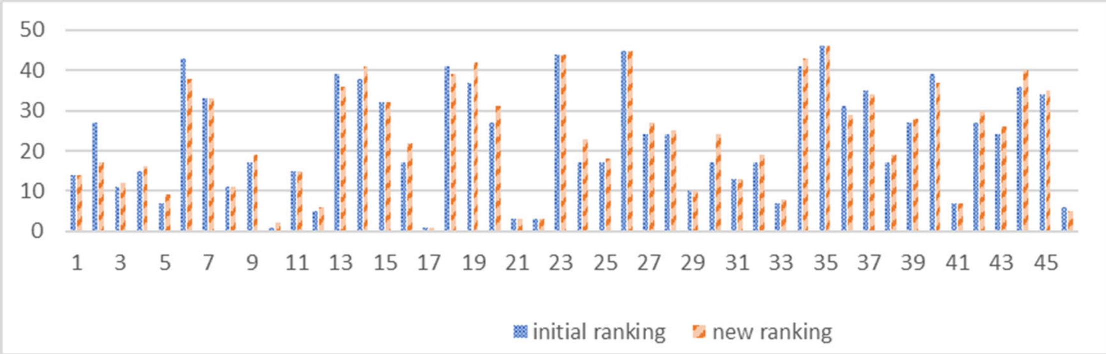

Figure 3. Initial ranking and new ranking

(1) The original ranking is basically the same as the ranking order of the students obtained by the new method, and the optimal decision is the No. 17 student. It shows that the intuitionistic fuzzy decision-making method given in this paper is feasible.

(2) In the sorting, in the original ranking, there are seven students tied for the 17th position and four students tied for the 27th position, for a total of 29 students ranked It is not unique. The ranking of students is further distinguished according to the topic level, which makes the analysis of various situations more detailed in the assessment. In the new ranking, a total of two students are tied for third place, and a total of three students are tied for 19th place position, and the rankings of the rest of the students are unique. The new sorting method makes the results more distinguishable.

(3) The new ranking is compared with the original ranking. A total of 14 students' rankings remain unchanged, 24 students' rankings drop, and 8 students' rankings are improved. Among them, the most floating students are No. 30 and No. 2. Student No. 30 dropped from 17th to 24th, and No. 2 rose from 27th to 17th. Further analysis, it can be seen that the main reason for the decline of the No. 30 student's ranking is that the 17th student in the initial ranking has a total of seven students. After further differentiation, the ranking is moved forward, and the main reason for the rise of the No. 2 student's ranking is the eighth question. The completion rate is much higher than that of most students in the class, and the answers to other questions are also impressive. Basically in line with the actual situation.

5. Conclusions and Prospects

Through the combination of AHP and intuitionistic fuzzy TOPSIS, the following problems are mainly solved:

(1) It promotes the reflection of the core literacy of disciplines in the summative assessment. The new assessment method implements the core literacy into teaching assessment, transforms it into observable and explicit performance, changes the overall assessment that only focuses on but a single dimension, and optimizes the education examination selection mechanism to promote the healthy development of material selection work and to promote education fairness significance.

(2) It provides a new assessment perspective for educational assessment. The new assessment method not only solves the shortcomings of the original score accumulation method, but also avoids the defects of the current scoring methods such as entropy weight scoring method and computer adaptive scoring method, making the scoring process objective and scientific, and the scoring results are reasonable and credible. Easy to operate and usable.

(3) Application innovation, with generalizability. The new assessment method adopts the idea of intuitionistic fuzzy sets to flexibly represent the ambiguity and uncertainty in the decision-making process, which is close to the subjective cognition of the Orientals, and more effectively

handles the fuzzy uncertainty in the real material selection decision-making problem, breaking the same topic. The same type of score and the same assessment method make the decision-making results reasonable, credible, reliable and usable, and have a strong use value. And in the process of scoring, the index weight can be adjusted flexibly, and the index weight can be determined according to the corresponding assessment focus to select talents in a targeted manner. In the future education assessment, this method can not only be extended to multidisciplinary or comprehensive discipline talent selection, but also can be combined with formative assessment to improve education assessment.

The main deficiency of this paper is that only one expert's rating is discussed, but in actual decision-making, there is a certain subjective judgment in the assessment of a single expert. Therefore, in future research, the focus will be on education in the case of multi-attribute group decision-making assessment, so as to build a more optimized multi-attribute decision-making education assessment model.

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