

## Research Article

# Construction of Moral Education Evaluation Model Based on Quality Cultivation of College Students

**Xiaolin Yuan** 

*School of Psychology, Hainan Normal University, Haikou, Hainan 571158, China*

Correspondence should be addressed to Xiaolin Yuan; 040029@hainnu.edu.cn

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Contemporary young college students are greatly impacted in the aspects of moral cognition and moral choice, which results in the weak moral will of some college students, vague moral concepts, and weak ideals and beliefs, which seriously affect the formation and development of college students' moral quality. Therefore, the moral education evaluation model based on college students' quality cultivation is constructed. Firstly, the present situation and defects of college students' quality training are analyzed. Based on this, association rules in data mining method are constructed and introduced to extract valuable knowledge hidden in the data to assist education managers to make effective decisions and improve management level. Finally, the evaluation index is selected and the weighted principal component TOP-SIS model is constructed to realize the evaluation of moral education based on college students' quality cultivation. The experimental results show that the evaluation results of the model are consistent with the actual situation, high degree of fit and freedom, and good practical performance.

## 1. Introduction

With the comprehensive deepening of economic globalization, the surging of new ideas, and the intersection and collision of multiculturalism, it has a profound impact on people's original moral concepts [1, 2]. Therefore, whether colleges and universities can grasp the pulse of the times and solve the moral confusion and value conflict of college students not only plays a vital role in comprehensively promoting the ideological and political work of colleges and universities, but also concerns whether college students can practice the socialist core values with practical actions [3].

Reference [4] uses Amos to test the doctoral education quality evaluation model. The results show that the education quality evaluation model can be divided into four parts: input quality, process quality, output quality, and development quality. There is a significant positive effect between these four parts. Reference [5] takes multiple regression analysis of time series as the main means to explore the linear relationship between the scientific and

technological innovation service function of local universities and the characteristics of innovation and entrepreneurship education resources and gives relevant conclusions and policy analysis. In [6], aiming at the phenomenon of "soft evaluation" in college curriculum academic evaluation, taking the evaluation triangle as the theoretical basis, and based on the comprehensive analysis of relevant research results at home and abroad, this paper constructs an "evidence" based academic evaluation model of college mixed learning curriculum (e-abc model). Based on the above research, this paper constructs an evaluation model of moral education based on college students' quality training, introduces association rules, extracts valuable knowledge, and assists education managers to make effective decisions and improve management level, building a weighted principal component TOP-SIS model to realize the evaluation of moral education. Compared with previous studies, the advantages of the model are that the evaluation results of the model are basically consistent with the actual situation, high degree of fit and freedom, and good practical performance.

## 2. Current Situation of College Students' Moral Education

- (1) Moral education is divorced from the reality of society. Morality originates from social life and is developed and perfected in social practice. Practice is the precondition for the existence and development of morality. Therefore, the moral character is the human forms and the development in the interactive contact practice; the personal practice cannot be less [7]. However, at present, the moral education of college students in some schools is often superior to the students' real life and divorced from the students' moral knowledge and behavior. In view of this serious situation, some colleges and universities still have weak response to the social reality in the process of moral education, and the theory of moral education lacks keeping pace with the times and self-innovation [8]. This kind of moral education is out of touch with the real society and lacks appeal and influence. It is impossible to make a convincing interpretation of the puzzles brought by the complicated real world to the moral cognition of college students from the theoretical level, which leads to the conflict between the moral behaviors of college students and their moral ideas, or even a set of ideas to switch between the superficial "moral spiritual world" and the inner "moral real world" and become a moral "double-faced person."
- (2) The blending degree of moral education and knowledge education is insufficient. Herbart, a German philosopher and educator known as "the father of educational science," argues that teaching without moral education is a means to no end, and moral education (or character education) without teaching is an end without means [9, 10]. Obviously, in Herbart's teaching idea, the moral education and the knowledge education need to unify. That is to say, moral education cannot fight alone but can play the role of "leading" and "running through" knowledge education only when it permeates into the teaching contents and process of various subjects. As the carrier of spreading morality, moral education should be embodied in the rich content of students' real life, which coincides with the function of knowledge education. Therefore, moral education and knowledge education complement each other in purpose and are unified in whole [11]. However, due to such problems as social value function orientation, teacher education concept, teaching evaluation index, or teacher assessment, in actual teaching practice, some teachers only pay attention to impart professional knowledge and train thinking ability to students but neglect to cultivate and inspire moral spirit and value rationality. Students only learn instrumental knowledge and lack the promotion of moral character [12]. Moral education is basically out of line with knowledge education. What is more regrettable is that some moral educators understand

moral education narrowly as the education of moral knowledge, inculcate moral knowledge into education instead of moral character, and lack the consideration of the true feelings of college students, so that moral education evolves into the study of moral concepts, moral rules, and moral feelings, moral education becomes pure knowledge teaching, and education becomes the materialization of human beings.

- (3) Moral education is separated from virtue cultivation. Colleges and universities cultivate moral education. It is the duty and responsibility of moral education in colleges and universities to cultivate the moral character of college students. This kind of moral education should be made up of the interaction between the external normalization and the internal cultivation of virtue, and the two are integrated into each other, so as to make the moral subject conscious, voluntary, and self-motivated in the historical circumstances and the practice of the times [13]. However, some scholars always emphasize the enlightenment and restraint of external norms, equate moral education in colleges and universities with "educators turn the moral norms and requirements respected by the society into a kind of education of individual moral character of the educated," regard it as the ultimate goal of moral education to train college students to obey the basic moral rules and constraints, and neglect the cultivation of inner moral character, which leads to the confusion and perplexity of cultivating college students into "obligatory moral" who blindly obey the basic social rules. It is precisely because of separating the cultivation process of external norms and internal virtues, ignoring the difference and connection between external norms and internal virtues, paying attention only to the obedience of external norms, and ignoring the moral value pursuit of the main body of university students that the two-way integration of the two aspects is deficient, there is no humanistic concern, only empty requirements of moral norms, and it is difficult to penetrate and touch the moral mind of university students, and it also deviates from the "original heart" of cultivating and promoting the moral character of university students [14].
- (4) Moral education is divorced from moral subjects. There is no doubt that people's moral character is not born but is gradually formed in the process of learning and practicing. Because of the differences in growing environment and life experience, people's moral cognition and behavior show greater differences. College moral education must also pay attention to this difference, study the students' moral development level, teach students according to their needs, and use various methods synthetically. While moral indoctrination is essential in this process, it may lead to a gradual distance between moral

education and the educated [15]. In moral education in colleges and universities, some moral educators, without fully understanding the students' living situation, actual needs, thoughts, and their different needs for morality, regard students as pure objects, ignore the subjective role of students and the differences of students, adopt monologue indoctrination education, and impose moral truth on students, and teachers seem to become the mouthpiece of morality, thus making it difficult for moral education to touch students' souls and obtain value identification, aggravating students' dissatisfaction and disgust for moral education and contradicting moral education from the heart. The biggest weakness of this educational model is that it neglects the subjectivity of moral education, mental development, and ideological reality of college students, which easily leads to the disconnection of moral knowledge and practice.

### 3. Moral Education Evaluation Model Data Mining

**3.1. Data Mining Process and Main Functions.** Data mining refers to the process of searching hidden information from a large number of data through algorithms. It is mainly a technology used by various disciplines. It plays a very important role in various fields. Data mining is a hot issue in the field of artificial intelligence and database. The so-called data mining refers to a nontrivial process of revealing implicit, previously unknown and potentially valuable information from a large amount of data in the database. Data mining is a decision support process of moral education evaluation. It highly automatically analyzes the data of moral education evaluation, makes inductive reasoning, excavates potential models, and helps decision makers adjust education and teaching strategies, reduce risks, and make correct decisions. The process of extracting effective knowledge hidden in noisy and fuzzy data information [16, 17] comes from the knowledge extraction in the database, namely, KDD (Knowledge Discovery Database) [18], and it is also the theoretical basis of the proposed data mining. People use KDD to describe the whole process of data mining and use data mining to describe the basic process of data mining using mining algorithm. The process of discovering valuable knowledge in the database, known as the KDD process, is shown in Figure 1.

According to Figure 1, KDD is composed of data collection and processing, data information mining, and result analysis, etc. Among them, data mining is mainly based on association analysis and cluster analysis and prediction of various statistical analysis tools to find useful knowledge in large-scale data and through model evaluation will be valuable model as knowledge to assist relevant personnel to make a scientific and rational decision.

The main function of data mining mainly refers to making valuable knowledge-based decisions by predicting future development trends. The main function of data mining technology is not realized by a single way, but by a

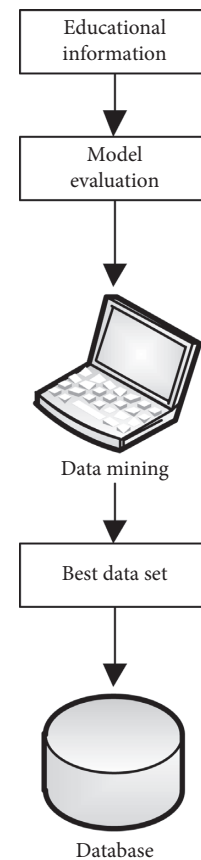


FIGURE 1: Overall process of KDD.

group of methods. The main task of data mining is to find valuable knowledge or information from relevant databases. Its main functions are as follows.

(1) Correlation analysis of data

In a database, the analysis of the correlation between data is the key link to discover the important knowledge. If there is some special law between the values of two or more variables, then it can be called correlation [19].

(2) Cluster analysis between data

In the database, the data information records can be divided into different meaningful data subsets; the process is data clustering. Among them, the smaller the distance between the data in the same data class, the more similar they are, and the less similar they are by contraries. Data clustering can enhance people's cognition of objective facts, and it is the precondition of concept representation and deviation analysis. At present, there are several data clustering algorithms in common use: mean clustering, density clustering, and fuzzy clustering, etc. [20].

(3) Forecast analysis

In some instances, the public may have to predict some vacant values. If the data for the vacant value is a numeric type, it is generally called a forecast. Prediction process is according to historical data to

find the laws between the data information, build a corresponding model, and based on the model predict the next data.

#### (4) Data evolution analysis

In the database, the analysis of the evolution of data information indicates that there are laws and trends in the target of a certain behavior changing with time, and the model of such trends is established [21].

### 3.2. Data Mining and Quality Evaluation of Moral Education.

From the above analysis, we can see that association rules are one of the most significant methods in data mining. The application of association rules in the management of moral education quality is more and more extensive [22]. There are many objects involved in the management of college moral education quality, such as curriculum and evaluation index, etc. Association rules can extract valuable knowledge hidden in data, assist educational administrators to make effective decisions, and improve the management level.

## 4. Constructing the Quality Evaluation Model of Moral Education

**4.1. Selection of Evaluation Indicators.** The evaluation index of moral education level is the key to construct a high-precision evaluation model, and the index system is the concrete regulation of moral education level.

In order to construct an objective and accurate evaluation model of moral education quality, a hierarchical and multiobjective evaluation index system is constructed by AHP [23]. The AHP is selected to obtain the evaluation index to ensure the completeness of the evaluation system.

AHP operation is divided into four steps: design and build a hierarchical structure model, build a comparison matrix, calculate the weight value, and get the combination weight vector and implement consistency test.

Based on the comprehensive analysis of each evaluation index, the preparation of the curriculum, the effect of moral education, and the content are taken as the first index. See Table 1 for details.

According to the above AHP running steps, we can see that it is necessary to construct the criterion judgment matrix. Based on experience, use 1 to 9 as the corresponding judgment matrix scale [24]. The judgment matrix scale is as follows: when the scale is 1, it means  $i$  and  $j$  are equally important; when the scale is 3, it means that  $i$  is slightly more important than  $j$ ; when the scale is 5, it means that  $i$  is significantly more important than  $B$ ; when the scale is 7, it means that  $i$  is very important than  $j$ ; when the scale is 9, it means that  $A$  is extremely important than  $j$ ; when the scale is 2, 4, 6, 8,  $i$  and  $j$  are in the middle of two adjacent judgments [25–27].

**4.2. Evaluating the Properties of Matrix Composition Operator.** The properties of the synthesis operator are analyzed through the following nonlinear fuzzy matrix [28]:

$$B = A \cdot R = a_n \cdot \begin{matrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{matrix} \quad (1)$$

In the above matrix,  $A$  represents the index salience influence coefficient vector, and  $A = (\lambda_1, \lambda_2, \dots, \lambda_n)$ , where  $\lambda_i \geq 1$ . With higher impact of indicator  $R$ ,  $\lambda_i$  will increase accordingly.

Assuming  $\lambda = \max\{\lambda_1, \lambda_2, \dots, \lambda_n\}$ , the nonlinear matrix composition operator is expressed in the form of

$$f(\lambda) = a_1 x_{11}^\lambda + a_2 x_{22}^\lambda + \dots + a_n x_{nn}^\lambda. \quad (2)$$

Because in the nonlinear evaluation, there is generally membership grade  $r_{ij} \in [0, 1]$ , so in the process of nonlinear matrix synthesis, it is necessary to change the membership grade of the evaluation target matrix so that the membership grade is higher than 1, then the matrix synthesis operator has the following properties:

$$f(\lambda)_i = f(\lambda)r_{ij} + Mc^\lambda. \quad (3)$$

In the formula,  $M = n(a_1 a_2 \dots a_n)^{1/n}$ . When  $na_1 = na_2 = \dots = na_n$ , the equation holds; then  $M = 1$ ,  $f(\lambda)_i \geq c^\lambda$ .

And because  $0 < 1/n^\lambda < 1$ , and the function  $f(\lambda)_i = a^x$ , at  $0 < a < 1$ , it is monotonically decreasing, indicating that the higher the  $\lambda$  value, the higher the  $M$  value, so the minimum value of  $f(\lambda)_i$  is greater [29].

In the nonlinear synthesis matrix, when the influence of all the indexes is different, some indexes have greater influence.

Assuming  $x_i < x'_i (i = 1, 2, \dots, n)$ , there is the following expression:

$$f(x_i) < f(x'_i). \quad (4)$$

The above expression is obtained by monotonically decreasing function  $f(x_i)$  with respect to  $X$ .

$$\lim_{x_i \rightarrow x'_i} f(x_i) = f(\lambda)_i. \quad (5)$$

Formula (5) is successively obtained on  $[1, +\infty]^n$  according to function  $f(x_i)$  and  $X$ .

Assuming that all the evaluation indexes of one evaluation target are larger than other targets, the former evaluation result should be larger than the latter. An increase in the value of a single target indicator leads to an increase in the final indicator value, which remains steady and does not lead to sudden jumps [30].

### 4.3. Moral Education Evaluation Model of TOP-SIS

#### 4.3.1. Weighted Principal Component TOP-SIS Model.

The weighted principal component TOP-SIS value moral education model is selected to evaluate the moral education of a city. The main processes of data screening and statistics are as follows: first, analyze the educational subjects, including schools, society, and families. At the same time,

TABLE 1: Evaluation index system.

First-level evaluation index	Secondary evaluation index
Course preparation	Master the details of moral education
	The lecture process is consistent with the schedule
Effect of moral education	Clear learning objectives
	Cultivate students' self-study ability
	Cultivate students' ability to analyze problems
	Cultivate students' application ability
Content of moral education	The lecture is well organized
	Expand knowledge on the basis of new knowledge
	The content of moral education is perfect and focused
	Reasonably arrange students' homework
	The content of moral education has depth
Professional conduct and ethics	Responsible and patient to answer questions
	The examination method is scientific and fair
	Discipline is lax
	Pay attention to communication with students
	Pay attention to the problems reflected by students
	Pay attention to being a teacher
Moral education method	The way of moral education is scientific and appropriate
	The course explanation is vivid
	Clean and tidy facilities related to moral education

three teams of big data technology, analysis, and education should be established to collect and summarize data information through the daily learning and life of college students, comprehensively grasp and understand the moral performance of college students, guide college students to establish a correct moral outlook, and abide by the correct TOP-SIS value and moral code of conduct. Second, from the analysis of the form of education, it mainly covers the content of TOP-SIS value and moral education, the practice of TOP-SIS value and moral education, and the networking of TOP-SIS value and moral education.

Based on the above research, the weighted principal component TOP-SIS model is constructed, and the process is as follows:

- (1) Select SPSS software to carry out principal component analysis on the secondary indicators moral education factors in the evaluation index system, and according to the principle that the eigenvalue and cumulative contribution rate are greater than 1 and 80%, respectively, the principal component with the quantity of  $j$  is represented by  $Y_{ij}$ ,  $i = 1, 2, 3, 4$ ,  $j = 1, 2, \dots, n$ , and the extracted principal component is set as the secondary indicator of the evaluation model to establish the principal component expression [31, 32]. Input the original data of standardization processing into the principal component expression; get the final principal component score matrix expressed by  $Y_{p \times i_j}$ ,  $p = 1, 2, \dots, 16$ .
- (2) The normalized principal component decision matrix  $Z = \{z_{p \times i_j}\}$  shall be established by means of vector normalization according to the corresponding principal component scores of each first-grade index. The weight matrix of principal component contribution rate and cumulative contribution rate

expressed by  $W = (w_1, w_2, \dots, w_j)^T$  is established, and the weighted canonical matrix expressed by  $X = \{x_{p \times i_j}\}$  is obtained.

- (3) Obtain the maximum reasonable value of each level of indicators and the relative proximity between the maximum reasonable value and different schemes through the TOP-SIS method, and use the maximum reasonable value and the relative proximity to evaluate the comprehensive evaluation indicators of moral education.
- (4) Obtain the moral education indices of 10 cities of a certain province and the final ranking of each city through the calculation formula of relative moral education [33].

4.3.2. *TOP-SIS Value Function Model.* The TOP-SIS model of value moral education is often used in the decision analysis of fixed scheme determination. The TOP-SIS model of value moral education is a method to minimize and maximize the distance between positive ideal scheme and negative ideal scheme and the optimal scheme. The TOP-SIS model of value moral education is used to rank many objects to be evaluated which have measurement attributes.

- (1) Select the vector normalization method to obtain the standardized decision matrix  $Z = \{z_{p \times i_j}\}$ .
- (2) The weight and weight coefficient of vector matrix are represented by  $W = (w_1, w_2, \dots, w_j)^T$  and  $w_j = \eta_j / \sum_{j=1}^n \eta_j$ , and the weighted gauge matrix is established and represented by  $X = \{x_{p \times i_j}\}$ .
- (3)  $X^+$  is the positive ideal solution;  $X^-$  is the negative ideal solution and can be obtained;  $X_{i_j}^- = \min(x_{i_j})$ .

- (4) Obtain the distance from different schemes to the positive ideal solution and the distance to the negative ideal solution, and evaluate the pros and cons of each scheme by using the relative proximity of the positive ideal solution to different schemes. The range of relative proximity is  $[0, 1]$ ; when the value is close to 0 and 1, the scheme is close to the worst level and the optimal level, respectively.

Using the relative proximity of 10 cities in a province to obtain the comprehensive relative proximity and using the comprehensive relative proximity to evaluate the moral education of each city in a province, the higher the comprehensive relative proximity is, the higher the moral education of the city is, otherwise the contrary [34].

**4.3.3. Index Correlation Judgment.** Before nonlinear evaluation, it is necessary to clarify which indicators in the evaluation objectives have linear correlation, because the indicators with linear relationship not only have no additional information, but also easily bring more redundant data [35, 36].

Combined with the grey correlation analysis method, the pairwise comparison sequence is regarded as two indicators with linear relationship among the objectives to be evaluated. The detailed process is as follows:

- (1) Experts study the known assessment indicators and mark the indicators with linear relationship as the target of grey relational grade analysis.
- (2) Assume that  $x_i$  and  $x_j$  are two indicators with linear relationship, and  $b, x, w$  represent ideal scheme, evaluated scheme, and negative ideal scheme, respectively. Using the index as the comparison unit, all the indexes are dimensionless. If the distance between the corresponding points is small, the consistency of the change of the series is strong, otherwise weak. So, according to  $X_{ij}(k) = |x_i(k) - x_j(k)|$ , the distance between indices  $x_i$  and  $x_j$  is in  $b, x, w$ .
- (3) Define operation expression:

$$\varepsilon_{ij}(k) = \frac{(X_{\min} + \rho X_{\max})}{(X_{ij}(k) + \rho X_{\max})}. \quad (6)$$

In the above formulas,  $\varepsilon_{ij}(k)$  represents the grey correlation coefficients of indices  $x_i$  and  $x_j$  in any scheme,  $X_{\min}$  and  $X_{\max}$  represent the maximum and minimum values of absolute difference, respectively, and  $\rho$  is a resolution coefficient, which can control the influence of  $X_{\max}$  on data transformation and enhance the difference between the correlation coefficients.

- (4) The association coefficient shall be averaged, and the definition of association degree shall be

$$g_{ij} = \frac{1}{3} \sum_{k=1}^3 \varepsilon_{ij}(k). \quad (7)$$

- (5) If the correlation degree is higher than a certain threshold, it indicates that indicators  $x_i$  and  $x_j$  have great correlation, and one of them can be eliminated.

Accurate value evaluation type: suppose that  $x$  represents the evaluation value,  $b$  represents the best evaluation value obtained by each ideal value index, and  $e$  represents the worst evaluation value obtained by all negative ideal value indexes. Therefore,  $(x - w)/(b - w)$  is the optimization degree  $p_b$ ;  $(b - x)/(b - w)$  describes the degree of deterioration  $p_w$ . Then the calculation formula of comprehensive score is

$$P_f = 5 \times p_b + p_w. \quad (8)$$

Interval value evaluation type: suppose  $[x_1, x_u]$  represents interval evaluation value, and  $[b_1, b_u]$  and  $[w_1, w_u]$  represent ideal and negative ideal scheme evaluation values, respectively. And  $x_1, b_1, w_1$  represent the lower limit of interval value,  $x_u, b_u, w_u$  are the upper limit, and  $b_u > w_u$ . At this time, the following three situations will occur: the value range of the scheme to be evaluated is all in the ideal value range or negative ideal value range, and there may be intersection with the two ranges. When the third condition occurs,  $x_u \in [b_1, b_u]$ ,  $x_1 \in [w_1, w_u]$ , or any of the following conditions are met:

$$\begin{aligned} p_b &= \frac{(x_u - b_1)}{(x_u - x_1)}, \\ p_w &= \frac{(w_u - x_1)}{(x_u - x_1)}. \end{aligned} \quad (9)$$

When  $w_u < x_i < b_1$ , the calculation formula of intermediate rate is

$$p_m = \frac{(b_1 - w_u)}{(x_u - x_1)}. \quad (10)$$

Then the comprehensive score is expressed as

$$M = 5 \times p_b + p_w + 3 \times p_m. \quad (11)$$

**4.3.4. Relative Development of Moral Education Calculation.** There are great differences in the maximum reasonable values of population, resources, and other indicators in 10 cities in a province. The use of unified evaluation criteria makes the evaluation results more reasonable. Select the unified evaluation index to process the data to obtain the relative score formula of the evaluation index for the development of moral education, as follows:

$$R_{pi} = \frac{F_i^+ - f_{pi}}{F_i^+} = 1 - \frac{f_{pi}}{F_i^+}, \quad (12)$$

where  $R_{pi}$  and  $F_i^+$ , respectively, represent the standardized score and the maximum reasonable value of the indicators within the first-level indicators of each city in a province;  $f_{pi}$  represents the corresponding value of each city in a province in the weighted norm matrix.

The weighted summation formula is as follows:

$$\omega_p = \sum_{i=1}^n \eta R_{pi}, \quad (13)$$

where  $\omega_p$  and  $\eta$ , respectively, represent the comprehensive score of moral education of each city in a province and the primary index weight in the comprehensive evaluation index system of moral education.

**4.3.5. Index Contribution Rate Operation.** For complex evaluation objects, not all the indicators have the significance of participating in the evaluation. According to the information theory, the function of each index in the evaluation system depends on the amount of decision information it has. The more the information is, the higher the effect is.

The Del entropy method combines the information of all indexes to judge the importance of indexes, that is, entropy weight. Assume that the initial indicator attribute matrix is represented by  $D' = (z_{ij})_{m \times n}$ , and  $z_{ij}$  is the attribute value of Plan  $i$  under the  $j$  indicator, so the contribution of Plan  $i$  to the  $j$  indicator attribute  $p_{ij}$  is expressed as

$$p_{ij} = \frac{z_{ij}}{\sum_{j \in (1, m)} z_{ij}}, \quad i = 1, 2, 3. \quad (14)$$

This contribution rate includes a kind of information that can describe the sum of contribution rates of the three methods to the  $j$  index through entropy  $E_j$ .

$$E_j = -k \sum_{i=1}^m p_{ij} \ln p_{ij}, \quad i = 1, 2, 3. \quad (15)$$

In a formula,  $k$  represents a constant, usually a value of  $1/\ln 3$ , and  $E \in [0, 1]$  is guaranteed.

If the index belongs to interval type, the contribution rate and entropy of the interval upper bound and lower bound of the index in all schemes are obtained, and the value of interval entropy is taken as the total contribution rate.

Assuming that the contribution degree of two indicators is basically the same, that is,  $E_j$  is close to 1, it indicates that the indicator does not play any role in the decision-making process, and the weight attribute of the indicator is 0; otherwise, if the contribution degree of an indicator is small, it indicates that the information content of the indicator is larger, and the role is larger. When the contribution of the index is higher than 0.85, the index is less important in the decision-making process. The contribution of other indicators can be obtained according to the following formula:

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$$F_2 = -X1 - 0.275 \times X2 - X3 - X4 + X5 + X6 + X7 + X8 + X9 + X10. \quad (18)$$


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The formula of component score  $F_3$  is as follows:

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$$F_3 = X1 + X2 - X3 - X4 - X5 - X6 + X7 + X8 + X9 + X10. \quad (19)$$

$$\chi = \frac{(1 - E_j)}{m - \sum E_j}. \quad (16)$$

In the formula,  $m$  represents the total number of indicators corresponding to level  $n$  indicators.

The final score of the final development of moral education in each city is obtained by using the first-level indicators of each city in a province relative to the moral education index. The level of moral education in a province can be reflected by the final score of moral education. The higher the score obtained, the higher the development of moral education in the education industry of the city.

## 5. Experimental Design and Test

Bring the original index data of a city into SPSS software for principal component analysis. Due to the different units of measurement of the original indicators, it is impossible to compare directly. Therefore, it is necessary to standardize the original indicator data of 10 cities to eliminate the impact of dimensions on the evaluation results.

**5.1. KMO and Bartlett Test.** In order to ensure the validity of the empirical analysis results of factor analysis and extraction of comprehensive factors, it is necessary to conduct correlation test on the standardized index data, using the commonly used KMO and Bartlett sphericity correlation test methods, and the test results are shown in Table 2.

Table 2 shows that the final KMO value is 0.643, and the KMO value satisfies the prerequisite requirements for the quality of PCA data, and the PCA can be carried out for the index data; the Bartlett sphericity test result for the index data is  $P = 0$ , and the index data is verified again to meet the PCA requirements.

**5.2. Validation of Accuracy of Principal Component Analysis Results.** The obtained component score coefficient matrix results are shown in Table 3.

By analyzing the component score coefficient matrix in Table 3, we have the following.

The formula of component score  $F_1$  is as follows:

$$F_1 = X1 + X2 + X3 + X4 + X5 + X6 + X7 + X8 - X9 + X10. \quad (17)$$

The formula of component score  $F_2$  is as follows:

TABLE 2: KMO and Bartlett’s inspection.

KMO value	Bartlett sphericity test		
	Approximate chi square	df	P value
0.643	230.307	66	0

TABLE 3: Component score coefficient matrix.

Name	Component			
	Component 1	Component 2	Component 3	Component 4
X1	0.242	-0.228	0.059	-0.257
X2	0.220	-0.275	0.327	0.006
X3	0.229	-0.076	-0.26	-0.299
X4	0.229	-0.232	-0.228	-0.257
X5	0.226	0.222	-0.247	0.296
X6	0.095	0.264	-0.306	0.375
X7	0.244	0.022	0.002	-0.209
X8	0.047	0.442	0.007	-0.436
X9	-0.224	0.232	0.222	-0.027
X20	0.093	0.308	0.258	-0.002

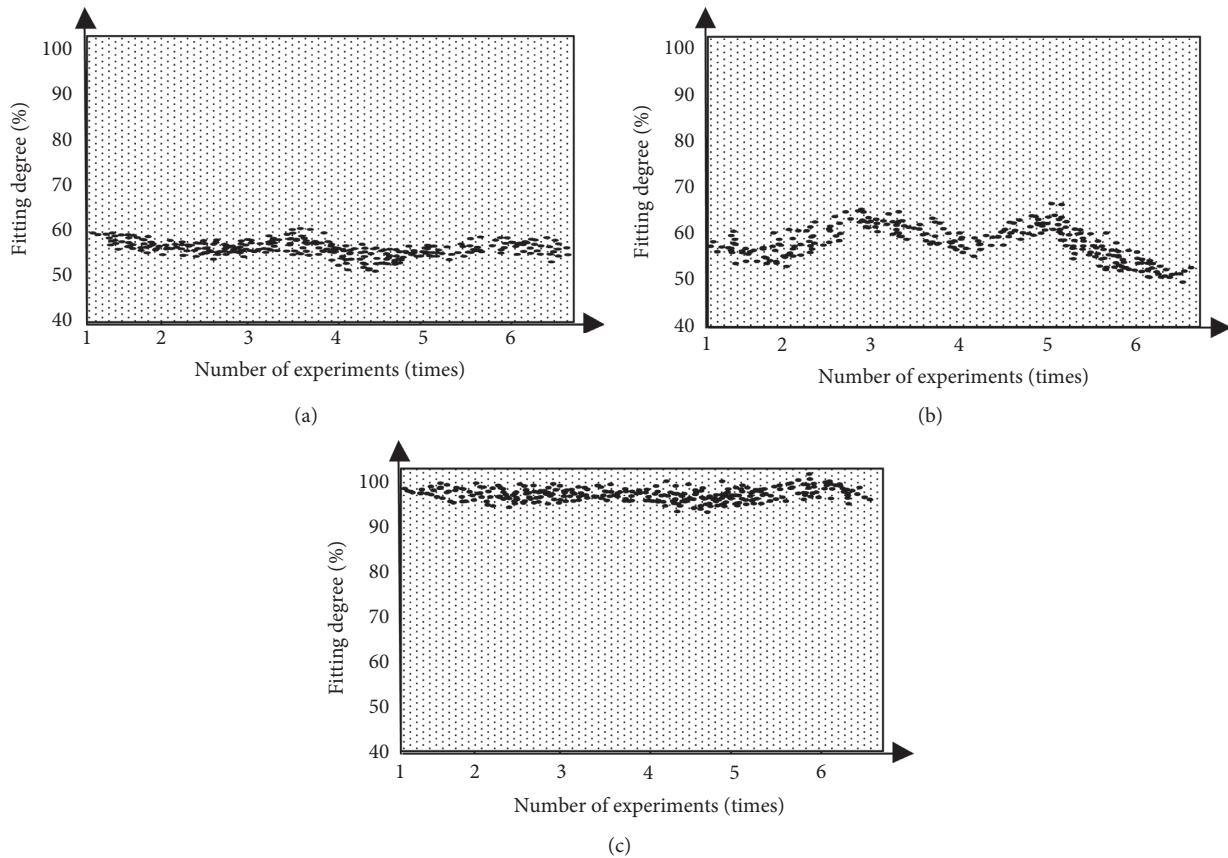


FIGURE 2: Comparison of the fitting degree between the evaluation results of different models. (a) Education quality evaluation model based on Amos. (b) Educational quality evaluation model based on multiple regression of time series. (c) Designed model.

The formula of component score  $F_4$  is as follows:

$$F_4 = -X1 + 0.006 \times X2 - X3 - X4 + X5 + X6 - X7 - X8 - X9 - X10. \tag{20}$$



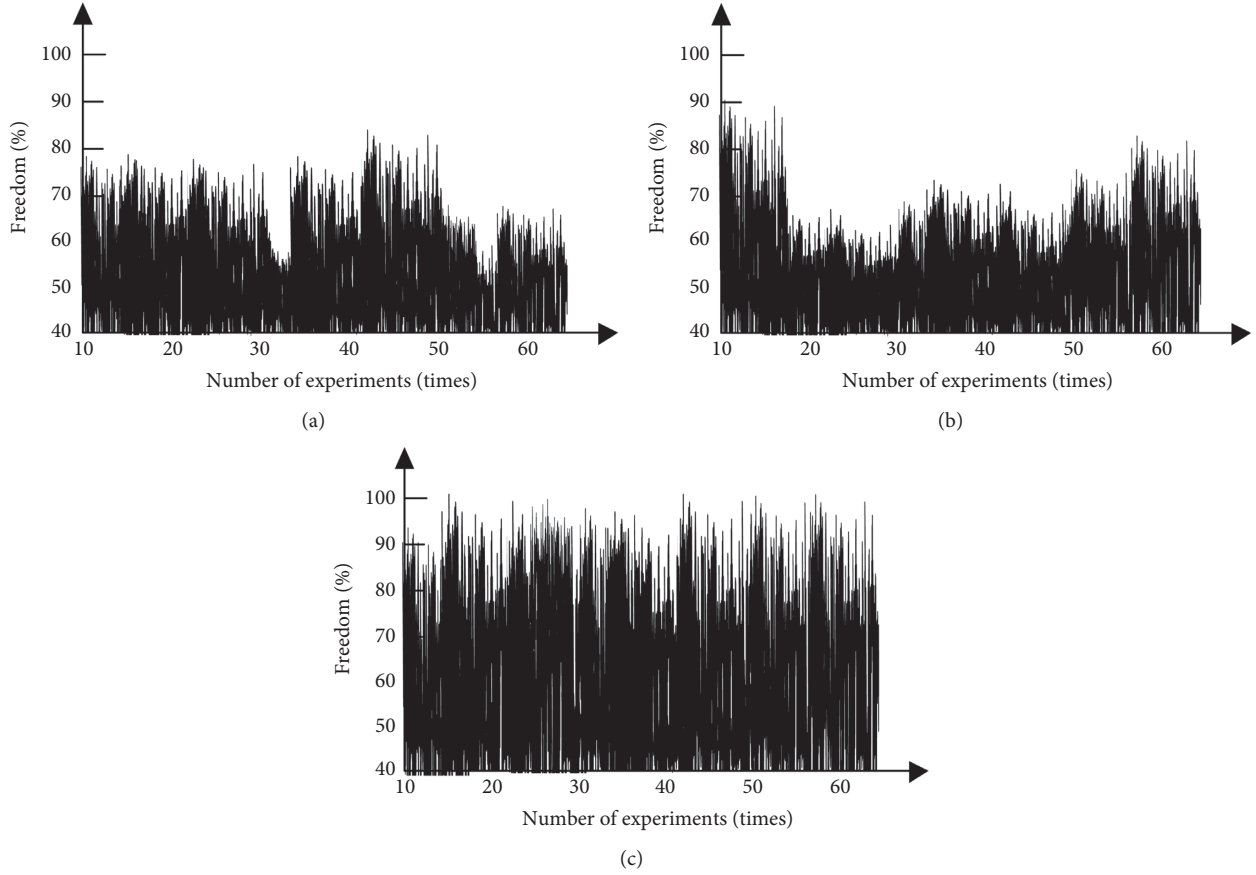


FIGURE 3: Comparison of degrees of freedom of different models. (a) Education quality evaluation model based on Amos. (b) Educational quality evaluation model based on multiple regression of time series. (c) Designed model.

The comprehensive factor score is obtained by using the linear combination of the original indicators. The comprehensive factor score formula is as follows:

$$F = \sum F_i \varepsilon_i \quad (21)$$

In formula (21),  $F$  is the comprehensive factor,  $F_i$  is the main factor score, and  $\varepsilon_i$  is the score weight. The evaluation equation of moral education obtained by formula (22) is as follows:

$$F = F_1 + F_2 + F_3 + F_4. \quad (22)$$

The single and comprehensive scores of principal components are positive, indicating that the urban moral education is stronger than the average development of a province, and a negative value indicates that the urban moral education is weaker than the average development of 10 cities in a province. The higher the comprehensive score and individual score, the better the city's moral education and the stronger its competitiveness.

**5.3. Comparison of Fitting Degree of Different Models.** Using the Amos based education quality evaluation model proposed in [4] and the time series multiple regression based education quality evaluation model proposed in [5] as the control experimental group, and integrating the

experimental environment and data, the fitting experimental results of different models are shown in Figure 2:

The higher the fitting degree between the evaluation result and the actual situation is, the higher the evaluation precision is. In Figure 2, the accuracy of the model is lower than that of the paper. Based on the data mining technology, the model extracts the valuable knowledge hidden in the data of moral education quality evaluation by using the association rules and assists the education managers to make effective decisions, which provides a reliable support for improving the fitting degree between the evaluation results and the actual situation. In order to set up an objective and accurate evaluation model of moral education quality, a hierarchical and multiobjective evaluation index system is established by using AHP. Selecting AHP to obtain the evaluation index not only ensures the completeness of the evaluation system, but also improves the accuracy of evaluation results to a certain extent [37].

**5.4. Comparison of Degrees of Freedom between Different Models.** The higher the degree of freedom is, the lower the evaluation complexity is. As can be seen from Figure 3, the moral education level evaluation model constructed in this paper has a higher degree of freedom under different experimental times, but the evaluation complexity is lower than that of literature achievements. The proposed model

uses the fuzzy comprehensive evaluation method to construct the moral education quality evaluation model, which not only fully considers the fault tolerance of the evaluation process, but also effectively improves the degree of freedom of modeling, that is, reduces the complexity of evaluation.

To sum up, the moral education evaluation model based on college students' quality training has a high degree of fit and freedom, which can effectively reduce the complexity of education evaluation and has good applicability.

## 6. Conclusion

In order to strengthen the moral will and moral concept of college students, an evaluation model of moral education is established based on the analysis of college students' quality cultivation, using data mining method to extract valuable knowledge hidden in the data, to assist education managers to make effective decisions, and improve management standards. According to the evaluation index, the weighted principal component TOP-SIS model is constructed to complete the evaluation of moral education. The following experimental results are obtained:

- (1) The moral education evaluation model based on college students' quality training has a high degree of fit between the evaluation results and the actual situation, and the evaluation accuracy is high.
- (2) The model fully considers the fault tolerance of the evaluation process and effectively improves the degree of freedom of modeling, and the evaluation complexity is low, which verifies the practicability of the model.

## Data Availability

The raw data supporting the conclusions of this article will be made available by the author, without undue reservation.

## Conflicts of Interest

The author declares that there are no conflicts of interest regarding this work.

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