

## *Retraction*

# **Retracted: Evaluation Method of College Students' Education Management Quality Based on Collaborative Filtering Algorithm and IoT Apps**

### **Wireless Communications and Mobile Computing**

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

### **References**

- [1] L. Tang, "Evaluation Method of College Students' Education Management Quality Based on Collaborative Filtering Algorithm and IoT Apps," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 8747964, 10 pages, 2022.

## Research Article

# Evaluation Method of College Students' Education Management Quality Based on Collaborative Filtering Algorithm and IoT Apps

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Considering the ongoing unfortunate evaluation impact of College Students' education management quality, this paper advances an undergrad' education management quality evaluation technique in light of collaborative filtering algorithm, gathers the impact indicators of College Students' education management quality, and builds an understudies' education management quality evaluation record framework joined with collaborative filtering algorithm. At long last, it is affirmed by tests that the quality evaluation technique for College Students' Education Management Based on collaborative filtering algorithm has high precision and practicability during the time spent down to earth application, which gives reference and help for college education management.

## 1. Introduction

The quality of college students' education management is the focal point of advanced education exercises, and the showing quality is additionally the center foundation of the entire advanced education quality. Whether the school running quality of schools and colleges can be constantly improved relies upon the fulfillment and viability of the inner quality management exercises and arrangement of schools and colleges. Instructions to assess the showing quality management exercises of schools and colleges have turned into the support to pry the entire quality lever [1]. Driven by the difference in hierarchical quality, quality starts to leap out of the customary item and administration class and go to the authoritative activity level, and that implies that the focal point of quality evaluation should be reached out from one quality to another management exercises. The way to working on the quality of running a college is to further develop the development level of quality management exercises. As of now, advanced education has entered the "evaluation period." It is of incredible worth to change the thinking and paradigm of quality evaluation with the help of maturity method. China's higher education quality evaluation is usually an externally led government behavior

[2]. The performance quality concept embodied behind it is essentially the accountability for the results of the university running quality, so it is inevitable to have problems such as homogenization and path dependence. Development evaluation centers, around the course of quality management exercises in colleges, mostly assess the flawlessness of inner quality management ways of behaving and measures and take the endogenous development of quality management capacity in colleges as the objective direction [3]. Contrasted and conventional quality evaluation, development evaluation centers around the upward progress of showing quality management exercises in colleges, underlines the self-evaluation in light of school-based management and is appropriate for the broadened improvement necessities of universities and colleges at various levels with its adaptable and subjective evaluation method [4].

The Internet of Things (IoT) is gaining increasing significance in a variety of spheres of our daily lives. As we get closer to the age of "smart education," one particular aspect that should be taken into account is the manner in which the Internet of Things (IoT) is having a big effect on education and learning. The Internet of Things (IoT) is continuing to have a major influence on the educational environment, transforming not just the classrooms and grading systems

but also the culture and attitudes of the student body. In the fight to overcome the educational challenges of the future, “smart education” will be an important component of the toolbox that will be relied upon significantly. Tools that are a component of the Internet of Things are being employed at an increasing amount in educational settings with the purpose of improving student engagement, as well as the general satisfaction of students and the quality of their education. The Internet of Things will have an enormous influence on the traditions and practices of today’s students all around the world.

In this manner, development evaluation can all the more likely follow the rule of autonomous and cognizant advancement of schools and colleges, serve the improvement of showing quality management framework in colleges, and reflect more grounded assistant and helpful in guaranteeing the quality of running schools and colleges. Showing quality management in colleges is the center object of development evaluation. Only with the help of a complete conceptual model can we establish the system and implement the evaluation.

## 2. Quality Evaluation of College Students’ Education Management

*2.1. Collection of Indicators Affecting the Quality of College Students’ Education Management.* The evaluation of college students’ education management is the critical connection to guarantee the quality and a significant means and strategy to advance the improvement of school running quality. In China by using IoT, quality evaluation is generally an outside driving government or social way of behaving, chiefly with the assistance of outer quality evaluation and quality confirmation framework, for example, undergrad showing level evaluation and key discipline evaluation [5]. This evaluation strategy can assume a superior part of restriction and control in the underlying stage and direct and advance the improvement of the quality of running colleges and universities, but with the development of time, its internal shortcomings and defects begin to become increasingly obvious. Firstly, this evaluation method is aimed at the accountability and monitoring of external service quality, reflecting strong instrumental rationality and managerialism, and does not well achieve the purpose of “promoting construction through evaluation.” Secondly, this evaluation method mainly focuses on performance evaluation, takes the evaluation of school running quality results as the core goal, and pays less regard for the viability of inner management cycle of colleges and universities. Thirdly, in this method of evaluation, colleges and universities themselves lack sufficient construction as the main body of quality, and their internal enthusiasm and autonomy cannot be highlighted and released [6]. The traditional quality standard is a horizontal standard, which is mainly used to judge the static quality, which is reflected in the provisions on quality elements such as quantity, baseline, and indicators. “Only pay attention to whether the university can meet the expectations and standards given and formulated by the outside.” The quality standard based on maturity evaluation is a vertical standard, which is mainly used to characterize the dynamic quality, which is reflected in the improvement, improvement division

of process, and stage quality such as improvement. Therefore, we can describe the vertical development process of teaching quality management activities in colleges and universities through maturity evaluation criteria, divide it into several limited maturity levels, and mark that quality management has been improved step by step [7]. The standard here is the basis for measuring and judging the maturity of teaching quality management in colleges and universities. It is an upward norm for process development, not a norm for even outcomes. In light of the possibility of programming area development, joined with programming capacity development model (CMM) and project management maturity model (OPM), this paper constructs the basic hierarchical structure of teaching quality management maturity evaluation in colleges and universities and gives a detailed behavior description and characteristic definition for each level by using IoT.

The significance of evaluation factors fluctuates. As indicated by the significance of evaluation factors, the general significance of every evaluation factor is mathematically investigated to get the weight worth of every evaluation factor. The set made out of the heaviness of every evaluation factor is the weight set [8]. The weight is the objective impression of the actual property of the actual list and the consequence of emotional and objective extensive estimation. The strategies for deciding the weight incorporate the strategy for deciding the weight coefficient by direct specialists and the estimation based on collaborative filtering method. Experts determine that the weight coefficient method is to artificially give a certain weight value to each evaluation factor as the weight coefficient of each evaluation factor according to the importance of the evaluation factor [9]. This method depends on the experience of experts. It is simple and convenient, but it lacks scientific calculation basis. Collaborative filtering method determines the weight value through calculation. It has the characteristics of systematic analysis method, simple and practical, and can determine the weight value with less quantitative information. However, when there are too many evaluation factors in collaborative filtering method, the data statistics are large, the weight is difficult to determine, and the accurate calculation of eigenvalues and eigenvectors is relatively complex. Because collaborative filtering method has less quantitative data and more qualitative components, the determined weight value may not meet the needs of practical work. The evaluation factor indicators of the student evaluation system are collaborative filtered [10]. The understudy evaluation framework incorporates five star factors like ethical quality, insight, and sports. Under every five star evaluation factor, it is partitioned into inferior evaluation factors (or staggered evaluation factors). Not just the top of the line evaluation factors have various loads, yet additionally, the below average evaluation factors (or staggered factors) underneath the five star evaluation factors have comparing loads, as displayed in Figure 1.

Figure 2 is the analytic hierarchy process of evaluation factors. The evaluation methods can be divided into quantitative evaluation and qualitative evaluation or hard evaluation and soft evaluation [11]. “The so-called hard evaluation is an evaluation method based on objective

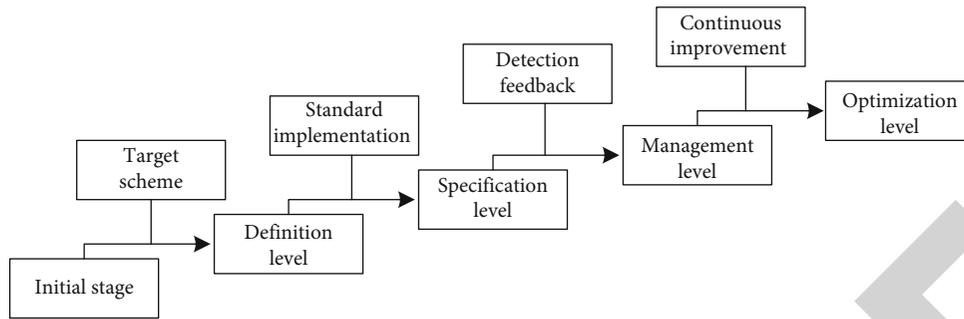


FIGURE 1: Hierarchical structure of maturity evaluation of teaching quality management in colleges and universities.

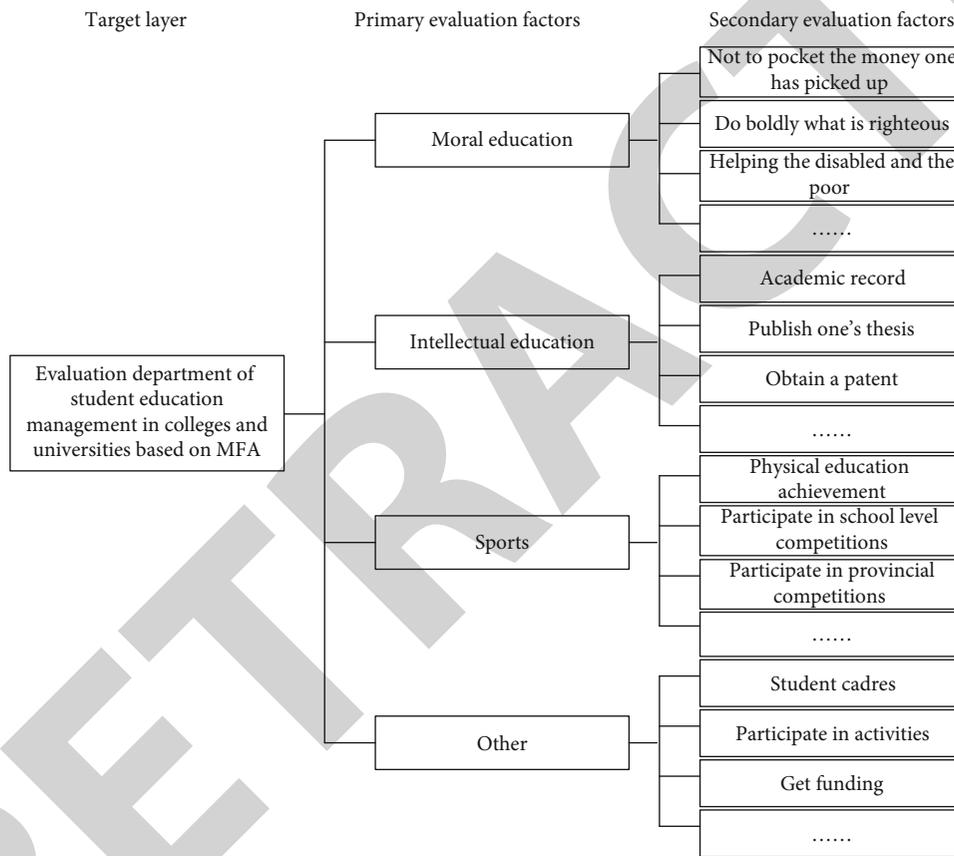


FIGURE 2: Analytic hierarchy process of evaluation factors.

information collection methods and quantitative analysis techniques; in contrast, soft evaluation is an evaluation method based on subjective information collection methods and qualitative analysis techniques.” The characteristics and attributes of those things that do have the concept of accurate quantity in educational activities and their effects must be hardly evaluated [12]. If the method of soft evaluation is used, the evaluation results will be lack of objectivity and accuracy. On the contrary, for the characteristics and attributes of things that do not have accurate quantitative concepts or lack of understanding of their quantitative concepts and are difficult to accurately and quantitatively describe, the soft evaluation method must be adopted. If the hard evaluation method is reluctantly adopted, the quantitative evaluation results cannot

really reflect the true nature of the evaluated things and also make the evaluation results lose authenticity [13]. For accuracy and objectivity, from the development trend of educational evaluation, the importance of qualitative evaluation is turning out to be increasingly critical, fundamentally on the grounds that individuals give increasingly more consideration to the worth of evaluation in improving educational work.

2.2. Evaluation Algorithm of College Students' Educational Management Quality. Memory-based (nearest neighbor) algorithm in collaborative filtering is a successful recommendation technology, recommended according to the historical probability of customers with similar hobby behavior. However, this technology also has some disadvantages. For

example, if a new session appears in the database, it is almost impossible to be recommended due to the factor of probability [14]. In addition, if a user has a special hobby, he cannot find the nearest neighbor and get the correct. The collaborative filtering structure model is shown in Figure 3.

Coordinated filtering recommendation algorithms are principally partitioned into two classes: client-based collaborative filtering algorithm (userc) and thing-based collaborative filtering algorithm. In light of the client's collaborative filtering suggestion, work out the similitude between clients, decide the  $k$  closest neighbor clients of the ongoing client, and foresee the things preferred by the current user through the preference item set of the nearest neighbor users. Finally, the predicted items are organized into a list for recommendation [15]. However, the algorithm has a premise: the preferences between users will not change over time. The algorithm can be briefly divided into three steps: establish a "user item" scoring matrix. The user's scoring data set for all items is represented by a matrix  $n \times m$ . The set  $(a, b)$  represents  $n$  users in the recommendation system. Set  $c$  determines the nearest user of the user which is the basis for generating recommended items, and the nearest user of the user is determined by the value of similarity between users. In the matrix  $n \times m$ , the  $m$ -dimensional vector certificate represents the diversity of all items by users  $u_a$  and  $u_b$ , and there are usually three ways to calculate the similarity between users. The cosine similarity between users is as follows:

$$\text{Sim}(u_a, u_b) = \cos(a, b) = \frac{cn \times m}{\|u_a\| \times \|u_b\|}. \quad (1)$$

Assuming that there are  $k$  data samples and  $p_i$  class label attributes of different class marks in the sample data set  $s$ , the expected information value of the class label attribute of a given sample is as follows:

$$I(k_1, k_2, \dots, k_n) = \text{Sim}(u_a, u_b) - s \sum_{i=1}^n p_i \log_2(k). \quad (2)$$

The modified cosine similarity between users  $G_{ac}$  and  $G_{bc}$  is shown in the following equation.

$$\lambda = \frac{I(k_1, k_2, \dots, k_n)}{\sqrt{\sum_{c \in C_{a,b}} (G_{ac} - G_{bc})^2 - \text{Sim}(u_a, u_b)}}. \quad (3)$$

The scores of all users are used in the calculation of cosine similarity, that is, for all users who have filled in the score and those who have not filled in the score, the score that has not been filled in is set to 0. The item set scored mutually by client a and client b is utilized in the computation of modified cosine similarity and Pearson's coefficient: the items that have not been scored are not set to 0 in the calculation of modified cosine similarity but are directly ignored. According to the above formula definition, the similarity  $e^{-\beta \times n}$  between user a and user b is as follows: the scoring vector  $u_a$  of user a and the scoring

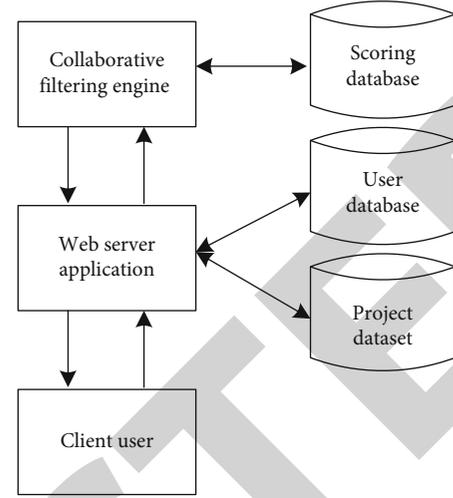


FIGURE 3: Collaborative filtering structure model.

vector  $u_b$  of user b, the article set  $c_{ab}$  of the common scoring items of user a and user b and the scores  $G_{ac}$  and  $G_{bc}$  of user a and user b on article c. The average score  $g$  of all users on item  $u_k$  and the average scores of user a and user b on the common scoring item set  $c_{ab}$  are  $G_a$  and  $G_b$ , respectively. Assuming that the number of management actions is, the weight of the second management action is

$$\text{weight}(n) = (a + b) \times \lambda e^{-\beta \times n} - u_k. \quad (4)$$

In the formula,  $\beta$  is the attenuation velocity,  $\alpha$  is the control the implicit scoring degree of teaching management,  $X$  is the hypothetical user  $Y$  is administration, and  $n'(X, Y)$  is the number of times. Then, according to the attenuation formula of the formula, the user's dual recommendation mechanism for teaching management can be obtained:

$$f = \sum_{n=1}^{n'(X,Y)} \text{weight}(n) / \alpha \sum_{n=1}^{n'(X,Y)} e^{-\beta \times n}. \quad (5)$$

According to the above dual recommendation mechanism, take the preference of all users for a manager or teaching management as a vector, calculate the similarity between them, obtain the similar contents between the manager and teaching management, predict the teaching management types that the current user has not determined according to the user's historical preference, and obtain a sorted teaching management list as a recommendation item. Combined with the closest neighbor client set UK of the past client, compute the score value of the item that the user has not selected through the formula, which is recorded as:

$$P_{ui} = \overline{G_u} + \frac{\sum u_k f}{\sum u_k (\text{weight}(n) - \lambda)}. \quad (6)$$

$\overline{G}_u$  represents the average score of the current user on all items,  $b_i$  represents the average score of user AoR on all items, and  $g_{ij}$  represents the nonzero score of user  $b_j$  on item  $I$ . According to different evaluation models, different formulas are used to calculate the result matrix. The calculation formula of the result matrix of the primary model is:

$$B = AoR b_i / f \sum_{i=1}^n b_j. \quad (7)$$

According to the matrix  $(i, f)$  of the item and the matrix  $F$  of the attribute of the item selected by each user UN, the relationship matrix  $P$  between the user and the attribute of the item can be obtained.

$$p(u, f) = B \sum_{\forall R(u, i) > 0} F(i, f). \quad (8)$$

The resource used by the filtering recommendation system to filter calls is the user rating database, as shown in Table 1.

$R$  is an  $M \times N$  in the user item scoring matrix of  $N$ , line  $M$  addresses  $m$  clients, segment  $n$  addresses  $n$  evaluation things, and  $R_i$  addresses the evaluation worth of the  $i$ th client on thing  $J$ . The evaluation esteem addresses the client's advantage in the task. This worth shows the client's advantage in the project [16]. The worth of PA is arranged, and the article recommendation set composed of several items with large value is recommended to the current user. According to the demand analysis of the course selection and teaching evaluation system, the course selection module and teaching evaluation module are designed in detail [17]. The functional diagram of each module is shown in Figure 4.

The course selection module mainly provides the function of course selection: select the required courses according to the course selection rules, and also independently select the elective courses of each semester [18, 19]. Through the improved course recommendation algorithm, we recommend appropriate elective courses for students to help students learn systematically and reasonably. The detailed flow chart of course selection module is shown in Figure 5.

The teaching evaluation module mainly provides the function of course teaching evaluation: view the list of showing evaluation, and view the rundown of educating evaluation information of evaluated and nonevaluated teaching through the status of teaching evaluation. The courses that have not been evaluated will be scored according to the indicators [19–21]. View feedback on the evaluated courses.

**2.3. Evaluation Algorithm of College Students' Education Management.** As a key part of teaching management, teaching evaluation information has strong guidance for teaching management. It not only regulates, guides, and promotes teaching but also is the main means of evaluating teaching work. Data mining is carried out from the history teaching evaluation data accumulated by the school every semester to explore whether there is an inevitable relationship

TABLE 1: User evaluation matrix.

Item user	A1	A2	...	A <sub>j</sub>	...	A <sub>n</sub>
S1	W11	W12	...	A1 <sub>j</sub>	...	A1 <sub>n</sub>
S2	W21	W22	...	A2 <sub>j</sub>	...	A2 <sub>n</sub>
...	...	...	...	---	...	...
S <sub>i</sub>	W <sub>i1</sub>	W <sub>i2</sub>	...	A <sub>ij</sub>	...	A <sub>in</sub>
...	...	...	...	---	...	...
U <sub>m</sub>	W <sub>m1</sub>	W <sub>m2</sub>	...	A <sub>mj</sub>	...	A <sub>mn</sub>

between the quality of teaching effect and teachers' age, professional title, students' different grades, students' GPA, etc. [22, 23]. For different students, reasonably adjust the teachers of one class, especially for the topic selection of papers and elective courses. Based on the characteristics of collaborative filtering information, combined with student information, evaluation information, and teacher information, the improved user recommendation model is applied to process three kinds of information, and the internal relationship attribute matrix of students and educators in the showing evaluation framework is acquired. On this premise, the collaborative filtering algorithm is applied to obtain useful rules to guide teaching. The data mining module is shown in Figure 6.

Combined with the teacher's age, teaching age, educational background, students' grade, GPA, gender, and other main attribute information, comprehensively consider the number and representativeness of the selected samples for analysis, and get the potential correlation between teaching and the selected attributes. Data preprocessing is a very important connection during the time spent information mining, which can guarantee the quality of the informational index expected for information mining. In particular, some data attribute values may be lost or uncertain in the data record, as well as the incomplete data caused by the necessary data, so data preprocessing is more necessary. For example, in the evaluation data, students' evaluation of teachers may have two extremes: zero or full score. It is impractical to completely deny the teaching effect of teachers, so "zero" should be treated as abnormal data. Any teaching process is a process of continuous improvement. Whether teachers or students, any one is perfect, which is obviously practical. Therefore, the records with full marks also need to be processed. Preprocessing is also required for different data. In the teacher information, the age information is displayed as the birth year  $h$ , so it should be transformed into the corresponding age. There are also some missing values that need to be processed. Finally, the basic information (Table 2) of teachers, the information (Table 3) of students' showing evaluation, and the fundamental data table of understudies are put away in the data set.

As shown in Figure 3, based on the theory of organizational quality, maturity evaluation regards school running quality as a process of continuous self-improvement, so it emphasizes self-evaluation based on school-based management. "Self-evaluation is the constituent element of value. It is a personal evaluation activity of the value it participates

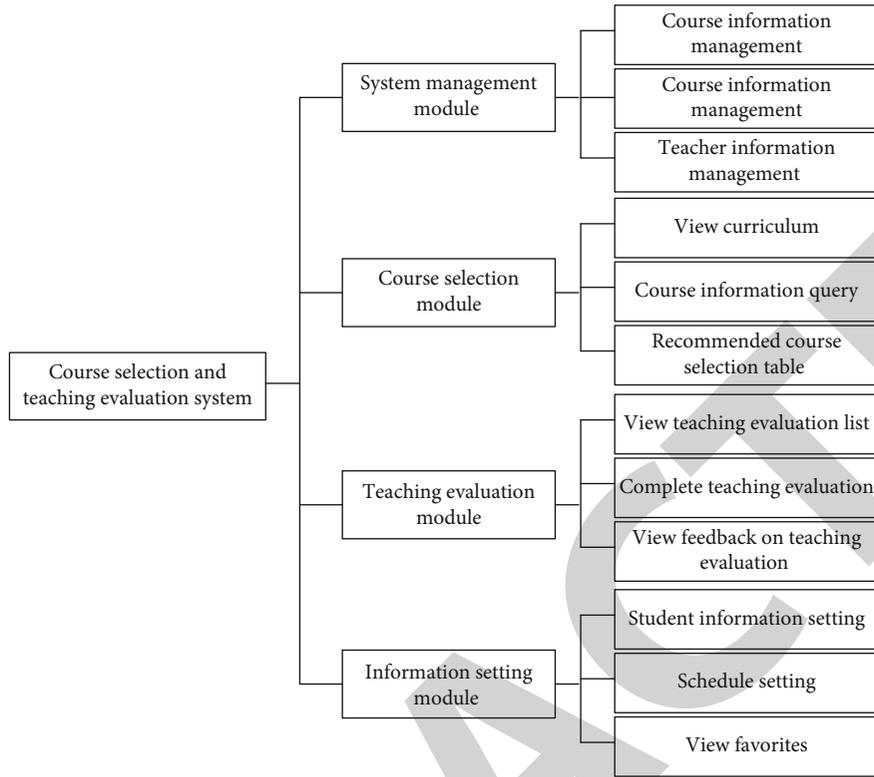


FIGURE 4: Function module diagram of teaching management.

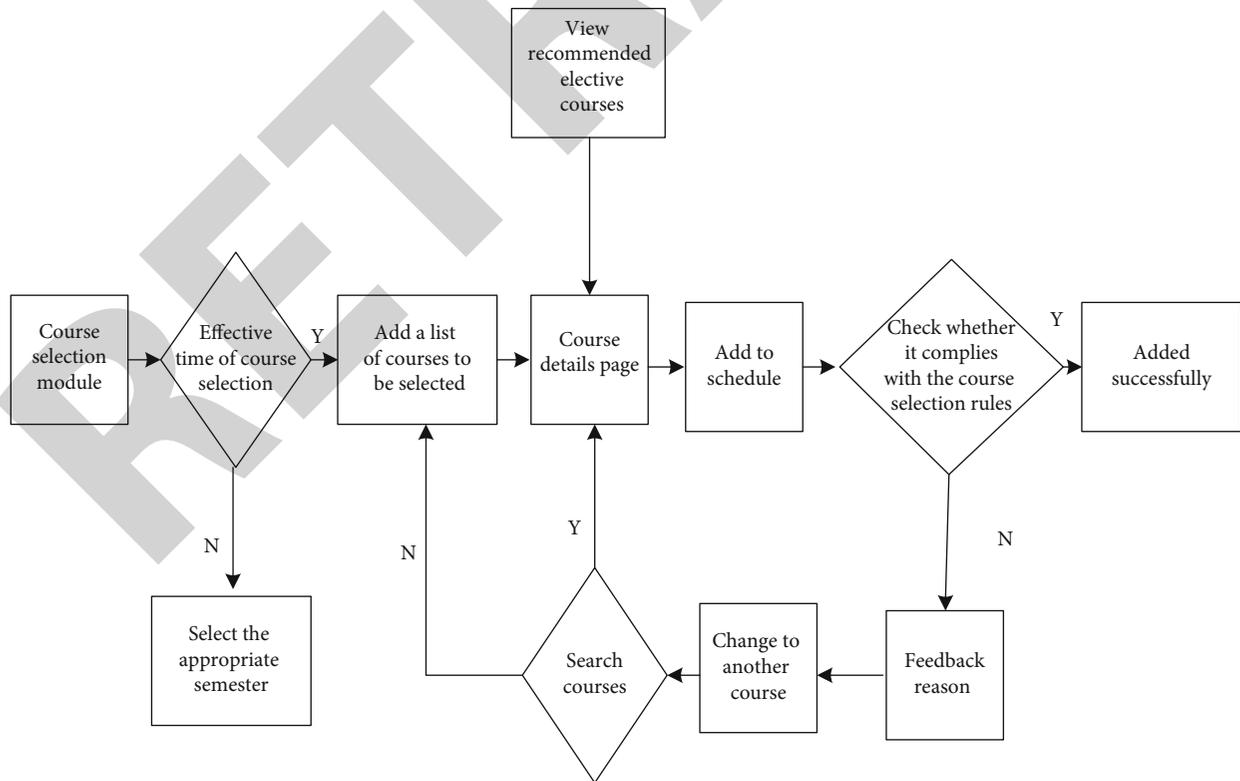


FIGURE 5: Flow chart of undergraduate education course selection module.

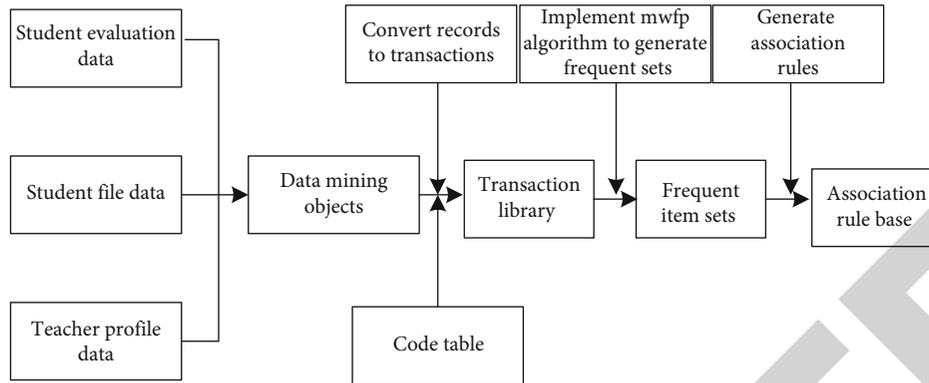


FIGURE 6: Data mining model of college students' education management.

TABLE 2: basic information of teachers.

Full name	Title	Age	Education	Gender
Zhou	Professor	56	Doctor	Male
Wang	Professor	51	Doctor	Male
Lee	...	...	...	...
Money	Associate professor	41	Master	Male
Zhao	Lecturer	33	Doctor	Female
Zhu	Lecturer	39	Master	Female

in and establishes as a value subject. For the self-evaluation in educational evaluation, the evaluation subject is essentially the same as the value subject of educational value.” Maturity evaluation is based on the self-evaluation of colleges and universities, focusing on self-evaluation combined with other evaluation. Through self-evaluation, it provides a basis for schools to improve teaching quality management activities. This kind of self-evaluation usually takes colleges and universities as the subject and object of evaluation, so it is a typical internal evaluation. According to the different initiators of the evaluation object, it tends to be isolated into inward evaluation and outer evaluation. Internal evaluation is an evaluation aimed at the department where it is evaluated. It is an evaluation organized by the evaluator or the evaluation object itself. External evaluation refers to the evaluation implemented by evaluators other than the evaluation object itself. The comparison between internal evaluation and external evaluation is shown in Table 4.

Colleges and universities are the worthy subject of showing quality management. Further developing school running quality is the essential obligation and errand of colleges and universities. Therefore, we pay attention to school-based evaluation. Internal evaluation is different from external evaluation. It has its own particularity, which is mainly reflected in the following: first, the main body of evaluation is colleges and universities themselves, so the problem of being mere formality or unable to carry out objective evaluation due to various relations can be avoided in the evaluation. Second, the object of evaluation is each department that undertakes the teaching task. While accepting the school evaluation, they should also ensure the smooth

advancement of day-to-day education and instructing work. Third, a definitive motivation behind the evaluation is to get data, find, change, and write a few weaknesses, which lacks in time. It is a course of mindfulness and personal growth. The beginning stage of development evaluation is to trust that colleges and universities, as the principal collection of education quality, have the obligation and capacity to work on the quality of running schools. The cycle and proportions of showing quality management in colleges and universities need more self-evaluation and review. By expressing its quality management cycle and conduct, it shows the actions and endeavors of colleges and universities in quality management and afterward mirrors the development level of showing quality management exercises in colleges and universities.

### 3. Analysis of Experimental Results

The main software environment of the experiment is as follows: macOS Sierra, Xcode9, Windows 10, and JDK1.7. Eclipse Mars' hardware environment is processor Intel corei5-4590, memory 4 GB. The data sets extracted in the system application mainly include course relationship information, course selection records, student operation record logs, and more than 200 alternative courses. These data sets are used to verify and test the rationality of the above algorithm. In this experiment, the system first reads the data in the data set. According to the user's operation log, predict the course interest, combined with the relationship between courses, preprocess the course weight, and generate the “student course” weight matrix. The exploratory climate settings are displayed in Table 5.

Calculate the similarity between students, set the threshold, determine the student nearest neighbor set, and calculate the course recommendation. When comparing the effects of different detection algorithms, the following abbreviation is used for convenience of description, as shown in Table 6.

Combined with the different weight coefficients of each dimension, the overall maturity of self-assessment of teaching quality management in 10 colleges and departments is calculated. Figure 7 is the total maturity of teaching quality management of each college.

TABLE 3: Basic information of students.

Full name	Grade	GPA	College	Gender	Major
Wang	1	3.3	Computer	Male	Computer technology
Liu	2	3.6	Computer	Male	Computer software
Sun	1	3.1	Signal communication	Female	Communication engineering
...	...	...	...	...	...
Zhou	2	3.7	Mechanics	Male	Mechanical automation
Zheng	5	...	Management	Female	Electronic commerce

TABLE 4: Comparison between internal evaluation and external evaluation of colleges and universities.

Project	Internal evaluation	External evaluation
Spirit	Self-management	External certification and recognition
Initiator	Higher education institutions	Groups outside higher education institutions
Objective	Self-improvement	Demonstrate compliance with performance accountability requirements
Role	Formative evaluation	Summative evaluation
Emphasized quality types	Improvement of internal quality	Control of external quality
Evaluation tools	Self-evaluation, peer evaluation	Reviewer
Time	Longer	Shorter
Handling of reports	Not public	Open
Application of reports	As a reference for improvement	As the basis for students and employment units to select schools and people

TABLE 5: Experimental parameter setting.

Parameter	Numerical value
Node	15
CPU	3
Core frequency	2.4 GHz
Memory	16 GB

TABLE 6: Abbreviation of detection algorithm.

Whole course	Abbreviation
Random recommendation	XO
Collaborative filtering recommendation algorithm based on	QE
Improved hybrid model recommendation algorithm	OJ
Course recommendation based on collaborative filtering of course weights	ZOAN

Through the radar chart and histogram of the maturity self-assessment results of each department, we can clearly see the level of teaching quality management of each department and intuitively reflect the maturity status of each department in each dimension: first, each department has great differences in the overall maturity of teaching quality management, and the department with the lowest maturity score is only about half of the level of the department with the highest score. Second, each college and department show differences in all dimensions

of teaching quality management. For example, the weakness of the GW college is organization and leadership, the deficiency of CJ, MS, and other colleges is measurement and analysis, and ZY, KT, and other colleges have deficiencies in teaching and learning management. Therefore, through self-evaluation, colleges and departments can quickly locate the weak links in their own teaching quality management and take corresponding measures to improve them. In the second part, the colleges and departments do not show uniform development in all dimensions of quality management but are relatively mature in some dimensions and relatively insufficient in some dimensions. Only individual colleges and departments are “full” in all dimensions. This requires colleges and departments to analyze the corresponding indicator dimensions, find out the secondary indicators that affect the maturity score of this dimension, and try to ensure the balance of all dimensions of teaching quality management. User-based collaborative filtering algorithm (CF), improved hybrid model recommendation algorithm (HM), random recommendation (RS), and this algorithm (cwcf) are utilized to test the informational collection. The trial results show that different number of suggested courses will influence the exactness and review rate. Select a different number of recommended elective courses  $n$  to experiment with each algorithm. The experimental results of accuracy precision are shown in Figure 8.

In the contrasted and other three algorithms, the collaborative filtering algorithm proposed in this paper has the most elevated precision, which shows that the suggestion effect of collaborative filtering through curriculum weight is higher than that of traditional curriculum scoring

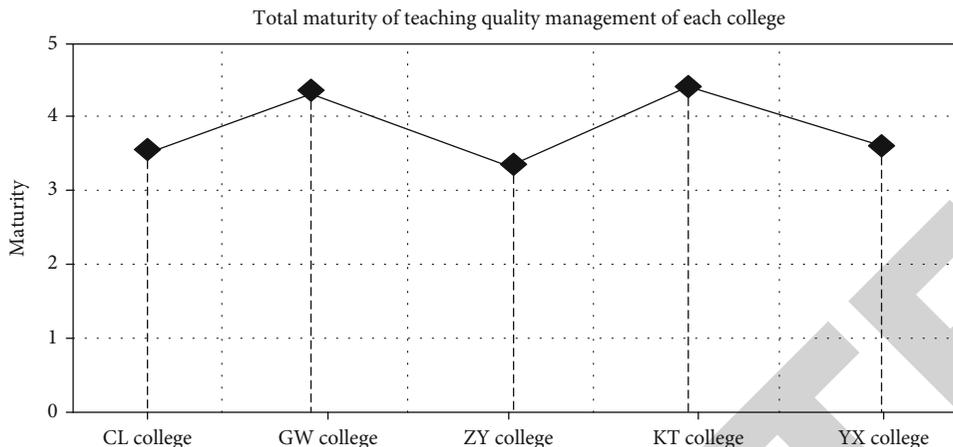


FIGURE 7: The total maturity of teaching quality management of each college.

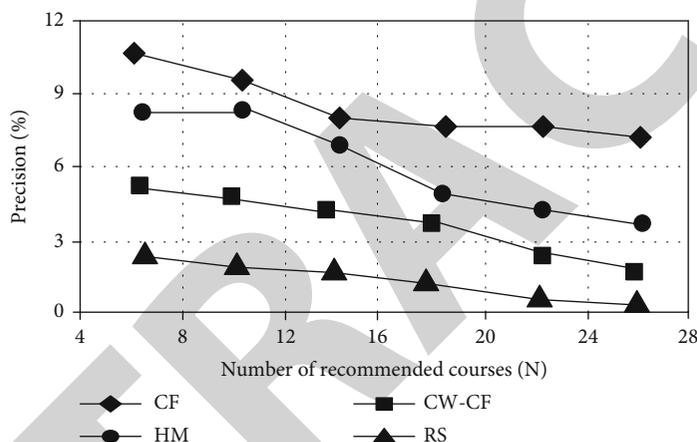


FIGURE 8: Comparison test results of accuracy of teaching evaluation methods.

collaborative filtering, and its overall evaluation accuracy is significantly improved, which fully meets the research requirements.

#### 4. Conclusion

In order to reflect the problems and current circumstance of showing quality management in colleges and universities more carefully, a more refined and operational maturity evaluation scale is developed based on the maturity questionnaire. The whole scale design follows the guiding concept of active improvement and dynamic improvement, adopts the evaluation method of combining judgment questions and question and answer questions, and completes the revision of the scale after three rounds of expert demonstration. The case evaluation results show that each department shows great differences in different dimensions of teaching quality management, and each dimension does not show balanced development, indicating that teaching quality management also needs to be treated differently within colleges and universities (IoT). The evaluation scale can help universities and departments to clarify the current situation of

quality management level, identify weak links and key processes, and be used as an effective tool to diagnose and improve teaching quality management activities.

#### Data Availability

The data used to support the findings of this study are included within the article.

#### Conflicts of Interest

The author declares no conflicts of interest.

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