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Retraction

Retracted: Quality Assessment Method of Information Model Reform of Higher Mathematics Education Based on Big Data

Mathematical Problems in Engineering

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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.

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[1] J. Li, J. Xue, and H. Fu, "Quality Assessment Method of Information Model Reform of Higher Mathematics Education Based on Big Data," *Mathematical Problems in Engineering*, vol. 2022, Article ID 5932902, 8 pages, 2022.

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Research Article

Quality Assessment Method of Information Model Reform of Higher Mathematics Education Based on Big Data

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The quality of higher mathematics teaching in colleges and universities is related to a variety of influencing factors, and the changing laws are very complex, which makes the current model unable to accurately evaluate the quality of higher mathematics teaching in colleges and universities. In order to solve the deficiencies in the current teaching quality evaluation process in colleges and universities and improve the correct rate of college teaching quality evaluation, a quality evaluation method based on big data is proposed, which reforms the information model of college teaching quality evaluation. The literature related to mathematics teaching quality evaluation is researched and analyzed, and the influencing factors of higher mathematics teaching quality evaluation in colleges and universities are established. Then, collect the data of the influencing factors of higher mathematics teaching quality in colleges and universities, and establish a learning sample of college teaching quality evaluation through the star rating of the teaching quality of colleges and universities by experts. Finally, the neural network and decision tree of big data technology are introduced to train the learning samples to form an evaluation model of higher mathematics teaching quality in colleges and universities. The results show that our method can achieve high accuracy.

1. Introduction

When it comes to the new period, the development and advancement of the times are inextricably linked to reform and innovation, and the development of education is even more closely linked to reform and innovation as the subject of our day [1–3]. Continually strive to deepen education reform and innovation, fundamentally activate the innovation of graduate education in the era of big data, and build an effective system for developing high-caliber talent. Nowadays, with the advent of the big data era, there is an increasing demand for the quality of undergraduate graduates, with particular emphasis on the mathematical quality of talents [4–8]. Higher educators are confronted with a number of challenges as a result of these developments, and higher education must be reformatted as soon as possible to suit the needs of mass education and the new period of society for talents. At the same time, the teaching methods and content of higher mathematics are being reformed, and preliminary achievements have been accomplished to a certain extent. All universities provide an advanced mathematics course as a required public basic course in engineering, which is one of the learning instruments that must be mastered before moving on to a more advanced level of study. Among its objectives are the development of students' abilities to analyze and solve problems, and the development of students' accurate logical thinking processes and talents. In practice, if our approaches are not adequate, it is possible that students may become bored with this course, and we will be unable to achieve the aim of teaching and students will be unable to reach their learning objectives [9, 10].

Increasingly evident in the quality of college education, higher mathematics teaching quality is becoming more and more apparent with the increasing number of college students. As such, higher mathematics teaching quality has become an indicator to measure the effectiveness of teaching as well as the evaluation of talents [11, 12]. Many universities have come to the conclusion that improving the quality of higher mathematics education is a good idea these days. Because of the large number of disciplines available at a university, as well as some crossover across disciplines and a wide range of flexible and diverse teaching methods, evaluating the quality of teaching may be a complicated and difficult task [13–18].

At the moment, higher mathematics teaching quality assessment can be divided into two branches: one branch is based on qualitative analysis of higher mathematics teaching quality assessment methods, and the other branch is based on quantitative analysis of higher mathematics teaching quality assessment methods [19, 20]. Expert systems, association rules, and other qualitative analysis techniques are the most common. They just have a general understanding of the higher mathematics teaching quality, and they only look at the overall trend of change. It is difficult for qualitative analysis methods to describe the quality in a fine way because some quantitative factors are included as well as non-quantitative factors in the teaching quality assessment system [21], and the practical application value is low and only provides guiding significance [22]. One of the branches is quantitative analysis-based methods of higher education teaching quality assessment, which can be further subdivided into the following subcategories: traditional statistical methods of higher education mathematics teaching quality assessment and machine learning algorithms of higher education teaching quality assessment [23]. Traditional statistics, which primarily consists of linear regression and gray theory, can only describe the simple and linear statistical relationship between factors and quality, and as a result, the accuracy of higher mathematics teaching quality assessment does not meet the necessary standards [23, 24]. Machine learning algorithms encompass a variety of techniques such as BP neural networks, extreme learning machines, decision trees, and others. Based on modern statistical theory, they belong to the category of data mining and obtain better results in higher education teaching quality assessment in practical applications [25–31]. The parameter optimization problem of the BP neural network and the structure determination problem of the limit learning machine are not effectively solved, and the outcomes of the college teaching quality assessment are negatively impacted as a result of this [32, 33].

With the goal of improving the accuracy of higher mathematics college teaching quality assessment, the quality assessment method of higher mathematics education information model reform based on big data is designed with the goal of improving the accuracy of higher mathematics college teaching quality assessment and analyzes the superiority of higher mathematics teaching quality. The findings of this article demonstrate that the method provided in this study for assessing higher mathematics teaching quality has a substantially smaller error than the existing standard methods used in the field.

2. Related Work

2.1. Mobilize Students' Enthusiasm. Students are the focus of the entire teaching activity, while teachers, who constitute the primary body of the activity, are responsible for imparting knowledge to students.

First and foremost, the first impression a person has of another person is quite significant, and this is also true in the teaching process. The first impression that students get of the teacher will have a direct impact on their interest in the course. This, however, is a test of the overall quality of the teacher's performance. The first session in higher mathematics is extremely crucial in helping pupils accept and enjoy higher mathematics in the future. In the first class, the teacher can explain himself or herself, as well as his or her academic background, research interests. He or she should describe his or her academic background, research interests, and how mathematical knowledge is applied in contemporary high technology and what the prerequisites are for talents in the age of big data. Funny and witty words should be used throughout the document. To begin with, obviously, it allows for the development of students' knowledge about mathematics, including what new successes have been accomplished and what difficulties remain unanswered in the course of their academic careers. The opposite is also true: it can help to stimulate their interest in and inventiveness in learning advanced mathematics, which will have a greater impact than simply beginning to teach the topic the moment that the bell rings.

Second, it is critical to introduce students to the history of higher mathematics and to explain how higher mathematics has progressed from its inception and development to its current state of theoretical maturity. This entails, of course, explaining to students how university life differs from secondary school life and that university is a place where they may enhance their learning ability and creativity, as well as a transition from youth to maturity, all of which are important points to emphasize. We must inform students of the purpose for why they have come to college and help them develop a strategy for their four years of college. What we need to be clear about is why we need to study mathematics and what role it plays in the university curriculum and, even more importantly, in their future employment. Only when students have a clear comprehension of the significance of this subject as well as an emotional awareness of the teacher will they be able to use their initiative more effectively in future classroom instruction.

Moreover, the classroom teaching process should not be cluttered with duck-filled teaching approaches, which will soon cause pupils to despise mathematics, become bored, and rebel against it, as has happened in the past. They nap in class, hang out, and even play games on their cell phones while in class. The introduction of the history of an important mathematical problem to students at an appropriate time, interspersed with anecdotes about a famous mathematician, can help them achieve better learning states. This not only helps to liven up the classroom atmosphere, but also motivates students to learn. Students can have a basic comprehension of what they would be learning in this manner, which can help increase students' interest in learning.

Furthermore, teachers should not limit their mathematics instruction to classroom practice alone, but should make full use of the time they have outside of class to communicate with students, to understand their learning methods and living habits, to provide them with specific guidance and advice, and to make students feel that you care about them and like them. Freshmen, in particular, having recently graduated from high school, have left their comfortable hometown, have separated from their parents, and have experienced some liberation, but have also experienced some discomfort. We need to show them that we care about them and that we are willing to assist them through this difficult time. Students will respect and adore their teachers from the bottom of their hearts if they receive this level of care and attention. As a result, they will be interested in the subject matter you are teaching and will work hard to master it. Teachers should assist students in responding to queries and resolving problems in a timely fashion. Their students can benefit from using the time before class to correct mistakes in homework and the time between classes and evening study to assist them in answering questions. This will allow them to overcome any challenges they may be having with advanced mathematics learning in a timely manner and thereby increase their enthusiasm for learning.

Finally, when it comes to abstract mathematical information, we may integrate modern teaching methods, such as multimedia instruction, to give pupils a more intuitive sense of what they are learning. It is preferable to develop a step-by-step derivation of the more dull knowledge and to explain the analysis process to make it more intelligible when dealing with more boring knowledge. For example, when it comes to memorizing the Taylor formula, pupils believe that it is a burden to have to do so. In this regard, we must first inform students about the origins of Taylor's formula as well as the applications of the formula. Finally, we can employ multimedia teaching to allow students to experience the Taylor formula approximation of a function, where the degree of approximation changes as the order of the derivative increases. During the process of learning mathematics, it is critical to communicate to children that mathematics is not just for subsequent professional classes but also for everyday life.

Mathematics is required in every aspect of our existence, and we cannot function well without it. Rather than being common information, the principles of many seemingly ordinary things are mathematical knowledge, and many of them are advanced mathematical knowledge, which cultivates students' enthusiasm in discovering and investigating. This also stimulates pupils' desire to learn and investigate new things.

2.2. Initiating Student Initiative. After pupils have been inspired to learn, they should be guided to take the initiative in their own learning. In addition to enhancing students' self-learning abilities and their daring to demonstrate themselves, this paradigm of transpersonal learning is extremely good for improving students' self-confidence. It is possible for students to demonstrate their self-learning abilities by explaining their thinking processes to themselves. It is also possible for students to demonstrate their information retention and understanding by explaining their thinking processes to themselves and applying them flexibly. Students will think about difficulties in a more extensive and comprehensive manner if they are given the opportunity to stand at the podium and lecture. This technique helps students improve their abilities to study and collaborate with others. In this method, providing students with frequent opportunities to learn and exercise can substantially drive them to learn and take the initiative, thus making the abstract advanced mathematics classroom more engaging. Higher mathematics has traits such as being abstract, monotonous, densely packed with calculating procedures, logical, and so on. Students must synthesize appropriate methods and skills under the supervision of professors in order to better grasp, master, and apply what they have studied. This will help them master what they have learned and achieve integration. As a means of ensuring that students master the material they have learned and attain competence, educators must assist them in mastering the learning methods and skills so that they may better understand and apply the teaching materials of higher mathematics.

Second, when students first encounter advanced mathematics, they are frequently perplexed and do not understand why they should be studying mathematics in college, let alone whether it will be relevant in their future professional courses. Teachers should differentiate their assistance for students based on their majors at this time so that they can comprehend the function of higher mathematics in their respective majors and make it obvious that higher mathematics is the most fundamental information and tool for their respective majors. Only when they recognize the importance of advanced mathematics as a key to unlocking the doors to their respective fields of study will they take the initiative to learn it.

The final point to mention is that rather of merely presenting students with an overwhelming number of topics, we should direct them to review and summarize their work. Students should be allowed to sort out, summarize, and summarize their knowledge in accordance with the rule of human memory forgetting in order to ensure that they retain the information points correctly and absorb them entirely. Students can become familiar with the face of mathematics concerns and professional courses in the relevant type of problems if all chapters are combined and made simple to use, allowing them to gain mastery of all chapters. When you are juggling a lot of studying with an active college life, how do you find the time to review and summarize your work? These skills are especially important for first-year college students. When it comes to good advice, students in the first year can greatly benefit from it. It can not only inform them about the importance of cultivating good study habits and mastering good study methods, but can also greatly relieve them of all kinds of discomfort and unpreparedness when they first arrive at the university, as well as assist them in dealing with the pressure of future examinations, thereby increasing their motivation and initiative as they progress through the process of learning advanced mathematics.

3. Method

The first step toward a more accurate evaluation of the information mode reform of higher mathematics education

Table 1: Influencing factors of reform quality assessment.

Influencing factors for teachers	Influencing factors for students
Number of class suspensions	Reasonableness of course content
Number of class transfer	How good the classroom atmosphere is
Number of postponed classes	Relevance of the course content
Number of early class dismissals	The organization of the lecture
Number of substitute classes	Teaching skills
Number of assignments corrected	Teacher responsibility

is to identify and study some of the characteristics that influence the quality assessment of the reform.

As stated in Table 1, the influencing elements impacting the reform are mostly offered from two perspectives: that of the teachers themselves and those of the pupils.

BP neural network includes input layer, output layer, and hidden layer, and the output is as follows:

$$O_i^{(1)} = x(i), \quad i = 1, 2, \ldots, n, \tag{1}$$

where x_i is the input. The input and output of hidden layer are as follows:

$$\begin{aligned} \text{net}_i^{(2)}(k) &= \sum_{j=1}^{m} w_{ij}^{(2)} O_j^{(1)}(k), \\ O_j^{(2)}(k) &= f\left[\text{net}_i^{(2)}(k)\right], \end{aligned} \tag{2}$$

where $w_{ij}^{(2)}$ denotes layer weight coefficients, $f[\cdot]$ is the mapping function.

The input and output of output layer are as follows:

$$\begin{aligned} \text{net}_i^{(3)}(k) &= \sum_{j=1}^{m} w_{ij}^{(3)} O_j^{(2)}(k), \\ O_j^{(3)}(k) &= f\left[\text{net}_i^{(3)}(k)\right]. \end{aligned} \tag{3}$$

The error function between $O_p(k+1)$ and $O_p'(k+1)$ is

$$\text{error} = \frac{\left[O_p(k+1) - O_p'(k+1)\right]^2}{2}. \tag{4}$$

The sum of error is

$$\text{sum error} = \sum_{p=1}^{P} \frac{\left[O_p(k+1) - O_p'(k+1)\right]^2}{2}. \tag{5}$$

The update equation of $w_{ij}^{(2)}$ and $w_{ij}^{(3)}$ is as follows:

$$\begin{aligned} w_{ij}^{(2)} &= \alpha w_{ij}^{(2)}(k-1) + \beta \frac{\partial(\text{sum error})}{\partial w_{ij}^{(2)}(k)}, \\ w_{ij}^{(3)} &= \alpha w_{ij}^{(3)}(k-1) + \beta \frac{\partial(\text{sum error})}{\partial w_{ij}^{(3)}(k)}, \end{aligned} \tag{6}$$

where β is learn rate, and α is weight.

The core structure of the decision tree (DS) is shown in Figure 1.

Figure 1 presents the structure of DS, which introduces the detailed flow of the internal organization algorithm of the decision tree algorithm.

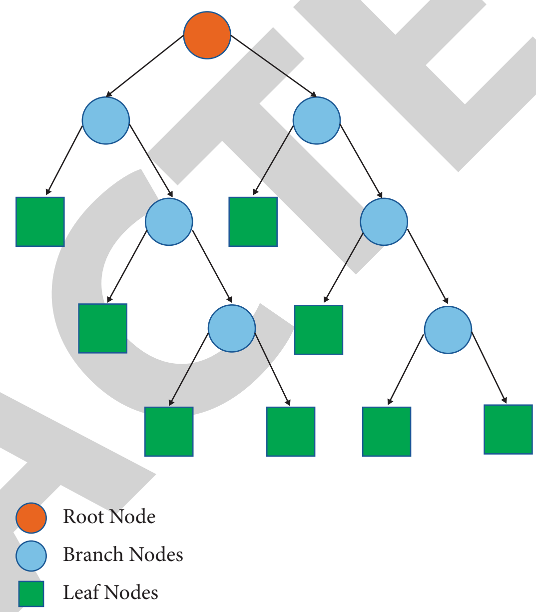

Figure 1: The structure of DS.

Table 2: Quality evaluation data.

University number	Number of teachers
1	15
2	15
3	15
4	12
5	8
6	10
7	12
8	14

The expected entropy is calculated as follows:

$$I(s_1, s_2, \ldots, s_m) = -\sum_{i=1}^{m} \frac{s_i}{s} \log_2 \frac{s_i}{s}, \tag{7}$$

where s_i is the number of samples belonging to C_i. The expectation of attribute A for S division is

$$E(A) = \sum_{j=1}^{m} \frac{s_{1j} + s_{2j} + \cdots + s_{mj}}{s} I\left(s_{1j} + s_{2j} + \cdots + s_{mj}\right). \tag{8}$$

Then, we have

$$I\left(s_{1j} + s_{2j} + \cdots + s_{mj}\right) = -\sum_{i=1}^{m} \frac{s_{ij}}{s_j} \log_2 \frac{s_{ij}}{s_j}. \tag{9}$$

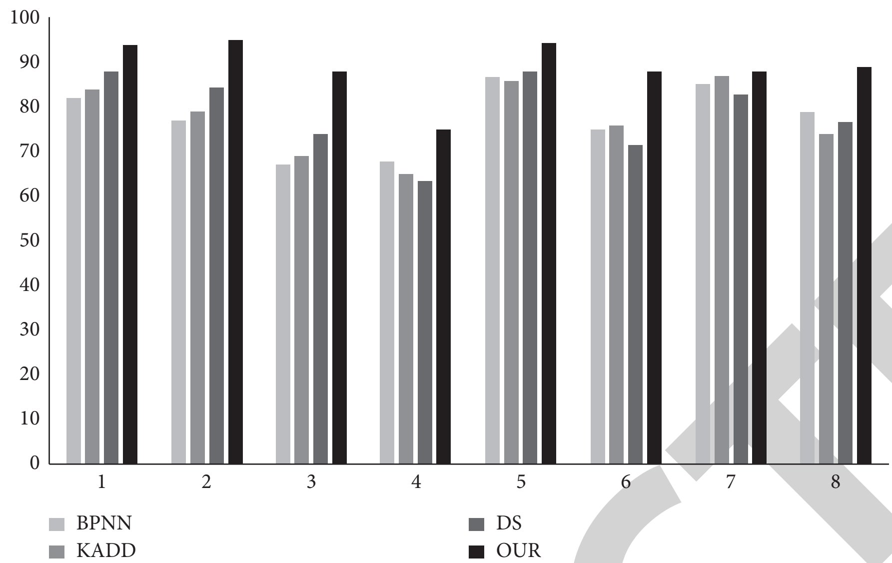

Figure 2: The precision curves of different methods.

And the expected entropy gain is

$$\text{Gain}(A) = I(s_1, s_2, \ldots, s_m) - E(A). \quad (10)$$

We also have

$$\text{Gain}(A) = \frac{\text{Gain}(A)}{\text{splitinfo}(s)}, \quad (11)$$

where $\text{splitinfo}(s) = \sum_{i=1}^{m} (s_i/|s|) \times \log_2 (s_i/s)$.

Using big data, the quality evaluation approach for higher mathematics education information model change may be broken down into the following steps:

(1) Gather data in accordance with the influencing elements of higher mathematics teaching quality assessment listed in Table 1, and then initialize the data in order to generate samples for evaluation
(2) Determine the corresponding grade values in accordance with the relevant influencing elements through the use of professionals
(3) Determine the first incremental values of all indicators to generate DS using the results of step 3
(4) Create categorization rules with the help of DS
(5) According to the classification rules, the samples that have been labeled are filtered
(6) Determine the structure of the neural network according to the influencing factors
(7) Input the samples classified by DS for the first time and train the network until the training error meets the preset range

4. Experiment Result

A comparison of the BPNN, the KADD model of literature [15], and the DS model was conducted on the same platform in order to determine the advantages of using the method of quality assessment of the information model reform of higher mathematics education based on big data to analyze the advantages of the information model reform of higher mathematics education based on big data. A total of eight institutions were chosen as the research subject, and the number of professors selected in each university is displayed in Table 2. The corresponding values of the influencing factors were also collected, but they are not listed here owing to space constraints on the page layout.

To evaluate the quality of information model reform in higher mathematics education for teachers in eight universities (Table 2), four models were used, and the accuracy of quality assessment in higher mathematics education in each university was counted, with the resulting results depicted in Figure 2.

Because this cross-model combines BPNN and DS and introduces parameter adaptive optimization algorithm, it is able to overcome some problems in the current assessment process and effectively improve the assessment effect. As can be seen, the average value of higher mathematics education information model reform quality assessment method based on big data is significantly higher than the average value of BPNN, KADD, and DS models.

Because of the growing volume of data, this work improves the efficiency of the quality assessment method by analyzing and statistically estimating the modeling time of each model. The results are illustrated in Figure 3.

It can be shown in Figure 3 that the mean value of modeling practice time for the model used in this work is 22.4 milliseconds, which is in line with earlier findings. As a consequence of the results of the comparison, we can conclude that the high performance of the model presented in this study can raise the efficiency with which higher mathematics education institutions can reform their quality evaluation of the information model by increasing its efficiency.

Because of this, seven additional university courses were selected in order to further illustrate how effective the method presented in this paper is; the evaluation metrics

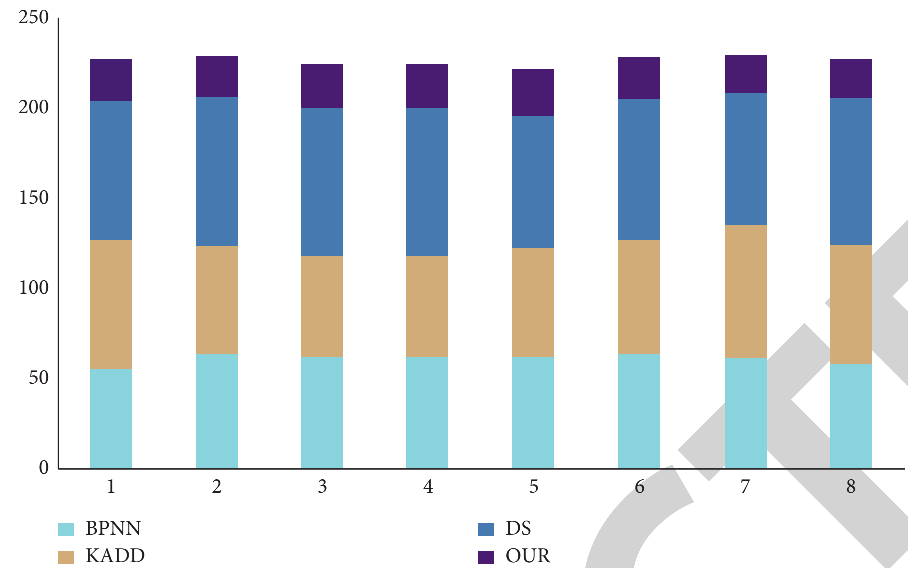

Figure 3: Comparison of the efficiency of different methods.

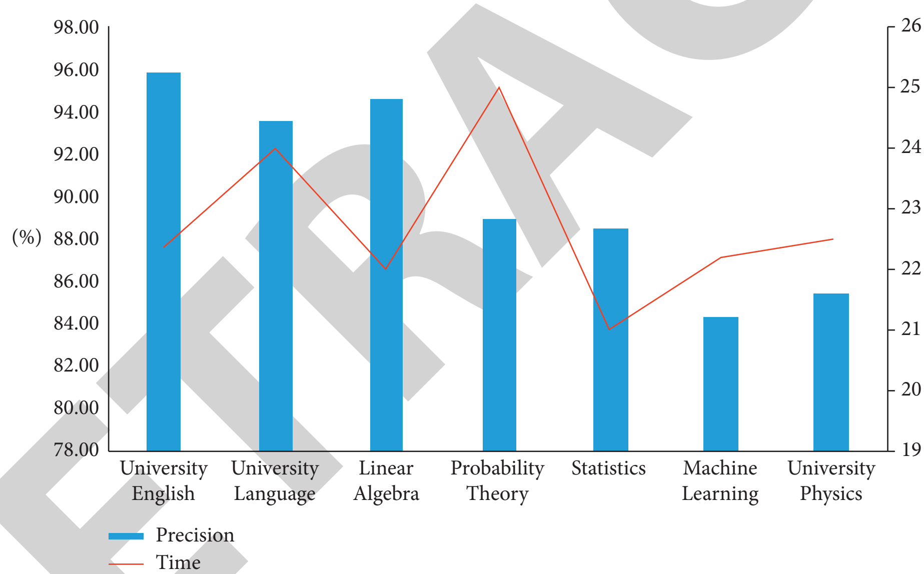

Figure 4: Generalization analysis of the algorithm in this paper.

used were modeling practice and modeling accuracy, as illustrated in Figure 4, which demonstrates how the algorithm presented in this paper has a high modeling accuracy while also having a short modeling time.

It can be seen that the accuracy rate of our proposed method can reach more than 94% and the modeling time is maintained at about 23 ms in three courses: college English, college language, and linear algebra. The modeling time for the probability theory course is higher, which is only 25 ms, and the shortest modeling time is 21.25 ms for the statistics course.

5. Conclusion

The quality of higher mathematics teaching reform in colleges and universities is related to a variety of influencing factors. How to effectively combine these factors to carry out teaching reform has become a current research focus. In order to obtain better reform quality evaluation results, a big data-based reform quality evaluation method for higher mathematics education informatization model was proposed by introducing big data technology. First, the method is to study and analyze the current literature on the quality evaluation of higher mathematics teaching in colleges and universities, and establish the influencing factors of the quality evaluation. Then, the data of quality influencing factors are collected, combined with BPNN and DC methods, to construct the most adequate reform quality evaluation model. The results show that the model in this paper is a high precision and efficient quality evaluation model of higher mathematics teaching reform, which has a very wide range of application value.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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