

## *Retraction*

# **Retracted: Mathematical Model Construction of Teaching Evaluation in Colleges and Universities Based on Convolutional Neural Network under the Background of Big Data**

### **Journal of Function Spaces**

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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] C. Tan, "Mathematical Model Construction of Teaching Evaluation in Colleges and Universities Based on Convolutional Neural Network under the Background of Big Data," *Journal of Function Spaces*, vol. 2022, Article ID 7064287, 8 pages, 2022.

## Research Article

# Mathematical Model Construction of Teaching Evaluation in Colleges and Universities Based on Convolutional Neural Network under the Background of Big Data

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With the development of teacher evaluation, the main purposes of university evaluation are divided into the final purpose of ensuring teaching quality and the formative purpose of promoting professional learning. In order to effectively help teachers teach students according to their aptitude and realize personalized learning. This paper mainly analyzes and studies the mathematical model of college teaching evaluation based on convolutional neural network under the background of big data. The research analyzes the teaching evaluation under the background of big data and evaluates the teaching of big data participants. The teaching evaluation data can promote the development of education and teaching. Data acquisition processes and functions in the context of big data. Ensure the comprehensiveness and accuracy of data collection. At the same time, the function of teaching evaluation results is analyzed. The evaluation and formulation of mathematical model program in this study make full use of education big data information to provide scientific support for education decision-making.

## 1. Introduction

Nowadays, education has entered the stage of industrialization, and big data has become the main way, spreading in many fields such as educational technology, distance education, and teaching evaluation, and has become an important research hotspot. From the evolution of textbooks, it can be seen that new media textbooks are not simple digitization of paper textbooks, but a redesign of teaching materials. In the commercial field, help e-commerce to analyze customer characteristics and realize personalized recommendation. Higher education is the foundation of talent training in China, and undergraduate education is the main part of higher education. As the main position of talent training, it undertakes the main task of talent training [1]. The evaluation work must implement the national education policy and make use of books and periodicals to educate students in political, ideological, moral, cultural, and scientific knowledge, etc. With the help of certain means and tools, such as smart wearable devices, the characteristics of students can be collected without the knowledge of the students, which can

effectively help teachers teach students in accordance with their aptitude and achieve personalized learning [2]. However, the e-learning system developed to achieve this goal of online education has lost many functions of education itself, such as the function of personalized education and the function of tracking learners' emotional feedback. The continuous improvement of the degree of informatization has also gradually transformed the learning method from the traditional learning method to the information-based and digital learning method. Mathematical models are designed to provide targeted teaching plans based on students' individual characteristics and to provide students with precise and personalized educational services, thereby promoting learning and improving performance. Evaluation tools play an important role in how to effectively implement learning process evaluation. The development of information technology, especially the rise of smart education, big data full sample collection, and high-efficiency data processing capabilities are to realize the collection, storage, and analysis of learning process resources. Then, through the personalized evaluation and recommendation of the learning process,

it provides technical support to promote the improvement of students' learning process evaluation. Therefore, building a personalized and accurate evaluation model based on big data in the smart education environment is of great significance to promote the all-round development of students and stimulate the vitality of classroom life.

The mathematical model in the era of big data relies on the support of information technology and big data analysis technology and depicts the personalized characteristics of students by analyzing and mining students' basic information data and learning behavior data. With the goal of promoting learning and improving performance, a targeted mathematical model scheme is given according to the individual characteristics of students. With the further deepening of the construction and application of smart campuses, changes in the teaching environment, course content and teaching mode, the application of various learning spaces, big data platforms, mobile learning, blended learning, and other learning modes are carried out [3]. It can be seen that the school teaching evaluation is an important educational institution of the school. It is not only the function of borrowing and repaying but also serving the teaching and scientific research of teachers and students. It is also possible to set up an early warning line for learning conditions, conduct specific observations on different students, and conduct timely counseling work, which can reduce the appearance of problem students to a certain extent and promote the healthy development of students. However, the training of convolution neural network models requires large-scale data and strong computing power. Because the CPU lacks parallel computing power, it is inefficient to train and run convolution neural networks. Therefore, the GPU with strong parallel computing power is the most popular general processor for training and running convolution neural networks [4]. Composite textbooks add information technology to the original paper textbooks, so that paper textbooks and teaching resources are connected, so that paper and digital learning resources are all presented in the hands of students. In summary, the mathematical model in the era of big data is of great significance for promoting teaching accuracy, learning individualization, environmental intelligence, and management intelligence.

To implement process management and process evaluation based on big data, the collection of process data is the first step of evaluation. Make its due contribution to improving the quality of the whole nation and the healthy growth of the next generation. Teaching evaluation should not only publicize and guide students to read all kinds of books and periodicals but also provide all kinds of reference materials for teachers' teaching. At present, with the development of teacher evaluation, its main purpose is divided into the summative purpose of ensuring teaching quality and the formative purpose of promoting professional learning [5]. For the judgment of learners' learning experience and data collection, most online education platforms get feedback from users through questionnaires. But the results are often incomplete answers or even misleading information. Open-source hardware refers to the computer and electronic hardware designed in the same way as open-source software. It includes a large number of electronic devices, such as vari-

ous development boards and components with different uses [6]. Providing support for education and teaching decision-making through data-driven is the main feature of mathematical models in the era of big data. The summative purpose is to provide a certain basis for teachers' rewards and punishments through teacher evaluation [7]. The formative purpose is to evaluate the improvement and progress of teachers' abilities in various dimensions through teachers [8]. Based on this, developing university learning evaluation based on educational big data is an important part of solving teaching problems in Chinese universities, and how to build a university evaluation system based on educational big data has also become one of the important contents of the development of university informatization.

## 2. Related Work

Intelligent education has become a new hot topic in the research of educational informatization. According to their own educational informatization development, many schools gradually turn from theory to practice and implement it into curriculum teaching by using the education cloud platform supported by big data in the context of smart education. Further research has been carried out on the personalized learning of junior middle school students. Carry out personalized teaching research and Taiwan application research through accurate evaluation and personalized learning application research under intelligent education. In order to help students improve their academic performance and core literacy, traditional learning evaluation focuses on the external value of knowledge. The evaluation is mostly based on a certain period of time during which students participate in learning, and the evaluation dimension is limited to the mastery of pure objective knowledge. Science curriculum is a new curriculum with great reform and innovation, which needs to start from improving the scientific literacy of every student. Establish an evaluation system that is compatible with science curriculum with diversified evaluation, comprehensive evaluation content, and diverse evaluation methods. With the dramatic increase of students' process data, learning evaluation has turned to process-based learning evaluation based on educational big data, which runs through the whole process of students' learning, instead of taking a quantitative evaluation of students as the evaluation result. Zhibin designed big data platform, based on the theory of emotional computing, which can identify six basic emotions: happiness, fear, sadness, surprise, anger, and disgust [9]. Ning and Lin put forward a neural network tree facial expression automatic classification method with good recognition effect [10]. Oliveira et al. explored the construction of a blended teaching quality evaluation system, combined with the blended teaching process, to evaluate students' learning activities and learning results and to stimulate students' learning initiative [11]. Youyin et al. have established the learning platform that constructs a learning evaluation index system, which reflects students' learning situation and evaluates students' learning effect from four dimensions: learning goal, interaction, emotional attitude, knowledge, and skills [12]. Chen and Nielsen put

forward that a mathematical model based on big data is constructed from three dimensions: the establishment of teaching objectives, the design of teaching process framework, and teaching evaluation and prediction [13]. Gao et al. have discussed the learning evaluation of universities under the flipped classroom mode under the background of big data and constructed the index system of student evaluation from four dimensions: before, during, after, and learning results, which mainly involves four aspects: learning resources, learning interaction, knowledge feedback, and learning achievement [14]. Yinzhen et al. put forward a mathematical model supported by information technology, which includes four links: accurate target determination, development of materials and teaching process, counting and drawing performance, and data decision [15]. Scholars such as Yangxin et al. established the following: on the basis of facial expressions, other physiological signals such as heart rate, blood pressure changes, and skin electrical conduction were combined. In this way, the emotional changes of learners are obtained, and the full use of learners' emotional feedback in learning is discussed to improve the learning experience [16]. Scholars such as Houhe et al. believed that the FILT-WAM learning framework was proposed by combining facial expression recognition with speech expression. In the learning process, hardware devices such as cameras and microphones are used to obtain learners' facial expressions and voice information [17]. Weibo et al. built a data-driven learning support design model that includes two subjects, four dimensions, and four links. Therefore, it is necessary to systematically analyze the learning evaluation in colleges and universities, propose a learning evaluation index system based on educational big data, and reconstruct the educational evaluation system [18].

### 3. Teaching Evaluation in the Context of Big Data

*3.1. Participants in Big Data.* The application of big data in education calls for theoretical innovation while promoting profound changes in education. However, the traditional thinking of the dichotomy of subject and object holds a critical attitude towards the educational application of technology. In this regard, on the basis of clarifying the presence of teaching evaluation in the context of big data, this paper justifies the rationality of the evaluation supported by educational big data from two aspects of method and value and points out the direction of theoretical development. First, it expounds the evaluation methods and principles based on educational big data from three dimensions: the integration of evaluation into the process of teaching activities, the data integration teaching evaluation system, and the intelligent evaluation of human-computer collaborative achievements; secondly, around the value cognition of education big data evaluation, it describes that evaluation promotes the evolution of teaching ecology and cultivates subject consciousness. This promotes the continuous generation of learning value and demonstrates the significance of intelligent assessment in promoting human development in the context of education big data. In practice, the teaching big data in col-

leges and universities is directly carried out in various education and teaching links and activities, including the teaching process and community activities, and the data covers a wide range. Moreover, the period of data collection is also very short, and the amount of data is huge. Theoretically, the evaluation activities have two purposes. The first is to verify the teaching effectiveness and provide a basis for the appointment and promotion of school proofreaders, that is, rewarding and punishing teacher evaluation [19]. Therefore, in the autism teaching scene, teaching evaluation is an important research data carrier of information technology. Convolutional neural network is the mainstream algorithm of teaching evaluation, and it is used in the scheme of identifying students' behaviors and actions in related work [20]. Although the log is the simplest form, it is the most basic form of user behavior and the richest form of data. For example, if a user clicks on some information, it will be stored in the click log. In recent years, teaching evaluation methods based on convolutional neural networks have achieved outstanding results in teaching evaluation-related competitions. And it is also widely praised in the industry, so it is based on the convolutional neural network to realize the teaching resource integration scheme. And on this basis, in order to improve the teaching effect, promote teaching and learning as the goal, and provide targeted teaching guidance for students. Therefore, students' learning should return to the real situation and solve specific practical problems; and the learning process is not only the acquisition, processing, and storage of learning content. College students can learn about the latest and higher-level technologies in today's society through teaching evaluation, and they can connect with the times and understand the technological development of the times. Under the influence of the long-term "separation of teaching resources," the difficulty of obtaining such teaching resources by free means can be imagined. The management mechanism of different colleges and universities also makes the integration of teaching resources difficult. The purpose of teacher evaluation should be to give feedback on teachers' work, to achieve the purpose of improving and perfecting their own abilities, so as to improve teachers' abilities to promote the achievement of future goals. The neural network simulates the neurocognitive mechanism, and by learning the subfeatures of the object, it can still recognize the object even when the object is displaced and deformed. These are the elements that can really help the teaching evaluation work to exert greater value, can promote the development of college teaching management, and can also help students learn management more smoothly. The calculation process is as follows:

$$\begin{aligned}
 W_i &= \frac{w'_i}{\sum_{i=1}^n w'_i}, \\
 W_i &= \sqrt[n]{\prod_{i=1}^n a_{ij}}, \\
 \lambda \max &= \frac{1}{n} \sum_{i=1}^n \frac{(AW)_i}{W_i}.
 \end{aligned} \tag{1}$$

TABLE 1: Second-level indicator judgement matrix under learning attitude after aggregation.

Learning attitude	Necessary activity initiative	Self-directed learning initiative	Explore initiative
Necessary activity initiative	1	0.7030	0.5375
Self-directed learning initiative	1.4225	1	1.7000
Explore initiative	1.8601	0.5883	1

TABLE 2: Content after aggregation master the judgment matrix of next level indicators.

Content control	Knowledge learning situation	Deep processing feedback
Knowledge learning situation	1.0001	1.0623
Deep processing feedback	0.9413	1.0000

TABLE 3: Judgment matrix of secondary indicators under professional competence after aggregation.

Professional ability	Problem solved	Innovative practice	Innovative practice
Problem solved	1	0.4793	0.3114
Innovative practice	2.0855	1	0.5564
Collaborative interaction	0.2640	0.3160	0.1223

3.2. *The Influence of Teaching Evaluation Data on the Development of Education and Teaching.* In the traditional teaching mode, the teacher is the only subject of evaluation and acts as the standard setter and judge in the evaluation. The new curriculum requires diversified curriculum evaluation, which will be a new challenge for teachers who have worked for many years, but it does not mean giving up teacher evaluation. On the contrary, the new curriculum raises the evaluation standard of teachers to a new standard. In ordinary classroom teaching, we can set questions with different difficulties according to the level of students, so that every student can get the opportunity to perform.

In the context of big data, many teaching evaluation data are very diversified and multilayered, which means that the data that can be collected in the context of big data is relatively more comprehensive and accurate. It has helped teachers and students in different degrees. By consistency detection, the consistency of the judgement matrix can be accepted, and the relative index weights of the secondary indicators can be trusted, as shown in Tables 1–3.

For example, the method based on logic, but in reality, it is considered that the possibility of using this method to realize artificial intelligence is almost zero, because so far, no good algorithm has been found to learn and calculate logical symbols. Different from other types of neural networks, convolutional neural networks greatly reduce the overall complexity of the network by sharing weights and connecting locally and avoid the complex preprocessing of input data required by the traditional network. Only when learners actively participate can they get more positive emotional behaviors, thus promoting learning efficiency. Therefore, online education is also increasingly focused on the learning process. However, some of the troubles that humans can solve with instinct are difficult for computers, and this has become a problem that artificial intelligence needs to solve,

including image recognition, natural language processing, and speech recognition. Because the teaching scheme has certain after-effects, it takes a certain period of time for a teaching scheme to have an impact on the teaching effect, and it is not immediate. The output of the convolutional layer is as follows:

$$\text{Feature}_j^i = \phi \left( \sum_{i \in M_i} \omega_{ij}^l \otimes_{x_i}^{l-1} + b_j^l \right). \quad (2)$$

Sigmoid expression:

$$\text{sigmoid}(x) = \frac{1}{1 + e^{-x}}. \quad (3)$$

Expression for tanh function:

$$\tanh(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}}. \quad (4)$$

Guidelines are defined as follows:

$$\begin{aligned} \text{BIC} &= -2 \ln g(\hat{\theta}_k | y) + k \log n_s, \\ C^p &= \frac{\text{RSS}_k}{\hat{\sigma}^2(n2k)} \end{aligned} \quad (5)$$

Therefore, learning includes network nodes and connections. Nodes are external entities used to form cognitive networks and are all kinds of available information sources. The purpose of students passing through this position is very strong. One is to go to teaching evaluation, and the other is to go in and out of the school gate, so this position cannot well intercept a group of people. However, the classification

of teaching resources in some colleges and universities is unscientific, and related types of teaching resources websites generally only aim at teaching courseware and teaching materials, which cannot provide students and teachers with the resources they need to learn. Although the concept of artificial neural network was put forward by scientists when the computer was first born, it was considered unrealistic due to the limitation of computer hardware at that time. The loss curve and training accuracy curve base on convolutional neural network are shown in Figure 1.

At present, all colleges and universities have built campus networks and accumulated a large amount of online behavior data. Making full and effective use of these data can provide certain decision-making for the education and teaching of colleges and universities. In order to achieve this goal, some decision-making information related to education and teaching can be obtained by analyzing the characteristics of data mining and big data technology, so as to provide powerful decision support for school leaders and teachers in education and teaching management. With the rapid development of science and technology, the deep integration of big data and education will become an inevitable trend. Educational big data will promote the reform and development of traditional education. Big data technology can help people analyze education and teaching from different angles and levels and explore new laws of education and teaching. In the future, big data will set off a new educational revolution, such as innovating the ways and methods of students' learning, teachers' teaching, and educational policy-making.

#### 4. Data Acquisition Process and Function in the Context of Big Data

4.1. *Data Collection Should Pay Attention to Comprehensiveness and Accuracy.* Only when the data of teaching evaluation are valid and accurate can teaching evaluation play its due role and effect. Therefore, it is necessary to change the result of linear calculation into the result of nonlinear function that fits the probability theory. In the classroom scene, teachers and students have one-on-one classroom teaching during the course, and cameras are used to record the whole classroom teaching process. After class, teachers can evaluate students' learning status in the course and adjust the teaching activities after class by watching the recorded videos. In the traditional classroom, teachers can communicate emotionally with students in many ways, such as one-on-one classroom questioning, interactive discussion, and eye contact between teachers and students. Teachers obtain students' emotional information in all directions, and emotional feedback is real-time and diversified. Especially in the face of some comprehensive problems that need to be solved manually, in addition to spending a lot of energy, it may take researchers decades to complete. Specifically, combined with the characteristics of mathematical models in the era of big data, indicators that reflect students' characteristics and behavioral performance are extracted from the data. Observe the correlation coefficient of the trained model and the relationship between the true and predicted values, as shown in Figure 2.

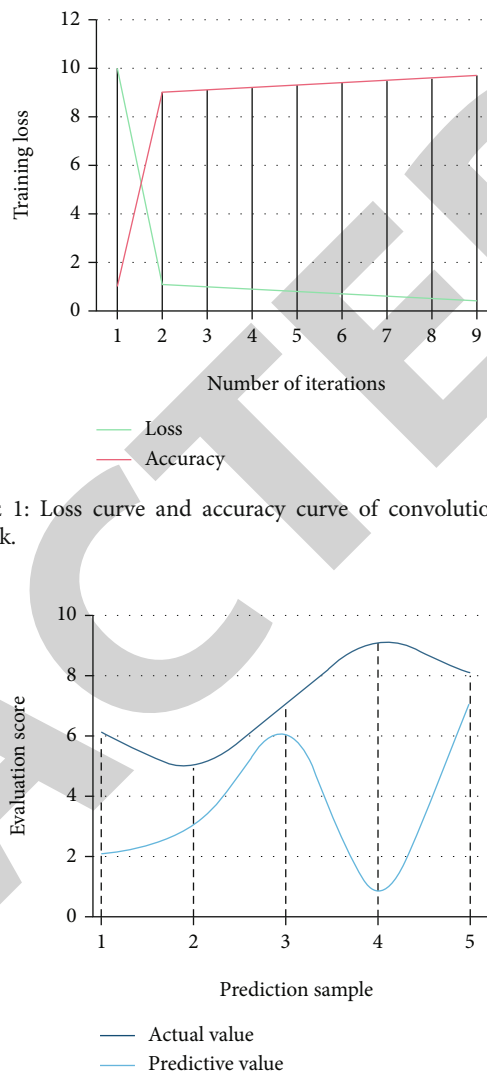


FIGURE 1: Loss curve and accuracy curve of convolution neural network.

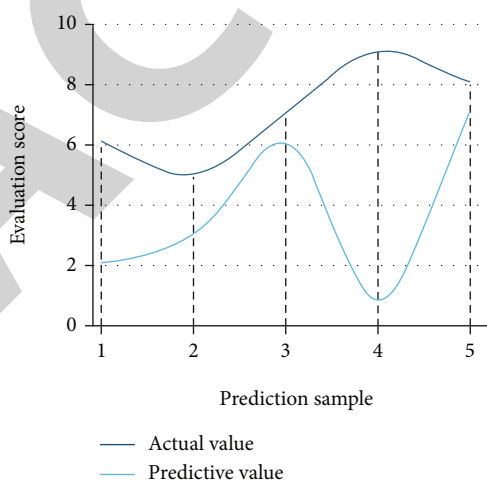


FIGURE 2: Comparison of teacher ability prediction results.

Establish a model to describe the relationship between these indicators and teaching effect, and then complete the evaluation of mathematical model scheme. In the information age, learning evaluation takes promoting students' development as the core concept of evaluation and takes students' learning process and learning results as the evaluation object. Taking the investigation of students' ability as the core content of evaluation, it emphasizes the diversified evaluation subject of the combination of teacher evaluation, peer evaluation, and self-evaluation. And show them the latest scientific and technological knowledge achievements of this era, expand college students' knowledge, and improve college students' professional quality and professional skills. These universities and related majors are increasingly unable to meet the development requirements of information technology. Static data and dynamic data are complementary to each other. Either data alone is not comprehensive enough. Only the combination of these two data can be considered accurate and comprehensive. It is a method to make decisions for complex systems that are difficult to quantitatively

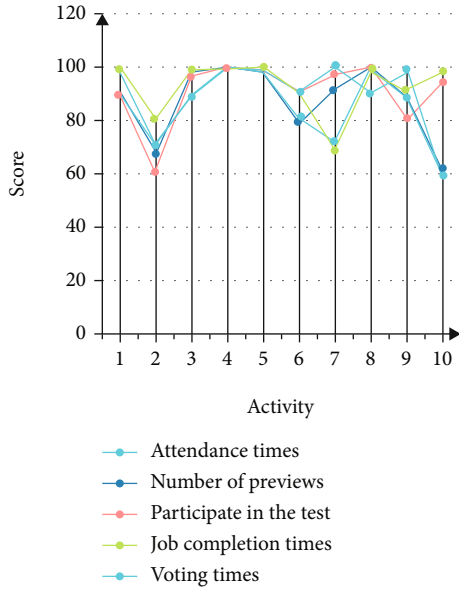


FIGURE 3: Visualization results of students' learning attitudes and necessary learning activities initiative.

analyze. Originally, the analytic hierarchy process (AHP) is to decompose a problem into various components according to the goal it wants to achieve. The method of controlling the particle size of loop unrolling can completely expand the inner circulation without expanding the outer circulation, because the deeper the loop, the more times it will be executed when the system is running. Expanding the inner loop can significantly improve the running speed of the system. For example, if the examination result of a certain course is not satisfactory, it may be a teaching problem, and these problems will be reflected in the data.

4.2. *The Role of the Results of Teaching Evaluation.* Because teaching evaluation can timely understand and adjust the learning situation of students and teachers' teaching situation, the importance of teaching evaluation is unquestionable, and the results of teaching evaluation can help teachers to adjust the teaching content. The difference between the convolutional neural network accelerators implemented by the two is that the slice granularity of loop unrolling is different, resulting in different hardware consumption and final performance of the convolutional neural network accelerator. This kind of space isolation can easily lead to the lack of students' emotions. An open English learning study shows that in the process of big data, learners' self-control is easily shaken, their adaptability to new learning methods is relatively weak, and their emotions fluctuate greatly. According to the existing activity data of students, the scores of students' various learning activities are displayed, and the final scores of students can be obtained by weighting the scores of various activities. Some students' activities are shown in Figures 3–6.

The main problem that deep learning is eager to solve is to organically combine the extracted simple features through automated methods to make them more complex features

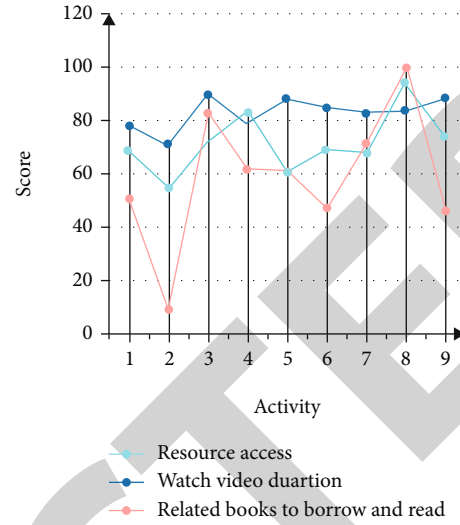


FIGURE 4: Visualization results of students' learning attitude and self-directed learning activity initiative.

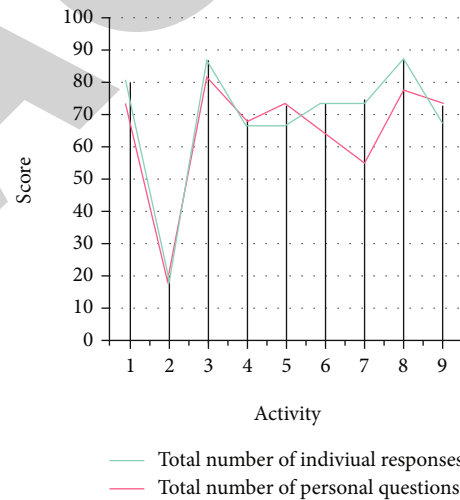


FIGURE 5: Visualization results of students' learning attitudes and necessary learning activities initiative.

and use these combined features to solve problems. In addition, the more variables the model contains, the higher its complexity will be. If irrelevant variables are introduced into the model, it will unnecessarily increase the complexity of the model and is not conducive to a good interpretation of the model. The “process” of process evaluation is oriented relative to the “result.” Process evaluation is not an evaluation that only pays attention to the process but not the result, let alone simply observing the performance of students. The self-study classroom is for students to borrow and read. Students can read, extract, and mark without taking out the teaching evaluation, which provides convenience for students to read. At the same time, the teaching management department can use the results of teaching evaluation to solve hidden problems in teaching activities. At the same time, the teaching evaluation can also find out the situation

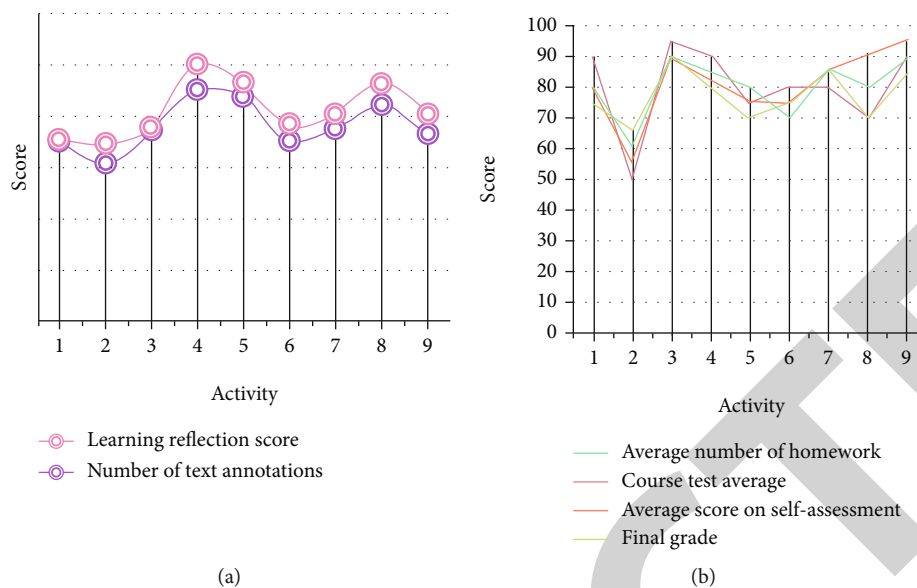


FIGURE 6: Visualization results of student content mastery.

in the evaluation indicators and can also understand and investigate this and put forward some suggestions for improvement. Promoting teaching is mainly in the transformation of hardware and investment in order to build a platform suitable for the development of students' basic skills of English majors, so as to meet the training of students' basic skills of English majors. In terms of the construction concept of language laboratory, the college has changed from the traditional construction of training places to the construction of modern independent learning center integrating teaching, self-study, and examination. Create an atmosphere in the environment and promote the construction of campus culture.

## 5. Conclusions

In the context of big data, Chinese colleges and universities can use information technology and big data ideas to carry out teaching evaluation and comprehensively use a variety of data mining and analysis techniques to mine and analyze teaching evaluation data and provide timely feedback. For example, through a large amount of data, the overall learning status of students can be monitored more comprehensively, to fully grasp the students' learning situation and to achieve a balanced and personalized teaching. The current online education system does not have the function of learners' emotion recognition, resulting in the phenomenon of "emotional lack" in online classrooms, which causes many learners to have no interest in learning and lack of concentration. When the learner uses the recognition program to carry out learning, the learning task can be completed in a shorter time, and the learning efficiency is higher. Mathematical models for building mathematical models in the era of big data are designed. Research the evaluation and formulation of mathematical model programs, make full use of educational big data information, and provide scientific sup-

port for educational decision-making. At the same time, it also helps teachers improve teaching and enhance teaching quality, so that students can better understand their learning level, and promote the reform of teaching evaluation in colleges and universities.

## Data Availability

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

## Conflicts of Interest

The author declares no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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