



# Research on Teaching Quality Evaluation in Colleges and Universities Based on Data Mining

## The Case of Chinese Language and Literature Teaching

Min Zhao<sup>1,2</sup>(✉), Lanqing Ou<sup>1</sup>, Junqing Wang<sup>2</sup>, and Qianyu Ma<sup>1</sup>

<sup>1</sup> Northwest Minzu University, Lanzhou 730000, Gansu, China  
minminleemo2023@163.com

<sup>2</sup> Shanxi Datong University, Datong 037005, Shanxi, China

**Abstract.** In order to solve the deficiencies in the current teaching quality assessment process in colleges and universities and improve the accuracy of teaching quality assessment in colleges and universities, this paper takes the model of Chinese language and literature teaching as an example, and designs a college teaching quality assessment model based on data mining algorithms. The model firstly researches and analyzes the relevant literature on the current Chinese language and literature teaching quality evaluation, and establishes the influencing factors of the teaching quality evaluation in colleges and universities; then, collects the data of the influencing factors of the Chinese language and literature teaching quality, and establishes the learning sample of the teaching quality evaluation in colleges and universities. This paper introduces the data mining technology BP neural network to train the learning samples, form the Chinese language and literature teaching quality evaluation model, and analyze the superiority of the Chinese language and literature teaching quality model through specific examples. The results show that the data mining algorithm can describe the evaluation results of Chinese literature teaching quality level with high precision.

**Keywords:** Quality Assessment · Influencing Factors · Data Mining Algorithm · Learning Samples · Chinese language and literature teaching

## 1 Introduction

With the continuous increase of the number of college students, the status of teaching quality in the quality of college education has become more and more obvious [1]. It has become an indicator to measure the teaching effect and talent evaluation of colleges and universities [2]. The consensus of colleges and universities. In a university, because there are quite a lot of subjects, there is a certain overlap between disciplines, and the teaching methods are flexible and diverse, the evaluation of teaching quality in colleges and universities has become quite complex, which is a rather challenging problem [3]. Taking the model of Chinese language and literature teaching as an example, this paper designs

a teaching quality evaluation model based on data mining algorithm, and expounds that based on data mining technology, it analyzes various information of students and teachers, and obtains relatively accurate teaching quality evaluation results [4].

## **2 Current Situation of Chinese Language and Literature Teaching in Universities Under the Background of Big Data Mining Technology**

According to McKinsey, a world-renowned consulting firm, in its research report *big Data: Innovation, Competition and The Future Frontier of Productivity*, “data as an important factor of production has permeated all industries in today’s society.” [9] “Modern education must be data-driven, not a purely empirical exercise.” [10] Therefore, in the teaching of Chinese language and literature, only by clarifying the research status of this major can we provide corresponding technical support for the subsequent improvement of the corresponding education quality.

### **2.1 Impact on Educational Objectives**

Under the background of big data mining technology, the corresponding teaching goal, great changes have taken place, focus on the Chinese language and literature education in such aspects as data collecting, sorting, analysis the influence of, when making relevant Chinese language and literature teaching goal, needs to use data mining technology, fully analyzing the students’ learning and cognitive level, targeted to the classroom teaching. Then improve the quality of teaching.

### **2.2 Influence of Teaching Resource Allocation**

Big data mining technology makes it easier to capture students’ learning status and interests, understand students’ autonomous learning, and optimize the allocation of teaching resources to improve the overall teaching efficiency and quality. The precision, bias and pertinence of learning resources brought by data mining analysis are more in line with diversified and personalized classroom teaching and easier to teach students according to their aptitude. At the same time, Chinese language and literature teachers will also use big data mining technology to collect and sort out data in advance, change the content and method of classroom teaching, so as to fully mobilize students’ enthusiasm and initiative, enrich classroom content and improve learning efficiency.

### **2.3 Influence of Teaching Methods and Methods**

Big data mining technology has great impact and change on teachers’ teaching and students’ learning style. In the traditional teaching, teachers or make a centralized “education”, or “cramming” teaching, it is difficult to give attention to two or more arrives the enthusiasm of students learning and subjectivity, Using data mining technology, fully tap before, during and after the student to study the large data analysis, can students learning interest and learning at any time control of the degree, is beneficial to improve the efficiency of classroom teaching, students can also command the difficult point of teaching, to dispose the lines, to enhance the perception of learning.

### 3 Data Mining Algorithms

The current teaching quality assessment in colleges and universities can be divided into two branches: one is the assessment method of college teaching quality based on qualitative analysis. Analyze the overall trend of changes [5]. Another branch is the quantitative analysis-based teaching quality assessment method in colleges and universities, which is subdivided into: traditional statistical college teaching quality assessment methods and machine learning algorithms for colleges and universities. Teaching quality assessment methods. Traditional statistics mainly include linear regression and gray theory. The factors they consider are simple, and they can only describe the simple and linear statistical relationship between the influencing factors and the teaching quality of colleges and universities, so that the accuracy of teaching quality evaluation in colleges and universities cannot meet the actual requirements. In practical applications, the problem of parameter optimization of BP neural network and the problem of structure determination of extreme learning machine have not been effectively solved, which directly affects the evaluation results of teaching quality in colleges and universities [6].

Aiming at the problem that the current model cannot accurately evaluate the teaching quality of colleges and universities, aiming at improving the accuracy of teaching quality evaluation in colleges and universities, this paper designs a teaching quality evaluation model based on data mining algorithm, and analyzes the superiority of the teaching quality model in colleges and universities through specific examples.

The BP neural network includes an input layer, an output layer and a hidden layer. If the input of the input layer is  $x(i)$ , then its output is:

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

Assuming that the weight coefficient of the hidden layer of the BP neural network is  $w_{ij}^{(2)}$ , and  $f[\cdot]$  represents the mapping function, then the input and output calculation formulas are respectively expressed as:

$$net_i^{(2)}(k) = \sum_{j=1}^m w_{ij}^{(2)} O_j^{(1)}(k) \quad (2)$$

$$o_i^{(2)}(k) = f[net_i^{(2)}(k)] \quad (3)$$

Assuming that the weight coefficient of the output layer of the BP neural network is  $w_{ij}^{(2)}$ , and  $g[\cdot]$  represents the mapping function, then its input and output calculation formulas are respectively expressed as:

$$net_l^{(3)}(k) = \sum_{i=1}^m w_{il}^{(3)} O_i^{(2)}(k) \quad (4)$$

$$o_l^{(3)}(k) = g[net_l^{(3)}(k)] \quad (5)$$

For the  $M$ th sample, its actual output and network output are  $O_M(k+1)$  and  $O'_M(k+1)$  respectively, then the calculation formula of its error is:

$$E_M = \frac{1}{2} [O_M(k+1) - O'_M(k+1)]^2 \quad (6)$$

For all training samples, their total error is calculated as:

$$E_M = \sum_{M=1}^M E_P = \sum_{M=1}^M * \frac{1}{2} [O_M + (k + 1) - O'_M(k + 1)]^2 \tag{7}$$

where M is the number of training samples.

## 4 Design of Teaching Quality Evaluation Model Based on Data Mining Algorithm

### 4.1 Quality Assessment Algorithm Model

See Fig. 1.

### 4.2 Factors Influencing the Quality of Chinese Language and Literature Teaching

In order to better evaluate the teaching quality of colleges and universities, first of all, it analyzes some influencing factors related to the evaluation of Chinese language and literature teaching quality. The details are shown in Table 1.

### 4.3 Evaluation Steps of Chinese Language Teaching Quality Based on Data Mining

- 1) Collect data according to the influencing factors of college teaching quality evaluation in Table 1.
- 2) The corresponding college teaching quality grade value is determined by experts according to the influencing factors of college teaching quality evaluation.
- 3) Determine the structure of the neural network BPNN according to the influencing factors of college teaching quality evaluation.

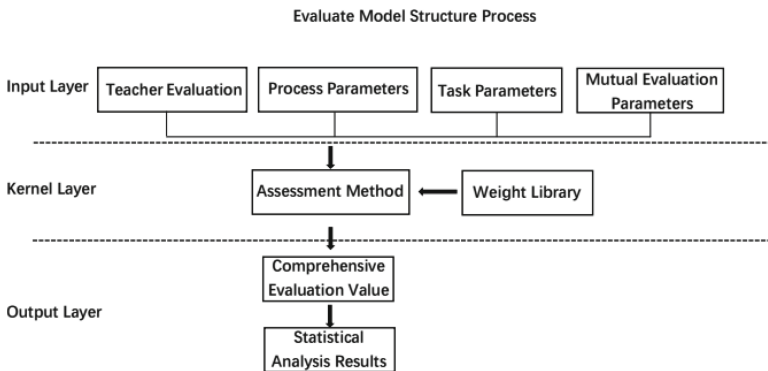


Fig. 1. Evaluate Model Structure Process

**Table 1.** Influencing factors of teaching quality evaluation

Internal factors	External factors
Adjust the number of class hours	Teaching skills
Number of suspensions	the logic of the content
Substitutes	teaching atmosphere
Number of revision assignments	depth of teaching content
Early dismissal times	teacher's responsibility
Postponement of classes	Professionalism in marking assignments

- 4) The adaptive genetic algorithm is used to determine the initial value of the hidden layer and the output layer weight, the value of the learning rate and the momentum factor.
- 5) Determine the number of hidden layer nodes according to the number of input nodes of the neural network.
- 6) According to the learning samples of college teaching quality assessment, the BP neural network is trained until the training error meets the preset range.

## 5 Case Analysis of Teaching Quality Evaluation Model

### 5.1 Comparison of the Performance of the Teaching Quality Evaluation Model in Colleges and Universities with the Classic Model

In order to analyze the advantages of the data mining algorithm's teaching quality evaluation model in colleges and universities, on the same platform, the standard BP neural network and the college teaching quality evaluation model in the literature [8] are used for comparative analysis. Select the Chinese language and literature of a certain 20 universities as the research object. The number of teachers selected by each university is shown in Fig. 2. The corresponding influencing factor values are collected. Due to the limited space, they are not listed one by one.

The average accuracy of the Chinese language and literature teaching quality evaluation of the standard BP neural network is 78.45%, and the Chinese language and literature teaching quality evaluation error is the largest. This is because its parameters are determined in a random way, and it is impossible to establish an evaluation model that describes the complex and changing characteristics of Chinese language and literature teaching quality, resulting in many overfitting points of Chinese language and literature teaching quality evaluation, and the worst effect of Chinese language teaching quality evaluation.

### 5.2 Effectiveness of Big Data Mining Technology

Education is neither a tool nor an appendage of technology [7]. In specific teaching, the application of big data mining technology has achieved good results in the richness of lesson preparation, effectiveness of class, independent learning effect and pass rate of grades (Table 2).

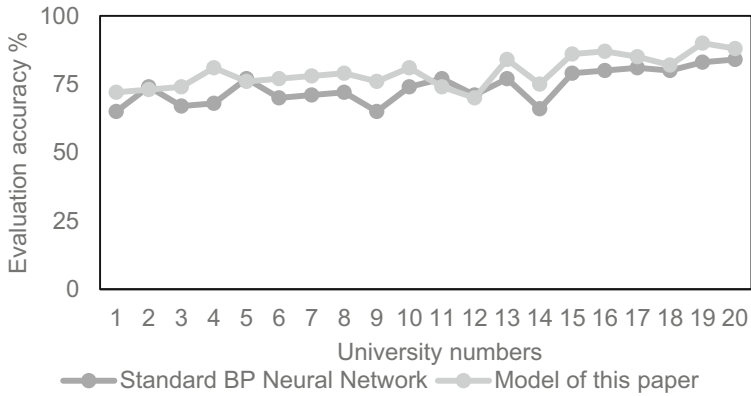


Fig. 2. Comparison of Teaching Quality Assessment Accuracy

Table 2. Effectiveness of big data mining technology

Year	Effect of preparation	Class effect	Effect of learning	Passing Rate
2020	85%	83%	General	84%
2021	96%	95%	Good	96%

## 6 Conclusion

In order to obtain better teaching quality evaluation results in colleges and universities, the BP neural network of data mining technology was introduced to establish a teaching quality evaluation model in colleges and universities. The introduction of Chinese language and literature teaching into data mining technology has important theoretical and practical significance. At the same time, this technology also has a good development trend and broad development space. Making full use of this technology can create more benefits and values in Chinese language and literature education. The results show that the model in this paper is an efficient teaching quality evaluation model in colleges and universities, and has a very wide range of application value.

**Fund Project.** This paper was supported by 2019, 2020 University-level Educational Reform Project of Shanxi Datong University XJG2019226), (XJG2020240), 2021 Innovation project of teaching reform in Shanxi Province (J2021511).

## References

1. Fu Cuixia, Luo Yiyong. An evaluation model of the theoretical and experimental teaching quality in colleges and universities based on RVM machine learning method [J]. Modern Electronic Technology, 2019, 42(13): 181-186.
2. Yue Qi, Wen Xin. Research on Teaching Quality Evaluation Model Based on GA and BP Neural Network [J]. Journal of Inner Mongolia University (Natural Science Edition), 2018, 49(2): 204-211.

3. Zhao Xinrui, Zhou Yuqing. Teaching Quality Evaluation of College Physics MOOC Based on Fuzzy Comprehensive Evaluation Method [J]. Higher Engineering Education Research, 2019(1): 190-195.
4. Zhang Mingya. Evaluation of English teaching quality based on principal component analysis and support vector machine [J]. Modern Electronic Technology, 2018, 41(7): 178-182.
5. Zhang Yaqing. A model of assisted teaching quality assessment based on active learning support vector machine [J]. Modern Electronic Technology, 2019, 42(7): 112-114.
6. Ma Xing, Wang Nan. Construction of College Teaching Quality Evaluation System Based on Big Data [J]. Education Research of Tsinghua University, 2018, 39(2): 38-43.
7. Sun Kwanning. Individual development paradox and its resolution in artificial intelligence education [J]. Chinese Journal of Education Science, 2021.4(04):100-111
8. Liu Zhiping. Teaching quality evaluation in colleges and universities based on the integration of evidence theory and support vector machine [J]. Modern Electronic Technology, 2017, 40(17): 175-178
9. Mickinsey Global Institute. Big Data: The Next Frontier for innovation, Competition and Productivity[R].Mickinsey Global Insitute,2011.
10. Yang kaecheng. Why education is big data [J]. Research of electronic education, 2019,40(02):5-11

**Open Access** This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

