



Evaluation Method of Teaching Effect of Applied Logistics Management Course Based on Deep Learning

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Abstract. In order to improve the teaching quality of applied logistics management course, a model of teaching effect evaluation based on deep learning is designed. The evaluation system of teaching effect of applied logistics management course is constructed, and the evaluation model of teaching effect is established by using the method of deep learning according to the evaluation system, and the evaluation level analysis is carried out on the evaluation value. The experimental results show that the design evaluation model is more accurate and the error value is smaller than the traditional model. Therefore, the evaluation model of teaching effect based on deep learning is more in line with the teaching effect requirements of applied logistics management course.

Keywords: Deep learning · Applied logistics management · Teaching effect evaluation · Artificial neural network

1 Introduction

Course teaching effect is the basic standard of college teaching. With the arrival of the popularization of higher education in China, how to ensure the teaching quality of applied logistics management course while expanding the enrollment scale has become an important task for higher education in the new era [1, 2]. In order to meet the needs of the future development of the logistics industry, and to train senior technical personnel with solid basic theoretical knowledge of logistics and proficient in the core competence of the major, applied undergraduate majors have emerged. How to ensure the quality of application-oriented talent training while adapting to the needs of society is an urgent problem that needs to be solved in this profession. High quality teaching effect evaluation is the basis and premise of verifying teaching quality. The formulation and implementation of professional teaching effect evaluation method can make the logistics professional teaching quality management from illusory, free and changeable to the track of standardization, systematization and institutionalization.

At this stage, the traditional teaching effect evaluation method of logistics management course can not meet the development needs of the professional application-oriented

talents. There is no scientific and standardized teaching quality assurance system in the traditional teaching effect evaluation mode, so the teaching quality standard can only stay in words and oral, and can not be truly implemented. Therefore, this paper uses the artificial neural network technology in deep learning to optimize the traditional teaching effect evaluation method of logistics management course. Artificial neural network is a complex machine learning algorithm. Aiming at the current teaching effect of applied logistics management, this paper designs the evaluation method of teaching effect by using artificial neural network model, further improves the evaluation method of course teaching effect, and promotes the improvement of teaching effect of applied logistics management course.

2 Design of Teaching Effect Evaluation Method for Applied Logistics Management Course Based on Deep Learning

Based on the deep learning background, the teaching effect model of application-oriented logistics management course is set, and through the analysis and Research on the system process of the set teaching effect evaluation model, the teaching effect evaluation

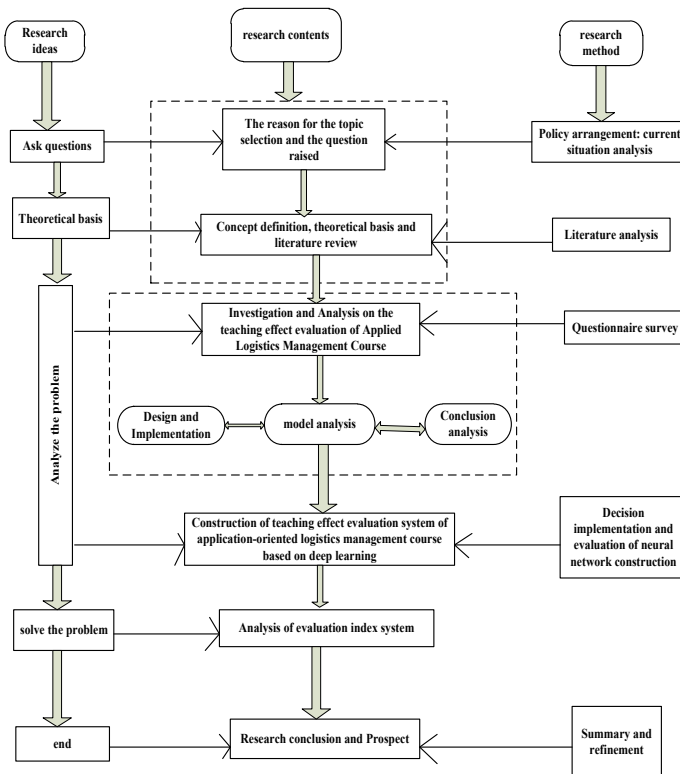


Fig. 1. Flow chart of the evaluation method of applied logistics management course teaching effect

model of application-oriented logistics management course is completed according to the following system process.

According to the process of effect evaluation model set in Fig. 1, the teaching effect evaluation model of application-oriented logistics management course based on deep learning is designed. According to the model setting experiment, the feasibility of the design effect model in this paper is tested.

2.1 Teaching Effect Evaluation System of Applied Logistics Management Course

Before establishing the teaching effect evaluation model of application-oriented logistics management course based on deep learning, we should first determine the evaluation index system. Based on the principles of scientificity, comprehensiveness, accuracy and operability [3, 4], taking the application-oriented logistics management course teaching effect evaluation index as the research object, the evaluation index system based on deep learning should be designed. The network structure of teaching quality evaluation model (Fig. 2).

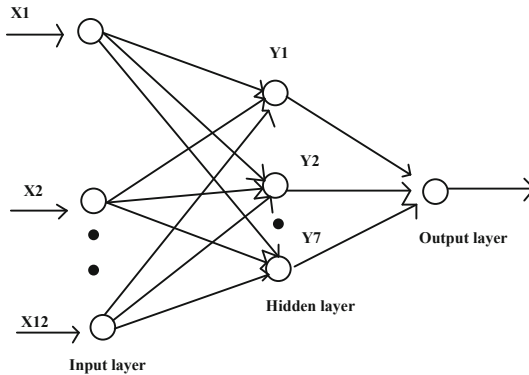


Fig. 2. Deep learning model diagram of teaching effect of applied logistics management course

The teaching effect evaluation index system is designed by using the above model as shown in the table below (Table 1).

The course schedule of applied logistics management is divided in detail, such as the main idea of each chapter, course schedule, teaching attitude and so on. The neural network model is constructed by using its index system, and the evaluation method designed in this paper is deeply studied by constructing the teaching effect evaluation model.

2.2 Construction of Evaluation Model Based on Deep Learning

Because the evaluation of the teaching effect of applied logistics management courses requires comprehensive and multi-level analysis and research on the problem, which contains too many uncertain factors. In order to solve the problems of weight determination and data dispersion in the process of experiment, a teaching effect evaluation model

Table 1. The teaching effect evaluation system of applied logistics management courses based on deep learning

Primary indicators	Serial number	Secondary indicators
Teaching attitude	1	Abide by laws and regulations, no lateness, early leave, absence from class
	2	Love students and care about their growth
	3	Be rigorous in academic research, prepare lessons, correct homework seriously, answer questions and solve puzzles seriously and responsibly
Content of courses	4	Clear teaching objectives, highlight the key points of teaching, and be good at teaching students in accordance with their aptitude
	5	The language is concise and accurate, and the advanced teaching methods are used to teach courses
	6	Good at combining theory and practice to develop students' sense of innovation
Teaching method	7	High professional theoretical level and strong practical ability
	8	Follow the outline closely and connect with reality
	9	The classroom atmosphere is enthusiastic, encouraging students to actively participate in the teaching process
Teaching effectiveness	10	Through teaching, students master the theoretical knowledge of the course
	11	Through teaching, improve students' self-study ability in relevant courses
	12	Through learning, help students find problems in the course

is designed. Using the experimental target value under the condition of reducing the speed is most suitable for the variance problem of the numerical evaluation model. The article uses the artificial neural network [5, 6] in the deep learning mode to evaluate the teaching effect of applied logistics management courses. Through the in-depth study of the model, the accuracy of the data processing of the obtained indicators is ensured, and the feasibility of the course teaching model is improved. In this paper, we introduce the set of evaluation elements as the set of factors that affect the evaluation objectives, that is, "A" is used to represent, and $A = \{A_1, A_2, \dots, A_n\}$, where $A_i (i = 1, 2, \dots, n)$ represents each element in the set, which constitutes the elements of the teaching effect evaluation target set. The information contained in the set is fuzzy. According to the hierarchical structure of the teaching effect evaluation index of the applied logistics management course, four first-level evaluation indexes can be expressed as $A = \{A_1, A_2, A_3, A_4\}$.

In the set of teaching effect evaluation targets, A_1 is the teaching method, A_2 is the teaching effect, A_3 is the teaching content, and A_4 is the teaching attitude. Each first-level indicator is divided into several second-level indicators that affect the higher-level indicators. For example, the teaching methods in the first-level indicators are divided into guided teaching, flexible teaching methods, teaching integration with practice, and teaching method innovation, which can be expressed as $A = \{A_{11}, A_{12}, A_{13}, A_{14}\}$. The same way can be used to establish the teaching effect evaluation element set. The teaching effect evaluation index of application-oriented logistics management course designed above is simplified. Under the determined evaluation target, it is divided into four first level indicators and sixteen second level indicators, and α is the weight value. The importance of different teaching effect evaluation elements is not the same, and the evaluation results of teaching effect are also different. In order to reflect the importance of teaching effect evaluation elements more scientifically, the weight value of objective element $\alpha_i (i = 1, 2, \dots, n)$ is constructed for evaluation element $ai (i = 1, 2, \dots, n)$, that is, the teaching effect evaluation weight set $\alpha = \{\alpha_1, \alpha_2, \dots, \alpha_n\}$; the weight value $\alpha_i (i = 1, 2, \dots, n)$, with the normalization and non negative, the factor set is as follows:

$$\sum_{i=1}^n b_i = 1, b_i \geq 0 \quad (i=1,2,\dots,n) \tag{1}$$

The teaching effect evaluation element set $ai (i = 1, 2, \dots, n)$ can be regarded as the degree of membership under the teaching effect evaluation result set, and the weight value set is a subset of the element set. In order to avoid the artificial subjectivity in the setting of the weight value, the fuzzy consistent judgment matrix is used to obtain the corresponding weight value. According to the constructed secondary factor set [7] $A = \{A_{11}, A_{12}, A_{13}, A_{14}\}$, the fuzzy description of the factor set is judged by the quantitative scale., Construct a judgment matrix with the same ambiguity, as follows:

$$R = \begin{pmatrix} r_{11} & r_{12} & r_{13} \\ r_{21} & r_{22} & r_{23} \\ r_{31} & r_{32} & r_{33} \end{pmatrix} \tag{2}$$

Among them: r_{ij} is a factor, ai and aj are relatively important membership relations, and the weight meets the following conditions:

$$u_i = \frac{1}{n} - \frac{1}{2r} + \frac{1}{nr} \sum_{j=1}^n r_{ij}, i = 1, 2, \dots, n \tag{3}$$

It can be seen from formula (3) that r can:

$$r \geq \frac{n - 1}{2} \tag{4}$$

In the above formula, the larger the selected value r , the smaller the weight difference; the smaller the r , the larger the weight difference. Therefore, the larger the value of r , the more it shows that the teaching effect model ignores the factor of the importance of elements. In practice, $r = \frac{n-1}{2}$ is generally adopted. This is the way to ignore the importance of elements.

Because the teaching effect evaluation set model is a set of quantitative evaluation of the evaluation objects by the participants. If it is marked as V , then $V = \{v_1, v_2, \dots, v_m\}$, where $v_i (i = 1, 2, \dots, n)$ in set V represents the total evaluation result of teaching effect. By considering all the influencing factors in the teaching effect model, the best result is selected.

Fuzzy comprehensive evaluation [8, 9], as an evaluation method in the artificial neural network model, is to evaluate all the fuzzy vector element sets, and obtain the scientific evaluation results that best reflect the characteristics of things through the comprehensive evaluation of the impact evaluation target, Fuzzy comprehensive evaluation considers the influencing factors involved in the evaluation objective more comprehensively, and can be expressed in the results with the characteristics that are most in line with the actual situation. In the fuzzy evaluation of the teaching effect evaluation target element, suppose that when the i element A_i in the teaching effect evaluation target fuzzy vector set is evaluated, the membership degree of the j element v_j of the effect evaluation set is O_{ij} , then the i element A_i a single evaluation set $O_i = (o_{i1}, o_{i2}, \dots, o_{im})$ derived from the evaluation result.

Since the evaluation of a single element can only reflect the influence of a single element on the evaluation goal, the evaluation of the teaching goal can only reflect the scientificity and correctness of the evaluation goal result only when the overall fuzzy evaluation is carried out. If the weight set R is a fuzzy matrix with one row and n columns, combine the weight set with a single-element matrix to obtain a fuzzy set C_i ;

$$C_i = A_i \bullet R_i = (a_1, a_2, \dots, a_m) \begin{pmatrix} r_1 & r_{i12} & \dots & r_{i1m} \\ r_{i21} & r_{i22} & \dots & r_{i2m} \\ \vdots & \vdots & \ddots & \vdots \\ r_{im1} & r_{im2} & \dots & r_{imm} \end{pmatrix} \tag{5}$$

In the above formula, $c_j (j = 1, 2, \dots, m)$ is the evaluation index. The first level evaluation judgment matrix can be obtained from the fuzzy vector element set of the second level evaluation.

2.3 Grading of Evaluation Results

Through the evaluation value obtained from the deep learning-based applied logistics management course teaching effect evaluation model set above, the evaluation level is analyzed, and the first-level index weight and the first-level index fuzzy relationship matrix W obtained by the design are used, thus, The intermediate variable S is obtained, and the formula is shown below.

$$W = S \circ R = S \circ \begin{pmatrix} C_1 \circ R_1 \\ C_2 \circ R_2 \\ C_k \circ R_k \end{pmatrix} = (b_1, b_2, \dots, b_p) \quad (6)$$

Among them, $b_k (k = 1, 2, \dots, P)$ refers to the comprehensive evaluation value of each evaluation index, that is, the final value in the teaching process of the application-oriented logistics management course; by normalizing b_k [10–12], the evaluation value can be calculated, that is, the w value, then the evaluation level of the application-oriented logistics management course can be obtained.

$$w = b_k \times v^T \quad (7)$$

As a result, the evaluation grade w of the teaching effect evaluation of the applied logistics management course is obtained. If the value of w is in which level of the teaching effect evaluation grade, the overall comprehensive evaluation is at which evaluation grade.

Through the evaluation of the teaching effect of application-oriented logistics management, the teaching effect evaluation model based on deep learning is set on the basis of the traditional evaluation model. Through the deep division of the first level index into the second level index, combined with the secondary index weight obtained, the weight values of the first and second level indicators are obtained, and the relationship moments are obtained by different weight values Array.

R obtains the intermediate value B , and then normalizes the obtained B to obtain the evaluation value, that is, the shape value, which can obtain the grade level, which is the comprehensive evaluation result of the teaching effect of the applied logistics management course designed in the article.

3 Experimental Demonstration Analysis

3.1 Experimental Environment Setting

In order to better verify the feasibility of the optimization design of the effect evaluation model of the application-oriented logistics management course teaching based on deep learning, the experimental link is constructed, and the advantages of the design system in this paper are verified by comparing the design model and the traditional model.

This experiment uses the BP neural network evaluation model to collect data for the experiment. Because the BP algorithm is very sensitive to the network structure, different network structures have different ability to solve problems. The more complex the structure of the neural network, the stronger its ability to handle complex nonlinear

problems, but the longer the training time; if the neural network structure is too simple, the network training will be difficult to converge or even if it can converge, the time will be too long. Studies have shown that increasing the number of hidden layers can improve the nonlinear mapping ability of neural networks and enhance the network's ability to deal with complex nonlinear problems, but too many hidden layers will prolong the learning time of the network. Therefore, the number of neurons in the input layer is set to $n = 4$, the number of neurons in the hidden layer is $s = 4$, the activation function of the BP neural network neurons is a combination of the rectified linear unit and the Maxout function, and the learning rate is set to 0.05, the coefficient of inertia is 0.9%, and the maximum number of training sessions is 15,000. Introduce the matlab programming to the set experiment and use the LMBP algorithm to make each iteration no longer follow a single negative gradient direction, but allow the error to search along the direction of deterioration, and use the different accuracy error values obtained as a comparison Parameters to verify the feasibility of the teaching effect evaluation model of the design course in the article.

3.2 Experimental Process

The design teaching effect evaluation model in the text is compared with the traditional model under the experimental environment set above, and the two models are subjected to 5 repeated experiments at the same time with the same experimental process, and the experimental results are extracted. The experimental steps are as follows:

First of all, the traditional model and the teaching effect model designed in this paper are initialized with network and parameters, and random values between $[-2/n, 2/n]$ are given to each connection weight coefficient β_{ij} , β_j and threshold value δ_j , δ , where $i = 1, 2, \dots, n, j = 1, 2, \dots, s$.

Secondly, in each of the two models, a pair of sample training data $Ep = [e_1, e_2, \dots, e_{16}]$ is selected as the input layer and yp is the expected output. Use the data Xp obtained in the input layer to connect the weight coefficient β_{ij} and the threshold β_j to calculate the output of each hidden layer neuron.

Finally, through the iterative calculation of the experimental process, the error values of the two models are obtained, and then a second pair of samples is selected for training, and the above algorithm is repeated until the end of the five experimental runs of the two models.

3.3 Analysis of Experimental Results

Use the above experimental process to extract the error data obtained from the traditional model and the teaching effect evaluation model set in the article. Under the condition of three different precision target values, draw two model error numerical curves, as shown in the following figure (Figs. 3, 4, 5).

From the above experimental results, we can see that when the set target value is constantly shrinking, and the data is processed through the interaction between independent neurons and hidden neurons, the error value of the course teaching effect evaluation model designed in this paper is the smallest, the result is the best, and it is easier to get the accurate value in a short time than the traditional model. Because the teaching quality

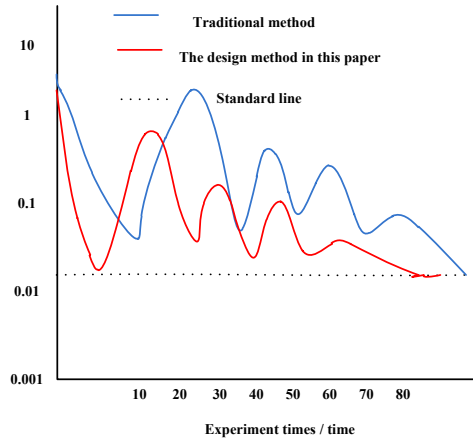


Fig. 3. Error curve of the traditional model and the design model in the text when the target is 0.01

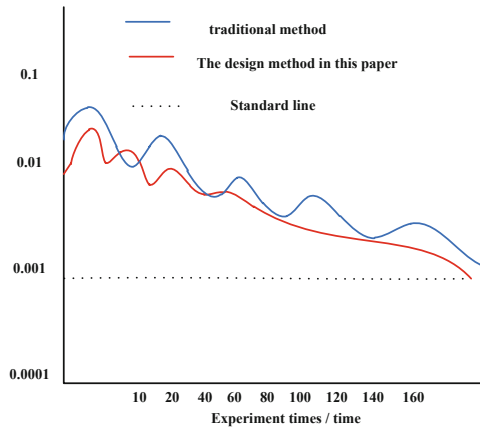


Fig. 4. Error curve of traditional model and design model in this paper when the target is 0.001

evaluation system in Colleges and universities is a complex nonlinear system, there are many uncertain factors between input and output. Neural network model, with its highly nonlinear function mapping function, self-adaptive and self-learning ability, can effectively overcome the defects of traditional evaluation methods and weaken the artificial influence factors of index weight determination in traditional evaluation methods when the structure of the network and its algorithm are determined, the output accuracy of the network depends on the quantity and quality of the input samples. The more the number and the better the quality of the samples, the closer the output evaluation value of teaching effect is to the actual evaluation value, and the more accurate the effect of teaching quality can be described. Therefore, the teaching effect evaluation model designed in this paper is better than the traditional system model.

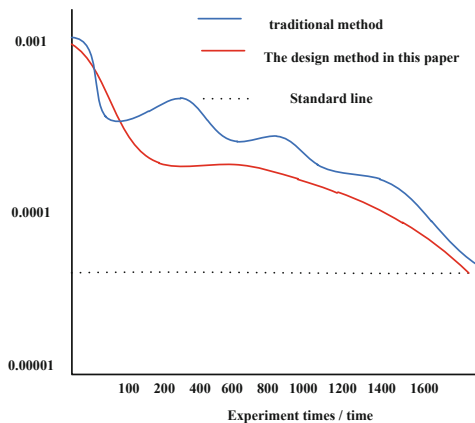


Fig. 5. Error curve of the traditional model and the design model in the text when the target is 0.0001

4 Concluding Remarks

Improving applied logistics management talents has become an urgent problem in the current logistics industry. The basis of solving this problem is to improve the evaluation method of applied logistics management course. With the deepening of teaching reform in Colleges and universities, how to improve the teaching quality and train more applied talents has become the core of the teaching reform in Colleges and universities. The establishment of a course teaching effect evaluation method that focuses on improving teaching quality also highlights its importance. significance. Through the study of the teaching effect evaluation method of applied logistics management courses based on deep learning, artificial neural network technology is added to the traditional teaching evaluation model to comprehensively collect, organize and analyze the teaching status, and make value judgments on it to improve teaching Activities, the process of improving teaching quality, and comparing the teaching effect evaluation of the set courses in the article with traditional models through setting experiments, proves the use of neural network algorithms to optimize traditional effect evaluation methods. However, it is a very complex task to improve a teaching effect evaluation model. Due to the various and complex factors affecting teaching, this paper can not cover a wide range of situations. It is hoped that in the future, the evaluation model can be further optimized to make it more in line with the needs of application-oriented Logistics management course teaching effect evaluation method.

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