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Retraction

Retracted: Evaluation of Japanese Teaching Quality Based on Deep Neural Network

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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

In addition, our investigation has also shown that one or more of the following human-subject reporting requirements has not been met in this article: ethical approval by an Institutional Review Board (IRB) committee or equivalent, patient/participant consent to participate, and/or agreement to publish patient/participant details (where relevant).

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] H. Liu, "Evaluation of Japanese Teaching Quality Based on Deep Neural Network," *Security and Communication Networks*, vol. 2022, Article ID 3466632, 8 pages, 2022.

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Research Article

Evaluation of Japanese Teaching Quality Based on Deep Neural Network

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The 21st century is an era of rapid development of information and frequent international exchanges, and Japanese language teaching has received increasing attention. Because of this, colleges and universities are now focused on improving the quality of Japanese education, both now and in the future. We need to boost the whole management of teaching quality, notably the assessment of instructors' teaching quality, in order to improve teaching quality. However, because a number of factors influence the quality of instruction, and each factor's weight varies, the evaluation results are difficult to express in a mathematical analytical formula, resulting in a complex nonlinear classification problem that traditional classification methods cannot solve well. As a new technology, as a result of the artificial neural networks (ANNs) fundamental qualities, it has been extensively applied in different evaluation issues for pattern recognition, nonlinear classification, and other research. This subject introduces the optimized deep neural network theory into Japanese teaching quality evaluation and completes the following work: (1) the algorithm of discrete Hopfield neural network is introduced in detail, and the neural network theory is introduced into teaching evaluation. (2) Then, based on the evaluation data of teachers' teaching quality in a school, a large number of simulation experiments and training were carried out, and a neural network model for evaluation of teachers' teaching effect was constructed and designed. Experiments reveal that the neural network model proposed in this paper is a nonlinear mapping method, which increases the evaluation's dependability and makes the outcomes more effective and objective.

1. Introduction

The 21st century is an era of rapid development of information and frequent international exchanges. Due to the influence of global internationalization, foreign languages have now become an indispensable means of international communication. Under this background, Japanese teaching has received increasing attention, and the Japanese curriculum standard will also develop students' comprehensive language ability as the overall goal of the curriculum. Teachers are required to cultivate students' cultural literacy, language knowledge, emotional attitude, language skills, and learning strategies during the teaching period, while there are few studies on the evaluation system of Japanese teaching quality. But one of the important factors restricting the development of curriculum reform is the scientificity and rationality of the educational evaluation system. Classroom teaching is the main way for schools to achieve educational goals. Evaluating teachers' classroom teaching quality helps school leaders and managers to understand the degree of achievement of teaching goals, comprehensively and accurately grasp the school's teaching work, and improve teaching quality. The level of teaching work has a great impact on the level of personnel training, so the evaluation of school teaching level is a relatively complex process [1–5]. It is a multifactor, multivariable, fuzzy nonlinear process. The evaluation methods used in the teaching evaluation system include a weighted average method, analytic hierarchy process, grey relational evaluation theory, and fuzzy comprehensive evaluation. In classroom teaching evaluation, in order to objectively, impartially, and comprehensively understand students' views on teachers' teaching situation, the number of people participating in the evaluation is large, so the system data collection volume is large. Human variables have a significant impact on the evaluation of teaching quality. There are many subjective aspects in the assessment because of individual students' prejudices or preferences for specific teachers. Second, during the operation process, some students fill in some data and submit it, while others fill in the incorrect data, resulting in data loss or incompleteness. Finally, in the evaluation process, students' personal characteristics, including aesthetics, learning goals, personal interests, etc., are due to different personal starting points, resulting in uneven evaluation results when grading teachers [6–10]. Addressing the present state and existing challenges with the teaching quality evaluation system, this topic suggests a more effective technique for resolving such issues via the application of data network name (DNN) technology. With its basic capabilities of nonlinear mapping, learning classification, and real-time optimization, neural networks have paved the way for new directions in pattern recognition and nonlinear classification research, and they are extensively employed in a variety of evaluation issues. This topic integrates artificial neural networks into the system for evaluating teaching quality, which not only eliminates the direct impact of human variables on assessment outcomes but also develops a complete and appropriate evaluation index system.

The paper organizations are as follows: Section 2 defines the related work. Section 3 discusses the methods of the proposed concepts. Section 4 discusses the experimental analysis. Section 5 concludes the article.

2. Related Work

When developing the content of the teaching level evaluation system, keep in mind that because learning and development are continuous processes with diverse learning and growth environments, quantifying the role of a teacher in a particular course or learning stage is difficult. Generally, do not use course performance or teaching effect as the primary indicator, but rather focus on the teaching process. From the perspective of process management, the school teaching process is a combination of multifactor interaction and multilink; therefore, it is difficult to compare teaching across disciplines, courses of varying types, teaching connections, and teaching materials. As a result, the teaching quality assessment method is primarily based on the most fundamental variables that immediately represent the teaching level and share similarities. From the existing teaching level evaluation system, the design of indicators is mainly reflected in the following aspects:

(1) Teaching attitude
(2) Teaching content
(3) Teaching ability
(4) Teaching method
(5) Teaching and educating people
(6) Teaching effect

The emergence of artificial intelligence has changed the single and closed limitations of traditional teaching, and the system of evaluating teaching has been developed accordingly. In order to make the evaluation indicators more accurate, reference [11] first used factor analysis and then used cluster analysis, effectively combining three common methods to calculate the weight of each indicator, using two methods to verify the reliability of the empirical data. Reference [12] constructed a relatively accurate index system, perfected the traditional AHP, and it overcomes the limitation that the weight of each indicator is too different, and it will not be too small and obtained real data resources based on large samples to ensure the credibility of the data. Reference [13] conducted a related survey on the evaluation system of colleges and universities. In order to truly grasp the relevant problems in the evaluation of teaching in colleges and universities, two survey methods were adopted, and a preliminary understanding of the deficiencies in the evaluation system of colleges and universities was obtained. Reference [14] constructs an index system summarily by listening to the different opinions of various experts, calculates the weights, establishes a mathematical model, and finally develops a network platform for students to evaluate teachers online through the Internet. It is preliminarily proved that it is scientific by running the model, the system runs stably and reliably, achieves the predetermined goal of the subject, and realizes the practical value of the subject. Reference [15] found the shortcomings of the existing teaching evaluation methods by evaluating teachers in different classes and different disciplines and then developed an improved teaching evaluation method. First, analyze the reasons and sizes of the differences between different classes, explain the reasons for the need to be revised, and then find a research method to calculate the correction coefficient, get its regularity, find the method of the correction coefficient, reflect the impact of the course on the evaluation of teaching, so that the evaluation of teaching can be achieved. The method is grounded and authentic. Reference [16] shows that because human factors have an important impact on teaching evaluation, the evaluation system has a certain degree of grey characteristics. Reference [17] uses Bayesian classification to determine the evaluation system, explains the simple classifier, and lists classification examples. The data used in the experiment is the previous empirical data, which shows that the classification performance is relatively good and the classification accuracy is relatively high. The application of Bayesian classification technology in teaching evaluation is feasible. Reference [18] first uses the BP neural network to evaluate teaching and then verifies the correctness of this evaluation method. Reference [19] lists several different evaluation methods, expounds on the advantages and disadvantages of all evaluation methods, and decides to use ANN to evaluate teaching, then states the basic characteristics and operation process of the back-propagation (BP) neural network, and improves its incomplete evaluation method. Finally, a new evaluation model is established and the performance of the model is tested. Reference [20] introduced a new model, which has input-output characteristics and has the biological characteristics that Hopfield and Tank fully match, and it is concluded that this model has stable characteristics and accurately draws 100% accurate image results.

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In recent years, neural networks have garnered considerable interest because of their unmatched information processing and problem-solving capabilities, indicating a vast application potential. It offers a number of benefits that other approaches do not. The neural network approach is a robust, nonparametric technique with a high capacity for nonlinear mapping, self-learning, and classification accuracy. The neural network is failure tolerant due to its distributed storage structure. Local faults in a small number of units in the network will not result in the network's paralysis but will impair the overall situation, demonstrating the neural network's resiliency. The amazing superiority of neural network technology has been shown in pattern recognition and classification, recognition filtering, autonomous control, and prediction, among other applications. It is well known that it is capable of processing almost any form of data. This is unmatched by a large number of conventional approaches. The rules may be discovered by continual learning from a big quantity of complicated data with unknown patterns. The neural network technique simplifies the conventional analytical procedure and alleviates the difficulties associated with finding a suitable model function form. It is a naturally occurring nonlinear modeling procedure that simplifies modeling and analysis [21, 22].

3. Method

In the method section, discrete Hopfield neural network, working method and stability of the network, the construction of the indicator system, and model construction of neural network are explained.

3.1. Discrete Hopfield Neural Network. Feed forward neural network (FFNN) operation is one-way propagation, there is no feedback so it does not have dynamic behavior, and the convergence speed is slow. In the feedback neural network (FBNN), the DHNN is an important single-layer fully connected, FBNN model, which has extremely rich dynamic behavior and overall computing power, and has stronger computing power than the FFNN. It opens up new ways for neural networks to be used for associative memory and optimized computation. Therefore, it is feasible to use a discrete Hopfield neural network to classify teachers' teaching quality. The DHNN is fully connected, and its neurons have only two output values of 1 and −1, so it is called a discrete Hopfield neural network (DHNN). 1 and −1 in the output value indicate activation and inhibition states, respectively. That is to say, this is a single-layer full feedback network with a binary output value. This paper draws the structure diagram of the DHNN composed of three neurons, as shown in Figure 1.

From Figure 1, it is easy to know that the network structure consists of the 0 th layer and the 1st layer, the latter is a neuron, the former is not, it can be used as the input of the network; the latter has the function of calculation, the former is not; the calculation principle is the weight coefficient and input product of information is accumulated and summed, and the output information can

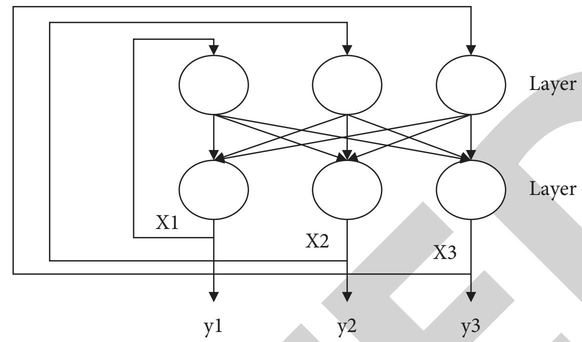

Figure 1: Discrete Hopfield neural network structure diagram.

be obtained under the action of the threshold function *f*. When the output information is less than the threshold δ, the neuron outputs −1, otherwise, it outputs 1. For such neurons with output values of 1 and −1, the calculation formula is

$$N_a = \sum_b w_{ba} y_b + x_a, \tag{1}$$

where x_a represents an external input.

$$\begin{cases} y_a = 1, & N_a \geq \delta_a, \\ y_a = -1, & N_a < \delta_a. \end{cases} \tag{2}$$

The network state is a collection, and the elements are the output information. For a neural network, assuming that its output layer is composed of m neurons, the state at time t can be represented by an m-dimensional vector:

$$Y(t) = \left[y_1(t), y_2(t), \ldots, y_m(t) \right]^T, \tag{3}$$

$y_a(t)(b = 1, 2, \ldots m)$ takes 1 or −1, and $Y(t)$ has 2^m values, that is, there are 2^m network states. The neural network in Figure 1 contains 3 neurons, and each network state consists of three 1 s or −1 s, so there are 8 values, that is, 8 network states. If the state of the a^{th} node at time t is represented by $y_a(t)$, then the state of this node at time $t + 1$ should be expressed as

$$\begin{aligned} y_a(t+1) &= f([(t)] = f(x) \\ &= \begin{cases} -1, & N_a(t) < 0, \\ 1, & N_a(t) \geq 0, \end{cases} \\ N_a(t) &= \sum_{b=1}^{m} w_{ba} y_a(t) + x_a + \delta_a. \end{aligned} \tag{4}$$

3.2. Working Method and Stability of the Network. For the DHNN, its entire working process is the process of changing the state of neurons. Starting from the most primitive state of the neuron, it evolves in a certain direction. When the neuron state reaches a stable state, it will remain unchanged and no longer evolve, and the neural network will output it. This neural network has the following two main ways of working.

Table 1: Japanese teaching quality evaluation index system.

Num.	First-level index	Secondary index	Label
1		Teachers are full of energy and infectious	*X*1
2	Teaching attitude	Arrange and correct assignments on time	*X*2
3		Treat all students equally	*X*3
4		Inspiring students to think and innovate	*X*4
5	Teaching method	Motivate students' enthusiasm	*X*5
6		Excellent classroom discipline and management	*X*6
7		Skilled in course content	*X*7
8	Teaching content	State the problem concisely and accurately	*X*8
9		The course content is substantial	*X*9
10		Students gain much and have a good impression	*X*10
11	Teaching effect	Master basic knowledge and practical ability	*X*11
12		Students can identify professional problems	*X*12

3.2.1. Serial Working Mode. The change of the state of one neuron will not lead to the change of the rest of the neuron's state; we call this working mode the serial working mode.

3.2.2. Parallel Working Mode. We set t at any time, and a neuron is represented by the letter a. If the state of neuron a changes, the state of other neurons will also change along with it. In other words, the state of some or all neurons changes at the same time, and we call this way of working as parallel working. A DHNN is a nonlinear dynamic system with multiple input ports, thresholds, and two output values. With the movement of the system, the energy value of a certain energy function is constantly decreasing. When the energy value no longer changes, we can call the neuron state at this moment as a balanced stable state. In a neural network, when the weight coefficient matrix w is symmetric and all the elements on the diagonal are 0, such a neural network is stable, that is, w satisfies

$$\begin{cases} w_{ab} = 0, & a = b, \\ w_{ab} = w_{ba}, & a \neq b. \end{cases} \tag{5}$$

Then, the network is stable. The main point of the DHNN learning rule is to design the weight coefficient matrix w. There are two common methods, namely, the outer product method and the orthogonalization method. The design weight coefficient matrix w has the following four explicit purposes:

(1) Ensure that the neural network has good stability in the serial working mode, that is to say, the weight coefficient matrix w is a symmetric matrix
(2) Ensure that all the balance points that require associative memory can converge to themselves
(3) Make sure that the number of pseudostable points is as small as possible
(4) Make sure that the attraction of pseudostable points is as large as possible

3.3. The Construction of the Indicator System. By consulting the literature related to teaching quality, this paper understands the scientific research results of teaching quality in recent years and follows the basic principles of establishing an index system. Among them, there are 4 first-level indicators and 12 second-level indicators, as shown in Table 1.

The index system for teaching evaluation should be able to reflect the teaching level of teachers well.

3.3.1. Teaching Attitude. The relevant system of the school must be abided by all personnel in the school, and teachers are no exception. They must adhere to rigorous content restraints and set an example. Only when teachers comply will students, under the subtle influence of teachers, follow the school's relevant requirements. At the same time, teachers abide by the relevant requirements of the school, which helps to improve the efficiency of students' acquisition of new knowledge. As a result, the foundation for improving the teaching quality of teachers is to enhance their teaching attitude.

3.3.2. Teaching Content. Prepare lessons carefully before class, and reasonably and accurately control the major and difficult points of class content. Difficulties in teaching design are the key, and difficulties in teaching are the core. The accuracy of control directly determines whether a class is valuable or not. Continue to make new additions and expansions of knowledge so that the content of the lectures has depth and breadth. The purpose is to strengthen the understanding of what has been learned through the study of new content or use new knowledge to lay the foundation for learning other knowledge, as long as it can be improved, it is feasible. And the reasonable supplement of new knowledge can make the content of the lecture more in-depth and broad, which is beneficial for students to master the relevant knowledge points.

3.3.3. Teaching Methods. To reach the ultimate goal of considering students as the main body, rational use of teaching equipment and effective selection of teaching methods are required. The proper usage of teaching equipment allows it to perform at its optimum in the classroom and increases students' enthusiasm in learning. Write standardized blackboard writing and make teaching designs with texture. Take the writing of each instructional

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design seriously, consult various teaching materials, carefully understand each section in the textbook, and write an instructional design that students can easily accept knowledge. Whether it is basic teaching abilities or the ability to create teaching designs, a standard can be used to evaluate the quality of a teacher's instruction.

3.3.4. Teaching Effect. How to judge the fairest teaching effect of teachers in class, that is to see the reaction of students in class, what kind of class is a good class, that is, students have high enthusiasm for learning, are particularly active in classroom learning, and have the courage to find problems, is willing to solve problems, is good at thinking about problems, and has good discipline throughout the classroom. Therefore, as a teacher, it is necessary to grasp the classroom, not only to mobilize the students' enthusiasm for learning but also to control the discipline of the classroom, so that they can be freely retracted. The second aspect that can judge the effect of teachers' classroom teaching is the situation of teachers' completion of teaching content. The first is the quantity, whether the originally expected teaching content has been explained, and the second is the knowledge points or teaching content explained, whether the students understand it thoroughly and master it. No. All the knowledge taught by teachers in the classroom is actually for cultivating children's problem-solving ability, so the third aspect of judging the teaching effect is to study hard in class. Gain the corresponding ability, form unique ideas, and finally use what you have learned to solve problems.

3.4. Model Construction of Neural Network. This paper involves 12 evaluation indicators, so the neural network has 12 input neurons. The number of neurons in the output layer is the evaluation result of the teacher's teaching quality, namely 1. Therefore, the number of neurons in the output layer is 1. The number of neurons in the hidden layer is very difficult to select the number of neurons in the hidden layer, and there is no theoretical basis for the selection of nodes in the hidden layer. It often needs to be determined based on the designer's experience and multiple experiments. According to experience, for a three-layer neural network, the formula for the number of hidden layer units can be obtained as follows:

$$h = \sqrt{i + j} + c, \tag{6}$$

where i and j are the numbers of input and output units, respectively, and c is a constant between [0, 10].

Finally, it can be determined that the range of the number of hidden layer units is [3, 14]. The optimal number of hidden layer units can be tested by the trial and error method, and the specific experiment is in Chapter 4.

4. Experiment and Analysis

In this section, we defined dataset, experiment on the number of hidden layer units of neural network, and comparison of network model simulation results.

Table 2: Sample of the experimental dataset.

Label	Num.							
	1	2	3	4	5	6	7	8
$X1$	0.65	0.72	0.78	0.59	0.81	0.48	0.75	0.69
$X2$	0.81	0.77	0.56	0.43	0.83	0.49	0.56	0.62
$X3$	0.71	0.74	0.85	0.45	0.51	0.66	0.52	0.70
$X4$	0.55	0.58	0.59	0.74	0.79	0.67	0.59	0.82
$X5$	0.84	0.63	0.78	0.75	0.49	0.64	0.73	0.84
$X6$	0.79	0.45	0.84	0.85	0.75	0.81	0.59	0.61
$X7$	0.60	0.86	0.80	0.65	0.67	0.72	0.76	0.51
$X8$	0.65	0.39	0.42	0.53	0.66	0.75	0.62	0.46
$X9$	0.73	0.71	0.88	0.87	0.77	0.76	0.68	0.56
$X10$	0.69	0.66	0.74	0.82	0.45	0.38	0.82	0.80
$X11$	0.75	0.65	0.81	0.74	0.58	0.47	0.82	0.64
$X12$	0.48	0.62	0.70	0.65	0.71	0.81	0.74	0.58

4.1. Data Set. The establishment of the evaluation model of the teacher's teaching effect on the neural network must be based on sufficient and truly scientific and authoritative historical sample data. Therefore, in this project, the real data of some teachers of an information vocational school in a city in 2018 were selected as historical sample data for neural network training and testing. In this way, the internal connection between the input and output in the teacher's comprehensive quality evaluation model can be found. These data are based on the evaluation of teachers since their teaching work, professional expertise, and teachers' awards. Part of the dataset is shown in Table 2. Select appropriate sample data from a large number of samples and input it into the computer, and then apply the evaluation of the teaching backbone of each school sent by the education bureau and the experts of the Ministry of Education as the final result. The whole evaluation process of teachers' teaching effect focuses on the basis of empirical materials and data, and pays attention to the combination of teachers' self-evaluation, teachers' mutual evaluation, and teacher evaluation during evaluation, which improves the credibility of evaluation results.

4.2. Experiment on the Number of Hidden Layer Units of Neural Network. Using Chapter 3's range for the number of neurons in the hidden layer, a total of [3, 14] are in the hidden layer, with a total of 4, 6, 8, 10, 12, and 14 picked by the trial-and-error technique. Figures 2 to 4 depict the findings of the research. There are finally eight neurons in the buried layer.

4.3. Comparison of Network Model Simulation Results. The functions of the MATLAB neural network toolbox are very complete. It provides various functions, including functions such as the establishment, initialization, training, and simulation of the neural network. Users can easily simulate. The neural network toolbox's system simulation process consists of four key steps:

(1) The function "new" creates the network by automatically setting the number of neurons in the input and output layers using sample data. The user must

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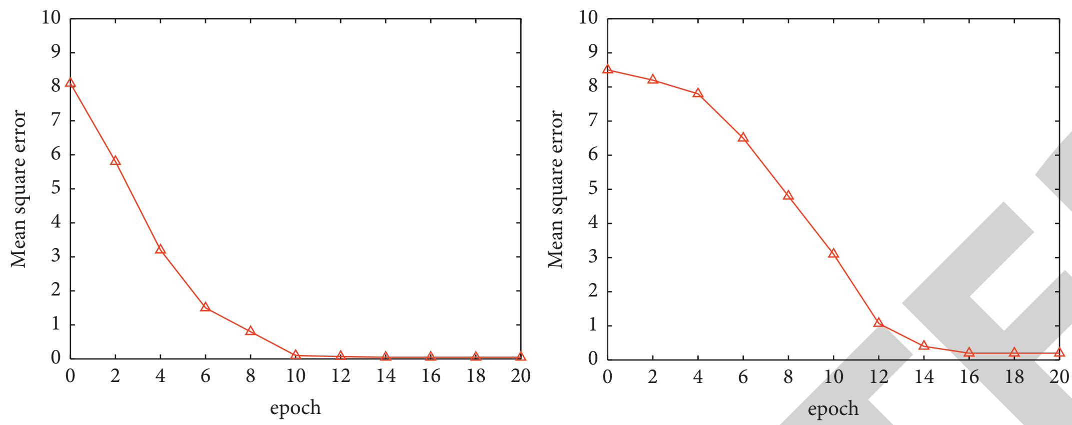

Figure 2: Training effect when $N = 4$ and $N = 6$.

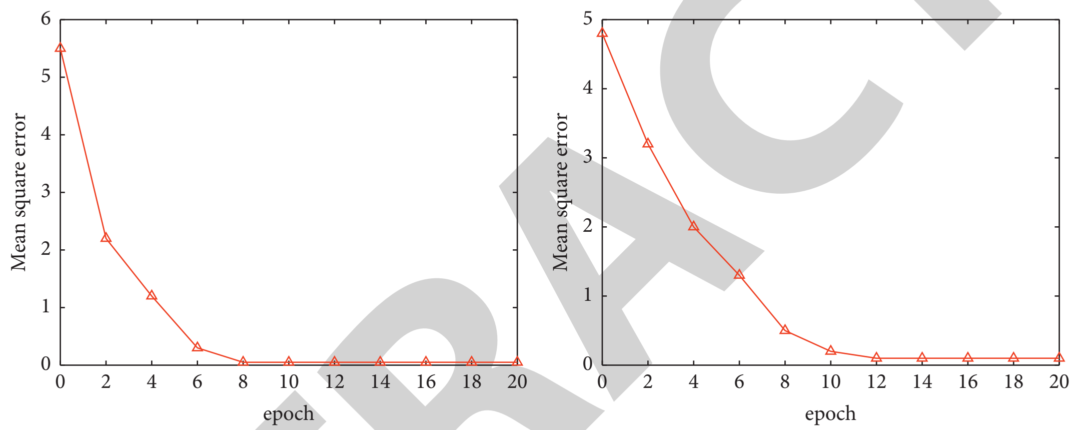

Figure 3: Training effect when $N = 8$ and $N = 10$.

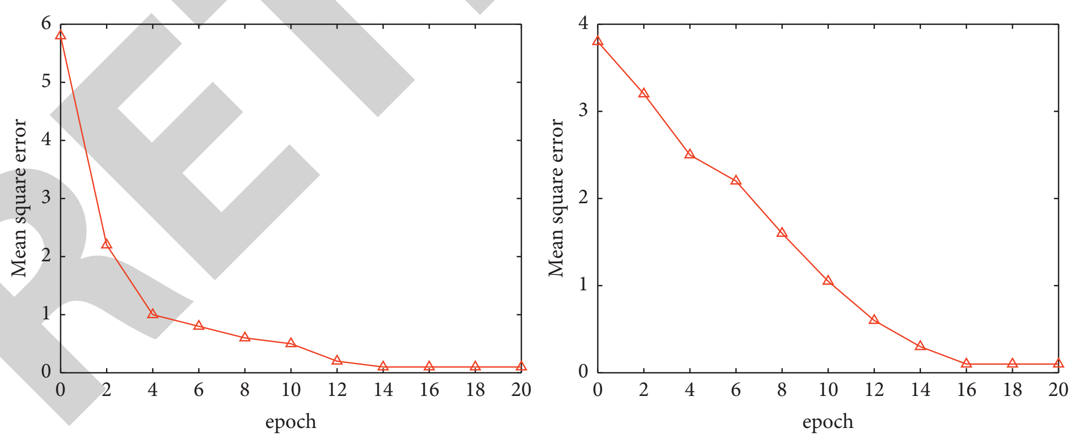

Figure 4: Training effect when $N = 12$ and $N = 14$.

define the number of neurons and layers in the hidden layer, as well as the transformation function between the hidden and output layers and the training algorithm function.

(2) Initialization: when "new" creates a network object, it automatically executes the unit function to set the connection weights and thresholds to their default settings.

(3) Network training: network training is performed by the function train, which trains the network using the input vector P of the sample, the target vector T, and the parameters of the predefined training function.

(4) Network simulation: this is accomplished via the Sim function, which mimics test data using the trained network. The system then uses the MATLAB neural

Table 3: Comparison of simulation results with expert results.

Num.	1	2	3	4	5	6	7	8
Expert evaluation	0.75	0.76	0.68	0.81	0.55	0.62	0.85	0.79
Network evaluation	0.74	0.77	0.68	0.79	0.54	0.62	0.86	0.77
Error	0.01	0.01	0.00	0.02	0.01	0.00	0.01	0.02

network toolbox to simulate training and experimentation, resulting in the conclusions shown in Table 3, which are mainly consistent with the expert assessment results.

5. Conclusion

After the continuous advancement of the new curriculum reform, many teachers are aware of the importance of the implementation of cultural literacy, but when it comes to cultural literacy, teachers generally think that it refers to the Japanese cultural background or some nonverbal behavior characteristics of the Japanese. Characteristics are not well understood, and some teachers do not even include them in cultural literacy lessons. During the teaching of Japanese courses, teachers frequently immediately understand some speech act features as grammatical knowledge, so evaluating the quality of Japanese teaching is especially significant. The evaluation of a teacher's teaching effectiveness is a crucial step in encouraging teachers to improve the quality of education and instruction. ANN technology is increasingly becoming a hot spot in the contemporary high-tech field. With the wide application of neural network theory, ANN technology has become an indispensable tool in many fields. At the same time, many new neural network models and algorithms also continuously enrich neural network technology. Combining the two organically is a significant step toward actively exploring methods and principles suitable for evaluating teachers' teaching effectiveness, and it can also help to advance neural network technology. This paper uses ANN technology to attempt to realize the evaluation of teachers' teaching effect and develops a more scientific and fair approach of evaluating teachers' teaching effect. This paper first introduces the related concepts of ANN, introduces the algorithm of DHNN in detail, and introduces the theory of ANN into teaching evaluation. The results of multiple simulated examinations and training are then used to build and design a neural network model for analyzing the effectiveness of a teacher's instruction. According to the results of the trials, the neural network model proposed in this study corresponds to a nonlinear mapping technique, which increases the reliability of the evaluation and makes the evaluation outcomes more effective and objective.

Data Availability

The datasets used during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

References

[1] D. Yu, "Triangular hesitant fuzzy set and its application to teaching quality evaluation," *Journal of Information and Computational Science*, vol. 10, no. 7, pp. 1925–1934, 2013.

[2] L. Liu, L. Yu, and G. Shi, "Evaluation of quality of teaching based on BP neural network [J]," *Journal of Chemical and Pharmaceutical Research*, vol. 6, no. 8, pp. 83–88, 2014.

[3] R. Song and T. Liu, "The application of modified BP neural network method to the evaluation of the quality of teaching," *Advanced Materials Research*, vol. 710, pp. 628–632, 2013.

[4] H. M. H. Mustafa, F. B. Tourkia, and A. Al-Hamadi, "On improvement of teaching quality for a selected mathematical topic using artificial neural networks modeling (with a case study)," *Literary and Art Studies: English Edition*, vol. 7, no. 2, p. 8, 2017.

[5] A. Yz, L. A. Hao, Q. A. Ping, K. Shi, J. Chambua, and Z. Niu, "Heterogeneous teaching evaluation network based offline course recommendation with graph learning and tensor factorization- ScienceDirect," *Neurocomputing*, vol. 415, pp. 84–95, 2020.

[6] T. Liu and L. Ning, "Deep convolutional neural network and weighted bayesian model for evaluation of college foreign language multimedia teaching," *Wireless Communications and Mobile Computing*, vol. 2021, Article ID e3080, 7 pages, 2021.

[7] Y. Chen, "College English teaching quality evaluation system based on information fusion and optimized RBF neural network decision algorithm," *Journal of Sensors*, vol. 2021, no. 5, pp. 1–9, 2021.

[8] J. Gu and R. Shi, "English teaching quality evaluation based on fuzzy comprehensive evaluation of neural network algorithm," *Dynamic Systems and Applications*, vol. 29, no. 5, 2020.

[9] L. Jiang and X. Wang, "Optimization of online teaching quality evaluation model based on hierarchical PSO-BP neural network," *Complexity*, vol. 2020, no. 7, Article ID 1, 12 pages, 2020.

[10] J. Zuo and P. Jia, "Empirical research on evaluation system of college mathematics teaching quality based on BP neural network," *Revista de la Facultad de Ingenieria*, vol. 32, no. 14, pp. 188–193, 2017.

[11] K. Masaki, "Multistate vector product hopfield neural networks," *Neurocomputing*, vol. 65, no. 10, pp. 56–62, 2017.

[12] B. Adriano, B. Alberto, S. Enrica, and C. Pierluigi, "On the equivalence of Hopfield networks and Boltzmann Machines," *Neural Networks*, vol. 34, no. 05, pp. 32–37, 2012.

[13] V. Figueiras, "A bank of Hopfield neural networks for the shortest path problem," *Signal Processing*, vol. 61, no. 02, pp. 90–96, 1997.

[14] H. Shouping, "Teacher's teaching quality assessment in college based on AHP and fuzzy comprehensive evaluation," *Advanced Materials Research*, vol. 2695, no. 807, pp. 106–110, 2013.

[15] P. B. Hu, "Dimensional structure and measurement on index system of evaluations of teaching in university," *Journal of*

RETRACTED

Jiangxi University of Finance and Economics, vol. 20, no. 03, pp. 111–115, 2010.

[16] B. S. Chen, "The research of teacher teaching quantity evaluation based on fuzzy theory," *Journal of Mathematics in Practice and Theory*, vol. 41, no. 06, pp. 72–78, 2011.

[17] X. W. Sun, "Application of Bayes classification technology in evaluating university teaching quality," *Journal of Shanxi Normal University (Philosophy and Social Sciences edition)*, vol. 32, no. 01, pp. 98–102, 2014.

[18] Y. Ranran, "Study on teaching and scientific research of integration in teachers' team construction," *Applied Mechanics and Materials*, vol. 1326, no. 66, pp. 231–240, 2011.

[19] X. Y. Shi, "Exploration on the evaluation mechanism of teachers' teaching quality," *Education Review*, no. 3, pp. 48–50, 2014.

[20] G. Zoe, E. Samantha, and R. Jeremy, "Near-peer teaching program for medical students," *The Clinical Teacher*, vol. 14, no. 03, pp. 131–139, 2017.

[21] J. Pei, K. Zhong, J. Li, J. Xu, and X. Wang, "ECNN: evaluating a cluster-neural network model for city innovation capability," *Neural Computing & Applications*, pp. 1–13, 2021.

[22] B. Ji, Y. Li, D. Cao, C. Li, S. Mumtaz, and D. Wang, "Secrecy performance analysis of UAV assisted relay transmission for cognitive network with energy harvesting," *IEEE Transactions on Vehicular Technology*, vol. 69, no. 7, pp. 7404–7415, 2020.

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