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Intelligent System for Educational Informatization Based on BP Neural Network

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In keeping with global informatization, a combination of science and technology is being applied in the education sector where an intelligent system of educational informatization is playing a vital role. However, with the continuous changes being made to educational objectives and requirements, the volume of data generated by teaching activities are increasing, the teaching environment is becoming more and more complex, and teaching management is beginning more difficult. The traditional education system cannot cope with such a complicated and problematic scenario, let alone manage education and teaching activities effectively. In this paper, and utilizing a BP neural network algorithm, an in-depth analysis of the teaching environment is conducted, and teaching theory and algorithm theory is applied to construct an intelligent teaching information system. Then, the constructed intelligent system is tested in terms of: management efficiency, user use and system performance. Finally, it is found that the average management efficiency of the system proposed in this paper can reach more than 80% in terms of course management and student management, which proves that it is a practical solution. If it is widely applied in the current education sector, it can provide scientific and effective technical support for the intelligent development of education informatization.

Keywords: education system, BP neural network, network regulation, teaching management

1. INTRODUCTION

With the increasing role and influence of science and technology in the market economy, the pace of social informatization is accelerating, and intelligent technology is constantly being integrated with various industries, leading to advanced development and innovation. Today, the education sector is evolving in terms of intelligence and informatization. E-learning has become another major learning method to supplement traditional offline learning and, in the future, it is highly likely that this learning mode completely replace the traditional education mode of teaching and learning. However, in practical application, it is not only as simple as having a good class: the management and education before and after class is very important. For teachers, most of the current education systems can only offer online teaching, which cannot be analyzed in combination with teaching practice and student needs, and lack personalized and intelligent features. For users and students, the existing education system cannot perform targeted management according to students' individual differences; nor can it guarantee the quality of learning if students' individual learning styles and abilities are not taken into account. Therefore, in order to develop a feasible and sustainable education system, it is important to accurately analyze the complex educational data and provide more reliable theoretical and technical support for an intelligent educational information system.

Against the background of the continuous development and improvement of artificial intelligence (AI) technology, the BP neural network has developed unprecedentedly and has demonstrated its unique value in many fields of application. The BP neural network has enabled many industries to upgrade and transform in alignment with the characteristics

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and demands of the intelligent era. It has changed not only the way that manufacturing is done, but also plays a key role in people's daily activities. The application of the BP neural network to the construction and research of educational informatization intelligent system can improve the quality and effect of systematic educational management analysis, and make educational and teaching activities more scientific and rational. In this paper, the BP neural network algorithm is integrated with the educational information intelligent system. According to the experimental data, the efficiency of the proposed system in terms of course management and student management is 81.78% and 83.37% respectively. In regard to user use, there is little difference between the test results of teachers and students and the traditional education system. The average scores for teaching effect and learning quality are 84.02 and 82.21 respectively. Finally, test results show that the performance of the proposed system is superior. In different test environments, the security and stability of the system are ideal, with the average results for the security test being 85.50% and the average value for the stability test being 82.75%.

2. RELATED WORK

In recent years, many scholars have carried out research on intelligent educational informatization systems. Lakhno et al. (2017) proposed an information object (OBI) protection and control system architecture, which has an intelligent support subsystem to make decisions on the educational operation and management of network protection [1]. Guided by the system model and design principles of intelligent education environment, Ji (2019) put forward preliminary design ideas for an intelligent education system, in order to provide some guidance for the construction of an intelligent education environment [2]. Liu (2020) constructed a visualization analysis framework for an intelligent educational informatization system, and discussed the realization process and mechanism of educational talent training data visualization in terms of timeliness and media form [3]. Lu (2021) studied the entrepreneurial mode of an intelligent educational informatization system, and based on machine learning technology, combined with intelligent image recognition technology, recognized the state and expression of students in educational informatization intelligent system [4]. Through the in-depth research conducted by countless scholars, the educational information intelligent system is now relatively mature. However, with the continuous development of educational undertakings and the continuous reform of educational objectives, the requirements for the analysis of teaching quality are requiring constant improvement. In order to keep pace with technological and other modern developments, it is a more intelligent choice to integrate a BP neural network algorithm into the construction of educational informatization intelligent system.

In order to obtain a thorough understanding of the BP neural network algorithm, in this paper, relevant research on the application of this algorithm is examined. Ma et al. (2017) established a BP neural network prediction model to obtain heat transfer coefficient of supercritical water in order to determine the heat transfer coefficient within the range of supercritical water pressure, based on the experimental data [5]. Lü et al. (2017) analyzed the density, stress, strain and other parameters that affect the compressional and shear wave velocities of elastic waves, and used LM-BP neural network to obtain the experimental results. The estimated average relative error was 2.22% [6]. Li et al. (2018) encoded the weights and thresholds of BP neural network, and obtained a general optimal solution by genetic algorithm, and then got an accurate optimal solution by adding chaotic disturbance [7]. Liu and Yin (2017) used an advanced adaptive acceleration factor and improved adaptive inertia weight to improve the initial weight and threshold of BP neural network, and gave details of the process [8]. These studies have made good use of the BP neural network algorithm, but with the rapid development of the times, the application of the intelligent algorithm has expanded from a relatively professional technical field to educational and teaching activities, although few studies have focused on building an educational information intelligent system. Therefore, there is an urgent need to examine and analyze an intelligent educational information system based on a BP neural network.

3. BP NEURAL NETWORK AND INTELLIGENT SYSTEM OF EDUCATIONAL INFORMATIZATION

3.1 Overview of Educational Informatization Intelligent System

The construction of an intelligent educational informatization system must be based on an established teaching theory. In education and teaching, we generally conduct teaching activities in a scientific and orderly manner, guided by the notion of individualized teaching.

Individualized teaching is student-centred, takes students' individual differences into account, encourages active learning, inspires students to create self-worth, delivers individualized education, and encourages people to make their best use of their talents. Individualized teaching theory has four main elements as shown in Table 1:

(1) Emphasize the individual differences of students.

Teachers should conduct targeted teaching activities according that cater for students' individual differences. This is because students have different abilities and learning styles, and will learn best when their strengths and preferred learning mode are taken into account.

(2) Encourage students to learn actively.

With traditional learning and teaching practices, students are usually passive recipients of the knowledge imparted by teachers, often lacking the subjectivity and autonomy of learning. Under the guidance of individualized teaching theory, an intelligent educational information system will encourage students to participate actively

Table 1 Classification of individualized teaching features.

Scope	Sequence	Connotative features
Individualized Teaching Theory	1	Emphasize the individual differences of students
	2	Encourage students' active learning
	3	Inspire students' self-creation ability
	4	Apply individualized teaching strategies

in learning, stimulate students' interest in learning, and cultivate a different learning mindset.

(3) Inspire students to create self-worth.

Individualized teaching theory requires the coordinated development of students' learning ability and personality, and attaches great importance to students' self-creation ability in the learning process. Teachers also need to create a more natural and friendly image when transferring knowledge to students, so that students have the confidence to express their opinions, interact better with their instructors, and develop independent thinking skills.

(4) Individualized teaching strategy

If we want to develop an equitable and comprehensive education system, we should examine with the education strategy implemented by each school. In delivering education, every school should uphold the principle of fairness and justice, and teachers should play an active and healthy leading role, and strive to teach students in accordance with their individual abilities and aptitudes. Students should be encouraged to develop individual thinking skills and cultivate their talents.

Teachers' lesson content needs to be supplemented or adjusted according to the actual progress of students' learning. At the same time, after each teaching session, students should be given appropriate learning tasks, and individual assessment and feedback should be provided. This reflects the application of the student/learner-centered principle that characterizes individualized teaching.

In order to obtain an in-depth understanding of the role and influence of individualized teaching theory in an intelligent educational information system, in this paper, an analysis is conducted from two perspectives: the three elements of teaching theory and the principles that an system educational information intelligent should encompass in the network learning environment.

According to the theory of individualized teaching, the learning environment is where students are located for the purpose of learning, together with the learning tools they use when engaging in learning-related activities. The learning places and learning tools are the physical elements associated with the normal learning activities. Learning places can be either larger collective places or smaller individual places. Learning tools are classified according to whether they are concrete or abstract.

According to the individualized teaching theory, the learning environment needs to be personalized and diversified at the same time. Because each student's learning characteristics and personal interests are different, the appropriate learning environment is also different. Some students like to acquire knowledge through collaboration, some students are independent and like to study alone, some students can acquire knowledge through indirect experience conveyed by teachers, and some students like to acquire direct experience through practice. Therefore, when constructing an intelligent educational information system, these individual differences should be considered, which distinguishes this system from the traditional educational model.

The learning style and the above-mentioned learning characteristics of students are similar to personal interests, but its scope goes far beyond these. A learning style is the unique learning style gradually formed by students during their growth and learning. This includes the learning strategies used by students, and their learning tendencies (including learning attitude, learning characteristics, personal interests and other factors). Both strategies and tendencies will undergo subtle changes due to the differences in learning content and difficulty. An intelligent educational information system can fully apply individualized teaching theory and improve students' learning efficiency. Based on the results of an in-depth analysis of students' learning data, we can understand students' personality traits and provide each student with a learning environment that matches his/her learning style.

An intelligent educational information system needs to obtain a variety of data on students' learning activities, which can be divided into two categories: learning mechanism and learning needs. In the system, the learning records are collected by a BP neural network algorithm, and then classified according to different items. The learning mechanism is the social mechanism of learning activities from a large-scale perspective, while from a small-scale perspective, it is the physiological and psychological traits of students. Simply put, learning needs drive the students' motivation to learn. A BP neural network algorithm creates a personalized teaching plan according to different classifications.

The design of course content should also be underpinned by individualized teaching theory, so that it is delivered to students in different ways that cater for their different levels of progress. The delivery method is also based on the completion of previous tasks, that is, according to students' different learning styles, providing and recommending diversified teaching forms to students. The recommendation system is implemented by the algorithm's analysis results, although this is just a reference. In practical application, students can learn according to the teaching methods provided by the system and, of course, they can also choose their own learning content delivery methods according to personal preferences and interests. When this step is completed, the whole learning framework will be comprehensively defined.

Table 2 Principles of Educational Informatization Intelligent System.

Scope	Sequence	Classification
Principles that education information intelligent system should grasp in network learning environment	1	The educational goals of the course should be clearly understood.
	2	The course content should be progressive in terms of difficulty and the students' mastery of knowledge.
	3	The education system should be able to promote students to form a system of what they have learned
	4	The system should include tests to determine whether the teaching objectives have been achieved.
	5	The system should provide extension activities for the more advanced students, and remedial activities for those who are struggling.
	6	Students should be encouraged to collaborate with their peers in learning activities.

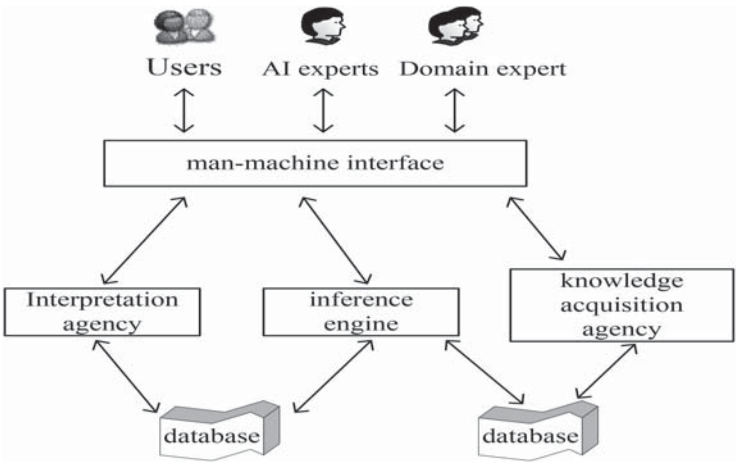

Figure 1 Composition of the expert system.

There are six principles that an intelligent educational information system should encompass in the network learning environment, as shown in Table 2.

The construction of an intelligent educational information system should also be based on expert system theory and constructivism theory. An expert system utilizes artificial intelligence technology to imitate expert thinking to solve professional problems and challenges. It consists of six parts: knowledge base, database, inference engine, explanation mechanism, knowledge acquisition mechanism and user interface, as shown in Figure 1.

With the rapid development and uptake of computer technology throughout the world, constructivism theory has gradually expanded its influence and role in the field of education. Underpinned by constructivism theory, the whole process of instructional design, educational information intelligent system should not only comprehensively understand the instructional requirements and students' individualized differences, but should also focus on the design of instructional situations.

Of course, it is not difficult to find that this issue has been addressed in the traditional education system. However, the traditional education system often only pays attention to the influence of specific teaching situations on the achievement of teaching objectives, and always takes this as a starting point to create other teaching situations. However, this approach ignores the central position of students in the learning process, and the role of teacher-student interaction in improving teaching quality. According to cognitive theory, students are capable of being active information builders, not passive information receivers. To create an optimal teaching situation, we must realize the importance of students' subjectivity in the whole teaching process. Therefore, this point is particularly emphasized in the construction of an intelligent educational information system.

In this system, cognitive theory is applied to both teaching and learning, as it can give full play to students' learning initiative, correctly understand the leading role of teachers, and achieve a balance between them. However, currently, cognitive theory has not achieved remarkable results in improving students' learning. It is often effective only for the achievement of learning objectives involving lower-level cognitive abilities (such as memorizing, understanding and simple application), and is not as good as the "collaborative"

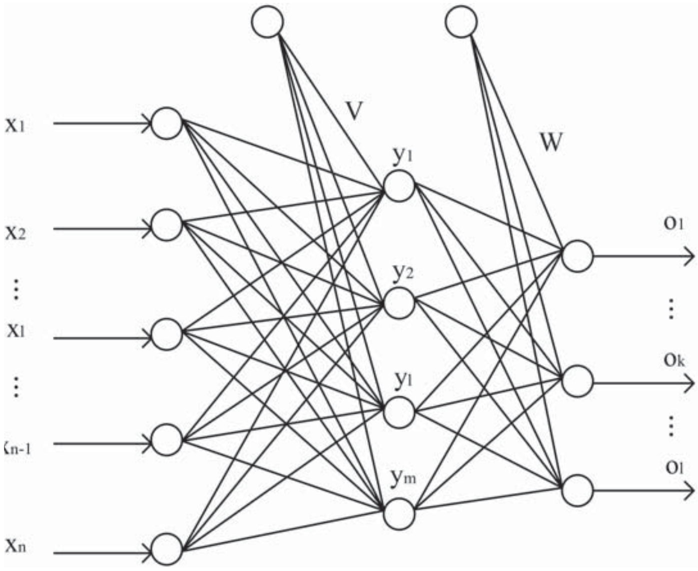

Figure 2 BP neural network structure.

teaching model for learning objectives involving higher-level cognitive abilities. In other words, the kind of model that should be adopted for an education system should be determined by the learning objectives and course contents, and should not be the same as all other models.

3.2 Application of BP Neural Network in Intelligent System of Educational Informatization

A BP neural network consists of three layers: input, hidden, and output layers [9]. Each neuron is a basic component, connected to the others to form each layer of a neural network. The input layer, the hidden layer and the output layer are mainly connected by neurons, but the neurons in each layer are independent The structure of a BP neural network is different from that of other algorithms. As shown in Figure 2, its structure is relatively simple, but has great application value in the construction of educational information system.

The application of the BP neural network algorithm principle in an intelligent educational information system involves forward propagation and backward propagation [10–11]. The forward propagation process can transmit working signals to obtain network errors; the back propagation process involves the continuous transmission and transformation of the acquired network error signal until the network weight is adjusted to a state that is the closest to the actual value [12].

In the process of forward propagation, the working signal starts from the input layer, then leads to the hidden layer where it undergoes several transformations. Finally, the transformed results are output via the output layer. If the final output signal has reached the preset goal of the system, the algorithm will stop the operation.

The error back propagation process calculates the difference between the actual value and the ideal value calculated by the BP neural network during forward propagation [13]. When the BP algorithm's back propagation operation is applied to an intelligent educational information system, the error signal will be transformed several times and the weight will be adjusted continuously, from the output layer of neural network to the hidden layer of neural network, and finally to the input layer [14]. The actual final value is obtained after constant adjustment and correction of network weights.

In these two processes, the BP neural network is repeatedly crossed and trained, and finally the actual output value is slowly matched with the ideal output value, and it will not stop until the accuracy is aligned with the requirements.

The algorithm flow is shown in Figure 3 below.

The input layer of BP network has I input signal, the hidden layer is composed of J neurons, and finally the output layer signals are K, the input of neurons is u, and the v output of neurons is as a transfer function $Sigmoid$. The thresholds introduced by the hidden layer and the output layer neurons are $x_0 = -1$, $y_0 = -1$, respectively, the input vector is $X = (x_1, x_2, \cdots, x_t, \cdots, x_n)^T$, the hidden layer $X_k = (x_1, x_2, \cdots, x_i, \cdots, x_n)^T$ output vector corresponding to any training sample is $Y_k = (y_1, y_2, \cdots, y_i, \cdots, y_m)^T$, the actual output is $O_t = (O_1, O_2, \cdots, O_k, \cdots, O_l)^T$, the expected output is $d_r = (x_1, x_2, \cdots, x_k, \cdots, x_l)^T$, the weight matrix from the input layer to the hidden layer is w_{ii}, the weight matrix from the hidden layer to the output layer is w_{ik}, and t is the iteration of the learning process.

When X_k input sample is operated through the output layer, there can be for the hidden layer [15] :

$$u_j^J = \sum_{i=0}^{I} w_{ij}^I x_{ni} \ j = 1, 2, \cdots, J \tag{1}$$

$$v_j^J = f(\sum_{i=0}^{I} w_{ij}^I x_{ni} \ j = 1, 2, \cdots, J) \tag{2}$$

For the output layer [16]:

$$u_k^K = \sum_{j=0}^{J} w_{jk}^J v_j^J \ k = 1, 2, \cdots, K \tag{3}$$

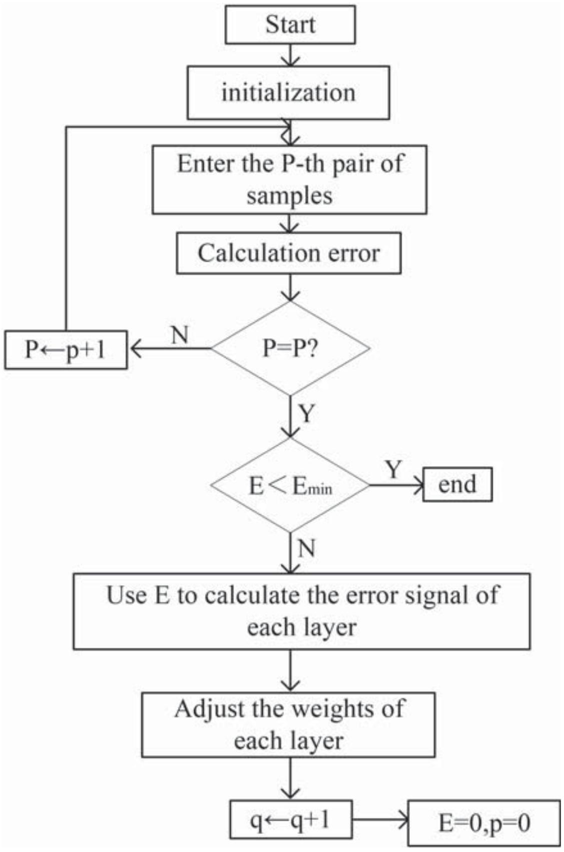

Figure 3 BP neural network algorithm flow.

$$v_k^K = f(\sum_{j=0}^{J} w_{jk}^J v_j^J)k = 1, 2, \cdots, K \tag{4}$$

It can be obtained from Formula 1 to Formula 4:

$$y_{nk} = v_k^K = f(u_k^K) = f(\sum_{j=o}^{J} w_{jk}^J v_j^J)k = 1, 2, \cdots, K \tag{5}$$

For the unipolar transfer function Sigmoid [17]:

$$f(x) = \frac{1}{1+e^{-x}} \tag{6}$$

It is continuous and derivable, and has [18]:

$$f'(x) = f(x)(1 - f(x)) \tag{7}$$

E represents the total error energy, which is expressed by the formula [19]:

$$E(t) = \frac{1}{2}\sum_{k=1}^{K}(d_{nk} - o_{nk})^2 \tag{8}$$

Set $e_{nk}(t)$ as the error signal obtained through the output layer during forward propagation [20]:

$$e_{nk}(t) = d_{nk}(t) - o_{nk}(t) \tag{9}$$

In this way, the error signal and the total value generated by the continuous transformation of the working signal in the forward propagation process can be obtained. The expected value is the preset condition of the system parameter. At that time, the algorithm automatically ends the operation process, otherwise it enters the next operation process [21].

The next operation process is the back propagation process we mentioned earlier, as shown in Figure 4:

The error signal obtained with the previous step is input from the output layer, transformed by the hidden layer, and continuously adjusted along the negative gradient direction of the weight. This step reduces the error between the actual value and the expected value, and finally the result is output via the output layer. We characterize the weight correction as Δw_{ik}, $\Delta w_{ik}$is proportional to the negative gradient direction of the error, that is [22]:

$$\Delta w_{jk} \infty - \frac{\partial E(t)}{\partial w_{jk}} \tag{10}$$

$$\Delta w_{ij} \infty - \frac{\partial E(t)}{\partial w_{ij}} \tag{11}$$

Because the derivative function is transitive, Formula 10 can be written as [23]:

$$\frac{\partial E(t)}{\partial w_{jk}(t)} = \frac{\partial E(t)}{\partial e_{nk}(t)} \cdot \frac{\partial e_{nk}(t)}{\partial y_{nk}(t)} \cdot \frac{\partial y_{nk}(t)}{\partial u_k^K(t)} \cdot \frac{\partial u_k^K(t)}{\partial w_{jk}(t)} \tag{12}$$

The representative values of the formula components are shown in Table 3:

There are [24]:

$$\frac{\partial E(t)}{\partial w_{jk}(t)} = -e_{nk}(t) \cdot f'(u_k^K(t)) \cdot v_j^J \tag{13}$$

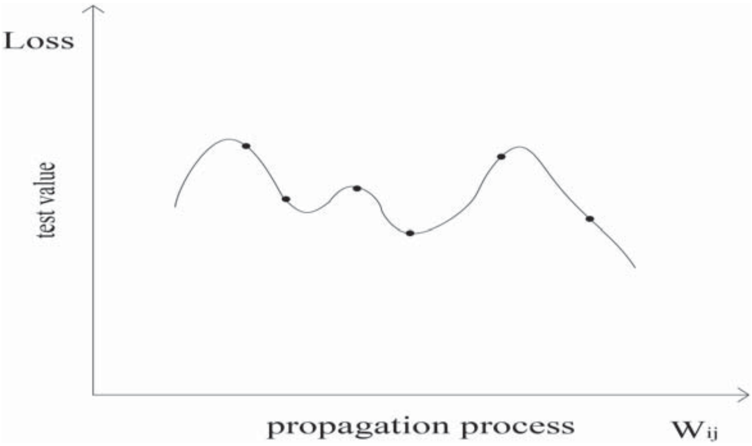

Figure 4 Back propagation process graph.

Table 3 Representative values of formula components.

Sequence	Formula	Calculation method
1	$\frac{\partial E(t)}{\partial e_{nk}(t)}$	$e_{nk}(t)$
2	$\frac{\partial e_{nk}(t)}{\partial y_{nk}(t)}$	-1
3	$\frac{\partial y_{nk}(t)}{\partial u_k^K(t)}$	$f'(u_k^K(t))$
4	$\frac{\partial u_k^K(t)}{\partial w_{jk}(t)}$	v_j^J

Let the local gradient be [25]:

$$\delta_k^K = -\frac{\partial E(t)}{\partial u_k^K(t)} = f'(u_k^K(t)) \cdot e_{nk}(t) \tag{14}$$

Using the unipolar function Sigmoid as the activation function, there is [26]:

$$f'(u_k^K(t)) = \frac{\partial v_k^K(t)}{\partial u_k^K(t)} = y_{nk}(t)(1 - y_{nk}(t)) \tag{15}$$

So there are:

$$\delta_k^K = y_{nk}(t)(1 - y_{nk}(t)) \cdot e_{nk}(t) \tag{16}$$

It can also be expressed as:

$$\delta_k^K = -y_{nk}(t)(1 - y_{nk}(t))(d_{nk}(t) - o_{nk}(t)) \tag{17}$$

According to Debla's learning rule, the correction is [27]:

$$\Delta w_{jk} = -\eta \frac{\partial E(t)}{\partial w_{jk}} \tag{18}$$

and can be expressed as:

$$\Delta w_{jk} = \eta \delta_k^K(t) \cdot v_k^K(t) \tag{19}$$

Among them, both $\delta_k^K(t)$ and $v_k^K(t)$ can be obtained, so the weight correction $\Delta w_{jk}(t)$ can be obtained by formula. Therefore, in the next iteration, the weight of any node from hidden layer J to output layer K is:

$$\Delta w_{jk}(t+1) = w_{jk}(t) + \Delta w_{jk}(t) \tag{20}$$

4. TESTING OF EDUCATIONAL INFORMATIZATION INTELLIGENT SYSTEM

In this paper, the intelligent education information system based on a BP neural network is tested, and evaluated in terms of: 1) educational administration management; 2) user use (teaching quality and learning effect); and 3) system performance (stability and security). Compared with the traditional education system, the effectiveness of the proposed system has been confirmed.

(1) Educational Administration

Educational administration mainly involves curriculum management and student management. Each academic year is divided into two semesters, and each semester is subdivided into two parts. The educational administration tasks associated with each part are different. The educational administration test in this paper examines the efficiency of the system in dealing with curriculum management and student management tasks during one academic year cycle. The test results are shown in Figure 5:

Figure 5A shows the educational system proposed in this paper, and Figure. 5B shows the traditional education system.

As can be seen from Figure 5, in the educational administration work, the average course management efficiency of the educational information intelligent system proposed in this paper based on BP neural network algorithm is 81.78%, and the average student management efficiency is 83.37%, which shows relatively stable overall performance. In the fourth stage

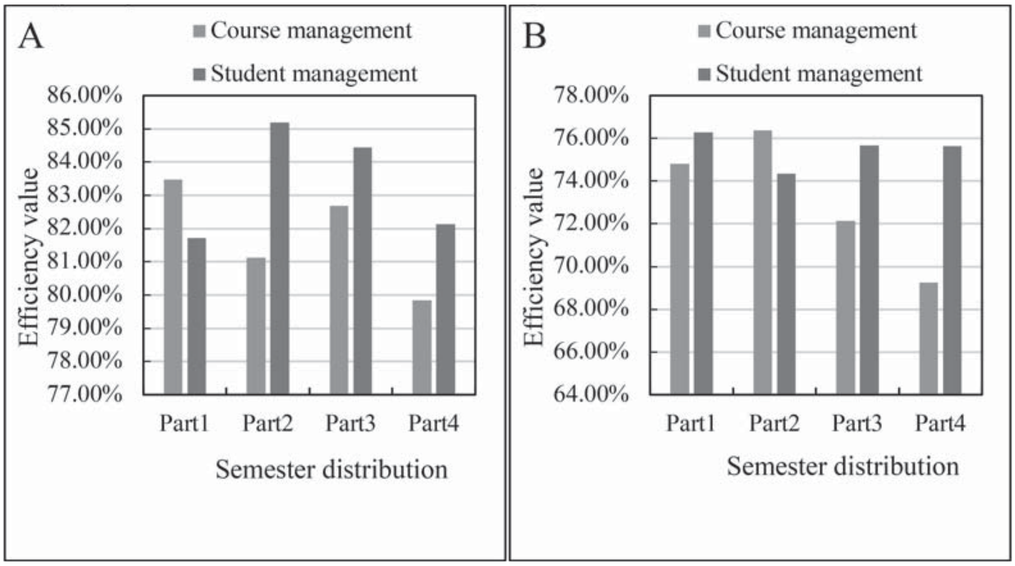

Figure 5 Course Management and Student Management Tests.

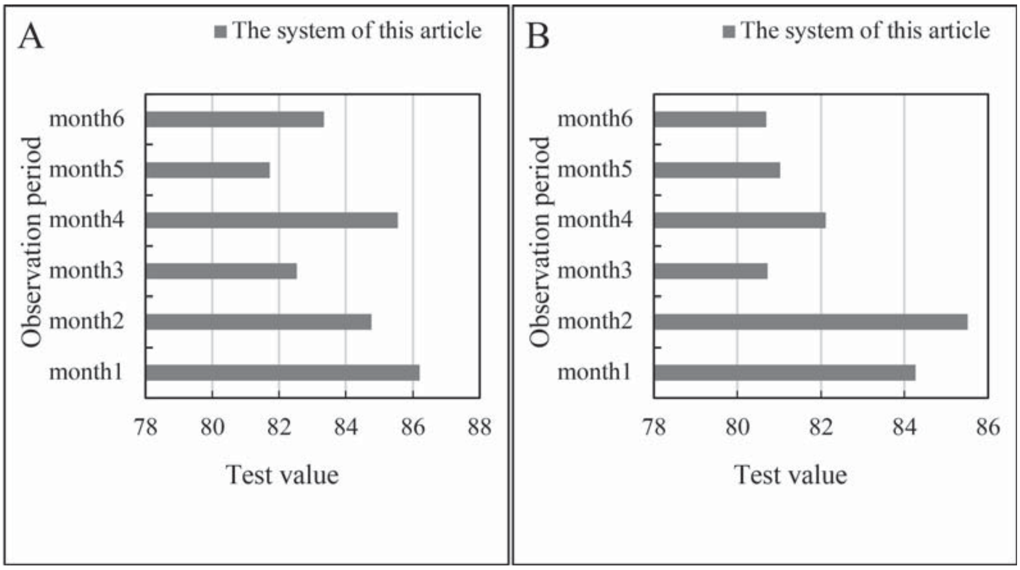

Figure 6 Teacher user usage test results.

of curriculum management, the management efficiency decreased slightly because the major courses had entered the review stage at the end of the school year, and the number of tasks increased correspondingly, so the system algorithm would be affected by this, as would the traditional education system. However, overall, the management efficiency achieved by the traditional education system was far less than that of the proposed system.

(2) User's Use

Teachers and students are the main stakeholders in an education system. The education system facilitates teachers' teaching and students' learning. The features and functions of the system may vary according to subjects and course objectives. In this paper, an academic year is taken as an observation cycle, and teachers' teaching quality and students' learning are scored on a monthly basis. The scores are generated by the education system's comprehensive analysis of teachers' and students' performances before, during and after classes. The total score is 100. The higher the score, the better is the user's performance. The test results are shown in Figures 6 and 7 below.

Figure 6A is a teacher user test of this system. Figure 6B is a teacher user test of the traditional system.

As can be seen from Figure 6, there is no significant difference between the teaching quality test results of teachers in the intelligent educational information system based on BP neural network and the teaching quality test results in traditional education. The average of teachers' quality test results in this system is 84.02 points, while that in traditional education system is 82.39 points. Th data show that the application of BP neural network in intelligent educational information system can improve teaching quality and efficiency, which is

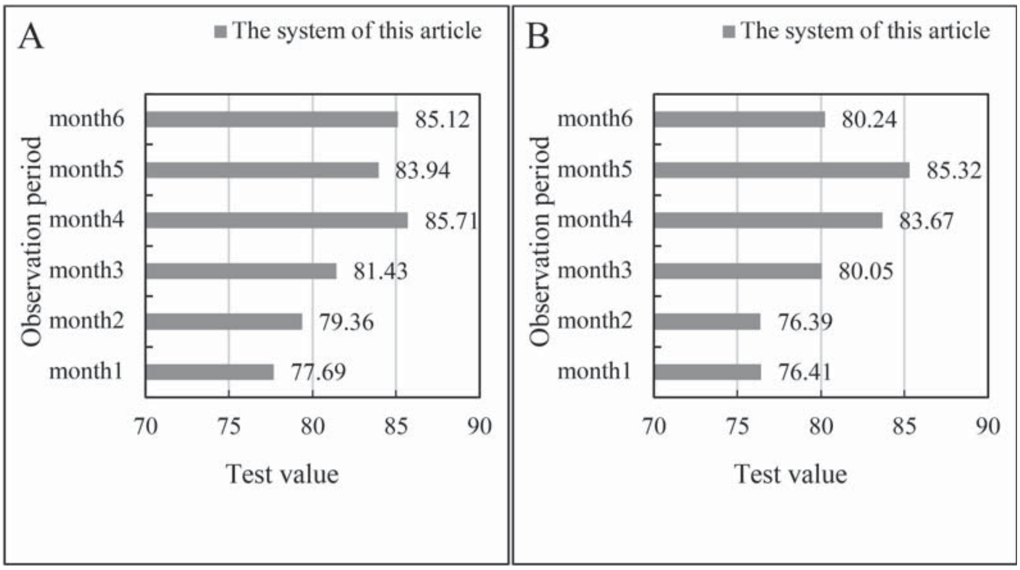

Figure 7 Student User Usage Test Results.

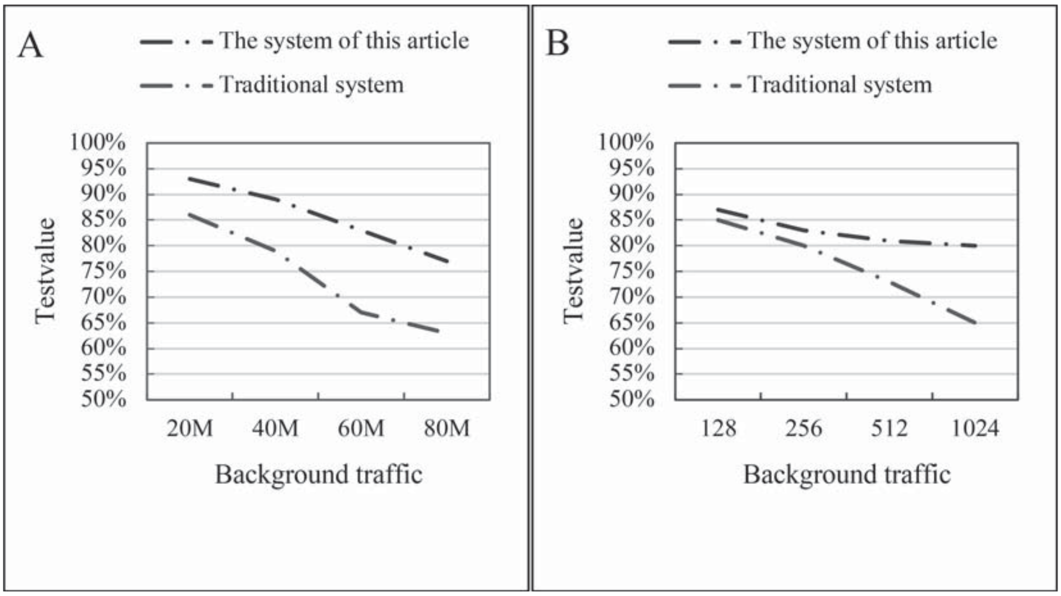

Figure 8 Performance Test of Educational Informatization Intelligent System.

crucial to the rapid development of education. While the traditional education system is stable in terms of teaching quality, it cannot keep pace with the times and the market requirements.

Figure 7A is a student user test of the proposed system, while Figure 7B is a student user test of the traditional system.

As can be seen from Figure 7, the test results of each system in terms of students' use are roughly the same as those of teachers' use. The average score of the educational information intelligent system proposed in this paper in terms of students' learning effect is 82.21 points, and that of the traditional education system is 80.35 points. The difference between the test results is not big, and the learning results obtained with this system is slightly higher than that of the traditional system. Learning results, a major parameter used to evaluate whether the teaching requirements and goals have been met, play a very important role in all educational activities. In this respect, the proposed education system meets the requirements of sustainable educational development.

(3) System Performance

If an education system wants to run normally, it must meet the two properties of security and stability at the same time. Therefore, the performance test of educational information intelligent system mainly focuses on the system's defense rate against factors with high external security risks under different background flows and its stability under different node numbers. The test results are shown in Figure 8.

Figure 8A shows the results of the system security test, while Figure 8B shows the results of the system stability test.

As evident in Figure 8, in terms of system security testing, generally speaking, the greater the background traffic of the network, the greater is the security risk to the system. It can be seen that when there are 10 megabits of traffic, the defense rates of the two systems against external information reach 93% and 86% respectively, but with the increase in traffic, the defense rates of the systems also gradually decrease, so that when the background traffic is 80 megabits, the defense rates of each system are 77% and 63% respectively. In the system stability test, the education system proposed in this paper runs stably in the face of different nodes, and the average test value reaches 82.75%, while the average test value of the traditional education system is only 75.75%. that the results demonstrate that the performance of the proposed system is superior.

5. CONCLUSIONS

The implementation of education informatization is a change that education has to make in order to meet the requirements of the times and the market. In this paper, a BP neural network algorithm and its theoretical basis were applied to the construction of an intelligent education informatization system, which improved the management efficiency and performance of the system in terms of ensuring the quality, alleviating the problems and inconsistencies in the current education and teaching management of the current education system, and promoted the development of education informatization to a certain extent. Although it has contributed valuable research on the intelligent system of educational informatization based on BP neural network, the study had several shortcomings. The depth and breadth of this research were not enough, and my academic level research was limited. The research on the construction and application of intelligent system of educational informatization was still in the initial stage. In future work, we will analyze it from more perspectives based on the current level of technology, and endeavor to improve the quality and output of research work.

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REFERENCES

1. Lakhno, V., Boiko, Y., Mishchenko, A., Development of the intelligent decision-making support system to manage cyber protection at the object of informatization. *Eastern-European Journal of Enterprise Technologies* 2(9) (2017), 53–61.
2. Ji, X., Community guidance model based on interactive multimedia system. *Multimedia Tools and Applications* 78(4) (2019), 4723–4741.
3. Liu, S., Wang, J., Ice and snow talent training based on construction and analysis of artificial intelligence education informatization teaching model. *Journal of Intelligent and Fuzzy Systems* 40(3) (2020), 1–11.
4. Lu, H., Application of wireless network and machine learning algorithm in entrepreneurship education of remote intelligent classroom. *Journal of Intelligent and Fuzzy Systems* 40(2) (2021), 2133–2144.
5. Ma, D., Zhou, T., Chen, J., Supercritical water heat transfer coefficient prediction analysis based on BP neural network. *Nuclear Engineering and Design* 320 (Aug.) (2017), 400–408.
6. Lü, J, Xie, R., Zhou, W., Application of LM-BP neural network in simulation of shear wave velocity of shale formation. *Journal of China University of Petroleum (Edition of Natural Science)* 41(3) (2017), 75–83.
7. Li, D. J., Li, Y. Y., Li, J. X., Gesture Recognition Based on BP Neural Network Improved by Chaotic Genetic Algorithm. *International Journal of Automation and Computing* 15(03) (2018), 1–10.
8. Liu, T., Yin, S., An improved particle swarm optimization algorithm used for BP neural network and multimedia courseware evaluation. *Multimedia Tools & Applications* 76(9) (2017), 11961–11974.
9. Wang, W., Tang, R., Li, C., A BP neural network model optimized by Mind Evolutionary Algorithm for predicting the ocean wave heights. *Ocean Engineering* 162(aug.15) (2018), 98–107.
10. Pan, Q., Dong, H., Han, Q., A computing method for attribute importance based on BP neural network. *Journal of University of Science and Technology of China* 47(1) (2017), 18–25.
11. Ayman Dawood Salman1, Osamah Ibrahim Khalaf and Ghaida Muttashar Abdulsahib, An adaptive intelligent alarm system for wireless sensor network. *Indonesian Journal of Electrical Engineering and Computer Science* 15(1) (2019), 142–147.
12. Naveed Ahmad Khan, Osamah Ibrahim Khalaf, Carlos Andrés Tavera Romero, Muhammad Sulaiman, Maharani A. Bakar, Application of Intelligent Paradigm through Neural Networks for Numerical Solution of Multi-order Fractional Differential Equations. *Computational Intelligence and Neuroscience* 2710576 (2022), 16.
13. D. Zhang, D. Huang, Chong, Z., Application of BP Neural Network Based on Genetic Algorithm in the Inversion of Density Interface. *Journal of Jilin University* 47(2) (2017), 580–588.
14. Gang Wang, Jun Zhou., Dynamic robot path planning system using neural network. *Journal of Intelligent & Fuzzy Systems* 40(2) (2021), 3055–3063.
15. D. Zheng, Qian, Z. D., Liu, Y., Prediction and sensitivity analysis of long-term skid resistance of epoxy asphalt mixture based on GA-BP neural network. *Construction & Building Materials* 158(jan.15) (2018), 614–623.
16. He, F., Zhang, L., Mold breakout prediction in slab continuous casting based on combined method of GA-BP neural network and logic rules. *International Journal of Advanced Manufacturing Technology* 95(9–12) (2018), 4081–4089.

17. Liu, C., Fan, P., Wang, H., Modeling forest fire risk assessment based on BP neural network of transmission line. *Power System Protection and Control* 45(17) (2017), 100–105.
18. Wang, H., Wang, J., Zhou, Q., Comprehensive Error Compensation of Machine Tools Based on BP-Neural Network Algorithm. *Hsi-An Chiao Tung Ta Hsueh/Journal of Xi'an Jiaotong University* 51(6) (2017), 138–146.
19. Hu, H. X., Gong, X. J., Shi, C. L., Research on vibro-acoustic characteristics of the aluminum motor shell based on GA-BP neural network and boundary element method. *Journal of Vibroengineering* 19(1) (2017), 707–723.
20. Fan, W., Lin, Y. Y., Zhong-Shen, L. I., Prediction of the Creep of Piezoelectric Ceramic Based on BP Neural Network Optimized by Genetic Algorithm. Jiliang Xuebao/Acta Metrologica Sinica 38(4) (2017), 429–434.
21. Li, Y., Research on application of BP neural network in library electronic resource quality evaluation. *Revista De La Facultad De Ingenieria* 32(5) (2017), 605–613.
22. Wang, Y., Fu, P., Integration performance statistics of green suppliers based on fuzzy mathematics and BP neural network. *Journal of Intelligent and Fuzzy Systems* 40(2) (2021), 2083–2094.
23. Li, J., Research on the Reform and Innovation of Preschool Education Informatization under the Background of Wireless Communication and Virtual Reality. *Wireless Communications and Mobile Computing* 2021(2) (2021), 1–6.
24. Kou, S., Application of Education Informatization Promoting Educational Equity in Remote Areas of China. *International Journal of Information and Education Technology* 10(8) (2020), 608–613.
25. Qizi, S., Pedagogics of formation of future teachers' social outlook in the conditions of informatization of education. *ACADEMICIA An International Multidisciplinary Research Journal* 11(3) (2021), 1257–1260.
26. Kravtsov, Y. S., Oleksiuk, M. P., Halahan, I. M., Pedagogical Innovation in the Conditions of Informatization of Humanities Education. *Universal Journal of Educational Research* 8(11D) (2020), 117–121.
27. Wu, Y., Impacts of Cloud Classroom on the Communication of Higher Education in the Time of Educational informatization. *Frontier of Higher Education* 2(3) (2020), 1–9.

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