

Retraction

Retracted: Design and Management of Microteaching Mode of Innovation and Entrepreneurship Education in Colleges and Universities Driven by Big Data

Mobile Information Systems

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] H. Zhu and Q. Wang, "Design and Management of Microteaching Mode of Innovation and Entrepreneurship Education in Colleges and Universities Driven by Big Data," *Mobile Information Systems*, vol. 2022, Article ID 4689950, 10 pages, 2022.

Research Article

Design and Management of Microteaching Mode of Innovation and Entrepreneurship Education in Colleges and Universities Driven by Big Data

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There have been few studies on the quality assessment at the meso- or microlevel in my country's colleges and universities despite the fact that innovation and entrepreneurship (IAE) education is constantly progressing. A new assessment method based on big data is employed in this paper to investigate the design and management of microteaching modes for IAE education and to promote the development of IAE at these institutions while also enhancing the quality of innovative talent training. This paper addresses the urgent need to reform the evaluation system for IAE education. This paper has completed the following work: (1) this paper firstly analyzes the current situation of IAE education evaluation at home and abroad on the basis of literature research and summarizes the current theoretical thinking, methods, and shortcomings of IAE education evaluation. (2) Analyzing the present condition of IAE education assessment, relevant ANN technologies are introduced, and a suitable quality index system for IAE education is created. (3) With the use of big data, we were able to gather samples and data sets for the experiment, and then, we utilized the BP algorithm and the GA-BP algorithm to compare their accuracy in predicting the quality of IAE education, and the GA-BP algorithm has better performance.

1. Introduction

The current economic development is increasingly based on information, knowledge, and technology as the main components of the transformation mode, which continuously promotes the progress of the era of knowledge economy and the era of big data driven by IAE [1]. The advent of the era of knowledge economy marks the continuous strengthening of the constraints of resources and environment, and the investment model and industrial structure under the traditional model are unsustainable due to the characteristics of excessive investment, excessive consumption, and extensive use. It deviates from the low consumption, high added value, and intensive development direction required by the current society [2]. Under the general trend of the era of data technology, we will continue to promote the development trend with innovation as the

main driving force and promote scientific and technological development to achieve progress and innovation. To achieve a more innovative and entrepreneurial society, it is necessary to enhance the IAE skills of the workforce. Since economic growth is now taking place in a spontaneous order, there is not enough innovation and entrepreneurialism in the whole society, nor is there enough training for those who want to be innovators in this new data economy [3]. For this reason, innovation and entrepreneurial education should be enhanced in the face of a societal challenge of imbalanced supply and demand. Colleges and universities serve as a crucial guarantor and basis for the implementation of my country's innovation-driven growth plan and the creation of an inventive nation. The colleges/universities also perform the roles of education, research, and service to the community. As a result, providing quality and quantity of IAE education and training to future business leaders is critical

[4]. Worldwide, entrepreneurship education is on the rise. Western developed nations, such as the United States, continue to ensure the quality of IAE education and utilize educational assessment to halt the deterioration in the quality of IAE talent training. However, my country's IAE education is also plagued by issues such as a lack of financing and a lack of capacity to turn successes in the process of growth. Therefore, since the middle and late 20th century, with the important subject of innovative talent training proposed by "Qian's Questions," after a time of review and standardization, innovation and entrepreneurship education in my nation has moved on to a new phase of systematization and standardization. My nation's economic growth is now approaching a new normal, and the government and the higher education sector are more interested in innovation and entrepreneurial education [5]. It is essential to modernize education via innovation and entrepreneurial education, and it is the only method to build "double first-class.". Mass entrepreneurship and innovation will be fostered during the "two sessions" in 2020 as well as the development of an innovation and entrepreneurship assessment system that will serve both to cultivate an innovative school environment and to effectively cultivate inventive talent [6]. Because of this, there is a pressing need to overhaul the assessment system for IAE education. Microteaching mode of innovation and entrepreneurial education is discussed and managed in this paper using big data-driven evaluation method for new-era research, which aims at improving innovative talent training in universities, as well as the development of entrepreneurship in higher education institutions. IAE education reform may also be encouraged via the use of quality evaluations of these programs. Education modernization is a vital aspect of promoting the new requirements of society for talent development in the current age [7]. Since the development of IAE potential relies on the rigorous study on the quality of education that fosters it, this research also serves as an effective tool for encouraging educational institutions to better prepare their students to meet the demands of the marketplace. The quality assessment mechanism for IAE education must be improved to increase education and training quality. The development of a more scientific and methodical approach to IAE education might be encouraged by the construction of a realistic assessment system. As a result of the quality assessment of IAE education in my country, I hope to enhance the quality of IAE education as well as the effectiveness of training innovative talent. I also hope to promote further reform and improvement of IAE education [8]. A strong IAE education assessment system may effectively enhance the fit of the demand for talents in the data economy age based on the execution of the innovation-driven development strategy in the new era.

2. Related Work

In 1945, Harvard University professors advocated that students' inventive capacity and the combined growth of knowledge and ability should be the focus of their education. In addition, the universities of Cambridge and Oxford in the

United Kingdom have always regarded "detecting, excavating, and developing students' potential capabilities and stimulating individual creativity" as their school-running ideas [9]. In 1958, the "National Defense Education Act" promulgated by the US government stated that it is necessary to strengthen the purpose of innovation education to use innovation to enhance national defense competitiveness and the development of modern science [10]. In 1989, Japanese entrepreneurs put forward the "Gap Theory" of entrepreneurship education, which pointed out that there are actually many teaching and market environments. In a similar way, filling the gaps in the market can yield unexpected benefits. Similarly, filling the gaps in entrepreneurship education can yield surprising results. An international symposium on education for the twenty-first century organized by UNESCO in the same year emphasized the need of fostering students' pioneering abilities and inventive spirits via entrepreneurial education. When British colleges and universities began to include entrepreneurship education into their governance and personal development programs for college professors, it had a significant impact. The "Higher Education Society" has specially designed courses related to innovation and entrepreneurship for more than 30 colleges and universities [11]. German colleges and universities pointed out that they should focus not only on the explanation of theoretical knowledge of entrepreneurship but also on the expansion of students' overall thinking mode and the cultivation of relevant quality and ability, gradually infiltrate the relevant knowledge of entrepreneurship in the professional field chosen by the students, and stimulate and guide the students to establish an entrepreneurial spirit. In 1995, the Korean government gradually realized the importance of "innovative elements" and pointed out in the education reform plan that it launched later that the focus of education must be shifted from focusing on cultivating knowledge and memory to focusing on cultivating innovation. The content of university education is no longer just the dissemination of knowledge but should pay attention to the dissemination of technology and creativity [12]. As part of its 2010 education report, the EU urged member states to continue to establish their own entrepreneurial education programs by stating that the EU was open to the idea, encourages collaboration between businesses and universities in the realm of entrepreneurial education, then reforms the autonomous model of entrepreneurship education, and builds a regulatory framework suitable for the development of entrepreneurial enterprises. Universities all over the world are also constantly implementing educational reforms and teaching innovations, expecting the vigorous development of IAE education to live up to the teaching mission of cultivating talents [13]. In 1998, Tsinghua University held an on-campus entrepreneurship competition, which was the first time that the university student entrepreneurship competition was introduced to Asia. Subsequently, the Ministry of Education designated 9 key universities in my country as pilot universities for IAE education. Inventive education was described in 2000 by reference [14] as the educational philosophy and practice of using the principles of creativity to foster students' innovative spirit and skill in

classroom instruction, and as outlined in prioritizing development, education, reform, innovation, equality, and quality improvement were all part of the 2010 Outline of the National Medium- and Long-Term Education Reform and Development Plan. Progress in education may be accelerated by reform and new ideas [15]. Reference [16] pointed out that since 2006, the research on entrepreneurship education in my country has gradually increased, and entrepreneurship research accounts for 1/5 of all entrepreneurship research. However, in terms of total study, there are just a few studies on education quality assessment. As the popularity of innovation and entrepreneurship education grows, academics from both domestic and international countries are more interested in evaluating its quality. IAE education evaluation appeared in the 1990s, and they believe that entrepreneurship education-related courses are the best indicator of quality and that the resources and support given to entrepreneurship education courses can be used to determine their level of effectiveness [17]. Then, a professor further improved the evaluation content of IAE education. He believed that the evaluation indicators mainly include seven aspects, such as courses created, relevant works of educators, social value, and entrepreneurial achievements of students after graduation [18]. In my nation, the quality assessment system for IAE education emerged later than in other countries, although research in this area has risen dramatically in recent years. Scholars first focused on the assessment system's significance and provided several requirements and design guidelines. Reference [19, 20] believes that the construction of the quality evaluation index system of IAE education should follow the five principles of subjectivity, innovation, practice, technological advancement, and team integrity. Reference [21] believes that the construction of relevant indicator systems should follow comprehensiveness, comparability, operability, and scientificity. On this basis, the curriculum, teachers, entrepreneurial environment, and students of entrepreneurship education are set as the first-level indicators of the evaluation index system. Reference [22] gives 40 evaluation indicators more systematically and in detail and divides them into eight categories. According to the article, colleges and universities' investment in IAE education should be taken into account when evaluating the quality and effectiveness of such education. Many academics in the field have also backed this theory. Scholars started to suggest qualitative and quantitative assessment techniques in order to enhance the objectivity and reliability of the evaluation system in the following years. According to some researchers, the evaluation index is determined using the expert survey technique, whereas the evaluation index weight is determined using the AHP analysis approach [23, 24].

3. Method

3.1. Microteaching Mode and Design. "Microteaching" is a new concept in China. The so-called "microteaching" refers to decomposing a complex teaching process into many specific knowledge points or skill points that are easy to master. It proposes teaching objectives for each knowledge

point or skill point and teaches students in a short period of time. The microteaching mode has the following characteristics:

- (1) The teaching time is short. Generally speaking, the teaching time of a knowledge point or skill point is controlled within 20 minutes, preferably 5 to 15 minutes. Typically, an adult's concentration time is 1 hour. However, according to psychological research, in nearly an hour of classroom teaching, the time for students to be able to concentrate and fully understand the teaching content is generally 15 to 20 minutes, and then, they need other stimuli to continue to maintain their attention. Therefore, a corresponding teaching reform has been carried out abroad, that is, a 45-minute classroom teaching is divided into three parts. The first 20 minutes introduce a knowledge point, followed by 5 minutes of relaxation, including classroom discussion, free conversation, learning feedback, etc., and then, a 20-minute knowledge point lecture. Therefore, it is more efficient to generally control a knowledge point of the core value system within 20 minutes.
- (2) The teaching content is small. Generally, a knowledge point or skill point is explained in a microteaching unit, and the learning situation of the knowledge point is reviewed and fed back. After learning this knowledge point, students can have a strong impression of the basic content of the knowledge point.
- (3) The teaching content is refined. Due to the short time of microteaching, the explanation of knowledge points should select the essence of the content and explain it in the most powerful language. In this way, students can master the essence of the course content in less time so as to improve teaching efficiency.

As for IAE education and teaching mode across the country, there is a trend of a hundred flowers blooming as a whole. Another example is that with the help of school-enterprise joint training, practical training courses are set up based on the needs of talents in specific industries. In addition, some colleges and universities adopt the integration model of universities, government, and enterprises. The government provides preferential policies and funds, enterprises build platforms, and schools provide teachers. No matter which mode, its purpose is to cultivate students' innovative thinking, entrepreneurial awareness, and innovative spirit and to enhance students' IAE ability.

3.2. Theoretical Basis of Artificial Neural Network. ANN is a mathematical model established by imitating the structure and function of the human brain. In the sense of a network with a specific topology, the canonical form of the network of neurons is derived. The activity characteristics of the topology are related to any given topology. The network is the same, which marks the official birth of the neural

network. Since then, the ANN has gradually developed, and the application field has gradually expanded. The human brain is the central nervous system of the human body, which is composed of neurons. The transmission of information within the nervous system is achieved through the interconnection of neurons. The human brain can adjust the connections between neurons within the nervous system at the fastest speed according to changes in external information and send chemical signals to other neurons to quickly process and solve problems. Similarly, the ANN composed of artificial neurons can also adjust the interconnection between internal neurons according to external changes so as to have the ability to deal with problems. Since the ANN is established by simulating the human brain, it not only has similar functions to the human brain, such as learning, association, and memory, but also has similar functions to the way of human memory.

3.2.1. Neuron Model. Neural nodes are the basic units that make up a neural network, also called neurons. It is a simplified virtual structure from the basic unit of the biological nervous system, that is, biological neurons. A neural network is formed by connecting neural nodes one after another, and different neurons carry specific data information. Information is transmitted to each other through the connections between nodes, so the characteristics of neural nodes also represent the overall characteristics of neural networks to a large extent. As the basic unit of information processing, neurons have several important functions: excitation and inhibition, plasticity, impulse and potential conversion, spatiotemporal integration, learning, forgetting, and fatigue. It is precisely because of these important functions of neurons that neural networks have excellent performance. Artificial neurons are generally divided into two models, one is an artificial neuron with multiple inputs and a single output, and the other is an artificial neuron with a single input and a single output as shown in Figure 1.

The relationship between the parameters of single input and single output is shown in the following formula:

$$\begin{cases} y_0 = L(x_0), \\ x_1 = A(w, y_0, \sigma), \\ y_1 = f(x_1), \end{cases} \quad (1)$$

where x_0 is the scalar input parameter; y_0 is the output of the preprocessing unit; L is the preprocessing function; A is the activation function, also known as the input function; w and σ are the weight and threshold, respectively, both of which are adjustable parameters; and the threshold is negligible in most network structures; x_1 is the output of the activation function; f is the transformation function of the artificial neuron; and y_1 is its output function.

3.2.2. Classification and Characteristics of Artificial Neural Network. ANNs may be classified into supervised and unsupervised learning networks depending on the learning technique used. Stochastic, competitive, and feedforward

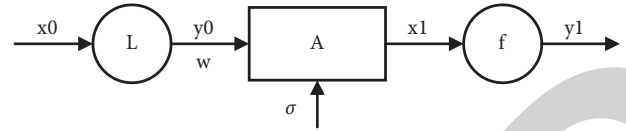


FIGURE 1: Artificial neuron with single input and single output.

neural networks, as well as feedback networks, may be created by combining the network structure with a variety of different learning methods. The following are the major characteristics of a neural network: (1) distributed storage of information. Storing information in different locations can ensure that the network can still output correctly when the network is locally damaged or the input signal is distorted, improving the fault tolerance of the network. (2) Each neuron has both information processing and storage functions. (3) Coprocessing information in parallel. Each neuron of the neural network has the ability to process information independently, and the neurons in the same layer can calculate the output result at the same time and pass it to the next layer for further processing. This feature greatly improves the operation rate of the neural network and has very strong real-time performance. (4) It has the characteristics of self-organization and self-learning. With the increase of training samples and repeated learning, the neural network itself continuously learns and adapts, thereby constantly improving itself and showing a strong self-learning ability. (5) With association storage function: during the training process of the neural network, various influencing factors and continuously adjusted thresholds and weights will be stored in the memory of the neural network. These abnormal data are automatically identified and excluded, and sometimes, several numerical values are added to ensure the accuracy of the output results.

3.3. BP Neural Network and Its Improved Algorithm

3.3.1. BP Algorithm Prediction Steps. BPNN is a feedforward network that includes an input layer, a hidden layer, and an output layer. According to the situation at hand, the number of input layer and output layer neural nodes is defined, whereas the number of hidden layer neurons is often computed using an empirical method. Finally, the output layer receives the information that was communicated from the hidden layer via the transfer function. The status of each layer of neurons only impacts the following layer of neurons throughout the transmission process. A neural network will modify the weights and thresholds of neurons in each layer if the error between the output layer and the predicted value of the target is too big, in order to accomplish the aim of reaching the target. The conventional BPNN's learning procedure is as follows: (1) initialize the weight threshold; (2) input the training samples and calculate the output of each layer through the established network structure and the initialized weight threshold; (3) adjust the weight threshold through error backpropagation; and (4) calculate the error and the mean square error between the output value and the target value, if the convergence conditions are met, end,

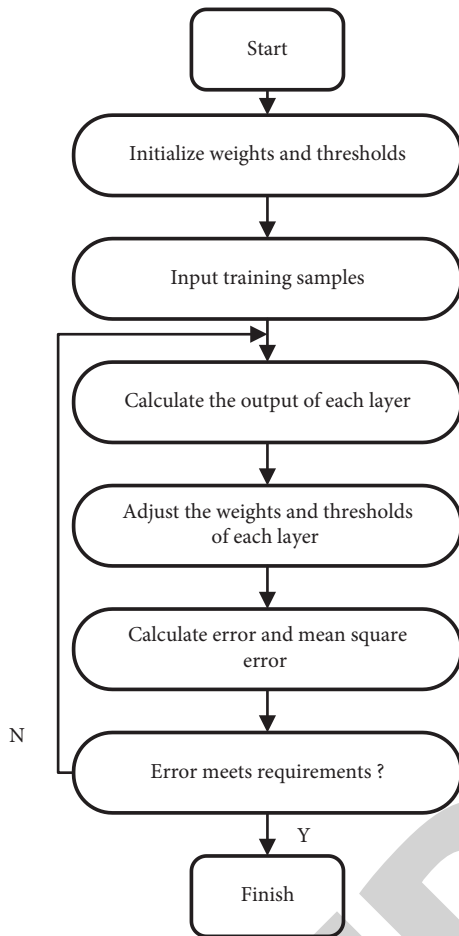


FIGURE 2: Standard BP network flow chart.

otherwise return to the third step, and repeat the error backpropagation to adjust the weight threshold. The standard BPNN process is shown in Figure 2. BPNN has self-learning function, can store and learn a large number of input-output mapping relationships without prior description, and can well adapt to various linear and nonlinear systems, so it is widely used to solve prediction problems in multifactor complex systems.

3.3.2. Genetic Algorithm Improved BP Neural Network.

BPNN has the disadvantage that it is easy to fall into local optimum, while genetic algorithm has the characteristics of high efficiency, strong fault tolerance, and global search. Therefore, using genetic algorithm to improve neural network prediction model can overcome the shortcomings of BP neural network optimization, which can avoid local convergence. In Darwin's theory of natural evolution, it is mentioned that when animals and plants mate to select mates, there are two types: artificial selection and natural selection. The difference between the two is as follows: artificial selection is where breeders select plants and animals with desirable traits to mate and leave the best offspring that combine more of the desired traits in a single individual for further breeding. Although natural selection operates in a similar way, it is the selection of mating objects by

individuals of animals and plants according to the characteristics of their environment and other characteristics and leaves those characteristics that lead to acquisition and can be converted into offspring resources. Whether it is artificial selection or natural selection, their mating method achieves "crossover" at the chromosome level to a certain extent, and even chromosomal mutation occurs in the process. In general, both artificial selection and natural selection have a large number of possibilities to be explored in the search space. When exploring this search space, the usual goal is not to find the best individual but to find a set of improvements. Each element has a specified value in the search space, called fitness. The objects of the search are individuals with higher fitness levels. Inspired by Darwin's theory of evolution, scholars imitate the theory of biological evolution, encode the individuals in the problem into chromosome-like strings, search in the search space, and find chromosomes with higher fitness levels to find the solution to the problem. Based on this bold conjecture, model establishment and formula derivation are carried out, and a genetic algorithm is finally proposed. The basic principle of genetic algorithm is as follows. Genetic algorithm is an adaptive optimization search algorithm developed by simulating the genetic evolution process of organisms and the natural law of survival of the fittest. Its biological principle is Darwin's survival law of "natural selection, survival of the fittest, and survival of the fittest." In accordance with the principles of genetics, individuals are selected, crossed, and mutated to update the population and optimize the population. The differences between genetic algorithms and traditional optimization methods can be described in four ways: (1) genetic algorithms encode sets of parameters rather than the parameters themselves; (2) genetic algorithms operate from a set of points rather than a single point; (3) genetic algorithms use yield information, not derivatives or other auxiliary knowledge; and (4) genetic algorithms use probabilistic transition rules, not deterministic rules.

The operation process of the genetic algorithm: the first step is to randomly select an initial population from the solution set containing the approximate optimal solution; in the second step, the individuals in the population are chromosomally encoded so that each individual is a chromosome with specific characteristics; the third step is to place these individuals with chromosome coding in the problem search space and use the value of the fitness function to select individuals with greater environmental fitness; the fourth step is to perform genetic operations such as selection, crossover, and mutation to generate new individuals and participate in the next evolution together with the remaining individuals as a new group. In this way, iterative evolution is repeated until the constraints are met; finally, the optimal solution with the largest fitness value is obtained. Genetic algorithm has high efficiency, parallel processing, global search, and good robustness, so it has unparalleled advantages in dealing with function optimization, combinatorial optimization, and complex nonlinear function problems. It is precisely because of these characteristics of the genetic algorithm that the genetic algorithm develops rapidly and is widely used in various fields.

3.3.3. *Basic Steps of Genetic Algorithm.* In the process of using genetic algorithm, it is generally necessary to go through chromosomal coding, formation of initial population, calculation of fitness, and genetic operations such as selection, crossover, and mutation.

- (1) **Chromosome Coding:** coding is to use chromosomes in genetics to represent the solutions to be solved in practical problems. Each solution represents a chromosome, and coding will enhance the search ability of the algorithm in the population. There are two main ways of encoding: one is binary encoding for the purpose of using less symbols, and the other is real number encoding for the purpose of easy calculation and high precision. The traditional genetic algorithm uses binary coding for chromosome coding. Due to the large number of independent variables and the long chromosome length, the operation process is complicated, and it is easy to fall into local extreme values and the search efficiency is very low. The real number coding is used in this paper. Compared with the binary coding, the real number coding is not only simple and not easy to fall into the local extreme value but also can improve the operation precision and speed.
- (2) **Fitness Function:** the fitness is the performance of the ability to adapt to the environment. The stronger the fitness, the easier it is to survive in the environmental competition. On the contrary, it is easy to be eliminated by the environment, determine the network structure of the BPNN, initialize the neural network, perform simulation prediction, and get the training error. Because the genetic algorithm searches for the network threshold and weight with the smallest sum of squares of the prediction error, the genetic algorithm can only increase toward the fitness function value. The larger the direction of evolution, the reciprocal of the MSE is selected as the fitness function. The fitness function calculation is shown in the following formula:

$$\text{fitness} = \frac{1}{\text{MSE}} = \frac{1}{\sum (P - Q)^2 / M}, \quad (2)$$

where fitness is the fitness function, P is the expected output, Q is the actual output, and M is the number of individuals.

- (3) **Genetic Operations:** among the simplest genetic algorithms to understand are selection, crossover, and mutation, which are the three fundamental genetic algorithm operators. The genetic algorithm's core is made up of these three operators. They make good use of previous data to make educated guesses about new search areas that might provide better results. Theoretically and experimentally, genetic algorithms have been shown to be capable of strong search in complicated search spaces.

3.4. *IAE Education Quality Evaluation System in Colleges and Universities.* The objective of this study and the peculiarities of IAE education necessitate the development of a scientific and reasonable quality assessment system for this kind of education, and this paper establishes the following principles for selecting indicators: (1) the principle of scientificity. On the one hand, the selection of indicators, the determination of indicator weights, and the processing of data should be based on scientific principles; in addition, the previous article also mentioned in the literature review that there is overlap and mutual penetration between secondary indicators such as curriculum construction and teaching staff. Therefore, it is necessary to avoid the overlapping of indicators and the loss of scientific principles. (2) The principle of operability. The source of indicator data should be reliable, and the data should be easy to obtain and aggregate. And in practice, it should be able to be directly collect or transform through processable data. In theory, the index data that can be included in the evaluation system but cannot actually obtain relevant data should be screened out to ensure the feasibility of index selection. (3) The principle of simplicity. The selection of indicators is not the more the better. Too many evaluation indicators will bring about difficulties in data selection, increased processing difficulty, crossover, merger, and duplication among indicators. Therefore, in the selection of indicators, this paper tries to choose indicators that are more representative and typical, easy to quantify, and contain a large amount of information so as to reflect the reality of the quality of IAE education.

Analysis of representative successes, such as quality criteria for IAE education quality assessment criteria, is based on educational evaluation theory and educational resource utilization efficiency. Colleges and universities vary in their growth features, as well as in the resources they depend on, the number of professors they employ, and the academic success of its students. The establishment of IAE is based on four aspects: social environment, college environment, teaching team, and student performance. Two secondary indicators are set under the overall social environment target, with relatively small numbers. Because of the limited information related to the social environment of colleges and universities in actual research, it is difficult to collect data, and it is impossible to find corresponding secondary indicators that can be quantified for calculation under the possible primary indicators. Therefore, there are certain unreasonable points in this index system, so it does not reflect the breadth of the concept of social environment indicators in the quality evaluation of IAE education. The constructed index system is shown in Table 1. After the final prediction result is obtained according to the system, the design and management of the microteaching mode is carried out.

4. Experiment and Analysis

4.1. *Selection of Sample Universities and Data Sources.* Colleges and institutions in city A began teaching students about innovation and entrepreneurship at an early age and saw considerable growth in this area. The benefits of

TABLE 1: IAE evaluation index system of colleges and universities.

First-level indicators	Secondary indicators	Label
Social environment	University-enterprise cooperation rate	X1
	Number of government-related events held	X2
	IAE education funding	X3
	Number of IAE policy documents released	X4
College environment	Number of revisions to talent training programs	X5
	The number of students' entrepreneurial associations	X6
	Number of IAE education lectures	X7
	Number of IAE incubation centers	X8
	Number of IAE courses open	X9
Teaching staff	Number of IAE practice bases	X10
	Number of full-time teachers	X11
	Number of career guidance teachers	X12
	Number of special training for teachers	X13
	IAE course attendance	X14
Student performance	Graduate entrepreneurship program satisfaction	X15
	Student employment success rate	X16
	IAE competition winning rate	X17
	Graduate entrepreneurship rate	X18

aggregating educational resources have led to the formation of national institutions that can ensure academic success and provide access to cutting-edge knowledge and expertise. Five National Innovation and Entrepreneurship Education Reform Demonstration Schools currently exist in China. This study uses a technique of horizontal assessment based on the status, level, and efficacy of each university's IAE education and conducts research at three A-class construction universities and two A-class general undergraduate universities. First of all, the five sample universities are all comprehensive universities in terms of functional orientation, and there is no development biased toward a certain subject area. Secondly, at the level of colleges and universities, this article has selected subordinate colleges and universities and municipal colleges; subordinate colleges and universities have their advantages in education funds, educational resources, etc.; and the source of students is relatively good. However, some municipal colleges and universities are in a relatively disadvantaged position due to the limitation of teachers and the level of teaching and scientific research. Many diverse subjects are included in entrepreneurship and innovation education, and each institution has the ability to establish its own. It is thus required to conduct horizontal and vertical comparisons to identify the gaps in growth between colleges and universities at two different levels in many sectors and then provide specific recommendations to address them. Finally, because of the wide scope of IAE education, there are variances among the many professions, industries, and models of IAE in terms of the successes in college and university development. The examples included in this study are from the fields of education and practice related to innovation and entrepreneurship. As a consequence, various fields should be evaluated and compared separately, and the

potential influence on the assessment findings should be taken into account. The data used in this article is highly available, mainly from the 2019–2020 “Undergraduate Teaching Quality Report” released by each sample college in 2020 and the documents published on the official website of the college.

4.2. Prediction Model Establishment

4.2.1. Data Preprocessing. In order to reduce the computational complexity of the BPNN, it is necessary to normalize all input parameters before training to eliminate the influence of the difference in the order of magnitude on the error. The normalization process is shown in the following formula:

$$I' = \frac{I - I_{\min}}{I_{\max} - I_{\min}}, \quad (3)$$

where I' is the value obtained after normalizing the data, I is the sample value of the data table, and I_{\min} and I_{\max} are the minimum and maximum values of the data sample, respectively.

4.2.2. Determination of the Number of Neural Nodes in the Hidden Layer. As a result of this, the number of hidden layer neural nodes has a direct impact on network fitting and simulation prediction accuracy. The network's fault tolerance will be low if the hidden layer's number of neurons is too small, and the proper input and output mapping relationship will not be identified and fit. Increasing the number of hidden neurons will not only increase the number of network iterations but also diminish the network's generalization capacity. The range of the number of neurons in the hidden layer is first calculated using empirical formulae, and then, the network is trained for various numbers to eventually identify the number of neurons. The empirical formula used in this paper is as follows:

$$N = \sqrt{m + n} + i, \quad (4)$$

where m and n are the number of input and output layer nodes, respectively; i is an integer between [1, 10].

According to the number of input and output nodes in this paper, the range of the number of hidden layer nodes is finally determined to be between [5, 15], and the trial and error method is used to conduct experiments, and the results are shown in Figure 3. According to the experimental results, it can be determined that the training effect when the number of nodes is 10 is the best.

4.3. BP Algorithm and GA-BP Algorithm Model Experiment

4.3.1. BP Algorithm Model Experiment. The network simulation runs in the MATLAB environment, and the transfer functions of the input layer, hidden layer, and output layer are tansig function, tansig function, and purelin function, respectively. The number of training iterations is 5000, the learning efficiency is 0.005, and the error target is 0.000165.

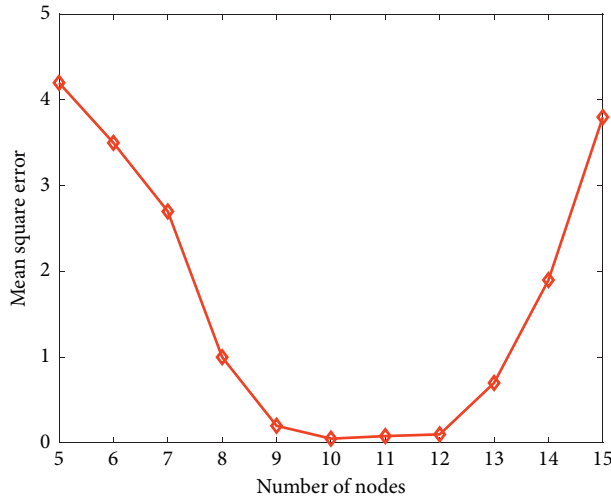


FIGURE 3: The training error of different number of hidden layer nodes.

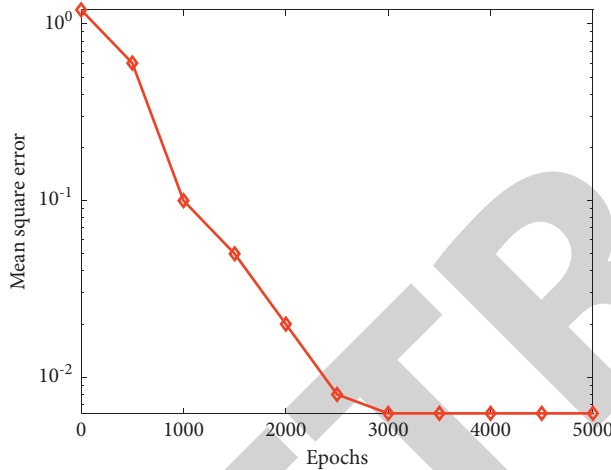


FIGURE 4: BP neural network mean square error diagram.

The mean square error diagram of BPNN is shown in Figure 4. During the 5000 iterations, the minimum mean square error MSE is 0.00625. We can see from the figure that the minimum error has been trained when iterative to about 3000 generations.

It can be seen from Figure 5 that the error between the output of the BPNN and the expert evaluation is very small, and the average error of the 8 experiments is less than the target error, which meets the error requirements, indicating that the BP algorithm model proposed in this paper has a good prediction effect.

4.3.2. GA-BP Algorithm Model Experiment. The transfer functions of input layer, hidden layer, and output layer are tansig function, tansig function, and purelin function, respectively, and the model training function is trainlm. The number of BPNN training iterations is 200, the learning efficiency is 0.01, and the error target is 0.0000165. The maximum evolutionary generation of the genetic algorithm

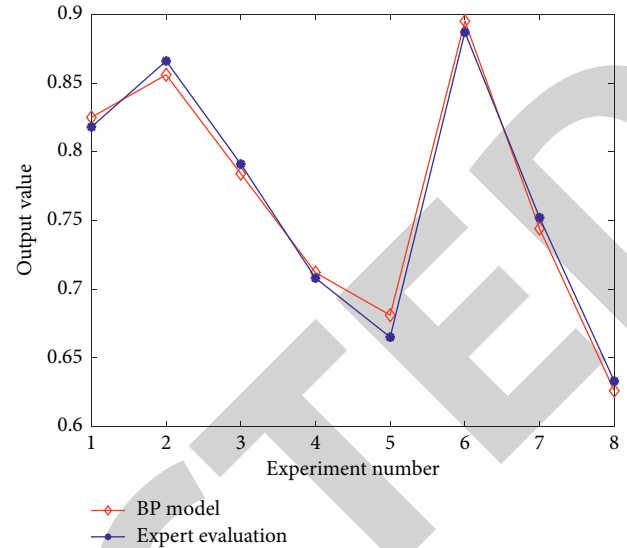


FIGURE 5: Comparison of BP neural network output and expert evaluation.

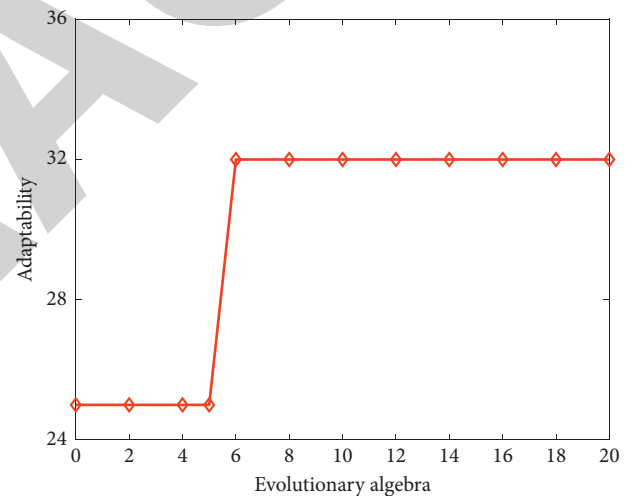


FIGURE 6: GA-BP neural network fitness curve.

is 20, the population size is 30, the crossover probability is 0.5, and the mutation probability is 0.25. For model training, the Levenberg–Marquardt algorithm with high prediction accuracy and less iteration time is selected. Figure 6 shows the fitness curve of the GA-BP neural network. It can be seen that the evolutionary algebra is between 5 and 6, and there is an obvious gradient change, indicating that iterative optimization is being performed at this time. After the sixth generation, the curve is stable and the fitness value reaches the maximum. At this time, the optimal solution has been found, and the mean square error is the smallest.

It can be concluded from Figure 7 that the error between the output of the GA-BP neural network and the expert evaluation is very small, and the average error of the 8 experiments is less than the target error, which meets the error requirements, indicating that the GA-BP algorithm model proposed in this paper has good predict effect.

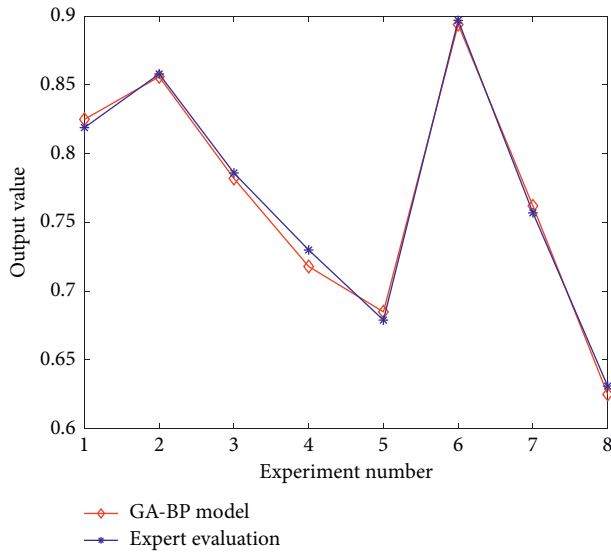


FIGURE 7: Comparison of GA-BP neural network output and expert evaluation.

TABLE 2: Comparison of two models with expert evaluation.

Number	1	2	3	4	5	6	7	8
Expert evaluation	0.825	0.856	0.782	0.718	0.685	0.894	0.762	0.625
BP model	0.816	0.862	0.788	0.706	0.673	0.885	0.751	0.633
GA-BP model	0.819	0.858	0.786	0.730	0.679	0.897	0.757	0.631

4.3.3. *Comparison of the Two Models.* The output results of the two models are compared with the expert evaluation, and the obtained results are shown in Table 2. It can be seen that the GA-BP algorithm model has higher accuracy and better performance than the traditional BP algorithm.

5. Conclusion

It is critical to support efforts to improve the quality of university-based innovation and entrepreneurship education by conducting assessments and conducting research on the current state of the field. This will help guide future efforts to improve university-based innovation and entrepreneurship education. Research on how colleges and universities evaluate the quality of their innovation and entrepreneurship education shows that in order to create a more conducive social environment for the growth of this type of education, the construction of a school-business cooperation platform needs to be strengthened. There must be more investment in innovation and entrepreneurship in college environments, together with a greater emphasis on the curriculum and faculty resources, in order to improve students' innovation abilities and promote the further transformation of innovative successes. Therefore, this paper has completed the following work: (1) this paper firstly analyzes the current situation of IAE education evaluation at home and abroad on the basis of literature research and summarizes the current theoretical thinking,

methods, and shortcomings of IAE education evaluation. (2) Analyzing the present condition of IAE education assessment in certain colleges and universities, relevant ANN technologies are introduced, and a suitable quality index system for IAE education in colleges and universities is created. (3) With the use of big data, we were able to gather samples and data sets for the experiment, and then, we utilized the BP algorithm and the GA-BP algorithm to compare their accuracy in predicting the quality of IAE education in colleges and universities, and the GA-BP algorithm has better performance.

Data Availability

The data sets used during the current study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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