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Retraction

Retracted: Application of Wireless Network Based on Artificial Intelligence in Network Teaching of Preschool Education Manual and Aesthetic Education Practical Course

Mathematical Problems in Engineering

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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] X. Li and W. Xiao, "Application of Wireless Network Based on Artificial Intelligence in Network Teaching of Preschool Education Manual and Aesthetic Education Practical Course," *Mathematical Problems in Engineering*, vol. 2022, Article ID 6729830, 10 pages, 2022.

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Research Article

Application of Wireless Network Based on Artificial Intelligence in Network Teaching of Preschool Education Manual and Aesthetic Education Practical Course

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For preschool education majors, art and crafts are required courses. This course is a hands-on exercise that helps students develop their creative awareness, design thinking, and hands-on skills. At the same time, it provides learners with the teaching thinking mode of art and handicraft theme and the form of online teaching helps learners to construct the thinking mode of online learning. As a new teaching form, online teaching is gradually leading the reform in the field of education. However, the majority of present online teaching is simply a continuation of traditional teaching thought, relying on substantial teaching research rather than utilizing its particular advantages to develop and expand. Also, the connotation depth of traditional teaching may not involve the essential problem of teaching application itself—teaching methods and experience of acquiring knowledge. As a result, determining how to characterize an individual's ability to acquire knowledge and successfully assessing the level of growth of an individual's cognitive structure is critical to the development of a new generation of online education. In order to prepare for the next generation of network teaching, this article uses artificial intelligence and wireless networks to teach preschool education manual and aesthetic education practical courses through the Internet. From the perspectives of individuals and groups, two teaching case recommendation experiments are given. The experiment's end result confirms the practicality and logic of the evaluation model described in this research, which is based on individual cognitive structure.

1. Introduction

Manual courses help students establish a real connection with the things around them, learn practical knowledge, and respect creation. The contents of handcraft courses are divided into the plane and three-dimensional classes in space. Plane handcraft includes paper cutting, collage, dyeing, and other contents; three-dimensional classes include origami, paper modeling, and other contents. In terms of handcraft, the common basic techniques include folding, pruning, carving, mud kneading, hand tearing, and so on [1]. Handmade and research tools are available in different regions of China, and relevant materials are provided in different primary and secondary schools at the same time; school teachers in San-Jiang Dong Autonomous County of Guangxi give full play to the advantages of ethnic elements and make use of unique resources to set up manual courses such as plant collage, cloth collage, and root carving, which has a far-reaching impact on the nation's own living customs. The paper-cut teaching created by a retired worker in Shanghai provides a good demonstration for the handicraft class in middle school and makes students get great help in the study of culture class [2].

Manual courses can help students establish contact with things around them, learn practical knowledge, generate respect for nature, help to cultivate students' artistic temperament, and promote the internal growth of the mind through the process of turning materials into works [3]. At the same time, manual courses can cultivate students' judgment ability. Imagination plays a role and forms judgment through the heart; we need not only our

brain but also all kinds of impressions absorbed by our whole person and integrate them together to form a judgment. With the ability of judgment, students can better understand themselves and others; the training of manual courses can also play an auxiliary and complementary role to other courses, making the whole education more balanced and complete [4]. Manual courses can cultivate students to form a good aesthetic. The dynamic factors of handcraft are emotion, attitude, and values, which affect the process and effect of students' learning about handcraft, which is the goal of aesthetic education [5]. A relaxed teaching environment is conducive to stimulating students' thinking, promoting the balanced development of students' hands, brain, and expression ability, and promoting the combination of students' emotional activities and cognitive activities in the situation, so as to establish a good aesthetic feeling and extend the aesthetic feeling [6]. The functional design structure of the network-assisted instruction system is shown in Figure 1.

The drawbacks of traditional schooling are becoming more widely known, prompting people to seek out other educational opportunities. Network teaching arose as a result of the continued growth of distance education and Internet technology [7]. Network teaching is an unavoidable demand of educational progress and an unavoidable outcome of technological progress. It has been useful in resolving issues such as unequal allocation of regional academic materials and unbalanced regional cultural development. Network teaching integrates high-quality teaching resources with students via Internet technology innovation, teaches kids according to their capability, pays focus on students' deep requirements, and allows for personalized education [8]. Although the current network teaching can integrate high-quality teaching resources and carry out personalized management of students, it also gradually reveals some problems. The first is the lack of scientific learning theory guidance [9]. The existing network teaching is still simply to share knowledge on the Internet after multimedia packaging, and its learning theory is between behaviorism and cognitivist. Secondly, from the perspective of knowledge organization, the current network teaching is still only the repackaging of traditional teaching knowledge and fails to extract the experience summary and law behind the knowledge from the essence of teaching application [10]. Taking explicit knowledge as the basic unit of teaching makes it difficult to extract the similar characteristics behind different knowledge points in the teaching process, which seriously restricts the cultivation of students' metacognitive ability.

This paper applies artificial intelligence and wireless network to the network teaching of preschool education manual and aesthetic education practical courses. From the perspectives of individuals and groups, two teaching case recommendation experiments are given. The final result of the experiment verifies the feasibility and rationality of the evaluation model based on the individual cognitive structure proposed in this paper.

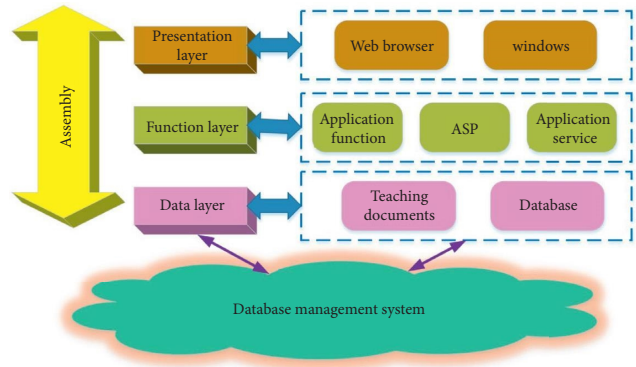

Figure 1: Functional design structure diagram of network-assisted instruction system.

The following is a summary of the research. Section 2 discusses the related work. Section 3 discusses the design of the application model in detail. Section 4 defines the wireless network technology. Section 5 consists of results and analysis. Finally, the conclusion brings the paper to a finish in Section 6.

2. Related Work

In this part, we described the research status of network teaching course of art and crafts, research on evaluation method of network teaching, and research status of wireless network in detail.

2.1. Research Status of Network Teaching Course of Art and Crafts. Children's art and handicrafts is a highly practical subject. Through learning, students can understand the artistic characteristics and production methods of children's art and handicrafts and master the basic methods of creating children's art and handicrafts [11]. Therefore, when designing online courses, we mainly design the learning form of theme teaching activities and pay attention to practicality and cutting-edge in the selection of practical learning content, and the presentation of learning materials should meet the needs of different learners [12]. Each unit designs the source of theme selection based on the connotation and characteristics of comprehensive art theme education activities; closely combined with kindergarten practice teaching, organize the design process of unit theme activities. The creation of activity environment should also be combined with the actual teaching of kindergarten.

The selection of learning content takes into account the content that learners really need in their work and is difficult to complete alone, teaching them practical learning methods [13]. Design multiple online learning activities and multiple assignments and carry out step by step according to the important knowledge points and learning progress in learning. Online video learning activities are designed to promote learners' easy understanding [14]. The design of these links should be designed to the details. The teaching design must have the concept of role exchange, consider the

needs of learners, and adopt a variety of teaching methods, such as classroom teaching, microclass video teaching and discussion, work appreciation, kindergarten real scene observation, practical teaching, and practical training; let students master the learning concept and practical operation methods [15].

The Internet has created a new way for us to interact with the world, allowing everyone to gather and integrate into an organic whole in a short time, making the communication between people and the dissemination of manual technology convenient and fast. Excellent manual courses can enable students all over the world to learn and understand each other through the Internet [16]. The process of globalization has changed our thinking mode, learning methods, and teaching methods. For example, the class worship revolution triggered by the Internet is affecting our teaching methods [17]. Muke is interpreted as a large-scale open online course based on online learning, covering science and technology, society, humanities, and other disciplines. The Internet can enable students to learn interactively among various disciplines, develop morally, intellectually, physically, and aesthetically, bring the learning of methods to students, and teach students how to acquire more comprehensive knowledge and constantly update knowledge at the same time [18]. Internet learning provides a guarantee for national learning and makes education happen at any time. China's current society does not need students who can test, but students who can innovate and create. Innovative students rely on innovative education. Handicraft courses can use this communication mode to analyze and produce excellent artist works into videos, so that more students can learn and inherit and develop handicraft culture [19].

2.2. Research on Evaluation Method of Network Teaching. Nodes on a network assessment have always been a critical component of the network instruction and the foundation of network teaching performance measurement. According to different evaluation objects, evaluation objectives, and evaluation indicators, there can be different evaluation methods [20]. With the increasing amount of data in network teaching platforms, it seems to be an inevitable trend to apply data mining techniques to network teaching evaluation. Data mining is a method of identifying patterns in a vast number of datasets using computers. Artificial intelligence, deep learning, statistics, and database are the key methods used. Data mining's overall purpose is to extract information from a data source and transform it into a useable structure for future use [21]. Figure 2 depicts the knowledge mining algorithm.

As can be seen from the figure, the main steps of knowledge mining are as follows:

(1) Data cleaning and data integration: data cleaning is to clean data noise and data that are obviously irrelevant to the mining subject. Data integration is the process of combining relevant data from several sources.

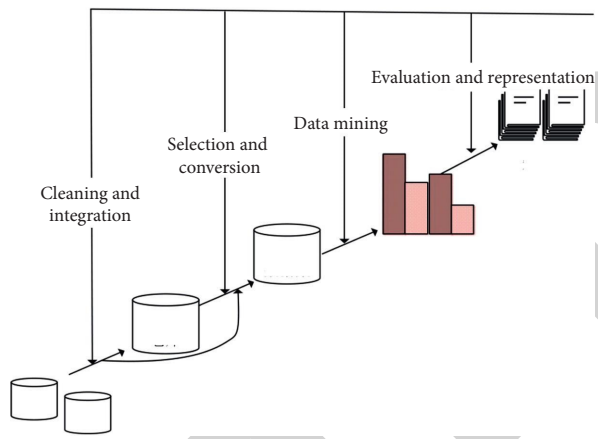

Figure 2: Schematic diagram of knowledge mining process.

(2) Data selection and transformation: data selection is to select the data related to the mining subject. Data conversion is to convert data into a data storage form that is easy for data mining.

(3) The method of data mining is to use a knowledge mining pattern or intelligent data mining pattern.

(4) Pattern evaluation and knowledge representation: pattern evaluation is the process of selecting relevant pattern knowledge from mining results based on a set of judging criteria. The use of visualization with knowledge expressing technology is known as information processing to show users the relevant knowledge mined [22].

2.3. Research Status of Wireless Network. In the future, heterogeneous wireless networks will become more diversified and comprehensive. The development of artificial intelligence makes the intelligent management of network resources possible. Based on perception, the scalable multidimensional complex system formed by deep integration of computing, communication, and control is expected to develop rapidly in recent years [23]. Driven by the demand for sensing and controlling the physical world, 10 billion heterogeneous devices such as computers, smartphone terminals, sensing devices, and video monitoring terminals are increasingly distributed in the physical space by means of wireless access and generate massive data with a fast flow and complex characteristics, including environmental physical information data, network interaction data, social data, image information data, etc. As a result, the data carried by wireless networks continue to grow rapidly in capacity, diversity, and growth rate [24]. However, in the future, the expansion of network scale and the rapid growth of wireless data traffic caused by the access of a large number of heterogeneous devices will lead to a more prominent contradiction between the supply and demand of wireless network resources.

Network resource management is a bridge between the efficient utilization of wireless resources and the demand for network capacity improvement, which has high research

value [25]. Massive heterogeneous base stations and equipment, seamless access to emerging network technologies, and the promotion of intelligent applications raise bandwidth and high-speed transmission requirements for heterogeneous wireless networks, and the explosive growth in the number of devices in heterogeneous wireless networks will make network resource management more difficult [26]. Therefore, driven by the emerging communication technology and the diverse needs of users, combined with various wireless access technologies and according to the network structure, it becomes extremely urgent to propose a network resource management method suitable for the new generation of heterogeneous wireless networks.

Heterogeneous wireless networks have become the structure of future networks. They are widely used in smart cities, information management and control, environmental monitoring, and other fields [27]. Through the analysis of the research status of heterogeneous wireless networks at home and abroad, we find that there are many forms of utilization of existing heterogeneous wireless networks, but most of the proposed architecture models are limited to theoretical research. In the process of practice, a large number of infrastructure structures need to be built and changed, and the effect in practical application is poor. In short, the further research and commercial application of heterogeneous wireless networks need the joint efforts of scholars at home and abroad. Since the diversification of network access technology, there has been an upsurge in network resource management in the world. Scholars from communication, computer, and other fields put forward a series of applications according to their different research fields, which have been widely used and supported [28]. Domestic research on network resource management has already begun. With the national attention to the new generation of wireless communication technology, there are remarkable achievements from different angles. Through the analysis of the research related to network resource management, this topic finds that many research results have provided practical theoretical schemes and technical means for heterogeneous wireless network resource management [29]. However, the existing network resource management schemes do not fully consider the heterogeneity of user equipment in heterogeneous wireless networks and effectively obtain all kinds of different network resources, resulting in insufficient and unbalanced resource utilization.

3. Design of Application Model

3.1. Knowledge Expression Model of Individual Cognitive Structure Analysis. Based on constructivist learning theory, cognitive style theory, and cognitive ability research, this section seeks an expression model to support the expression of individual cognitive structure. Based on the knowledge expression model supporting individual cognitive structure, by analyzing the characteristics of cognitive style and cognitive ability, an expression model supporting not only explicit knowledge evaluation but also pattern knowledge evaluation is constructed. The development of anything is a process from a low level to a high level. From the development status of network teaching, network teaching was initially a multimedia stage of direct expansion of traditional teaching. The main focus of this stage is how to solve the shortage of educational resources. In the recovery stage of network teaching, there have been a number of user learning management systems for the purpose of evaluating students' learning status. From the current situation of network teaching research in recent years, network teaching research is gradually combined with the direction of cognitive science and artificial intelligence, and gradually the importance of metacognitive ability, cognitive structure, tacit knowledge, and other concepts in the application of network teaching is realized. With the continuous development of cognitive science theory, the research on the application of cognitive science theory is also increasing. As an important branch of pedagogy, network teaching is obviously an important concern in the application of cognitive science theory. Cognitive science research and network teaching are the inevitable trends of the development of the times. From the perspective of cognitive science, it is obvious that the current research is still in the framework of traditional teaching. It is imperative to break through the traditional teaching framework from the perspective of cognitive science. The structure of basic knowledge is shown in Figure 3.

Traditional knowledge expression models usually construct explicit knowledge, which cannot reflect the deep-seated relationship between knowledge points and the level of individual metacognition. According to the theory of constructivism, tacit knowledge is the core and essence of individual cognition and the key to studying the level of individual cognitive ability. Therefore, only by constructing a knowledge expression model supporting tacit knowledge can we comprehensively analyze the individual cognitive structure. In order to emphasize that tacit knowledge has pattern characteristics, this paper calls tacit knowledge pattern knowledge. Pattern knowledge is the application of pattern concepts in knowledge description and its application. It is the description of the law and experience of knowledge application in a knowledge domain. Pattern knowledge can be used to understand, learn, and deal with similar problems. Among them, each pattern knowledge has several pattern knowledge feature points to represent the learning characteristics of pattern knowledge. There may be a construction relationship between multiple kinds of model knowledge, and new model knowledge is formed through the model. Its formal definition is as follows.

For learning – D in a certain learning field, there are M patterns of knowledge $\{\mathrm{PK}_1, \mathrm{PK}_2, \ldots, \mathrm{PK}_M\}$. Assume that there are N_i pattern feature points for a pattern knowledge PK_i $(1 \le i \le m)$. PK_i can be represented by a N_i dimensional column vector, and each dimension of the vector represents one of its features. A pattern knowledge PK_i containing N_i features can be expressed as $\mathrm{PK}_i = (p_{i,1}, p_{i,2}, \ldots, p_{i,n_i})$. The teaching system based on pattern knowledge can obtain students' scores under each pattern knowledge. It can be seen from the above examples that each pattern knowledge has its own unique pattern feature points, and the number of pattern feature points is not necessarily the same. By

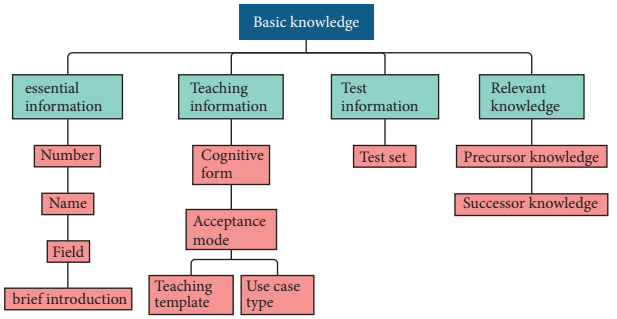

Figure 3: The structure of basic knowledge.

recording the test case scores of learning individuals, the score records corresponding to pattern feature points of each learning individual can be obtained. Then, by analyzing the pattern feature point score of each learning individual, we can get the learning group with similar learning characteristics. Within the allowable range of certain similarity deviation, this learning feature has group characteristics, that is, it can be considered that the learning individuals in a learning group have similar learning behavior characteristics.

The attribute dimension of pattern knowledge is consistent with the basic knowledge, focusing on the pattern information of a pattern knowledge. Schema information is the schema feature framework of schema knowledge and the analysis and description of features. It describes schema knowledge in terms of five different aspects: problems to be solved, solutions, features, examples, and notes. A schema knowledge is an XML document that describes the schema attributes. The purpose of online teaching evaluation is to evaluate learning individuals, and the specific evaluation object should not only be students' performance information, so only the knowledge expression model is not enough. Through the study of cognitive theory and the analysis of the related attributes of learners' cognitive ability, it is found that the evaluation of individuals' ability to learn new knowledge can be abstracted as the level of activity of an individual's cognitive structure assessed. As a result, systematic modeling of an individual's overall organization is critical.

3.2. Mathematical Description of Individual Cognitive Structure Model. The mathematical description is abstracted from the conceptual description of the individual cognitive structure model. Let the individual cognitive structure be CogStruct, and the individual cognitive structure model can be expressed as

$$\text{CogStruct} = \{\text{CogStyle}, \text{CogAbility}\}. \quad (1)$$

CogStruct is a collection of cognitive styles and CogAbilit is a collection of cognitive abilities. CogStruct can be further expressed as CogStyle = {CogApproach, CogStrategy}.. CogStyle is cognitive style and CogStrategy is cognitive strategy. CogApproach is a four-dimensional vector, and the expression is

$$\text{CogApproach} = (\text{CogApp}_1, \text{CogApp}_2, \text{CogApp}_3, \text{CogApp}_4), \quad (2)$$

where $\text{CogApp}_1 \in \{\varnothing, \text{cogApp}_{1,1}, \text{cogApp}_{1,2}\}$. When $\text{CogApp}_1 = \varnothing$, it means that the learner's cognitive style has no obvious characteristics in the dimensions of active and contemplative; when $\text{CogApp}_1 = \text{CogApp}_{1,1}$, it indicates that the learner's cognitive style presents the characteristics of active type in the dimensions of active type and contemplative type; when $\text{CogApp}_1 = \text{cogApp}_{1,2}$, it indicates that the learner's cognitive style presents the characteristics of contemplation in the dimensions of activity and contemplation. Cogstrategy is a scalar, where $\text{CogStategy} \in \{\text{cogStr}_1, \text{cogStr}_2, \text{cogStr}_3\}$. For Cogability, it can be further expressed as CogAbility = {CogExperience, MetaCogAbility}, where CogExperience is cognitive experience and metacognitive ability is metacognitive ability. MetaCogAbility records the mastery of basic knowledge learned by learners, while metacognitive ability records the mastery of pattern knowledge learned by learners. Assuming that students have learned basic knowledge and pattern knowledge, the expression formula of CogExperience is

$$\text{CogExperience} = \{\text{OvlCompre}, \text{Acc}, \text{Prof}\}. \quad (3)$$

This section mainly introduces the construction process of the individual cognitive structure model and the description of related concepts. Firstly, starting from the essence of network teaching application, this paper expounds on the importance and inevitability of constructing an individual cognitive structure model. Then, the related concepts of the knowledge expression model supporting tacit knowledge are described, which provides a data source for analyzing individual cognitive structure. Starting from the research of cognitive theory, this paper analyzes the characteristics and differences of cognitive style and cognitive ability, and it takes it as two dimensions to analyze the individual cognitive structure. Finally, based on the knowledge model supporting the expression of tacit knowledge, this paper constructs an individual cognitive structure model and gives the corresponding conceptual description and mathematical description of the model.

The knowledge expression model supporting tacit knowledge does not directly reflect the attributes of individual cognitive structure, but the knowledge expression model can deduce the attribute information of individual cognitive structure. This section will map some attributes in the knowledge expression model with the attribute information in the individual cognitive structure model. From the characteristics of cognitive style and cognitive ability, we can see that cognitive style is closely related to the attribute information when students learn teaching cases, and cognitive ability is closely related to the achievement of students' learning basic knowledge and model knowledge. Through the above analysis, we can get the mapping relationship between the attribute information of teaching use cases and individual cognitive style, as shown in Figure 4.

From the perspective of cognitive ability, cognitive ability is divided into the cognitive experience and

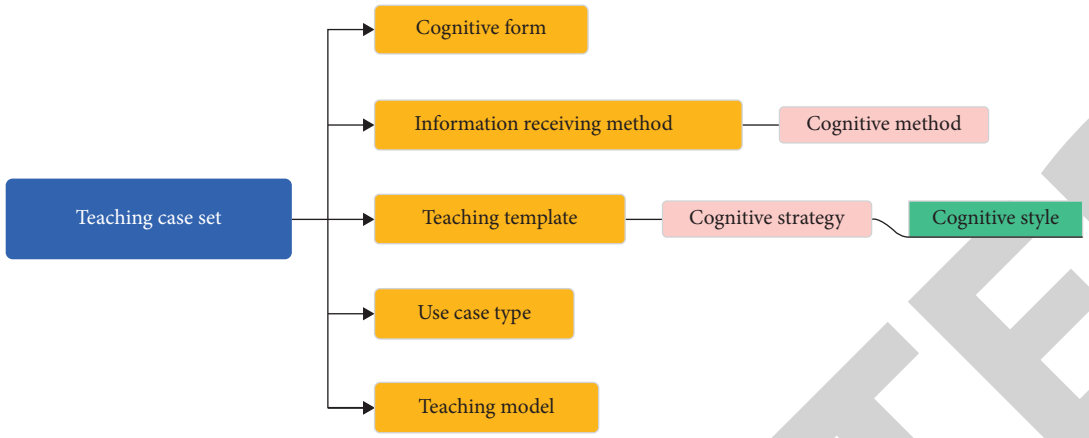

Figure 4: Mapping relationship between teaching use case set and cognitive style.

metacognitive ability. Cognitive experience refers to the knowledge experience and its structure in an individual's mind, which reflects the learning situation of learning basic knowledge. Metacognitive ability is an individual's ability of self-observation, self-reflection, self-evaluation, and self-regulation in his own cognitive processing process, which reflects the learning situation of learning individual learning mode knowledge.

4. Wireless Network Technology

Network resource management is a complex resource optimization and allocation process. In heterogeneous networks, various application scenarios and heterogeneous business requirements make the optimization objectives of various network resources different, but some technical principles common to the network must be considered: first, intelligent network resource management strategy needs to ensure the flexibility and effectiveness of heterogeneous networks. In the process of resource allocation, resource conflict can be avoided and the conversion between access technologies can be carried out reasonably. Second, an efficient resource management strategy has good practical application value and can be transformed into technical applications in engineering. The designed resource management strategy needs to fully consider the dynamics and mobility of network resources and reduce the computational complexity and time consumption of resource management strategy. Third, a good resource management strategy determines the performance and quality of service of heterogeneous wireless networks.

Between device nodes, there are several data transmission channels available, and device nodes can occupy one or more of them. The number of device nodes, on the other hand, far outnumbers the number of channels. It is critical to understand how to distribute channels to device nodes in order to make the most of scarce channel capabilities. Appropriate channel allocation can maximize the efficiency of data transmission in the network. This section describes the channel allocation method of equipment nodes. We define N data modes in heterogeneous wireless networks. The data mode set is defined as $\text{Type} = \{\text{Type}_1, \text{Type}_2, \ldots, \text{Type}_N\}$. These different modal data blocks are extracted by corresponding methods, and then the data features are mapped to the corresponding binary code by the hash method.

$$h(\phi(x)) = \operatorname{sign}\left(\sum_i \varpi(i)\left(\phi(x_i)^T \phi(x)\right)\right). \tag{4}$$

The binary feature coding matrix is represented by formula (4). We map two different modal data to the subspace after creating the mapping relationship, as opposed to the CCA algorithm, which can only map different modal data to the same subspace e after coding. In this approach, the features of distinct modes have a matching relationship. A similarity search is performed in the subspace and the correlation measures of different data blocks are returned. We also consider the distance factor in the clustering process of heterogeneous devices. For two heterogeneous devices, the distance between them is

$$\Theta\left(r_i, r_j\right) = \sqrt{\left(r_i^x - r_j^x\right)^2 - \left(r_i^y - r_j^y\right)^2}, \tag{5}$$

where r_i and r_j are two distance factors in the clustering process of heterogeneous devices. The data association and distance between heterogeneous devices jointly determine the association degree of the two devices:

$$\operatorname{Sim}\left(r_i, r_j\right) = \frac{\lambda \delta_{ij}}{\Theta\left(r_i, r_j\right)}, \tag{6}$$

where $\operatorname{Sim}(r_i, r_j)$ is the joint association degree of two devices. Every device in heterogeneous wireless networks is designated as a cluster during the initialization step of clustering. The value of every element in the adjacency matrix represents the correlation between the two devices during the creation of the data structure, since each device is a cluster in the initial stage of clustering. The cluster's correlation is represented by the entries on the major diagonal of the adjacency matrix, and its default value is 1. The correlation between clusters varies between 0 and 1. We set the items on the major diagonal to 0 in order to reduce the time-space complexity and superfluous operations in the clustering process. As a result, the clustering process will not consider its own predicament. Figure 5 depicts the artificial

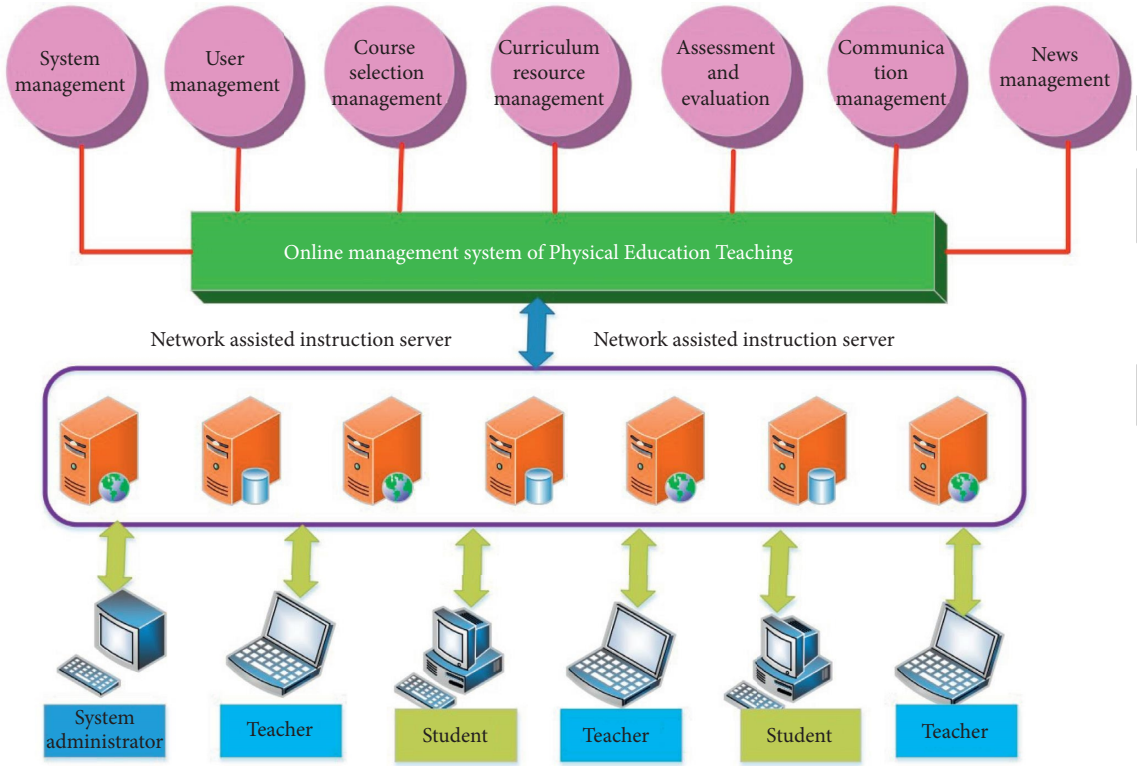

Figure 5: Wireless network model framework based on artificial intelligence.

intelligence-based wireless network model developed in this article.

The management method of network resource virtualization is to abstract and unify the users and network resources in the network, decouple them from the complex hardware environment of the network, and carry out unified planning and management. Form centered network resource management, improve the network environment and reduce the interference and congestion caused by the occupation conflict of heterogeneous devices when transmitting data. Then, the optimization analysis of the problem is carried out, and the network resource management method is proposed to improve the data transmission rate, reduce the system energy consumption in heterogeneous wireless networks, and improve resource efficiency. In heterogeneous wireless networks, heterogeneous devices are clustered according to the correlation of data, and the devices with high transmission correlation are classified into one category. The clustering process can effectively reduce the network overload by establishing the relationship between data, and the heterogeneous devices with more relevant data can be clustered together.

5. Experiments and Results

Based on the teaching prototype system developed to support the expression and evaluation of individual cognitive structure, this chapter carries out two kinds of teaching case recommendation experiments. Taking the learners' learning process on the network teaching platform as the mainline, the experiment verifies that the network teaching system supporting the evaluation of individual cognitive structure can indeed improve the learning efficiency and also verifies the feasibility of the evaluation model based on individual cognitive structure proposed in this paper.

5.1. Experimental Overview. In order to carry out the experiment, an online questionnaire was designed, focusing on the evaluation of individual cognitive structure. A total of 40 sample papers were collected as training samples. In this experiment, 15 students are invited to participate in the test experiment. These 15 students are divided into 5 groups with 3 students in each group, and the difference between the scores of students in each group is within 3 points. During the study, there is no other relevant training. Table 1 shows the specific details. The 15 students will all study for a week, and the daily learning time shall be controlled within 2 hours, with an error of less than half an hour. For each knowledge point, there is the same test volume. In order to ensure the rationality of the experiment, the test content will not appear in any teaching cases, and the test content is difficult.

The experimental system does not recommend any learning for the first student in each group, and it can choose learning cases completely independently. The experimental system recommends teaching cases for the second student in each group by using the evaluation

Table 1: Students' initial learning.

Group I		Group II		Group III	
Number	Grade	Number	Grade	Number	Grade
1	85	2	84	3	84
4	82	5	80	6	79
7	79	8	79	9	78
10	78	11	76	12	75
13	72	14	70	15	69

method of individual cognitive style. For the third student in each group, the experimental system will use the existing learning information to recommend teaching cases to learners based on collaborative filtering technology.

5.2. Results and Analysis. This experiment trains the initial decision tree model based on the training sample information to provide the basis for model updating. By collecting the experimental data and summarizing the learning records of group I and group II, Table 2 and Figure 6 can be obtained. The average learning time represents the average learning time of each knowledge point, and the unit is minutes; the average score is the average score of each knowledge point. Note that the average score is based on the result of the first test case, and the unqualified score is not counted.

This experiment compares the learning situations of the first and second groups of learners using the same learning path and test cases but different teaching case acquisition methodologies. Among them, the learners in the first group use the default teaching cases for knowledge learning, and the learners in the second group can select the teaching cases that meet the individual cognitive style according to their own cognitive style characteristics. Finally, by comparing the learning records of the first group and the second group of learners, it is verified that the learning method recommended by teaching cases according to learners' cognitive style can indeed reduce students' time to learn knowledge and improve their academic performance. By collecting experimental data and summarizing the learning records of group I and group III, Table 3 and Figure 7 can be obtained.

Based on the network teaching prototype system supporting the evaluation of individual cognitive structure, this paper carries out the recommendation experiment of two teaching cases. According to the cognitive style of the first group of learners, the experiment was carried out to verify the feasibility of the second group of learners' recommended teaching style according to the cognitive style of the first group of learners. In Experiment 2, the teaching case recommendation experiment was carried out for learners based on collaborative filtering technology. By comparing the learning situation of the first group and the third group, the feasibility of teaching case recommendation based on collaborative filtering technology was verified.

Table 2: Comparison of the overall learning situation of group 1 and group 2.

Number	Time	Score	Number	Time	Score	Reduce	Rate (%)
1	20.70	84.50	02	18.40	88.90	02.30	5.20
4	19.10	82.60	05	18.60	87.50	0.50	5.90
7	23.30	77.90	08	19.20	82.50	04.10	5.90
10	22.50	80.20	11	17.90	85.50	04.60	6.60
13	25.50	75.50	14	20.50	81.90	05.00	8.50

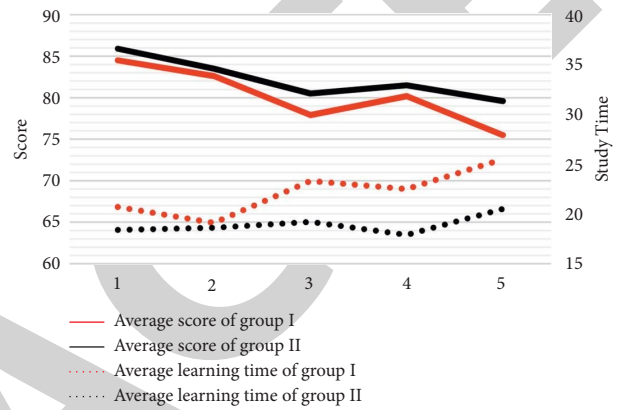

Figure 6: Comparison of the overall learning situation of group 1 and group 2.

Table 3: Comparison of the overall learning situation of group 1 and group III.

Number	Time	Score	Number	Time	Score	Reduce	Rate (%)
1	20.70	84.50	3	19.40	85.90	01.30	1.70
4	19.10	82.60	6	21.60	83.50	−2.50	1.10
7	23.30	77.90	9	22.50	80.50	0.80	3.30
10	22.50	80.20	12	20.90	81.50	1.60	1.60
13	25.50	75.50	15	21.50	79.60	4.00	5.40

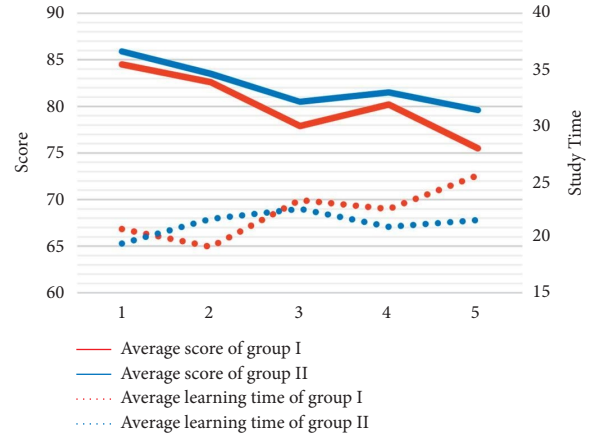

Figure 7: Comparison of the overall learning situation of group I and group III.

6. Conclusion

Facing the development of the new generation of network teaching, using the characteristics of the network teaching environment and based on constructivist learning theory and cognitive related theory, this paper puts forward an individual cognitive structure expression model supporting tacit knowledge teaching, further puts forward the corresponding evaluation model of the development level of individual cognitive structure based on this model, and realizes the corresponding network teaching application prototype system. The feasibility and usefulness of the individual cognitive structure model and its evaluation approach are confirmed by recommending real-time individualized teaching situations to individuals. Incorporating tacit knowledge into the classroom encapsulates the core of teaching application and results in a positive teaching effect.

Starting from the essence of the application of network teaching, this paper expounds on the importance of the individual cognitive structure model in network teaching. Combined with the latest research results of cognitive theory, this paper summarizes the different characteristics of cognitive style and cognitive ability: cognitive style is the cognitive form preferred by individuals in the cognitive process, and there is no difference between strong and weak; the cognitive ability of an individual can be measured and categorized into strong and weak categories. The expression model supporting individual cognitive structure is supplied from the two aspects of cognitive style and cognitive ability, and its conceptual description and mathematical description are given based on the knowledge expression model supporting tacit knowledge.

The deficiencies and further research of this paper are mainly reflected in the following aspects. This paper does not consider the impact of the learning path on learners' learning new knowledge. Complete personalized teaching should include teaching case recommendations and personalized learning path recommendations. This paper does not consider the impact of the learning path on teaching and uniformly uses the preset default learning path for teaching. The reasonable learning path should be from shallow to deep, from easy to difficult. Obviously, the organization of different learning paths has an important impact on network teaching. Therefore, the recommendation of a personalized learning path will be one of the key contents of follow-up research.

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.

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