The Design of Media Teaching System Based on CAI Under the Vision of Multiple Learning Theories

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Abstract. Information technology has great potential in supporting teaching. Developing and applying modern information teaching methods is the only way for the transformation and development of classroom teaching today. For the teaching of media group majors, it is one of the plastic designs to promote the transformation and development of the media teaching system in the classroom. It is conducive to remedy the disadvantages of traditional classroom teaching, create a colorful and flexible classroom learning ecological environment, and achieve the correct teaching objectives with quality education as the core; Compared with traditional classroom teaching, CAI has its own advantages. It has changed the relatively rigid teaching method of traditional audio-visual teaching methods in the past, and added images, animations, sounds, images, etc. on the basis of text and graphics to enhance the performance effect; On the other hand, there are serious problems in current CAI. The scientific approach is to take a variety of learning theories as the guidance, absorb their strengths, overcome their shortcomings, conduct specific analysis of teaching, identify different types of learning, and then find appropriate guiding ideology, teaching methods and strategies.

Keywords: Teaching System Design; Learning Theory; Computer Assisted Instruction; Media Teaching.
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1 INTRODUCTION

Through personal practice and analysis of literature, we find that, on the one hand, CAI does have its own advantages compared with traditional classroom teaching. It has changed the relatively rigid teaching method of traditional audio-visual education, and added images, animations, sounds, images, etc. on the basis of text and graphics to enhance the performance effect; On the other hand, there are serious problems in current CAI. These problems are reflected in the design,

production and use of multimedia courseware, which has seriously hindered the further development of the advantages of CAI and the further deepening of educational reform [1].

Information technology, represented by the Internet, has brought about great changes in many fields of today's society, especially triggered a new round of teaching reform marked by innovative educational technology. It is a top priority in the front-line teaching field to apply advanced educational technology [2].

Not only realize modern computer-assisted teaching in secondary vocational schools, but also enhance the autonomy of media teaching system design in computer learning. This paper will make a specific analysis and research. The application of computer-assisted online development trend at present, and computer-assisted online teaching has gradually become another classroom outside the classroom. It uses students' own sensory perception to collect knowledge information [3]. At present, the representative ILS and VARK are two practical methods of style classification of perceptual school. Such teaching theories will better serve the practical application of computer-assisted online teaching. The more sophisticated Internet CAI system produced in recent years has carried out a harsh and detailed analysis of the actual characteristics of the course, further in-depth feedback. Through the Internet computer, online assisted instruction effectively combines the depth of the course with the CAI system [4].

To solve these problems, we must do a good job in teaching design. At present, there are several different learning theories, each of which has its own understanding of learning and instructional design ideas and specific processes and steps under its guidance. Some teachers are also accustomed to making instructional design [5]. Learning is a complex activity process. This is mainly because there are many internal and external factors that affect this activity process, many physical and mental changes caused by learning activities, and many levels and types of learning. Therefore, the learning process is a complex process with multiple causes, multiple results, multiple levels, multiple types and multiple sides. Therefore, if we want to use a certain learning theory to guide our teaching and solve all problems in teaching, it is also not feasible. The scientific approach is to take a variety of learning theories as the guidance, absorb their strengths, overcome their shortcomings, conduct specific analysis of teaching, identify different types of learning, and then find appropriate guiding ideology, teaching methods and strategies.

2 RELEVANT CONCEPTS AND THEORETICAL BASIS

The research of instructional design mode is to synthesize various factors related to education and conduct systematic exploration. CAI software instructional design mode provides a theoretical framework for the design, implementation and management of CAI software development. Li et al. [6] can help us determine the specific items (elements) and many variables of CAI software system through the research of instructional design mode. However, due to the lack of consideration of the network teaching function, the corresponding theory of software design and development, and the development direction of network teaching. It is difficult to give full play to the advantages of computer network teaching, and it is also difficult to make a fundamental change in the face of teaching. Integrable ware is a software system that teachers combine and use multimedia teaching information resources according to teaching needs. Li and Liao [7] believes that the idea of integrable ware has improved the position of teachers in the design and development of CAD software, making teachers no longer the bystander of CAD. This also runs through the humanistic teaching ideas and principles. Respect and develop human personality, give full play to human potential, discover human value, and finally emphasize "people-oriented". Its guidance for the design of multimedia CAD software is to form a learner-centered instructional design view and a structured instructional design view. The constructivist learning theory believes that the development process of human cognitive structure is the process of interaction between the adaptive mechanism of organism self-regulation and the external environment. CAD fully embodies teachers' teaching ideas, teaching experience and teaching methods. It has greatly improved the teaching efficiency and made the multimedia network no longer a decoration. Niu [8] believes that

the computer-aided process cannot be separated from the knowledge, experience and representation in the original cognitive structure. Situational creation needs to create favorable conditions for extracting these knowledge, experience and images from long-term memory. The increase in the amount of information in the multimedia teaching resource database can be divided according to the close relationship with the current school classroom teaching. Onofrei and Ferry [9] has conducted in-depth research on CAD software design patterns. A theoretical model of instructional design is established, which focuses on learners' "learning" and can play a leading role of teachers and adapt to the campus network environment. Writing the corresponding manuscript will not only affect the development process of multimedia CAD software, but also directly affect its development quality and efficiency. The establishment of this model is also conducive to deepening the guiding role of constructivism and integrable ware in the construction of modern teaching software. This is also the premise and foundation of the practice of multimedia CAD software design. Shi et al. [10] believes that the unique advantages of multimedia CAD courseware should be fully utilized. Stimulate students in audio-visual and interactive ways, show students teaching scenes and provide rich perceptual materials. Turn dull preaching teaching into lively and interesting exploratory teaching. In this colorful and dynamic world, students can deeply brand the knowledge they have learned in their minds through various sensory organs.

Media in CAI refers to the carrier of information. All kinds of media and their forms of expression have their own individual characteristics. For specific teaching objectives, there is a certain media or a combination of certain media whose teaching effect is significantly better than that of other media. In order to pursue optimal teaching effect, we should identify the strengths and expertise of various media. The multi-dimensional nature of teaching information makes the form of teaching media diverse, and the correct selection of teaching media becomes the focus of multimedia teaching, which largely depends on the understanding and prediction of the best role of media. The application of multimedia assisted teaching is different from the general classroom teaching. One mode or the combination of main mode and other modes can be used as a whole. The multimedia assisted teaching can often adopt such teaching modes as "self-study", "inspiration" and "inquiry". See Figure 1 for details.
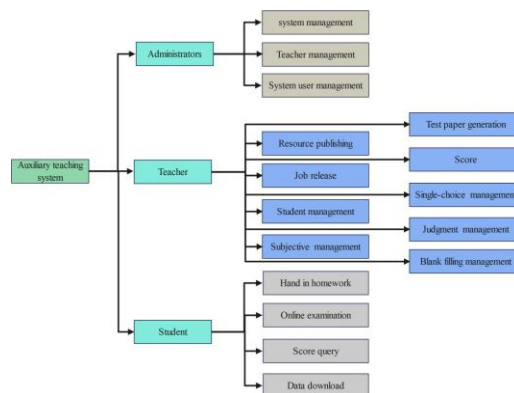

Figure 1: Computer Online Teaching Assistant System.

3 RELATED TECHNOLOGIES

3.1 Cloud Computing and Load Balancing of Media Teaching System

Most of the online teaching work is carried out in a unified or relatively concentrated time. Therefore, for online teaching systems, the number of visits will increase sharply in a short time, and the reading and calling requests of teaching resources will be concentrated. After the

distributed optimization design of cloud computing for the online teaching system based on J2EE, there may also be uneven load distribution between cloud computing cluster nodes, service request blocking, and computing resource waste.

These two load balancing algorithms are applicable to different situations, but overall, the dynamic load balancing algorithm has more outstanding resource allocation ability and good flexibility. Therefore, it is more respected by the majority of program developers and has more applications. Among many dynamic load balancing algorithms, Pick-KX algorithm is more representative. The algorithm is implemented in a clustered server environment with the number shown in the following formula 1:

$$S = \{S_i, i = 1, 2, \cdots, n\} \tag{1}$$

As shown in the above formula, the cloud computing cluster operation cycle can be expressed in T. The load capacity of each node in the cluster can be expressed by. On this basis, the Pick-KX algorithm can be used to allocate server resources only if certain conditions are met, as shown in the following formula.

$$P_j = \frac{X_i}{\sum\limits_{i=1}^{i} L_i} \tag{2}$$

$$L_{total} = \sum\limits_{i=1}^{i} L_i \tag{3}$$

$$X_i = \frac{L_{total} - L_i}{L_{total}} \tag{4}$$

Through the calculation of the above expression, the larger the Pj value representing the probability, the smaller the current load of the server. At this point, the request submitted by the user can be dynamically allocated to this server for processing.

3.2 Algorithm Optimization

Genetic algorithm is an algorithm based on biological genetic method in the mid-1970s. Genetic algorithm is more practical and easier to use. It is widely used in the research of computer knowledge. The most important part is to simulate the genetic law through the parameters of variables in the genetic process and the carrier of genetic information, that is, select the result of this combination according to the specific situation, and simulate the selection conditions according to the natural environment.

First, let the largest generation of the first generation of heredity be the t generation, and its population sample can be represented by A (t). After evolution, the number of reserved genes is m, and the factor can be represented by the variable m (H, t). The probability formula shown in the following equation 5 can be used to screen the jth individual Aj in t.

$$P_j = \frac{f_j}{\sum f_i} \tag{5}$$

Then, if the number of evolution samples of the first generation is n, then the number of samples of the t+1 generation can be calculated according to the above principles, as shown in the following equation 6:

$$m(H, t+1) = m(H, t)n\frac{f(H)}{\sum f_i} \tag{6}$$

According to the above formula 6, the following formula 7 can be deduced:

$$m(H, t+1) = m(H, 0)(1+c) \tag{7}$$

At present, the intersection point generated by mode H is only the survival probability of H under simple intersection, as shown in coefficient 8.

$$P_s = 1 - \frac{\delta(H)}{(t-1)} \tag{8}$$

Pick-KX algorithm has many advantages in practical applications, the most important of which is that it can calculate the required resources in real time. However, this allocation method does not fully consider the characteristics of node resources in the cluster for differentiated allocation of nodes, and the surface algorithm cannot produce the expected results in practical applications.

For the computing capacity of different nodes, genetic algorithm can be used to optimize the resource allocation scheme.

In the optimization algorithm, the number of cluster nodes is shown in the following equation 9:

$$S = \{S_i, i = 1, 2, \cdots, n\} \tag{9}$$

The algorithm allocates resources after calculating the node load capacity, as shown in the following equation 10:

$$P_i = \frac{1 - L_i \times F_i}{\sum\limits_{j=1}^{k} \left(1 - L_j \times F_j\right)} \tag{10}$$

3.3 BP Neural Network

$$net = x_1 w_1 + x_2 w_2 + \ldots + x_n w_n \tag{11}$$

The problem to be solved has a decisive effect on the dimension of the output vector and the input vector. At this stage, it is difficult to show the functional relationship between the research results and the scale and type of the problem. The structure of BP neural network is shown in Figure 2.
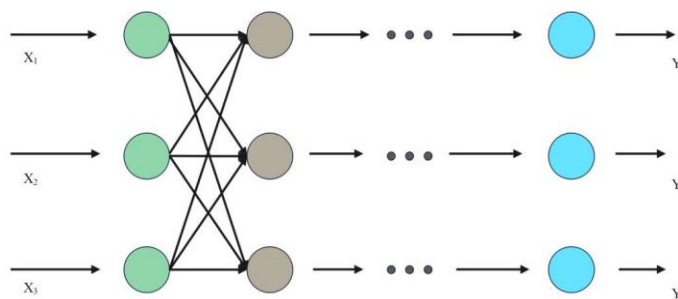

Figure 2: Structure diagram of neural network.

$$x(k) = \left(x_1(k), x_2(k) \cdots\cdots x_n(k) \right) \tag{12}$$

$$Do(k) = \left(d_1(k), d_2(k) \cdots\cdots d_q(k) \right) \tag{13}$$

$$P_s = \left(1 - P_m \right)^{o(H)} \approx 1 - o(H)P_m \tag{14}$$

Based on the above, it is not difficult to know the sample number of offspring of mode H as shown in the following formula 15:

$$m(H, t+1) \geq m(H, t) \frac{f(H)}{\bar{f}} \left[1 - P_c \frac{\delta(H)}{l-1} \right] \left[1 - o(H)P_m \right] \tag{15}$$

4 EXPERIMENTAL RESULTS AND ANALYSIS

4.1 Media Teaching System Test

Therefore, test cases should be created according to the system development function, so as to gradually check and test whether the system conforms to the user's functional requirements. The first step of function test should be to create system error data and valid data, so as to judge whether the system function can be performed correctly, whether the expected test effect can be obtained under the condition of clear data test, and whether the system prompt can be obtained from the error test data. The business regulations in the system shall be clarified during the test. The system test unit includes: learning style test, student function test, teacher function test, administrator function test, etc.

The so-called load test is actually to test whether the system operates normally under specific pressure. You can record scripts including student module function, teacher module and management module, and ensure that the script can be executed correctly. The test system opens the script, schedules the virtual user, selects the created script, and schedules the virtual user in the interface, as shown in Figure 3.
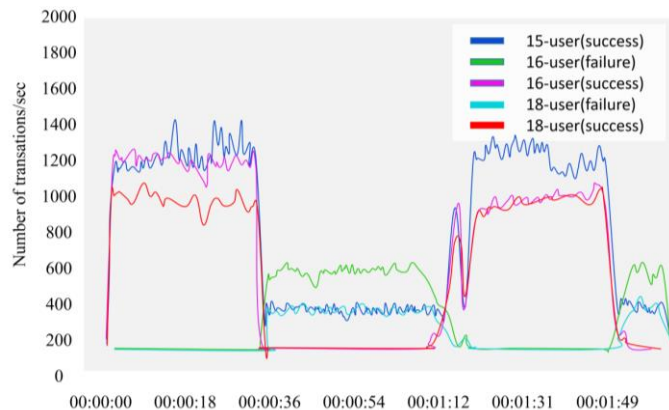

Figure 3: Comparison of system load performance test results.

It will also increase, and the memory utilization and server CPU utilization will also increase. However, the system status should be fully understood in the specific environment during the system operation.

4.2 BP Neural Network Training Test

The first is to collect the internal sample data of the factors of improving resource classification, so as to carry out the learning work. Select the random sampling mode, and get 20 groups of data. 15 groups of data are used to create the training set, and the other 5 groups of data are test sets. Figure 4 is the BP neural network test diagram.
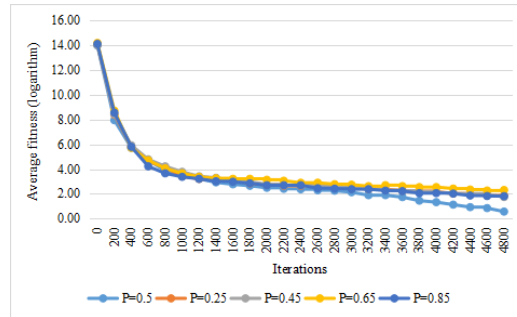

Figure 4: Test results of BP neural network.

Through the test, it is found that after 800 repeated iterations and 1000 training, the network error change curve is checked. The further research results show that the training link changes relatively significantly. It can be seen that in the early stage of classification of resources, the classification of resources has a relatively large change because of the low accuracy of classification. However, the gradient of change between 100 and 500 training courses has slowed relatively significantly, which can be seen that the classification of training resources is slowly in a stable state. After 600 times, its system training neural network classification resources are in a suspended state, which shows that the resources have accurate classification. The expected effect can be achieved by selecting BP neural network.

4.3 Load Analysis of Teaching Resources

The main process of the test is to first establish the connection thread using the optimization algorithm, and increase the number of connections in a stepwise manner, and then collect and record the time that the server nodes respond to these connection requests for statistical analysis. Figure 5 shows with the increasing number of connection threads, the overall response time of the teaching resources load balancing optimization algorithm is significantly reduced compared with that of the traditional algorithm, and it is more obvious. Therefore, it can be demonstrated that the teaching resources load balancing optimization algorithm can effectively improve the overall performance of the server.
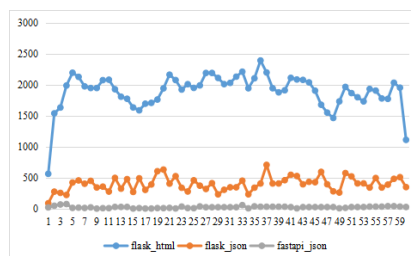

Figure 5: Response time of resource load.

The system throughput can reflect whether the load balancing optimization algorithm. The test process is similar to the server average response time experiment process. The same is to establish different number of connection threads, and the number of threads increases in a ladder manner. Then upload the data file to the server node through the established connection, and calculate the data throughput of the server receiving the file under different conditions at the same time, and finally analyze it as a whole. Figure 6 shows with the increasing number of connection threads, the system throughput time of the optimization algorithm is significantly higher than that of the traditional algorithm, and it is more obvious.
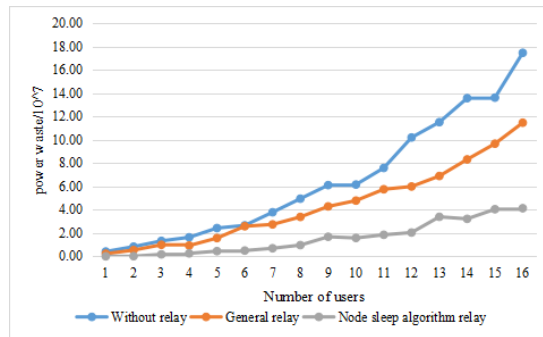

Figure 6: System Throughput Test Results.

Specific test methods include black box test, gray box test, white box test, dynamic static test, etc. Functional test and non-functional test of CAI system, such as load test, security test, etc. The process of investigation and practical application based on this system shows that. For students, the system has greatly improved their learning autonomy of computer courses. After students choose the best resource category, they have greatly improved their learning efficiency. The teacher said that the system has greatly improved the teaching efficiency and also significantly improved the teaching effect. The results are shown in Figure 7.
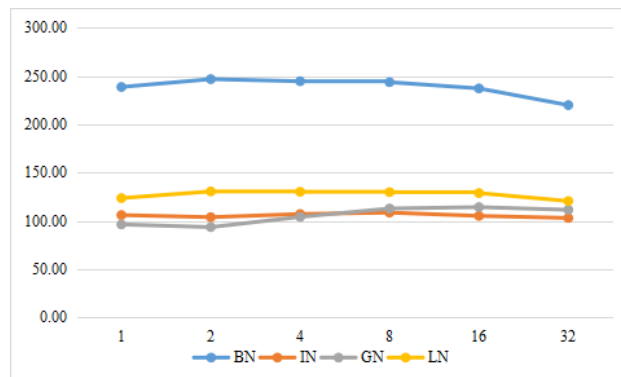

Figure 7: Performance comparison before and after the system is used.

Due to the use of computer assisted instruction system, the teaching space is more diversified, the number of students' computer practice is significantly increased, and the number of exchanges has increased significantly. At the same time, because teaching resources are provided by teachers,

the speed, quality and quantity of students' access to resources have increased to varying degrees.

5   CONCLUSION

The system has a broad application prospect. Information technology has changed the life of human beings, and has also led to major changes in education and teaching around the world. It has become an international trend to use information technology to reform curriculum teaching and improve teaching quality. It is indeed a long way to go to fully develop and apply the technical means suitable for the teaching of this major. The media teaching enters the conventional classroom to remedy the disadvantages of the traditional classroom teaching, create a colorful and flexible classroom learning environment, and enable students to achieve rich and deep learning smoothly; Give full play to the mobile, open and interactive performance of media teaching, let the media help the class before and after class, form the full support of information means to the class.

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