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Network Teaching System of Power Machinery Based on Computer Science

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Abstract: With the development of Internet technology, at this stage, many industries and enterprises make full use of Internet technology to promote the development of companies. Under the requirements of national strategic policies, informatization development should make full use of the advantages of different enterprises to achieve resource contributions. In addition, in the process of building a conservation oriented society, informatization can effectively drive economic development and social progress. At this stage, the development of market economy is highly competitive, and the informatization construction of colleges should follow the trend of the times and strengthen the construction of informatization platforms. Only in this way can colleges maintain their own advantages in the tide of social development. The main purpose of this paper is to analyze and research the network teaching system (NTS) related to the power machinery course based on computer science. The thesis mainly focuses on student management subsystem, teacher management subsystem, administrator management subsystem, etc. Taking the NT of power machinery as the research object, the different stages of system design and implementation are demonstrated, and the whole process of system design is comprehensively analyzed. The implementation of the system is mainly based on the requirements of the system and the established functional modules to implement the detailed results of the system one by one, including the implementation of the system functional interface and the compilation of the code. The experiment shows that all dimensions of the system in terms of performance test meet the requirements of software design and meet the needs of users.

1. Introduction

With the promotion of network technology, the teaching and learning (TAL) methods of TAS in colleges have also changed. At this stage, many colleges are starting to study the networked teaching methods, the development methods of networked courses and teaching methods, which

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also directly affect the next development mode of colleges. Many colleges have completed the construction and optimization of their websites, which can help colleges better publicize their own characteristics, help the outside world better understand the development of the school, effectively achieve interaction and communication between different industries, and significantly improve the management level and teaching quality of colleges [1].

In relevant research, Hauser et al. aim to explore the real questioning practice of English language art teachers [2]. The author studies how the same teachers ask literary questions in different environments. The author asked. When teachers play different roles in literary discussions, to what extent and in what ways do their questions about literature change? The research draws lessons from the theory of classroom discourse and daily practice, and compares and analyzes the types of questions raised by senior high school teachers when they assume three roles.

Rezaei et al. aimed to determine the impact of online social networks on college students' environmentally responsible behavior (ERB) [3]. It mainly develops and tests a behavior model in the context of online social networks, that is, students' attitudes, knowledge and behavior will affect their ERB. A quasi experiment was used with a pretest posttest design and a randomized parallel control group. The results show that social networks have a great impact on motivating ERB. In addition, it has improved environmental attitudes.

Gkalp aims to study the social and technological drivers of data science practice, develop a standard model, obtain gap analysis by providing data science capability/maturity assessment, and create a comprehensive improvement roadmap in a standardized way to assist organizations in digital transformation [4]. A theoretical model called Data Science Capability Maturity Model (DSCMM) has been developed. The study found that organizations are seeking a capability/maturity model standard to assess and improve their current capabilities.

This paper mainly takes the NT of power machinery as the research object, demonstrates the different stages of system design and implementation, including demand determination, system design, system implementation and summary, and comprehensively analyzes the whole process of system design. In the determination stage of system requirements, it is necessary to first define the goal, direction and functional requirements of system development, and then effectively position the user role of the system to provide a basis for the next design and implementation of the system. After the system requirements are determined, the functional modules of the system should be fully designed, so that the logical order of the system can be effectively guaranteed. In addition, in order to make the system run more stably in the future, the system functions should be tested and improved for a long time.

2. Design Research

2.1. Construction Needs of Nts Integrating Computer Science

There is no difference between a traditional learning support system and the core content of an ESS that incorporates computing technology. The system aims to achieve greater efficiency in teaching and learning and to help students better understand what they know [5-6]. However, traditional learning support systems make it difficult to adapt teaching to the specific needs of different students. As a result, an EMS system has been developed that incorporates computing technology. It uses the flexible management of learning resources to harness the needs of learners, meet their needs and create different levels of knowledge. Given these connections, the following three aspects should be considered when designing an EMS system for information science [7-8].

(1) Create a learning model that meets the needs of learners at different levels.

A prerequisite for implementing adaptive management of online learning resources is the creation of a learner model. In order to scientifically identify learners' learning styles, some research

institutions have developed the AACS model and the CS383 model, and have provided recommendations for the organisation and management of learning resources based on the analysis of the learner model. Some researchers have used genetic algorithms to predict recent patterns of learning resource use by testing learners' abilities. This paper maximises the learning potential of students by capturing and extracting their learning, suggesting learning resources of appropriate difficulty for them, and providing real-time statistical and structural design feedback to relevant teachers [9-10].

(2) The NTS Knowledge Base.

The knowledge base is a key component of the NTS. Traditional learning support systems simply connect learning resources to the web and do not manage them effectively. By designing activation rules for courses and knowledge points, web-based learning tools can be flexibly configured to suit the learner. In NTS, domain models can be used to create mapping links between knowledge points to describe system resources. In order to achieve adaptive management of learning resources, it is necessary to partition the knowledge system according to the complexity of the subject, collect information on students' and teachers' evaluations of teaching and learning, and adapt the design of activation rules to the cognitive level of students [11-12].

(3) A learning guidance mechanism based on adaptive resource management.

The TAL considered in this work should achieve a reasonable match between learners and resources through a comprehensive analysis of the learners' levels and allocate them according to the complexity of the knowledge system in order to improve teaching and learning outcomes. Adaptive Resource Management The learning management mechanism is the basis of EDP in computer science [13-14].

2.2. Basis of NTS Structure Model

(1) WEB technology is the technical basis of adaptive management of TR. Based on HTML and HTTP, WEB technology can realize dynamic resource integration, open human-computer interaction and other functions, and has advantages over other technologies in intelligent and adaptive management [15-16].

(2) According to the project response teaching rules, the adaptive management of TR can set different learning objectives according to the actual situation of different students, and give suggestions on curriculum arrangement and TR recommendation, so that learners can reasonably arrange the difficulty of courses according to their own conditions, and achieve the preset learning objectives. The adaptive resource management can make the difficulty of courses and assignments conform to the students' cognitive level by making statistics of students' feedback and teachers' feedback to correct the difficulty coefficient.

(3) According to the analysis of the traditional NTS and the adaptive management model of learning resources, it is necessary to design the system from the different needs of different students, so that the NT platform can achieve better teaching results [17-18].

To sum up, this paper constructs a theoretical model of NTS. As shown in Figure 1.

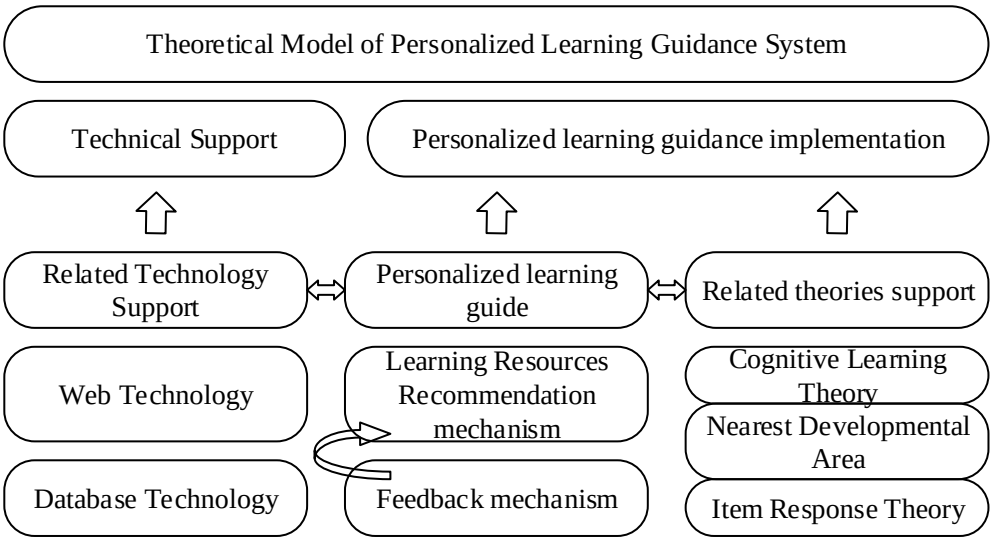

Figure 1. Theoretical model of online teaching system

The creation of a theoretical model of NTS must not only be supported by advanced web-based technology, but must not forget the theoretical basis[19]. The aim of creating a theoretical model of NTS is to integrate and distribute learning tools according to the actual situation of the students so that they can overcome their immediate areas of development through the teaching system, increase their interest in learning and improve their learning efficiency by tapping into their potential. The development of learning systems would not be possible without the support of online technologies. In this paper, computer science and computer science methods are used to design NTS software that enables communication and interaction between administrators, TAS, leading to adaptive resource integration and allocation to achieve better NT outcomes[20].

3. Experimental Study

3.1. Learning Resource Recommendation Mechanism

(1) Recommended resources

The system can evaluate the cognitive level of students according to their test situation by ability value, and when the ability value is the maximum, the amount of information is also the maximum. The evaluation results of ability value can be used to match the difficulty of resources. The single parameter item information function is:

(1)

among θ Is the student ability value, and bj (tuned) is the adjustment parameter for the difficulty of recommended resources. When the value of the function is the maximum, the difficulty of the resource represented is the most suitable recommended resource.

Using the traditional classroom teaching mode for reference, the NTS integrating computer science obtains knowledge point information by dividing the curriculum resources into chapters, and organizes multiple small knowledge points according to chapters to form a systematic NT resource to adapt to students with different cognitive levels.

(2) Resource difficulty adjustment

After completing the assessment of students' ability, the difficulty of resources needs to be adjusted. The difficulty of TR is divided into 5 grades from difficult to easy. Using the five point Likert scale can not only simplify the resource management process, but also achieve a reasonable division of the difficulty of TR. In Formula (3.1), bi is the difficulty index, and the range can be (-

∞,+∞) theoretically. However, considering the feasibility of the algorithm, the value range of the difficulty index should be limited to [- 2,+2]. At the same time, make - 2 very simple, - 1 simple, 0 general, 1 difficult, and 2 very difficult. The evaluation of the difficulty level of TR should not only refer to teachers' opinions, but also include students' evaluation results:

Concept 1 (initial difficulty of learning resources). Let D={D1, D2,..., Dj,... D5} be the degree of difficulty of TR, corresponding to different levels of difficulty. D1 stands for very simple, the value is - 2; D2 stands for simple, the value is - 1; D3 stands for medium, the value is 0; D4 is difficult, the value is 1, D5 is very difficult, and the value is 2.

Concept 2, (based on the difficulty of student users' evaluation of No. j resource)

(2)

In (2), bj (voting) is the weighted average of the difficulty of No. j course resource after the student users have completed the evaluation, nij is the number of students who have been rated as difficulty i in No. j resource, and Nj is the total number of students who have participated in the evaluation of No. j resource, of which:

(3)

Concept 3 (difficulty adjustment of learning resources):

(4)

In (4), bj (initial) is the initial difficulty value of the jth teaching material initialized by the teacher, bj (voting) is the average difficulty of the jth learning resource based on learners' cooperative voting introduced above, and bj (tuned) is the adjusted difficulty value of the jth learning resource based on learners' cooperative voting feedback, where w is an adjustable weight, Curriculum experts and teachers are often more authoritative and objective, so the weight value of this study can be set as 0.9. By estimating the learner's ability and adjusting the difficulty of learning resources, the link between the user's ability and the difficulty of learning resources is constructed according to relevant algorithms, so as to meet the current cognitive level of users and achieve the adaptability of educational resources.

3.2. Overall Function Design of the System

The system is divided into three parts, as shown in Figure 2:

(1) Student: has the rights related to the student category. In particular, this includes entering student data, reading teacher profiles and course summaries, receiving regular notifications, selecting courses and participating in online teaching, submitting post conference papers, taking exams, viewing exam results, participating in answering questions, and evaluating teachers and course content.

(2) Teachers: responsible for the strength and resources required by teachers. This includes, in particular, providing information about teachers, e-learning, sending and reviewing textbooks, and initiating and evaluating examinations.

(3) System operator: responsible for the management and maintenance of the education system, especially the management of teachers and student users, as well as the management of teaching resources.

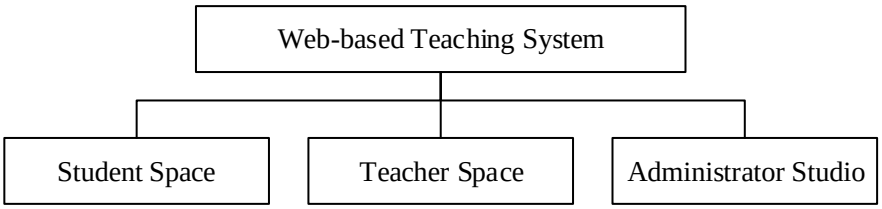

Figure 2. System functional structure diagram

3.3. Teaching Evaluation Module

The system collects and processes relevant information in the background, finds association rules through a series of data operation functions, and finally provides visual information for TAS. The NTS can evaluate the NT participants according to the feedback information from teachers and student users. The teaching system evaluates users by collecting their behavior data and relevant data processing operations when they participate in teaching. The evaluation process is mainly based on the user's login frequency, teaching participation time, use of question answering module, and homework and examination results to analyze users and obtain the final evaluation results. The specific data acquisition flow chart is shown in Figure 3.

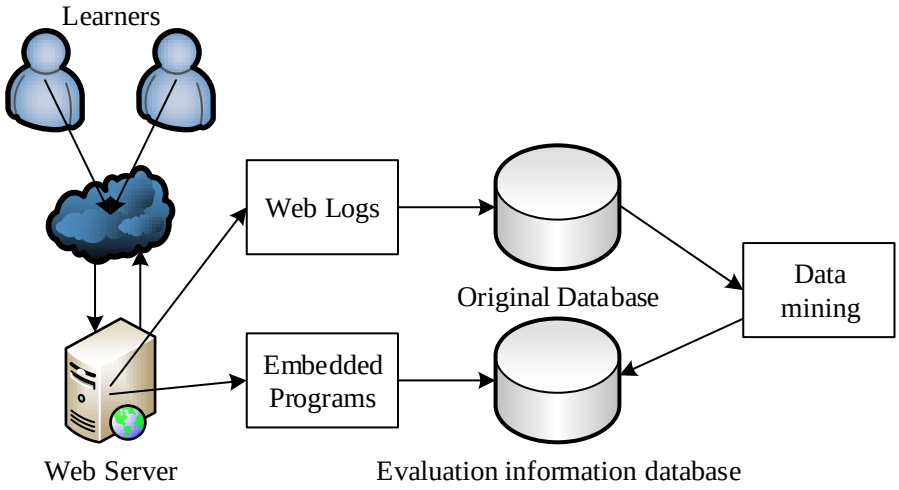

Figure 3. Flowchart of data collection of online teaching system

The evaluation data collection table of the computer science integrated NTS is shown in Table 1, which mainly collects the relevant behavior data of student users' participation in NT.

Table 1. Evaluation data collection method table

Collection object	Collection method
Number of logins	Using Record Mining
Online time	Record mining
Time of course learning	Record mining
The number of times the course was studied	Record mining
Number of questions and answers	Record mining
Number of comments made	Record mining
The number of times the comments were viewed	Record mining
Number of resources downloaded	Record mining
Number of resources uploaded	Record mining
Number of times uploaded resources were downloaded	Record Mining
Unit test scores	Calculation
Final exam results	Calculation
Number of assignments submitted	Calculation

4. Experiment Analysis

4.1. System Function Test

The purpose of testing the NTS integrating computer science is to verify the realizability and stability of various functions of the system. In the process of system verification, various functions of the system are verified by writing test cases.

(1) Test content

The testing link needs to test the software in many aspects: the achievable effect of the system, computing performance, information security, system reliability, robustness and human-computer interaction interface. Testing the online education system integrating computer science involved in this paper includes the following aspects:

Function test: check the consistency of system user functions and requirements;

Performance test: test the fault tolerance and concurrency of the system;

Stability test: test the system's stuck condition in the long running process, deal with and solve various errors in the running process of the system;

Security test: mainly tests the security and recoverability of the data involved in case of user misoperation;

Robustness test: test the fault tolerance of the system by setting various fault scenarios;

User interface test: test the usability of human-computer interaction interface.

(2) Test process design

Function test: the system function test is conducted by the system designer, and the test result evaluation standard is whether the function is consistent with the requirements.

Performance test: the performance test is carried out by the programmer. The flow pressure test is carried out on the system by establishing a simulated user library. The evaluation standard of the test results is the maximum response time of the system when a large number of users operate simultaneously.

Security test: the security test is conducted by the program designer and ordinary users to test the probability of user misoperation when quickly accessing various functions and the recoverability after data deletion.

Stability test: conducted by the system administrator user, the system functions are frequently switched by writing test cases to simulate the system's stuck rate during long-term operation.

User interface test: whether the user is easy to use in the process of using the system. The test is based on the user's needs analysis during system development. Some program developers also participate in this stage.

4.2. Performance Test Results

The main tool for system performance testing is load runner, which mainly tests the response time, processor utilization, throughput, database load, etc. The number of simulated users is 5 million. After using virtual users to resume users, repeat the test and complete the test. The test is shown in Table 2.

Table 2. System performance testing test cases

Test cases	Requirements
Simulated users	5 million
Number of test repetitions	100 times
Execution time	100ms

The results are presented in Table 3.

Table 3. System performance test test results

Test Points	Test Results
Response Time	1s
CPU Occupancy	20%
Database Occupancy	10%
Memory usage	5%
Network Throughput	100M
Cache Usage	8*

As shown in Table 3, all dimensions of the system in terms of performance test meet the requirements of software design and meet user requirements. From the functional point of view, the system has met the requirements of the user requirements specification. It can be seen from the security analysis that the system is strictly set for security. After the system logs in, if the user takes a screenshot of the page, the system will automatically detect that the user cannot log in without authorization; If you do not log in, but only open related pages according to a URL, the system will not agree to such an operation.

5. Conclusion

Combined with the development and application experience of network, this paper comprehensively discusses the development mode and method of power machinery NTS. With the continuous development of technology, NT has become the main way of teaching in colleges. Moreover, the NT has already presented the obvious characteristic at the present stage. Compared with the traditional open classes, we can find that the teaching assistance system, a new form of open classes using video as a means of communication, is neither shown to specific people for the purpose of demonstration or observation, nor is it to discover and solve a specific problem, but to promote knowledge and culture to the general non-specific people and stimulate people's enthusiasm for learning, So as to achieve the goal of education and communication of guiding people's ideological learning imperceptibly. The teaching assistant system is loved and pursued by the majority of people, which reflects that modern teaching means are gradually progressing towards multimedia, and on the other hand, it also brings inspiration and challenges to modern higher education.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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