Development of Distance Teaching System for College Professional Courses Based on 5G Network

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Abstract. 5G (the Fifth Generation Network) refers to the fifth generation mobile communication network. 5G has three important advantages: large bandwidth, low latency, and large connections. At present, 5G is being implemented in 4K / 8K coding and other technologies in remote consultation, remote monitoring, emergency rescue, remote surgery, and remote teaching scenarios, and has achieved good application results. We can foresee that the future of professional course teaching will be closely integrated with 5G technology, and the informationization of medical course teaching will also continue to increase. To further promote the construction of medical education and information technology. This paper mainly studies the development of distance education system for professional courses based on 5G network. In this paper, the system test in the student results query, class results query, time answer query, student information query and teacher information query test, the connection failure times were 22, 11, 9, 6, 9 respectively, and the successful connection success rate was 99.78%, 99.89%, 99.91%, 99.94%, 99.91%, the database connection success rate is high, and the system can be used.

Keywords: Distance Teaching, System Development, 5G Network, Professional Course Teaching

1. Introduction

On June 6, 2019, the Ministry of Industry and Information Technology issued 5G commercial licenses to four telecommunications operators including China Mobile, and China entered the first year of 5G. 5G technology will have a huge impact on the teaching of ultrasound medicine courses, and medical schools should study the preemptive layout in advance, in order to achieve both the improvement of the teaching level and scientific research level in the future ultrasound medicine course teaching reform. The implementation of education and teaching is essentially the process of information transmission and communication. Therefore, the development and application of information technology will also fundamentally affect the form of education. At present, 5G technology and cloud computing, augmented reality / virtual reality (AR / VR), and 4K / 8K video coding technologies are rapidly developing and accelerating their implementation. Analysis of the advantages and characteristics of the above-mentioned technologies will help to correctly understand their application.
Distance professional teaching is an educational method compared to direct face-to-face education. It mainly refers to a flexible learning method with free time for those who cannot normally receive general formal education or want to further study during work [1-2]. Distance professional course teaching is divided into two types according to the existing technical means: synchronous distance professional course teaching and asynchronous distance professional course teaching [3]. Synchronous distance professional course teaching requires that all students in this course need to study the course at the same time, similar to synchronous teaching methods such as web conferences and video conferences, and similar to traditional classroom teaching methods [4-5]. The asynchronous remote professional course teaching is just the opposite. It does not require all students to start the course at the same time, similar to message discussion forums, audio and video recordings, e-books, etc [6]. With the rapid development of computer and Internet technologies, the above two types are organically combined on the basis of the original types, including online virtual classrooms and online teaching interaction methods, which provide opportunities for teachers and students to collaborate and further improve The quality of teaching truly realizes the dynamic combination of distance teaching and learning [7-8].

Distance professional course teaching has the characteristics of wide openness, extension and extension, flexibility and diversity. The wide openness of distance professional teaching is the most basic feature different from traditional education. The teaching of distance professional courses is aimed at the general public, which lowers the threshold for studying and the hardware requirements of teaching facilities, so that educational resources can be effectively used and shared throughout the society [9-10]. At the same time, since the distance professional course teaching effectively disseminates related teaching content and teaching concepts throughout the society through various media, and is enriched and optimized again in various communication links, the teaching content is selectively diffused and optimized. Extension is conducive to the improvement of the quality of teaching resources; the teaching format of distance professional courses is flexible and diverse. With the development of computer and Internet technologies, the information technology support methods have also been continuously innovated and improved, which can adapt to more different application needs and management requirements [11-12].

2. Method

2.1 System Design Method

Overall design plan of distance education system in colleges and universities The distance education system in colleges and universities mainly includes: (1) Real-time teaching system; (2) Courseware on-demand system; (3) Multimedia courseware production system. To realize the multimedia distance education system based on port network technology, the corresponding hardware and software foundation are needed. Therefore, the multimedia distance education system includes three parts: teaching resources, communication network, and terminal equipment. The communication network and terminal equipment constitute the hardware foundation of the system, and the teaching resources are the software foundation of the system. Users can dial through the LAN or using a cat. Go online to access system resources.

The system uses a traditional server-client model. The server includes live classrooms, storage equipment, audio and video servers, and web servers. The data obtained by encoding the real-time audio, video and other information in the live classroom in the computer can be stored in the storage device, or directly transmitted to the media server, and then transmitted to the remote students through the Internet network. The information and data obtained from the media server may be real-time data collected directly from the capture card, or it may be information in the storage device, or of course it may be transmitted from other servers. The media server passes various This path publishes this information. The WEB server manages the entire long-distance teaching system, stores and manages all teaching resources, and the functions that can be realized are multimedia courseware on demand,
remote evaluation, homework release and answer, online discussion, and teaching management. Remote users can connect to the distance education system through the Internet or LAN to browse the required teaching resources.

The distance education system based on the Internet network can realize related teaching activities. The distance learning process includes the participation of teachers, students, and related management personnel. It analyzes the functions of university distance teaching system in four aspects: teachers, students, managers and technology.

From a technical perspective. The distance education system includes two teaching modes. The real-time online distance teaching mode is supported by the real-time teaching subsystem. The system includes a real-time teaching system and a streaming broadcast system. The autonomous asynchronous remote teaching mode is supported by a non-real-time teaching subsystem. The system includes a series of teaching auxiliary systems such as the production system of electronic courseware, the courseware on demand system, the online communication system, the online answering system, and the remote test system.

2.2 Design Ideas of Online Test System
We know that e-learning is a new type of learning method. Without a corresponding comprehensive learning evaluation method, such a learning system (or teaching system) is incomplete. Therefore, the establishment of a complete teaching and learning system on the Internet, this is our ultimate goal of implementing network teaching. When we design and implement an online testing system for a teaching platform, we must not only highlight the characteristics of online testing, but also absorb the favorable factors of traditional testing as much as possible. Specifically, we will gradually build a test question bank, implement the test, and evaluate the problems of automated design. All knowledge points should be covered, and the types of questions are not only multiple-choice questions, fill-in-the-blank questions, but also judgement questions, sorting questions, and matching questions. The test results are counted and recorded.

3. Experiment
During this system test, tests were conducted on the design quality, function implementation, and stability of the distance learning system. Testers need to establish a good hardware environment to ensure that the processor, system memory, hard disk space, and browser meet the requirements of actual testing. In order to meet the requirements of actual testing, testers can choose a black box test method to perform different tests for different modules.

First, in the course of the course management function module test, the test functions mainly include learning records and course learning plans. After actual testing, the system can log in to request and verify normally, realizing the normal operation of the learning plan.

Second, in the test of the test information management function module, the main tests are individual subjects, test appointments, test plans, and personal test rooms. After testing, the system can implement personal operations and make test appointments in accordance with user applications. Exam planning features to help candidates obtain corresponding candidate information.

Third, in the learning support management function test, the main tests are online testing, online Q & A, and homework resources testing, which can ensure that users can log in normally and complete online testing and other services.

Fourth, in the graduation management function module test, the graduation work plan, graduation thesis submission, and graduation design results inquiry are mainly tested. The landing system can meet the expected standards and requirements.

Fifth, in the feedback feedback management function module, the main functions of the station's letter and the dean's mailbox can be tested, which can complete the station's message business function and the dean's mailbox business process.
4. Discuss

4.1 System Performance Test Analysis
The system performance test plays an important role in improving the user's perception of use. It mainly tests the corresponding length of the system to ensure that the system outputs the calculation results within a user-acceptable time. This article selects several key application scenarios for testing, including randomly selecting test questions to generate test papers, score calculation time, query score time, test paper answer query, and question search time tests. The efficiency test of the distance interactive teaching system is shown in Table 1.

**Table 1. System average response time test**

| The test component          | Number of connections | Mean response time (ms) |
|----------------------------|-----------------------|-------------------------|
| Test paper generation       | 100                   | 2.755                   |
| Results calculation         | 100                   | 1.792                   |
| Student performance enquiry | 200                   | 3.203                   |
| Class grade enquiry         | 50                    | 2.065                   |
| Time answer query           | 100                   | 1.590                   |
| Search problem              | 200                   | 1.283                   |

As shown in Table 1, in the case of 100 students connected to the system for online examination, the average response time of the simultaneous test system is about 3 seconds, and the average response time of the online problem search is about 1 second, which can meet the requirements of user applications.

![Figure 1. System database connectivity test](image)

As shown in Figure 1, in the student results query, class results query, time answer query, student information query and teacher information query test, the number of connection failures was 22, 11, 9, 6, and 9, respectively, and the successful connection success rate They are 99.78%, 99.89%, 99.91%, 99.94%, and 99.91%, respectively. The database connection success rate is high.

4.2 Advantages of 5G Applications
5G network will rely on its "large bandwidth, low latency, large connection" and other advantages, will achieve "the information is at your fingertips, all things within reach" magnificent scene. As the infrastructure of future IT technology, it will play an important role in teaching full life cycle management, restore real case teaching scenarios, and promote high-quality resource sharing with technologies such as cloud computing, AR / VR, 4K / 8K, and reshape traditional medicine. Imaging Teaching Mode
A smarter way to reach knowledge. With the help of 5G networks and cloud computing, the quality education resources of medical schools will be re-integrated, and the school will become a new type of learning center. In the context of 5G technology, access to educational resources for medical imaging will be faster and more convenient. Medical imaging education resources will be digitized and stored in the cloud in the form of video, audio, multimedia courseware, electronic documents, etc. Medical students can use ultra-high-speed, low-latency 5G through smart media such as mobile phone screens, computer screens, and television screens Network, fast access to rich medical resources in the cloud. Artificial intelligence technology (AI) will intelligently recommend resources such as medical information, literature, and MOOCs to achieve what you want, what you see, and what you get.

5G + AR / VR teaching is a multi-person synchronous, real-time interactive teaching method that puts participants in a combination of reality and reality. It is the future development direction of the teaching field. For the experimental session, with the help of AR equipment, students can see teachers operating virtualized experimental equipment from different perspectives, and jointly create a virtual world in the real world. Medical imaging teaching uses a lot of real cases. On the premise of meeting patient privacy protection and related laws and regulations, teachers can quickly access medical imaging systems such as PACS through ultra-high-speed and low-latency 5G networks to find suitable medical records as classroom cases. Using AR / VR technology, holographic projection technology, and other high-tech, it can realistically restore various imaging equipment to check the scene, give people an immersive feeling, and improve the ability of imaging medical students to combine theory and practice.

5. Conclusion
Medical imaging is a discipline that closely combines theory with practice. College classrooms are characterized by openness, broad knowledge, and high levels of teachers. They have always been at the forefront of the use of information technology. As the infrastructure of future IT technology, 5G will work with cloud computing, AR / VR, 4K / 8K and other technologies to play an important role in student autonomous learning, practical teaching of imaging and sharing of high-quality resources, completely overturning traditional medical imaging. The teaching model plays an important role in the teaching and development of medical imaging. Based on their core competitive advantages, each medical school should follow the development trend of 5G and related technologies, research ahead of time, and actively cooperate with leading companies such as China Mobile to build a 5G smart campus and realize digital, information and intelligent medical education. Continuously improve the level of construction and application of the school's information-based learning environment, and improve the ability of teachers and students to apply and innovate in information technology.

References
[1]. Mefleq Qublan B Al-Juda. Distance Learning Students’ Evaluation of E-Learning System in University of Tabuk, Saudi Arabia[J]. Journal of Education & Learning, 2017, 6(4):324.
[2]. Alex A. Florindo, Douglas R. Andrade, Paulo H. Guerra. Physical activity promotion by health practitioners: a distance-learning training component to improve knowledge and counseling[J]. Primary Health Care Research & Development, 2017, 19(2):1-11.
[3]. Didik Dwi Prasetya, Aji Prasetya Wibawa, Ansari Saleh Ahmar. Design of Web-based Lightweight Interactive Multimedia for Distance Learning[J]. Journal of Physics Conference Series, 2018, 1028(1):012059.
[4]. W. G. C. W. Kumara, Kanoksak Watanachote, Batbaatar Battulga. A Kinect-Based Assessment System for Smart Classroom[J]. International Journal of Distance Education Technologies, 2017, 13(2):34-53.
[5]. Jinjun Tang, Shen Zhang, Yajie Zou. An adaptive map-matching algorithm based on hierarchical fuzzy system from vehicular GPS data[J]. Plos One, 2017, 12(12):e0188796.
[6]. Hu, B, Li, XW, Sun, ST. Attention Recognition in EEG-Based Affective Learning Research Using CFS plus KNN Algorithm[J]. IEEE/ACM Transactions on Computational Biology &
Bioinformatics, 2018, 15(2):38-45.

[7]. Wendy Lowe, Richard Malinski. DISTANCE LEARNING : SUCCESS REQUIRES SUPPORT[J]. Education Libraries, 2017, 24(2-3):11-14.

[8]. Ouadoud Mohammed, Mohamed Yassin Chkouri, Amel Nejjari. Learning Management System and the Underlying Learning Theories: Towards a new Modeling of an LMS[J]. International Journal of Information Technology, 2018, 2(1):25–33.

[9]. Olanike Sharon NICHOLAS-OMOREGBE, Ambrose Agbon AZETA, Idowu Aigbovo CHIAZOR. Predicting the adoption of e-learning management system: A case of selected private universities in Nigeria[J]. Turkish Online Journal of Distance Education, 2017, 18(2):106-121.

[10]. Jenny WANG. Cloud Computing Technologies in Writing Class: Factors Influencing Students’ Learning Experience[J]. Turkish Online Journal of Distance Education, 2017, 18(3):197-197.

[11]. S. Liu, N. Rao, C. Zhang. Design of electromagnetic ultrasonic nondestructive testing system based on labview[J]. Transactions of China Electrotechnical Society, 2018, 33(10):2274-2281.

[12]. Meibin Qi, Jingxian Han, Jianguo Jiang. Deep feature representation and multiple metric ensembles for person re-identification in security surveillance system[J]. Multimedia Tools & Applications, 2017(4):1-15.