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Design of an online interactive teaching platform for physical education courses based on cloud computing

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Abstract: *The traditional online interactive teaching platform for physical education courses is designed in classroom interactive teaching, but due to the teacher's leadership, students' interest in interaction is not high. Therefore, the design of an online interactive teaching platform for physical education courses based on cloud computing is proposed. The platform is designed from both hardware and software aspects. In the hardware design, the AFDHU-567121 model memory is used to store interactive teaching resources, and the HI3520RTSP processor is used to design and analyze the teaching platform server. In software design, the first step is to read and retrieve online teaching resources, followed by processing online teaching data based on cloud computing. Finally, through feedback from interactive data, the design of an online interactive teaching platform for physical education courses is achieved. In the experiment, the average user experience score of the experimental group among the five samples was 85.74; The average user experience score of the control group in the five samples was 58.32. The experimental results demonstrate that the designed platform can better meet user needs and provide a smooth interactive teaching experience.*

Keywords: *Cloud computing; Physical education courses; Course interaction; Online teaching; Design of teaching platform*

1. Introduction

With the rapid development of the Internet and the continuous popularization of adult education, the online interactive teaching platform of physical education courses has become an important tool to meet people's learning needs. Cloud computing, as a new technology under the era of industry, can play an important role in course design through its application. The purpose of this paper is to design an efficient, secure and reliable online interactive teaching platform for physical education courses based on cloud computing. Therefore, through the use of cloud computing technology, this paper designs and expounds the online interactive teaching platform from many aspects and angles. This paper focuses on the hardware design, analysis processor, analysis processing server, data converter and interactive platform construction. Through the design and experimental results of this paper, the potential of the online interactive teaching platform for physical education courses based on cloud computing technology in providing high-quality educational resources and improving user experience can be verified [1].

2. Platform hardware design

2.1 Teaching data storage

One of the hardware designs for the platform in this article is the storage of teaching data. Compared to the data teaching resources of ordinary physical education courses, interactive teaching has more flexibility and immersion. Therefore, the data storage required for this teaching resource requires more powerful hardware devices. The memory selected in this article needs to provide reliable, secure, and efficient data storage and management functions, ensuring the integrity and traceability of learning records and student data. Therefore, this article will use the AFDHU-567121 model memory as a hardware device to achieve data storage and management functions. It is a high-performance and reliable storage device suitable for processing large amounts of data and complex operation scenarios, and can accommodate a large amount of interactive data, including students' learning records,

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assignments, and grades. This can ensure that the platform can handle large-scale interactive data and support multiple users to learn and interact simultaneously. The continued use of cloud computing technology on the platform has improved its reliability and attack resistance. This storage will provide the platform with high-performance and highly reliable data storage and management functions.

2.2 Analysis and processing server

The data is evenly divided into parallel subdomains according to the traffic volume, and then handed over to each storage thread for secure transmission. The interactive teaching data in the platform cannot be modified by non-administrators at will. The function of the online analytical processing server is to process, reorganize or integrate the required interactive teaching materials, to understand the interactive teaching materials from multiple angles, multi-level, fast and all-round, and to provide a secure basis for the multidimensional presentation and analysis of the data. Therefore, this paper will combine HI3520RTSP processor to design analysis and processing server to support video data processing and streaming media transmission. The Analytics Processing server is a high-performance server designed to process and analyze video data from the HI3520RTSP processor and provide real-time streaming media services. The analysis and processing server provides real-time streaming media transmission function, and through collaboration with the HI3520RTSP processor, the processed video stream is transmitted in real-time to the bidirectional interactive end. By analyzing students' learning behavior and interactive data, the server can provide personalized learning suggestions and feedback, helping students better understand and master physical education courses. By integrating this processor, the analysis and processing server can provide high-performance video data processing and real-time streaming media transmission capabilities, support video content playback and interactive experience on online interactive teaching platforms, and provide students with high-quality learning environments and interactive teaching resources[2].

3. Platform software design

3.1 Online interactive teaching resource reading and retrieval

This paper uses MYSQL and HDFS to read the required interactive teaching resource data. At the same time, in order to realize the storage and management of resources, this paper will adopt distributed file management, and use cloud computing technology to achieve the record and management of resource location information. In order to store a variety of different types of online physical education interactive teaching resources, this paper will use the cutting method to cut the data in the resources. The resource is divided into multiple data blocks, each of which can be represented as:

$$M = \left\{ T_{ai}, m, Es_B \left(k_{ai}, T_{ai}, m \right) \right\} \tag{1}$$

In formula (1), M represents the description information of the online interactive teaching resource segmentation database for the course; T_{ai} is the timestamp on each resource data transmission path, Es_B is the private key of recommended system user B, and $Es_B \left(k_{ai}, T_{ai}, m \right)$ is the digital signature of recommended user B; m is the specific amount of data in the data block. Store the data blocks obtained according to the above segmentation on the corresponding management storage data nodes and manage them uniformly. At the same time, the platform can ensure the credibility and traceability of resources, providing safer and more reliable interactive teaching resources [3].

3.2 Processing online interactive teaching data based on cloud computing

Through the design of reading and retrieval of online interactive teaching resources, users can search the corresponding physical education teaching resources more accurately and conveniently in the actual application of platform courses. For the smooth presentation of teaching data in the cloud, it needs to be based on cloud computing technology.

In platform design, the group paper discussion of interactive teaching content still occupies an important position. To ensure that the generated questions meet the constraints, this article introduces cloud computing technology and proposes an online interactive teaching data processing algorithm to

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generate questions that meet the constraints. By utilizing cloud computing technology, the platform will analyze and process existing problems. Each question can be represented as a data record in cloud computing. During the process of generating questions, the platform will filter out questions that match the given constraint x on cloud computing. Through the processing and calculation of cloud computing technology, the platform can efficiently generate a collection of questions that meet the requirements for teachers to discuss and evaluate. The calculation formula is:

$$K(X)=\frac{\sum_{i=1}^{n}\sum_{j=1}^{k}F_{ij}\chi\frac{x}{X}}{V} \tag{2}$$

In formula (2) : $K(X)$ is the similarity of the generated problem; n、k、i、j is a constant; F_{ij} is the j similar data in the i problem; χ is the coefficient of big data partition; V is the number of problems. After the instruction for the generation of test papers is issued, multiple test papers can be quickly generated by using the characteristics of cloud computing technology in order to process interactive data in real time and improve the fluency of teaching [4].

3.3 Realize efficient online interactive teaching of physical education courses

In the actual calculation process, this article mainly analyzes the data parameters directly related to the course content to reduce the redundancy of the platform's operation phase and ensure stable operation in the presence of a large number of parallel users. Therefore, after dealing with the presentation of teaching resources, it is necessary to improve and optimize interactive teaching from the perspectives of immersion and interactivity.

Firstly, by collecting the learning data of learners through cloud computing technology, personalized interactive teaching process can be provided to ensure the reliability and efficiency of interactive teaching. On this basis, based on the analysis of user learning results accumulated by class G_i users, corresponding interactive teaching guidance is carried out according to the data parameters g_{bi} and G_i feedbacks in user profile information and the intuitive relationship between class users' corresponding data. The calculation formula is as follows:

$$\Delta=\begin{cases}0, g_{bi\min}\le b_i\le g_{bi\max}\\ b_i-g_{bi}, b_i>g_{bi\max}\\ g_{bi}-b_i, b_i<g_{bi\min}\end{cases} \tag{3}$$

In formula (3), Δ represents the degree to which the user needs guidance during the learning process; $g_{bi\max}$. And $g_{bi\min}$ are the information parameters for the learning effect feedback from Class G_m users, respectively; b_i is the information parameter of the learning effect feedback from the current user. In the actual interactive teaching process, the online interactive teaching platform of this course utilizes the characteristics of cloud computing to collect and store learners' learning data.The distributed node is used for data analysis and processing, and the corresponding calculation and analysis are carried out according to the learner's data parameters. At the same time, the technical characteristics of cloud computing ensure the fluency and breadth of the interactive teaching process. To provide personalized learning experience and interactive teaching guidance, to help learners better experience the physical education curriculum. By using cloud computing technology for data analysis and personalized interactive teaching, teachers and learners can jointly promote the development of interactive teaching and achieve more efficient, flexible and credible physical education [5].

4. Platform performance measurement experiment

4.1 Experimental description

In order to verify the effectiveness of the platform designed in this article in online interactive teaching of physical education courses, this article chooses to conduct specific experiments on the

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platform. Through the comprehensive application of the platform, the comparison between the platform designed in this article and traditional online interactive teaching platforms for physical education courses is achieved. In order to make the experiment concise, the cloud computing based online interactive teaching platform for physical education courses in this article is set as the experimental group, set the traditional online interactive teaching platform for physical education courses as the control group.

Users in the experiment were randomly divided into 5 groups of samples with certain uncertainty, which can better provide the authenticity of platform experience. According to the actual registration information of users of the platform, through the background data analysis, the platform was analyzed from multiple perspectives, and user experience scores were obtained in aspects such as immersion, interactivity, intelligence and fluency.

4.2 Experimental preparation

The online sports interactive teaching platform designed in this article aims to build a virtual and networked sports learning environment, reducing the limitations of sports venues. Therefore, the platform architecture of this experiment is shown in Figure 1.

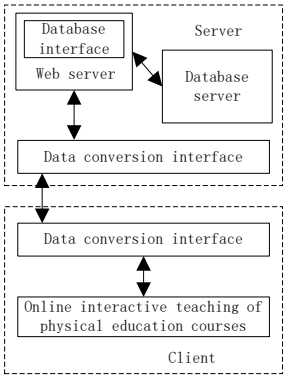

Figure 1: Architecture of Online Interactive Teaching Platform for Physical Education Courses

In order to ensure the uniformity of the experiment, five different online interactive teaching resource files of physical education courses were imported into the two platforms respectively. The equipment and software parameters used in the experiment are shown in Table 1:

Table 1: Experimental Parameters

Hardware configuration	Software configuration
Processor: 23GHz HI3520 RTSP processor	Operating system: Mac OS Mojave 10.14.5
Memory: 16GB 2133MHz LPDDR3	Truffle:v3.1.1
Hard drive: Macintosh HD 512GB	Node:v9.6.2
Network: 100/1000M adaptive wireless Ethernet card	JDK:v1.8.0-201
Graphics card:Intel Iris Plus 640 1536 MB	MYSQL:v5.6

This paper takes the interactive experience of the two platforms as the evaluation index, and obtains the required online interactive teaching resources of physical education courses in the same operation mode in the two platforms. In order to verify the smooth effect of the two platforms, the playback effect in the experiment was analyzed. The formula for calculating resource response fluency is as follows:

$$e_{\exp} = \sum_{U(u,s)} \alpha X_{sim} U \tag{4}$$

In formula (4): $e_{\exp}$ represents the user's platform experience, and $U(u,s)$ represents the different physical education courses obtained by the user on the platform; α represents the time it takes for users to search for courses, and the longer the search, the worse the experience; X_{sim} represents the level of interest of users in providing courses on the platform.

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4.3 Experimental results

According to formula (4), users' experience degree of course resources under the two platforms is completed, and the results are shown in Figure 2.

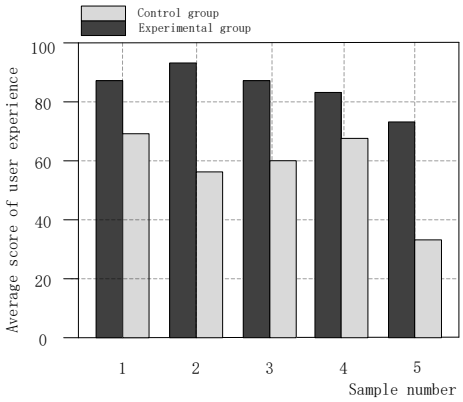

Figure 2: Comparison of user experience scores between the two groups of platforms

According to the experimental results in Figure 2, it can be analyzed that both platforms can play a certain promoting role in online teaching of physical education courses. However, based on the division of age groups and the consideration of comprehensive data, the average user experience score of the experimental group in the five sample groups is 85.74; The average user experience score of the control group in the five samples was 58.32. This indicates that the platform design based on cloud computing is more in line with users' needs and interests in their eyes. This result further validates the advantages of the cloud computing based education platform designed in this article in performance testing. Through the attributes of cloud computing, the platform can provide interactive teaching more efficiently and conveniently to meet the learning needs of users. This means that it can provide users with higher quality resource recommendation services and enhance the use value of online interactive teaching resources. This is of great significance for the online interactive teaching platform for physical education courses, because it can provide personalized learning support and promote learners' learning effectiveness and learning experience.

5. Conclusion

This article presents the design and experimental analysis of an online interactive teaching platform for physical education courses under cloud computing technology. Firstly, the hardware is divided to reflect the functional roles of each key component. The software stores interactive resources for users to extract more accurately and conveniently. Then, based on cloud computing technology, the teaching platform is designed and improved to achieve interactive teaching. With the assistance of experimental results, the user experience of the design platform was measured through comparative experiments. However, in the process of data partitioning of platform resources, this article did not consider comprehensively enough, and there are still certain shortcomings. For the design of this link, in-depth analysis will be conducted in future research.

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