Research on the Design of University Sports Teaching System Based on Cloud Computing

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Abstract. In this paper, we conduct an in-depth analysis and research on physical education teaching systems in colleges and universities through cloud computing-related technology, and design a physical education teaching system. The historical process of developing and utilizing educational resources, promoting knowledge innovation, and sharing, and promoting profound changes in educational ideas, concepts, models, contents, and methods. Education informatization is conducive to optimizing the structure of the educational community, rationalizing the allocation of educational resources, and improving the quality and management of education. Its technical characteristics are digitalization, networking, and intelligence, and its basic features are openness, sharing, interaction, and collaboration, and information technology penetrates all kinds of educational management, teaching, and scientific research, influencing and determining the overall situation and direction of educational reform and development. A more comprehensive and integrated quantitative process evaluation of students' physical education performance at school will also yield more objective evaluation results.

Keywords: Cloud computing · Physical education teaching system · Design research

1 Introduction

The physical education model in colleges and universities refers to the implementation of a system of educational strategies that use physical activity to promote the overall physical and mental development of students. It contains physical education cognitive education, physical education curriculum implementation, physical education teaching content, physical education extracurricular activities, and physical education performance evaluation in five aspects [1]. Physical education cloud refers to a comprehensive college sports model built according to the general rules and principles of college physical education by using cloud computing as technical support to achieve more optimal college sports implementation, monitoring, and management.

However, according to the results of the questionnaire, 423 out of 500 school students, or 84.6%, were willing to receive scientific physical fitness instruction in extracurricular physical education activities, which means that most students are still willing to receive scientific knowledge in sports-related aspects [2]. At present, colleges and universities

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do not pay enough attention to the teaching of physical education cognitive aspects, and the development and cultivation of students' motivation are not enough.

College students have studied physical health and education for nearly 12 years, but few of them know a series of basic knowledge of exercise physiology and exercise rehabilitation. They only know to follow the teacher's requirements to complete the tasks in a physical education class, but they do not know why they should do these exercises, what are the benefits of doing these exercises, or whether these exercises are suitable for them. Most of the students are only concerned about their grades in physical education classes, and the exercises they do outside of class are usually for exams, not for spontaneous scientific physical exercise. However, according to the results of the questionnaire, 423 students out of 500 university students were willing to receive scientific physical fitness instruction in extra-curricular activities of physical education, accounting for 84.6%, which means that most students are still willing to receive scientific knowledge in sports-related aspects.

2 Related Studies

Shaw supplemented his students' lessons by recording instructional videos and then dubbing the videos [3]. Today, the flipped classroom continues to play a role in changing the traditional teaching model from one in which the teacher explains the knowledge in class and the students do the homework after class to one in which the teacher sends the learning tasks to the students in advance and the student's study and complete the tasks outside of class time through the system; in class, the teacher answers the questions that the students encounter during their study [4]. The teacher has changed from being a teacher to a tutor.

Yang et al. collected video resources through channels such as TV recording, videotape conversion, CD conversion, network download, and network integration, and after format conversion, designed a platform for sports video integration through the integration of these resources, integrating various sports videos of various disciplines and specialties to play a reference role for teaching and research; secondly, playing the specialties of school sports, the various sports videos are specialized cutting, description, and analysis for special research; the authors describe in detail the whole process of this characteristic video library from conception to concrete implementation, especially focusing on the characteristics and installation and use of the open-source system, which is powerful and scalable [5].

Because each student is influenced by genetic factors, physical performance varies. Some students do not need to work very hard in a physical education class and do not need to spend effort after class, and they can achieve excellent grades in physical education class because of their good innate qualities, while some students can only achieve just passing grades because of genetic factors, even if they take physical education class seriously and work hard after class. In this respect, the fairness of our evaluation criteria is not ideal [6]. Therefore, we need to add process evaluation to outcome evaluation. To objectively evaluate students' learning, both outcome and process evaluations need to be quantified. While outcome assessment can be quantified, process assessment has not been a good quantified solution in the current physical education management system.

3 Cloud Computing Physical Education System Analysis and Design

3.1 Cloud Computing Design

Currently, there is no uniform and clear definition of cloud computing in the industry, but there are several expressions of cloud computing that are widely accepted. According to Wikipedia, cloud computing is an Internet-based computing method that provides on-demand supply for computers or other devices through the sharing of hardware and software resources and information in a grid-like manner [7]. In this paper, cloud computing is based on virtualization technology and Internet-based technology to manage numerous distributed hardware and software resources and to realize the unified management of resources, and collaborative work. Since this paper mainly applies cloud computing technology to realize enterprise project management from the perspective of enterprise project management, we understand cloud computing technology from two aspects: on the one hand, we use Hadoop technology to manage many hardware and software resources, and provide a resource storage platform with huge storage capacity for enterprise project management system; on the other hand, we unify project management-related information management to provide services for all parties of the project management system. On the other hand, the information related to project management is managed in a unified manner, and a standardized and unified information service interface is provided for all users of the project management system.

Hadoop Distributed File System (HDFS) is a distributed file storage system with high throughput, suitable for storing large amounts of data at the PB level. HDFS adopts a master/slave master/slave structure, including a Name Node master node with master task and several Data Node slave nodes with worker task. The HDFS uses a master/slave architecture, which consists of a Name Node master with the task of master and several Data Node slaves with the task of worker. The overall architecture of HDFS is shown in Fig. 1.

The Data Node is the worker node responsible for storing the file blocks and responding to the operations of the Name Node on the data blocks and client read and write requests. Name Node processes the data stored on the Data Node after receiving heartbeat information from the Data Node. The Data Node is organized using racks, and each file in the HDFS file system has two backup data blocks. Different backup data is stored on different racks to ensure the security of Data Node data nodes on different racks.

A data warehouse integrates historical data information over some time, rather than simply recording current state information [8]. Therefore, most of the data in the data warehouse carries time information, which provides data support for changes in transactions and analysis of future trends. Data in the data warehouse is mainly used to be queried and statistics, and is rarely modified. Therefore, the stability characteristic of the data warehouse means that the data in the data warehouse will not be changed by another. However, new data will be added to the data warehouse periodically, so the stability of the data warehouse is only relatively stable. The relative stability characteristic of a data warehouse ensures the continuity of data in a data warehouse, and ensures that the operation of data in a data warehouse does not need to consider concurrency control.

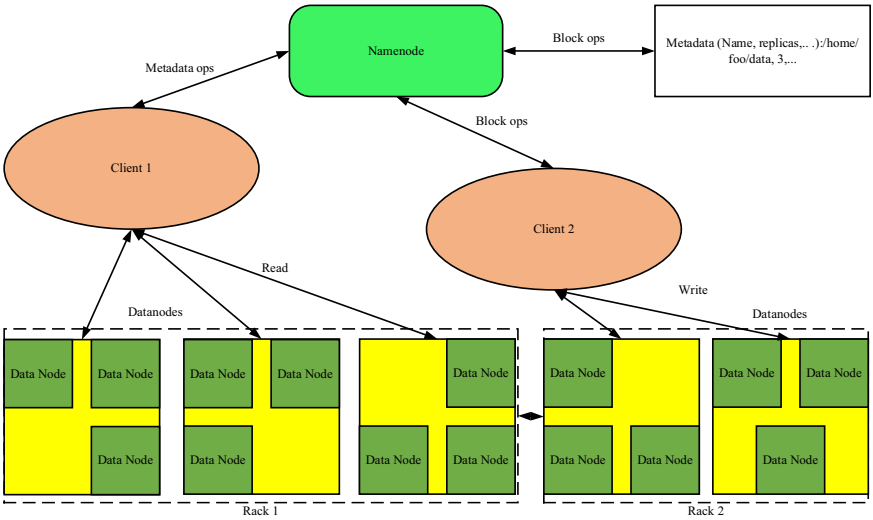

Fig. 1. HDFS file system architecture

3.2 Design of Physical Education System in Colleges and Universities

We can adopt a one-library-one-table model for the system, i.e., a microservice corresponds to a separate data house. This one-library-one-table model can realize the features of a separate process, separate deployment, separate development, and separate maintenance for each service [9]. When a microservice needs to be upgraded or maintained, it can well avoid the shadow of other services. The system has 5 functional modules and is designed into 5 microservices, each of which contains business source code and database, namely: statistics centre service, information management service, data centre service, micro-video on-demand service, and teaching interactive service. Each microservice in the system corresponds to a different functional module, and the services are developed, installed, and maintained separately from each other. The teaching support platform also includes many Spring Cloud service base components for implementing the microservice architecture to assist in realizing the whole system architecture. The system architecture design is shown in Fig. 2.

Microservices exist in the system as separate program modules, and developers can manually modify the parameters to configure various parameters of the services such as ports and addresses in the configuration files of microservices so that they can realize mutual remote invocation between services and achieve mutual invocation implementation. As the parameters of the microservice are modified, other services will not be able to find the modified service directly, and as the project grows, the configuration file will also become bigger after the project becomes bigger, then the manual maintenance of the configuration parameters will become unsuitable, which is not conducive to the weak coupling feature of microservice. The registration of configuration parameters can be solved by the Service Registration and Discovery Centre, which can register the service list for discovery and reduce the maintenance of programmers. When the parameters of a

microservice module are changed, other services associated with it can continue to communicate with it without other modifications, which effectively improves the scalability of the system [10]. A single service can also be discovered and identified by service governance if it runs several instance units at the same time, and instances can also be combined as needed. The microservice registration and discovery centre enables service processes to identify each other and can resolve the failure rate when an instance call fails by invoking other instances to achieve high availability of the system.

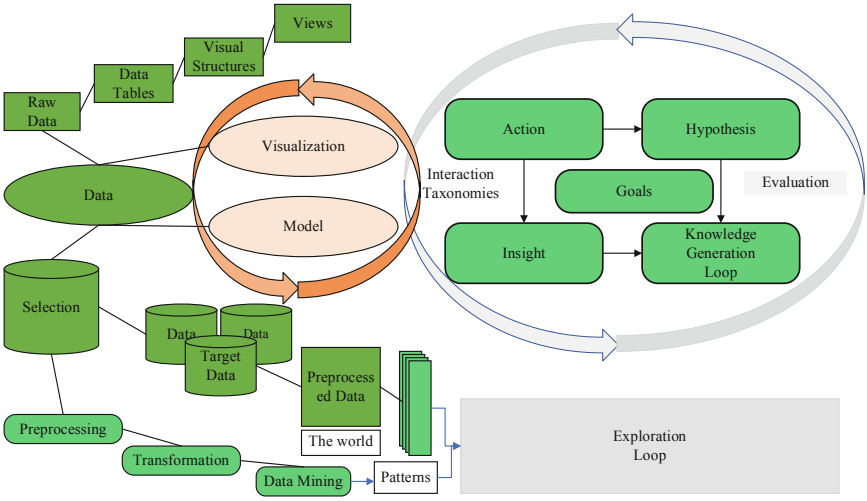

Fig. 2. System architecture design

This project adopts the microservice architecture system. Docker is a set of open-source programs that enables virtualization-based packaging of container technology, which is currently used in many industries. Docker's container technology has many advantages, such as Docker containers have the runtime environment required for a single microservice, which makes it very convenient to shift the value of the program and reduce the deployment time of the deployer through a unified deployment implementation; program design engineers can simulate the user scenario in the design coding scenario to achieve the design coding scenario and the user scenario Consistent, preventing errors caused by different environments; when changing the physical location of deployment, it can achieve rapid migration and deploy specific microservices to different environments.

4 Results Analysis

The results of the survey of 30 physical education teachers showed that all of them gave feedback on the evaluation results after the evaluation. In terms of the content of feedback, 53.33% of physical education teachers were not clear about the specific content of feedback, so that more than half of the physical education teachers were not clear about the results of evaluation feedback, and the content of feedback was relatively

single; in terms of the timing of feedback, as shown in Fig. 3, the timing of feedback was mainly at the beginning of the new semester before giving feedback to teachers and after some time (this semester), so the feedback In terms of the timing of feedback, as shown in Fig. 3, the timing of feedback is mainly at the beginning of the new semester and after a while (this semester), so the feedback is not timely, which leads to most physical education teachers not paying attention to the feedback results; from the way of feedback, the way of feedback is mainly private conversation feedback, posting on the public board and written feedback, which is old and lack of openness, so the way of feedback should keep up with the times, such as online feedback, and the feedback should be more open, so that physical education teachers pay attention to the feedback results.

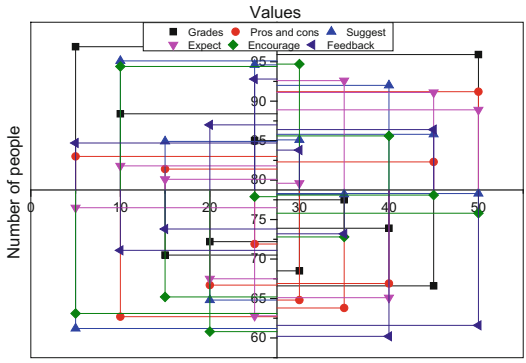

Fig. 3. Feedback content

From Fig. 4, the content of the evaluation of students' physical education is based on physical education theoretical knowledge, motor skills, classroom performance, and

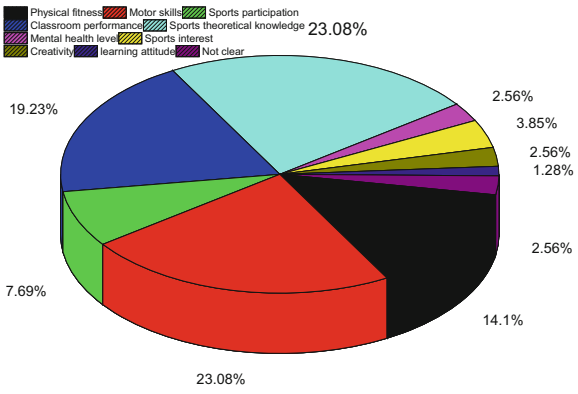

Fig. 4. Evaluation content

physical quality, and neglects the evaluation of students' innovation ability, sports interest, and mental health level, so the content of the evaluation is too much emphasis on some common contents and neglects the differences of individual students.

As shown in Fig. 5, the average number of 13 secondary indicators in the first round was greater than 3.5, indicating that the primary design of secondary indicators was approved by experts; 11 items had coefficients of variation less than 0.25, but the coefficients of variation of physical fitness and physical quality were still greater than 0.25, indicating that these two items needed to be adjusted, and some experts pointed out that the indicator of physical quality included the indicator of physical fitness. These two items should not exist side by side, and the indicator of basic knowledge of sports theory also needs to be considered again. The Kendall's harmony coefficient in the graph is 0.087, which indicates that the experts' evaluation results are consistent but not highly coordinated.

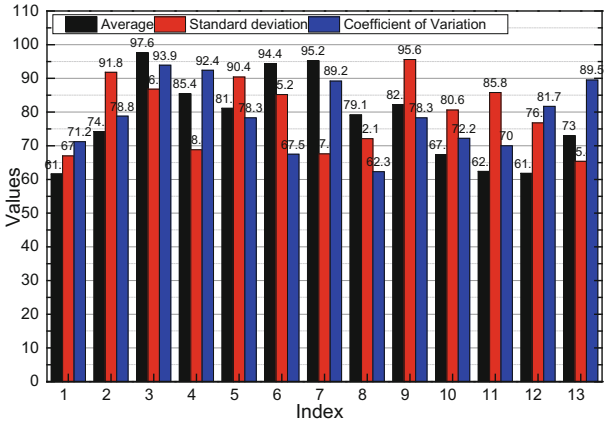

Fig. 5. Results of the first round of secondary index parameters

Education modernization and education informatization are the main strategies for us to promote teaching reform and improve teaching quality. As a computer science graduate student who has been working in secondary vocational schools for a long time, to promote the deep integration of information technology and education teaching and improve the quality of classroom teaching, this paper combines my work reality, analyses in detail the teaching problems existing in secondary vocational education, and proposes an education informatization strategy to optimize the traditional classroom teaching process and improve the quality of teaching through information technology. In other words, a distributed teaching aid system is developed to assist teachers in the classroom teaching process, and a series of traditional teaching behaviours are integrated with information technology to achieve better teaching results.

When users use the system, if the system response time is too long, it will cause a very poor experience. In general, the system users have a tolerance for the system response time within 5 s. Therefore, this system uses response time to test the performance of the system. The performance of the system is evaluated by simulating concurrent accesses

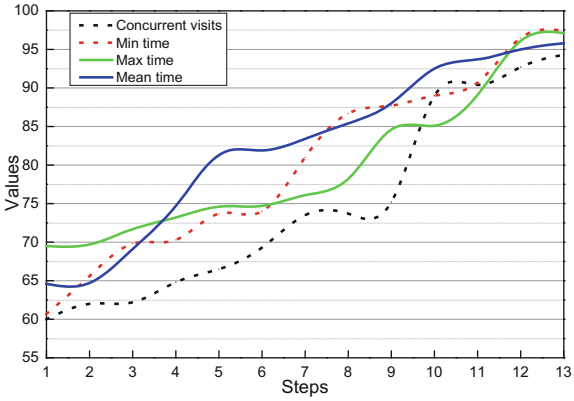

Fig. 6. Stress test results

to the system by different orders of magnitude of users at the same time, as shown in Fig. 6.

According to the test results, we can see that the system can maintain a good response time despite the increasing number of concurrent accesses to the system. The API gateway is the exit portal of the system, and it is the transit station of the system, which is directly facing the users, so the API gateway is chosen here to test the performance of the system. JMeter is used to test the performance of the API gateway to get a general understanding of the performance of the whole system.

5 Conclusion

This paper analyses the architecture system used in this system, and concludes the development and characteristics of microservices, and studies the core technologies Spring Cloud and Spring Boot to implement microservices, through which the system is developed and designed to improve the performance and concurrency of the system. The feasibility, business requirements, performance requirements, and functional requirements of the system were analysed in the context of the actual situation of the secondary school, and the specific problems and functions to be solved by the system were clarified. Based on the requirement analysis, the system architecture is designed, and the teaching support system is divided into 5 functional modules, which are encapsulated into 5 independent microservice modules for design and development. This paper also designs and implements the core components of Spring Cloud such as service registration discovery and governance and API gateway. Finally, the system was tested to verify that the system functions properly, and the performance of the system was also tested to verify that the system has a good performance and can strongly support the real-time use of thousands of people in the university.

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