



Sharing Method of Online Physical Education Teaching Resources in Higher Vocational Colleges Based on Soa Architecture and Wireless Network

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Abstract. Due to the large amount of data and complicated information processing of online physical education teaching resources, the reliability of traditional teaching resources sharing method is difficult to guarantee, and it is easy to collapse when multiple users run together. In order to improve the transmission efficiency of online educational resources sharing, SOA architecture and wireless network are introduced, and an online physical education teaching resource sharing method is designed. Design an overall architecture of data sharing based on SOA architecture, and establish an online physical education teaching resource base according to this framework; On this basis, the entity E-R diagrams of different modular teaching resources are established, and the data information is converted into DBMS records. By dividing the attributes of physical education teaching resources and classifying teaching resources, the effective transmission of resource sharing can be realized. Complete the sharing of online physical education teaching resources in higher vocational colleges in the data exchange center. The experimental results show that the proposed method has a good effect in practical application, which can improve the network load rate, ensure the transmission speed of resource sharing at a higher level, and have higher reliability and better resource sharing performance.

Keywords: SOA Architecture · Wireless Network · Higher Vocational Colleges · Online Physical Education Teaching Resources · Sharing Method

1 Introduction

With the continuous advancement of education, teaching and information construction, the widespread application of network multimedia and the promotion of higher vocational education, the education and teaching in colleges and universities have presented a variety of learning methods, and modern higher vocational education has been inseparable from the support of information technology [1]. Among them, online learning is the most convenient and popular learning method in colleges and universities, and online physical education teaching is a novel teaching method. At this stage, most colleges

and universities have established campus networks, and in the process of construction, teaching resources such as textbooks and teaching courseware have been electronically processed and placed in the websites of various schools to facilitate the learning of students and teachers [2, 3]. However, in different campus networks, students' learning resources are relatively independent. Without correct identity authentication, it is difficult for students and teachers to share the teaching resources in the campus network, and they can't log in to the school website and teaching website [4]. This way of resource circulation can not meet the needs of users for learning resources, but also lead to the phenomenon of repeated use of learning resources within the school. In order to realize the circulation of high-quality teaching resources and optimize students' learning resources, technical units put forward special guiding measures for building campus resource sharing methods.

Reference [5] puts forward the application of Internet-based mobile information system in college physical education classroom teaching. Firstly, the survey data is analyzed by induction. Secondly, the characteristics of college courses are studied by case analysis. Finally, after discovering the existing problems, the author uses the method of comparative study to compare the influence of students, teachers and leaders in charge on the existing educational problems. Physical education in colleges and universities lacks theoretical guidance and concept sorting, which makes students not form a good sense of lifelong physical education; The positive influence of physical exercise on a person greatly promotes the development of personal lifelong sports. Reference [6] puts forward the application of massive open online course in physical education teaching mode under the background of big data, and applies big data technology to online teaching platform. According to the analysis results of big data, learners can flexibly choose the time and place of class according to their own needs and characteristics, and study personalized and customized teaching resources. Through the comparative experiment of two classes of students majoring in physical education in a university, the results of big data analysis show that the application of massive open online course in physical education teaching mode can improve students' learning enthusiasm to a certain extent, and students' satisfaction with massive open online course is as high as 92%. It can also help students improve their academic performance, and the average grade of classes using massive open online course is 10 points higher than that under the traditional education mode.

Although the above research has made some progress, due to the lack of modern technology as a support for the development and construction of the shared system, after the system is put into use, there are some problems such as high maintenance cost and failure to play the expected effect. Therefore, this paper puts forward a method of online physical education teaching resources sharing in higher vocational colleges based on SOA architecture and wireless network. The innovation of this method is to share resources by using the service combination technology of SOA architecture, and at the same time, to break through the academic and cultural barriers between campus and off-campus by using wireless network technology, so as to make the sharing of physical education teaching resources more efficient, convenient and popular. Establish entity E-R diagrams of different modular teaching resources, and convert data information into DBMS record form; Divide the attributes of physical education teaching resources,

classify teaching resources and realize the effective transmission of resource sharing. The research shows that the proposed method has a good effect in practical application, which can improve the network load rate, ensure the transmission speed of resource sharing at a higher level, and have higher reliability and better resource sharing performance.

2 Teaching Resource Sharing Based on SOA Architecture

2.1 Based on SOA Architecture to Establish the Overall Architecture of Data Sharing

SOA architecture is a service-oriented architecture, which can complete the interoperability of different program functions through good interfaces and component architecture, and it is a technical system to solve the development and maintenance problems of application systems in complex distributed environments [7, 8]. Its core idea is to decompose the application into multiple reusable, decentralized and autonomous service units, and build a complex application system through the combination of these service units. Through SOA architecture, we can realize standardized management of different resources, reuse resources and improve development efficiency.

In order to ensure the real-time sharing of online physical education teaching resources information in higher vocational colleges, this paper designs an interactive model of information sharing, and the overall structure is shown in Fig. 1.

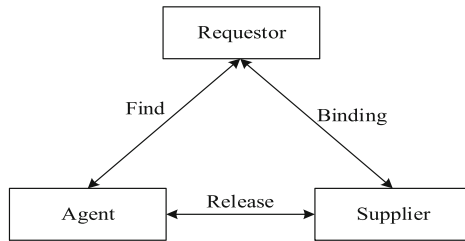


Fig. 1. SOA physical education teaching resources information sharing model architecture

The SOA sports teaching resources information sharing model shown in Fig. 1 includes three parts: the agent, the supplier and the requester of sports teaching resources information sharing. The supplier means that the platform provides various services, including providing information to the database and publishing existing data. The main task of the supplier is to provide available data resources to the agent platform to meet the positioning and query needs of the requester [9]. Requester refers to the platform that needs to download information. People can get the registered service description by searching the directory information and bind it with the corresponding service provider network. The main task of the requester is to obtain the required teaching resource information through the agent platform. Agent means that the platform completes the agent task by providing various services for the requester and the supplier. The agent acts as an intermediary, which connects the supplier and the requester, so that the requester can

obtain the required teaching resource information through the agent without directly interacting with the supplier. The agent can also provide other services to meet the needs of the requester.

Generally speaking, the framework of SOA sports teaching resources information sharing model aims to connect the supplier and the requester through the agent as the intermediary to realize the sharing and exchange of teaching resources information. In this way, the acquisition and utilization of teaching resources become more convenient and efficient.

2.2 Establishing Online Physical Education Teaching Resource Database Under Wireless Network

Wireless network technology is a high-tech technology to realize wireless communication. At present, wireless network covers many places, has a wide range of applications, and has also been widely used in the field of education. The use of wireless network technology can break through the academic and cultural barriers between higher vocational colleges and make the sharing of teaching resources more convenient and popular [10]. In order to meet the demand of resource sharing, after building the information sharing model of SOA physical education teaching resources, the online physical education teaching resource database is established to fill the data layer inside the system. According to the requirements of system development and design, the database in this system includes teaching resource database, user information database and management database, in which the teaching resource database is mainly used to store the professional knowledge of ideological and political courses, which belongs to the foundation of resource sharing system development, and the resource information database includes learning resources and announcement information [11, 12]. Teachers can upload their personal information in a regular format to the database, including knowledge points, cases, etc., and also upload it to other resources that other students think are beneficial to learning. Students can browse the resources on the web page and download the required materials according to their personal learning needs. Managers can organize, store and manage the contents in this database. In this process, students of different majors can choose their own learning methods, so as to better cultivate students' awareness of autonomous learning. The public information in the database includes information posted on the website and linked resources. Administrators need to update resources in time according to students' learning progress and teaching needs.

The establishment of online physical education teaching resource database under wireless network is shown in Fig. 2.

According to Fig. 2, the information base is mainly used to store system login records and personal privacy information of users. The student information database contains personal basic information, study attendance and network status [13, 14]. The personal information database contains the registered user's name, email address, personal profile and other information, and the administrator needs to manage the data after logging into the system and completing his personal identity authentication. The learning sign-in status database can record students' online learning data, including each learning time and learning content [15, 16]. The online learning exchange meeting records the problems encountered by students in the interaction and discussion between groups.

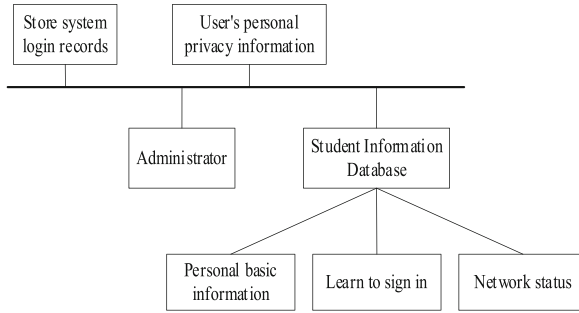


Fig. 2. The structure of online physical education teaching resource pool is established under wireless network.

Take the online physical education teaching resource database as an example, design the information input format in the database, as shown in Table 1.

Table 1. Information input format in online physical education teaching resource database

Data type	Field	Constraint condition	Meaning
Grade	String	Without	Grade
Subject	String	Without	Subject
Coding	Int	Primary key	Encode
Creator	String	Without	Creator
Content	String	Without	Content
Difficulty Level	String	Without	Difficulty Level
Source	String	Primary key	Source
Type	String	Without	Type
Access Control	String	Without	Access Control
Comments	String	Without	Comment Information

According to Table 1, the format of information input in the online physical education teaching resource database is provided, including the data types, constraints and meanings of each field. This information is very important for entering and managing physical education teaching resources in the database, which can help ensure the accuracy and consistency of the data. According to the above way, the establishment of online physical education teaching resource database under wireless network is completed.

2.3 Attribute Division and Resource Sharing Transmission of Online Physical Education Teaching Resources in Higher Vocational Colleges

On the basis of the above-mentioned online physical education teaching resource database, SOA architecture and wireless network technology are introduced to divide

the attributes of online physical education teaching resources, and different types of resources are provided to effectively share transmission channels through the classification of teaching resources. In this process, the entity E-R diagrams of different modular teaching resources are established, and the data information is converted into the form of DBMS records. In this way, the internal sharing between information resources is constructed, and this mode is used as the interactive interface between system programs and databases. Integrate the data at the communication transmission interface into a data set and upload it to the system cloud. Call the data transmission function in SOA architecture and wireless network to upload resource data. The expression of the transfer function is as follows.

$$A_{\alpha} = \frac{B}{C \times D} \quad (1)$$

In formula (1), A_{α} stands for data transfer function; B indicates the time required for uploading resources to the cloud; C represents the system operation buffer coefficient; D represents the amount of data uploaded at a time. It is assumed that each SOA architecture and wireless network module have the same perception of data, and different types of data have different attributes. Therefore, it is necessary to set an attribute parameter when dividing resource attributes, and express this parameter as E , so the relationship between E and cloud data can be expressed by the following calculation formula.

$$E = \frac{E_{11}(K_{11} + E_{21})}{A_{\alpha}} \times F_G \quad (2)$$

In Formula (2), E_{11} and E_{21} represent the amount of data that can be carried by the cloud at different times; F_G stands for data attribute perception coefficient. According to the above formula, a delay parameter condition of the shared signal in transmission is set. In this way, an attribute pattern for online physical education teaching resources is generated, and the attribute pattern is used as the basis for the division of resource attributes. This process is shown in the following calculation formula.

$$G_G = F \begin{bmatrix} u_k \\ v_k \end{bmatrix} + e \begin{bmatrix} 1, j \\ 0, E \end{bmatrix} \quad (3)$$

In formula (3), u_k represents the stability coefficient of spatial data; v_k represents the sharing efficiency of spatial data transmission; F represents the attribute parameters of online physical education teaching resources; e represents the resource transmission timing; j indicates the sensitivity of the processor in the system to data perception. Through the above methods, we can master the basis of attribute division of resources in the system. On this basis, in order to share resources, we should unify the data format and improve the timeliness of cloud sharing transmission through pre-processing. This process is shown in the following calculation formula.

$$H_J = \frac{K_L \times T}{E \times j} \times G_G \quad (4)$$

In Formula (4), G_G represents the unification of data formats; K_L represents the working frequency of the data processor; T stands for the reliable period of single shared

transmission. In the process of sharing, teachers need to set the multicast address of resources in advance. On this basis, they use multimedia technology to receive data from the teaching resource server, set different multicast addresses in different shared files, and form a teaching resource flow communication channel according to the structure of address data. Through the above methods, the attribute division and resource sharing transmission of online physical education teaching resources based on SOA architecture and wireless network are realized.

2.4 Realizing the Sharing of Online Physical Education Teaching Resources in Higher Vocational Colleges by Data Exchange Center

After completing the above-mentioned attribute division and resource sharing transmission design of online physical education teaching resources in higher vocational colleges based on SOA architecture and wireless network, in order to ensure the absolute security of teaching resources in the sharing process, online physical education teaching resources in higher vocational colleges can be used as metadata and a data exchange center can be constructed to realize the comprehensive sharing of online physical education teaching resources in higher vocational colleges. This structure can be expressed as a process as shown in Fig. 3.

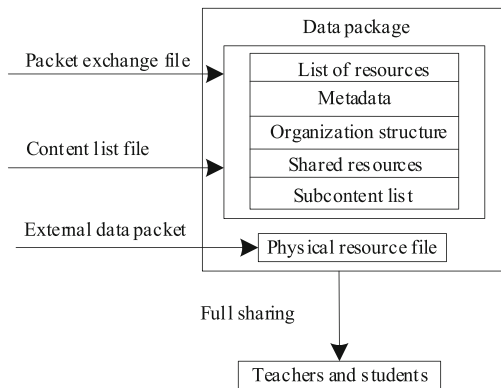


Fig. 3. Metadata interactive sharing structure

According to the data interactive sharing structure of 3 yuan, the storage format of online physical education teaching resource A can be adjusted to format-A, and the storage format of teaching resource B can be adjusted to format-B, and the process of resource sharing can be regarded as the interactive process of A and B. According to the following steps, metadata exchange is carried out in the data center where format resources are stored. The specific steps are as follows:

Step 1: Organize the remote online physical education teaching resources to be transmitted and shared, and determine the data transmission standard. Store the corresponding data in the template to complete the relevant preparation work.

Step 2: Set the shared terminal as the receiving format, and explain, remark, register and record the data information to be transmitted at the receiving terminal. At the same time, a clear file is established to store the entity information, so as to ensure that the teaching resource sharing agreement in the data exchange center has been generated.

Step 3: Dock the user server application interface with the shared transmission communication interface, as shown in Fig. 4.

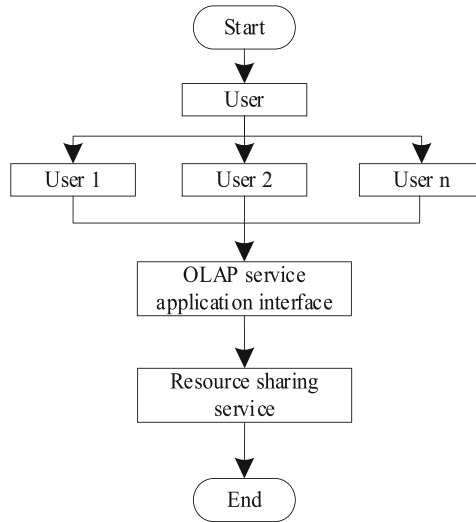


Fig. 4. The user server application interface interfaces with the shared transmission communication interface.

According to Fig. 4, the user server application interface refers to the interface where the application running on the user server interacts with other systems or services. It provides a standardized way, which enables the user server to perform data transmission and information query with other systems. Through the docking of user server application interface and shared transmission communication interface, data sharing and communication between different systems can be realized, and the interoperability and integration between systems can be improved. Applications on the user server can interact with other systems more flexibly to meet various business needs.

Step 4: Check the identity information of the sharing end to ensure the security and privacy of personal information and resource information during transmission. The authentication process of identity information can be expressed by the following calculation formula.

$$\theta = \frac{P_d \times G_d \times H_J}{N_0 + \sum_m y_c^d \times P \times G_{dc}} \quad (5)$$

In Formula (5), P_d is represented as an information transmitter; G_d denotes controllable or uncontrollable interference of the transmission channel; N_0 stands for fixed

communication base station; y_c^d is expressed as shared channel bandwidth; P is expressed as the effective gain value of the communication channel; G_{dc} stands for user identity information category. Usually, there are three types of m , corresponding to m_1 , m_2 and m_3 , which are respectively represented as receiving end users, sending end users and intermediate users. The specific value of m is set according to the category of shared transmission peer users.

After the user's identity information is checked, remote online physical education teaching resources are shared and transmitted according to the resource sharing agreement, so as to realize the research on online physical education teaching resources sharing method in higher vocational colleges based on SOA architecture and wireless network.

3 Experimental Analysis

In order to verify the effect and feasibility of online physical education teaching resources sharing method in higher vocational colleges based on SOA architecture and wireless network, an experiment was designed. Before the experiment, a pilot higher vocational college in a certain area was selected as the test unit, and the existing online physical education teaching resources in colleges and universities were called, and the teaching resource sharing system in schools was developed by using this method. In order to meet the experimental requirements, a comparative experimental test environment is built according to Fig. 5.

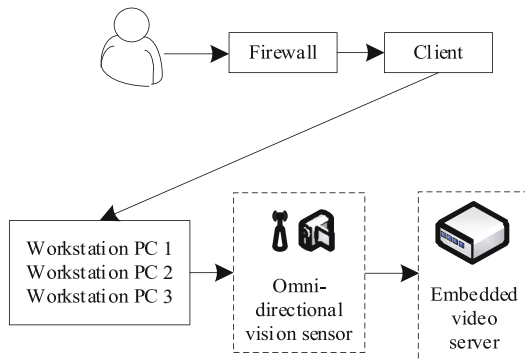


Fig. 5. Structure diagram of experimental environment

On the basis of the above experimental environment structure of Fig. 5, in order to ensure that the test environment meets the actual needs, the technical parameters of the equipment are designed after the selection of the equipment in the test environment is completed. In order to ensure that the distance education terminal can effectively carry online physical education teaching resources in higher vocational colleges, relevant arrangements are made in the experimental operation terminal. The specific contents are shown in Table 2.

Table 2. Table of shared information of experimental operating equipment terminals

Serial number	Information list	ID terminal address information
1	Terminal server 1	@S1 Domain
2	Terminal server 2	@S2 Domain
3	Intermediate agency	@Agent
4	Shared service user 1	@Com-1
5	Shared service user 2	@Com-2
6	Shared service user 3	@Com-3
7	Security audit log server	@Log Server
8	Data backup server	@Backup Server
9	Emergency response server	@Emergency Server
10	System monitoring server	@Monitor Server

After the comprehensive deployment of the test environment is completed, the proposed method is integrated into the computer terminal according to the standard. According to the channel of online teaching resources in higher vocational colleges, the professional course education information is obtained, the database is introduced, and the online physical education teaching resources-driven transmission mode in higher vocational colleges is designed in combination with the WEB terminal. On this basis, a data exchange center is designed in terminal server 1 and terminal server 2, and teaching resources are shared in the center.

In order to ensure a certain contrast of the experiment, the reference [5] mobile information system based on the Internet in college physical education classroom teaching method and reference [6] massive open online course's application method in physical education teaching mode were selected as the control group, and the sharing performance of the methods was tested by calling the terminal server to run data in the background. In order to test the feasibility of the proposed method in real educational environment, the proposed method was used as an experimental group to test it.

Establish the communication connection between multiple terminals in the school, ensure that after different terminals are in good communication state, drive the program and share the online physical education teaching resources among multiple terminals. Take the network speed of resource sharing transmission under different concurrent access numbers as the evaluation index, call the background data, record the running network speed under different concurrent access numbers, and count the experimental results, as shown in Fig. 6.

As can be seen from Fig. 6, with the increase of the number of concurrent visitors, the network speed of physical education teaching resources sharing transmission decreases under the method of reference [5], and the network interruption occurs when the number of concurrent visitors reaches 240, that is, the number of simultaneous online users has exceeded its own load. Only the resource sharing network speed of the proposed method does not increase with the increase of the number of concurrent visitors. Therefore,

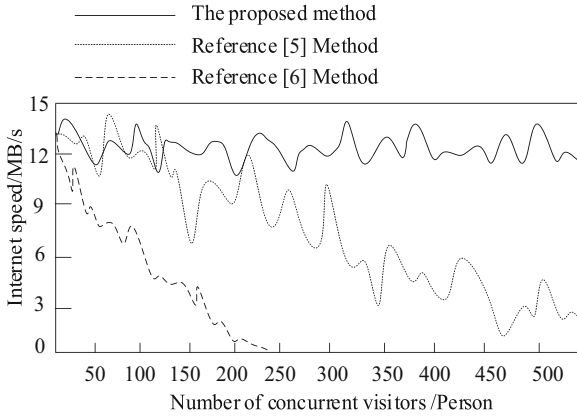


Fig. 6. The results of network speed of PE teaching resources sharing transmission under different methods.

the proposed method has a good effect in practical application, which can improve the network load rate and ensure the transmission speed of resource sharing at a higher level.

In order to verify the resource sharing efficiency of the proposed method, we compared the method in reference [5] with the method in reference [6], conducted multi-user data search, and recorded the running situation and resource matching results of the three methods. The specific experimental results are shown in Table 3.

Table 3. Comparison Table of Experimental Results

Number of users	Number of requests	Average response time/s			Matching degree of shared resources/%		
		The proposed method	Reference [5] method	Reference [6] method	The proposed method	Reference [5] method	Reference [6] method
50	30	0.17	0.28	0.34	98.9	84.5	84.2
100	150	0.19	0.32	0.36	98.6	72.8	83.2
150	300	0.22	1.02	0.39	97.7	71.1	83.1
200	400	0.23	1.98	1.02	97.4	69.3	82.5
250	450	0.31	2.35	1.09	97.0	69.0	82.0
300	550	0.35	2.69	1.15	96.5	68.2	81.6
350	680	0.46	2.74	1.26	96.1	67.6	81.2
400	770	0.56	2.78	1.34	95.6	67.2	80.9
450	890	0.69	3.54	1.45	95.4	67.0	80.1
500	990	0.85	4.56	1.56	95.2	66.6	79.2

By comparing Table 3, from 50 to 500 users, the number of requests per user gradually increased from 30 to 990. With the increase of the number of users and requests, the average response time also increases gradually; The data of matching degree of shared resources fluctuates in increase and decrease. And it can be seen that the proposed method is superior to the methods in reference [5] and reference [6] in all aspects. With the increase of the number of users, the reliability of the proposed method is still guaranteed, and it can maintain a stable and fast response speed, which can meet the smooth operation when there are many users at the same time. Compared with the method of reference [5] and the method of reference [6], the response speed is normal in the early stage, but it is not optimistic when multiple users run at the same time. And in terms of matching effect of resource sharing, because the proposed method increases resource category information, the search efficiency is obviously faster, while the reference [5] method and the reference [6] method have no relevant information processing, and can only rely on similar names to search, so the search matching situation is poor or even mismatched. Therefore, the online physical education teaching resource sharing method based on SOA architecture and wireless network in higher vocational colleges has higher reliability and better resource sharing performance.

4 Conclusion

This paper puts forward a method of sharing online physical education teaching resources in higher vocational colleges based on SOA architecture and wireless network, and draws the following conclusions through research:

- (1) The proposed method has a good effect in practical application, which can improve the network load rate and ensure the transmission speed of resource sharing at a higher level.
- (2) With the increase of the number of users, the reliability of the proposed method is still guaranteed, and it can maintain a stable and fast response speed. At the same time, it runs smoothly when there are many users, and the resource sharing method has higher reliability and better resource sharing performance.

The research method is a research field with great potential and development prospect. Future research work can be prospected in the following aspects:

- (1) Improving system performance and stability: Future research can be devoted to improving system performance and stability. By optimizing the system architecture and improving the data transmission and processing mechanism, the response speed, concurrent processing ability and stability of the system are further improved, and the user experience is improved.
- (2) Strengthen security and privacy protection: Online physical education teaching resources sharing involves users' personal information and sensitive data, so security and privacy protection is an important research direction. Future research can explore more secure and reliable identity authentication and access control mechanisms, strengthen data encryption and transmission security, and design privacy protection strategies and mechanisms to ensure the security and privacy of user data are not infringed.

In a word, the future research can continue to explore and innovate in depth, and achieve more outstanding results in system performance, security and privacy protection, intelligent and personalized service, cross-platform adaptation and quality evaluation of teaching resources, so as to provide better support and services for online physical education teaching resources sharing in higher vocational colleges.

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