Design of University Teaching Resources Integration and Optimization Application System Based on Big Data Analysis Technology

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Abstract: With the development of informatization teaching reform in colleges and universities, the teaching resources are presented in a wide variety and a huge number of trends, and it is urgent to carry out scientific planning and management. In the massive teaching resources of colleges and universities, how to extract effective data, integrate data, optimize data, share data, and mine data value is a topic worthy of further study. In the context of the era of big data, the application of big data analysis in the field of teaching resource management in colleges and universities also shows a trend of deep integration. In view of this, the paper analyzes the development status of the integration and optimization of teaching resources in colleges and universities, points out the importance of resource integration and optimization, and designs the overall framework and functional modules of the application system to provide valuable information for the management and construction of university teaching resources.

1. Development Status of Integration and Optimization of Teaching Resources in Colleges and Universities

Due to the limitations of the teaching management system of each university and the lack of resources sharing platform, the status quo of most quality education resources is in the hands of a few teachers. The difficulty of using these resources free of charge can be imagined[1]. In the era of big data, universities face many challenges in the integration and optimization of teaching resources due to the problems of uncentralized distribution of teaching resources, unscientific organizational structure of teaching resources, imperfect construction of high-quality teaching resources system, and lack of search and retrieval functions[2].

1.1 Uncentralized Distribution of Teaching Resources.

Under the existing management mechanism of colleges and universities, college teachers are the developers and applicators of teaching resources, and they master the construction and management of resources. This also directly leads to the non-centralized distribution of teaching resources, the imperfect management system, and the inability to achieve unified integration and sharing[3].As all participants in the teaching process, such as students, teachers, and teaching managers, they are eager to have teaching resources and realize the fairness and free development of teaching, learning, and management.

1.2 Unscientific Organization Structure of Teaching Resources.

In some colleges and universities, teaching resources have been collected and managed in a unified way. However, the unreasonable organizational structure and unscientific classification of various types of resources have increased the difficulty in optimizing and integrating resources in the later period[4].At the same time, the lack of timely updating of teaching resources is also a bottleneck, affecting the quality of teaching, learning, and management.

1.3 The Construction of Quality Teaching Resource System is Incomplete.

In the massive teaching resources, the extraction and construction of high-quality teaching

resources are not comprehensive enough, and they face many difficulties in the realization of technology.The construction of the whole quality teaching resource system is incomplete, there is no unified optimization model and management mechanism, and it is prone to duplication and uneven quality teaching resources, limiting the full use of teaching resource value[5].

1.4 Query Retrieval Function is Missing.

In the current teaching resource management model of colleges and universities, there is no search function of specific resources, which seriously restricts the efficiency of resource utilization and can not achieve targeted resource processing, extraction and use.

2. The Important Significance of Big Data Analysis Technology in the Integration of Teaching Resources in Colleges and Universities

As one of the important technologies of big data application, big data analysis shows an increasing trend of development and application in various fields. Especially in the field of education and teaching, it has greatly promoted the reform process of education informatization and provided better services for modern teaching models[6].Big data analysis technology plays an important role in the integration and optimization of teaching resources in colleges and universities. It is mainly reflected in the following points.

2.1 Promotion of Teaching, Learning and Management Quality.

The core goal of integrating and optimizing university teaching resources is to enable all teachers with teaching needs, students with learning needs, and teaching managers with management needs to obtain the required resources through the resource cloud bank. It provides information resources for teaching, learning, and management, avoids repetitive labor, implements a free teaching service data platform, and gradually improves the quality of higher education teaching.

2.2 Improve the Utilization of Teaching Resources and Explore the Potential Value of Data.

Because of the huge amount of teaching resources in colleges and universities, the redundant data need to be analyzed and optimized. Through the visualization analysis and data mining algorithm, we can extract the potential value of resources and build a database of quality teaching resources to provide higher quality shared services for college teaching[7].

2.3 Promoting the Reform Process of Teaching Informatization in Higher Education.

As the core resources of higher education teaching, teaching resources determine the quality and efficiency of teaching. By integrating and optimizing the teaching resources of colleges and universities, all resources are represented by informatization data, which facilitates the process of processing and utilization, and promotes the reform process of higher education teaching informatization[8].

3. Design of University Teaching Resource Integration and Optimization Application System Based on Big Data Analysis

3.1 Application System Architecture Design.

For colleges and universities, the formation of teaching resources is a gradual and complex process. Under the action of big data technology, the teaching resources of colleges and universities refer to the collection of various factors that have more teaching value, more obvious teaching effect, and can play a positive role in the cultivation of talents[9].In the design of the architecture for the integration and optimization of teaching resources in colleges and universities based on large data analysis technology, in order to better collect, integrate, analyze, optimize, store and share data, it is easy to form standardization, standardization, integration and optimization processes[10]. The design of the system is mainly composed of "two major databases + four major platforms". The overall structure of the system is shown in Fig. 1.

Among them, "two major databases" refers to the two large database clusters of teaching resources cloud bank and high-quality teaching resources cloud bank, which are mainly used to store teaching resources in universities and colleges. The teaching resource cloud bank mainly stores the college teaching resources uploaded by the higher education department of the University. After large data visualization analysis and mining algorithm processing, the data that meets the high quality resource standard is submitted to the high quality teaching resource cloud bank; The data in the quality teaching resource library, through sharing user feedback, carries out a new round of evaluation and predictive analysis, and returns to the teaching resource cloud bank for data that does not meet the quality resource standards, and finally realizes the renewal of the high-quality teaching resources in universities. In addition, no matter what kind of teaching resources are requested and downloaded by shared users, they are processed interactively through proxy web servers. They do not directly access background databases and provide certain data security mechanisms.
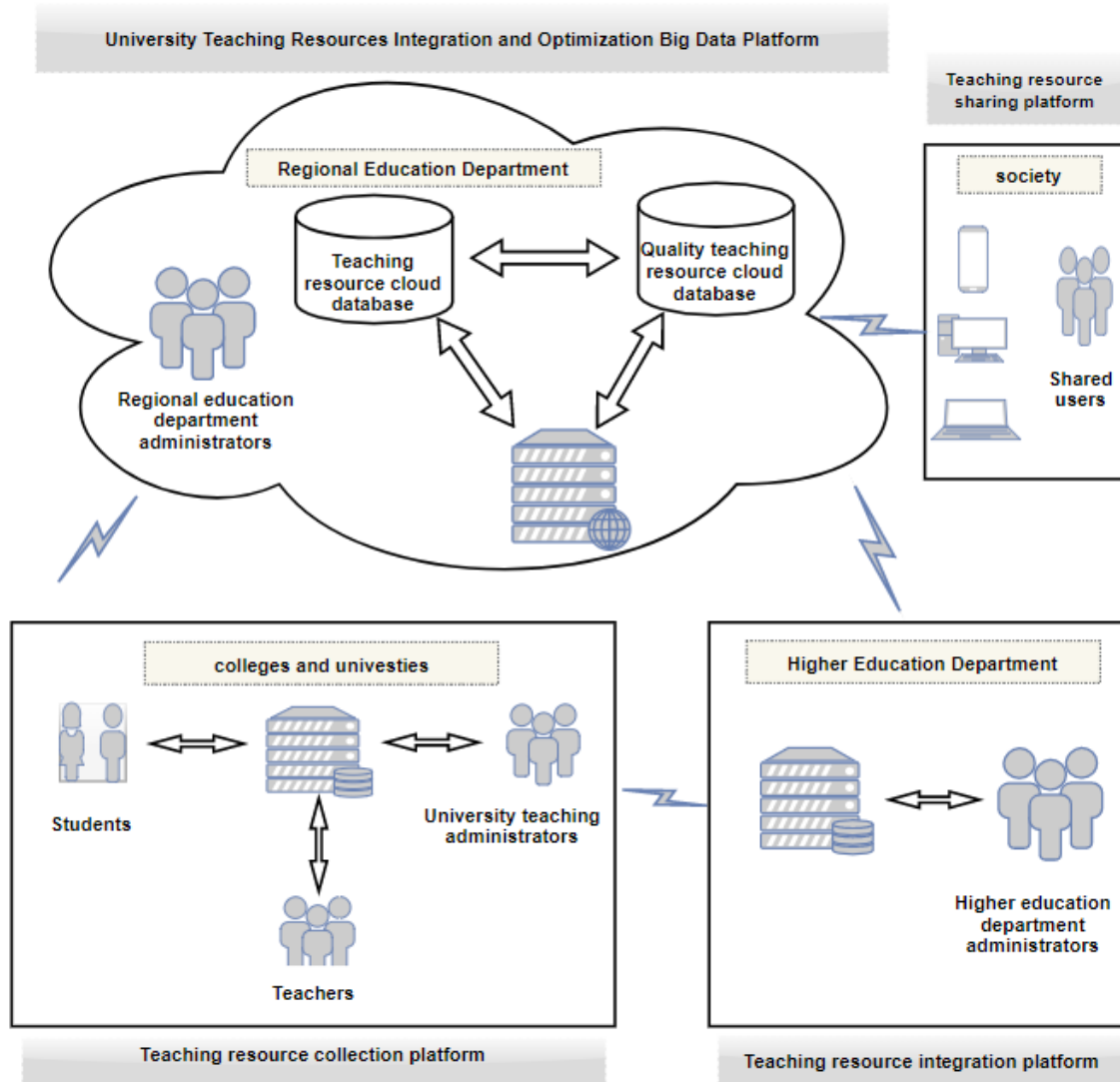

Figure 1.   Integration of Teaching Resources and Optimization of Application System Architecture Based on Big Data Analysis

The "four major platforms" are mainly composed of four parts: Teaching Resource Collection Platform, Teaching resource integration platform, College Teaching Resources Integration and Optimization Big Data Platform, Teaching resource sharing platform. Each functional module complements each other, and the division of labor and cooperation provides the necessary basic conditions for the integration and optimization of teaching resources in colleges and universities.

3.2 Application System Function Module Design.

In each functional module of the application system, there is a corresponding role in the daily

management and maintenance of the system. According to the design of the operational attributes of different roles, optimize the reference standards for teaching resources, and clarify the corresponding relationship between roles and permissions. Each character has different work priorities, specific description as shown in Table 1.Through a series of data analysis and processing programs such as "collection-integration -analysis-optimization-storage-sharing", a set of standardized functional systems for the integration and optimization of advanced university teaching resources is formed.

Table 1 Role and Operational Attributes in the Integration and Optimization of Teaching Resources

platform	Location	Role Type	Operation Properties	Optimizing standards
Teaching Resource Collection Platform	colleges and univesties	Students	Evaluation of teaching resources, learning feedback	Second-order standard
		Teachers	The collection of teaching resources, basic optimization, updating.	Basic standards and Second-order standard
		University teaching administrators	Integration and classification of teaching resources in colleges and universities; Submitted to higher education authorities.	Second-order standard
Teaching resource integration platform	Higher Education Department	Higher education department administrators	The integration of teaching resources and the visualization of big data are analyzed. Second order optimization.	Second-order standard
Integration and Optimization Big Data Platform	Regional Education Department	Regional education department administrators	Regionalized teaching resources data mining, cluster analysis, higher-order optimization, library storage. Analysis of shared user learning paths and preferences	High-order standards
Teaching resource sharing platform	society	Shared users	Resource evaluation, teaching and learning feedback	High-order standards

The platform for collecting teaching resources is mainly composed of participants at all levels of colleges and universities, including students, teachers, and university teaching administrators. Teachers are mainly responsible for organizing, uploading, and updating teaching resources, as the basic standards and second-order standards for optimizing teaching resources; Students are mainly responsible for the evaluation of teaching resources and feedback of learning effects after teaching practice, as the second-order standard for optimizing teaching resources; University teaching administrators are mainly responsible for the integration of teaching resources in schools, classification uploading, and submission to higher education department. This is the second-order standard for optimizing teaching resources.

The main role of the teaching resources integration platform is the administrator of the higher education department. It is responsible for the collection and integration of teaching resources in subordinate universities, and the visualization of large data for users. It is the second-order standard for optimizing teaching resources.

The main role of teaching resources integration and optimization of the big data platform is the regional education department administrator, responsible for the teaching resources data mining, cluster analysis, and library storage in all universities in the region. In addition, it is responsible for the online analysis of learning paths and learning preferences of shared users. This is the second-order standard for optimizing teaching resources.

The main role of the teaching resource sharing platform is all shared users. They can be teachers, students, and social learners. They have equal rights to use resources. They are mainly responsible for evaluating teaching resources and conducting feedback on teaching and learning. These data are all important sources of large data clustering analysis and predictive data analysis, which can help the system better analyze teaching resources and excavate resource values. As a high-level standard for optimizing teaching resources.

4. Conclusion

The design of the application system for the integration and optimization of university teaching resources based on big data analysis technology is oriented by user needs and focuses on students, teachers, teaching managers, and shared users, so as to improve the quality and effectiveness of university teaching as the core goal. The system design of structure, modularization and flow system is adopted to provide a way for the management and construction of the cloud bank of teaching resources in colleges and universities.

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