Review of Online Teaching Resources Integration in the New Situation

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Abstract. Integration of online teaching resources is an important way to achieve optimal allocation of resources. This paper aims at the problem that the existing online teaching resources are overloaded and dispersed, which makes it difficult for users to obtain resources accurately. Beginning with the concept and goal of online teaching resources integration, this paper summarizes the research progress of online teaching resources integration, compares the advantages and disadvantages of various integration methods, and finally the future research direction of online teaching resources integration is put forward.

Introduction

Under the new situation, with the transfer of China's university enrollment expansion strategy, colleges and universities have introduced a variety of measures to improve the quality of teaching. Among them, the construction of online teaching resources is a common way to meet the national requirements for improving the quality of education in the new situation. However, in recent years, online teaching resources have shown an exponential growth, this growth gives users the feeling that “serious information overload, find the right teaching resources more and more difficult, waste a lot of time...”. Therefore, we believe that the future development of online teaching resources should take the road of resource integration, on this basis, to optimize and update, so as to promote the development of higher education. In recent years, the research on the integration of online teaching resources has appeared, so it is necessary to make a summary of the research in recent years, in order to promote the progress of this research, and provide some ideas for the benign development of online teaching resources. This paper analyzes the current strategies and key technologies of online teaching resources integration, compares the advantages and disadvantages of various methods, and puts forward the future research direction of online teaching resources integration.

The Concept and Goal of Online Teaching Resources Integration

The integration of online teaching resources is to organize and coordinate the related but separated teaching resources on the existing network under the thinking mode of system theory, and to integrate those independent excellent resources into a customer service system by specific means or methods, so as to achieve the effect of 1+1>2. Integration is to optimize the allocation of resources, that is, there should be progress and retreat, there should be trade-offs, is to obtain the overall optimization. The way is to identify and select different sources, different levels, different structures, different contents of teaching resources on the Internet, draw and allocate, activate and organic integration, so that it has a strong flexibility, orderliness, systematicness and value, and create a new resource of a complex dynamic process. The integration of online teaching resources is an important means to further improve the quality of teaching.
From the above concepts, the goal of online teaching resources integration is very clear, that is, through some means to make the existing resources become orderly and searchable, can quickly find the required teaching resources within a limited time, so as to meet the needs of specific users of teaching, learning, teaching research and management. In terms of tactics, there are both strategic and technological levels, which are the unity of the two. At present, the research of online teaching resources integration mainly includes three aspects:

The construction of online teaching resources, namely, who and how to build the main body of online teaching resources. Since entering the new century, with the rapid development of the Internet, from abroad to home, the Ministry of Education to the provincial and municipal education departments, from colleges and universities to primary and secondary schools, from schools to the private sector, many departments or people have constructed a variety of online teaching resources. Including the introduction of foreign online teaching resources network, the national and provincial and municipal construction of the network of quality courses, the network of high-quality courses in Colleges and universities, MOOC, micro-class network, the construction of teaching resources network of social organizations[1,2]. In view of the various forms and levels of online teaching resources, how to build and what functions are included to better meet the teaching needs. For example, Cai Qunying and others have studied the curriculum resources integration platform based on SCORM. The platform can integrate all kinds of materials on the network with curriculum as the center, so as to adapt to learner autonomy[3].

The release of online teaching resources is released by who, where, and how. Online teaching resources generally follow the principle of who builds and who publishes them, but where to publish them is a serious problem. For example, self-built websites published and published on the National Quality Course Network will have different effects, especially when the latter involves the issue of qualification and authority. Publishing methods include two different ways: micro-course and complete course. In recent years, the popular micro-course and flipped classroom are the former.

The use of online teaching resources is how to obtain resources, how to share and authority settings. On the acquisition of online teaching resources, it is a hot research topic at present, such as the use of subject-based web crawler technology[4,5,6] and personalized Resource Recommendation technology[7,8], which are mainly used to solve the problem of how to accurately acquire massive information resources. Resource sharing and privilege settings mainly discuss how the resource builders share the released resources in order to achieve the harmonious coexistence of the relevant groups.

In fact, the different solutions to the above 3) are the main differences between different resource integration studies.

**Research Progress of Online Teaching Resources Integration**

Faced with the difficulty of obtaining information due to the overload of information resources and the uneven quality of online teaching resources, in recent years, researchers have proposed a variety of solutions and key technologies in order to make online teaching resources as efficient and high-quality as possible to obtain highly relevant resources of the subject. In this paper, they are divided into the following categories.

**Resource Integration from Policy and Strategy Directions**

This method means that under the new situation, the integration of online teaching resources should be carried out under the macro policies and specific strategies. So far, some scholars have done similar research. Yu Yandong and others[9] discussed the deep-seated integration strategy and teaching resource database model of the concept and digital education resource database through the analysis of Web 2.0 concept; Feng Xiangchun and others[10] discussed the motivation, conditions and Strategies of the integration of digital teaching resources in Colleges and universities; Ma Jingjie[11] proposed to create a global organization system of resource integration. It can promote international cooperation. On the whole, these documents are based on
the macro-integration of online teaching resources to study the strategy and framework of resource integration, and to some extent point out the direction and solution to the existing problems of online teaching resources, such as decentralization, low utilization rate, and duplicate construction. However, the reality is that there are too many online teaching resources, new online resources will continue to emerge every day, and the format is different. How to integrate online teaching resources without major changes or restructuring on the part of the construction side, and the interests of the management side remain unchanged is a problem worthy of study.

Resource Integration from a Technical Point of View

From the technical point of view, the integration of online teaching resources mainly includes the following methods:

Build New System Based on New Technology for Resource Integration

The application of new technology to develop new systems for resource integration refers to the direct use of new technologies (cloud computing, large data technology, mobile development technology, in-depth learning technology, WEB development technology, etc.) on the basis of planning for online resource platform development, the use of WEB service discovery methods, fast teaching resource push technology, etc. Resource sharing technology and mobile client access technology to achieve rapid access to teaching resources, and to a certain extent to achieve the “latest” integration of resources. Aiming at the common problems of uneven distribution, duplicate construction and low sharing of educational resources, Gao Hongqing and others[12] designed the architecture of educational resources integration scheme based on cloud storage; Liu Zhiliang and others[13] proposed a new mode of integrating regional educational information resources by means of service combining with cloud computing; Le Chengyi and others[14] combined cloud computing technology from The acquisition, organization, storage and sharing of educational cloud resources put forward the process and mode of integration of educational cloud in Colleges and universities. These documents combine cloud computing technology to study the integration of teaching resources. Generally speaking, they are the strategies and frameworks for the integration of online teaching resources on the basis of macro-integration. They point out the direction and solution to the problems of decentralization, low utilization rate and repeated construction of existing online teaching resources to a certain extent, but this method is useful for the on-line operation of the old platform. The integration of teaching resources is powerless.

Build “Big System” for Resource Integration

It refers to the integration of existing decentralized systems into a “large system” by means of system integration, and the transformation of a fully distributed and isolated system into a centralized management and unified access system by means of unified specification, consistent interface, different permissions of a password, rapid navigation and service resource discovery technology. This reduces the user in different systems due to switching and authentication troubles, the original system can basically remain unchanged, only need to increase the access interface can be OK, low cost, conducive to resource sharing. The key to the implementation of the method requires the relevant resource owners to reach a certain agreement license alliance. On the basis of investigating and analyzing the construction and integration of teaching resources in 20 “985” colleges and universities, Sun Rong et al. put forward that a teaching resources management platform should be built as a carrier to integrate teaching resources[15], and based on this platform to integrate the functions of teaching resources retrieval, resources navigation, personalized customization of resources and push services. It is proposed to build a unified system to solve the problem of low resource dispersion and low utilization rate.

Resources Integration through Upgrading or Upgrading Existing Systems

Upgrade the existing online teaching resources platform pointer to some of the shortcomings of the original platform to use new technology for functional upgrading, or technical transformation (Use the new platform and development tools to achieve the same function), so that it can adapt to the current integration of resources. Based on Semantic Grid technology, Gao Jie[16] discusses the system framework and implementation mechanism of information-based teaching resources
integration, and explores its application in the integration of information-based teaching resources in Colleges and universities, so as to solve the problems of resource island and resource overload in the construction of information-based teaching resources in Colleges and universities. This method can make the existing resource platforms adapt to the actual application needs quickly, but due to the lack of planning, the original system infrastructure constraints and other reasons, the expansion of flexibility is not enough, poor sustainable development.

Other Resource Integration Methods
In addition to the above resource integration methods, from the perspective of cost and implementation, there are researchers who logically achieve the goal of integrating distributed resources without changing existing resources through the application of technologies such as automatic acquisition, storage management and personalized recommendation of online teaching resources. Li Hongyun and others[17] have studied an online learning resource management recommendation platform for micro-blogging applications, aiming to improve the online resource growth caused by rapid resource dispersion and lack of integration from three levels of integration, management and discovery. Taking Coursera, Udacity and edX platforms as examples, this paper explores the crawling strategy based on the customized crawler platform and uses the crawler scheduling system to realize the automatic management of courses, and uses the data warehouse to realize the multi-functional services of course search and course evaluation. In data usage, personalized recommendation is provided for users based on recommendation method. According to the online teaching resource recommendation that the target user is interested in, Li Gaomin[18] studies the application of personalized recommendation technology of teaching resource based on collaborative filtering technology. In fact, based on the rapid acquisition (search) of online teaching resources and personalized recommendation, many scholars have done this research[19,20,21,22,8,23].

Research Trend of Online Teaching Resources Integration
With the deepening of online teaching resources integration research, integration strategy and technology are constantly improving. In the future, the research direction of online teaching resources integration is mainly focused on the following aspects:

Integration of Technology Orientations
From the cost point of view, it is unrealistic to abandon or restructure the existing online teaching resources for the purpose of resource integration, especially for large-scale (cross-unit, cross-regional, cross-provincial and even global) resource integration. Because there are too many stakeholders involved, including the system, the need for unified organization and coordination, the need to develop a large number of standards and document formats, to eliminate and purchase a large number of basic equipment, but also to build new venues and staff training, such as unified human and material costs. From the technical point of view, this paper argues that a resource pool should be established on the basis of existing resources by means of automatic acquisition, management and personalized recommendation of online teaching resources. All users can obtain resources from the pool so as to logically achieve the integration of distributed resources without changing the existing resources.

Technology and Non-technical Consideration
According to the basic concept of online teaching resources integration, online teaching resources integration is a kind of technical and non-technical activities which have a choice of various resources under the unified planning. Therefore, the framework for online education resource integration (Figure 1) must be such a comprehensive framework, which includes non-technical-based activities (the dotted boxes in Figure 1) such as policy, protocol, technical specifications and data specifications, technical activities (on the basis of the implementation of non-technical activities) and Comprehensive guarantee system for these two activities.
On-line teaching resources collection is mainly achieved by crawling various kinds of educational subject data (online teaching resources data constructed by the government, various educational institutions and other organizations or individuals) to solve the problem of online teaching resources dispersion and information overload. Teaching resources data storage and management, mainly through data warehouse to achieve the crawled data storage, classification management, while providing resources search, scoring and evaluation functions; The application of teaching resource data mainly constructs reasonable recommendation strategies based on specific recommendation methods, provides personalized resources for users, and then helps users find the resources they need. According to Figure 1, it is not difficult to see that the most critical technologies to achieve this framework include online teaching resources collection, teaching resources storage and management and teaching resources application. They are the key to online teaching resources integration, solving the problems of source, management and use of teaching resources data.

In a word, the ultimate goal of online teaching resource integration is how to obtain more subject-related teaching resources with less infrastructure, less change, network and storage resources, and more consumption of computing resources within a reasonable time-cost and limited human and material resources.

Summary
This paper introduces the current strategies and methods of online teaching resources integration, and analyzes the advantages and disadvantages of various methods, on this basis, puts forward the future research direction of online teaching resources integration. At present, the research on the integration of online teaching resources mainly focuses on the automatic acquisition, storage management and personalized Resource Recommendation of resource data. The goal is to improve the efficiency and minimize the cost of the integration of online teaching resources.

This paper holds that the operability and flexibility of online teaching resources integration is the key to online teaching resources integration. For the automatic acquisition of online teaching resources, the guarantee of improving the precision and recall rate should be considered in the design of automatic acquisition of subject resources. On the other hand, personalized recommendation algorithm should be effectively combined with user behavior log, user evaluation and social activity information when applying online teaching resources data.

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