



Dynamic Integration Method of Economic Teaching Resources Based on Information Fusion

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Abstract. In order to manage massive teaching resources more effectively, taking the major of economic education as an example, this study proposes a dynamic integration method of economic teaching resources based on information fusion. Firstly, a scientific and reasonable collection system of economic teaching resources is constructed combined with information fusion technology, then the evaluation criteria of dynamic integration of economic teaching resources are divided, and the steps of dynamic integration of economic teaching resources are simplified. Finally, experiments show that this method has high practicability in the process of practical application.

Keywords: Information fusion · Economic teaching · Resource integration · Evaluation criterion

1 Introduction

Teaching resources refer to the elements that can form teaching ability, have value and can be applied in teaching in the process of education and teaching. The coverage of teaching resources mainly includes information fusion and electronic teaching resources and information. Multimedia materials, teaching plans, courseware, test questions, homework exercises, educational papers, e-books, network courses, etc. required in the process of information technology application in education and teaching activities can be called teaching resources [1].

In the context of information explosion, effective management and scientific screening of massive teaching resources is one of the main research contents of current teaching resource management. Due to the different emphases of resource management and application in the teaching process, and the characteristics of the pattern of teaching resources to be collected and identified, it is very easy to have the problems of repeatability and error of data extraction [2].

In the process of Information Fusion Teaching Resource Construction in Colleges and universities, the current teaching resource management effect is still difficult to meet

the current research requirements. Take the major of economic education as an example. This major focuses on theoretical economics and has the attributes of Applied Economics. It aims to train high-quality economic professionals with solid professional basic knowledge and theory, as well as international vision and innovation and entrepreneurship ability. For the teaching of economics majors, the dynamic integration of economic teaching resources is more conducive to helping students get the latest economic development trends and better improve the teaching quality. Therefore, this study proposes a dynamic integration method of economic teaching resources based on information fusion. The specific research ideas are as follows:

- (1) Use information fusion technology to collect economic teaching resources.
- (2) Mark the integration characteristics of economic teaching resources.
- (3) Classify the dynamic characteristics of economic teaching resources.
- (4) Establish the management model of college teaching resources, and design the dynamic integration framework.
- (5) We will focus on five aspects of teaching resources and content, teaching plans and design, teaching organization, teaching effectiveness, and reform and innovation, and build an evaluation standard system for the integrated application of economic education resources.
- (6) The integration and sharing of resources are completed through the process of downloading, storing, sharing, regrouping and combining resources.

This method improves the goal of storage and management of teaching resources from different channels through information fusion from the technical level, and realizes the fusion processing of teaching resources.

2 Dynamic Integration Method of Economic Teaching Resources

2.1 Information Fusion Collection and Feature Marking

“Teaching resource integration” is an existing state of optimized combination of digital resources. It is to integrate, cluster and reorganize the data objects, functional structures and their interactive relationships in each relatively independent digital resource system according to actual needs, so as to form a new, more effective and efficient digital resource system.

Information fusion storage architecture is the data integration platform of information fusion resource integration system, occupying the bottom layer of three-tier structure [3]. Information fusion storage system is a storage system that can share large capacity and high transmission rate. It does not occupy campus network (LAN) resources, but also can realize remote disaster recovery, data backup and high scalability. It is becoming an ideal solution for integrating resources such as digital economy teaching in colleges and universities.

Since the SAN storage area system separates the storage device from the server in the network environment, the information fusion storage system connects the RAID disk array with the teaching resource server through FC optical fiber switch. When there is a demand for resource data access, the resource data is transmitted at high speed between

the relevant server and the background RAID disk array through information fusion, Moreover, the resource data server can access any storage device on the San, which improves the availability of the resource data system. The logical topology of a typical information fusion storage system is shown in Fig. 1.

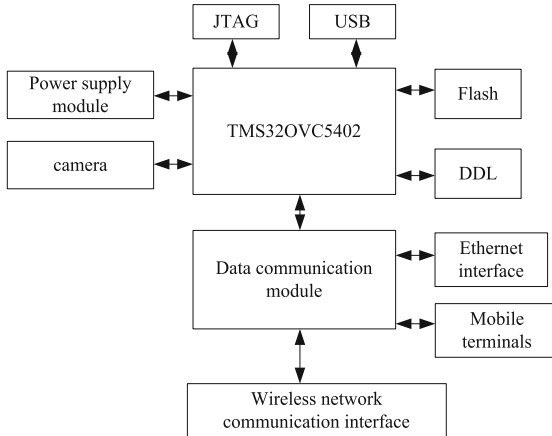


Fig. 1. Logical topology diagram of information fusion collection and management

The learner centered information fusion learning resource integration model mainly adopts metadata and web2.0 and other technologies, provide relevant resources to learners according to the teaching plan and taking the learning process as the main line. The formal structure is mainly characterized by the logical continuity of knowledge, and the substantive structure forms a collection of relevant resources according to the requirements of teaching design [4].

On this basis, the integration mode of information fusion learning resources is studied, as shown in Table 1.

Table 1. Characteristics of information fusion learning resource integration mode

Type	Resource centered integration model	Learner centered integration model
Subject	Resource construction and organizer	Integrate designers and teachers
Basis	Resource attribute characteristics	Learner centered
Technology	Computer integration, etc	Semantics, metadata technology, etc
Form	Subject classification, subject navigation, learning resources, etc	Online courses, learning platforms, etc
Characteristic	Integrating resources based on attribute characteristics	Integrate resources according to the learning process

Based on the current problems faced by the construction and management of information fusion teaching resources, as well as the advantages and value of feature marker

oriented digital resource construction, this paper constructs a feature marker model according to the characteristics of information fusion technology and teaching resources, and carries out the classified management of teaching resources with the help of information fusion teaching resources feature marker related technology. The feature marking system model of information fusion teaching resources is shown in Fig. 2.

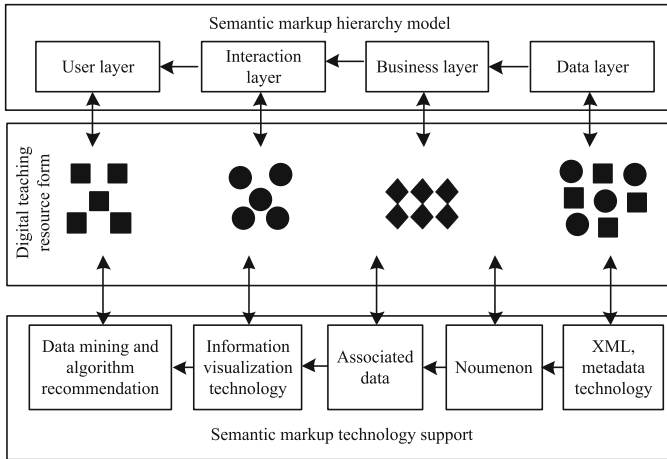


Fig. 2. Feature marking system model of Information Fusion Teaching Resources

In Fig. 2, the data layer is used to store various types of data. In feature tags, there are rich data types, including a large number of semi-structured and unstructured data in addition to the traditional structured data. The data layer is used to store different types of data. It is the basis of feature marking system [5].

The data layer is not only the traditional teaching data resource library with a single resource as the storage unit, but also a large number of databases with fine-grained “knowledge unit” as the independent storage unit, such as XML database, relational database and so on. The establishment of these databases meets the information needs of users to realize the rapid acquisition and efficient utilization of knowledge, deepens the information service from the resource itself to the knowledge unit within the resource, and makes the feature mark have the function of knowledge service.

On the basis of storing all kinds of data and establishing an independent knowledge base of knowledge units in the data layer, the business layer identifies the knowledge units and realizes the automatic association between the knowledge units, so as to build a factory wide knowledge network full of characteristic connections and realize the automatic discovery of knowledge [6]. The business layer can structurally process the data, and carry out fine-grained identification and feature annotation on the knowledge units within the resources, connect many resources, and establish multi-level and rich knowledge associations to meet the needs of users for information and knowledge integration and centralized acquisition in the current environment. The association established by the business layer not only includes the correlation between traditional teaching resources, such as establishing the connection between a resource and related resources, but also

includes the connection between various parts of the resource and the link between the internal knowledge unit of teaching resources and external resources, which greatly enriches the knowledge content of teaching resources.

The interaction layer is directly user-oriented and guides users to discover, acquire and utilize knowledge by providing user interaction interface [7]. The navigation design based on resource discovery and information visualization window in the interaction layer can present knowledge to users in a more vivid way, help users quickly obtain the desired knowledge and enhance users' understanding of complex knowledge.

The user layer is to meet the personalized needs of users for knowledge and information by analyzing and identifying user needs and mining user interests [8]. At the user level, by recording and analyzing the user's behavior of using the network and browsing teaching resources, with the help of data mining and other technologies, analyze the user's information needs and interests, establish the user interest database, and recommend the resources that may be interested to users, so as to greatly improve the resource utilization level and knowledge service level.

2.2 An Analysis of the Elements of Economic Teaching Resources Retrieval and Dynamic Integration

Online teaching is not simply teaching new courses or simplifying and repeating previous courses. Attach importance to resource expansion and ability improvement. In the process of online teaching, we should highlight the advantages of information fusion resources of online teaching, which are convenient for transmission, diverse types, function oriented to support students' online learning, and highlight the cultivation and improvement of students' online learning ability. Focus on discussion and interaction, answer questions and solve doubts [9, 10].

To this end, information fusion technology and content management system are used to integrate heterogeneous data, integrate distributed data resources of different sources, types and formats, and build the middle layer of the three-tier model structure of resource integration. The data flow of the economic teaching resource retrieval system is shown in Fig. 3.

For the scientific management of teaching resources in colleges and universities, based on the existing teaching resources information, this paper analyzes, counts, stores, queries and backs up all the information, and establishes a multi-functional resource management model on this basis. So as to realize the informatization of teaching resources, scientific management, office automation and networking of communication among colleges and universities. According to different functions, the information fusion center can be divided into infrastructure service layer, virtualization layer, management middleware layer and application service layer. The center is a resource pool composed of infrastructure, software and application platform. In this resource pool, the underlying hardware platform with blade server as the core is responsible for data processing, and users obtain services on demand through the upper software and application platform. The information fusion platform realizes the integrated management of server teaching resources, and can expand or shrink resources according to the actual needs of users. It has the characteristics of high resource utilization, good scalability and low complexity of equipment management.

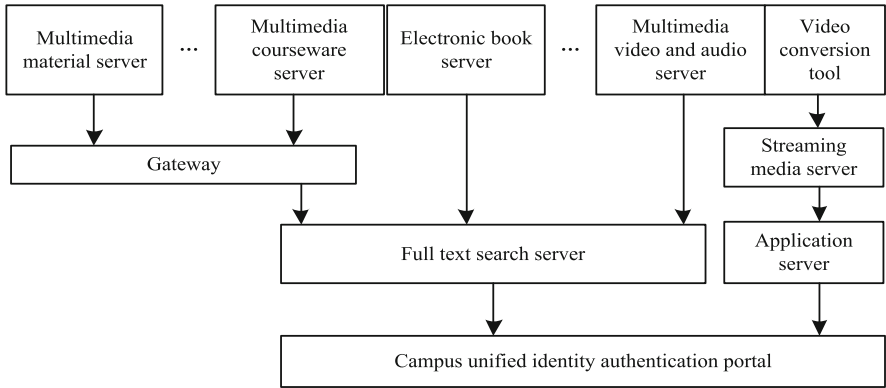


Fig. 3. Data flow diagram of economic teaching resource retrieval system

The management model of teaching resources in colleges and universities is shown in Fig. 4.

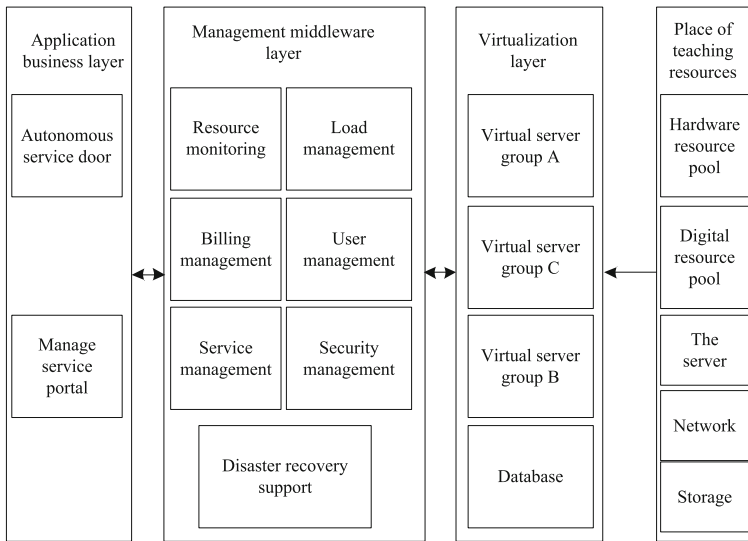


Fig. 4. Management model of teaching resources in Colleges and Universities

In the research on the evaluation of the dynamic integration model of information fusion learning resources, this research adopts the research strategy of combining qualitative and quantitative research. Based on the Expectation Confirmation Theory of information system, through the practical application of the dynamic integration model of information fusion learning resources in teaching, this paper carries out the research on the influencing factors of learners' willingness to continue to use, so as to verify the effectiveness of the dynamic integration model of information fusion learning resources.

Finally, on the basis of empirical research, this study puts forward the strategy of dynamic integration of information fusion learning resources,

The research framework of dynamic integration of information fusion learning resources is shown in Fig. 5.

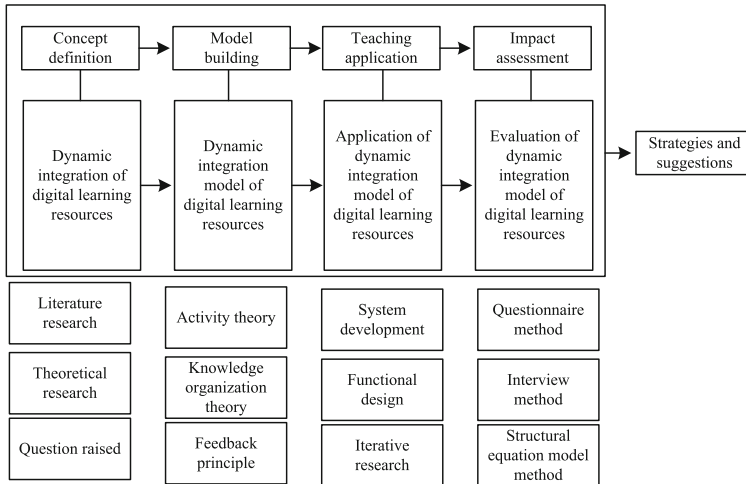


Fig. 5. Research framework of dynamic integration of information fusion learning resources

On this basis, with five aspects of teaching resources and content, teaching plan and teaching design, teaching organization, teaching effectiveness and reform and innovation as the evaluation focus, the evaluation criteria for the integrated application of informatization teaching resources and economic education resources are constructed, as shown in Table 2.

According to the description of the six elements and their relationship in the activity theory, combined with the eight specific steps of model construction and the comprehensive factors to be considered, as shown in Table 3. Table 3 directly reflects the main influencing factors to be considered in the process of integrating learning resources of information fusion.

In the dimension of resource integration, a conceptual model is formed according to the interaction relationship between the six elements of activity theory, and the functions of each element are described in detail according to the goal formed by “demand action”, which can realize the two-way interaction of effective information.

The dynamic integration elements of information fusion learning resources are shown in Table 4.

In the learning process, learners participate through the functional design of dynamic integration of information fusion learning resources, complete learning activities by using information fusion learning resources, participate in feedback and sharing according to their experience in the learning process, and feed back effective information to implementers, so as to realize two-way interaction of effective information.

Table 2. Evaluation criteria for integration of teaching resources

No	Dimension	Index	Content decomposition
A	Technical	Teaching resources and contents	Curriculum resources can meet the curriculum standards and enrich the content; Teaching resources can better develop new ideas and serve the curriculum objectives and academic requirements; Rich resources, able to meet the needs of ordinary assessment
B	Instructional design	Reorganization and reconstruction of granular resources	The teaching objectives are clear, the teaching arrangement and design are reasonable, the teaching content is properly designed, and the key points and difficulties of the course can be accurately grasped
C	Usability	Vocational skills training	The process of vocational skills training is arranged reasonably, which can reflect the characteristics of online courses, the arrangement of teaching interaction is reasonable, the focus of online teaching process is prominent and well-organized
D	Resource integration	Teaching effectiveness	Teachers' advanced teaching concept and good teaching effect; Students actively participate, have strong interaction, and can achieve learning goals
		Reform and innovation	Be able to continuously improve the effect of online teaching according to the teaching characteristics of online courses

2.3 Dynamic Integration of Economic Teaching Resources and Realization of Relationship

The process of resource classification, integration and extraction is shown in Fig. 6.

The teaching resource integration platform supports users to select required resources from material library, courseware library and case library. For the selected results, you can browse the details of resources or open the resource file to view. When you decide to select a resource, click the “join” link on the right side of the resource title. The system will automatically add the selected resources to the defined consolidated resource file

Table 3. Element analysis of dynamic integration model of information fusion learning resources

Modeling steps	Essential factor	Influence factor
Clarify the objectives of the activity	Object	Social environment
Identify the executor of the activity	Subject	Ability
Clarify the tools used to support the main body to complete the activities	Tool	Technology and method
Clarify the planning and specifications in the implementation of activities	Rule	Task type and characteristics
Clarify the responsibilities of different subjects	Community	Task allocation
Clarify the role division of different subjects	Division of labor	Situational factors
Specify the specific environment in which the activity takes place	–	Situational factors
Clarify the expected results	–	Achievement degree of mission objectives

and store them in the SQL Server database. The sharing model of economic teaching resources is shown in Fig. 7.

The co construction and sharing of information resources is the starting point of the integration and utilization of teaching resources in Colleges and universities. It is an effective measure to integrate teaching resources by regrouping and combining teaching resources according to relevant disciplines or themes and certain principles, and then integrating teaching resource databases in the network environment.

3 Analysis of Experimental Results

The following experiments are designed to verify the effectiveness of this method.

The computer configuration required for the experiment is as follows: the experimental environment is composed of five machines, one is the test machine (2-core processor above 2GHz, 4 GB DRAM and SATA hard disk at 250B) as the test machine, and the test program 1 Roadrunner 1L is installed: one server is the main controller of cloud cluster, and the other three (2-core processor above 2GHz, 2 GB Drau and SATA hard disk at 250GB) as the node controller, Installation of node RPM software package: equipped with San switches and routers above 100bps: the installation system includes Linux, eucalyptus, EC2, what software and MYSQL to build a test system for university teaching resource management model under the information fusion environment. In this test requirements, the response time of the page for registering and querying student information shall not exceed 8 s.

The experiment first shows the statistical results of teaching resource management, as shown in Table 5.

Table 4. Analysis of dynamic integration elements of information fusion learning resources

Activity system	Activity elements	Activity content
Target	Activity objectives	Realize the two-way interaction of effective information
Subject	Learner	Carry out the learning process according to the learning objectives and participate in dynamic integration activities
Object	Digital learning resources	Open learning resources, commercial sex education resources, etc
Tool	Dynamic integration of instructional learning resources	Design corresponding functions to achieve activity objectives
Rule	Feedback principle	Use resources and participate in feedback and sharing
Community	Teachers and other learners	Have the same learning objectives and learning situations
Division of labor	Subject	Learners are not only the main body of the learning process, but also the participants of dynamic integration
Performance	Specific activities	Through the corresponding functions and modules, the two-way interaction of effective information is realized

The test values in Table 5 reflect that the design of university teaching resource management model is feasible and has good stability.

On this basis, the traditional method of dynamic integration of teaching resources based on information navigation is compared with the method in this paper, and the results are shown in Table 6.

Based on the comparative analysis of the above experimental results, compared with the traditional methods, the dynamic integration effect of teaching resources of this method is significantly better, which can fully meet the research requirements.

Finally, the application performance of different methods is verified by taking the resource response amount in the same time as an index, which can reflect the integration response efficiency of different methods. In order to avoid the singleness of the experimental results, two comparison methods were selected, namely, traditional method 1 based on information navigation and traditional method 2 based on B / S architecture. The comparison results are shown in Fig. 8.

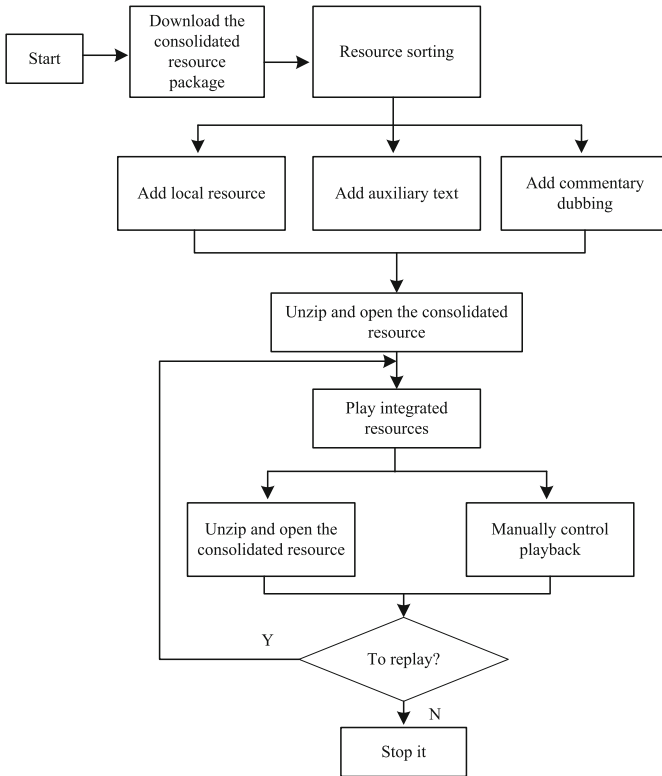


Fig. 6. Classification, integration and extraction process of teaching resources

From the analysis of Fig. 8, it can be seen that under the same environmental impact, compared with the two traditional methods, after the integration and extraction of teaching resources by using this method, the response volume of resources is more, indicating that the amount of data that can be integrated and processed by this method is also significantly larger, which meets the design requirements.

4 Conclusion

The integration of information fusion and teaching resources is an important problem in the construction of information resources in local colleges and universities. Its information integration and service should be people-oriented, and pay attention to the diversity, comprehensiveness, personalization and specialization of users' information needs. Because users are the utilization and judge of the results of information integration. Therefore, local colleges and universities should pay attention to strengthening the research on the utilization efficiency of information fusion teaching resources on campus, assign full-time personnel in economic teaching in colleges and universities to be responsible, feed back opinions and utilization at any time, make statistical analysis and evaluation on the utilization of integrated resources, and explain the problems with

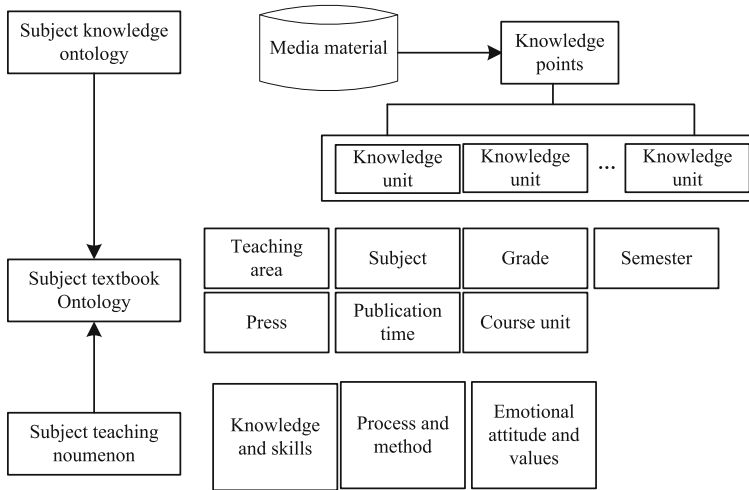


Fig. 7. Economic teaching resource sharing model

Table 5. Statistical results of teaching resource management

Test item	Target value	Practical value	Pass no
Login corresponding time	< = 2.9	2.653	adopt
Query response time	< = 2.9	1.652	adopt
Login transaction success rate	100%	2165	adopt
Query transaction success rate	100%	2165	adopt
Total number of completed transactions	2200 in 30 min	2165	adopt
CPU utilization	75	53.58	adopt
Memory usage	70	52.16	adopt

statistical data, It can be provided to the competent department as the reference basis for the planning and construction of information fusion teaching resources in Colleges and universities, so as to realize the value-added of the development and utilization of information fusion teaching resources.

At present, the online courses of colleges and universities established in China have achieved initial results in the collection of resources, but in terms of application, they pay insufficient attention to the application and application effect after the release of online course construction. The utilization rate of these high-quality teaching resources is not high, they have not played their due role in the improvement of teaching quality and school running efficiency, large investment has no large output, and high investment has not doubled efficiently. The research on how to use online courses to restructure and reengineer high-quality resources and how to organically combine this high-quality

Table 6. Comparison of two integration methods

	Traditional method	Paper method
Function	Resource construction, organization and classification, sequence integration, using links to provide retrieval access and quickly locate resources	Provide references, information summary and automatic retrieval
Retrieval	Integrate into the retrieval portal and establish a one-stop resource navigation database	One stop information query and obtain results
Basic feature	Ease of use and effectiveness of the system; Friendly retrieval interface and reasonable link	The retrieval function is powerful, the knowledge system is complete, and the acquisition and document transmission are convenient
Resource organization	Integrate the information resources through the organization system and deeply reveal the resources	The distributed information resources are seamlessly connected in a conventional way to facilitate access
Integration technology	Use navigation to process the search results and select reasonable results to pass to users	Cross database integration, merging multilingual search results

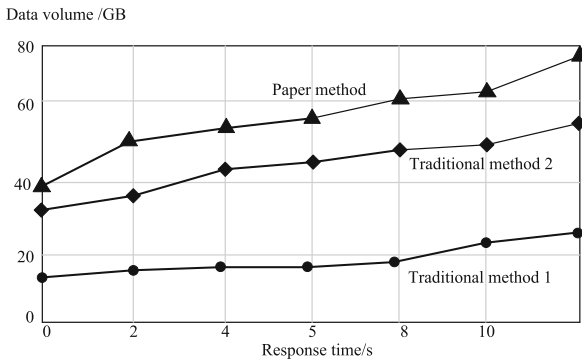


Fig. 8. Comparison of resource search response and detection results

resources with the teaching of the course itself is not in-depth, and there are no effective measures and countermeasures, which need to be further studied.

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