



Research Article

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## Research on development and sharing mechanism of teaching resources based on ontology knowledge management

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### ABSTRACT

Knowledge management is concerned with the acquisition, processing and maintenance of knowledge in an organization. As the foundation of the semantic web Ontology provides the technical support for knowledge management. Construction of teaching resources is to solve the city domain dispersed education resources, education information resources construction equipment idle, low efficiency and low level repetition problems. The paper presents research on development and sharing mechanism of teaching resources based on ontology knowledge management. The proposed scheme solves the problem of the new curriculum and construct environment of group learning and inquiry for teachers and students.

**Keywords:** Teaching resources; Knowledge management; Ontology; Sharing mechanism.

### INTRODUCTION

The teaching resources is the new curriculum standard to carry out the necessary support and implementation, but what is the teaching resources, teaching resources should be how to development has always been a debate problem [1]. In the face of the early emergence of the application of information technology a large number of low level repetition of the courseware, some scholars put forward the thought of "integrable ware" construction, used to improve the teaching resources can be reused, application flexibility and autonomy.

Based on the network technology "educational resources library", "High School Department of case base, build a" based on the teaching reform practice of effective knowledge management support of the comprehensive education and teaching resources system, through a series of activities based on the practice of education teaching resources storehouse, case database application, solve the city from the domain of educational resources the fundamental dispersion, education informationization equipment idle, teaching resources are not balanced, resources construction, low efficiency and low level repeated questions, provide strong support service system to promote the balanced development of education, improve teaching domain, the efficiency in the use of education resources.

Knowledge management is to produce knowledge organization (including knowledge acquisition, synthesis and innovation), management of the whole process of dissemination and application, in order to realize the innovation of knowledge and sharing, promote economic and social development. The school is a typical application of knowledge management in the industry, the introduction of the concept of knowledge management, which makes the digital campus construction shifted from infrastructure information teaching, scientific research, management, public service and school life after digitization, and from these the main process digitization to analysis and evaluation of digital effects, pointing to the ultimate goal of the school the cultivation of students, comprehensive, scientific and cultural quality and innovation spirit and practice ability.

The concept of ontology originated in the field of philosophy, for the research on the essence of the objective world. In the semantic web category, ontology is a precise specification of conceptualization, formal on the domain

knowledge of the. In the semantic web architecture, body function mainly displays in: the concept is the description of the concept description revealed by domain knowledge, semantic ontology has revealed the expression ability of RDF is stronger than, can reveal more rich semantic relations; ontology consistency as a clear specification of domain knowledge, can ensure the semantic consistency, thus a word ambiguities polysemy, synonymy and semantic phenomenon more thoroughly solve.

Under the guidance of integrable ware teaching resources while providing a great deal of teaching materials for teachers' teaching, enrich the classroom teaching content, reduce the teachers make teaching resources of the burden, but the learning pattern, teaching process, evaluation methods under the new curriculum standards than the traditional education reform strength is big, so that all levels of education research and education managers and front-line teachers still feel the difficulties of implementation, this gave the teaching resource construction has brought a series of problems needed to resolve. The paper presents research on development and sharing mechanism of teaching resources based on ontology knowledge management.

### 1. Mode of knowledge management based on Ontology

Knowledge management is the activity rule of knowledge innovation research on human acquisition, dissemination, sharing, use and management of all kinds of continuous process, relevant knowledge of theory and practice, to promote economic and social development. Its basic function is to focus on the sharing and exchange of knowledge, effectively promote the transformation between explicit knowledge and tacit knowledge. According to the inherent characteristics of knowledge to the knowledge into explicit knowledge and tacit are knowledge two categories. Teaching resources of the network can be divided into explicit and implicit teaching resources, teaching resources.

The semantic web is the greatest advantage of the network information "understanding and processing ability". Semantics by adding can be computer "understanding", which makes the understanding of the meaning of the text and is no longer a man's patent; the use of computer also can accomplish the same tasks. "Understanding" is just the first step in semantic net work, more important is the semantic web can make computer in "understanding", logical reasoning and automatic processing ability according to the existing data and rules. This is generally accomplished by intelligent agents. Intelligent agent is a good design program, it can help people to automatically complete certain work.

Knowledge management is concerned with the acquisition, processing and maintenance of knowledge in an organization. Due to the large commercial institutions to internal knowledge as a kind of can improve productivity, create new value and enhance the competitiveness of intellectual capital, knowledge management has become a key of their work, especially for the geographical distribution of the broader international community.

Semantic web is not a new technology, but consider how to combine existing techniques, more intelligent and network based information interaction. These techniques include knowledge markup (i.e. markup language, knowledge representation) and knowledge processing (i.e. intelligent agent, network service) of the "core" technology, knowledge organization (i.e., information science, machine learning) and knowledge access (i.e., database system, language technology) 'authorization (enabling) ". Discussion on the relationship between the technology and the semantic web in more detail in the next few sections we will do it [2]. System structure diagram of the semantic web is as shown in Figure 1.

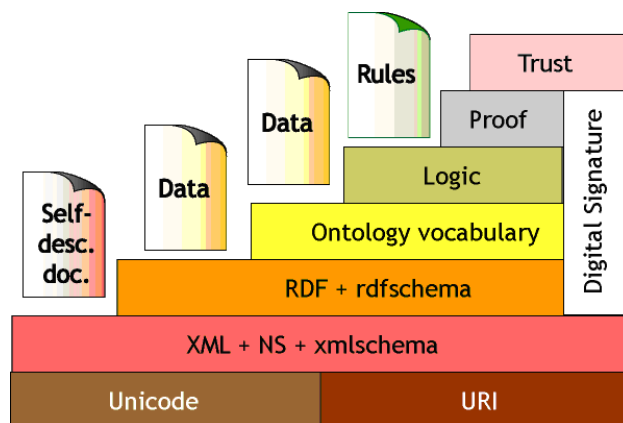


Fig. 1. The semantic web hierarchy and system structure diagram

Most of the current available information has only weak organization form, such as text, audio and video etc.. From

the knowledge management perspective, from the existing technology in the following aspects: the limitations of information search. Companies often rely on keyword based search engines; this limitation has been briefly described above. Need to manually browse documents, so as to find out the related information from. Intelligent agent existing (intelligent agent) is also not satisfactory completion of the task.

RDF(S) is an important component of the semantic web, it uses URI to identify different objects (including resource nodes, the attributes of the class or attribute values) and can connect different URI, clearly expresses the relationship between objects. In order to reveal the relationship between objects and connected by URI into RDF has got rid of the tree structure of XML document resources implied constraints to graph, can be more flexible to express the knowledge on the network or resources, to reveal the relationship between them, which is more in line with the characteristics of WWW of open, distributed and loose structure.

Design of RDF data storage stored does not take into account this kind of query. But focusing on how to have the same attribute or tuple is three on the same subject together. Others are given for different attributes of the object - the theme of hash keys. No one can do it according to the object to find out the column or property related topics. We believe that this function is not only necessary, but also because the three tuples, the characteristics of RDF data, it is able to realize.

Semantic network is to express the complex relationships between the concepts and to, thus forming a composed of nodes and arcs in the semantic network graph [3]. From the graph theory point of view, they are a "labeled directed graphs, semantic network consists of nodes and arcs between nodes, nodes represent various objects, concepts, properties, action, and situation, as is shown by equation(1).

$$F_p = a_{1m} X_1 + a_{2m} X_2 + \dots + a_{pm} X_p \quad (1)$$

The goal is to make the organism according to unified semantic to enrich the use right, from the Internet to find them in between the network of the smooth continuum advantage. In a grid applications, individual module WPS running in different part of the basic structure, while sharing state and control applications using the network service effect. However, each module is made to tie together - known as the database, file system, mail server - and data about the intelligence must be compared with the application module.

Although the classification and organization of knowledge is a highly intelligent, need someone to complete the task. However, due to the number and complexity of knowledge organization needs rapid growth, equation (2) must be in need of automatic support. Therefore need to machine learning methods and tools to support the Semantic Web ontology development, adaptation and use.

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_p x_{ip} + \varepsilon_i \quad (2)$$

Information maintenance is now that there are still some problems, such as the term incompatibility and cannot remove out of date information and so on. Information mining is to although can data mining (data mining) and other means to extract the hidden new knowledge in corporate databases, but for the distributed, weakly structured document collections, this task is still difficult. The information view is often needed to restrict certain employees browse access to certain information. "View" means to hide some information, this concept is known for the people in the database field, but on the enterprise internal network is still difficult to achieve.

In determining the concept of ontology description and powerful semantic revealing ability at the data level effectively is to ensure the validity of inference. Compared with resource description layer, ontology provides a common understanding and description of field knowledge, have stronger expression ability, support can ensure the computational integrity and Decidability of logical reasoning. From the semantic web architecture, ontology layer plays a key role in. It not only makes up the shortage of resource description layer, and its conceptual model is the logic layer (Logic) above each layer plays the role of foundation, because only in the formation of consistency on the description to the domain knowledge is the corresponding rule description, inference and verification.

## 2. Development and sharing mechanism of teaching resources

Through the survey found, at present is not the hardware construction puzzle teaching reform is not in place, but the lack of software resources, especially the problem of resource sharing. The survey found, most teaching resources library of teaching materials is isolated, the only one goal: to provide the available material for teachers' teaching, can not reflect the construction and application of teaching materials of thoughts and ideas, and some teaching

material mostly is compiled, curing, is not conducive to the development of teacher's Application two and editing, to a large extent weakens the availability of resources.

The digitized teaching resources in the process of educational informatization, play a decisive role, and the teaching of basic digital resources existing teaching resources website is aiming at the research status of knowledge management at present teaching resource database construction and application in Colleges and universities, mainly exists the following problems: (1) the course of all levels, various colleges and universities teaching resources construction is not the unified standards and formats, methods and application of the construction of large gap, is not convenient to provide unified service;(2) the development and application of the teacher's ability and level of demand is high, the content and the way of information technology training needs to be improved.

As one of the core competence of teaching resources of distance education courses, to design a set of scientific and effective, and can embody the idea of sharing system, provides a wealth of high-quality teaching resources for the practical teaching of students' autonomous learning and basic level teaching need, its significance is obviously [4]. The introduction of the project in the construction of curriculum system of teaching resources management mode because construction curriculum teaching resources have process lasting, time limited characteristics. Participate in the teacher, subject experts, technical staff, managers need to process the multimedia teaching resources construction; need all the applied disciplines, educational technology, computer technology and other professional knowledge and skills; needs to construct the unit of construction of curriculum teaching resources to perform planning, monitoring and acceptance of management functions.

In the teaching resources development and construction, because the team is participating in the construction of technical personnel and non graduate teachers professional teachers, although these teachers has a system of professional knowledge, but a lack of education and ideological training, especially the lack of theoretical guidance and teaching resources design, can truly embody the organic integration of the teaching objectives of information technology and curriculum resources not much, new thematic learning class lack of resources. So, in this way the development and construction of teaching resources is more one-sided attention to simple acquisition, organization, transmission and sharing of explicit multimedia material, the lack of relates to tacit knowledge teaching resource deep processing and processing, also ignore to teachers, students and most for the development and management of valuable experience, skills of recessive resources.

Information platform construction and sharing of the modern information technology research and development of teaching resources based on teaching resources system, for the excellent course website construction, digital teaching material resources sharing and construction of all kinds of teaching resources and share the information platform support, and applied research, at the same time teaching resource construction and sharing mechanism of innovation of the platform use, has achieved good application effect, as is shown by equation(3) [5].

$$Y = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix}, X = \begin{bmatrix} 1 & x_{11} & \cdots & x_{1p} \\ 1 & x_{21} & \cdots & x_{2p} \\ \vdots & \vdots & \ddots & \vdots \\ 1 & x_{n1} & \cdots & x_{np} \end{bmatrix} \quad (3)$$

The construction of educational resources is mainly to solve the "available, enough, apply" three major problems, the first stage through the teaching design, the development of teaching first-line needed teaching materials and other resources, solve the resource from scratch; the second phase of research and development, expand the type of research resources from the foundation to solve resource development, resource from there to Bo; continue optimization and improvement of the third stage outstanding resources, to solve the practical problems in the teaching resources.

The operation mechanism is the guarantee of distance education course resources sharing in the most important practical measures, combined with relevant research, can draw a scientific, reasonable distance education resources sharing mechanism should include the following 8 aspects: macroeconomic regulation and control, system planning, barrier, technical support, management coordination, monitoring and evaluation, benefit distribution and talent cultivation.

Broaden the channel resources, promote knowledge sharing. Mainly in network teaching resource database of excellent course website, as a source of information, through the XML data exchange way, taking course as unit, or

to the curriculum teaching task (project) as the unit, to provide mutual query and statistical information function. To improve the teaching task of the curriculum (project) polymerization and the sharing of resources, and improve the different areas, colleges and universities (the same courses or training project) of the exchange interaction, into the competition of teaching, improve teaching interests and practicality. At the same time, the teaching resource library provides information push function, in accordance with the contract, unified format, each request data and give response, improve the sharing and interoperability of the exquisite course data, improve resource utilization rate.

The integration of curriculum teaching resources design: refers to the project course construction group according to the requirement of teaching program, through the analysis of content of courses teaching content, teaching mode, teaching students according to their distance education, autonomous learning needs, to the teaching of the curriculum resources of integrated design. The project construction course organization work project course construction system in the organizational work mainly include: planning, organization, management and control four big functions.

The construction of teaching resources sharing information platform construction and application, the related management mechanism innovation, and cultivate the teachers make full use of modern information technology accomplishment construction and the sharing of teaching resources, so as to ensure the construction and sharing of teaching resources in school work is sustainable. Will continue to be 15 per year rate of around the door construction of college level excellent course, and use the existing platform and mechanism to speed up the professional curriculum integration project construction speed, resource construction and sharing good professional course cluster.

### 3. Research on development and sharing mechanism of teaching resources based on ontology knowledge management

As the implementation of the new curriculum reform in the face of the main body of the teachers, urgently needs to change the traditional education teaching idea, master new skills should have in the implementation of the new curriculum. At present, teachers with new skills from the implementation of the new curriculum requirements there is still a gap, in mastering and applying still exist problems, the status and reason of worthy of our consideration.

Integration teaching resources does not negate the current integrable ware resource construction forms, but more emphasis on teaching resources in promoting teachers' professional development role, emphasizing the application of resources for teachers to provide the application methods and ways for reference, and thereby lead to teacher's reflection on teaching and occupation of meaning, equation(4) is to promote teachers' professional development, ultimately promote the quality education reform. Therefore, the guidance of "integration" under the idea of teaching resources can not only contains a text, pictures, video form of knowledge, but also included teachers to finish the teaching, study and draw various materials needed [6].

$$\lambda p_1 = 2up_2, p_2 = \left(\frac{\lambda}{u}\right)^2 \frac{p_0}{2!} = \frac{\rho^2}{2!} p_0 \quad (4)$$

The application of knowledge management in this paper is to improve the application of teaching resources and at the same time, pay attention to the user experience. By recording the resource usage and application, combined with the registered users (teachers, students or technical personnel of enterprises) learning record information such as personal identity information, automatic analysis of user preference data, provide recommendation service. At the same time, it is the analysis of user access and application behavior, information relevance user recommendation.

In the semantic web architecture, ontology layer above the layers are collectively referred to as the rule layer [7]. The specific meaning of each layer of rule layer is different. The logical layer mainly describe the inference rules, because it is the agency of user task decomposition, positioning, coordinate, and the final verification based trust relationship, so the bottom of it is located in the rules. Proof layer (Proof) is a kind of authentication mechanism is provided to ensure the reliability of the agency work, its application logic layer and data layer rule ontology expression of logical reasoning, between the sub task and agent through the exchange of "proof" of providing reliable guarantee for the data or conclusion [8]. The basic idea is: I have provided the data and reasoning is correct, because there are a number of credible information source that I can be trusted, they are included in the Proof of the data section.

#### (1) Development and research of digital teaching resource sharing mechanism

In view of the multi campus network teaching resources construction of their own, do not regulate the development of standards, the reality data interface is not uniform, it is necessary to build a unified platform for network teaching resources, solve the current disordered state of each campus, each college construction of various sites [9]. Network

teaching resources platform should be based on knowledge management is different from traditional library resources including the management mechanism, management mechanism was established with decision-making, supervision organization, function; the construction of standard mechanism, provide the safeguard for the maximum range to achieve resource sharing, function implementation of educational resources between different schools, retrieval, exchange visits; the establishment of audit and certification scientific evaluation mechanism regularly on content, educational resources level, technical standards and other aspects, select high-quality educational resources for sharing.

$$W_{SN} = \frac{\sum_{i=1}^N \lambda_i}{\lambda_N} W_{1-N} - \frac{\sum_{i=1}^{N-1} \lambda_i W_{si}}{\lambda_N}. \quad (5)$$

### (2) Education teaching resources system construction of practice teaching reform of effective support

From the knowledge management perspective, in the process of multi campus network teaching resources sharing, the user first needs a huge number of teaching resources database, equation (5) is in a wide variety of fast, accurate to find the information they need. With the aid of the E\_Class system, and it is forming a complete set of production resources, system management, application, communication and service supporting platform. Including the construction of learning environment, create a resource rich learning situations, form a community of learners, to encourage the participation and the development of social practice, learning and communication.

### (3) The teacher learning system based on the shared environment

The construction of the resource pool is a complicated system engineering, which involves many aspects of software, hardware, network resources, such as construction, mainly to complete the software, hardware, network and some much-needed resources in the first stage; second stage mainly for software, hardware and network upgrade and resource comprehensive improvement; the third stage is the optimization and integration of software, hardware, network, resources. Including network full of teacher training based on practice, exploration and research activities based on network, network and urban secondary school teachers in rural middle school twinning based learning, network based on grade lesson preparation etc..

Ontology can be used for site organization and navigation. Many of the existing web site lists the term top concept hierarchy in on the left side of the page, the user can click on one of the relevant sub directory browsing. The body also can be used to improve the accuracy of web search. Search engine can be accurately according to the concept of ontology in the relevant search page, instead of collecting all occur in some (usually vague) keyword page. In this way, the terminology differences in query and web pages can be eliminated.

The construction of educational resources from the fundamental solution to city region education scattered resources, resources construction of low efficiency and low - level redundant problem, raise a large area in a short time the teacher education informatization level, promote information technology and curriculum integration, promote the balanced development of education city.

## CONCLUSION

Teacher perfect support system development and support resources is the key to the success or failure of the development of teachers, the teaching resources is the new curriculum standard to carry out the necessary support and implementation of research, to solve the bottleneck of the new curriculum reform, teachers, students to build self group learning, inquiry environment.

In this paper based on ontology knowledge base to build network integration platform of teaching resource library, teaching case database, realize the full range of three-dimensional cultivation environment, provide the inquiry, exploratory, interactive and open type teaching environment for teachers and students, to cultivate students' practical ability, creative thinking and exploration. The construction of teachers' information education training platform and it is cultivating the ability of teachers by means of informationization curriculum reform.

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