Design and Analysis on Computer Network Teaching Model based on TCPIP Network

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Abstract

With the continuous development of information technology and in virtue of its openness, richness, convenience and diversity, etc., it offers a vast space for the development in traditional fields. In education field, the rapid development of internet, cloud computing and internet of things and other technologies have a great impact on traditional form of college education; in recent years, as various colleges and universities start the construction of informatization, college education enters a leapfrog development stage, during which stage, more and more online course forms appear, and lots of excellent internet-based media materials, courseware and teaching cases aggregating cutting-edge scientific payoffs and expert reports have been produced, which significantly promote the improvement of the deficiency existing in traditional education mode. However, in practical education, due to the variety of education resources scattered in multiple carriers and platforms, some difficulties will inevitably arise during the process of application, which will further result in the difficulty in improving the utilization of resources. Therefore, how to make better use of vast education resources, reduce the difficulty and the cost of resource collection and improve the utilizing rate of education resources, so as to improve the teaching level, has become an important issue the college education is facing. Thus, this Paper, based on TCPIP network, carries out the study on computer network teaching, establishes the integrated utilization system for computer network education resources, which play a reference function for improving the level of university computer network teaching.

Keywords: TCPIP Network, Computer Network, Education Informatization.

1. OVERVIEW OF THE STUDY

1.1 Background

The disruptive function of information technology on the development of traditional education mode has drawn great attention of scholars. In 1996, our country officially brought forward the proposal on taking education informatization as the important direction for the development of education field, and through the wide utilization of advantageous education resources in colleges and universities, realizes the initial assumption of distance education. Later, in 1999, four key universities with Tsinghua University as the dominant power acquired the approval of the Ministry of Education, and carried out the pilot for modern distance education and have acquired excellent performance. Soon afterwards, the establishment of hardware and facilities for informatization education is constantly improved, and information technology plays an increasingly important role in college education. Up to this day, network education based on information technology has been among the most important teaching modes in colleges and universities. As a whole, the informatization construction in colleges and universities mainly consists of four parts, i.e. system integration, application integration, information integration and social integration, wherein, how to establish a good integration environment is the priority among priorities for the promotion of informatization construction development in colleges and universities. Especially at present when colleges and universities are at the primary stage of application integration and information integration, how to share and develop the vast information resources in network accordingly becomes the key issue faced by college informatization construction. Beyond that, the isomerism and close coupling of tools, platform and carrier adopted during the college informatization construction are the key cause for resulting in the low efficiency in the utilization of informatization education resource in colleges and universities and the difficulty in exerting informatization education advantages. If traditional form is still adopted to integrate the education resources of network, it may not only prolong the period of informatization construction, but also requires extra vast capital input, and accordingly cause the failure in realizing the orderliness, refinement and optimization of informatization construction. Therefore, establishing the system for integration and utilization of computer network education
resources and more efficiently integrating, developing and sharing the education resources have great significance for the promotion of collection education informatization construction level.

1.2 Literature review

During the college education informatization construction, establishment of computer network education resource integration system may help maintain the network education resources to the utmost extent and improve the visibility of scientific research and educational management in colleges and universities, better promote the orderly construction of college network education resources, improve the utilization of university resources, and accordingly better serve the improvement of teaching quality in colleges and universities. In addition, the establishment of computer network education resource integration system may effectively help eliminate the information isolated island generated by technology, realize the comprehensive sharing of education resources, so as to establish a unified information retrieval platform for teachers and students, and accelerate the realization of in-depth communication of education resources (Lin, 2013). At present, the issues existing in college education informatization construction mainly focus on following aspects, i.e. serious information isolated island phenomenon existed due to overmuch application of tools, technologies and carriers, difficulty in realizing in-depth association among education resources, and lack of systematic effect. Beyond that, along with the continuous development of university information technology, education information resources present complex features, i.e. disorderly and unsystematic existence due to the lack of reasonable arrangement, difficulty in guaranteeing the quality, and low efficiency and low level existing in the management of education information resources (Kong and Zheng, 2013). TCPIP is the short for transmission control protocol/internet protocol, also called internet communication protocol, which is the most important and fundamental protocol in network. Wherein, TCP refers to the transmission level of data and IP refers to the internet level of data, and TCPIP protocol directly determines how several electric devices should connect with internet and formulate the numerous parameters of mid-data transmission in network. Computer network teaching system established according to TCPIP protocol may equip the management of information data with more accurate and unified characters, and accordingly effectively improve the level of management of education resources during college education informatization (James, 2017).

2. EVALUATION MODEL FOR CONSTRUCTION QUALITY OF COMPUTER NETWORK TEACHING SYSTEM

2.1 Construction of hierarchical analysis structure

The evaluation model for construction quality of computer network teaching system mainly consists of three hierarchies, i.e. target layer, criterion layer and scheme layer, which are represented by A, B and C separately, as shown as Figure 1:

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Figure 1. A Hierarchical Structure Model
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According to the structure model of computer network teaching system, a judgment matrix may be constituted as shown as Table 1:

### Table 1 The Judgment Matrix of Analytic Hierarchy Process

<table>
<thead>
<tr>
<th>$B_k$</th>
<th>$C_1$</th>
<th>$C_2$</th>
<th>......</th>
<th>$C_n$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_1$</td>
<td>$C_{11}$</td>
<td>$C_{12}$</td>
<td>......</td>
<td>$C_{1n}$</td>
</tr>
<tr>
<td>$C_2$</td>
<td>$C_{21}$</td>
<td>$C_{22}$</td>
<td>......</td>
<td>$C_{2n}$</td>
</tr>
<tr>
<td>......</td>
<td>......</td>
<td>......</td>
<td>......</td>
<td>......</td>
</tr>
<tr>
<td>$C_n$</td>
<td>$C_{n1}$</td>
<td>$C_{n2}$</td>
<td>......</td>
<td>$C_{nm}$</td>
</tr>
</tbody>
</table>

Wherein, each matrix is required to meet the following conditions:

\[ C_{ij} > 0 \]

\[ C_{ij} = 1/ C_{ji} (i \neq j) \]

\[ C_{ij} = 1(i, j = 1, 2, ..., n) \]

With regard to above matrix, for "i", "j", "k" which may be assigned any value, there's a formula \( C_{ij} \cdot C_{jk} = C_{ik} \). Comparing above influence factors, and contrasting the results, apply scale 1-9 to assign the value to \( C_{ij} \). Wherein, 1,3,5,7,9, goes forward one by one according to the importance. If the former is less important than the latter, it shall be represented with fraction (Chen et al., 2015).

Then, carry out the consistency check, the purpose of which is to guarantee the coordination and unification of all judgment results, avoiding the conflicts of judgment results. According to matrix theory, we may conclude the following results:

Assuming \( \lambda_1, \lambda_2, \ldots, \lambda_n \) meets the formula \( A \lambda = \lambda \), i.e. the characteristic root of matrix \( A \), and for all \( a_{ij} = 1, a_{ii} = 1 \), there's a formula \( \sum_{i=1}^{n} \lambda_i = n \). Assuming matrix \( A \) is completely the consistent, then, \( \lambda_1 = \lambda_{\text{max}} = n \), and all other characteristic values are 0 (Li, 2013). If the consistence of matrix \( A \) is incomplete, then \( \lambda_1 = \lambda_{\text{max}} > n \), and the formula of another characteristic root \( \lambda_1, \lambda_2, \ldots, \lambda_n \) are as shown as follows:

\[ \sum_{i=1}^{n} \lambda_i = n - \lambda_{\text{max}} \]

Above content shows, if judgment matrix can't guarantee the consistence, its characteristic value will change, and the degree of change may be used for checking the consistence degree of judgment matrix(Gu,2014). Therefore, through the introduction of negative average value besides maximum characteristic root, it may effectively feedback the indicator indicating that matrix deviates from consistence, and the checking formula mainly adopted is as shown as follows:

\[ CI = (\lambda_{\text{max}} - n)/(n - 1) \]

According to above content, if consumption matrix possesses consistence, then "CI=0". In a similar way, assuming "CI=0", and \( \lambda_1 = \lambda_{\text{max}} = n \), which may also certify that the matrix is consistent. Following, for acquiring the consistence indicator "RI", the values assigned for "RI" should be as shown as Table 2:
3. TCPIP-BASED DEMANDS ON NETWORK EDUCATION RESOURCE INTEGRATION SYSTEM

3.1 Status quo of network education resource integration system

3.1.1 Deficiency in resources and unevenness of quality

At present, issues of insufficiency in construction fund exist widely in colleges and universities, and the lack of huge fund input during the development of education informatization construction result in the deficiency of education resources in colleges and universities. College education resources mainly comprise of various collected catalogue resources, affiliated education resources, affiliated teaching and research resources and available & charge-free network education resources. And for most colleges and universities, to purchase more education information resources only stay in discussion stage, and therefore, the quality of college education resources is difficult to be improved (Zhang, 2013).

3.1.2 Serious isolated island effect

Among the construction of university informatization, it features various disordered and unsystematic education resources, numerous platforms, channels and carriers for information resources, and lack of unified management platform and system, which result in the serious isolated island effect existing in various education resources, and accordingly, teachers and students in colleges and universities are difficult to effectively utilize the vast education resources, and there's no core target for realizing education informatization.

3.1.3 Shortage of overall management of education resources

By now, most colleges and universities haven't established the overall management system for education resources, and various education resources haven't realized the sharing, and therefore, huge funds are required in both organization of education resources and storage. Besides, there's no strict standard for search and collection of education resources, which result in the sneaking of poor quality resources into college education resource database, and accordingly cause the uneven quality (Zhao and Yang, 2013).

3.2 Construction targets of network education resource integration system

The construction targets of network education resource integration system are mainly embodied as follows:

Firstly, guaranteeing the effective integration and long-term maintenance of distributed education resources. Universities are required to establish a database, through which, integrate the education resources into an organic whole in the digital form, and through an effective order, offer them to the teachers and students for meeting their demands (Chen, 2015).

Secondly, single access mode. The sources of college education resources are diversified, and each resource has different access channel, which may hinder the application of education resources by teachers and students. Therefore, network education resource integration system will offer the teachers and students with a single assess mode by integrating education resources, so as to make the teachers and students easier apply education resources and accordingly reach the goal of improving college education level.
Thirdly, offer personalized services. The study ability, study level and study demand of each student diversify greatly, and if education resources are provided to the students according to the unified standard, it may not meet their diversified study demands, which is also the major deficiency existing in traditional education mode. Therefore, network education resource integration system is required to offer more pertinent teaching content according to students' diversified demands, so as to meet their personalized demands (Jiao, 2013).

Fourthly, intelligent search system. Network contains vast education resources, and if there's no intelligent search system in college network education resource database, teachers and students will face great difficulty to apply network education resources. In intelligent search system, it mainly comprises of primary search and advanced search. Wherein, primary search consists of the search of natural language, phrase, boolean operator, position operator, truncation operator and wildcard character, and advanced search offers multi-field search and multiple restricted options.

Fifthly, hierarchic user management system. Different person plays different function in network education resource integration system. Generally speaking, the users mainly include system administrator, general user and resource maintainer. The establishment of hierarchic user management system may effectively improve the management level of network education resource integration system (Ma and Jiang, 2011).

Sixthly, quality system assistance. For there're relatively more functions in network education resource integration system, some issues will inevitable appear during the application by teachers and students. Therefore, quality system assistance is required and different functions are required to be indicated through specific methods such as system hint and service manual, etc.

4. CONSTRUCTION OF TCPIP NETWORK-BASED COMPUTER NETWORK TEACHING MODEL

4.1 Design of overall structure of the system

According to the construction target of network education resource integration system brought forward in above content, the system mainly adopts B/S architecture, and the entire architecture is as shown as Figure 2:

![Figure 2. The Overall Architecture of B/S System](image)

After the user sends "http" request to Web server through Web browser, Web server then sends the request to network education resource database server and after finishing the search of database, database server feeds back the search results to Web server and presents the results to the interface of Web browser, till this step, the search function of network education resource is completed. Under B/S architecture, the application layer structure of network education resource integration system is as shown as Figure 5.

Wherein, it consists of four layers, firstly is the presentation layer, which contains browsing interface, retrieval interface, resource management interface, personalized service interface and system management interface, etc., is the application layers directly provided to the users. Followed by the business logic layer, which mainly contains the browser components, retrieval components, resource management components, personalized service components and system management components, and is an important application layer for maintaining the normal operation of the system. Then, the data access layer, whose major job is to upload the logical view of physical data, and analyze and store the data, so as to ensure the integrity of the network education resources. Finally, the data layer lying at the bottom of the application structure layer, which is mainly used to store a variety
of network teaching data resources, including storage resources metadata information, text information, user data, log data, etc. (Xu and Guo, 2010).

![Diagram](image)

**Figure 3.** The Overall Structure of the Computer Network Education Resource Integration System

### 4.2 System function design

Functions of the system for computer network teaching model mainly consists of the following items:

First, Resource Development and Submission Module. It mainly contains user registration, login and exit function; resource form submission, open access and aggregation function, and resource batch import function. In the computer network teaching system, there are two main ways to submit resources: one is through the Web page to import the network education resources meeting the requirements into computer network teaching system through a certain format, and have the submitter to fill in the completed metadata information. The other is a bulk import method, the process it adopted is generally the one provided by Dspace, and the file format is mostly in DSpace-SIP. In this process, colleges and universities are required to set the corresponding network education resource auditing commissioner to review the network education resources provided, so as to ensure the quality of trading resources in the computer network teaching system (Zhang, 2010).

Second, Resource Storage and Management Module. It mainly includes the user and user group authorization management, column management, column knowledge, metadata editing, storage and index maintenance, identifier management and workflow management, etc. The main purpose of this module is to solve the problem of insufficient storage capacity of network resources in the traditional computer network teaching system and to build a voluntary storage and management module to store more hours of educational resources. Based on the DSpace program, you can use two kinds of preservation methods, i.e. digital stream preservation and functional preservation. Digital stream preservation refers to the storage of network education resources in the form of digital documents, and functional preservation refers to the organization of network education resources through technical formats and media changes under the premise of maintaining its functionality. For the particularity of computer network teaching system, the effect of functional preservation is better, which is a more ideal storage method (Dong, 2010).

**REFERENCE**