



Construction of Network Teaching Assistant System of Digital Teaching Materials in Colleges and Universities Based on Epub

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Abstract. With the rise of “Internet + Education”, online teaching has changed the original educational form. The actual function of traditional paper textbooks is gradually weakening, and there are some problems such as low application, poor convenience and short timeliness, which can not meet the needs of the current teaching model. In this regard, based on Epub 3.0 technology, this paper will speed up the transformation and upgrading of college teaching materials, and put forward a set of construction scheme of digital teaching materials network teaching auxiliary system to improve the adaptation of traditional paper teaching materials and information teaching mode. The system as a whole belongs to B/S architecture, the front-end interactive page is added with Epub reading plug-in, and the back-end server is built by SpringMVC framework. The simulation test results show that the functions of the system are running normally, which greatly improves the utilization efficiency of teaching materials, optimizes the teaching process, promotes the close combination of digital teaching materials and online teaching, and makes a positive attempt to realize educational modernization.

Keywords: Epub · digital teaching materials · network teaching system · computer software application · Web technology

1 Introduction

As the commanding height of the national educational modernization development strategy, educational informatization will continuously promote the transformation and upgrading of all fields, processes and elements of education and teaching, and lay a solid foundation for building a new ecology of smart education [1]. Among them, teaching materials, as an important medium to carry out daily education and teaching practice in colleges and universities, occupy the core position of teaching elements, which is not only related to the presentation form of teaching content, but also directly affects the planning of teaching process and the formulation of teaching mode, and is the primary link to realize the reform of educational informatization. Faced with the problems of low application, poor convenience, short effectiveness and easy waste of resources in the actual use of traditional paper teaching materials, colleges and universities should

actively carry out innovative exploration from multiple dimensions such as content setting, typesetting design, usage scenarios and technology integration, and find a feasible path to break through the current bottleneck [2]. In view of this, this paper holds that colleges and universities should adhere to the “Measures for the Management of Teaching Materials in Colleges and Universities” as a guide and strengthen the construction, implementation and management of digital teaching materials in combination with the practical needs of education and teaching in colleges and universities. Taking this as a fulcrum, it incites the digital transformation of teaching process in colleges and universities and promotes the comprehensive reform of teaching mode [3]. At the same time, colleges and universities should focus on the development of network-assisted teaching platform, promote the close combination of digital teaching materials and online teaching, improve teaching service and management mechanism, and make positive attempts to realize educational modernization.

2 Development Process

The overall development content of the network teaching assistant system for digital teaching materials in colleges and universities is divided into two parts. One is to use Sigil editor to transform traditional paper teaching materials into digital teaching materials in Epub format. In Epub format, the contents of the book are based on HTML files, and can support the insertion of video, audio, images and hyperlinks, thus realizing the mixed typesetting of various types of contents. In addition, the Sigil editor also supports the use of CSS styles for content format control and beautification [4]. Sigil editor adopts graphical operation interface as a whole, and can quickly use various functional plug-ins to complete the editing, transformation and packaging of teaching materials. The digital teaching material in Epub format is essentially a zip compressed package, which contains many files, such as mimetype, META-INF/container.xml, fb.opf and fb.ncx [5]. Among them, fb.opf can organize all kinds of document contents and provide corresponding navigation mechanism, while fb.ncx is used to represent the directory.

Secondly, the overall framework of the system will be built with the help of Javaweb technology. In the design and development of front-end interactive pages, JSP technology is mainly relied on. At the same time, FBReader, the reader framework of Epub file, is deployed to support users to read and use digital teaching materials online. For the server side of the system, the SpringMVC framework is used to complete the construction. The basic development environment includes the operating system Windows 10.0 x86-64bit, the development language is Java, JDK version 1.8.0_251, the Web server is Apache Tomcat 9.0, the database is Oracle 11 g, and the integrated development tool is Eclipse Neon 4.6.2. Under Eclipse, all kinds of Jar packages required by SpringMVC framework are downloaded and introduced into Maven project, and the overall framework configuration is completed by creating the corresponding Controller layer, Dao layer, Service layer and entity layer in MVC mode [6]. Through the introduction of the above key technical theories, the overall environment of system development, the configuration of related software and tools are determined, and the technical feasibility of the overall project of online teaching assistant system for digital teaching materials in colleges and universities is also clarified.

3 Functional Implementation

3.1 Student Side

a. Online Learning.

When the student user passes the account password verification and authentication, the system will automatically jump to the online learning interface. The system supports student users to directly select the corresponding teaching materials in the catalogue and join the study. In the learning process, the system will provide a variety of auxiliary functions, such as adding bookmarks, full-text retrieval, adding notes and highlighting. It can also adjust the font size, background color and reading mode according to the personal preferences of student users to build a personalized reading and learning environment [7].

b. Online Test.

Under Epub technology, the system can support exercise evaluation and answer feedback based on QTI standard [8]. That is, student users can conduct online tests after completing the learning of the teaching material content, so as to consolidate their knowledge. QTI is a set of user interactive operation specifications, in which the topic type, topic content, topic answer and related scores will be placed under opf file in the form of xml documents. For the interactive engine in the answering process, JavaScript and Jquery under JSP page are needed to realize it [9].

3.2 Teacher Side

The functional authority of teacher users tends to organize and manage teaching practice. As an important part of teaching practice management, assessment is an important criterion for judging the effect of systematic teaching. According to the actual application, the system will construct the evaluation standard of learning effect and conduct simulation test. Table 1 shows the evaluation system of online teaching assistant system of digital teaching materials. In the simulation test, 10 students and 5 teachers were selected as the evaluation subjects, and the system was simulated and scored. The scoring results are shown in Table 2. According to the scoring results, the system uses the coefficient of variation algorithm to determine the weight of each observation point, and finally completes the final score [10]. The calculation formula of coefficient of variation is shown in Formula 1, where A_j is the standardized mean, S_j is the standardized mean square deviation, and V_j is the coefficient of variation. The weight calculation formula is shown in Formula 2, and λ is the weight value. The test results show that the system functions normally and can meet the needs of teaching effect evaluation.

$$V_j = \frac{\sqrt{\frac{1}{n} \sum_{i=1}^n (r - A_j)^2}}{\frac{1}{n} \sum_{i=1}^n r} \quad (1)$$

Table 1. Learning effect evaluation system

No.	Observation point	Grading standards
1	A1: Page design	Excellent: 5 points Good: 3 points General: 2 points Poor: 1 point
2	A2: Content of teaching materials	
3	A3: Interaction mode	
4	A4: Test and answer	
5	A5: Resource application	

Table 2. Final scoring results

	A1	A2	A3	A4	A5
Student S1	5	5	3	2	3
Student S2	3	5	5	3	2
...					
Student S10	5	3	3	3	2
Teacher T1	3	5	3	2	2
...					
Teacher T5	3	3	5	2	2
Standardized mean	3.375	3.750	4.000	2.875	2.875
Standardized mean variance	1.060	1.035	1.069	0.991	1.457
Variable coefficient	0.314	0.276	0.267	0.344	0.506
Weighted value	0.183	0.161	0.156	0.201	0.296

$$\lambda = \frac{V_j}{\sum_{j=1}^n V_j} \tag{2}$$

4 Conclusion

In order to promote the digital reform of teaching materials resources in colleges and universities, this paper starts with the sharing, management and application of teaching materials resources, and builds a Web-based network teaching assistant system for digital teaching materials in colleges and universities with the help of the application advantages of Epub technology, network information technology and computer application technology. A new attempt has been made to realize the digital transformation of teaching process and deepen the reform of teaching mode in colleges and universities. In the follow-up research, the interactive form of digital teaching materials will be further

expanded, and audio comparison will be introduced into the system to give students and users a better learning virtual environment.

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