The Design and Implementation of Network Teaching Platform Basing on .NET

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Abstract

This paper addresses the problem that students under traditional teaching model have poor operation ability and studies in depth the network teaching platform in domestic colleges and universities, proposing the design concept of network teaching platform of NET + C# + SQL excellent course and designing the overall structure, function module and back-end database of the platform. This paper emphatically expounds the use of MD5 encryption techniques in order to solve data security problems and the assessment of student learning using ADO.NET database access technology as well as the mathematical formula. The example shows that the network teaching platform developed by using WEB application technology has higher safety and availability, and thus improves the students’ operation ability.

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Keyword: network teaching platform, system design, SQL

1 Introduction

Excellent course is a demonstration course with teachers, teaching content, teaching methods, teaching materials and first-class teaching management, etc. of first class. Excellent course construction is an import part of colleges and universities’ teaching quality and teaching reform project, while the network teaching platform construction is the core of the project. With the development of the computer technology and Internet technology, people are no longer satisfied with simple online course, but turn their eyes on the network teaching platform. Network teaching as a new way of learning are more and popular. Most of the existing network teaching platforms are developed basing on the WebService and P2P streaming media and the models have not yet divorced from the traditional teaching field. The teachers only show the teaching content by images, text, audio, video and so on, and the students only study teachers’
"courseware". The acceptance check for the after-school links can not be guaranteed. How much that the students have learning cannot be checked in a short time. That means, in fact, there is a disconnection between the students’ learning and teachers’ teaching.

In order to make up for the existing defects of network teaching platform, this article introduces the excellent course network teaching platform based on ASP.NET. It fully considers the user-centric theme, changing the traditional "teaching center" into "learning center". It can monitor the teaching in real time; follow the students’ learning; give feedback to the learning efficiency and guide timely. It makes up for the deficiency of single teaching material and closed learning, helping improve teaching quality [1].

2 ASP.NET System Structure

2.1 ASP.NET Overview

ASP.NET is a new technology developed by Microsoft Company, used to create Web applications on server-side. As a unified Web developing model, ASP.NET Web provides the developers with the necessary services for the generation of enterprise-class application by using a minimum. For ASP.NET is a part of .NET Framework, when the developers write ASP.NET application code, they can visit the classes in NET Framework. Developers can use any language that is compatible with the common language runtime (CLR) to write the application code. These languages include Microsoft Visual Basic, C #, and JScript.NET and J#. Using these languages can develop ASP.NET applications making use of the common language runtime, type, security, inheriting the advantages. ASP.NET structure

ASP.NET itself is a three-tier structure, namely the user presentation level, business logic level and database level [2] whose core is the Web form in the business logic level. It is the basis to present the data and information to users as well as to response and process the information and data created during the interaction of the user and the displayed Web form. Detailed structure showed as below diagram:

![ASP.NET Structure Diagram](image)

**User Presentation Level**: It is responsible for the interaction with the user. Receive users’ input, and then through the page controls, pass parameters to business logic level. At last, according to the processing results of business logic level, change the page displaying method, and then present to the user.

**Business Logic Level**: It is responsible for taking over the parameter from the user presentation level. Determine which service it is according to the parameter, and then call the component service and database to handle the user presentation level’ requests. Finally return the results to the presentation level.

**Database Level**: Access to the database through ADO.NET to provide data service to the business logic level.
3 Platform Analysis

According to the entity engaged in teaching activities, the system is divided into subsystems for teachers and students. For the network teaching platform requires constant maintenance and update, the system must have administrator subsystem. And Question & Answer subsystem plays an important role in network teaching platform, so Q & A subsystem is also required. Each subsystem will be further subdivided. They are independent and interconnected to each other forming.

3.1 Introduction of Platform Functional Modules

Management Module: It includes the management of teacher information, student information and other information. Teacher information mainly includes adding information of new teachers; updating the information of old teachers; updating course content, assignments, etc. Student information mainly includes adding information of new students and updating the upload homework by students. Other information mainly consists of changing password, updating the message board and information bulletins and so on. As the default accounts and passwords are the same when teachers and students first time log into the system, in order to protect personal information, the password should be changed again.

Teacher Module: The module's main function is to provide students with courseware, assignment and the corresponding data and correct the students' assignment timely. School assignment is one important factor to check the teaching quality and is also an important part in traditional teaching process. It can urge the students to learn knowledge; consolidate the knowledge that students have got. Teachers assign homework to students and answer the difficult question of students through chatting room. Students upload their homework, so that teachers can revise and evaluate.

Student Module: This module's main function is to study the courseware. Through the study, the students finish their assignment independently, and upload for teachers’ approval. Students can communicate with each other and teachers on chatting room and review the chatting record.

Question & Answer module: The module plays an indispensable role in enhancing the communication between teachers and students and helping students make clear of the problems and get the answers they really need and the information. When students encounter some difficult problems in the learning process, they can enter the Q & A module of the network teaching platform for a solution. Students can first enter into the question resource centre and search the problem resource to see if there has the same question. If so, the students can browse directly for answers. And if not, students can access to the question center and put forward their own new problems. When the teacher is online, they can get the answers in real time; when the teacher is not online, they can ask questions through the message board, and timely view the teacher's reply.

3.2 Platform flow chart

This network teaching platform decides whether one should register or not according to how long the students and the teachers have been into the school (that is, whether the old and new user). After entering the teaching platform, one can select the desired function for the corresponding operation according to his identification. One can review the introduction of course information and teachers in the front interface without ID authentication and read the announcement, news and information that have been released through a browser. Background system can upload courseware, assignments and so on. Specific operational procedures as shown below:
4 The Key Technologies for The Achievement of the Platform

4.1 Data Security (MD5 Encryption technique)

MD5 stands for Message-Digest-Algorithm 5 (Message - digest algorithm). It was developed by the MIT Laboratory for Computer Science and Ronald L. Rivest from RSA Data Security Inc in the early 90s and is widely used in encryption and decryption techniques and commonly used in file verification. No matter how big the file is, it can produce the only MD5 value after MD5. MD5 transforms "byte string" in any length into a large 128bit integer, and it is an irreversible string transformation algorithm. In other words, even if you see the source program and algorithm description, you still can not transform a MD5 value back to the original string. From the mathematical principle, that is because there is an infinite number of the original string. This is a bit like the inverse function does not exist in a mathematical function. The typical application of MD5 is generating fingerprint for a byte string in order to prevent "tampering." For example, when you write one passage in a readme.txt file, and generate a MD5 value for the readme.txt and record it, then you can send this file to someone else, if he/she modifies any content of the file, you will find it the time you recalculate MD5.

During the creation process of the platform, because the students and teachers should regularly upload and download the appropriate archive, it is likely to occur data loss and so on. For example, the students upload the compressed assignment to the teaching platform, or the teachers upload their own compressed courseware and other course content, due to network failure or other reasons, it may occur data loss and so on when the teachers unzip the assignment uploaded by the students or the students down the courseware. Therefore, to prevent this from happening, the platform uses MD5 encryption technique, which party A is on behalf of students, part B is representative of teacher. The specific encryption process is as follows:
Encryption process: 1 Message digest algorithm is published by the Party A; 2 According to the message digest algorithm, Part B to process the appropriate message digest on the original data; 3 Party A send the original data and the results of message digest to Party B; 4 Party B digests the original data after receiving from Party A; 5 Compare the digested information treated by Party A and Party B and see if the same.

Encryption algorithm as shown below, the places in the platform used data encryption should only this code.

```java
public static byte[] encryptMD5(byte[] data) throws Exception {
    MessageDigest md5 = MessageDigest.getInstance(KEY_MD5);
    md5.update(data);
    return md5.digest();
}
```

4.2 SOAP Security Mechanism

Business logic level uses the SOAP protocol to transmit message between WEB forms and XML, WEB server. Carry out the digital encryption of the message when the SOAP requested message is sent out. It must first obtain the pre-encrypted SOAP message, and then the users’ authentication information and come to the encryption object to encrypt the obtained SOAP message. Then it generates new SOAP messages according to the message encrypted. Carry out security testing frm the message sent out to receive, making the communication between the service requester and Web application under a secured and reliable condition. Encryption process as shown below [5]:

Encryption algorithm as shown below:

```java
public Message encryptSOAPEnvelope(SOAPEnvelope unsignedEnvelope, Message axisMessage) throws Exception {
    Document doce = unsignedEnvelope.getAsDocument();
    // Code to encrypt SOAP message
    return doce;
}
```
Document Doced = encrypt.build(doce, crypto);
Message encryptedMsg = (Message)AxisUtil.
toSOAPMessage(Doced);  // search and encrypt SOAP Message
soapPart=encryptedMsg.getSOAPPartAsString();
((SOAPPart)axisMessage.getSOAPPart()).setCurrentMessage(soapPart,SOAPPart.FormString);
Doced=axisMessage.getSOAPEnvelope().getAsDocument();……}

4.3 Database Access

ASP.NET accesses the database through ADO.NET. ADO.NET is a set of object-oriented class library which interacts with data sources, providing a rich set of components for creating distributed data sharing application. It provides accession to relational data, XML and application data, and therefore is an integral part of NET Framework. Using ADO.NET to access the database is an easy way to achieve a variety of programming and then completing the complexity operation of the database. The figure below shows the schematic of ADO.NET accessing the database [6]:

NET Framework data provider is a core element of ADO.NET structure. Its purposes are data handling and accession of data in fast, forward-only, and read-only. Connection object provides connectivity with data sources; Command object can visit database command that used for returning data, modifying data, running stored procedures and sending or retrieving parameter information; DataReader provides high-performance data flow from the data source. Finally, the DataAdapter provides the connecting bridge of DataSet object and data source; DataAdapter uses Command object to execute SQL command in data source in order to load data into the DataSet, and makes the DataSet data consistent with the data source. DataSet is the core component of ADO.NET disconnected structure. DataSet is designed to achieve independent access without connecting to any data source.

An example for ADO.NET database access: Server names “server”, database names “database”, user names “xsm”, password is “123456”, and then add a Button control to Default.aspx page for the implementation of the database connection. Specific code as follows:

Initial DataSource ="server=(localhost);
Catalog = database;
UID = xsm;
PWD = 123456";//set connecting string
SqlConnection con=new SqlConnection(DataSource);
con.Open();//open database connection
string Sqlstr="select * from Member";//process SQL command
SqlDataAdapter ada=new SqlDataAdapter(Sqlstr,con);
DataSet sa=new DataSet();
ada.Fill(sa);//Use the result of DataAdapter to fill the data sheet of DataSet object,names sa;
GridView1.DataSource=sa;
GridView1.DataBind();//data binding
con.Close();//disconnect database

4.4 Elevation of Learning

This learning platform by calculating the speed and learning of students and doing real-time tracking of study, provides different training focus for different students and gradually improves their operation abilities to make teaching, learning, doing three links closely linked.

(1) Learning speed: 

$$AVE = \sum TCpi / \left( \sum TCp / n \right)$$
n: number of learning; TCpi: time of learning the course; \( \sum TCpi \): the total study time of students passed the knowledge point of the course test. \( \sum TCp / n \): The total time of all students learn in the course; AVE: the average speed of all the knowledge points of the course.

(2) Learning Effectiveness Measurement: This platform evaluates the learning by the scores and learning time of students, and gives the appropriate weight, mainly through the following formula:

\[
E = \varphi(s) \cdot \alpha + \gamma(t) \cdot \beta
\]

\( \varphi(s) \): The ratio of student test score of corresponding knowledge point and the average scores of all students.

\( \gamma(t) \): The ratio of the time of student studying the appropriate knowledge points and the average time for all students

\( \alpha, \beta \): Weight

5 Conclusion

Online teaching solves the existence of bottlenecks and constraints of original educational technology. In the computer network environment, without time and space constraints, teachers can use the new teaching equipment to show the online teaching materials, make the classroom and after school more effectively, and process teaching activities efficiently. Excellent courses network teaching platform is the radiation carrier of online classroom, the world of online study, and also the media of teachers and students interaction. By using typical example and essence cases, this platform broadens students’ creative horizons; changes students’ passive learning to active study, and improves the students’ abilities in analyzing and solving problems. It not only enhances the interaction between teachers and students, but also improves students’ learning enthusiasm.

Reference


Figure 5. ADO.NET Schema