

# The Design and Research of Mixed Teaching Mode of Mathematics in Senior High School Based on Online Teaching Platform

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**Keywords:** Blended Teaching Mode, Online Teaching, High School Mathematics, ASP.NET.

**Abstract:** In view of a series of problems such as outdated teaching mode, fixed teaching content, and difficulty in teaching in senior high schools in China, this platform will take computer equipment as a server and combine Visual Studio, SQL server, IIS and other software programs to complete the system construction. The overall design and development of the system adopts B/S architecture. Under the framework of ASP.NET, C# language is adopted to complete the system design and development according to MVC pattern. This system has another aspx function page under the function module. Teachers can use User Add.aspx to add user pages to complete registration, and then use Courserware Add.aspx to add and upload new courseware. Students can also use Question Add.aspx to add comments and express their opinions, so as to improve the detailed functions of the system module. The realization of these system functions combines traditional classroom teaching with emerging online learning, changes the outdated teaching system, pays more attention to teaching effectiveness, improves students' learning efficiency, and at the same time meets students' individualized needs, opening up a new way for teaching.

## 1 INTRODUCTION

With the application and development of digital technology, a single teaching mode can no longer meet the needs of individuals and society, thus promoting the innovation of education mode. In the traditional classroom teaching, the teaching idea of "teaching for teaching and learning for teaching" is often emphasized, which to some extent ignores students' dominant position, is not conducive to cultivating students' autonomous learning ability and solidifies students' thinking. With the influence of this traditional teaching idea, senior high school mathematics has followed the traditional teaching mode, but there are still many problems in this teaching mode. First of all, high school mathematics still adopts the traditional classroom teaching mode, and the way of knowledge presentation is very simple, which reduces students' interest in learning. Secondly, the standard pursued by this teaching method in the teaching process is relatively fixed, which makes it difficult to take into account the individual differences of students and easily affects the learning effect. Finally, high school students'

learning consciousness is poor, and the completion rate of teachers' self-preview before class is low, which is not conducive to the development of the new curriculum and slows down the teaching progress. (Yang, 2020) Therefore, the teaching mode of high school mathematics needs further exploration.

Based on the above problems, this paper constructs an online teaching platform for high school mathematics blended teaching, using C# as the programming language, Windows 10.0 as the operating system, Visual Studio 2019 as the bottom development tool, and then completing the hierarchical design and perfecting the system according to MVC mode. The data storage is managed by SQL server database. By organically combining online teaching and offline learning on the platform, the traditional teaching structure is innovated, and the "teaching" center in the traditional classroom is changed into "learning" center. While cultivating students' self-learning ability, more attention is paid to students' dominant position in learning, which broadens students' mathematical logical thinking, improves the effect of

high school mathematics learning, and makes contributions to the comprehensive development of students.

## 2 INTRODUCTION OF KEY TECHNOLOGIES

### 2.1 Asp.Net

ASP.NET is a kind of Web development platform, which provides an overall programming framework for the subsequent development of the platform, is the infrastructure used for development, and also provides various required services for web programs. ASP.NET relies on HTTP protocol, and uses HTTP commands to set up two-way communication between browser and server. The ASP.Net can also realize caching, update the performance of some applications, and then cache frequently used pages of users and store them in temporary locations, which can retrieve these pages more quickly and give better feedback to users. (Ren, 2017)

### 2.2 B/S Structure

The browser/server structure needs to be deployed on the server side, and other software needed to access the website and run on the client side only needs to adopt the browser. Within the B/S framework, users express their needs at the client and enter the corresponding parameters, and then rely on the network to access the server. First, the logic layer solves the user's needs, then the data needs are transmitted to the database, and the specific content is executed by the server. Finally, the business logic layer accepts this kind of feedback information, so as to generate a web page that meets the user's needs. It can be seen that the logic of client and server in B/S structure is more concise and clear, and data processing can be more efficient.

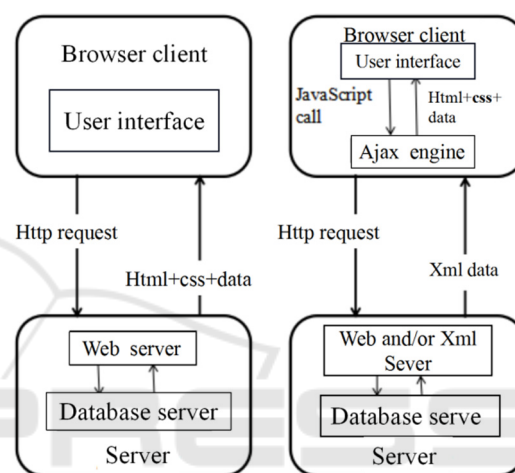
### 2.3 SQL Sever Database

The SQL Server is a database management system. Using SQL Server 2019, database users can easily publish the required information and data to the Web, and users can view the data stored in SQL Server through common browsers, which saves the query time and improves the operation efficiency. Therefore, the storage logic of SQL Sever database

is more concise and clear, and the data processing can be carried out more efficiently.

### 2.4 Ajax

The essence of Ajax is the engine tool between client and server. The information input by the client will not be completely received by the server, but Ajax will filter the information and send it to the server when there is a request for related data. (Ding, 2005) The Ajax can also dynamically respond to data, which improves the user's interactive experience. The model is shown in Figure 1.



Traditional web application model Ajax-based web application model

Figure 1: Comparison between Ajax and traditional web programs (Original)

### 2.5 Development Process

According to the introduction of the above-mentioned related technical contents, the configuration and deployment of online teaching platform development process of high school mathematics blended teaching mode are completed. In order to improve the system function of the high school mathematics teaching platform, the platform will be constructed by ASP.NET and other related technologies. The bottom development tool is Visual Studio 2019, and the operating system is based on Windows 10.0. In the aspect of web server, choose IIS version 10.0 to improve the operation ability of the server. The SQL server 2019 is selected as the data storage tool.

In the development process of the platform, first, choose Visual Studio 2019 tool in the menu, create the required project in the File section under the file, and select ASP.NET Web in the application. Then,

after the configuration attributes and paths of the newly created project are preset, click Next, select MVC in the pop-up window and name it, and then you can create ASP.NET MVC project to carry out the follow-up writing of online teaching platform of high school mathematics blended teaching mode. After the specific functional modules are configured, the simulation test is carried out. After that, publish the generated website to IIS, then create a new website project in IIS, select the advanced settings in the Manage Website page, and select the physical path. After the basic configuration is completed, the online teaching platform can be built. Through the description of the above key technologies, the overall framework of online learning platform is roughly planned, and the feasibility of establishing online teaching platform of college mathematics blended teaching mode is clarified.

### 3 OVERALL DESIGN OF THE SYSTEM

#### 3.1 Web Program

The Web program is an interface between the system and the user. Based on the web page, the user can delete or modify the browsing page, and the platform will store the user's operation to facilitate the user's second use. Finally, new results will be presented according to the user's actual operation requirements.

#### 3.2 Ajax Engine

The Ajax engine is between the program and the server, and is mainly used to handle some requests of users. In this platform, courseware uploading and online learning are frequently used functions. In order to ensure the synchronization between the use of the client and the operation of the server, ajax engine is introduced into the system. When the teacher submits the courseware, it only needs to be partially refreshed, so that the user can feel that the system and operation respond immediately, and the user's changed content can be displayed without reloading the page.

#### 3.3 Application Server

It is a background application server, which provides corresponding services for software. Its main functions include online learning for students,

uploading courseware for teachers, comments and exchanges between teachers and students, etc., which provides an important guarantee for the operation of the platform.

#### 3.4 Data Server

The courseware data, user information, learning modules and other data in the database are stored according to the established types, and the stored data are added, deleted and displayed. The results are interacted with the server, and finally transmitted to the client. (Hao, 2021) Its architecture is shown in Figure 2.

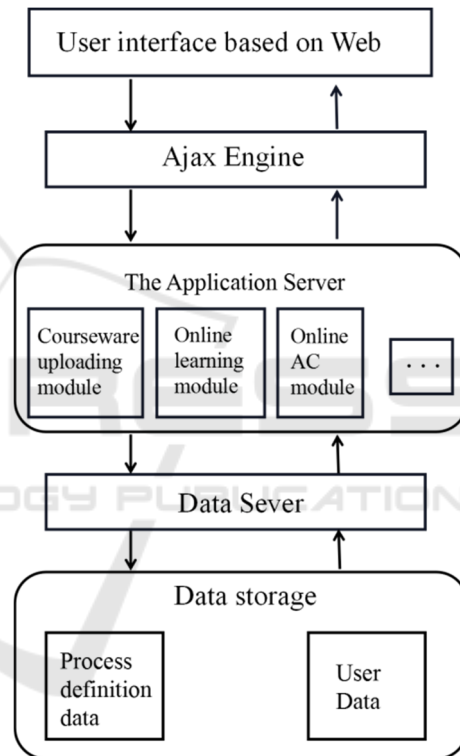


Figure 2: System architecture (Original)

The construction of this platform takes MVC pattern as the whole framework structure, and the development and creation are based on component-based layered development technology. Distributed multi-layer technology is an important development technology to create this platform. Using this technology can effectively realize the functions of the traditional pattern, and it has certain advantages in scalability and maintainability of the platform.

## 4 FUNCTION REALIZATION

### 4.1 Student Side

#### 4.1.1 Online Preview Module

In order to realize the organic combination of online and offline, this system divides the online learning module into the following three parts: basic knowledge preview, video course learning and thinking expansion. In the preview part of basic knowledge, students can learn independently in advance according to the math preview materials uploaded by teachers, so as to lay a knowledge foundation for offline classroom learning. In video course learning, it is divided into open class and video recording and broadcasting class. Students can watch according to their own learning habits, and adjust the video speed according to their own learning efficiency when watching, so as to achieve the fundamental purpose of practical mastery. The extended part of thinking mainly takes movies, documentaries or famous works related to mathematics as the specific content. (Ye, 2017) The content of this part shows that the knowledge of mathematics is not limited to those learned in high schools, and it covers a wide range of knowledge. For example, Peking University Peng Lizhong lectured on Advanced Mathematics, the film Beautiful Mind, the book Ancient Chinese Mathematics, etc. Learning these contents can stimulate students' interest in learning, enrich students' logical thinking ability, and prepare for subsequent teaching. The preview before class is an important part of laying a good foundation for the follow-up study. Only by previewing can you have a partial understanding of the knowledge to be learned, and it is easier to accept it in class. In the process of preview, you can communicate with the teacher in time through the online communication module, and the teacher will focus on explaining this knowledge point in the offline teaching. This kind of teaching is more targeted and can improve students' learning efficiency. Through the online preview module, students can get a general understanding of the knowledge they are going to learn, and to some extent, the difficulty of understanding high school mathematics is reduced. The students' autonomous preview code is shown in Figure 3.

```
function show - div(menu)
{ var Imgname;
if(documnant.all.item(menu).style.display = 'none')
{ documnt.all.item(menu).style.display = 'block' ;
Imgname = "images/Img"+menu+"-1.gif"
D ocutment.all.item("Img"+menu).src = Imgname;
else .
{ document.all.item(menu).style}display = 'none ";
Imgname = " images/Img"+menu+"-1. gif
documuent.all. ietm("Img"+menu).src = Imgname; .
< script language = " JavaScript">
</ scripts
```

Figure 3: Students' autonomous preview code (Original)

#### 4.1.2 Online Communication Module

When completing offline after-school practice assignments, students should upload their practice results and personal experiences to the personal center for evaluation by teachers and other students. In the meantime, under this module, students can publish the puzzles they encounter in their studies, and both teachers and students can participate in solving them, and teachers and students can actively communicate and exchange ideas. (Li, 2017)

#### 4.1.3 Online Test Module

In this module, students can use the system's automatic test paper generation function to select the content and difficulty for self-test, and students must attend the test content released by the teacher within the specified time. After the exam, the system will automatically upload the test papers answered by students to the teacher's personal center for teachers to correct. The test results and papers will be automatically shared with students, and the wrong questions in the papers will be analyzed in detail so that students can learn. The wrong questions in the exam will automatically generate a collection in the library, and students can do targeted exercises to ensure that the knowledge points can be fully mastered.

### 4.2 Teacher Side

#### 4.2.1 Resource Uploading Module

The teacher needs to upload the knowledge points of offline learning to the resource module in advance for students to preview online before class. When students preview before class, they will put forward doubts and difficulties, and teachers can carry out

targeted teaching design according to these contents, so that students can better master mathematics knowledge. At the end of online classroom teaching, teachers can also upload PPT courseware used in

class to the personal center, so that students can review after class online. The code of uploading data is shown in Figure 4.

```
public ActionResult Index()
foreach (string upload in Request.Files)
if (!Request.Files[upload].HasFile()) continue;
string mimeType = Request.Files[upload].ContentType;
Stream fileStream = Request.Files[upload].InputStream;
string fileName = Path.GetFileName(Request.Files[upload].FileName);
int fileLength = Request.Files[upload].ContentLength;
byte[] fileData = new byte[fileLength];
fileStream.Read(fileData, 0, fileLength);
const string connect=
@"Server=. \SQLExpress, Database= FileTest,Trusted_ Connection = True;";
using (var corm = new SqlConnection(connect))
```

Figure 4: Code of data uploading part (Original)

#### 4.2.2 Online Q&A Module

In the online teaching, teachers' responsibilities are more inclined to upload resources and organize and guide activities. In the classroom teaching, students seldom communicate with teachers because of their majesty or other reasons, thus reducing their enthusiasm for learning. In this module, teachers can not only correct the practice assignments uploaded by students, but also communicate online in time when facing students' questions, so as to solve problems more efficiently. In this pleasant learning atmosphere, teachers can also promote students' mastery of knowledge.

#### 4.2.3 Question Bank Management Module

In this module, it can be subdivided into automatic test paper and manual test paper. Automatic test paper generation means that the system can generate summary test papers according to users' needs, which is generally used for mid-term test or final test. The manual test paper generation means that the system generates the test paper according to the chapter and difficulty level selected by the user. In this module, the objective test questions are automatically marked by the system, while the subjective test questions need to be manually marked by the teacher, and finally the system automatically synthesizes the total score of the test paper.

## 5 CONCLUSIONS

In this paper, the hybrid teaching mode of senior high school mathematics based on online teaching platform has alleviated these problems to some extent, and changed the single offline teaching into multiple online and offline teaching, which met the individualized learning needs of students and increased the interest of senior high school mathematics teaching. The combination of platform teachers' "teaching" and students' "learning" not only improves students' learning ability, cultivates students' mathematical thinking, but also improves teachers' teaching and research ability, and at the same time opens up a new path for the teaching mode reform of other disciplines.

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