Online Resource Library in Mechanical Drawing Teaching Base on SQL Database

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Abstract. This study has constructed an online resource library for mechanical drawing on the Chaoxing SQL Server database. Chaoxing database is a cloud database SQL server provides comprehensive API interfaces and SDK, allowing users to develop based on their own needs. The resource library is a high-quality, diversified, and shared teaching resource library that conforms to the characteristics of vocational education. The resource library covers the entire process of daily teaching before, during, and after class, integrating various teaching applications in the classroom, mobile, and management into one solution. Users can access resource libraries through computers or mobile applications. This study is based on an online resource library and designs a blended teaching process that combines online and offline, in class and out of class, theory and skills. With the help of the resource library, learning is no longer limited to the classroom. The mechanical drawing teaching resource database established based on the Superstar database has been awarded the honor of "2021 Shanghai High Quality Online Course".

Keywords: mechanical drawing; online resource library; SQL database

1 Introduction

Mechanical drawing is one fundamental course of aircraft manufacturing majors and aircraft maintenance majors in Shanghai civil aviation college. Mechanical drawing can be used to conceptualize, analyze, and express engineering problems [1]. It can cultivate students' capability of three-dimensional imagination, reading design drawings, manual drawing, and computer drawing. Students will know part of national standards of mechanical drawing, and have the capability to search and use national standards in professional way.

The traditional teaching method of "Mechanical Drawing" course usually uses tools such as rulers, blackboards, charts, and models to analyze and explain knowledge points. However, the storage, transmission, and reproduction of information are limited, lacking means of "dynamic" presentation. With the continuous development of information technology, multimedia teaching has been widely applied in most universities'

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courses. Multimedia teaching has the characteristics of vivid and intuitive presentation, greatly improving the teaching effectiveness of the "Mechanical Drawing" course.

Modern information technology is used to integrate various high-quality resources. This resource library serves not only teachers and students but also employees of enterprises, continuing education participants, and other social learners. It aims to create a practical, professional, and practical open platform for the curriculum teaching resource library. The construction of the online teaching resource library for Mechanical Drawing is on the Chaoxing SQL database, and all resources are shared and open. Users can access the resource library through computers or mobile apps. [2]

2 Key Technologies

Chaoxing SQL Server database is a cloud database based on Microsoft SQL Server. Microsoft Cloud Database provides stable data storage and management services. The database has the following advantages: 1. High reliability: It adopts distributed storage technology with multiple copies of data backup to ensure data security and reliability. 2. High performance: It utilizes high-speed disks and multi-node load balancing technology to support high-concurrency requests. 3. High scalability: It supports horizontal and vertical scaling, allowing flexible expansion of node quantity and hardware configuration as the business grows. 4. Easy management: The database provides comprehensive API interfaces and SDK, allowing users to develop based on their own needs. It supports automatic backup, monitoring, and alarm functions, making it convenient for administrators to manage. This study mainly utilizes object-oriented technology, development-oriented JAVA language technology, and B/S platform technology.

SQL Server [3] is a client/server structured relational database management system that uses Transact-SQL statements to transfer requests between clients and servers.

SQL Server is a relational database management system. Under the multi-user and multitasking database operation environment of SQL Server, it provides management mechanisms such as data backup, error recovery, and security control. It also features centralized management server, enterprise-level data replication, parallel architecture, support for large-scale databases, and tight integration with OLE object technology. [4]

SQL Server uses Transact-SQL as its database query and programming language. Through Transact-SQL, you can access databases, query, update, and manage relational databases. SQL Server is tightly integrated with Windows Server and makes breakthroughs in security and support for multiprocessors. It can be run as a Windows Server service and can be conveniently started or stopped remotely. The basic process of using SQL Server database is as Fig. 1.

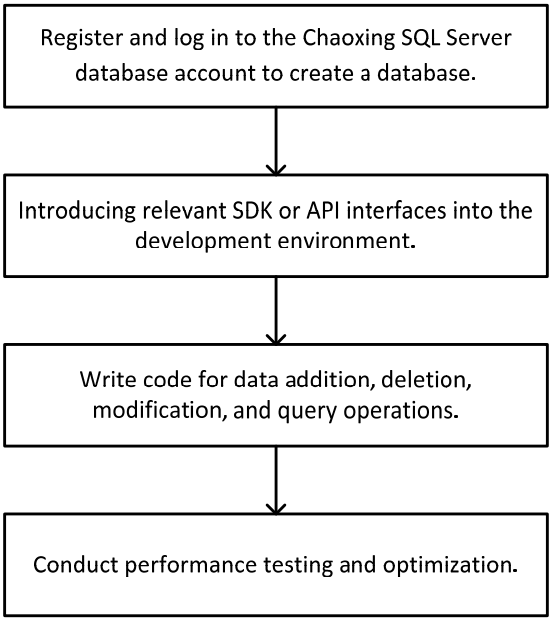

Fig. 1. Basic process of using SQL Server database

3 Requirements Analysis

The resource repository covers the entire process of pre-class, in-class, and post-class teaching, integrating various teaching applications for management terminals, student client and teacher client. It integrates the entire teaching process, including pre-class course preparation, student preview, in-class teaching and practical operations, and post-class review, assessment, and evaluation. It achieves real-time data collection, cloud-based analysis and processing, and real-time results feedback for the "online + offline" teaching process.

The teaching system mainly includes teaching resources, course management, project management, interactive teaching, training management, assignment and testing, analysis and evaluation, etc. The learning system mainly includes course selection, academic records, online learning and interaction, career positioning and navigation.

A rich online resource library allows students to utilize their time for self-learning. The online resource library has changed the traditional way of mechanical drawing teaching. Through various means such as animation, videos, and license question banks, students can learn and understand key knowledge easily.

4 Function Implementation

4.1 Management terminal

Based on tracking and analyzing data of teaching and learning, it provides managers with overall student learning monitoring, establishes a professional quality evaluation system, and integrates the process management model for teachers' teaching quality, workload statistics, teaching monitoring, and early warning. It promotes the linkage and organic combination of management departments, teachers, and students, thereby promoting the reform of classroom teaching. At the same time, it realizes management of misconduct. Through unique technologies such as AI face recognition in Chaoxing Era, it eliminates behaviors such as students watching videos, answering assignments, and taking exams through program codes. Other means are also used to solve the problem of artificial watching courses. [5]

For example, according to the requirements of the education personnel department, relevant data is entered, and teachers can directly access the relevant information of each student. They can also retrieve various keyword information through statistics. The specific code for student file update is as follows: (taking student file updating as an example, part of the code implementation is as Fig. 2)

```
public class UpdateStudentUser {
   private Connection conn=null;
   private PreparedStatement stmt=null;
   public void update(String id,String username,String password,String
role,String EmployeeID) throws SQLException{
        try{
             String
url="jdbc:mssql://localhost:3308/filems?auotReconnect=true&useUnicode
=true&characterEncoding=GB2312";
                 String user="name";
                 String pwd="12345";
                 Class.forName("MD library");
                 conn= DriverManager.getConnection(url,user,pwd);
          stmt= conn.prepareStatement(" update users set
username=?,passwords=?,role=?,EmployeeID=?where id=?");
          stmt.setString(1, username);
          stmt.setString(2, password);
          stmt.setString(3, role);
          stmt.setString(4, StudentID);
          stmt.setString(5, id);
       stmt.execute();
       }catch(Exception e){
             }
   }
}
```

Fig. 2. Play code of student file updating

4.2 Student Client

The student clients can access to rich teaching resources includes basic course information, Interactive mechanical drawing model, online learning resources and online forum. (Fig.3)

The learning content of the resource library strictly follows the national standards of Mechanical Drawing, based on the teaching laws and curriculum standards of vocational education, focusing on the cultivation of vocational abilities.[6]

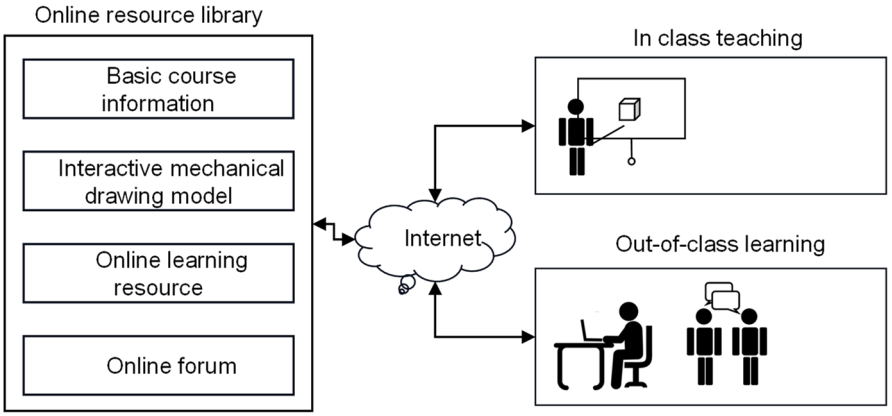

Fig. 3. Overview of online library and its usage

Basic course information Includes supporting textbooks, course introductions, teaching teams, relevant textbooks, relevant vocational certificates, Teaching plans, lesson plans, electronic textbooks, course assessment plans, learning guides, etc. [7].

Interactive mechanical drawing model includes more than 30 colored three-dimensional solid models, such as composite models, truncated solids, intersecting solids, sectional solid models, axis models, disk and lid models, box models, etc. Each model corresponds to a QR code, and students can learn the models by scanning the QR code with their smartphones.

The online resource library includes 1211 minutes of teaching video, multimedia courseware, 40 interactive animations, over 400 pages of PPT, and over 300 exercise resources.[8]

The resource library has also established a forum for students to interact with teachers. Using the forum, teachers can assign homework, conduct online tests, allow students to submit assignments online, provide feedback on assignments, provide online Q&A sessions, and gain timely understanding of students' knowledge mastery.

4.3 Teacher Client

The teacher client can build courses in the database, including videos, animations, PowerPoint, forums, etc. The teacher side also provides statistical analysis of each student's learning progress, including statistical analysis of individual students' course learning

progress (task completion status, video viewing duration, number of course learning discussions, etc.), chapter learning progress statistical analysis, and course learning access statistical analysis.

The online resource library has changed the teaching process. The teaching process can be combined online and offline. Now the teaching process is carried out in four stages: pre class guidance, in class learning, post class review, and extracurricular practice. (Table.1)

Teaching methods	Stage	Teachers' activities	Students' activities
Online	Pre class Guidance	Distribute preview task sheets;	Watch the videos; Complete pre class questions;
Offline	In class learning	Group teaching, Case teaching	Model making,
Online	After class review	Correct homework, Answer questions, Conduct group discussions	Complete the assignment and submit it, Watch the videos, Group discussions
Offline /online	Extracurricular practice	Organize drawing skills competition	Survey parts, Draw sketches based on CAD

Table. 1. Teaching process

Before class, teachers distribute preview task sheets through the forum of the resource library. The task sheets include Completing Pre class questions and watching teaching videos [9].

In the classroom, various teaching methods such as model making, group teaching, and case teaching are used to help students to learn, while developing their knowledge transfer and practical skills, and cultivating their comprehensive qualities.

After class, teachers use the online forum in the resource library to answer students' questions in time as well as conduct group discussions on the forum. Students can review courses in the online resource library [10,11].

After school, teachers will regularly organize drawing skills competition. In this competition, students will survey parts, draw sketches based on Catia. They are encouraged to access to information, design solutions, and implement them independently. Technical experts from aircraft manufacturing and maintenance enterprises are invited to guide students.

5 Result

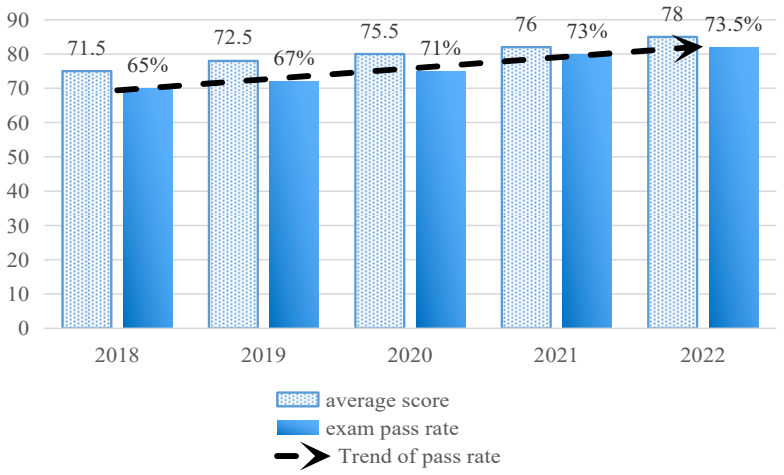

Fig. 4. students' score in mechanical drawing

Online resource library in mechanical drawing teaching base on SQL database changed the traditional teaching mode. This library help teachers design teaching activities, save preparation time, improve teaching efficiency, and improve learning quality. After implementation, the participation of students was 100%. Students' interest of learning increased significantly. According to database statistics, students' score significantly improved year by year (Fig. 4).The average score of mechanical drawing has increased from 71 points to 78 points, and the passing rate of exam results has increased from 65% to 73.5%. The trend of passing rate is increasing yearly.

6 Conclusion

The developed online resource library, which is based on Chaoxing SQL Server technology, has changed the teaching process of mechanical drawing in Shanghai Civil Aviation College. The mixed online and offline teaching process can ensure that students obtain deeper understanding of mechanical drawing and its application in aviation industry. Moreover, this course has won the honor of "Shanghai High Quality Online Courses in 2021". The resources of this course are opened on the database of Chaoxing. The achievement is worth promoting.

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