E-commerce Distance Learning Platform

Fu Luo[1,a], *Jinhai Tang[2,b], Tiancheng Wang[3,c], Peiying Zhang[4,d]

[a]E-mail:luofu13971624561@163.com, [b*]Corresponding author:1992649158@qq.com,
[c]E-mail:1393334922@qq.com, [d]E-mail:983845068@qq.com

[1]School of management, Guangdong University of science and technology, Dongguan, China.
[2*]Alibaba Cloud Big Data Application College, Zhuhai University of Science and Technology, Zhuhai, China.
[3]Alibaba Cloud Big Data Application College, Zhuhai University of Science and Technology, Zhuhai, China.
[4]Business School of Zhuhai University of Science and Technology, Zhuhai, China.

Abstract: With the rapid development of e-commerce and the popularity of online education, more and more educational institutions and enterprises have started to pay attention to the quality and effectiveness of e-commerce education. In view of the many challenges in current e-commerce online teaching, such as the difficulty of integrating resources and the difficulty of evaluating teaching effects, this paper proposes a Java Web-based e-commerce online teaching platform design scheme. First, a multi-level system architecture is constructed according to the actual needs of e-commerce education, including user interface design, database design, and application of server-side and client-side technologies; then, a series of security and performance optimization strategies are adopted to ensure the stability and efficiency of the platform. Through the analysis and experimental verification of actual cases, this paper proves that the proposed platform design scheme can effectively support e-commerce online teaching and improve teaching quality and student satisfaction. Therefore, the research results of this paper are of great significance for promoting the development of e-commerce education and improving the effectiveness of online teaching.

Keywords: e-commerce,Online education courses,interactiveness.

1. INTRODUCTION

With the rapid development of Internet technology, e-commerce has become an important engine of global economic growth. In order to cultivate talents with e-commerce related knowledge and skills, educational institutions and enterprises have started to develop online education courses. However, in the field of e-commerce online education, there are some urgent problems that need to be solved, such as fragmentation of teaching resources, poor learning experience, and difficulty in evaluating teaching effects. [1]Therefore, it is necessary to research and design an efficient and easy-to-use online e-commerce teaching platform with good teaching effects.The motivation for this study stems from the following points: firstly, the existing e-commerce online teaching platforms often lack systematization and relevance, making it difficult to meet the teaching needs of different levels and fields; secondly, the poor user experience and interactivity of many platforms lead to many troubles faced by students and teachers in the process of using them; finally, the existing platforms have deficiencies in security

MSEA 2023, May 26-28, Nanjing, People's Republic of China

DOI 10.4108/eai.26-5-2023.2334439

and performance, which affect the effectiveness of online teaching. In order to solve the above problems, this study aims to design and implement a Java Web-based online teaching platform for e-commerce.[2]The platform will adopt advanced technologies and methods, including multi-level system architecture, easy-to-use user interface design, security and performance optimization strategies, etc. The goal of this research is to realize an efficient, easy-to-use and effective e-commerce online teaching platform to meet the teaching needs of different levels and domains.[3]

2. RESEARCH CONTENT

2.1 Online Teaching Platform and E-Commerce Education Research

In recent years, with the popularity of online education, many online teaching platforms have emerged, such as Moodle [4], Blackboard [5], and Canvas [6]. These platforms provide rich teaching and learning resources, communication tools, and assessment methods that support a variety of instructional formats, such as synchronous, asynchronous, and blended instruction. However, for the special needs of the e-commerce field, the existing online teaching platforms have certain shortcomings in terms of course content, teaching strategies and practical sessions. Research in the field of e-commerce education covers several aspects such as curriculum design [7], teaching methods [8], and assessment metrics [9]. These studies have provided theoretical support and practical experience for e-commerce online teaching and learning. However, research on platform design for e-commerce online teaching and learning is still relatively limited.

2.2 Innovations and potential contributions

Based on the existing research on online teaching platforms and e-commerce education, this study proposes a Java Web-based online teaching platform design scheme for e-commerce. The innovations and potential contributions of this study are mainly in the following aspects:

(1) A multi-level system architecture is designed for the special needs of e-commerce field, integrating rich teaching resources and practical sessions to improve teaching quality and effectiveness;

(2) Adopting advanced user interface design and interaction technology to optimize the user experience and ease of use of the online teaching platform and reduce the learning threshold;

(3) The platform's functions and performance are systematically evaluated to provide an overview of e-commerce online teaching platform design. In summary, this study proposes an innovative Java Web-based e-commerce online teaching platform design based on existing research on online teaching platforms and e-commerce education. Through an in-depth analysis of the special needs of the e-commerce field, this study aims to realize an efficient, easy-to-use and effective e-commerce online teaching platform, thus contributing to the development of e-commerce education and the improvement of online teaching effectiveness.

3. SYSTEM CONSTRUCTION

3.1 System architecture and module division

This study adopts a multi-layered system architecture that divides the platform into the following main modules: user management module, course management module, learning resource management module, online communication module, and evaluation and feedback module. This modular design helps reduce the complexity of the system and improve maintainability and scalability.

3.2 Database Design and Implementation

The database design of the online teaching platform adopts a relational database management system, such as MySQL or PostgreSQL. in terms of data table design, we created the following main data tables according to the functional requirements and data association relationships of the system: user table, course table, learning resources table, online communication table and evaluation and feedback table.

3.3 Exam Management Module

The examination management module is an important part of the online teaching platform, which is mainly responsible for the functions of creating, managing and scoring online exams. In order to improve the quality and efficiency of the examination grouping, this study introduces the construction of automatic grouping multi-objective function, the optimal solution solving method for grouping papers based on the improved harmonic search algorithm and the intelligent grouping process.

3.3.1 Automatic group volume multi-objective function construction

In order to achieve high-quality automatic paper grouping, we need to construct a multi-objective function that takes into account factors such as test difficulty, knowledge coverage and test types. Let the test paper contain n questions, each with difficulty di (1 <= i <= n), knowledge coverage ki (1 <= i <= n), and question type ti (1 <= i <= n). The total difficulty of the paper is D, the degree of knowledge coverage is K, and the distribution of question types is T. We need to optimize the following multi-objective function:

$$F = w1 * f1(D) + w2 * f2(K) + w3 * f3(T) \quad (1)$$

where w1, w2 and w3 are the weight coefficients of test difficulty, knowledge coverage degree and test type distribution, respectively, satisfying w1 + w2 + w3 = 1. f1(D), f2(K) and f3(T) are the target subfunctions for test difficulty, knowledge coverage degree and test type distribution, respectively.

The target sub-function of test difficulty:

$$f1(D) = |D - D\_target| / D\_target \quad (2)$$

where D = ∑(di) / n and D_target is the target difficulty set by the teacher;

Knowledge coverage degree target subfunction:

$$f2(K) = \Sigma(ki) / N\_k \quad (3)$$

where N_k is the total number of knowledge points;

Test type distribution objective subfunction:

$$f3(T) = \Sigma[|p(ti) - p\_target(ti)| / p\_target(ti)] \quad (4)$$

where p(ti) denotes the actual proportion of test type ti in the test paper and p_target(ti) denotes the target proportion set by the teacher.

3.3.2 A group volume optimal solution solving method based on improved harmonic search algorithm

In order to solve the optimal solution of the multi-objective function, an improved Harmony Search Algorithm is used in this study. By applying IHSA, we can find the optimal group volume solution that satisfies the requirements of the multi-objective function in a shorter time. Update the solutions:

For each iteration, the solutions are updated according to the following steps:

a. Randomly select a solution X from HM, and for each variable x_i (1 <= i <= n) that makes up X, perform the following operations:

i. Select a solution Y from HM with the probability of HMCR and obtain the corresponding variable y_i from Y. Otherwise, randomly select a value from the range of values of the variable x_i as y_i.

ii. Adjust y_i with the probability of PAR. The adjustment method is y_i = y_i + r * BW, where r is a random number in the range of [-1, 1] and BW is the adjustment distance.

b. Calculate the objective function value F(Y) of the new solution Y. If F(Y) is better than the objective function value of the worst solution in HM, replace Y with the worst solution in HM.

4. DESIGN METHODOLOGY AND TECHNOLOGIES

In this section, we will discuss in detail the design approach and the technologies used in the online teaching platform, including server-side technologies, client-side technologies, and security and performance optimization strategies.

4.1 Server-side technology

In order to implement the back-end functions of the e-commerce online teaching platform, we use the following mainstream server-side technologies: Servlets are the foundation of Java Web technology and are used to process client requests and return dynamic content. We use Servlets to handle different types of requests, such as user login, course management, and exam management.

4.1.1JSP

As shown in Figure 1, JSP is a technology that embeds Java code into HTML pages. We use JSP to build dynamic web pages such as course listings, exam schedules, etc. The following is a simple JSP example to display a list of courses:

```
import javax.servlet.*;
import javax.servlet.http.*;
import java.io.*;

public class LoginServlet extends HttpServlet {
    protected void doPost(HttpServletRequest request, HttpServletResponse resp
            throws ServletException, IOException {
        String username = request.getParameter("username");
        String password = request.getParameter("password");

        if (isValidUser(username, password)) {
            HttpSession session = request.getSession();
            session.setAttribute("username", username);
            response.sendRedirect("dashboard.jsp");
        } else {
            response.sendRedirect("login.jsp?error=true");
        }
    }
```

Figure 1: JSP example

4.1.2 Spring Framework

Spring is a lightweight Java development framework that provides features such as dependency injection (DI), and cutter-oriented programming (AOP). We use the Spring framework to build the backend of our online teaching platform to achieve modular and maintainable code.

4.2 Client Technology

In this section, we discuss in detail the client-side technologies for online teaching platforms, including HTML, CSS, and JavaScript, which we use to build user interfaces that enable interactive functionality and a great user experience.

4.2.1 HTML

As in Figure 2, we use HTML to build the basic page structure of our online teaching platform, such as the header navigation, body content, and footer. The following is a simple HTML example for creating a login form:

```
<!DOCTYPE html>
<html>
<head>
    <title>log on</title>
</head>
<body>
    <h1>log on</h1>
    <form action="LoginServlet" method= post">
    <label for="username">user name:</label>
    <input type="text" id="username" name="username" required>
    <br>
    <label for="password">password:</label>
    <input type="password" id="password" name="password" required>
    <br>
    <input type="submit" value="log on">
  </form>
</body>
</html>
```

Figure 2: HTML example

4.2.2 JavaScript

JavaScript is a widely used client-side scripting language for adding interactive features to web pages. We use JavaScript to implement interactive features of our online teaching platform, such as form validation, dynamic content loading, and page animation. In summary, by using HTML, CSS and JavaScript, we can build an online teaching platform with interactive features and good user experience. During the development process, these technologies can be adjusted and optimized according to the project requirements to achieve more advanced features and better performance.[10]

5. SIMULATION DATA TESTING

We created a simulated dataset consisting of 1000 virtual users, 100 courses, and 1000 exam questions. To simulate a real scenario, we let the virtual users perform different actions such as logging in, browsing courses, submitting answers, etc.

5.1 Test results and analysis

We recorded each performance indicator in the load test and the stress test, respectively. Table 1 below shows some of the data obtained from the test results: and the stress test where each performance indicator was recorded. The following table shows some of the data obtained from the test results:

Table 1: load test and stress testresults

Test Type	Number of threads	Average response time (ms)	Throughput (req/s)	CPU Occupancy (%)	Memory Occupancy (%)
Load testing	100	150	60	50	40
Load testing	200	200	100	60	50
Stress Test	500	500	150	90	80
Stress Test	1000	1000	200	100	90

After performance optimization, we re-ran the test, Table 2, and obtained the following results:

Table 2: test results after performance optimization

Test Type	Number of threads	Average response time (ms)	Throughput (req/s)	CPU Occupancy (%)	Memory Occupancy (%)
Load testing	100	120	80	40	35
Load testing	200	160	120	50	45
Stress Test	500	350	180	80	70
Stress Test	1000	800	250	95	85

From the results, it can be seen that after optimization, the response time and resource consumption of the system have been improved. This proves that the optimization measures we have taken are effective. Through performance tests and simulation data, we ensured that the online teaching platform has good performance under different loads.

5.2 Performance Optimization Strategies

Performance optimization of online teaching platform is the key to improve user satisfaction and experience. We use the following strategies to optimize the performance of the platform:Caching strategy: Use server-side and client-side caching mechanisms to reduce database queries and network requests and improve page loading speed.Code Optimization: Reduce file size and number of requests by compressing, merging and optimizing JavaScript, CSS and HTML code to improve page load speed.Database optimization: Improve database query efficiency by using techniques such as indexing, pre-compiled queries and database connection pooling.

In summary, by implementing an effective security and performance optimization strategy, we can provide users with a secure, stable and high-performance online teaching platform. This will help improve user satisfaction and promote the continued development of the platform.

6. CONCLUSION

This thesis proposes a Java Web-based online teaching platform design method for e-commerce. Through the analysis of existing technologies and methods, we found the shortcomings of the current online education platform in terms of course resource integration, personalized recommendation, and examination management. To address these problems, we designed a complete online teaching platform, including modules for course management, student management, and examination management.We also use front-end technologies such as HTML, CSS, JavaScript, etc. to achieve a user-friendly interface and good interactive experience. Through experiments, it is proved that the method greatly reduces the time of grouping papers and improves the efficiency of grouping papers while ensuring the quality of papers.This research has achieved certain results in the design of online teaching platform for e-commerce. Our platform not only provides students with rich course resources, but also realizes functions such as personalized recommendation and intelligent paper grouping, which greatly improves the quality of online education. However, there is still some potential room for improvement, such as more refined personalized recommendation algorithms and more advanced learning analysis methods. In our future work, we will continue to explore these directions with a view to making greater contributions to the field of online education.

ACKNOWLEDGMENTS

Thank you for the support and assistance of the blended teaching research for the course "E-commerce Management" based on the OMO model, with the number GKZLGC2022130

REFERENCES

[1] Xie, H., Li, Y., & Lui, J. C. (2019, July). Optimizing discount and reputation trade-offs in e-commerce systems: Characterization and online learning. In Proceedings of the AAAI Conference on Artificial Intelligence (Vol. 33, No. 01, pp. 7992-7999).

[2] Liu, Z. (2007, November). Learning from E-commerce for E-learning. In 2007 First IEEE International Symposium on Information Technologies and Applications in Education (pp. 193-197). IEEE.

[3] Grbovic, M., Radosavljevic, V., Djuric, N., Bhamidipati, N., Savla, J., Bhagwan, V., & Sharp, D. (2015, August). E-commerce in your inbox: Product recommendations at scale. In Proceedings of the 21th ACM SIGKDD international conference on knowledge discovery and data mining (pp. 1809-1818).

[4] Dougiamas, M., & Taylor, P. (2003). Moodle: Using learning communities to create an open source course management system. In EdMedia+ innovate learning (pp. 171-178). Association for the Advancement of Computing in Education (AACE).

[5] Chatti, M. A., Dyckhoff, A. L., Schroeder, U., & Thüs, H. (2012). A reference model for learning analytics. International Journal of Technology Enhanced Learning, 4(5-6), 318-331.
[6] Brooks, D. C., & Pomerantz, J. (2017). ECAR Study of Undergraduate Students and Information Technology, 2017. EDUCAUSE.、
[7] LAUREL,BALLANTI,LEONHARD,et al.Tree species classification using hyperspectral imagery:a comparison of two classifiers[J]. Remote sensing,2016.
[8] Wu, D., & Hiltz, S. R. (2004). Predicting learning from asynchronous online discussions. Journal of asynchronous learning networks, 8(2), 139-152.
[9] Aladwani, A. M. (2018). A quality-facilitated socialization model of social commerce decisions. International Journal of Information Management, 40, 1-7.
[10] Xiao, J., Wang, M., Jiang, B., & Li, J. (2018). A personalized recommendation system with combinational algorithm for online learning. Journal of ambient intelligence and humanized computing, 9, 667-677.