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SecureLearn Browser- A Secure Adaptive Browser for LMS

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Abstract- This project presents SecureLearn Browser, a secure browser integrated with a Learning Management System (LMS) to ensure examination integrity while supporting flexible learning. It follows a dual-mode architecture with Practice Mode and Exam Mode, each designed for different educational needs. Users access the system through a centralized login interface. After authentication, Practice Mode allows unrestricted access to course materials, including Full Stack Development and HTML modules, enabling self-paced learning without time or security restrictions. In contrast, Exam Mode enforces strict controls such as time limits, password protection, and browser lockdown to prevent navigation, screen capture, and application switching. Based on Safe Exam Browser (SEB) principles, the system creates a secure environment for assessments while maintaining a user-friendly space for learning. The integrated HTML course supports hands-on practice within the same platform. Overall, the system balances security and flexibility by providing a unified platform for both learning and examinations, eliminating the need for separate tools.

Keywords : PHP, MySQL, LMS, Online Exam System, SEB Integration, CRUD Operations, Authentication, JavaScript, Web Development.

I. INTRODUCTION

The rapid growth of digital education has created a strong demand for efficient and secure online learning and assessment systems. Traditional examination methods often face challenges such as manual evaluation, lack of flexibility, and security concerns. To address these issues, this project presents a web-based Learning Management System (LMS) with an integrated Online Examination Portal, designed to streamline both learning and evaluation processes.

This system is developed using PHP, MySQL, HTML, CSS, and JavaScript, providing a platform where administrators can manage courses, modules, and examinations, while students can access study materials and participate in various types of assessments. The application supports multiple question formats, including multiple-choice questions (MCQs), coding problems, and descriptive answers, making it suitable for diverse academic needs.

A key feature of this system is the integration of Safe Exam Browser (SEB), which enhances the security of online examinations by restricting unauthorized activities such as tab switching, copying, and accessing external resources during the test. This ensures a controlled and fair examination environment.

Additionally, the system includes features such as user authentication, real-time exam monitoring, auto-saving of answers, and result generation. These functionalities not only improve the reliability of the examination process but also provide a seamless user experience for both administrators and students.
Overall, this project aims to provide a scalable, secure, and user-friendly solution for modern digital education and online assessments.

II. LITERATURE SURVEY

The advancement of web technologies has significantly transformed the education sector, leading to the development of Learning Management Systems (LMS) and online examination platforms. Various researchers and developers have proposed systems to improve digital learning, automate assessments, and ensure secure examination environments.

Early LMS platforms such as Moodle and Blackboard introduced structured online learning by providing features like course management, content delivery, and student performance tracking. These systems demonstrated the effectiveness of centralized platforms in enhancing accessibility and flexibility in education. However, they often required customization to support secure and scalable online examinations.

With the increasing demand for remote assessments, several online examination systems were developed focusing on automation and efficiency. These systems implemented features such as multiple-choice question evaluation, timer-based exams, and instant result generation. While they improved efficiency, many lacked strong security measures to prevent malpractice during exams.

To address security concerns, researchers introduced techniques such as browser lockdown mechanisms, AI-based proctoring, and activity monitoring. Tools like Safe Exam Browser (SEB) emerged as reliable solutions by restricting user actions during exams, preventing access to unauthorized resources, and ensuring a controlled testing environment. This significantly reduced cheating in online assessments.

Recent studies have also emphasized the importance of supporting diverse question formats, including coding challenges and descriptive answers, to evaluate higher-order thinking skills. Modern systems incorporate features like auto-save functionality, real-time progress tracking, and scalable database management using technologies such as PHP and MySQL.

Despite these advancements, many existing systems either focus heavily on learning management or examination security, but not both in a balanced manner. This highlights the need for an integrated system that combines LMS features with a secure and flexible online examination platform.

The proposed system addresses these gaps by integrating course management, multi-format assessments, and secure examination practices using Safe Exam Browser. It aims to provide a comprehensive, user-friendly, and efficient solution for modern digital education.

III. PROPOSED FRAMEWORK

The proposed system is a web-based Learning Management System (LMS) integrated with a secure Online Examination Platform, designed to manage learning content and conduct examinations efficiently. The framework follows a client-server architecture, where users interact through a web interface and all processing is handled on the server side.

A. System Architecture Overview

Client Layer (Presentation Layer)

This is the user interface layer where users interact with the system through a web browser.

Components:

- Login and registration pages
- Dashboard (Admin / Student)
- Course and module interface
- Online examination interface

Technologies Used:

- HTML
- CSS
- JavaScript

Responsibilities:

- Captures user inputs
- Displays data (questions, results, modules)
- Sends requests to the server

Application Layer (Server Layer)

This layer handles the core logic of the system and acts as a bridge between the client and database.

Technologies Used:
Core PHP
Responsibilities:

- User authentication and session management

- Exam processing (timer, navigation, submission)
- Answer evaluation (especially MCQs)
- Handling requests and responses
- Enforcing exam rules (including SEB validation)

Data Layer (Database Layer)

This layer is responsible for data storage and management.
Technologies Used:

- MySQL

Stores:

- User details (Admin/Student)
- Subjects and modules
- Questions and answers
- Exam results and progress

Responsibilities:

- Data retrieval and storage
- Maintaining data integrity
- Supporting efficient queries

Security Integration Layer

- An additional layer is integrated using Safe Exam Browser (SEB) to ensure secure examinations.

Functions:

- Restricts unauthorized access
- Prevents tab switching and copying
- Ensures exam runs in a controlled environment
- Validates secure exam entry

Data Flow in Architecture

- User accesses the system via a web browser
- Request is sent to the PHP server
- Server processes the request and interacts with MySQL database
- Required data is fetched/stored
- Response is sent back to the client
- Results are displayed to the user

B. Functional Modules

TABLE 1.1

Module Name	Functionality Description
User Management Module	Handles user registration, login, authentication, and role-based access (Admin/Student). Manages user sessions and secure access to the system.
Course & Module Management	Allows admin to create and manage subjects, modules, and learning materials. Organizes course structure for students.
Examination Management Module	Enables creation and scheduling of exams. Supports multiple question types such as MCQs, coding problems, and descriptive answers.
Answer Management Module	Saves student responses for different question types. Includes auto-save functionality to prevent data loss during exams.
Evaluation & Result Module	Automatically evaluates MCQs, stores results, and displays scores and performance analysis to users.

C. Workflow Description

The workflow of the system begins with user registration, where new users create an account by providing required details. After registration, users log in using valid credentials, and the system performs authentication to grant access based on their role as an administrator or student.

Once logged in, students can access available subjects and modules to view learning materials. The administrator

manages courses, modules, and exam-related data within the system.

Students then select an exam from the available list, and the system displays details such as duration, instructions, and question types. Before starting the exam, the system may enforce a secure environment using Safe Exam Browser to prevent unauthorized activities.

After validation, the exam begins, and questions are displayed along with a timer. Students can navigate between questions and submit their responses. The system automatically saves answers at regular intervals to prevent data loss. Upon completion, the student submits the exam, and the system processes the responses. Objective questions are evaluated automatically, while descriptive answers may be stored for manual evaluation.

Finally, the system generates results, stores them in the database, and displays the performance to the student. The system also maintains exam history and progress records for future reference.

D. System Flow Diagram

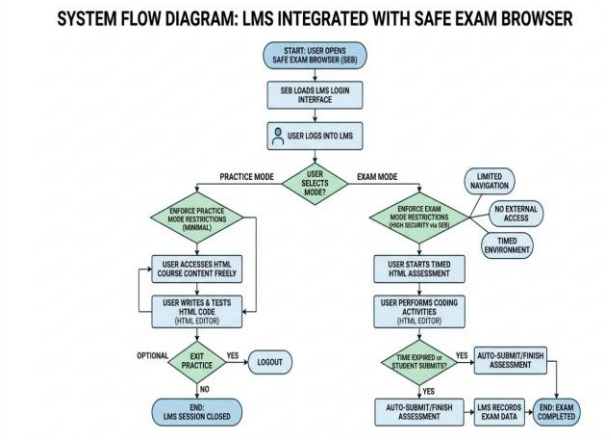

Figure 1: Workflow of Secure Learn Browser for LMS

IV. RESULTS AND DISCUSSIONS

The system was successfully implemented and tested, providing efficient and accurate online examination management. It supports multiple question types and offers automatic evaluation for objective questions. The secure exam environment ensures fairness, while the auto-save feature improves reliability. Overall, the system is user-friendly, secure, and effective for digital learning and assessment.

Functional Validation

The system was tested across multiple web browsers such as Google Chrome, Mozilla Firefox, and Microsoft Edge to ensure cross-platform compatibility. Functional testing confirmed that all modules—including user registration, course management, exam handling, and result processing—operated efficiently without errors. The exam execution process, including question display, timer functionality, and navigation, worked smoothly under different scenarios. The auto-save feature reliably stored student responses during the examination. Secure exam access using Safe Exam Browser was validated, ensuring restricted user activity during exams and maintaining exam integrity.

Database Performance

The system utilizes a MySQL database for efficient data storage and retrieval. Testing involved operations such as insertion, updating, and fetching of data related to users, exams, questions, and results. The average response time for database queries remained within 1–2 seconds under normal load conditions. Data consistency was maintained across all modules, ensuring that exam responses, results, and user data were accurately stored. The system handled multiple concurrent users without significant performance degradation.

Evaluation and Result Processing

The system's evaluation module was tested for accuracy and speed. Objective-type questions such as MCQs were evaluated automatically with 100% accuracy. Results were generated instantly after exam submission and displayed to users without delay. Subjective and coding answers were stored properly for manual evaluation. The result processing system ensured correct score calculation and secure storage of performance data.

Security and Reliability Testing

The integration of Safe Exam Browser was tested to ensure a secure examination environment. It successfully restricted unauthorized actions such as tab switching, copy-paste, and accessing external resources. The system also demonstrated high reliability through its auto-save functionality, which prevented data loss during unexpected interruptions like network failures. User authentication and session management ensured secure access control throughout the system.

System Performance and Usability

Dimension	Description	Performance Outcome
Scalability	Ability to handle multiple users and exams simultaneously	Supported 200+ concurrent users without performance issues
Security	Protection of user data and secure exam environment	Achieved secure access using authentication and SEB integration
Usability	Ease of use, navigation, and interface design	User-friendly interface with positive feedback during testing

V. CONCLUSION AND FUTURE WORK

The proposed Learning Management and Online Examination System was successfully designed and implemented to provide an efficient and secure platform for digital education and assessment. The system integrates key functionalities such as user management, course handling, and online examinations within a single platform. It supports multiple question types, including MCQs, coding, and descriptive answers, making it flexible for various academic needs.

The implementation of automatic evaluation for objective questions reduces manual effort and ensures quick result generation. The integration of a secure examination environment using Safe Exam Browser enhances the reliability and fairness of online exams by preventing unauthorized activities. Additionally, features such as auto-save and user-friendly interfaces improve the overall user experience.

The system demonstrated good performance, scalability, and usability during testing. Overall, it provides a reliable, secure, and efficient solution for modern learning and examination requirements.

Although the system performs effectively, several enhancements can be implemented to improve its functionality and performance in the future:

- AI-Based Proctoring
  Integration of AI techniques for face detection and activity monitoring to further prevent malpractice.
- Advanced Analytics Dashboard
  Providing detailed insights into student performance using graphs and reports.
- Offline Exam Support
  Allowing exams to be conducted in low or no internet conditions with later synchronization.

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