IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 7, May 2025
Impact Factor: 7.67

The Development of an Interactive Learning Management System with Real Time Assessment Features

Mr. B. Venkatesh, M.E., M. K.Ramprasath, G. Tamizhinian, J. Jayachandar
Assistant Professor, Department of Information Technology
Students, B. Tech, Final Year,Department of Information Technology
Anjalai Ammal Mahalingam Engineering College, Thiruvarur, India

Abstract: *This project introduces a performance-oriented, web-based Learning and Assessment System tailored for employee training and evaluation within corporate environments. Designed to support internal upskilling, the system empowers administrators to create and assign custom assessments to selected employees, enhancing targeted learning and ensuring workforce competency. Developed using Golang for a high-efficiency backend, Vue.js for a responsive and intuitive frontend, and MariaDB for secure data management, the platform ensures reliability and speed across functions. A unique feature of the system is the integration of course materials that users must study before taking assessments, with access duration configurable by the admin to enforce structured learning. Post-assessment, the system leverages AI-driven analytics to evaluate user performance and recommend relevant courses to address knowledge gaps and strengthen skills. Real-time scoring, instant feedback and detailed performance analytics enable data-driven decision-making for both users and management. With modules for group creation, question banks, access control, retesting and feedback, the system offers a comprehensive solution for managing corporate learning workflows. This intelligent, modular platform enhances employee development, drives continuous learning and supports strategic talent management in organizations.*

Keywords: Learning Management System, Online Assessment, User Authentication, Exam Management, Question bank, Result Analysis, Web based education, Real-time Analysis

I. INTRODUCTION

The rapid advancement of digital technologies has significantly transformed the education landscape, paving the way for interactive and personalized learning experiences. Traditional methods of classroom teaching and paper-based assessments no longer meet the dynamic needs of modern learners. To bridge this gap, Learning Management Systems (LMS) have emerged as vital platforms that facilitate the distribution of content, management of learners, and delivery of assessments. However, many existing LMS platforms lack real-time capabilities and personalized assessment mechanisms that enhance learner engagement and performance tracking.

This project focuses on the development of an Interactive Learning Management System with Real-Time Assessment Features. The system is designed to offer seamless content delivery, flexible user management, and structured exam functionalities. It integrates user authentication, group management, exam participation, question banks, and result analysis within a single platform. Real-time evaluation and automated feedback mechanisms are incorporated to help both learners and educators monitor progress effectively and make data-driven improvements.

Technologies used in the project include Golang for backend API development, MariaDB for efficient data storage, and Vue.js with Vuetify for building an intuitive and responsive user interface. The system also incorporates robust testing practices such as unit testing and API testing to ensure reliability. By combining modern web development practices with educational needs, the project aims to create a comprehensive, scalable, and adaptive learning ecosystem.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 7, May 2025
Impact Factor: 7.67

II. ROLE-BASED ACCESS CONTROL (RBAC) ALGORITHM

Role-Based Access Control (RBAC) is a security algorithm that governs user permissions based on their assigned roles. It is essential in this project for ensuring that users, such as students, instructors, and admins, only access functionalities relevant to their responsibilities. RBAC enhances system security and maintains workflow clarity by restricting unauthorized operations.

RBAC consists of several core components that work together to enforce controlled access:

- **Users**: Represent individuals who interact with the system (e.g., learners, teachers, administrators). Each user is uniquely identified and assigned one or more roles.
- **Roles**: Define a set of permissions associated with a specific function or responsibility, such as "Student", "Instructor", or "Admin".
- **Permissions**: Specific actions allowed on system resources, such as createExam, attemptTest, viewResults, or manageUsers. These are granted to roles rather than directly to users.
- **Sessions**: Track user login events and associate them with temporary activation of one or more roles during a session.

In the context of the Learning Management System, when a user logs in, the RBAC algorithm checks the user's role and dynamically enables or disables UI features and API access accordingly. For instance, a student can only view assigned exams and attempt them, while an admin has access to create exams, manage groups, and analyze results.

RBAC is ideal for scalable systems where users have distinct roles and responsibilities. It simplifies permission management, improves security, and provides flexibility when expanding the system to include new user types or modules.

III. PROBLEM STATEMENT

- Traditional Learning Management Systems (LMS) often provide static content and assessments that do not cater to the individual needs and learning pace of users. This one-size-fits-all approach results in reduced engagement and limited knowledge retention, especially for diverse learner groups. Manual exam creation and result evaluation also increase administrative workload and introduce delays.
- Many existing systems lack real-time assessment capabilities and fail to provide instant feedback to learners. Educators are often unable to monitor individual progress effectively due to poor analytics and limited reporting features. The absence of adaptive workflows and secure access control makes it difficult to scale the system for diverse academic environments.

- The proposed system is an interactive LMS with real-time assessment features, designed to offer personalized learning, instant result generation, and smart performance tracking. It integrates secure user authentication, automated exam management, and result analytics using modern web technologies. This improves learning efficiency, supports educator decision-making, and ensures a smooth and scalable user experience.

IV. EXISTING SYSTEM

- Most traditional Learning Management Systems (LMS) are static platforms focused primarily on content delivery and scheduled assessments.
- These systems typically lack the following features:
  I. Real-time feedback and result generation
  II. Dynamic assessment tools like randomized questions and timed exams
  III. Performance tracking dashboards for educators and learners
- Framework & Methodology:
  I. Learners access content and take periodic exams that are manually created and graded
  II. Educators analyze student performance offline or through exported reports

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 7, May 2025
Impact Factor: 7.67

- Limitations Identified:
  I. No adaptive learning or personalized exam flows
  II. Delayed feedback and result visibility
  III. Minimal security and role-based access control

V. PROPOSED SYSTEM

- The proposed system is an Interactive Learning Management System with integrated real-time assessment features for enhanced educational engagement and efficiency.
- It enables users to log in based on roles (student/admin), create or join groups, attempt randomized assessments, and receive instant result feedback after submission. All operations are managed via secure REST APIs, Vue.js frontend, and a Go-based backend, with MariaDB storing exam and user data.
- Admin users can create question banks, exams, and assign them to specific groups. Learners receive real-time evaluation upon submission, and the system tracks retakes with restrictions. Analytics modules allow educators to visualize performance patterns and intervene accordingly.
- The system is scalable, secure, and lightweight—equipped with API testing, unit testing, and modular design using Vuetify UI for seamless user interaction. This modern solution bridges the gap between passive content delivery and active learning with timely feedback and personalized workflows.

VI. ADVANTAGES OF PROPOSED SYSTEM:

Real-Time Adaptive Learning Modules: The LMS incorporates adaptive learning modules that adjust the difficulty and content delivery based on the learner's progress. The system monitors performance and tailors the learning experience in real-time, ensuring that each employee receives content suited to their current skill level. This personalized approach increases learning efficiency by focusing on areas that require the most attention.

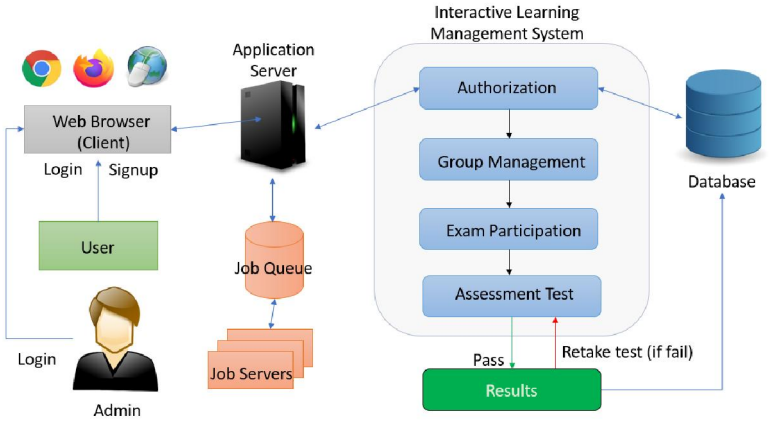
Immediate Feedback on Assessments: One of the core features of the LMS is the real-time feedback provided immediately after each assessment. Employees receive instant, detailed feedback on their performance, which helps them understand their strengths and areas for improvement. This immediate feedback loop fosters a continuous learning environment, ensuring that employees can address knowledge gaps promptly and move forward in their training.

Detailed Performance Analytics: The system offers comprehensive performance analytics for both employees and administrators. Employees can track their own progress over time, while administrators can analyze overall performance data across teams or departments. It performs effectiveness, and make informed decisions about future training initiatives.

AI-Driven Personalized Learning Paths: The LMS leverages AI-powered recommendations to create personalized learning paths for each employee. By analyzing performance data and engagement patterns, the system suggests tailored courses or materials that align with the employee's unique learning needs. These dynamic learning paths evolve as the employee progresses, ensuring that the system continuously adapts to their development.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 7, May 2025
Impact Factor: 7.67

VII. SYSTEM ARCHITECTURE



VIII. MODULES

List of Modules:

1. Create Group Module
2. Create Question Bank Module
3. Create Exam Module
4. User Login Module
5. Result Analysis Module

1. Create Group

The Create Group Module allows administrators to create and manage user groups such as classes or batches. Each group can be assigned specific exams and monitored independently. It includes features like group naming, user assignment, and role mapping. This promotes structured learning and easier exam administration.

2. Create Question Bank

This module enables admins or instructors to create and manage a centralized question bank. Questions can be categorized by topic, difficulty level, and exam type. It supports MCQs with multiple options, correct answer tagging, and question editing. Stored questions are reusable across different exams, improving efficiency.

3. Create Exam

The Create Exam Module lets authorized users configure exams with specific start times, durations, and question sets. It allows selecting questions from the question bank and setting scoring rules. Admins can assign exams to specific groups or users with attempt limits. This module ensures controlled exam scheduling and consistent evaluation parameters.

4. User Login

This module handles user authentication using secure credentials and JWT-based sessions. It verifies email and password, assigns role-based access, and redirects to role-specific dashboards. Login attempts are validated with real-time API checks and stored securely in the database. It forms the foundation for secure access to personalized features of the LMS.

5. Result Analysis

The Result Analysis Module processes exam submissions and calculates scores based on predefined answer keys. It generates performance summaries for each user and supports detailed reports like topic-wise analysis and accuracy rate. Admins and instructors can view group-wise analytics, identify weak areas, and export reports. This module enhances learning outcomes by enabling data-driven insights and continuous performance tracking.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 7, May 2025
Impact Factor: 7.67

By turning raw exam data into actionable insights, the Result Analysis Module enhances learning outcomes through continuous performance monitoring, early intervention mechanisms, and evidence-based academic planning. Integration with email or LMS notifications can also trigger automated feedback or suggestions for improvement based on individual results.

IX. CONCLUSION

The development of an interactive Learning Management System (LMS) with real-time assessment features successfully. Addresses the growing demand for efficient, accessible, and engaging educational platforms. By incorporating user roles, dynamic assessments, automated grading, progress tracking, and personalized learning paths, the system enhances both teaching and learning experiences. It simplifies course delivery for instructors while providing timely feedback and flexibility to learners. The integration of real-time technologies such as Web-Sockets and adaptive learning logic ensures that the platform remains modern, scalable, and user-centric. Overall, this LMS serves as a robust foundation for digital education across academic and professional environments.

REFERENCES

[1]. Al-Fraihat, D., Joy, M., & Sinclair, J. (2020). “Evaluating E-learning systems success: An empirical study”. Computers in Human Behavior, 102, 67–86.

[2]. Anderson, T. (2004). “Toward a theory of online learning”. In T. Anderson & F. Elloumi (Eds.), “Theory and Practice of Online Learning”. Athabasca University Press.

[3]. Blei, D. M., Ng, A. Y., & Jordan, M. I. (2003). “Latent Dirichlet Allocation”. Journal of Machine Learning Research, 3, 993–1022.

[4]. Brusilovsky, P., & Millán, E. (2007). “User models for adaptive hypermedia and adaptive educational systems”. The Adaptive Web, 3–53.

[5]. Dagger, D., O'Connor, A., Lawless, S., Walsh, E., & Wade, V. (2007). “Service-oriented e-learning platforms: From monolithic systems to flexible services”. IEEE Internet Computing, 11(3), 28–35.

[6]. Ferreira, H. S., & Andrade, A. (2020). “Design and development of adaptive learning environments: A systematic literature review”. Interactive Learning Environments, 1–17.

[7]. Kumar, V., & Sharma, R. (2021). “Machine learning approaches for grading short answers: A survey”. Artificial Intelligence Review, 54, 137–162.

[8]. Romero, C., & Ventura, S. (2020). “Educational data mining and learning analytics: An updated survey”. Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery, 10(3), IEEE 1355.

[9]. Tan, S. C., & Chan, C. K. (2017). "Learning from emerging technologies: Theoretical and methodological perspectives”. British Journal of Educational Technology, 48(3), 845–850.

[10]. Tarus, J. K., Niu, Z., & Yousif, A. (2018). “A hybrid knowledge-based recommender system for e-learning based on ontology and sequential pattern mining”. Future Generation Computer Systems, 72, 37–48.