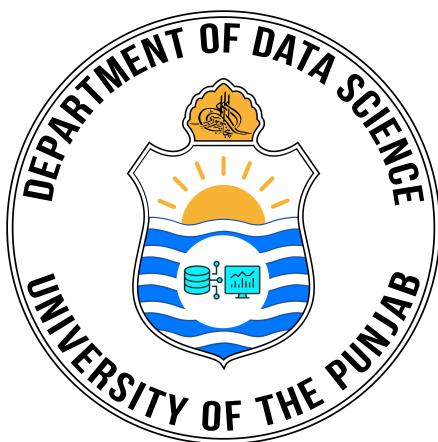


Final Year Project Proposal

MoodleIQ: Smart Grading Quiz AI



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Executive Summary

This proposal outlines the development of **MoodleIQ**, an AI-powered plugin for the Moodle learning management system aimed at streamlining educational workflows. The goal is to support educators by automating the creation of quizzes and assignments, while also evaluating the descriptive answers of students using artificial intelligence.

The system will be developed using an agile software development approach to ensure flexibility and iterative improvement. It will begin with analyzing Moodle's existing plugin architecture to identify key integration points suitable for AI components. Technologies such as MySQL, PHP, and Python will be used to create the backend infrastructure. Once development is complete, the plugin will undergo extensive testing in real-life classroom scenarios.

This includes unit testing, integration testing, and user acceptance testing to ensure stability and reliability. Deployment will take place in a controlled test environment within Moodle, accompanied by detailed documentation and user guides to assist instructors in adopting the system efficiently. MoodleIQ is expected to offer a range of impactful features. It will generate quizzes and assignments tailored to course material, automatically grade students' answers with detailed feedback, and send grade notifications via email. Furthermore, both students and instructors will have access to real-time performance dashboards for tracking progress.

Contents

Contents	3
List of figures	4
List of tables	5
1 INTRODUCTION	6
1.1 Background	6
1.2 Problem Statement	6
1.3 Project Goals Objectives	7
1.4 Scope	7
1.5 High-level System Components	7
1.5.1 Web Application	7
1.5.2 Backend Services	8
1.6 Application Architecture	8
1.7 User Case Diagram	9
1.8 System Limitations and Constraints	10
1.8.1 Limitations	10
1.8.2 Constraints	10
1.9 Tools and Technologies	11
1.10 Related Literature Review	12
1.10.1 Related Work	12
1.10.2 Gap Analysis	13
References	14

List of figures

1.1	System Architecture	9
1.2	User Case Diagram	9
1.3	Plugin WorkFlow	12

List of tables

1.1 Tools and Technologies Used	11
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Chapter 1

INTRODUCTION

1.1 Background

With the rapid popularization and development of the Internet, the construction of digital learning systems has become an integral component of many educational institutions. Numerous studies have emphasized that learning through digital platforms positively influences student engagement, autonomy, and performance [1], [2].

Moodle, one of the most widely adopted open-source Learning Management Systems (LMS), supports both blended and fully online learning models and provides core functionalities such as course content delivery, quiz creation, discussion forums, and grading. However, while Moodle offers robust functionality, researchers have pointed out that its default user interface often lacks the intuitiveness and interactivity found in modern AI-driven e-learning platforms [3].

In light of these limitations, there is an increasing demand for intelligent automation and personalization in digital education. The post-pandemic shift toward hybrid and remote learning has further highlighted the necessity for adaptive, AI-enhanced learning environments capable of auto-grading assignments, generating personalized quizzes, and providing instant feedback [4], [5].

According to recent studies, integrating artificial intelligence into LMS platforms significantly enhances the scalability and efficiency of online teaching by automating routine tasks and supporting personalized feedback [6]. Furthermore, AI-based assessment tools have demonstrated strong potential in evaluating subjective content, such as essays and open-ended responses, with a degree of consistency comparable to human grading [7]. These developments reflect a growing trend toward intelligent, data-driven education systems that can adapt to diverse learner needs while reducing educator workload [8].

1.2 Problem Statement

Moodle and similar LMSs rely on manual assessment workflows, slowing down the teaching process and creating bottlenecks for educators. This limits timely feedback, reduces opportunities for personalized learning, and increases instructor workload. An AI-powered plugin is

needed to automate assessments, generate instant feedback, and dynamically adapt learning materials—enhancing efficiency while improving student outcomes.

1.3 Project Goals Objectives

The main goals and objectives of this project are:

- To develop an AI-powered Moodle plugin that automates quiz and assignment generation.
- To implement automated grading for text-based student responses using NLP techniques.
- To reduce the manual workload for educators and improve feedback turnaround time.
- To enhance student engagement through personalized and adaptive assessments.
- To integrate performance dashboards for teachers and students for real-time tracking.
- To ensure the plugin is scalable, modular, and compatible with standard Moodle installations.

1.4 Scope

This project focuses on developing a modular AI plugin for the Moodle platform that automates the generation and grading of quizzes and text-based assignments. The plugin will use Natural Language Processing (NLP) to evaluate student responses and provide instant feedback. It will include dashboards for students and instructors, email notifications, and support for adaptive learning. The system will be designed to work within existing Moodle installations and will be scalable for future enhancements. Integration with core Moodle features and usability across multiple academic departments is also within scope.

1.5 High-level System Components

The system is structured into the following modules, categorized by functionality:

1.5.1 Web Application

- **Authentication Module:** Manages secure user login and role-based access. Supports integration with institutional Single Sign-On (SSO) and Google account login to enhance user convenience.

- **Student Interface Dashboard:** Offers students a personalized interface displaying their enrolled courses, assignment and quiz progress, grading summaries, AI-generated feedback, and overall learning analytics.
- **Assignment Upload System:** Facilitates the submission of assignments and academic papers in various formats, including document files and text form. Submitted work is automatically processed through the AI-based grading.
- **Intelligent Quiz and Paper Assessment:** Allows students to participate in quizzes and upload academic content, which is evaluated using advanced AI techniques. The evaluation is based on content quality, relevance to the topic, and depth of understanding, resulting in automated scoring.

1.5.2 Backend Services

- **AI-Based Grading Engine:** Employs transformer-driven large language models (e.g., LLaMA-3.3-70B) to assess student submissions. It generates objective scores and constructive feedback for quizzes, written tasks, and academic reports.
- **Quiz and Assignment Generation Module:** Generates intelligent and context-aware quiz items using fine-tuned generative language models. The module dynamically creates MCQs, fill-in-the-blank questions, and short-answer prompts aligned with Bloom's Taxonomy levels and course learning objectives (CLOs).
- **Data Management Evaluation Layer:** Leverages cloud-based storage (e.g., AWS S3) for scalable content retention. Academic metadata including quiz responses, AI scores, and feedback history are stored in relational databases (PostgreSQL). Semantic embeddings are indexed and searched via vector databases like Qdrant to support fast similarity lookups during grading.
- **Student Progress Tracker Analytics:** Captures and aggregates student activity logs, assessment history, and AI-generated insights. Offers dashboards for instructors to monitor academic trends, identify learning gaps, and adjust teaching strategies.[9].

1.6 Application Architecture

Our application is based on three-tier architecture. The first layer which is the Presentation layer which is directly accessible by the End-Users, business logic layer(Backend Services) and the data storage layer. 0.4

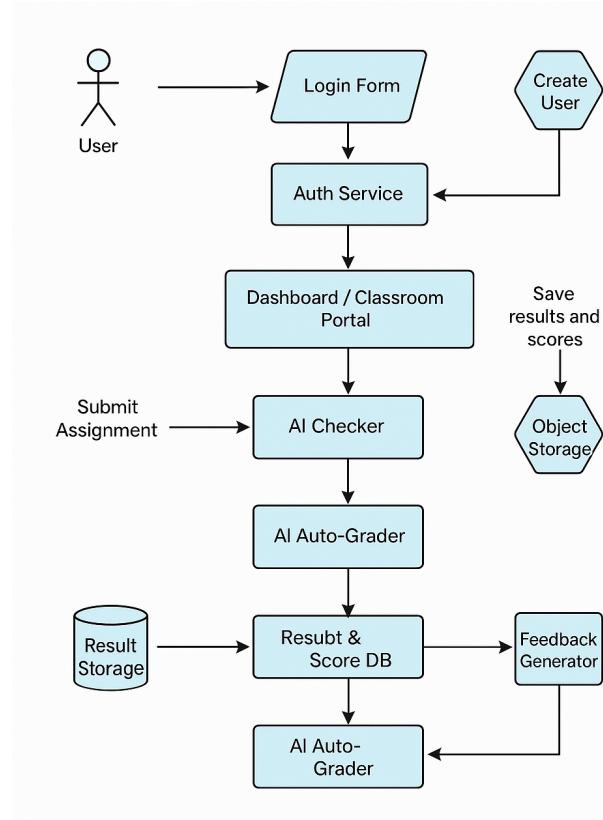


Fig. 1.1. System Architecture

1.7 User Case Diagram

This use case diagram illustrates the user's interaction with key system functionalities, including login, submission, and AI-based evaluation.

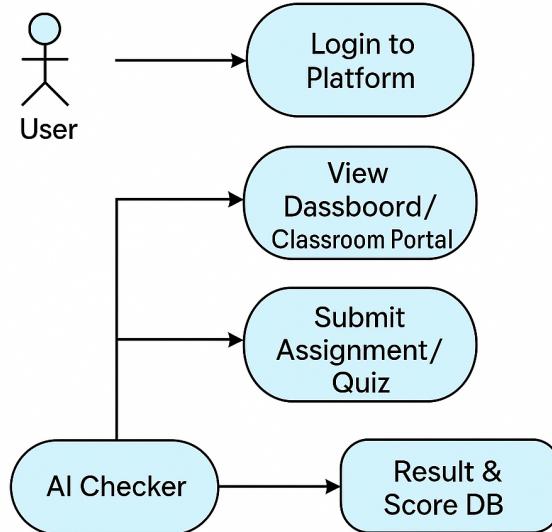


Fig. 1.2. User Case Diagram

1.8 System Limitations and Constraints

1.8.1 Limitations

- Internet issues can affect real-time AI features like quiz generation and assignment grading.
- AI may struggle with poor grammar, slang, or non-English text in quizzes and assignments.
- Auto-grading can miss subjective aspects like creativity or critical thinking in student submissions.
- Integration between Moodle (PHP) and AI modules (Python) may face technical challenges.
- AI-generated quiz questions may sometimes be irrelevant or require manual review.

1.8.2 Constraints

- This project is limited only to AI-based quiz generation, assignment auto-grading, and student performance dashboards within Moodle. Other Moodle features such as forums, chats, or live virtual classes are not covered.
- The project will be developed within a limited timeline (Q3 2024 to Q3 2025) and by a small development team of four members, which may limit the number of advanced features or large-scale testing.
- Only open-source AI tools, models, and libraries will be used due to budget restrictions. Paid APIs, commercial LLMs, and premium cloud services are excluded from the scope of the project.

1.9 Tools and Technologies

Table 1.1. Tools and Technologies Used

Tool/Technology	Description and Version
Moodle	Open-source Learning Management System (v4.x)
PHP	Backend language for Moodle plugins (v8.1)
Python python2024	Primary language for AI modules (v3.11)
FastAPI fastapi2024	API framework for serving AI models (v0.115)
MySQL / MariaDB PostgreSQL	Database for Moodle data storage (v10.6+) Database for storing AI-generated data, quiz logs, and analytics (v15.x)
HuggingFace Transformers LLaMA Models (Meta AI)	NLP library for text-based AI tasks (v4.x) Large Language Models for generating quizzes, evaluating text answers, and grading (LLaMA 3.x)
Scikit-learn Qdrant / FAISS	Machine Learning for prediction models (v1.x) Vector databases for semantic search, plagiarism detection, and advanced grading (latest version)
Docker	Containerization for AI microservices
GitHub	Version control and collaborative development
Postman	API testing and integration
VS Code	Code editor for plugin and model development
Apache / Nginx	Web server software to serve Moodle LMS to users (most common choice; Moodle supports both)

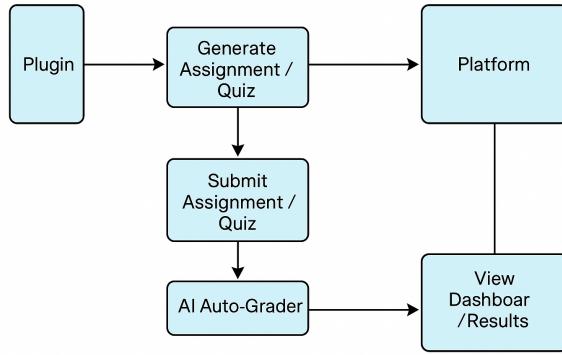


Fig. 1.3. Plugin WorkFlow

1.10 Related Literature Review

1.10.1 Related Work

Several research studies and educational platforms have investigated the integration of Artificial Intelligence (AI) within Learning Management Systems (LMS), particularly focusing on Moodle.

Edu-AI[10] is an AI-powered educational platform that offers automated classification and personalized student feedback. Using machine learning algorithms for essay scoring and automatic quiz generation. However, its primary focus is on English language learning and lacks deep integration with broader LMS platforms such as Moodle, limiting its applicability in diverse academic environments.

Similarly, **Smart Grader**[3] utilizes advanced deep learning models for automatic assessment of assignments and quizzes. Although it demonstrates high accuracy in evaluating objective-type questions, its integration with LMS platforms such as Moodle remains minimal, often requiring external middleware or complex configurations to function effectively.

Existing Moodle plugins, such as the **Moodle Essay Auto Grader**[4], primarily rely on basic techniques such as grammar check and keyword matching. As a result, these tools offer limited capabilities for assessing subjective, descriptive, or creative responses due to their lack of deep semantic understanding.

These existing solutions highlight the growing importance of AI in education, but also reveal critical gaps, particularly in:

- Seamless LMS integration,
- Multilingual support, and

- Advanced subjective or personalized evaluation.

This project aims to address these limitations by developing a robust, fully integrated Moodle plugin that takes advantage of state-of-the-art natural language processing (NLP) techniques and large language models (LLM) to deliver advanced automated quiz generation, assignment evaluation, and personalized feedback.

1.10.2 Gap Analysis

Although many AI-based educational tools are available, there are still significant gaps, especially for integration within Learning Management Systems (LMS) like Moodle.

1. Lack of Advanced AI Integration:

Current Moodle plugins do not effectively use advanced AI models such as transformers or large language models (LLMs). This limits their ability to understand complex student answers or generate meaningful quiz content.

2. Basic Auto-Grading Techniques:

Most existing auto-grading tools only rely on keyword matching or simple rule-based systems. These approaches fail to accurately evaluate subjective answers, essays, or creative writing tasks.

3. Fragmented Solutions:

Many tools are designed for just one feature, such as only quiz generation or only grading. They do not offer a complete and unified solution that covers quiz generation, grading, and performance analysis within the same system.

4. Limited Customization and High Cost:

Most advanced AI tools are commercial or closed-source. This makes them expensive and difficult to customize for institutions with limited budgets or specific academic needs.

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