Final Project Report

1. INTRODUCTION

1.1 Project Overview

EduTutor AI is a smart education platform that puts the needs of each student at the heart of learning. Using the power of artificial intelligence, it creates personalized quizzes based on how a student is performing, ensuring that no two learning paths are exactly the same.

1.2 Purpose

The purpose of EduTutor AI is to enhance educational outcomes by delivering AI-generated, adaptive quizzes using IBM Watsonx Granite models, providing insightful analytics for educators, and ensuring real-time interaction through a modular system architecture involving FastAPI, Pinecone Vector DB, and a Streamlit frontend.

2. IDEATION PHASE

2.1 Problem Statement

Students face challenges in getting personalized attention and immediate feedback. Educators struggle to track individual progress efficiently. EduTutor AI aims to solve this with generative AI and LMS integration.

2.2 Empathy Map Canvas

See attached Empathy Map: Provided in Empathy Map Canvas .pdf

2.3 Brainstorming

The team collaborated to identify problems, listed ideas, and grouped them. They prioritized based on feasibility and impact, focusing on AI-powered quiz generation, adaptive learning, and real-time dashboards.

3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

Student registers/login -> Takes quiz -> Receives feedback -> Progress tracked. Educator syncs class ->Views analytics -> Intervenes

3.2 Solution Requirement

- Adaptive quizzes tailored by performance
- Real-time feedback for students
- Role-based dashboards
- Google Classroom integration

3.3 Data Flow Diagram

Student and Educator interfaces interact with a FastAPI backend. The backend connects with IBM Watsonx (via LangChain) for quiz generation, Pinecone DB for storage and retrieval, and Google APIs for classroom sync.

3.4 Technology Stack

- Frontend: Streamlit
- Backend: FastAPI
- AI: IBM Watsonx Granite via LangChain
- Database: Pinecone Vector DB
- Auth: Google OAuth, JWT

4. PROJECT DESIGN

4.1 Problem Solution Fit

The solution addresses the need for personalized learning through AI-generated quizzes and performance analytics, integrated with existing LMS platforms.

4.2 Proposed Solution

EduTutor AI integrates IBM Watsonx for quiz generation, FastAPI for backend services, and Streamlit for frontend. It supports Google Classroom sync and role-based access.

4.3 Solution Architecture

The architecture includes a modular backend (FastAPI), frontend (Streamlit), AI via LangChain/IBM Watsonx, and data stored in Pinecone for similarity searches.

5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Two sprints were conducted: Sprint-1 focused on login, quiz generation, and integration; Sprint-2 on dashboard, adaptive learning, and deployment. All user stories were completed as per the plan.

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

Testing involved unit tests, API tests, and integration checks with IBM Watsonx, Pinecone, and Google Classroom. Manual UI testing validated role-based dashboards and Google login flows.

7. RESULTS

7.1 Output Screenshots

Demo available showcasing quiz generation, feedback, and dashboards:

Demo Link:
https://drive.google.com/file/d/1Sw3hFphvkME6BnDfkYjDanfyhsrIz7Nc/view?usp=sharing

8. ADVANTAGES & DISADVANTAGES

Advantages:
- Personalized learning
- Google Classroom integration
- Real-time analytics
- Scalable architecture

Disadvantages:
- Quiz generation delay

- Token expiration issues
- Mobile UI limitations

9. CONCLUSION

EduTutor AI successfully demonstrates how generative AI and LMS integration can transform personalized education. It supports teachers and learners by offering adaptive quizzes, real-time insights, and scalable architecture.

10. FUTURE SCOPE

- Add natural language feedback
- Improve mobile responsiveness
- Token auto-renewal
- Multi-language support
- Admin panel
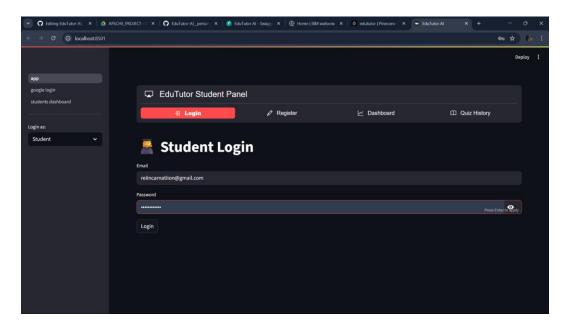- Gamification
- Subject hierarchy

11. APPENDIX

Source Code: https://github.com/Vishnu081612/EduTutor-AI-Personalized-Learning- with-Generative-AI-and-LMS-Integration

Project Demo Link:
https://drive.google.com/file/d/1Sw3hFphvkME6BnDfkYjDanfyhsrIz7Nc/view?usp=sharing

Below are screenshots of key EduTutor AI functionalities:

🔒 Student Login Screen:

📝 Quiz Generation Screen: