EduTutor AI - Detailed Project Documentation

1. INTRODUCTION

1.1 Project Overview

EduTutor AI is a personalized learning platform designed to enhance student engagement and educator efficiency through AI-powered quizzes, progress analysis, and adaptive feedback. Built with Streamlit, the platform supports real-time evaluation, role-based dashboards, and interactive educational tools. It utilizes rule-based logic and curated question banks to deliver context-aware assessments and personalized learning journeys.

1.2 Purpose

The purpose of EduTutor AI is to bridge learning gaps by delivering adaptive assessments and personalized feedback to students based on their past performance. It aims to empower educators with class-wide analytics while enabling students to monitor their own progress and learning paths. With an intuitive interface and role-based access, EduTutor AI promotes transparency, continuous learning, and skill development.

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2. IDEATION PHASE

2.1 Problem Statement

Student:

- Wants personalized help in weak areas and real-time feedback.
- Feels lost in generic, one-size-fits-all assessments.
- Lacks motivation due to non-interactive learning methods.

Educator:

- Wants to monitor student progress efficiently.
- Struggles with creating personalized quizzes.
- Needs fast insight into student learning trends.

2.2 Empathy Map

Thinks/Feels:

- "How can I improve my performance on topics I’m weak in?"
- "How do I keep my class engaged and progressing together?"

Says/Does:

- Students: "These quizzes feel repetitive."
- Educators: "I need quick insight into class performance."

Pains:

- Students: Unengaging learning experiences.

- Educators: Time-consuming quiz creation and tracking.

Gains:

- AI-generated quizzes, progress charts, feedback-based recommendations.

2.3 Brainstorming

- Adaptive quiz generation
- Student and educator dashboards
- AI-powered performance evaluation
- Diagnostic assessments
- Feedback-based progress recommendations

Final Modules:

- Login & Registration
- Quiz Generation
- Evaluation and Feedback
- Progress Tracking
- Analytics Dashboard

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3. REQUIREMENT ANALYSIS

3.1 Customer Journey

- User visits login page → registers/logs in
- Chooses a subject and topic → receives a quiz
- Submits quiz → sees feedback and performance level
- Can review progress charts and improvement tips

3.2 Functional Requirements

- FR-1: User authentication (login, registration)
- FR-2: Quiz generation (topic + difficulty)
- FR-3: Performance evaluation with feedback
- FR-4: Student progress dashboard
- FR-5: Educator analytics overview
- FR-6: Adaptive quiz generation based on history

3.3 Non-Functional Requirements

- NFR-1: Usability: Simple and intuitive Streamlit interface

- NFR-2: Security: Hashed passwords using Werkzeug
- NFR-3: Performance: Quiz generation under 2 seconds
- NFR-4: Reliability: Handles DB reconnects and reruns
- NFR-5: Availability: Deployed via Streamlit cloud with minimal downtime

3.4 Data Flow Diagram

- User → UI → Backend (quiz, DB, feedback engine) → Response (feedback, dashboard)
- Admin → UI → Dashboard analytics → View student KPIs

Entities: Student, Educator, QuizEngine, DB

Level 0: Generate quiz → Submit answers → Evaluate → Save → Display progress

3.5 User Stories

User	Requirement	User Story	Acceptance Criteria	Priority
Student	Quiz	As a student, I want to take quizzes so I can test my knowledge	Quiz is generated and submitted with feedback	High
Student	Progress	As a student, I want to see my progress to track improvements	Score chart and tips shown	High
Educator	Analytics	As an educator, I want to monitor class performance	Dashboard with scores, attempts	High

3.6 Technology Stack

Component	Technology
Frontend UI	Streamlit, Plotly
Backend	Python, SQLite
Authentication	Werkzeug (password hashing)
Database	SQLite (edututor.db)
AI Logic	Rule-based, static question banks
Hosting	Localhost / Streamlit Cloud

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4. SOLUTION DESIGN

4.1 Emotions: Before / After

Phase	Emotion
Before	Confused, overwhelmed, uninformed

Phase	Emotion
After	Informed, empowered, connected

Offline User Research: Conducted via community meetings, poster campaigns, and surveys.

4.2 Proposed Solution

Parameter	Description
Problem	Students and educators lack personalized assessments and real-time feedback tools.
Solution	AI-powered EduTutor platform using rule-based quiz engine, Streamlit UI, and adaptive performance evaluation.
Novelty	Combines diagnostic, adaptive testing, and feedback within one app. No internet/LLM dependency required.
Social Impact	Improves academic engagement and personalizes student learning experience. Saves educators time and enhances outcomes.
Business Model	Free open-source project, future potential as SaaS tool for institutions.
Scalability	Easily scales via cloud hosting and modular DB structure.

4.3 Solution Architecture

- Frontend: Streamlit (UI, Tabs, Widgets, Graphs)
- Backend: Python logic + SQLite database
- AI Logic: Rule-based adaptive quiz generator
- State: Managed via st.session_state
- Storage: Local database (edututor.db), secrets via .env

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5. PROJECT PLANNING & SCHEDULING

5.1 Sprint Planning

Sprint	Task	Story Points	Assigned To	Priority
Sprint-1	Setup DB & user auth	3	Maha Lakshmi	High
Sprint-1	Create static quiz generator	4	Maha Lakshmi	High
Sprint-1	Build basic UI for login/register	3	Maha Lakshmi	Medium
Sprint-2	Implement adaptive quiz & evaluation	5	Maha Lakshmi	High
Sprint-2	Design educator dashboard	3	Maha Lakshmi	High

Sprint	Task	Story Points	Assigned To	Priority
Sprint-2	Add visualizations & feedback system	4	Maha Lakshmi	Medium

Sprint Velocity:

- Total Story Points = 22
- Sprint Velocity = 11 points/sprint (avg)

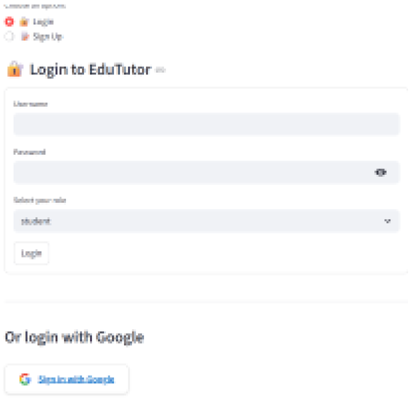
6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

Test ID	Scenario	Expected	Actual	Result
FT-01	Quiz load time	Under 3s	~2s	Pass
FT-02	Login/Register process	Form validation and session start	Working as expected	Pass
FT-03	Adaptive quiz accuracy	Difficulty adjusts by user score	Correct level selected	Pass
PT-01	Feedback delivery speed	<1s	<1s	Pass
PT-02	Concurrent usage	No crashes	Smooth operation	Pass
PT-03	Graph rendering	Must render charts without lag	Plots load instantly	Pass

7. RESULTS

7.1 Output Screenshots



Choose an option:

● Login

○ Sign Up

Login to EduTutor

Username

Password

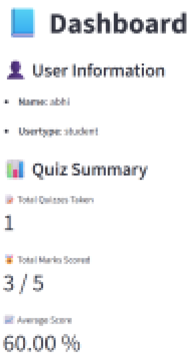
Select your role

student

Login

Or login with Google

Sign in with Google



Dashboard

User Information

- Name: abhi
- Usertype: student

Quiz Summary

Total Quizzes Taken

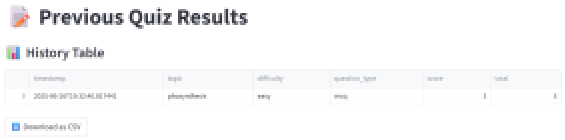
1

Total Marks Scored

3 / 5

Average Score

60.00 %

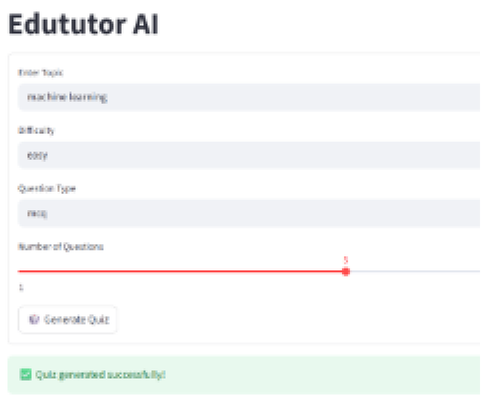


Previous Quiz Results

History Table

	timestamp	topic	difficulty	question_type	score	total
1	[illegible]	photosynthesis	easy	mcq	3	5

Download as CSV



Edututor AI

Enter Topic: machine learning

Difficulty: easy

Question Type: mcq

Number of Questions: 5

1

✅ Quiz generated successfully!

8. ADVANTAGES & DISADVANTAGES

Advantages

1. **AI-Powered Insights** – Automates quiz generation and feedback.
2. **Policy Simplification** – Easily integrates with educational or civic content.
3. **Enhanced Engagement** – Personalized feedback improves learning outcomes.
4. **Data-Driven** – Progress analytics inform educators.
5. **Modular & Scalable** – Streamlit-based micro-modules.

Disadvantages

1. **Offline Limitation** – Requires local runtime setup.
2. **No LLM Support Yet** – Currently rule-based, not LLM integrated.
3. **Limited Language Support** – English-only UI.
4. **Static Question Bank** – Manual curation required.
5. **Basic Security** – No advanced auth or encryption.

9. CONCLUSION

EduTutor AI is an impactful educational platform built for students and educators seeking personalized, adaptive, and interactive learning experiences. It showcases how a well-designed, non-LLM solution can still deliver high-quality assessments and insights. With modular components and open architecture, the system is future-ready for LLM integration, mobile deployment, and broader institutional adoption.

10. FUTURE SCOPE

1. **Mobile App** – Build Flutter app for broader reach.
2. **LLM Integration** – Add GPT/Granite for smarter quizzes.

3. **IoT Integration** – Link with attendance or biometrics.
4. **Multi-language UI** – Extend to regional languages.
5. **Blockchain Security** – Safeguard user analytics.
6. **Dynamic Content Upload** – Allow educators to input custom material.
7. **Gamified Learning** – Reward systems and badges.

11. APPENDIX

Source Code Snippet

```
# Sample Quiz Evaluation Logic
from ai_quiz import AIQuizGenerator
quiz_engine = AIQuizGenerator()
questions = quiz_engine.generate_quiz("Algebra", difficulty_level=2, subject="mathematics")
user_answers = [0, 2, 1, 1, 3]
feedback = quiz_engine.evaluate_answers(questions, user_answers)
print(feedback["performance_level"])
```

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