



PROPOSAL

HACKELITE 2.0

TEAM NAME	NovaX
UNIVERSITY	Moratuwa University of Sri Lanka
DOMAIN	Education And Learning



University of Moratuwa
IEEE Student Branch

PROBLEM IDENTIFICATION AND CONTEXT

Identify the core problem or challenge being addressed
and provide context for why it is significant.

Traditional education systems frequently rely on standardized teaching methods that do not consider the diverse learning styles, paces, and backgrounds of individual students. This uniform approach often leads to disengagement among learners, especially when instructional pacing does not align with their capabilities or needs. The issue has been further exacerbated by the COVID-19 pandemic, which created significant learning gaps that many students are still struggling to bridge. Teachers, particularly in under-resourced settings, face challenges in accessing tools and training necessary for differentiated instruction. As a result, student potential is stifled and educational equity remains an ongoing concern.

Problem Areas

- **Disengagement due to mismatched pacing:**
Students lose interest when lessons are too fast or too slow for their level.
- **Learning gaps post-pandemic:**
Interruptions in schooling have left many students behind, with uneven recovery.
- **Lack of personalized tools for teachers:**
Educators often lack the technology or support needed to adapt lessons to individual learners.
- **Equity challenges in under-resourced regions:**
Schools in disadvantaged areas are less equipped to address diverse learning needs.
- **Stifled student potential:**
The system limits academic growth by not catering to varied learning paths.

This problem hinders student potential and limits educational equity, especially in underresourced regions.

SOLUTION CONCEPT AND DISTINCTIVENESS

Describe the proposed solution and highlight what makes it stand out from existing alternatives.

To address the limitations of traditional education systems, an AI-powered personalized learning platform can be implemented to tailor education according to individual student needs. This solution utilizes adaptive assessments to map each learner's strengths and weaknesses, generating customized content paths that optimize their progress. A multilingual AI chatbot provides round-the-clock academic support, ensuring accessibility and inclusivity. Additionally, teachers benefit from a real-time analytics dashboard that delivers actionable insights into student performance. By combining personalization with engaging elements like gamification, the platform promotes continuous learning and reduces disparities, making education more responsive, inclusive, and effective.

Key Features:

- Adaptive quizzes to assess strengths and weaknesses.
- Personalized content recommendations (videos, articles, exercises).
- Gamification (badges, progress trackers) for engagement.
- Teacher dashboard for actionable insights.

VALUE PROPOSITION AND MARKET STRATEGY

Outline the value the solution offers and detail the strategy for reaching and capturing the target market.

Value Proposition:

- The platform personalizes learning experiences for each student, enhancing academic outcomes through targeted content.
- It automates data collection and analysis, reducing teacher workload while improving their ability to support students.
- The inclusion of multilingual AI support promotes inclusivity, especially for students from diverse language backgrounds.

Market Strategy:

- Initially target K–12 schools, ed-tech startups, and educational NGOs focused on digital learning transformation.
- Employ a freemium business model: provide free access to basic features such as adaptive quizzes and chatbot interactions, while offering advanced analytics, teacher dashboards, and AI-based recommendations under a premium subscription.
- Establish partnerships with government education departments and private institutions to pilot the solution in under-resourced regions.
- Attend ed-tech expos, conduct webinars, and build social media campaigns to raise awareness and attract early adopters.
- Scale globally by localizing content and support for regional languages and curricula.

TECHNICAL FRAMEWORK AND DEVELOPMENT PLAN

Provide an overview of the technical approach and development process for implementing the solution.

Technical Framework

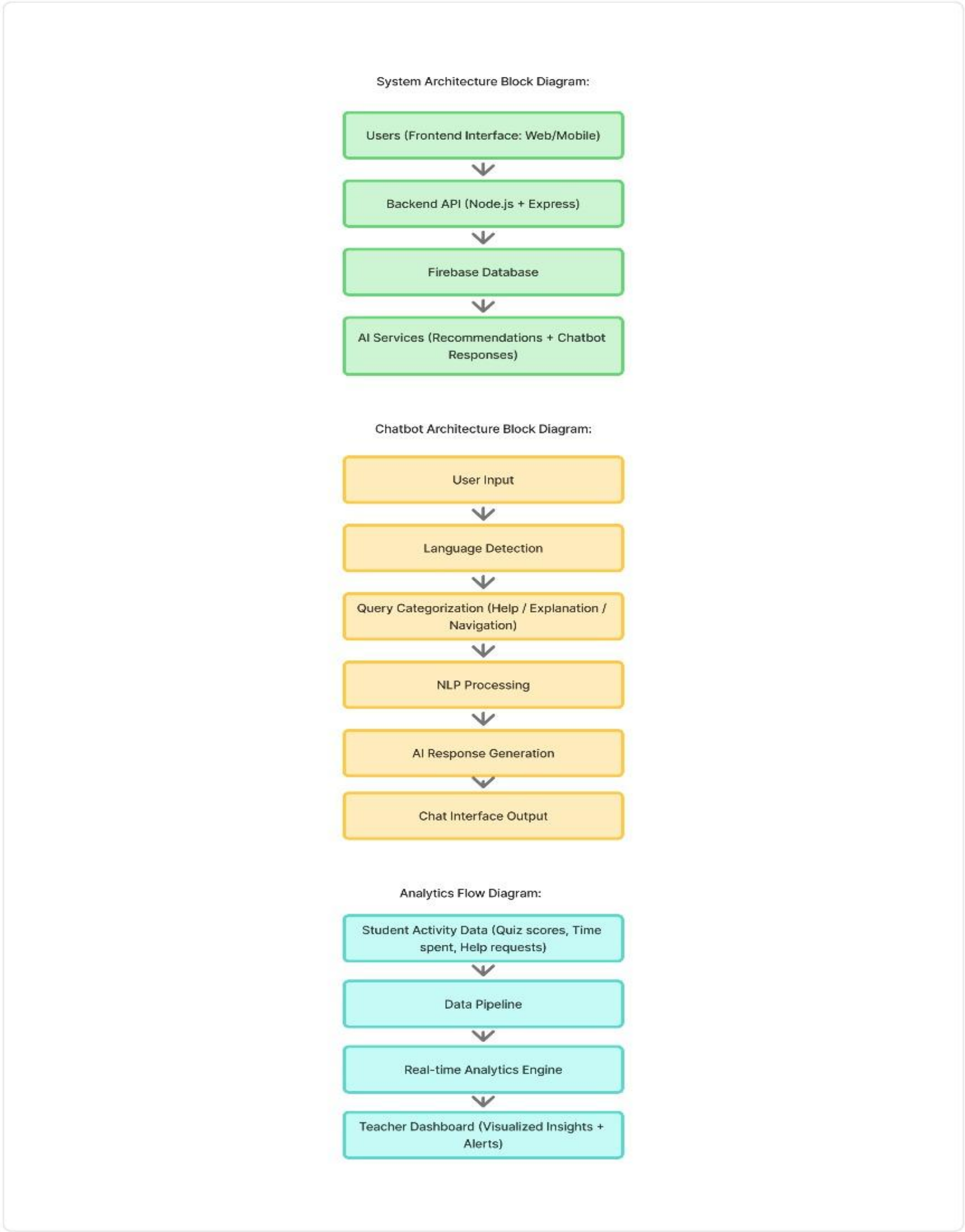
- . **Frontend:** Developed using React.js for the web and Flutter for mobile platforms, ensuring a responsive and engaging user interface across devices.
- . **Backend:** Powered by Node.js with Express to manage server-side logic, API endpoints, and integration with AI services.
- . **Database:** Firebase/Firestore provides real-time data updates, synchronization, and scalable cloud storage.
- . **AI Components:** TensorFlow or OpenAI APIs will handle adaptive learning logic and natural language processing for the multilingual chatbot.
- . **Analytics:** Google Analytics and custom-built dashboards using Power BI will support real-time monitoring and reporting.

Development Plan:

- . **Month 1–2:** Conduct requirement analysis and design the MVP, including wireframes and backend architecture.
- . **Month 3–4:** Develop core features: adaptive quiz engine, AI chatbot integration, and basic analytics dashboard.
- . **Month 5:** Perform system integration, QA testing, and gather feedback from initial testers.
- . **Month 6:** Launch the beta version for pilot schools and begin collecting performance and engagement data.

Technical Description

Architecture



USER INTERACTION AND APPLICATION SCENARIOS

Explain how users will interact with the solution and provide scenarios illustrating its practical application.

Student Experience:

- Students log in to the platform and take an initial diagnostic assessment.
- Based on their results, they receive a personalized learning path with recommended videos, articles, and exercises.
- They can interact with the multilingual AI chatbot to clarify doubts, practice problems, or get study tips at any time.
- As students complete tasks, they earn badges, track their progress, and receive feedback on improvements.

Teacher Experience:

- Teachers access a dashboard showing real-time student performance data.
- The system flags students at risk or falling behind, enabling teachers to intervene early.
- Teachers can assign personalized content or follow-up tasks based on AI recommendations.
- Dashboards also provide class-wide trends to inform lesson planning and resource allocation.

Application Scenarios:

- A Grade 6 student in rural Sri Lanka receives help in Sinhala from the chatbot late at night while preparing for exams.
- A teacher in an urban public school uses real-time analytics to adjust teaching strategies based on student comprehension.
- A dyslexic student is provided with audio-visual learning resources and progresses through the curriculum at a comfortable pace.
- NGOs implementing remedial programs in underdeveloped areas use the platform to standardize and track learning recovery efficiently.

Progress So Far

The following modules have been implemented:

- **Role-based access:** Students, teachers, and admins with distinct privileges
- **Lesson delivery and quiz engine:** Core content and adaptive assessments
- **Adaptive path logic:** Dynamic routing based on quiz scores
- **Assignment submission and grading:** Integrated workflows
- **Chat panel integration:** Real-time communication
- **Teacher dashboard:** Visual analytics for student performance tracking

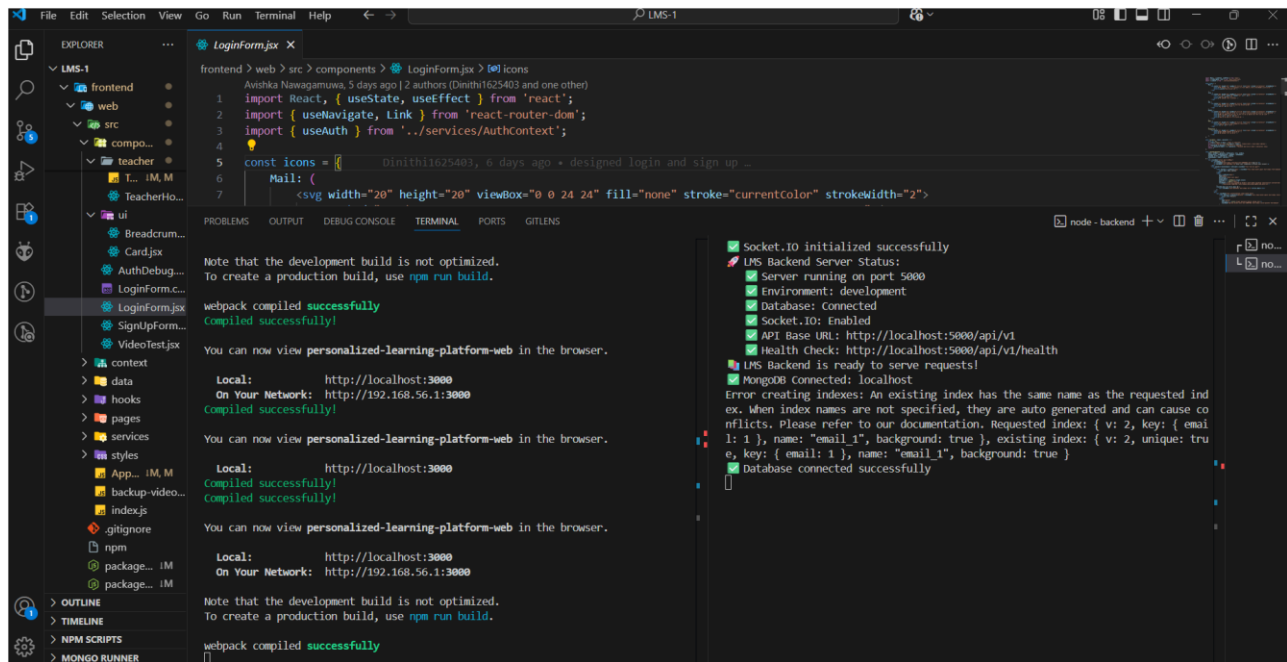
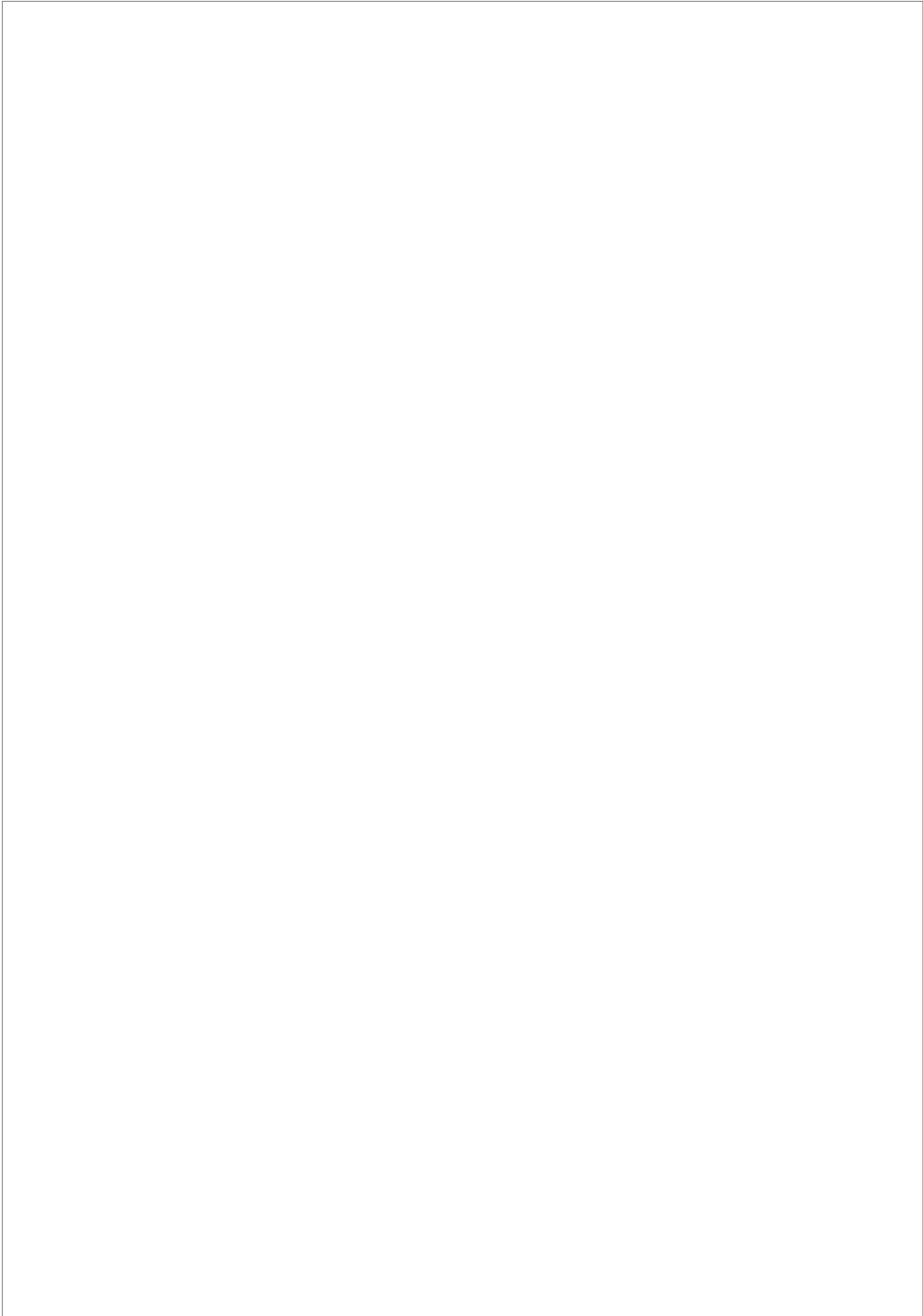


Figure 1.0 frontend connect with backend



Next Phase Development

Planned enhancements include:

UI Implementation

- . Finalize responsive layouts for student, teacher, and admin dashboards
- . Integrate modular React components for quiz interface, progress tracking, and content delivery
- . Ensure accessibility and multilingual support across all UI elements
- . Conduct usability testing to refine navigation and user experience

Backend Modification

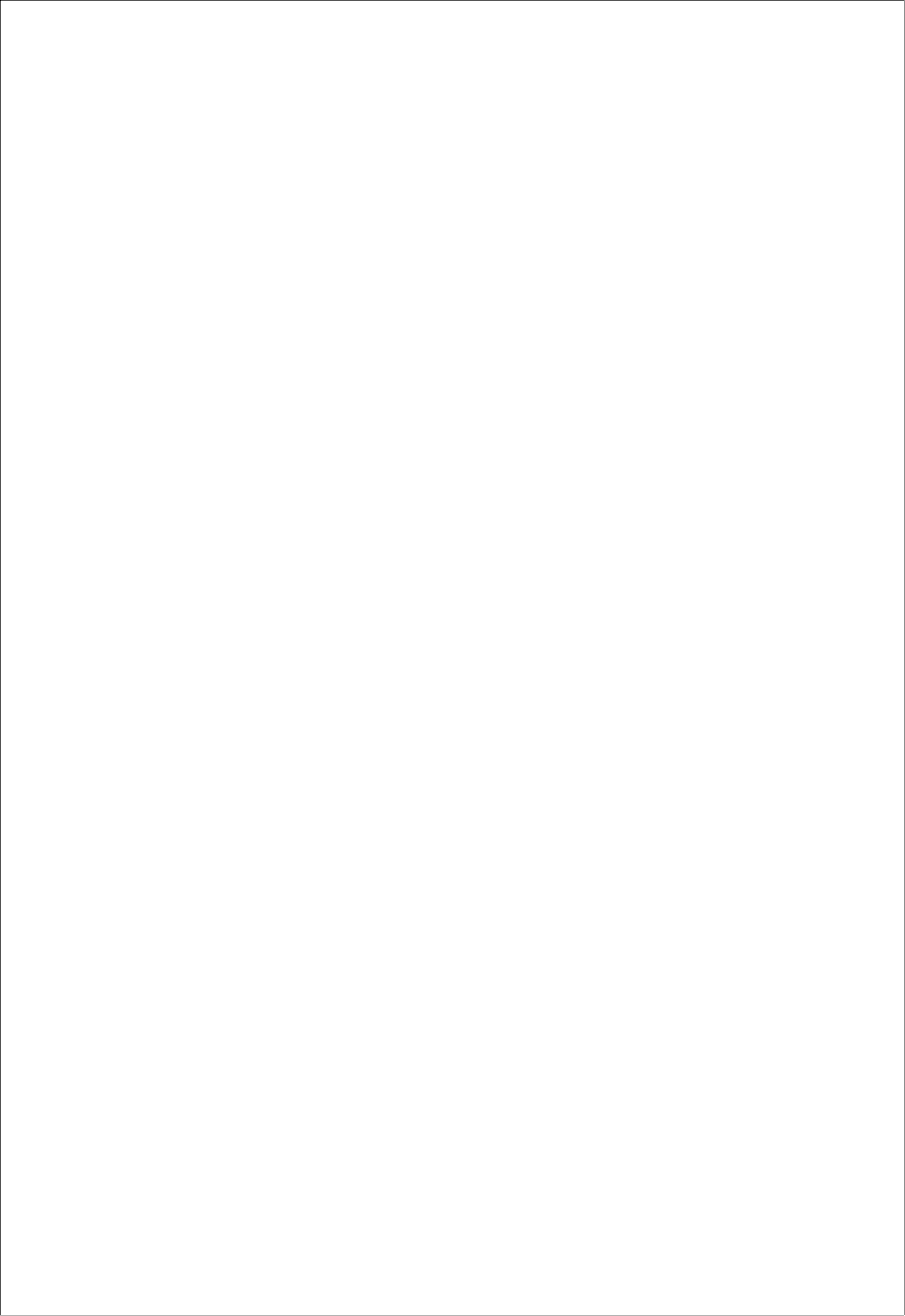
- . Extend controller logic to support new features (e.g., gamification, content recommendations)
- . Optimize API endpoints for performance and scalability
- . Implement secure data handling for quiz results, chat logs, and analytics
- . Integrate AI services for chatbot and adaptive learning engine

Web Finalization

- . Complete integration between frontend and backend modules
- . Configure deployment environment and CI/CD pipelines
- . Perform system-wide validation of user flows and data synchronization
- . Prepare documentation for deployment and maintenance

Testing and Validation

- . Conduct unit testing for React components and backend services
- . Perform integration testing across modules (authentication, quiz engine, analytics)
- . Execute user acceptance testing (UAT) with pilot users
- . Use tools like Postman, Jest, and Lighthouse for API, logic, and performance testing
- . Collect feedback and iterate based on usability and reliability metrics



TEAM DETAILS

Please provide the necessary details of your team. All fields including photograph are required.



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