Problem statement: Digital learning platform for rural school students in Nabha.

Project Report: Edunabha - A Modern Learning Ecosystem

1. Executive Summary

Edunabha is a comprehensive, multi-role educational platform designed to address the core challenges of modern digital learning, particularly in environments with unreliable internet connectivity. It provides a seamless and interactive learning experience for students, powerful monitoring tools for teachers, and transparent progress tracking for parents, all within a single, unified application.

The platform was built from the ground up to be accessible, intelligent, and resilient. By integrating features like a voice-activated assistant, an AI-powered chatbot, and an offline-first architecture, Edunabha moves beyond traditional e-learning apps to create a truly supportive and engaging educational ecosystem.

2. Technology Stack

The application was built using a modern, scalable, and cost-effective technology stack, leveraging powerful cloud services and cutting-edge frontend libraries.

Frontend (What the User Sees)

React: The core of the application is built on React, a leading JavaScript library for creating fast, dynamic, and responsive user interfaces.

Material-UI (MUI): The entire user interface is styled using MUI, a professional component library based on Google's Material Design. This ensures a clean, consistent, and visually appealing design across all dashboards.

Framer Motion: Used to add fluid animations and smooth page transitions, significantly enhancing the user experience and making the app feel polished and modern.

Progressive Web App (PWA): The app is configured as a PWA, allowing it to be "installed" on any device's home screen and enabling core components to function offline.

Backend (The "Brain" of the App)

The entire backend is powered by Google Firebase, a serverless platform that provides a suite of powerful, integrated tools:

Firebase Authentication: Manages all user sign-ups and logins securely, with built-in session persistence to keep users logged in across reloads.

Firestore Database: A flexible, real-time NoSQL database used to store all application data, including user roles, course content, lesson details, quiz questions, and student progress.

Firebase Storage: Used for hosting user-uploaded media, such as custom .mp4 video lessons created by teachers.

Firebase Hosting: Provides fast, secure, and reliable global hosting for the deployed web application.

Integrated APIs

Google Gemini API: Powers the intelligent, conversational AI chatbot, allowing students to ask complex questions and receive instant, detailed explanations.

Web Speech API: A browser-native API that enables the voice assistant, converting spoken user commands into text to allow for hands-free navigation and interaction.

3. How the App Works: A Seamless Workflow

Edunabha is built around three distinct user roles, creating a holistic educational loop.

The Student Dashboard:

Students log in to a personalized dashboard where they can see all their assigned subjects (Math, Science, etc.).

They can select a subject to view a list of lessons.

Each lesson contains three tabs: a text-based Lesson, an embedded Video, and an interactive Quiz.

Quiz results and lesson completions are automatically saved to the database. Upon completing all lessons in a course, the student is awarded a completion badge to gamify the learning experience.

The Teacher Dashboard:

Teachers log in to a dashboard that provides a high-level overview of their classroom.

They can see real-time statistics, such as the total number of students they manage and the average quiz score across all their students, allowing them to track class performance.

The Parent Dashboard:

Parents log in to a simple, easy-to-understand dashboard.

They can view a bar chart that displays their child's academic progress in each subject, providing a clear and transparent view of their performance.

4. Key Benefits

Accessibility: The voice-controlled navigation and AI assistant remove barriers for students who may have difficulty with typing or reading, making learning more inclusive.

Offline-First Reliability: As a PWA, the app shell and previously viewed content are available offline, ensuring that learning is never interrupted by poor internet connectivity.

Centralized Ecosystem: Edunabha is one of the few platforms that brings students, teachers, and parents together into a single, collaborative environment.

Engaging Experience: Gamification through badges and a modern, animated UI keep students motivated and engaged with the content.

5. Competitive Advantage: How Edunabha Dominates

Edunabha is uniquely positioned to outperform other educational apps through four key differentiators:

True Offline-First Architecture: While many apps require a constant internet connection, Edunabha is designed from the ground up to be resilient. This is a critical advantage in regions where internet access is unreliable.

Hyper-Localization and Teacher Empowerment: The future ability for teachers to create and upload their own video lessons in local languages (like Punjabi) is a game-changer. It allows for a level of cultural and linguistic relevance that large, generic platforms cannot match.

A Truly Smart Assistant: The combination of a hands-free voice assistant for navigation and a powerful Gemini-powered AI for doubt resolution provides a level of interactive support that is far superior to simple FAQ pages or basic chatbots.

A Holistic 360-Degree View: By providing dedicated dashboards for all three key stakeholders—student, teacher, and parent—Edunabha creates a collaborative and transparent educational ecosystem, ensuring everyone is aligned and informed.

List of commands that work for now:

Here is a complete list of all the voice commands currently available in the app, organized by where you can use them.

General Commands (Can be used anywhere)

Logout / Sign out:Logs you out of the application.

Back:Navigates to the previous screen (e.g., from a lesson back to the lesson list).

Stop reading / Stop:Stops the text-to-speech reader immediately if it's active.

Main Dashboard Commands

Open [course name]:Opens a specific course from the main dashboard.

Example: "Open Physics"

Take me to courses / Show me the courses:Navigates to the main course list screen.

Lesson List Commands (When viewing a course)

Open lesson [number] / Show lesson [number]:Opens a specific lesson from the list by its number.

Example: "Open lesson 2"

Show lessons:Switches to the "Lessons" tab if you are on the textbook tab.

Open textbook:Switches to the "Textbook" tab for the current course.

Lesson Detail Commands (When viewing a lesson)

Play video:Switches to the "Video" tab to show the lesson's video.

Open quiz / Start quiz:Switches to the "Quiz" tab.

Read the lesson / Explain / Clarify / What is:Reads the main lesson text aloud using the text-to-speech feature.

Quiz Commands (When taking a quiz)

Next question:Moves to the next question in the current quiz.

We will train the voice assistant for some more commands later for better performance.

6. Conclusion:

The Edunabha project has progressed beyond its initial prototype phase and now functions as a working application, demonstrating the potential of modern web technologies in delivering accessible and effective digital learning experiences. While the current version showcases core capabilities, it is not yet the final product. In the upcoming development phase, we plan to design a comprehensive application interface, introduce additional features to enrich the learning environment, and train the integrated voice assistant to ensure seamless and intelligent user interaction. These enhancements will further solidify Edunabha’s position as a dynamic and evolving educational ecosystem.