

Full Stack Development with MERN - Project Documentation

1. INTRODUCTION

1.1 Project Overview:

LearnHub is a MERN stack-based e-learning platform that enables seamless digital education through course management, video lectures, and assessments.

1.2 Purpose:

To bridge the gap in remote learning by creating a centralized platform for students, teachers, and administrators with role-based access and progress tracking.

2. IDEATION PHASE

2.1 Problem Statement:

Students in rural areas face limited access to quality education. There's a need for a scalable, digital learning platform.

2.2 Empathy Map Canvas:

- Users: Students, Teachers, Admins
- Needs: Easy access to courses, track progress, manage users
- Pains: Limited infrastructure, manual tracking, inconsistent content delivery

2.3 Brainstorming:

Brainstormed ideas included live classes, pre-recorded videos, course assignments, role-based dashboards, and progress metrics.

3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map:

From onboarding (login/register) to course completion and certification, the user journey is streamlined and intuitive.

3.2 Solution Requirement:

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- Secure authentication
- Role-specific dashboards
- CRUD operations for courses
- Video embedding

3.3 Data Flow Diagram:

User -> Auth API -> Dashboard -> Course APIs -> MongoDB

3.4 Technology Stack:

- Frontend: React.js (Vite), Tailwind CSS
- Backend: Node.js, Express.js
- Database: MongoDB (Mongoose)
- Authentication: JWT

4. PROJECT DESIGN

4.1 Problem Solution Fit:

Online education is growing rapidly. LearnHub addresses digital delivery gaps by offering a scalable learning system.

4.2 Proposed Solution:

A cloud-based web app with admin, teacher, and student roles. Courses, assignments, and progress tracking are integrated.

4.3 Solution Architecture:

Frontend <--> Backend <--> MongoDB

React Components <--> Express Routes <--> Mongoose Models

5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning:

Used GitHub Projects and milestones to divide tasks:

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- Week 1: Design UI and Database Schema
- Week 2: Setup backend and authentication
- Week 3: Develop course features
- Week 4: Testing and documentation

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing:

Tested with Postman and browser dev tools. Backend APIs responded under 300ms for most requests. Manual testing on multiple browsers/devices.

7. RESULTS

7.1 Output Screenshots:

(Diagram placeholders)

- Login/Register page
- Student dashboard
- Course details page
- Admin panel

8. ADVANTAGES & DISADVANTAGES

Advantages:

- Scalable architecture
- Clean and responsive UI
- Role-based user management

Disadvantages:

- No real-time communication yet
- Mobile responsiveness could be improved in some views

9. CONCLUSION

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LearnHub provides a robust foundation for remote digital learning using modern web technologies and cloud infrastructure.

10. FUTURE SCOPE

- Add video conferencing for live classes
- Integrate payment gateway for paid courses
- Enable mobile app version with React Native

11. APPENDIX

Source Code: Included in GitHub Repository

Dataset Link: Not applicable

GitHub & Demo Link:

- GitHub: <https://github.com/sandhyathatraju/LEARNHUB>
- Demo: (insert demo video or hosted link here)