



LearnHub – Complete LMS (Presentation)

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Executive Overview

LearnHub is a production-ready Learning Management System with AI assistance, course and video management, interactive quizzes, progress tracking, and automated certificate generation. The UI follows a minimalist, Zara-inspired aesthetic with responsive, fast, and accessible UX.

14

Complete Courses

97

Videos with Tracking

24

Quizzes (Auto-grading)

100%

Feature Complete

Source: project README and backend seed endpoints.

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Architecture & Tech Stack

Frontend

- **React 18 + TypeScript** (Vite)
- **Tailwind CSS** (custom Zara-inspired theme)

- **React Router** for SPA navigation
- UI libs: `@radix-ui/react-dialog`, `lucide-react`, `react-markdown`, `react-youtube/player`

Backend

- **Node.js + Express** with TypeScript
- **MongoDB + Mongoose**
- **JWT** authentication
- **Google Gemini AI** via `@google/generative-ai`
- Image processing with `sharp` (certificates)

Static assets and generated certificates are served from `/public` (backend) and `frontend/public`.

Key Features

- **Authentication:** Registration, login, JWT-protected routes, profile
- **Course Management:** Catalog, categories, search/filter, enrollment
- **Video Learning:** Player, previews, per-video progress tracking
- **Quizzes:** Multiple types, auto-grading, attempts, pass criteria
- **Certificates:** Auto generation as PNG with overlay text
- **AI Assistant:** Chat, suggestions, AI-generated quizzes (Gemini)
- **Analytics:** Progress metrics per enrollment
- **Design:** Minimalist, responsive, dark/light aware

Frontend (React + TS)

- **Pages:** Landing, Login, Register, Dashboard, Courses, Course Detail, Course Learning, Profile, Admin (Create Course/Add Video)
- **Components:** Header, Chatbot, QuizTaking, QuizList, AIQuizModal, ProfileCompletionModal, Global AI button
- **Contexts:** `AuthContext`, `ThemeContext`

Build: `npm run dev` with Vite; Production: `npm run build`.

Backend & REST API

Base URL: `http://localhost:5000`

System

GET	<code>/api/health</code>	Public
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Auth

POST	/api/auth/register	Public
POST	/api/auth/login	Public
POST	/api/auth/logout	Public
GET	/api/auth/profile	JWT

Courses

GET	/api/courses	Public
GET	/api/courses/categories	Public
GET	/api/courses/:courseId	Public/JWT (enroll check)
GET	/api/courses/:courseId/feedback	Public
POST	/api/courses/:courseId/feedback	JWT
POST	/api/courses/:courseId/enroll	JWT
DELETE	/api/courses/:courseId/enroll	JWT
GET	/api/courses/user/enrollments	JWT
POST	/api/courses	JWT (instructor/admin)

Videos

GET	/api/videos/:videoId	Public/JWT (preview rules)
GET	/api/videos/course/:courseId	Public/JWT
POST	/api/videos/:videoId/progress	JWT
POST	/api/videos	JWT (instructor/admin)
PUT	/api/videos/:videoId	JWT (instructor/admin)

Quizzes

GET	/api/quizzes/course/:courseId	JWT
GET	/api/quizzes/:quizId	JWT
POST	/api/quizzes/:quizId/submit	JWT
GET	/api/quizzes/:quizId/results	JWT
POST	/api/quizzes	JWT (instructor/admin)
PATCH	/api/quizzes/:quizId/status	JWT (instructor/admin)

Chatbot (AI)

POST	/api/chatbot/chat	JWT
GET	/api/chatbot/suggestions	JWT
POST	/api/chatbot/generate-quiz	JWT
GET	/api/chatbot/test	JWT (admin)

Certificates

POST	/api/certificates/generate/:courseId	JWT
GET	/api/certificates/my-certificates	JWT
GET	/api/certificates/download/:certificateId	JWT

Seeding

GET	/api/seed?force=true	Public
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Data Models (Summary)

User

- name, email (unique), password (hashed), avatar, role
- profile: DOB, gender, phone, country, institution, position, dept, yearOfStudy
- preferences: experienceLevel, fieldOfInterest[], learningMode, language
- career: careerGoal, profession, organization
- socialLinks: linkedin, twitter, github, website

Course

- title, shortDescription, description, category, level, price, duration
- instructor { id, name, email }, thumbnail, previewVideo, tags[]
- rating { average, count }, enrollmentCount, isPublished
- learningOutcomes[], requirements[], importantTopics[]

Video

- courseId, title, description, videoUrl, thumbnail
- duration (seconds), order, isPreview, resources[], transcription

Quiz

- courseId, title, description, instructions[]
- settings: timeLimit, passingScore, maxAttempts, randomize, showCorrectAnswers, allowReview
- questions[]: id, type, options[], correctAnswers[], explanation, points, order

- attempts[]: userId, answers[], score, percentage, timeSpent, passed

Enrollment

- userId, courseId, status (active/completed/...)
- progress: videosCompleted/total, quizzesPassed/total, overallPercentage
- videoProgress[]: per-video watchedDuration, completedAt
- quizAttempts[] with scoring snapshot

Certificate

- userId, courseId, userName, courseName, issuedAt
- certificateUrl (PNG in backend/public/certificates)

Security & Auth

- **JWT** auth with bearer tokens; middleware: `authenticate`, `authorize`, `optionalAuth`
- **Password hashing** via bcryptjs (salt 12); password not selected by default
- **Role-based access** for instructor/admin on sensitive routes
- **CORS** configured via `CORS_ORIGINS`

AI Integration (Gemini)

- Chat with educational system prompt, conversation history context
- Course-aware suggestions and topic-specific assistance
- AI-generated quizzes from existing course/video context
- Config via `GEMINI_API_KEY` and `@google/generative-ai`

Certificates

- PNG generation with `sharp` using template from `frontend/public/levelUpcertificate.png`
- Overlay user name and course name; files stored under `backend/public/certificates`
- Endpoints to generate, list, and download user certificates

Database Seeding

- Seed endpoint: `GET /api/seed?force=true`
- Creates 14 courses, 97 videos, and 24 quizzes with sample instructor

Setup & Environment

Backend

- Node 18+, MongoDB 5+
- Env: MONGODB_URI, JWT_SECRET, PORT, NODE_ENV, GEMINI_API_KEY, CORS_ORIGINS
- Run: cd backend && npm i && npm run dev

Frontend

- Run: cd frontend && npm i && npm run dev
- Dev URL: http://localhost:5173
- Open this file directly or via dev server: /LearnHub-Presentation.html

Pages & User Flows

- **Landing** → Explore courses → View details → Enroll
- **Learning** → Watch videos → Progress auto-tracked → Attempt quizzes
- **Completion** → Pass quizzes + reach progress threshold → Generate certificate
- **Dashboard** → Overview of enrollments, progress, and AI assistant
- **Admin/Instructor** → Create courses/videos, manage quizzes

Future Enhancements

- Advanced analytics dashboards
- Social learning (forums), notifications
- Mobile apps (iOS/Android)
- Multi-language (i18n) and accessibility audits
- Automated test coverage

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