

# Software Design Document (SDD)

Project: Adaptive English Learning App

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Authors: Group 30

## Introduction

### Purpose

The aim of this Software Design Document is to define the architecture, system components, data structures, user interface, and technical design for the Adaptive English Learning App. The application uses AI/ML to create personalized learning experiences, providing real-time translations, vocabulary support, adaptive exercises, and teacher analytics.

### Scope

The system includes:

- Mobile / Web application for learners
- AI-driven user interface that adapts based on behavior and proficiency
- Real-time AI assistance for translation, vocabulary, and exercises
- Teacher/Coordinator dashboard with analytics
- Secure backend for authentication, data storage, and machine learning models

### Intended Audience

- Developers
- UX/UI Designers
- Data Engineers
- Project Stakeholders
- QA/Testers

### Definitions

- AI Adaptive UI – UI lay-out changes based on user behaviour / proficiency
- ML Model – Predicts difficulty, engagement, and recommendations
- Learner – Primary user who studies English

- Coordinator/Teacher – Monitors student progress

## System Overview

The system is composed of:

- Frontend App (Mobile + Web) – UI, exercises, AI assistant
- Backend Services – API, authentication, analytics, adaptation logic
- AI / ML Layer – NLP, translation, difficulty prediction, analytics
- Database – User profiles, progress, exercise content
- Admin Dashboard – Teacher analytics and reporting

## Functional Requirements

User Profile Management	Users can register/login securely Users create a profile specifying language background, proficiency, culture
Adaptive Home Dashboard	Layout changes based on AI behaviour tracking Shows recommended learning tasks
Learning Exercises	Exercises adjust difficulty dynamically System tracks performance and time
AI Assistant	Real-time translation Vocabulary explanations AI-generated practice exercises Speech, text, and multimodal input
Teacher Analytics Dashboard	View learner progress Engagement prediction graphs Exportable reports
Data Storage	Save user progress Save vocabulary words Cloud sync
Notifications System	Reminders New exercises Teacher messages

## Non-Functional Requirements

Performance	UI loads within 2 seconds API response < 400ms
Scalability	Support 10, 000 concurrent learners Cloud auto-scaling
Security	End-to-end encryption (HTTPS/TLS) JWT authentication Secure password hashing
accessibility	WCAG AA contrast Font resizing

	Multilingual UI
Reliability	99% uptime target

## Detailed Design

### Frontend App Design

#### Technologies

- Option A: Flutter (Dart) for cross-platform
- Option B: React (Web) + React Native (Mobile)

#### Main UI Modules

1. Authentication
2. Profile Setup
3. Dashboard (Adaptive Layout)
4. Exercises Module
5. AI Assistant Interface
6. Vocabulary & Translation Pop-Up
7. Settings & Accessibility

### Backend Design

#### Technologies

- Node.js (TypeScript) or Python (FastAPI)
- PostgreSQL (main DB)
- Firebase/Mongo (event logs)

#### API Modules

- /auth/ - login, signup, token refresh
- /profile/ - user details
- /exercise/ - difficulty engine, question fetch
- /assistant/ - AI/NLP interface
- /analytics/ - teacher dashboard data

#### Figma wireframes

# ☰ Adaptive English Learning App

Light Theme Student View

## DOCUMENTATION

Design System

## USER FLOW

Welcome & Auth

Profile Setup

## STUDENT

Student Dashboard

Learning Exercise

AI Assistant

## TEACHER

Teacher Dashboard

## SHARED

Settings

LearnAI

## Adaptive English Learning

Personalized learning powered by AI. Our adaptive system adjusts to your learning style, pace, and goals.

### AI-Powered Personalization

Adapts to your learning style and proficiency level

### Multilingual Support

Learn in your native language with cultural context

### Real-time AI Assistant

Get instant help with vocabulary, grammar, and more

Login

Sign Up

## Welcome Back!

Sign in to continue your learning journey

Email

you@example.com

Password

.....

Remember me

[Forgot password?](#)

Sign In

Or continue with

Google

GitHub

## Signup page

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## Create Account

Start your personalized English learning experience

### AI Personalization Available

We'll customize your learning experience based on your background and goals

Full Name

John Doe

Email

you@example.com

Password

.....

I agree to the Terms of Service and Privacy Policy

Create Account

Or continue with

Google

GitHub

Already have an account? [Sign in](#)

## ≡ Adaptive English Learning App

Light Theme ▾

Student View ▾

### Profile Setup

Step 1 of 4



#### Language Background

Help us understand your linguistic background

What is your native language?

Select your native language

Do you speak any other languages? (Optional)

Spanish

Mandarin

Hindi

Arabic

French

Portuguese

Russian

Japanese

German

Cultural background region

Select your region

Next >

## Profile Setup

Step 2 of 4



### English Proficiency

Let's assess your current English level

How would you rate your current English level?

Beginner (A1-A2)

Basic words and phrases

Intermediate (B1-B2)

Comfortable with everyday conversation

Advanced (C1-C2)

Fluent in most situations



#### AI Proficiency Test Available

After setup, we'll provide a quick adaptive test to fine-tune your level assessment.

◀ Previous

Next ▶

## Profile Setup

Step 3 of 4



### Learning Goals

What do you want to achieve with English?

Primary learning goal

Academic

Professional

Travel

Personal Growth

Test Preparation

Immigration

How much time can you dedicate to learning daily?

10 min

20 min

30 min

1 hour+

Topics of interest (select all that apply)

Business

Technology

Arts & Culture

Science

Sports

Entertainment

News

Literature

◀ Previous

Next ▶

# ☰ Adaptive English Learning App

Light Theme ▾

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## Learning Style

How do you learn best?

Visual

Auditory

Reading/Writing

Kinesthetic

Mixed

### 📍 Your Personalized Learning Path

- ✓ Content customized for your speakers
- ✓ Difficulty adjusted to your level
- ✓ Lessons focused on your goals
- ✓ Content about your interests
- ✓ Adaptive UI optimized for your learning style

◀ Previous

Complete Setup ✓

# ☰ Adaptive English Learning App

Light Theme

Student View

## Adaptive Layout Demo

AI automatically adjusts this layout based on your proficiency and behavior

Intermediate View

# Welcome back, Sarah! 🙌

You're making great progress. Keep it up!

✉️ AI Assistant

🔥 Day Streak  
12

⌚ Today's Goal  
18/30 min

👤 Level  
B2

⭐ XP  
2450

## Today's Recommended Lesson

Personalized based on your progress

AI Recommended

✉️ Business Email Writing

25 minutes • Writing & Grammar

▷ Start Lesson

## Practice Activities



Speaking Practice

Pronunciation and conversation

10 min ➔



Listening Exercise

Audio comprehension

15 min ➔