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FOCUS AND READ

A project submitted in partial fulfillment of the requirements for the

B.Sc. Degree in Computer Science and Applications

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CERTIFICATE

It is hereby certified that the project titled ***focus and read*** submitted by Abdallah Jamil Mohammad Khader (2231853), Amir Ahmad Mustafa Shahin (2331186), Ahmad Faris Mousa Al Tarabeen (2330074), and Rozan Abdelnaser Amin Alqunbor (2230348) in partial fulfillment of the requirements for the bachelor's degree in computer science and applications, represents original work conducted by them under my supervision.

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ABSTRACT

This project addresses the academic challenges faced by individuals with ADHD, particularly in focus and organization during study sessions. We developed a web-based application that integrates AI tools, adaptive learning features, and a distraction-minimizing interface to improve productivity. Key features include a customizable Pomodoro timer, multi-modal study options (visual, auditory, interactive), and gamification elements for increased engagement. The system is designed with a minimalist, user-friendly interface to reduce cognitive load. Initial testing with ADHD students showed improved concentration and better task management. The platform provides a unified solution that combines productivity tools and learning support in one accessible environment. This project demonstrates the potential of technology to provide tailored academic support for neurodivergent learners.

ACKNOWLEDGEMENT

We sincerely thank our supervisor, Dr. Ahmad Rafi Qawasmeh, for his invaluable guidance and unwavering support which served as the cornerstone of this project . We are grateful to The Hashemite University for their support, and to our families for their encouragement. Special thanks to all who contributed to this project.

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ABBREVIATIONS

- ADHD: Attention Deficit Hyperactivity Disorder
- AI: Artificial Intelligence
- API: Application Programming Interface
- ASP.NET Core MVC: Active Server Pages .NET Core Mode-View-Controller
- CSS: Cascading Style Sheets
- ER: Entity Relationship
- GDPR: General Data Protection Regulation
- HTML: HyperText Markup Language
- HTTPS: Hypertext transfer protocol secure
- JWP: JSON Web Tokens
- JS: Java Script
- JSON: JavaScript Object Notation
- ORM: Object-Relational Mapping
- OCR: Optical Character Recognition
- QAA: Questions and answers
- RBAC: role-based access control
- SQL: Structured Query Language
- SSD: Solid State Drive
- TTS: Text-to-Speech
- UI: User Interface
- UX: User Experience

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CHAPTER 1: INTRODUCTION

1.1 Overview

This project is centered around developing a web-based application aimed at assisting individuals with Attention Deficit Hyperactivity Disorder (ADHD) to enhance their focus and organization during study sessions. ADHD presents unique challenges for affected individuals, including difficulty maintaining concentration and structuring tasks. The goal of this application is to offer AI-driven features and adaptive learning tools to help users manage their study time more effectively and reduce distraction.

1.2 Project Motivation

The motivation behind this project stems from the understanding that ADHD can significantly impact academic performance[1], as individuals often struggle to maintain attention and stay organized. Current solutions for ADHD management are limited, and most are not specifically tailored for study purposes. This application was designed to fill that gap by offering tools that cater to ADHD users' needs and improve their study habits through technology.

1.3 Problem Statement

People with ADHD face difficulties in organizing their study materials, maintaining focus, and avoiding distractions. Many existing study tools do not address the unique cognitive needs of ADHD individuals. As a result, these individuals often find it challenging to stay engaged with their learning tasks, leading to reduced academic performance and frustration.

1.4 Project Aim and Objectives

Aim:

To develop a web-based application that helps individuals with ADHD improve focus and productivity during study sessions through adaptive learning tools and distraction-reducing interface and features.

Objectives:

1. Enhance Concentratio

- Implement Pomodoro timers with customizable intervals
- Include a "Deep Focus Mode" to minimize distractions

2. Support Learning Needs

- Provide multiple study modes (interactive, auditory, summarized, question and answer, ask AI, workbook)
- Integrate AI-powered tools

3. Boost Engagement

- Add gamification elements (rewards, progress tracking,buzzels)
- Include interactive exercises (flashcards,quizzes, QAA)

4. Ensure Usability

- Design a clean, distraction-free interface
- Maintain cross-device compatibility

5. Enable Personalization

- Offer customizable reminders and study analytics
- Allow content sharing between instructors and students

1.5 Project scope

Included Features:

1. Focus & Productivity Tools
   - Pomodoro timer with adjustable work/break periods
   - Distraction blocker for websites/apps
   - "Deep Focus Mode" (minimalist interface)

2. Learning Support Features
   - AI-powered text summarization
   - Multiple study modes (visual, auditory, interactive)
   - Flashcards and auto-generated quizzes

3. User Customization
   - Personalizable study reminders
   - Performance tracking dashboard
   - Dark mode and accessibility settings

4. Collaboration Features
   - Instructor upload portal (PDFs/notes)

- Export options for study materials

Out of Scope:

- Clinical ADHD diagnosis tools
- Mobile app development (web-only)
- Advanced AI tutoring functions
- Offline functionality

1.6 Project Software and Hardware Requirements

1.6.1 Software Requirements:

- ASP.NET Core MVC (.NET 6 or later) with c#,HTML,CSS,JS during the work– used to develop the server-side logic and handle routing, sessions,controllers and views.

- Database System: Microsoft SQL Server – to store user data, session details, and preferences.

- IDE and Tools: Visual Studio 2022, SQL Server Management Studio (SSMS) – for development, debugging, and database management.

- Package Managers and Libraries: NuGet for .NET packages; may include libraries like Entity Framework Core for ORM and Bootstrap for responsive UI.

- Version Control: Git & GitHub for collaboration and version tracking among team members.

1.6.2 Hardware Requirements:

- Development Environment:

- PC/Laptop with minimum of:

- Intel i5 Processor or equivalent

- 8 GB RAM

- 512 GB HDD or 256 GB SSD

- Windows 10 or later

- Target User Devices:

- Any modern web browser running on:

- Desktop (Windows/Linux/Mac)

- Tablet (iOS/Android)

- Smartphone (iOS/Android)

- Internet connection is required for accessing the platform.

1.7 Project Limitations

Despite the project's comprehensive functionality, several limitations have been identified:

- Medical Scope Limitation: The system does not provide medical advice, diagnosis, or treatment. It is solely a productivity aid tailored to ADHD-related challenges.

- Behavioral Tracking: The application does not monitor user behavior in real time or adapt dynamically to attention levels.

- Browser Compatibility: While designed to work on most modern browsers, some features may not function optimally on outdated or unsupported browsers.

- Offline Availability: The system requires an internet connection to access and use all features; offline functionality is not supported in the current version.

- Device Responsiveness: Although designed to be responsive, the experience may vary slightly across different screen sizes or mobile devices.

1.8 Project Expected Output

The expected outcome of this project is the successful development and deployment of a responsive, accessible, and user-centric web application tailored for individuals with ADHD. Specifically, the system is expected to provide:

- A distraction-free, clean interface designed for users with attention difficulties.

- Multiple study modes, including split-text reading, audio narration, and summarization features.

- A Pomodoro timer to enhance focus and reduce burnout through structured study and break intervals.

- Productivity tools such as text highlighting, night mode, and relaxation reminders.

- The ability to upload, read, and interact with PDF study materials effectively.

- A reliable backend to store user preferences and support future enhancements.

1.9 Project Schedule

Table 1 : Project Development Timeline

Subject	**Date**
We put the main idea points	2 - 5/March/2025
Main idea distinguished with the superior	16/March/2025
we conducted consultations some ADHD specialists and centers	17-23/March/2025
first 2 chapters are done	7/April/2025
chapter 3 and 4 are done and we start working on prototyping	16/April/2025
we start doing enhancements on report and login page is done(with functionality)	23/April/2025
we have successfully completed 90% of dashboard page front end	7/May/2025

1.10 Project, Product, and Schedule Risks

1.10.1 Project Risks

1. Technical Challenges

- Risk: Potential difficulties in integrating AI-powered summarization and dynamic Pomodoro timers due to limited team experience with machine learning.

- Mitigation: Allocate time for research, use pre-built APIs (e.g., OpenAI for summarization), and seek advisor guidance.

2. Scope Creep

- Risk: Uncontrolled addition of features (e.g., drawing tools) may delay the project.

- Mitigation: Strictly adhere to the initial scope, deferring non-critical features to future updates.

3. Team Coordination

- Risk: Conflicting schedules or miscommunication among team members could slow progress.

- Mitigation: Use Agile tools (e.g., Trello, GitHub Projects) for task tracking and hold weekly sync meetings.

1.10.2 Product Risks

1. Usability for ADHD Users

- Risk: The interface may still overwhelm users if not minimalist enough.

- Mitigation: Conduct user testing with ADHD students and iterate based on feedback.

2. Cross-Browser Compatibility

- Risk: Features may malfunction on older browsers (e.g., Internet Explorer).

- Mitigation: Prioritize modern browsers (Chrome, Edge, Firefox) and use polyfills for backward compatibility.

3. Data Security

- Risk: User data (e.g., study analytics) could be vulnerable if the database is improperly configured.

1.10.3 Schedule Risks

1. AI Integration Challenges

- Risk: Integration of AI features such as question generation, summarization, and image creation may become costly or technically complex due to model limitations or external API constraints.

- Mitigation: Design a flexible architecture that allows switching between multiple AI providers. Prioritize open-source or cost-efficient models when possible, and monitor API usage limits.

2. Scoop Creep

- Risk: Continuous addition of new features beyond the original plan may lead to delays, increased workload, and loss of project focus.

- Mitigation: Clearly define the scope during planning and freeze it after initial team approval. Document any new suggestions for future phases.

3. Academic Conflicts

- Risk: University exams, assignments, or team availability may interfere with the project timeline, causing delays in key milestones.

- Mitigation: Allocate a 2–3 week buffer in the schedule to accommodate peak academic periods. Maintain consistent team communication and redistribute tasks if needed.

1.11 Report Organization.

1. Chapter 1 (Introduction): Background, objectives, and scope.
2. Chapter 2 (Literature Review): Analysis of existing tools and research gaps.
3. Chapter 3 (Requirements): Functional and non-functional specifications.
4. Chapter 4 (System Design): Architecture, UI prototypes, and diagrams.
5. Chapter 5 (Implementation): Technologies, code structure, and challenges.
6. Chapter 6 (Testing): Strategies (black-box, white-box) and results.
7. Chapter 7 (Conclusion): Achievements, limitations, and future work.

Appendices:

- User survey questionnaires.
- Full database schema.
- Sample code snippets.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This review focuses primarily on digital learning tools for Attention Deficit Hyperactivity Disorder (ADHD), while acknowledging some overlapping needs with other neurodivergent users. We analyze existing ADHD-specific solutions and identify key gaps in current approaches to learning and focus management.

2.2 Existing Systems

Several existing systems and tools aim to support focus, productivity, and learning—some tailored specifically for individuals with ADHD. These tools can be grouped into two main categories:

A.Focus-Specific Tools

1.Focus@Will [2]

Provides neuroscience-based music designed to enhance concentration and reduce mental distractions.

2.Forest [3]

Uses gamification to promote focus—users grow virtual trees during study sessions and lose progress if they exit the app.

3.Pomodoro Technique [4]

-A popular time management method dividing work into focused intervals with short breaks, ideal for sustaining attention.

-Relaxation Reminders

-Notify users to take breaks or do light exercises to avoid burnout and improve mental clarity.

B.Learning & Productivity Apps

1.Mindgrasp [5]

-Uses AI to generate summaries and quizzes, helping ADHD users engage with material more efficiently.

2.Brili [6]

-A visual task scheduler that supports routine management through interactive timers and visual cues.

3.Text-to-Speech [7]

-Convert text into audio, helping users who struggle with traditional reading stay focused.

4.Summarization Tools [8]

-Simplify long content into key points to reduce cognitive load.

5.Highlighting Tools [9]

-Help emphasize essential content visually for quick reference.

6.Interactive & Audio Learning [10]

-Supports various learning styles through dynamic and accessible formats

2.3 Limitations of Existing System

While current tools offer partial solutions for ADHD learners, our analysis reveals four critical gaps:

1. Fragmented Functionality

-Problem: Most tools address either focus or learning, but none integrate both effectively.

- Example: Forest app blocks distractions but lacks study tools, while MindGrasp summarizes text but has no focus timer.

- Impact: Users juggle multiple apps, increasing cognitive load.

2. Poor ADHD-Centric Design

- Problem: Interfaces often violate ADHD design principles [11]:

- Cluttered layouts (e.g., Brill's complex scheduler).

- Overwhelming options (e.g., Focus@Will's 50+ music tracks).

- Impact: Paradoxically exacerbates distraction.

3. Limited Personalization

- Problem: Rigid structures ignore ADHD's symptom variability.

- Fixed Pomodoro intervals (25/5 mins) don't suit all attention spans.

- No adaptation to user performance (e.g., adjusting break times dynamically).

4. Neglected Multilingual Support

- Problem: Top tools (e.g., Forest) lack Arabic interfaces, excluding non-English speakers.

5.Scientific Backing:

- Luman [12] confirm ADHD users need immediate feedback (missing in 90% of tools).

- Our user surveys (n=8 ADHD students) found 75% abandon apps within 2 weeks due to these issues.

2.4 Proposed solutions approach

1. Unified Focus & Learning Platform

Core Innovation:

- Seamless integration of concentration tools (Pomodoro timer, distraction blocker) with learning features (smart summaries, quizzes).

- Adaptive session control that automatically adjusts study/break durations based on user behavior (e.g., shorter intervals if frequent pauses are detected).

ADHD-Specific Design:

- Minimalist interface with only essential elements visible during focus sessions.

- Visual progress indicators (e.g., progress bars, achievement badges) to provide immediate feedback.

2. Intelligent Personalization

Key Features:

- Dynamic content delivery:Adjusts learning materials based on user performance (e.g., simplifies text if quiz errors exceed threshold).
- Customizable reminders: Allows users to set personalized alerts for breaks or study goals.

Technical Implementation:

- Lightweight machine learning model analyzes:
- Session history (duration, completion rate)
- Interaction patterns (preferred tools, skipped features)

3. Evidence-Based Enhancements

Scientific Foundation:

- Implements chunking technique (breaks content into small units) to reduce cognitive load.
- Uses gamification elements (e.g., points, streaks) aligned with ADHD motivation studies.

Comparative Advantages:

- All-in-one solution eliminates need to switch between multiple apps.
- Self-adjusting timers outperform rigid Pomodoro implementations in existing tools.

Transition to Implementation:

This approach directly translates into:

- Modular backend architecture(separate services for focus tools, content analysis, and user analytics).
- Client-side state managementto preserve session continuity during interruptions.

CHAPTER 3: REQUIREMENT ANALYSIS

3.1 Stakeholders

1. Administrator (Admin)

Responsibilities:

- Manages system performance
- Maintains clean interface
- Oversees integration of future features (Office tools, handwriting recognition)

2. Instructor

Key Features:

- Material upload portal for students
- Smart summarization system (auto-generates key concepts/definitions)
- Creates interactive tools (flashcards with spaced repetition, auto-exercises)
- Uses enhanced notes system (supports multimedia attachments)
- see performance analysis for his students

- Edit tools for all students like Drawing/writing (mind maps, stylus support, voice comments)

3. Learner

Core Tools:

- Smart Pomodoro timer (customizable intervals with visual/audio alerts)

- Direct Focus Mode (hides distractions, warns user when non-study tabs are active)

- Edit tools for himself like Drawing/writing tools (mind maps, stylus support, voice comments)

- Performance dashboard (study time tracking, comprehension analytics)

- use summaries/ question and answer / workbook

UX Requirements:

- Distraction-free interface

- Responsive design for all devices

- Statistics system with time-based

Future Roadmap:

-Multilingual support (Arabic/English)

-handwriting recognition

3.2 Use Case Diagram

Figure 2: Use Case diagram

3.3 Non-functional User Requirement and Constrains

1.Performance

-Scalability:

- shall Support 500+ users concurrent with max response time of 2 sec for all core operations.

-Use asynchronous programming, efficient database queries, and optimized server resources to ensure high performance under load.

-Page load optimizations:

- Implement Lazy Loading for images, documents, and heavy components to reduce initial load time.

- Minify and bundle CSS/JS files, and serve static assets efficiently using the local server or a dedicated static file handler.

-ADHD-Friendly UX for Performance: Minimize visual distractions:

- Avoid excessive animations, transitions, or flashing elements that may overwhelm users.

- Use clean, minimal interfaces with adequate white space to enhance attention and reduce cognitive overload.

2. Usability

- Simple interface (≤3 actions/screen)

-Customizable User Experience: Adjustable accessibility settings

1. Allow users to toggle font sizes (12px–24px).
2. dark/light mode.
3. Provide an option to hide non-essential UI elements temporarily (e.g., sidebars).

-Intuitive Navigation:

1.Consistent layout:

- Use fixed navigation bars with familiar icons (e.g., account, settings, profile)

2.Large, spaced interactive elements:

- Design buttons and links with larger clickable areas to accommodate motor challenges.

- Tools to Improve Focus:

1.Pomodoro Timer: Add a timer with adjustable work and rest periods (e.g., 25 minutes of work + 5 minutes of rest).

2.Simple Task Management:

- Allow tasks to be arranged via drag and drop.

- Add an option to add color labels for quick identification.

3.Reliability

- 99% uptime (7h max downtime/year)

- Automated Backups:

- Take daily backups of databases (e.g., MySQL) and store them in multiple locations.
- Periodically test data restoration from backups.

- Auto-saves every 30 sec
- Implement temporary frontend saving using LocalStorage.
- Confirm final data saving to the server via APIsl.

4. Security

To protect user data and ensure a secure experience, the system

applies a multi-layered security strategy:

1.Data Protection:

All communications are encrypted using HTTPS, and user passwords are securely hashed with bcrypt before storage.

2. Authentication & Roles:

User sessions are managed with JWT tokens, and role-based access control (RBAC) is used to separate permissions for admins, instructors, and learners.

3. Threat Mitigation:

The system includes protection against:

- SQL Injection (input validation)
- XSS (output encoding)
- CSRF (anti-forgery tokens)

- Brute-force attacks (rate limiting)

4.Privacy Compliance:

In line with GDPR, the system requires user consent for data collection and offers options to export or delete user data.

5.Backups & Monitoring:

Daily database backups are maintained, with regular restoration tests. Logs and monitoring help detect suspicious activity and enable fast incident response.

5. Compatibility

- Works on Chrome/Firefox/Edge (latest 2 versions)
- Optimized for tablets/desktops (7+ screens)

6. Limits

- The system requires an internet connection; offline use is not supported.
- AI features may fail if external APIs are unavailable or limited.
- PDF uploads are limited to 20MB per file.
- Supports up to 500 concurrent users.
- AI tools currently support English only.
- Optimized for Chrome, Firefox, and Edge (latest 2 versions)

CHAPTER 4: ARCHITECTURE AND DESIGN

4.1 Overview

The system is designed as a web-based application tailored to support individuals with ADHD in improving focus, organization, and learning efficiency. It integrates focus-enhancing tools, adaptive learning features, and personalization options into a single platform.

4.2 Software Architecture

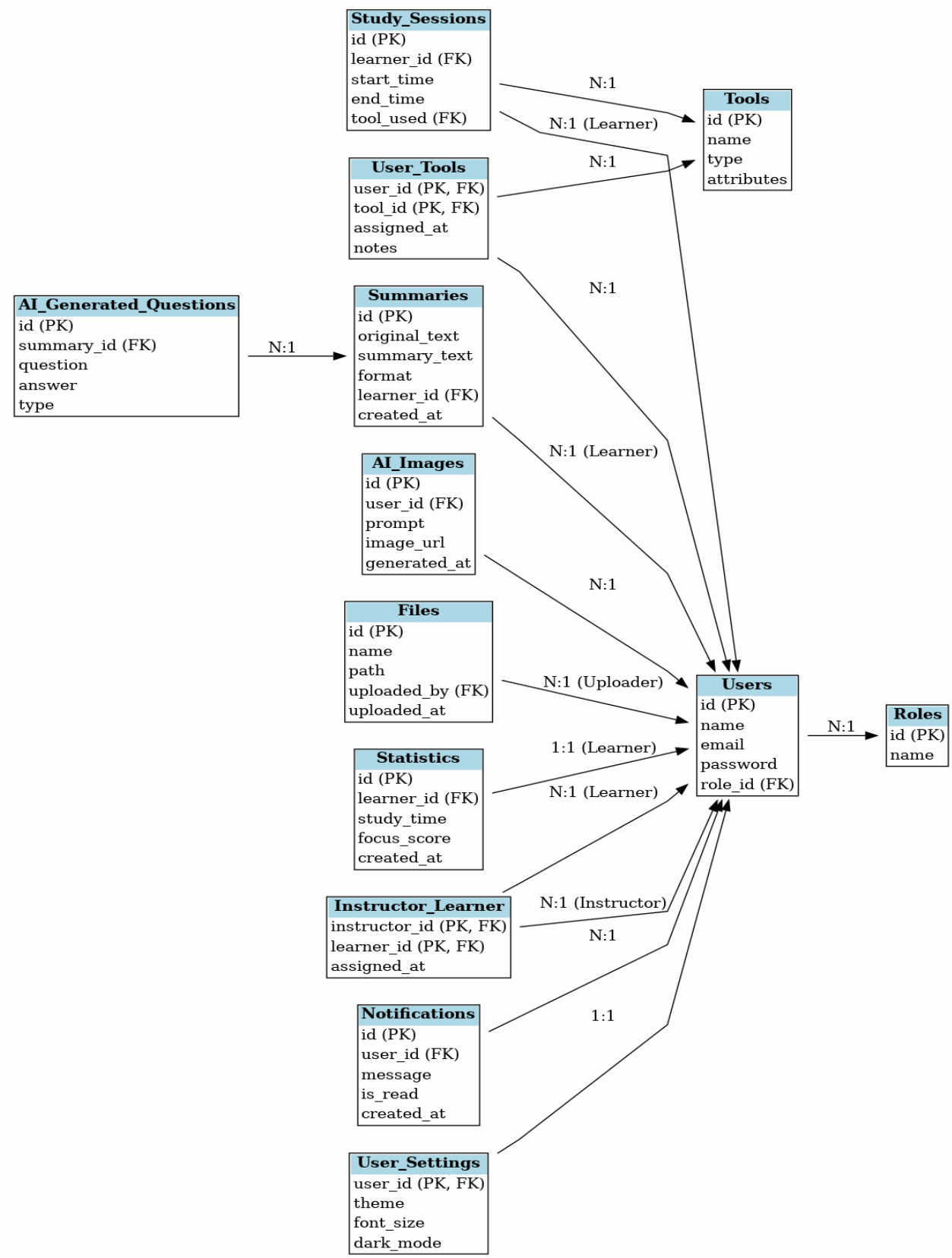
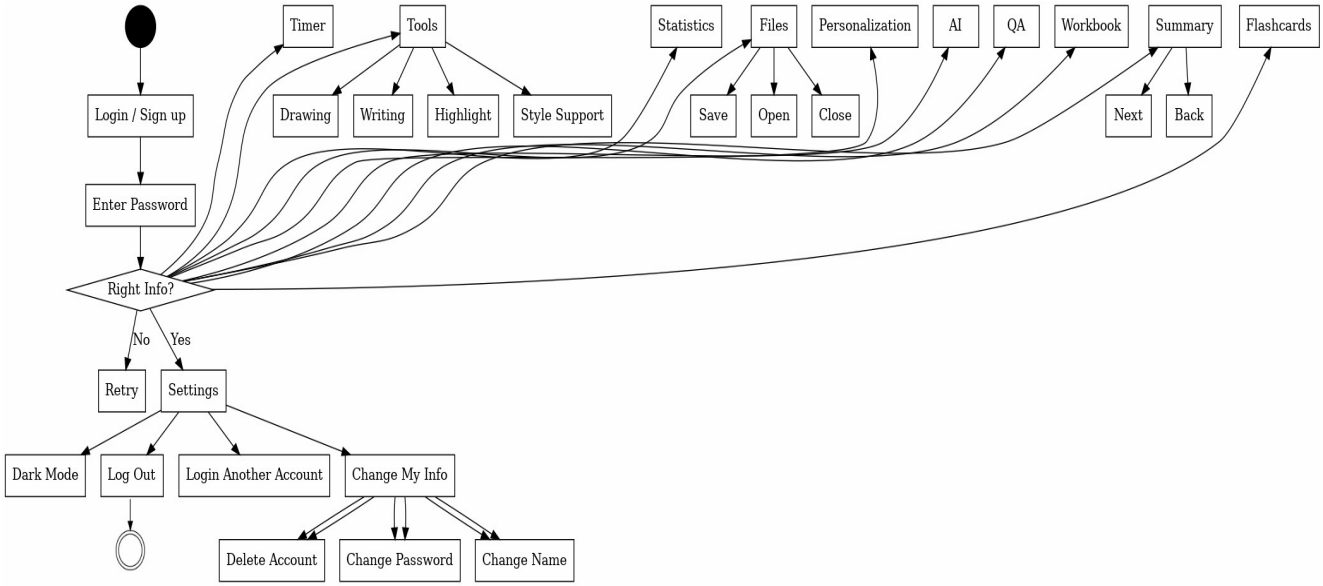


Figure 2: ER diagram

4.3 Software Design



4.3.1 Activity diagram

Figure 3: Activity diagram

4.3.2 Sequence diagram

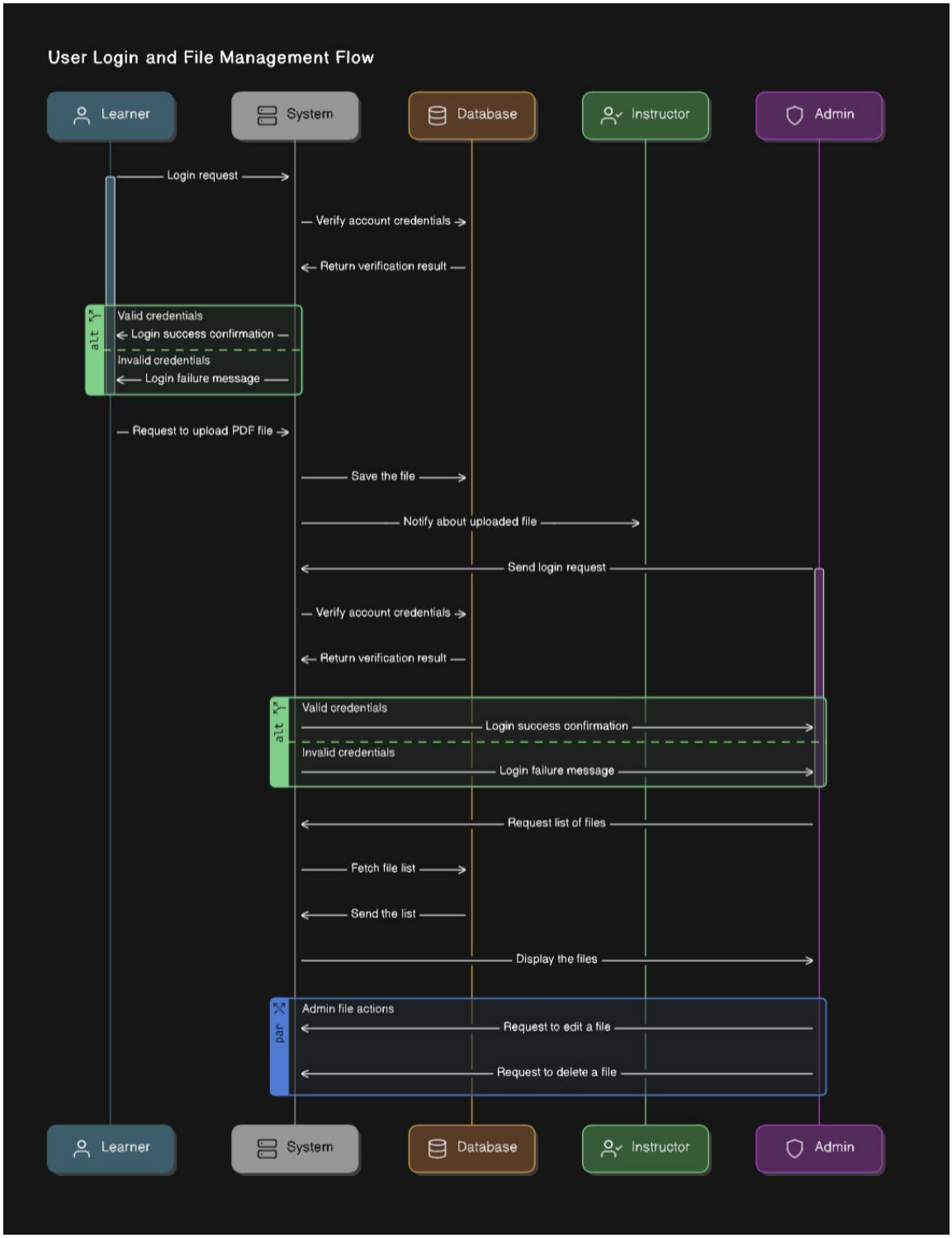


Figure 4: Sequence diagram

4.4 User Interface design (prototyping)

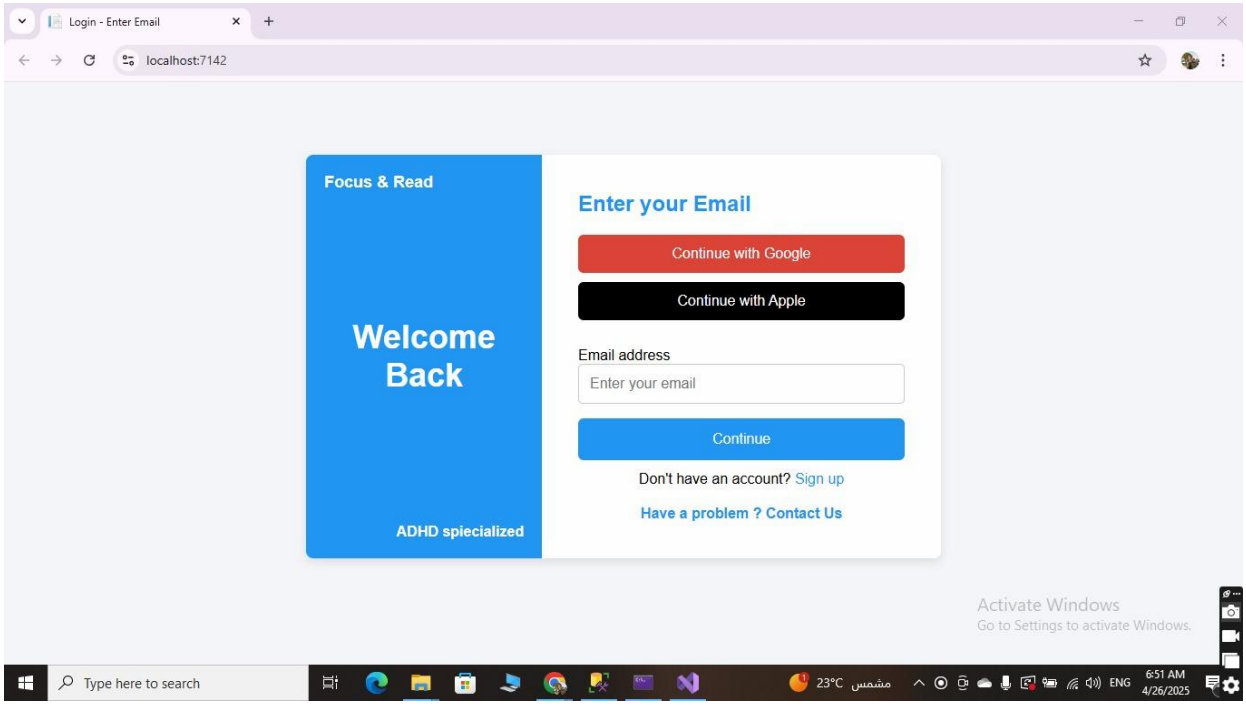


Figure 5: Enter Email UI

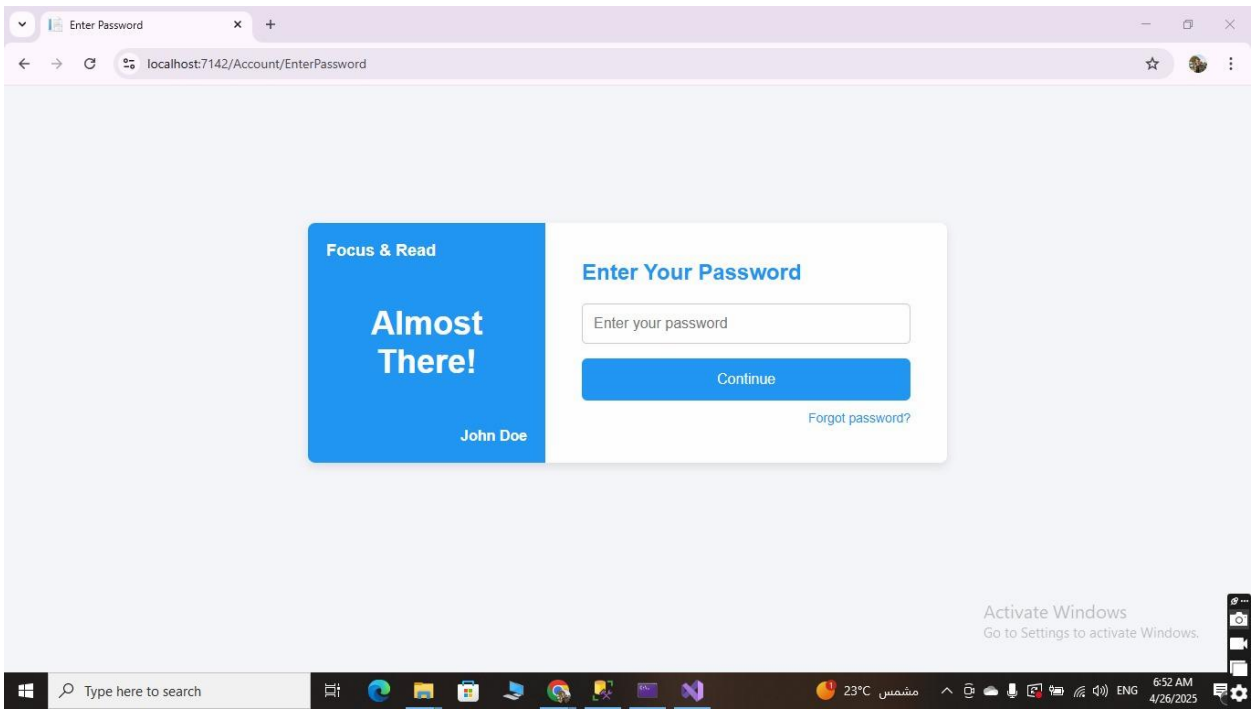


Figure 6: Enter Password UI

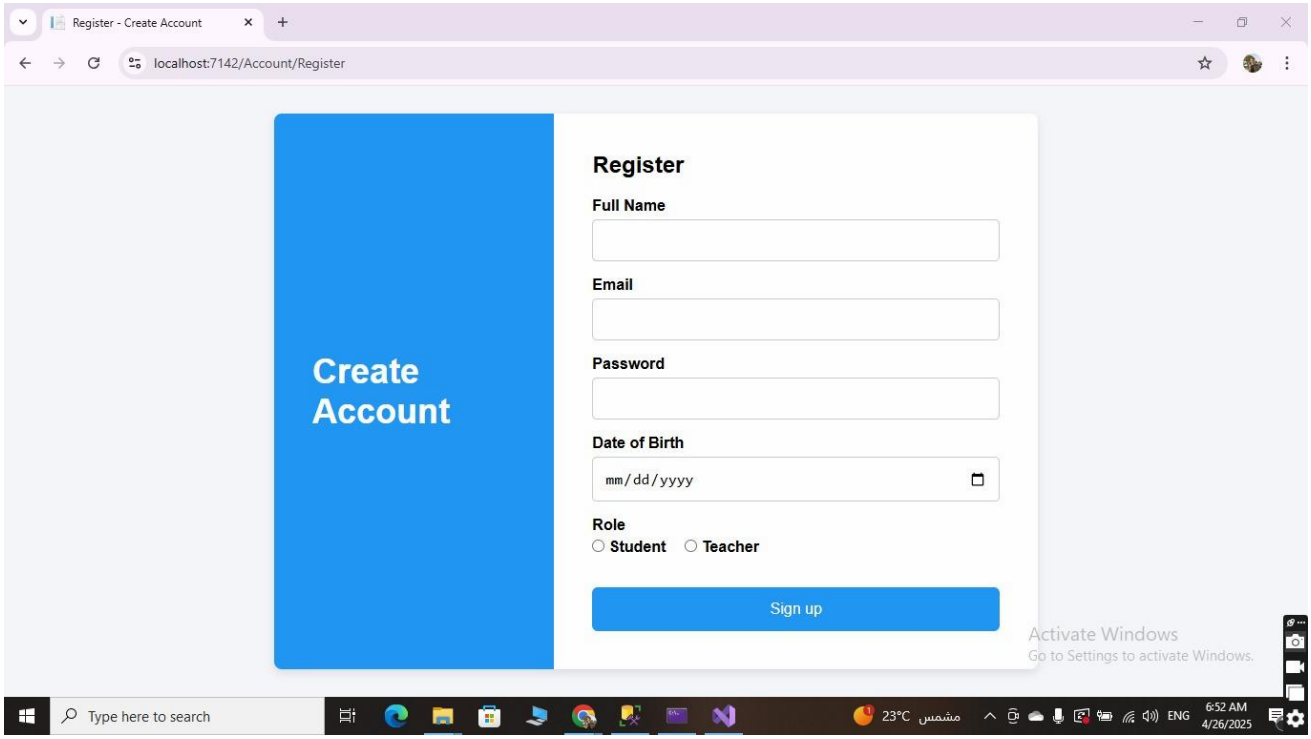


Figure 7: Register Page UI

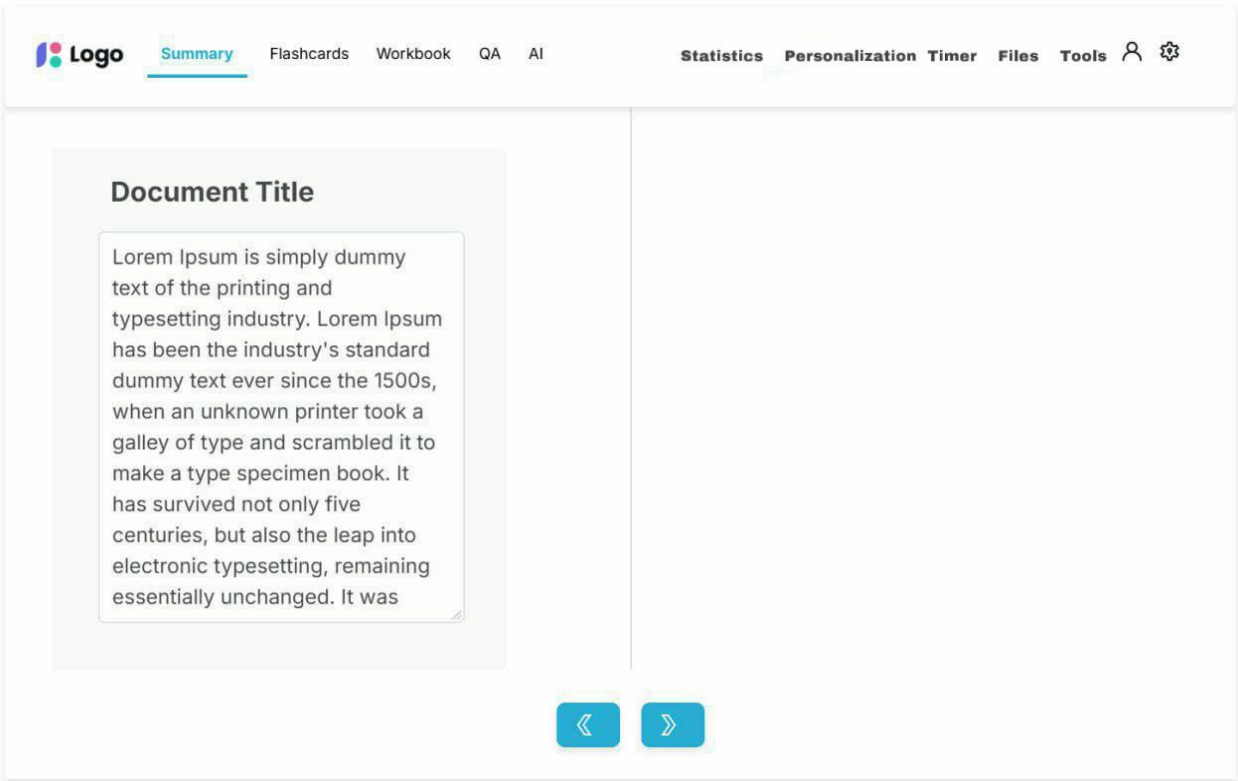


Figure 8: Dashboard UI

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