An-Najah National University

Faculty of Engineering &Information Technology

Computer Engineering Department

Graduation Project I Report

LearnWeb –Interactive HTML &CSS Learning App

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Dedication

To our parents, whose unwavering love shaped the heart of our dreams.

To our families, who stood beside us with strength, grace, and patience.

To our mentors, whose wisdom and guidance carved the path to success.

To our friends, who filled this journey with laughter, light, and joy.

To the obstacles, that taught us patience, courage, and growth.

This project is dedicated with gratitude and pride.

Acknowledgment

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We are also thankful to our teammates for their dedication, collaboration, and shared vision, which made this project possible.

Finally, we would like to thank our families and friends for their endless encouragement, motivation, and belief in us.

DISCLAIMER

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Abstract

Given the accelerated development in web technologies and the increased need for knowledge in these areas, the skill of web development has become very important for both students and new entrants in the field of technology. Both HTML and CSS are the basics of web development; nonetheless, both these tools are commonly difficult for those wanting to acquire these skills, as there are no interactive sessions or continuous guidance provided in the existing platforms. Existing platforms are usually limited to content delivery with static functionality.

This project introduces LearnWeb, an interactive learning website system focusing on learning HTML/CSS concepts effectively. The learning system includes structured lesson plans with varied levels of difficulty, an in-code editor for practical learning, learning tasks, quizzes, and projects. Moreover, this learning website system enables communication between students, supervisors, and administrators with a real-time chat and notification system.

LearnWeb also provides features related to performance tracking and analytics, enabling supervisors and administrators to track the progress of the learners, evaluate submissions, and improve the effectiveness of learning. In sum, the proposed system unifies learning, practice, assessment, and communication in one environment to offer better student engagement, knowledge retention, and skill acquisition, while offering an overall comprehensive and user-centered e-learning environment for web development education.

Chapter 1: Introduction

1.1 General Background

With the advancement in web technologies and increasing need for digital literacy, acquiring web development knowledge has emerged as an imperative for students as well as newcomers to the world of technology. HTML & CSS are basically the basics for web development, but often students struggle with these because there is an absence of hands-on exercise, guided support, as well as feedback. Conventional online platforms are primarily designed for teaching with static delivery, which might result in reducing engagement.

To address these challenges, modern e-learning systems are shifting toward interactive, user-centered platforms that combine theoretical content with hands-on practice, real-time communication, and performance tracking. Such platforms aim to enhance student motivation, improve learning outcomes, and support personalized learning experiences through continuous assessment and feedback.

1.2 Objectives of the Work

The key aim of this project is to develop an interactive web-based learning system that can facilitate HTML/CSS learning for students through a set of organized lessons, assignments, tests, as well as real projects that can allow them to gain knowledge about HTML/CSS in an effective manner.

The specific objectives of the project include:

- Lesson plans on structured HTML and CSS are given in a progressive difficulty manner.
- Enables learners to practice coding using an integrated code editor.
- Supporting supervision assignment, submission, and evaluation between supervisors and students.

- Facilitate real-time communication through Chat and Notifications.
- Stimulate collaboration and competition by sharing projects and challenges.
- Performance and engagement monitoring by analytics and evaluation tools for supervisors and administrators.

1.3 Significance of the Work

Importance of this project: This project is of major importance since it aims to meet the increasing demand for a convenient web development learning platform. With the increasing use of digital education platforms, learning systems that are beyond the basic information delivery are of great importance.

The value offered by the proposed platform is based on its ability to offer learning, assessment, communication, and collaboration through one program. The platform helps students develop web development skills while enabling administrators to track the progress of the students. From an educational point of view, the program increases learning efficiency and motivation for students while ensuring improved knowledge retention through constant assessment and practice.

1.4 Organization of the Report

This report shall be divided into various chapters

- In chapter 1, the project is introduced, and the background, aims of the project, its significance .
- Chapter 2 presents a literature review on the theoretical foundations from the areas of e-learning platforms, web-supported education systems, as well as interactive learning technologies.

- The methodology for the system is explained in Chapter 3 in relation to system architecture, user roles, and other details related to the features offered by the platform.

- Chapter 4 shows the system results and analysis.

- Chapter 5 marks the end of the report, where the most significant results are summarized, and recommendations for future works are provided.

Chapter 2 :Theoretical Background and Previous Work

2.1 E-Learning Platforms

E-Learning Platforms are computer-based systems that use the internet for delivering learning content as well as facilitating learning processes. These learning platforms are known to offer solutions such as learning, testing, user management, and tracking, among others. Contemporary learning platforms are known to concern learners by using engagement techniques such as interactivities, multimedia, and learning paths.

Studies have indicated that the use of interactive environments for e-learning translates into boosted motivation and better comprehension for the learner as they participate actively in the process of learning.

2.2 Web-Based Learning for Programming

Web-based coding education involves teaching coding skills through the use of web-based coding platforms and technologies. Online coding platforms

such as those with coding editors, live coding previews, and coding tests enable coding practice, where a programmer is able to see the immediate effects or outcomes through coding web technologies such as HTML, CSS, among others. Web technologies such as HTML, CSS rely heavily on visual feedback for understanding.

There exist some existing platforms through which one can follow tutorials on coding, but many do not allow evaluation supervision or collaborations.

2.3 Learning Management Systems (LMS)

Learning Management Systems (LMS), on the other hand, are commonly employed for managing learning content, users, assessments, and communications. Some of the standard functionalities of LMS are the allocation of tasks, grading, and tracking progress. The traditional LMS software is useful for managing learning content; however, it lacks a programming environment for learning technical skills.

The new system adds to the established LMS model by including code practice, project work, communication, as well as performance analysis.

2.4 Previous Work

Various learning platforms have been developed from which people can learn web development. Some examples are coding websites that offer learning through tutorials, quizzes, and coding challenges, as well as online learning platforms for web development that offer a learning path for students. The limitation of these learning tools is that they are designed for individual learning and are based on automated assessment.

The current project relies on previous work by incorporating supervised learning tutorials, task-based assessments, collaborative project sharing, and notifications within a single platform. Through the integration of these

aspects, the new system seeks to ensure a more encompassing and engaging learning environment for students learning HTML and CSS.

Chapter 3 : Methodology

3.1 Overview of the Methodology

The development of the LearnWeb system adopted a systematic approach to ensure that the end product was of high quality. The project was undertaken as a web and mobile-based system. The use of recent technologies made the learning process an interactive undertaking for those wishing to acquire knowledge in HTML and CSS.

The adopted methodology combined the initial requirement analysis with an iterative development approach. During the early stages, a preliminary analysis was conducted to determine the system requirements, based on both the project idea and the related educational needs it was trying to address. These requirements guided the overall system design and functionality. Subsequently, the system was developed through incremental means: its features were introduced successively and continuously improved.

The methodology was composed of a number of major steps, such as: Requirements Analysis, System Design, Platform Development, and finally Testing & Evaluation. The Implementation step was conducted in a series of iterations, where all components designed are individually tested after their development. It should be noted that design was where roles and interfaces were determined.

This is because this particular methodology is applied with the aim of improving system reliability, enhancing user-friendliness, and ensuring scalability for future expansion. Additionally, this methodology enables a system to meet its intended goals while being flexible to improve in the future.

3.2 Standards and Specifications (Codes)

The LearnWeb system was built in adherence to the acceptable principles of web design and software development. Such principles include ensuring compatibility, usability, and security. The design and development phases followed these principles.

3.2.1 Web Development Standards

It supports HTML/CSS standards for creating structured and organized web content. In HTML, the logical layout structure for web pages has been designed by focusing on separation between content and presentation, while in CSS, layout design, styling, and presentation have been performed. It increases the effectiveness related to maintainability, along with compatibility issues in browsers.

The system is designed to comply with W3C standards to promote consistency, compatibility, and proper rendering across all browsers. Moreover, basic accessibility principles were taken into account during interface design, like readable font, sufficient contrast between colors, and convenient navigation, so as to ensure the platform can be used by all users.

3.2.2 Software and Communication Standards

Principles of API that facilitate communication between the frontend and backend modules are being followed. The standard HTTP methods like GET, POST, PUT, and DELETE are employed for data-related operations.

All the data exchanged among the different system components is formatted in the form of JSON, which is a light, readable, and efficient method of data representation that can work well for all applications, whether it's a web application or a mobile application. The exchange of data among the client and server happens with the help of the HTTP/HTTPS protocol.

Authentication and authorization are carried out using JSON Web Tokens (JWT) for secure session handling and authorization to access protected system resources.

3.2.3 Coding and Design Best Practices

The system is designed in a manner where it follows modern coding and design principles. The principles of responsive design have been taken into account to ensure that this platform works well regardless of its size and the device being used. The application is built with React for the online application and with React Native for mobile application development.

Modular coding has been used, which involves breaking functionalities of the system into components that are independent of one another. This increases code readability. Additionally, secure development practices were used, which include secure routes, and proper validation methods, to make the overall system secure.

Adhering to this standard and specification, LearnWeb System ensures it follows a robust, scalable, and user-focused design that fits an Interactive HTML/CSS Tutorial system.

3.3 System Architecture

The LearnWeb platform adopts a client-server architecture design. The design encourages a clean separation of system components. Additionally, it promotes scalability, maintainability, as well as proper management of resources. The design ensures that web clients or mobile clients can effectively communicate with a centralized system using interfaces.

3.3.1 Overall Architecture

The system follows the client-server model, the frontend applications are the clients, while the central processing unit is at the backend. There is a separation of the presentation layer from the business logic layer to facilitate modularity and flexibility. Both web and mobile environments are supported on the platform, the web application uses React, while the mobile application uses React Native. Both clients receive the same services from the backend in order to guarantee uniformity of functionalities and data across platforms.

3.3.2 System Components

Frontend Layer:

The frontend layer is responsible for user interaction and interface presentation. It provides dynamic and responsive user interfaces that allow users to access learning materials, complete assignments, communicate through chat features, and receive notifications. The use of React and React Native enables component reusability and consistent user experience across web and mobile platforms.

Backend Layer:

The backend layer is implemented using Node.js and Express.js, and it handles the core business logic of the system. This layer manages user authentication and authorization, processes client requests, enforces access control, and coordinates communication between the frontend and the database through RESTful APIs.

Database Layer:

The system uses MySQL as the primary database management system. MySQL was selected due to its strong support for relational data, reliability, and efficiency in managing structured information. It stores essential system data, including user accounts, lessons, assignments, evaluations, messages. The relational structure of MySQL facilitates effective data organization and supports system scalability and maintainability.

3.3.3 Data Flow Description

System data flow in the LearnWeb application starts with the involvement of the users through the frontend. Each time a user carries out an action, for instance, the process of logging in or viewing educational material, a request is generated from the frontend to the backend through REST APIs. The backend handles the request, verifies the authenticity of the login performed by the user through the use of the JWT technique, responds accordingly, and finally delivers the expected feedback to the frontend, which displays it to the user. Each juncture of the system data flow is collaborated through a structured manner.

3.4 User Roles and Functionalities

The LearnWeb platform is designed to support multiple user roles, each with specific responsibilities and functionalities. This role-based structure ensures proper access control, efficient system management, and a well-organized learning environment.

3.4.1 Student Role

Students represent the primary users of the LearnWeb platform. The system provides students with access to structured learning materials and interactive tools that support skill development in HTML and CSS. Students can view lessons organized by difficulty level, practice coding through interactive exercises, and submit assignments and projects for evaluation. In addition, students are able to communicate with supervisors through the integrated chat system and receive notifications related to assignments, feedback, and system updates.

3.4.2 Supervisor Role

Supervisors play a key role in managing the educational process within the platform. They are responsible for reviewing student submissions, and providing evaluations and feedback. Supervisors can monitor student performance and engagement, allowing them to track progress and identify learning challenges. Through these functionalities, supervisors contribute to maintaining educational quality and guiding students throughout the learning process.

3.4.3 Administrator Role

Administrators are responsible for overseeing the overall operation of the LearnWeb platform. Their functionalities include managing user accounts, assigning roles, and monitoring system activity to ensure proper operation. Administrators also have access to analytics and reporting tools that provide insights into system usage, performance metrics, and user engagement. These capabilities support informed decision-making and help maintain system reliability and scalability.

3.5 Tools and Technologies Used

The LearnWeb platform was chosen in a bundle of modern tools and technologies, with efficiency, scalability, and high quality to support various learning experiences. The selected technologies are favorable for web and mobile platforms, realizing secure communication, real-time interaction, and intelligence.

3.5.1 Frontend Technologies

The frontend of the LearnWeb platform was implemented using **React** for the web application and **React Native** for the mobile application. These frameworks were chosen due to their component-based architecture, which enhances code reusability and ensures a consistent user experience across platforms. User interface libraries were utilized to create responsive, intuitive, and visually consistent interfaces that improve usability and interaction.

3.5.2 Backend Technologies

The backend system was developed using **Node.js** with the **Express.js** framework. This combination provides an efficient and scalable server-side environment capable of handling client requests, managing application logic, and supporting RESTful APIs. The backend serves as the core layer responsible for processing data, enforcing access control, and coordinating communication between system components.

3.5.3 Database

The platform uses MySQL as its primary database management system. MySQL was selected due to its reliability, support for relational data structures, and efficiency in managing structured information. It enables effective storage and retrieval of system data such as user accounts, lessons, assignments, messages, and activity logs.

3.5.4 Additional Tools

Several additional tools were integrated to enhance system functionality. **Firebase** was utilized to implement a real-time notification system, enabling instant alerts and updates for users across web and mobile platforms. Furthermore, **Ollama** was integrated to provide artificial intelligence

capabilities within the platform, supporting intelligent features such as content assistance and enhanced learning interactions. Authentication mechanisms and analytics tools were also incorporated to ensure secure access, monitor system performance, and track user engagement.

3.6 Design Constraints

The design and implementation of the LearnWeb platform were guided by several realistic constraints to ensure feasibility, usability, and compliance with technical, ethical, and educational requirements.

3.6.1 Economic Constraints

Regarding budget constraints, attempts were made to utilize these factors while designing the system. However, to save on budget, the project utilized open-source technologies and frameworks like React, React Native, Node.js, MySQL, and open-source tools for AI. This ensured that the project included innovative features like artificial intelligence with little or no effect on budget constraints.

3.6.2 Environmental Constraints

The system operates using a fully digital learning approach, which does not require any physical resource. The system optimizes resource performance and the use of cloud technology to avoid the wastage of resources and ensure that it develops in accordance with environmental sustainability.

3.6.3 Social Constraints

Social factors involved accessibility, privacy, and support for online learning . This online learning system LearnWeb, makes educational resources accessible to students from any place and facilitates flexible learning. The system layout is geared towards simplicity to benefit students with varying IT expertise and safeguard privacy in handling student details.

3.6.4 Ethical Constraints

Ethical considerations were addressed by ensuring secure handling of user data and respecting intellectual property rights . Additionally, the integration of artificial intelligence within the platform was designed to support learning without replacing human supervision, ensuring responsible and ethical use of AI technologies in education.

3.6.5 Health and Safety Constraints

User safety was addressed through the implementation of secure authentication mechanisms, protected user accounts, and controlled access to system resources. These measures help maintain a safe digital learning environment and protect users from unauthorized access and potential security threats.

3.6.6 Manufacturability Constraints

The system was built with widely available and well-supported technologies so as to ensure the viability for its implantation and subsequent maintenance. The adoption of development tools and technologies supports easy functioning and future development.

3.6.7 Sustainability Constraints

The guiding principle for LearnWeb's design was sustainability. This system architecture will make it easily scalable and extensible in the future, besides including more programming languages and learning modules than just HTML and CSS. Such a modular design further allows easier maintenance, feature enhancement, and long-term system evolution, ensuring that the platform remains adaptable for changing educational needs in the future.

By addressing these constraints, the LearnWeb platform achieves a balanced, ethical, and scalable design suitable for long-term use in AI-enhanced web development education.

3.7 Security and Privacy Considerations

Security and privacy were taken into consideration as key aspects of the LearnWeb system for safe guarding user data and for ensuring proper system functionality. The authentication process is done via a token-based approach (JWT), where users are required to log in for access to restricted functionalities. Authorization is done on a role-based approach, where users are restricted to functionalities tied to their roles.

User data such as personal details and logins is safely stored within the database, with secure communication between the front-end and back-end

handled through well-structured API requests employing HTTP/HTTPS protocols to guarantee confidentiality, controlled access, and overall system security.

3.9 Testing and Evaluation Strategy

Testing and evaluation were conducted to verify the correctness and reliability of the LearnWeb platform. Functional testing was performed to ensure that core features such as authentication, lesson access, assignment submission, communication, and notifications operate as intended. Each feature was tested after implementation to detect and resolve issues early.

Usability testing focused on evaluating ease of use and clarity of the user interface, while performance testing assessed system responsiveness and stability across both web and mobile platforms. The evaluation results confirmed that the system meets its functional requirements and supports the intended learning objectives.

Chapter 4: Results and Analysis

4.1 Overview of System Results

This chapter presents the results obtained from the implementation of the LearnWeb platform and analyzes the performance of its core functionalities. The results demonstrate how the system operates in practice and how the implemented features support the intended learning objectives. To ensure clarity and structured presentation, the results are organized according to *user roles*, highlighting the system behavior and interfaces for students, supervisors, and administrators, in addition to evaluating the overall system performance and functionality.

4.2 System Usage Statistics

After the implementation of the platform, the data on the use of the system was obtained through the analysis module. The data included the total number of registered members, which consisted of students, supervisors, as well as administrative members. In the system, there was the number of projects made, tasks submitted, comments posted, as well as the number of completed quizzes.

There was evident consistent usage on the platforms, implying the users were actively engaging with the system. The login activity for the past 30 days showed regular patterns, affirming consistent use instead of sporadic use.

4.2.1 Student Engagement and Activity Analysis

Student engagement was measured in terms of lesson completion, quiz and challenge participation, and project submissions. Provided data showed that students went through the lessons on HTML and CSS in a sequential manner (as was compelled by the level-based quiz mechanism). The majority first passed the lower levels and then progressed to unlock more advanced content, which very well supported findings on the progressive learning design.

Furthermore, through challenge participation and leader board activities, there was positive competitive engagement, which motivated the students to improve their scores and finish more activities.

4.2.2 Tasks, Submissions, and Evaluation Results

Data pertaining to tasks was examined for the number of tasks assigned, submitted, and appraised. It can be seen that most of the tasks were submitted within the deadlines set for them in their submission records. The assessments done by the supervisor were relatively equal in their marks, marking them sound and consistent.

Student feedback on supervisors was also collected and analyzed. Feedback on the evaluation showed satisfaction with supervision and communication.

4.2.3 Projects and Community Interaction

The project activity of the students was analyzed based on the number of projects uploaded, likes, and comments. The findings indicated that the students were actively sharing their projects on the Project Hub and interacting with each other in the form of comments and likes.

From the moderation data, there was only a limited amount of projects or comments that needed to be moderated, demonstrating responsible user interaction with the site.

4.2.4 Notifications and Real-Time Interaction

In addition, the effectiveness of the real-time features was checked by monitoring the activity of chats and notifications. Firebase Cloud Messaging works in task assignments, project uploading, sending messages, and evaluation without showing any delay in its notification delivery. Regarding the chats in real-time between students, supervisors, and administrators, proper records have continuously been found, which ensures reliable communication performance.

4.2.5 Discussion of Results

The analyzed outcomes show that the platform was able to accomplish its main goals efficiently. The learners were actively participating in content, tasks, and collaborative elements, while supervisors were efficiently managing tasks, assessments, and moderation, and administrators had full system control over the platform.

The data obtained has ensured that the combination of structured learning, effective communications, assessments for tasks, and analytics is effective for learning.

4.3 Authentication and Role-Based Access

This section presents the results related to the authentication process and role-based access control within the LearnWeb platform. The demonstrated results include system behavior across both web and mobile applications, highlighting how users are authenticated and directed to their respective interfaces based on assigned roles. The presented interfaces confirm the effectiveness of the login, registration, and authorization mechanisms implemented in the system.

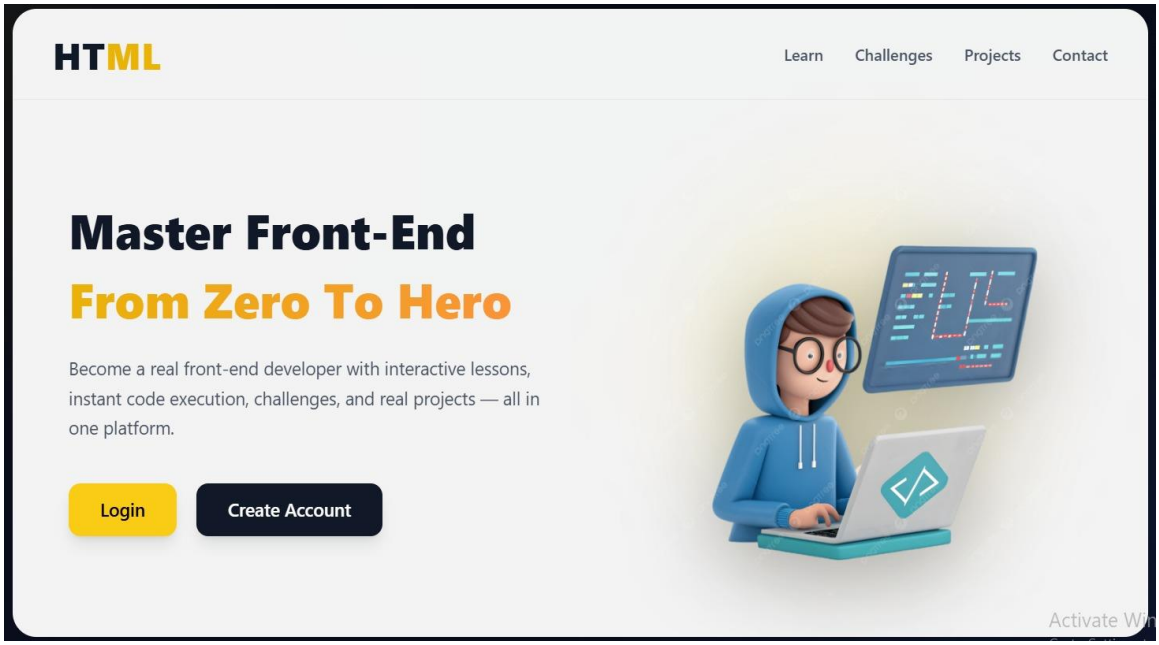


Figure 1 - authentication entry interface (Web)

Figure 1 illustrates the authentication entry interface of the LearnWeb platform, which serves as the initial access point to the system. The interface provides two main options: Login and Create Account. The Create Account option is available exclusively for students, allowing them to register and gain access to the learning platform, while supervisors and administrators access the system directly through the Login option using

pre-assigned credentials. This design enforces role-based access control from the entry stage and ensures a clear separation of user responsibilities across both web and mobile platforms.

Figure 2 illustrates the student registration interface of the LearnWeb platform, where students are required to create an account in order to access the system. This interface allows new students to enter their information and complete the registration process, enabling them to log in and use the learning features provided by the platform. Restricting the registration functionality to students ensures controlled access and supports the role-based design of the system.

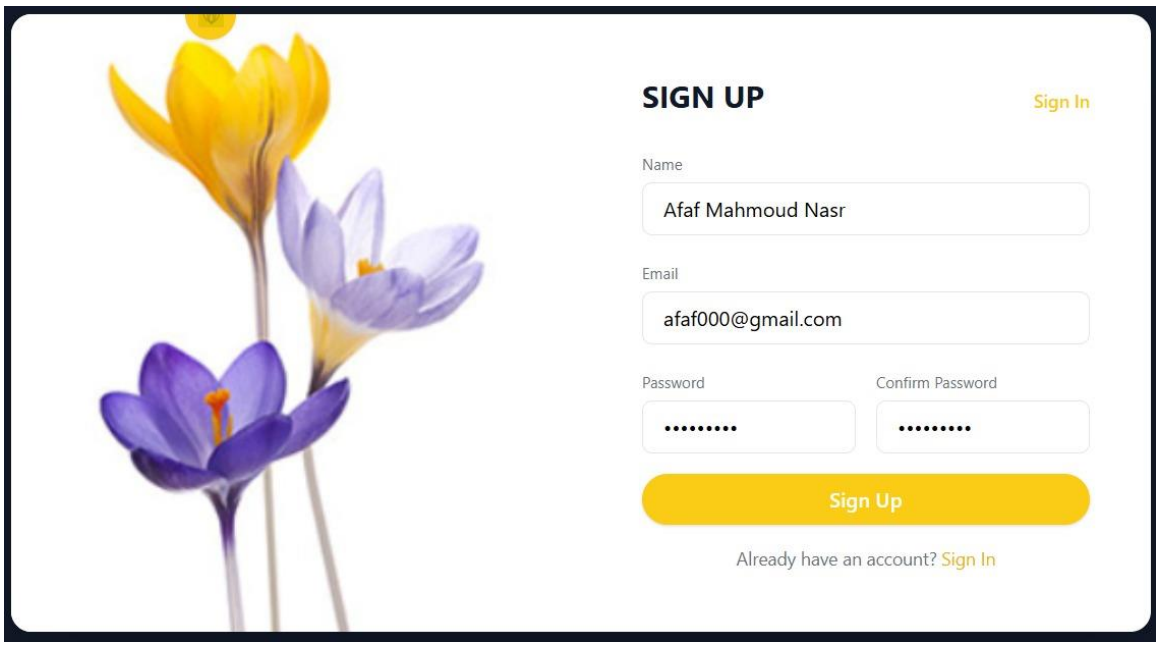


Figure 2 - Student Registration Interface (Web)

And after the user register the required information the following message appear for him and he go to the log in page :

Figure 3 illustrates the login interface of the LearnWeb platform, where registered users are required to enter their credentials in order to access the system. This interface is used by all user roles, including students, supervisors, and administrators. Upon successful

authentication, each user is automatically redirected to their corresponding dashboard based on their assigned role, ensuring secure and role-based access to the platform.

In addition, the login interface provides a password recovery option that allows users who have forgotten their passwords to reset them. When this option is selected, a reset notification is sent to the user's registered email address, enabling secure password re-assignment and ensuring uninterrupted access to the system.

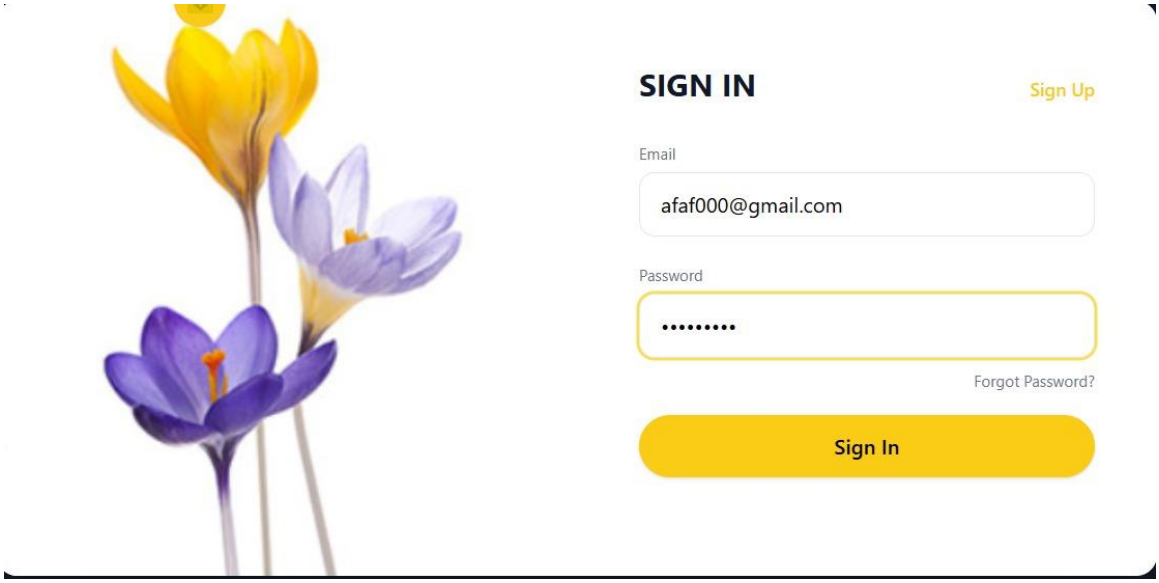
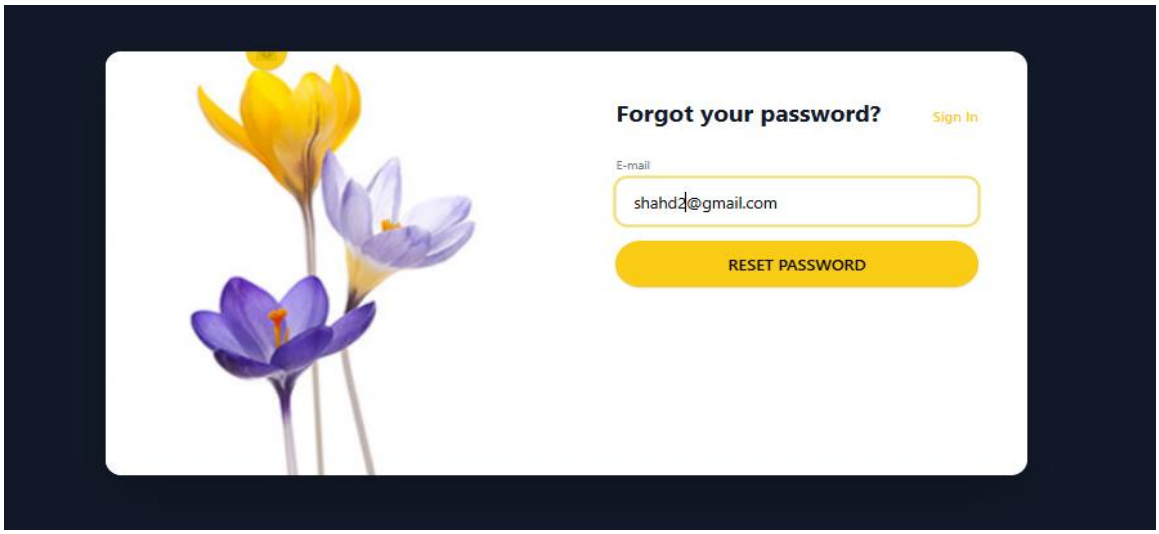
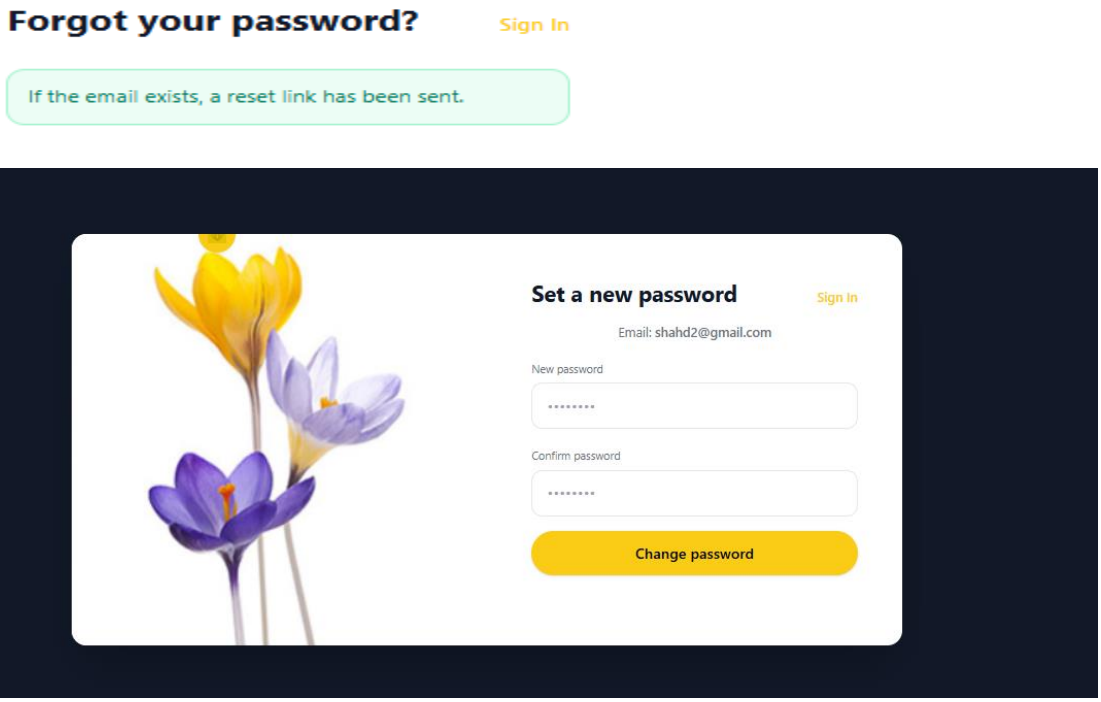


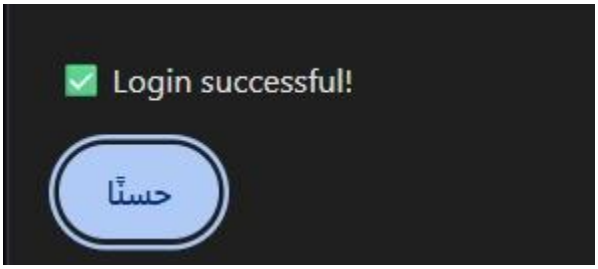
Figure 3 - Login Interface (Web)

If the user forgot his/her password he/she will click on Forgot Password? and go to this page and enter his/her email:





And after the successfull sign in .. this message appear for him :



Following the implementation of the web-based authentication interfaces, the same pages were developed for the mobile application with identical functionalities and behavior.

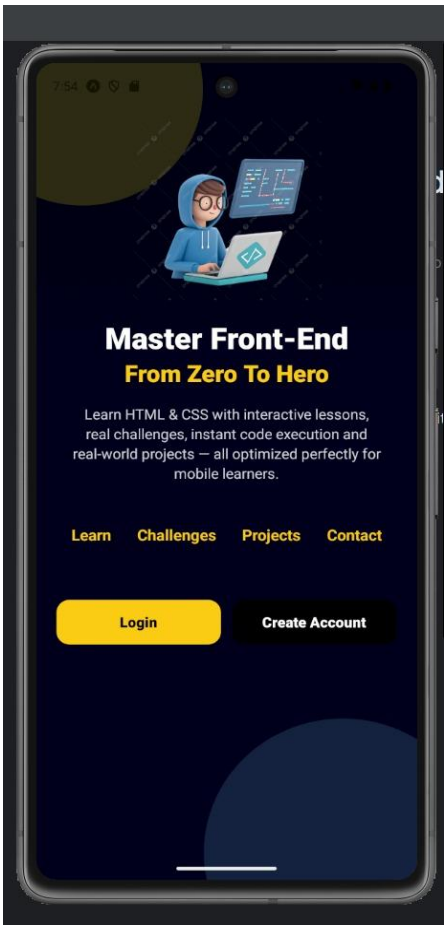


Figure 4 authentication entry interface (Mobile)

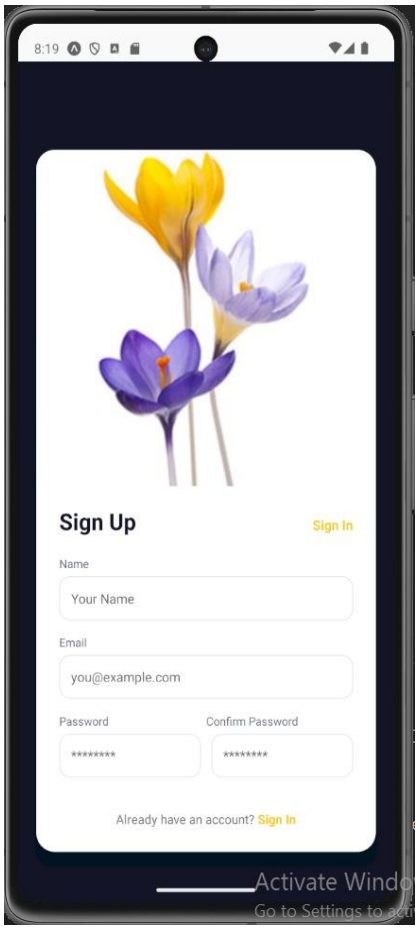


Figure 5 Student Registration Interface (Mobile)

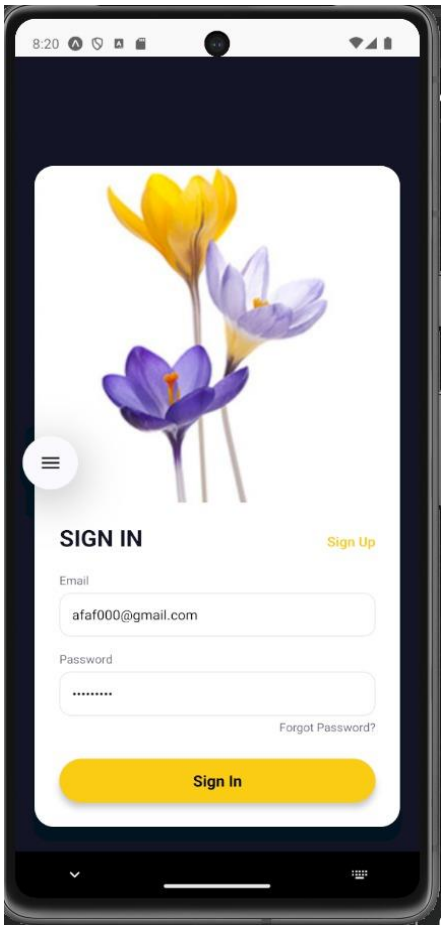


Figure 6 Login Interface (Mobile)

4.4 Student Interface Results

4.4.1 Student Home Page (Dashboard):

Figure 7 presents the main Student Dashboard, which serves as the central entry point for all learning activities within the platform. The dashboard welcomes the student and provides a clear summary of learning progress, displaying the number of completed lessons out of the total, along with a visual progress indicator that helps students easily track their achievement level.

The interface includes a Quick Actions section that offers fast access to essential features such as Lessons, Tasks, Challenges, Project Hub, Notifications, and Messages. This design reduces navigation time and enhances overall usability. In addition, the Continue

Learning section allows students to resume their current lesson directly, supporting a smooth and uninterrupted learning experience.

The dashboard also presents a Tasks Overview panel, which summarizes the status of assigned, submitted, and graded tasks, enabling students to monitor their academic responsibilities efficiently. Furthermore, the Challenges Arena section provides insights into the student's performance in coding challenges, including total attempts, the latest score, and constructive feedback aimed at improving skills.

Overall, the Student Dashboard demonstrates a well-structured and user-friendly design that integrates progress tracking, quick access to learning resources, and performance feedback, contributing to an engaging and effective learning experience.

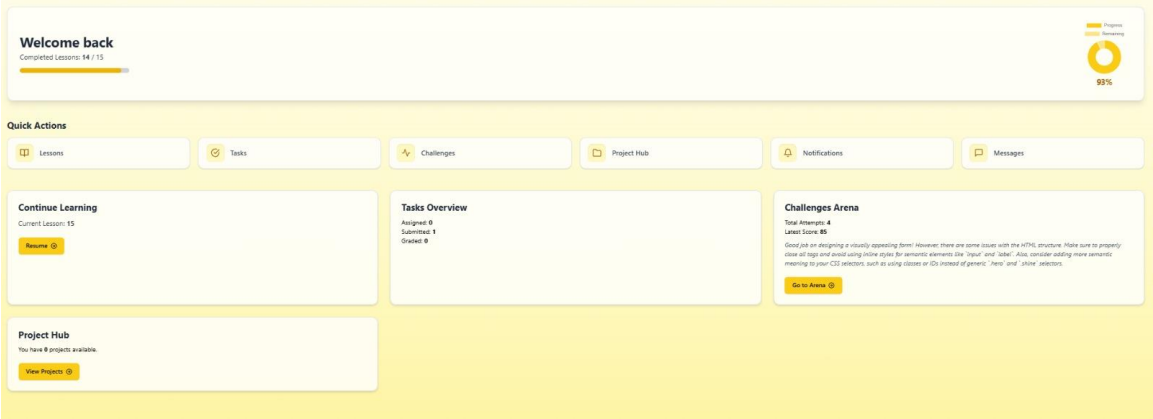


Figure 7- Student Dashboard Interface (Web)

4.4.2 Student Profile Page:

Figure 9 illustrates the Student Profile page, which can be accessed directly from the header navigation menu. This page allows students to view and manage their personal information and learning-related data within the platform.

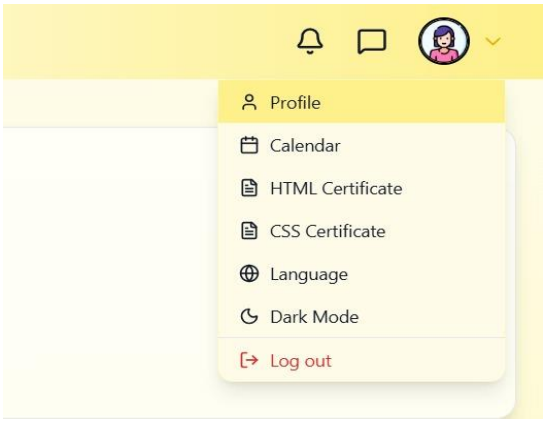


Figure 8- header navigation menu(Web)

At the top of the profile page, the student's basic information is displayed, including the profile avatar, name, email address, and last login time. This section provides a clear overview of the student's account status and enhances personalization within the system.

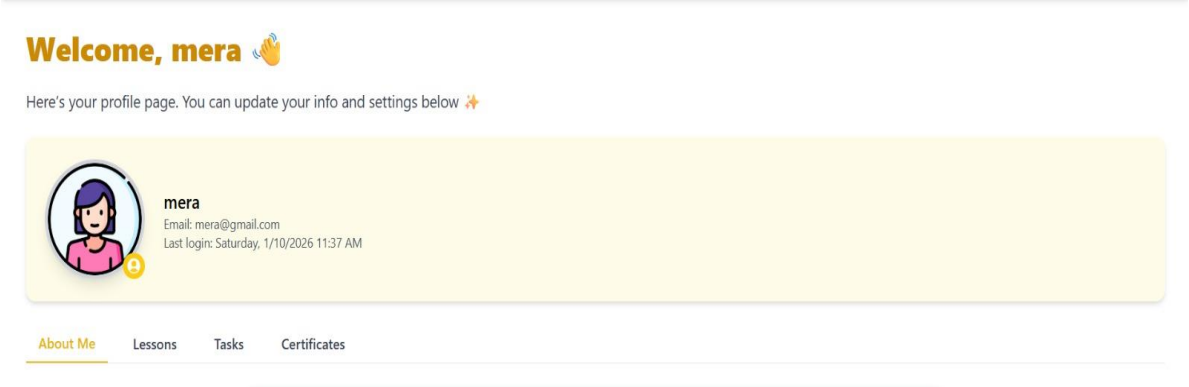


Figure 9- Student Profile page (Web)

The profile interface is organized into multiple tabs to ensure clarity and ease of navigation:

- **About Me :**

This section enables students to view and edit their personal details such as full name, email, phone number, city, address, and a brief personal description. It also includes secure password management, allowing students to update their credentials when needed.

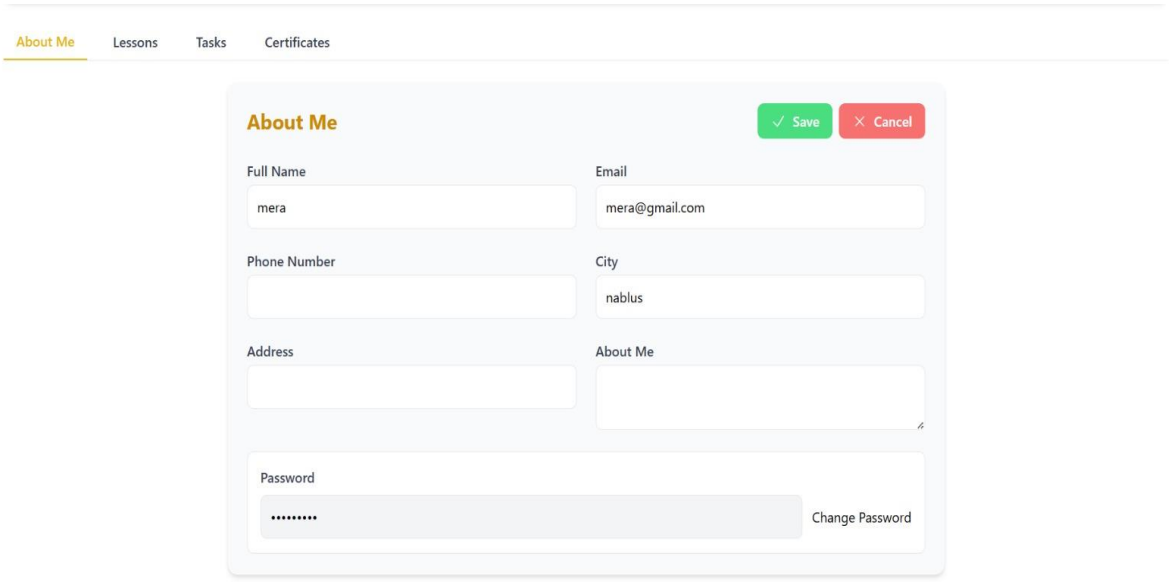


Figure 10 – About me (Web)

- **Lessons:**

By selecting the Lessons tab, students can access an overview of their enrolled lessons and track their learning progress across different modules. This feature supports continuous learning and progress monitoring.

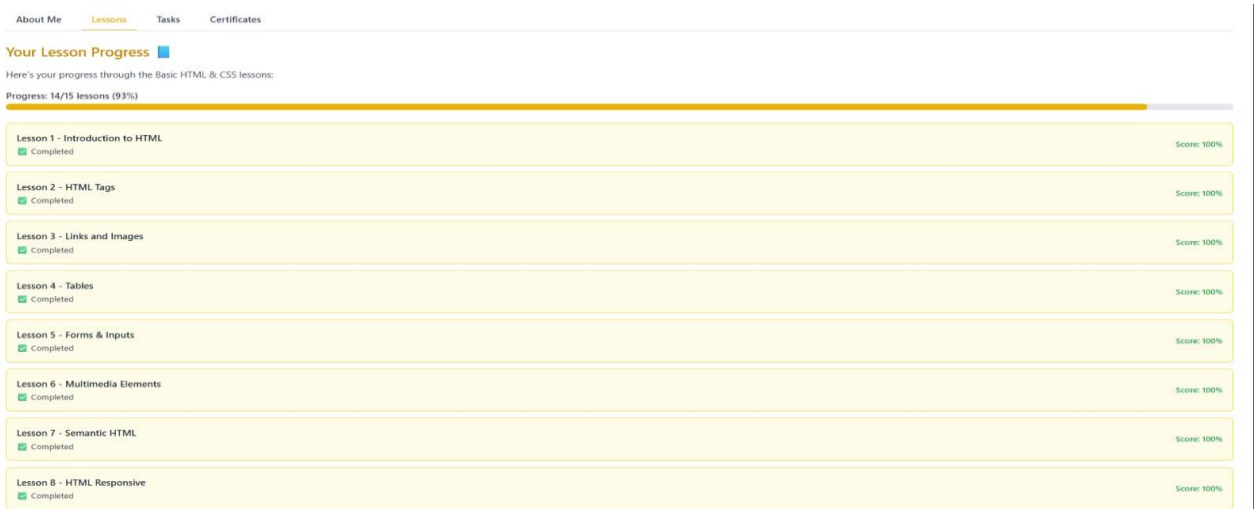


Figure 11 –Lessons Progress (Web)

- **Tasks:**

The Tasks tab provides students with access to their assigned and submitted tasks, helping them manage academic responsibilities and stay organized.

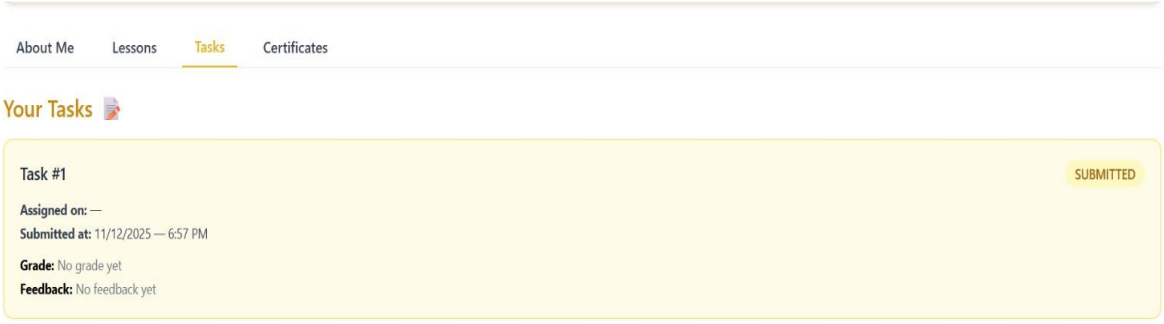


Figure 12–Tasks (Web)

- **Certificates:**

The Certificate of Completion page appears automatically after the completion of all necessary quiz levels for a certain learning track on the part of the student. A different certificate would be provided for the HTML and CSS skills, thus providing an opportunity for recognition on the basis of mastery for all skill areas. The certificate would present the basic information of the student, completion dates, name, certification title, instructor, and a certificate ID.

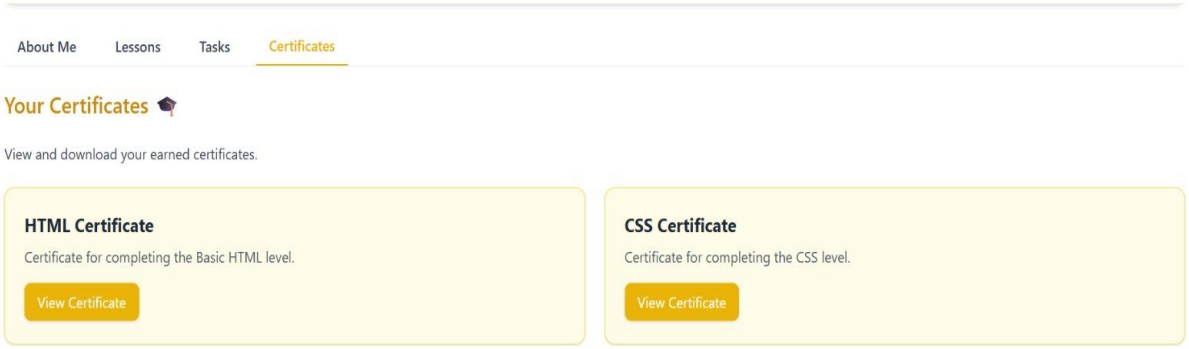


Figure 13- Certificates

When the Student click on view Certificates the **Figure 14** Appear for him :

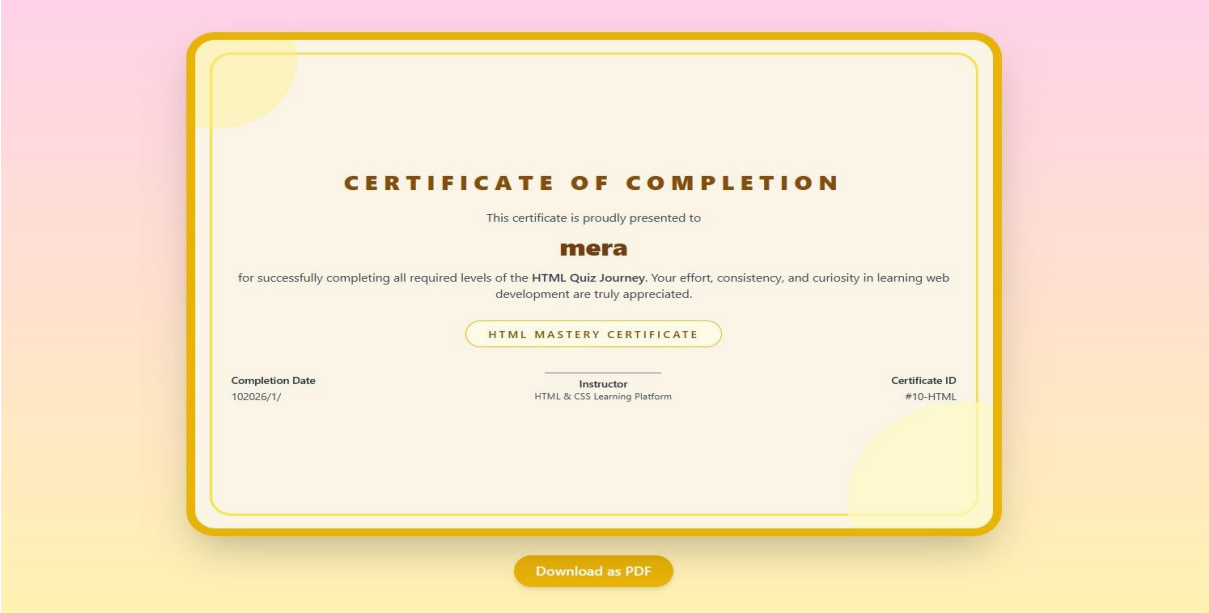


Figure 14-HTML Certificate(Web)

Figure 14 is a page that provides students with the ability to download their certificate as a PDF file, hence allowing them to archive the certificate of achievement. The aspect of certificate issuance is a reward mechanism that recognises students for their repetitive progression towards mastering the objectives of learning. Certificate issuance is linked to the completion of a quiz.

Following the implementation of the Student interfaces, the same pages were developed for the mobile application with identical functionalities and behavior.

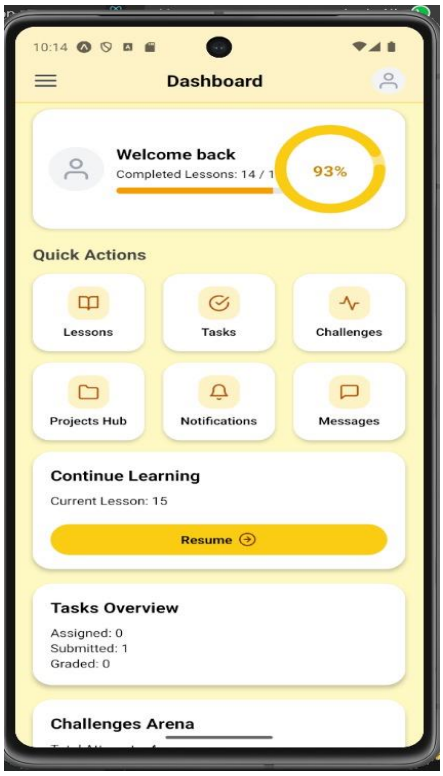


Figure 15-Student Dashboard (Mobile)

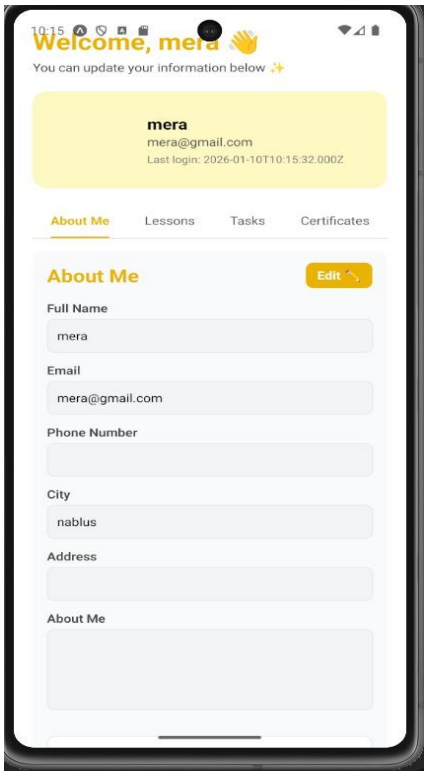


Figure 16-Student Profile (Mobile)

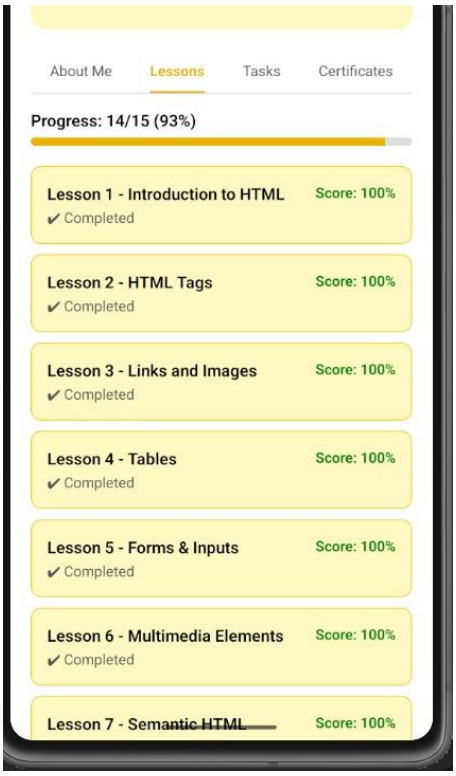


Figure 17-Lessons Progress (Mobile)

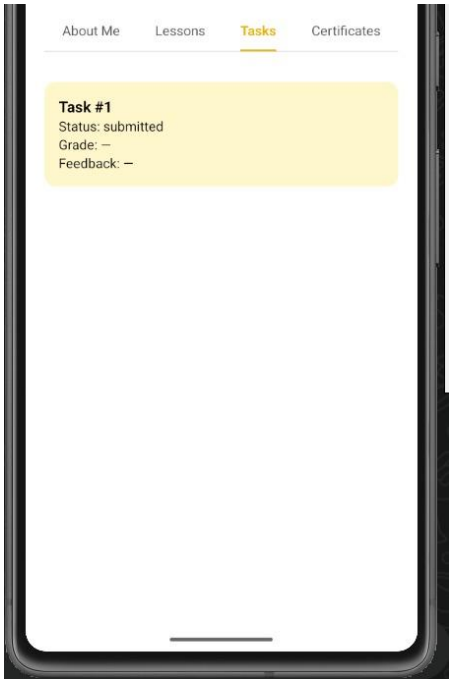


Figure 18-Tasks (Mobile)

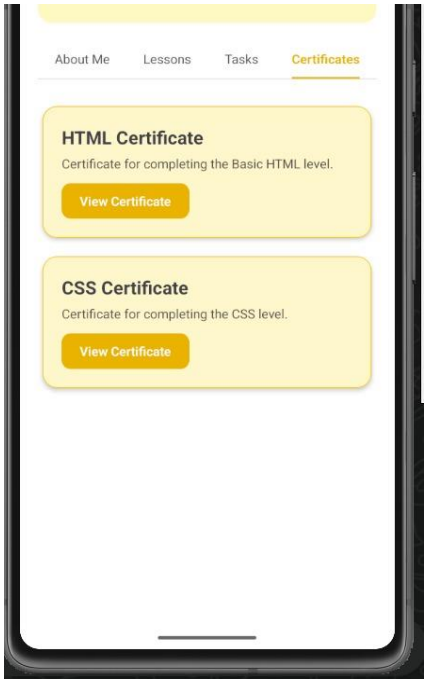


Figure 19-Certificates (Mobile)

Figure 20-View Certificates (Mobile)

4.4.3 Header Navigation and Page Access :

Figure 21 shows the Header Navigation Menu, which is displayed consistently across all student pages. The header provides a centralized navigation system that enables students to move easily between different sections of the platform without unnecessary complexity.

The header is designed to enhance usability by offering quick access to core learning features, ensuring smooth transitions between pages and improving the overall user experience.

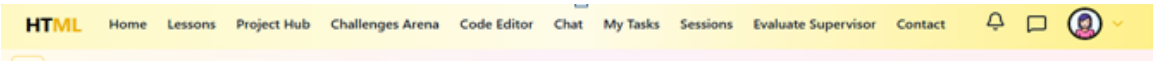


Figure 21- Header Navigation Menu (Web)

Header Sections Description :

- **Home:**

Redirects the student to the main dashboard, where overall learning progress, quick actions, and personalized content are displayed.

- **Lessons:**

When students navigate to the Lessons section, they are presented with a structured learning pathway divided into two main levels: Basic and Advanced, designed to support gradual skill development.

Figure 22-Choose Level (Web)

The Basic level consists of 15 interactive lessons focused on teaching the fundamental concepts of HTML. These lessons are presented using diverse and engaging learning approaches, allowing students to understand core elements, structure, and syntax through step-by-step explanations and practical examples.

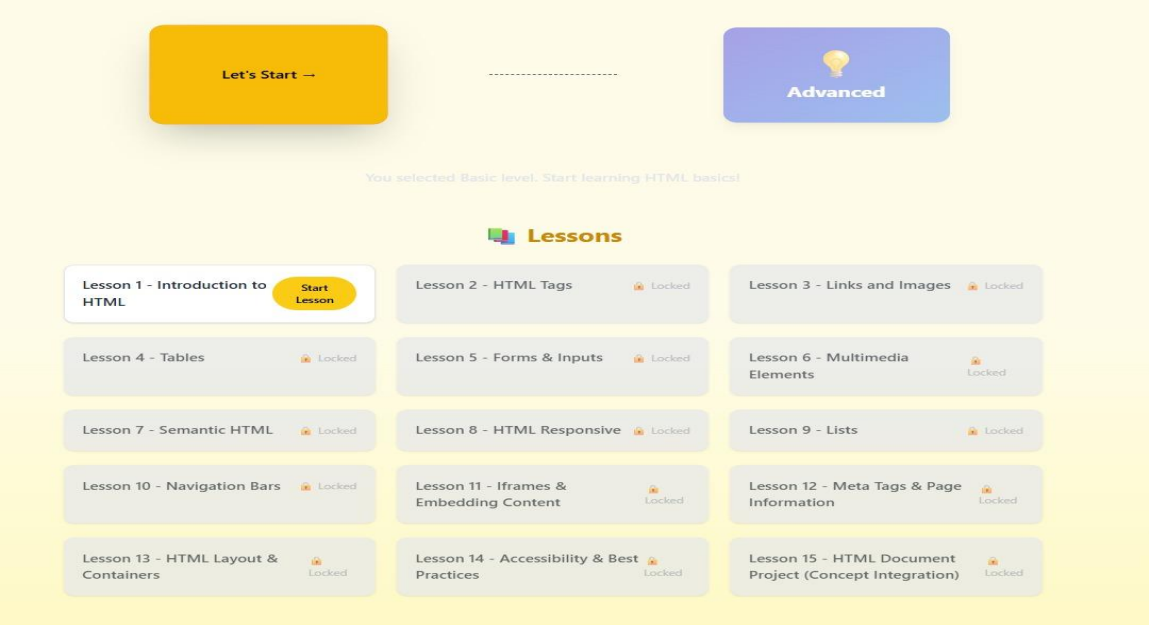


Figure 23-Basic Level Lesson

Basic Level Lessons Description :

1- Lesson 1 – Introduction to HTML :

The lesson starts with a short introductory video that familiarizes students with the course and prepares them for the learning content.

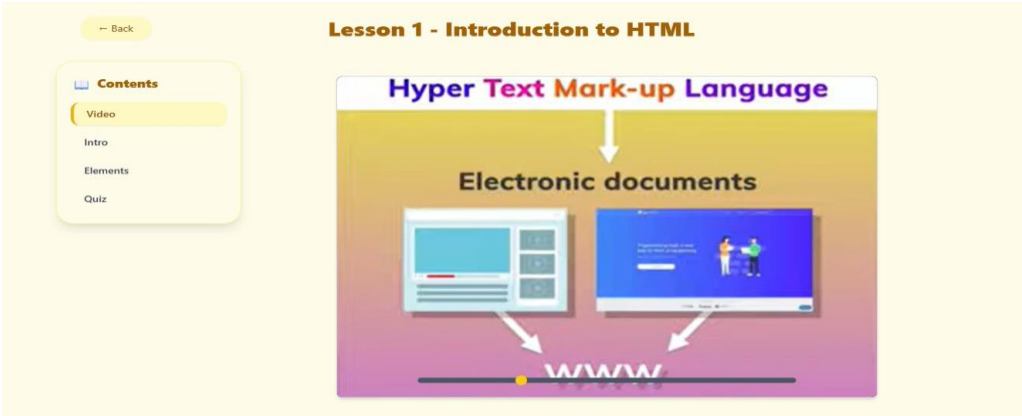


Figure 24-Lesson 1 Content

Next, a brief introduction to HTML is presented, explaining its role as a markup language used to structure web pages.

Figure 25-Lesson 1 Content

The lesson then highlights the evolution of HTML, giving students an overview of how the language has developed over time.

Figure 26-Lesson 1 Content

After that, students learn the basic HTML document structure through interactive elements that guide them in building a simple HTML page.

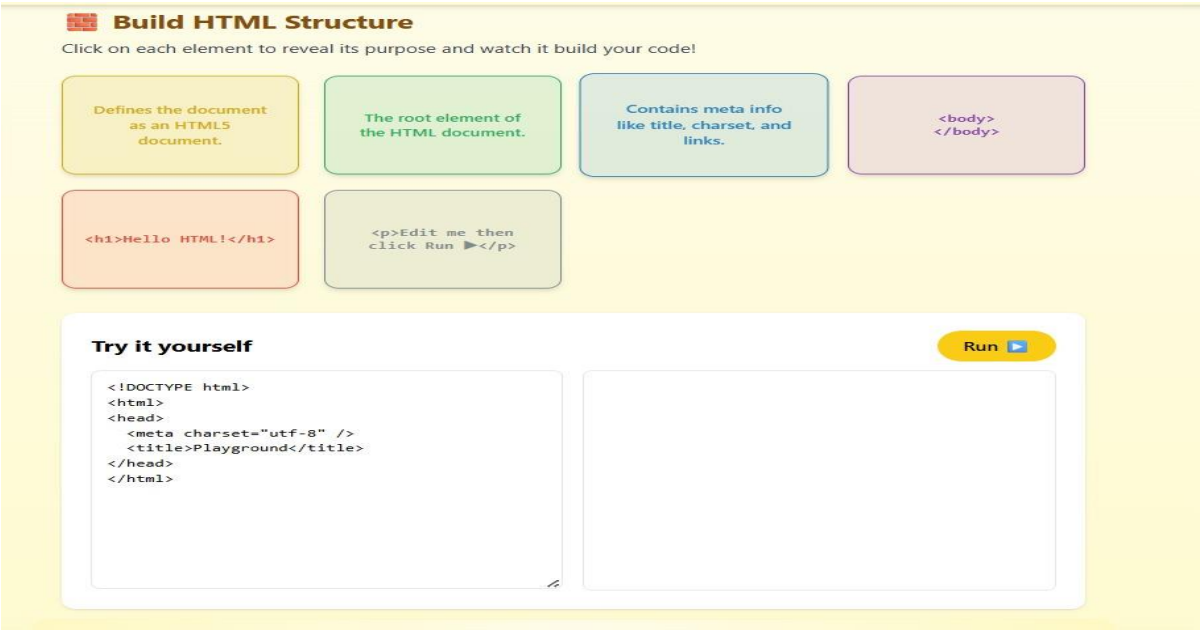


Figure 27-Lesson 1 Content

Finally, the lesson ends with a short quiz that must be completed to unlock the next lesson, ensuring understanding before progression.

Figure 28-Lesson 1 Content

2- Lesson 2 – HTML Tags:

Explains core HTML tags with interactive examples that allow students to explore tag usage in real time.

In this lesson, students can request additional explanations using the AI feature. By clicking on the Explain with AI option, the system provides a more detailed and simplified explanation of the displayed content. This allows students to deepen their understanding of HTML concepts and receive on-demand clarification without leaving the lesson page.

Figure 29 -Explain with AI

In addition, the lesson includes an AI Assistant that allows students to ask any question related to the lesson content. The AI Assistant provides instant responses, explanations, and examples, offering continuous learning support without interrupting the learning flow.

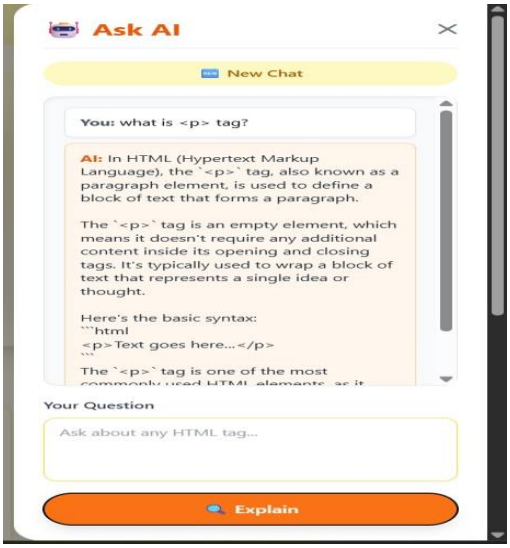


Figure 30-AI Assistant

3- Lesson 3 – Links and Images :

The lesson explains links and images in HTML in detail and includes multiple interactive features and a mandatory quiz for progression. One example of these features is an AI-powered tool that generates appropriate alt text for images, promoting accessibility best practices.

Figure 31-AI Activity

4- Lesson 4 – Tables :

The lesson teaches HTML tables using interactive features that display code examples and outputs, along with an AI-powered tool that generates tables based on student-defined properties. A quiz is required to proceed to the next lesson.

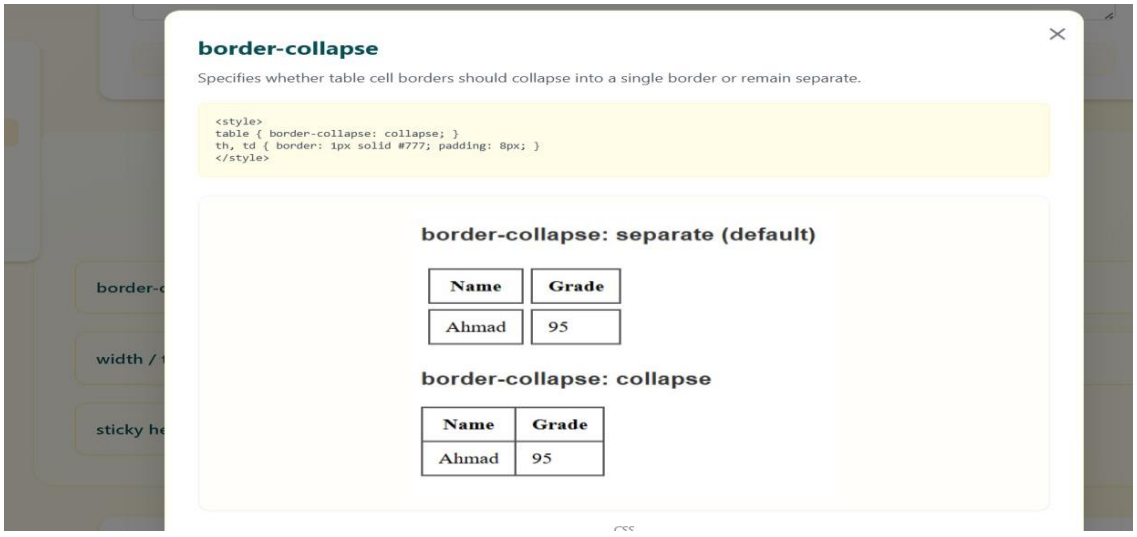


Figure 32-Example

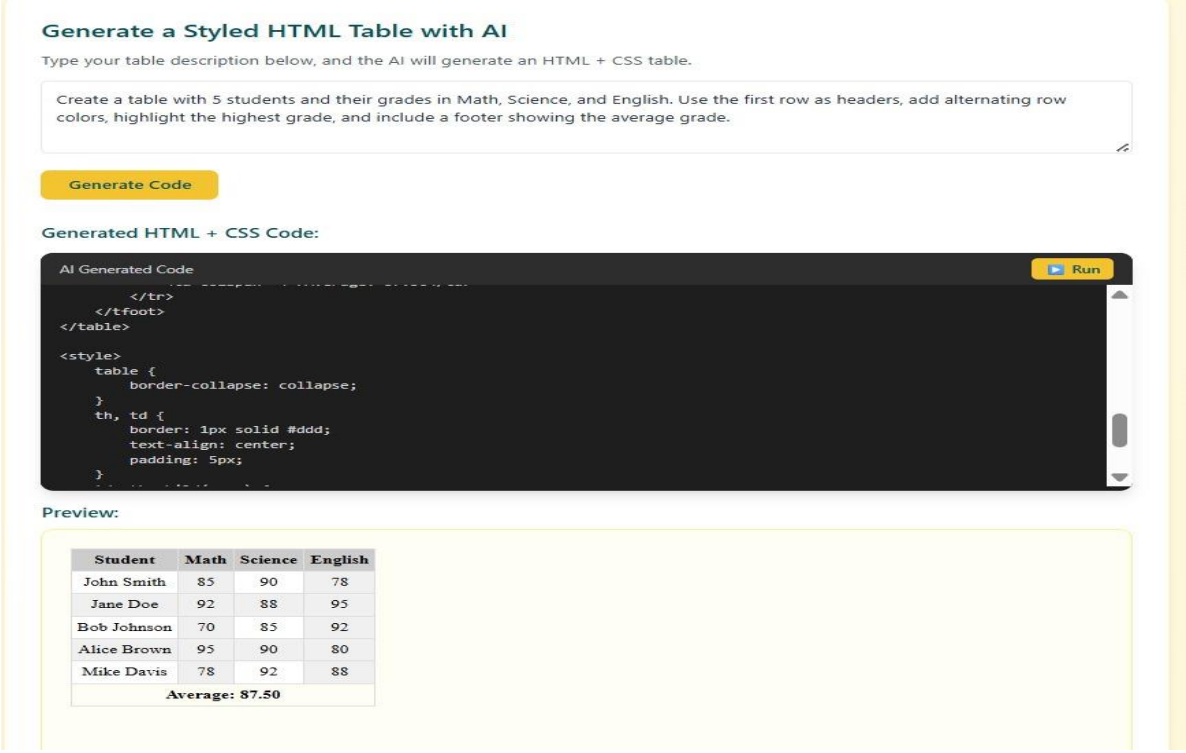


Figure 33-AI Table Generator

5- Lesson 5 – Forms & Inputs :

The lesson explains HTML forms and inputs using AI-supported explanations and a live example connected to an external API, followed by a mandatory quiz for progression. In addition, the lesson includes a mini project where students apply what they have learned, and the submission is evaluated by the AI, providing instant feedback and guidance for improvement.

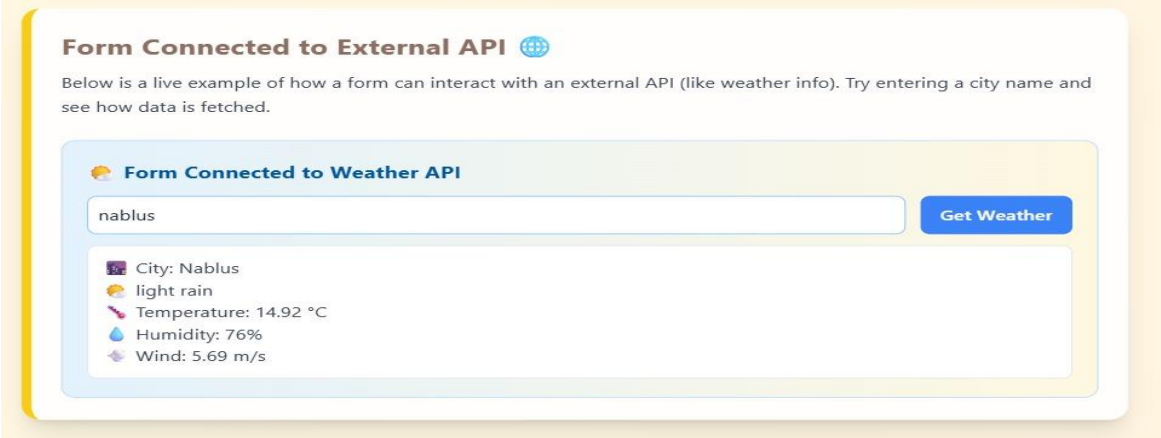


Figure 34-Example

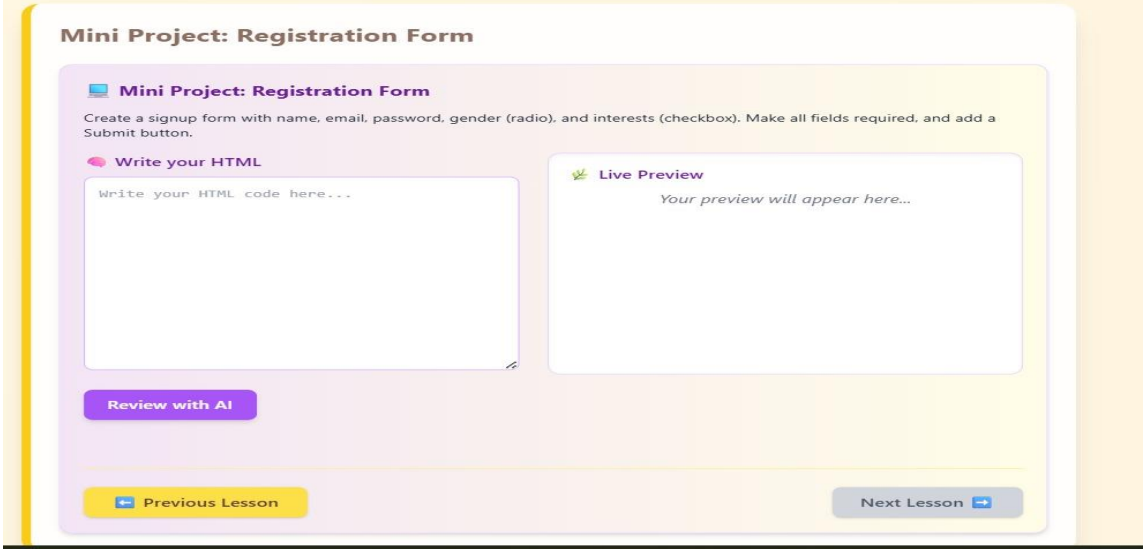


Figure 35-Mini Project

6- Lesson 6 – Multimedia Elements :

The lesson explains HTML multimedia elements using interactive examples and includes an AI-powered text-to-speech feature to enhance understanding and accessibility. A quiz is required to proceed to the next lesson.

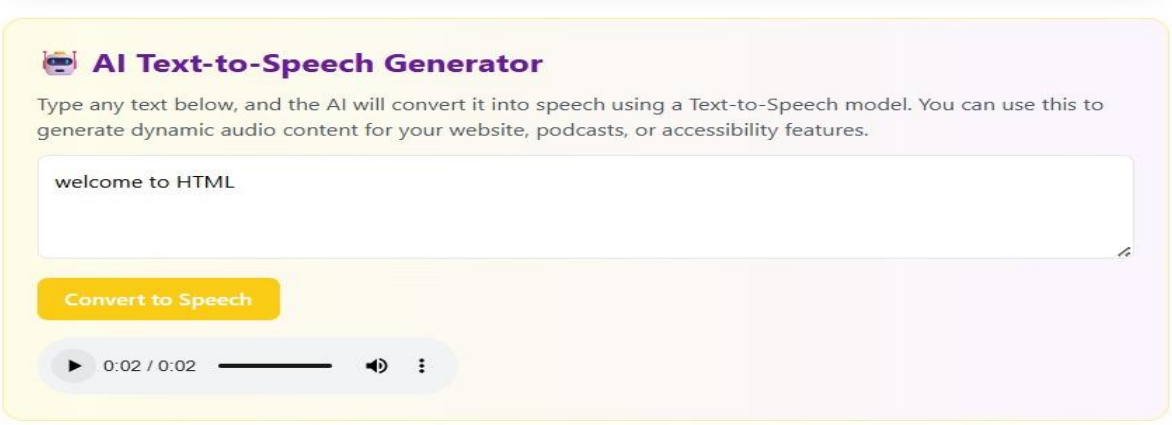


Figure 36-AI Text to Speech Example

7- Lesson 7 – Semantic HTML :

The lesson explains semantic HTML elements using interactive sections, AI-supported explanations, and a mandatory quiz for progression.

Figure 37- Example

8- Lesson 8 – HTML Responsive Design :

This lesson explains responsive HTML concepts using interactive examples that help students understand the topic in depth. Through practical demonstrations, students can observe how web content adapts to different screen sizes and layouts.

In addition, the lesson includes an AI Assistant that allows students to ask any questions related to the lesson. The AI provides instant explanations and guidance, supporting personalized learning and improving overall understanding.

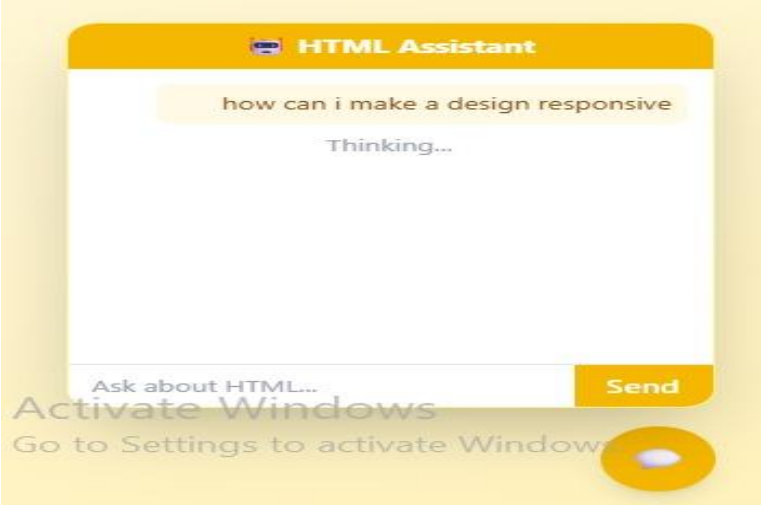


Figure 38-AI Helper

9- Lesson 9 – Lists :

The lesson explains HTML lists using interactive examples and includes an AI-powered Smart List Builder to support hands-on learning and understanding.

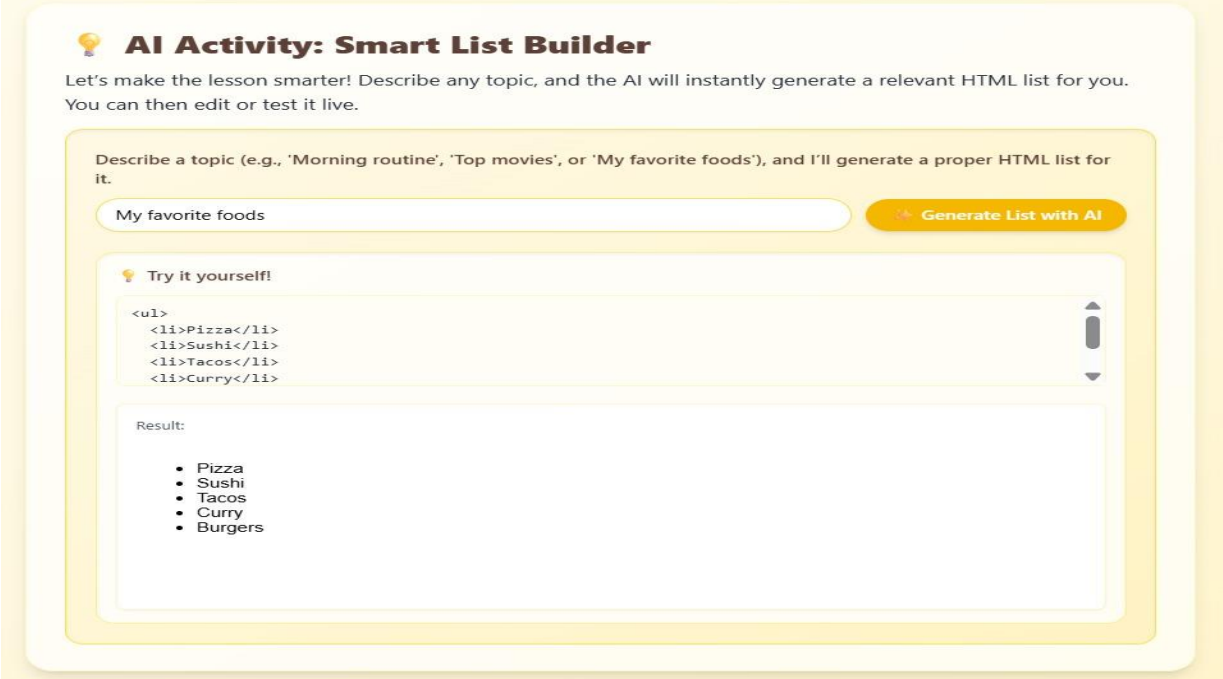


Figure 39 - Smart List Builder

10- Lesson 10 – Navigation Bars :

The lesson explains navigation bars using interactive examples, AI-supported guidance, and a mandatory quiz for progression.

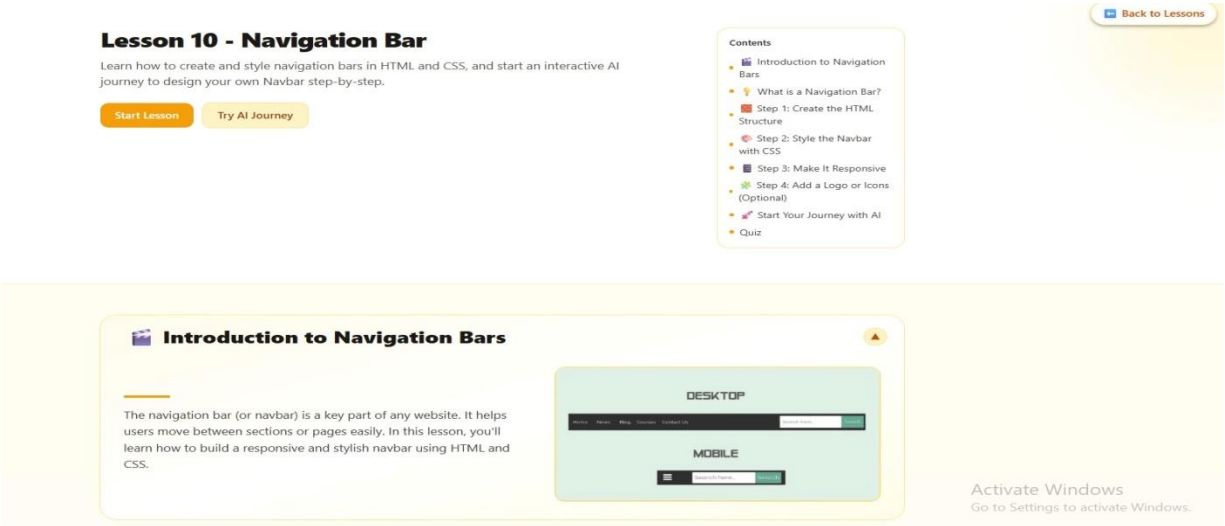


Figure 40 - Lesson 10

11- Lesson 11 – Iframes & Embedding Content :

The lesson explains iframes and embedded content using interactive examples, AI-supported guidance, and a mandatory quiz for progression.

Figure 41-Lesson 11

12- Lesson 12 – Meta Tags & Page Information :

This lesson explains the use of meta tags and page information through clear explanations and practical examples that help students understand their role in search engines and browser behavior. The lesson includes interactive sections that demonstrate how meta tags are written and applied within an HTML document.

In addition, the lesson integrates an AI-powered Meta Tag Generator, which allows students to enter a page title and description and automatically generate the appropriate meta tags. This feature helps students apply best practices easily and understand how meta tags improve SEO and page visibility.

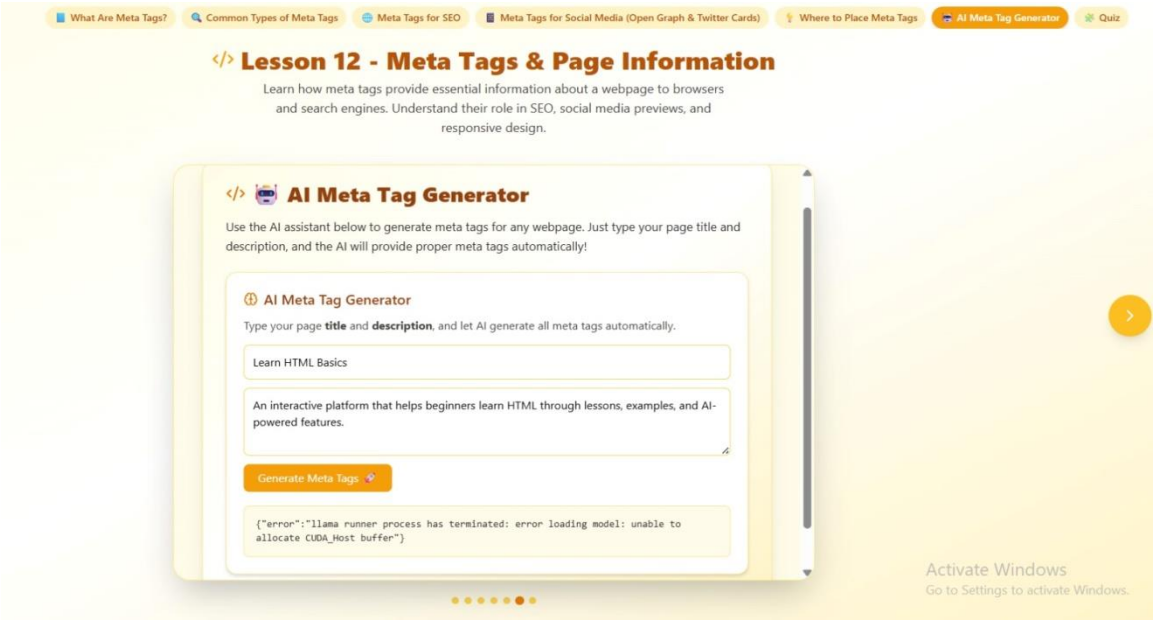


Figure 42- AI Meta Tag Generator

13- Lesson 13 – Layout & Containers :

This lesson focuses on teaching students how to structure web pages using HTML layout elements and containers through interactive explanations and practical examples. The lesson demonstrates how different layout components work together to organize page content in a clear and logical way.

To enhance understanding, the lesson integrates an AI-powered Smart Layout Builder. This feature allows students to describe the desired page layout, and the AI automatically generates the corresponding HTML structure. Students can then review, test, and modify the generated layout, reinforcing learning through experimentation.

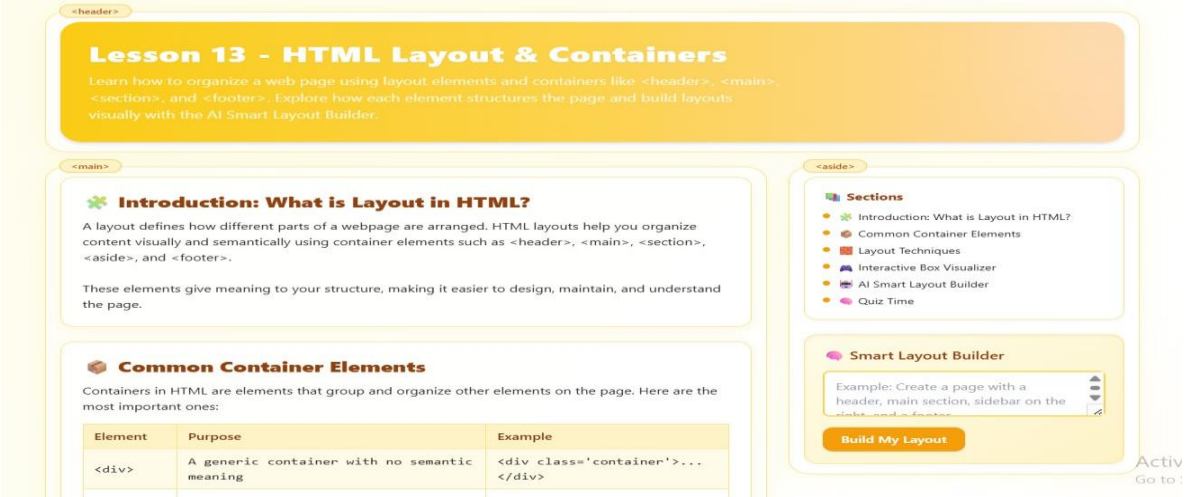


Figure 43- Lesson 13

14- Lesson 14 – Accessibility & Best Practices:

This lesson focuses on teaching students the principles of web accessibility and HTML best practices, helping them create web pages that are usable for all users. The lesson explains accessibility concepts through clear guidelines and practical recommendations.

To support learning, the lesson includes an AI-powered Accessibility Helper Chat, which allows students to ask questions related to accessibility rules, proper HTML usage, and best practices. The AI provides instant explanations and suggestions, helping students understand how to improve accessibility and follow standards effectively.

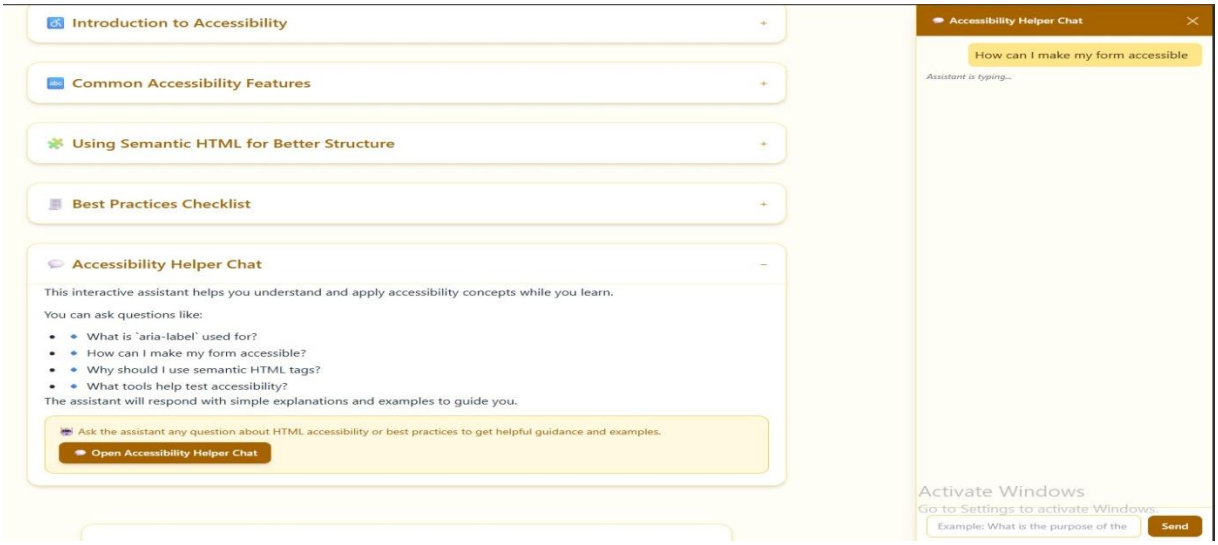


Figure 44 -Lesson 14

15- Lesson 15 – Final HTML Project :

The lesson consists of a final multi-stage project that must be completed to earn the certificate and unlock the Advanced level. The project is evaluated by AI, which provides a score and detailed feedback.

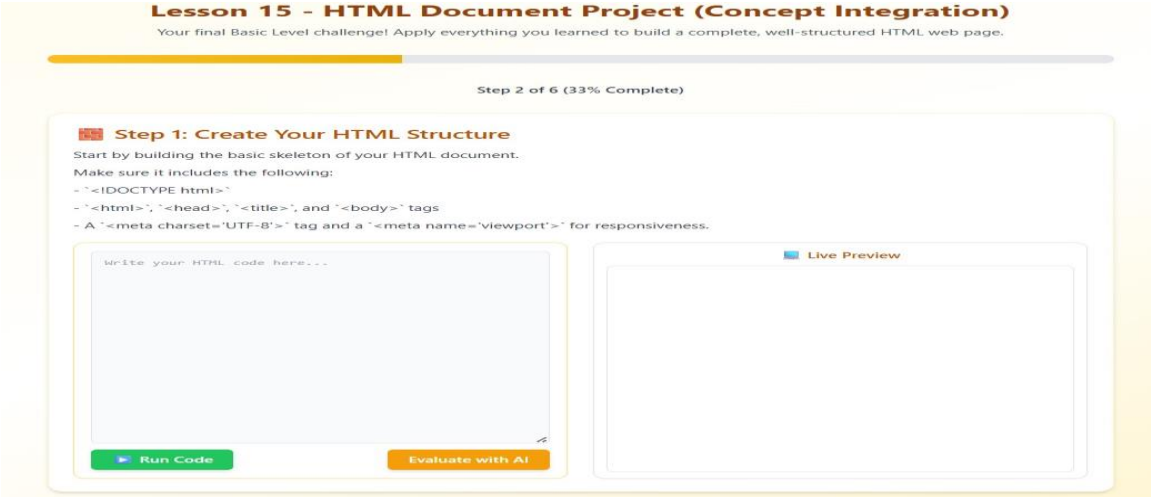


Figure 45-Lesson 15

Advanced Level Lessons Description :

After completing the Basic level, students unlock the Advanced level, where they can learn CSS, complete a comprehensive HTML and CSS quiz to earn the certificate, or build an advanced project integrating both technologies that is evaluated by a supervisor.

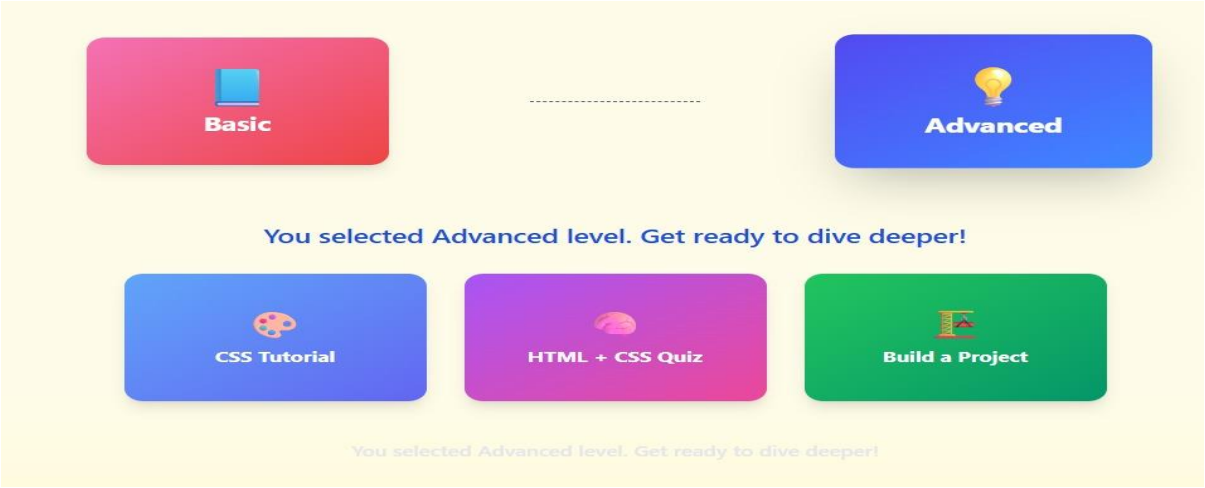


Figure 46 -Advanced Level

The CSS tutorial provides structured content to teach CSS fundamentals and includes an AI Assistant that directs students to the most relevant lesson based on the topic they request.

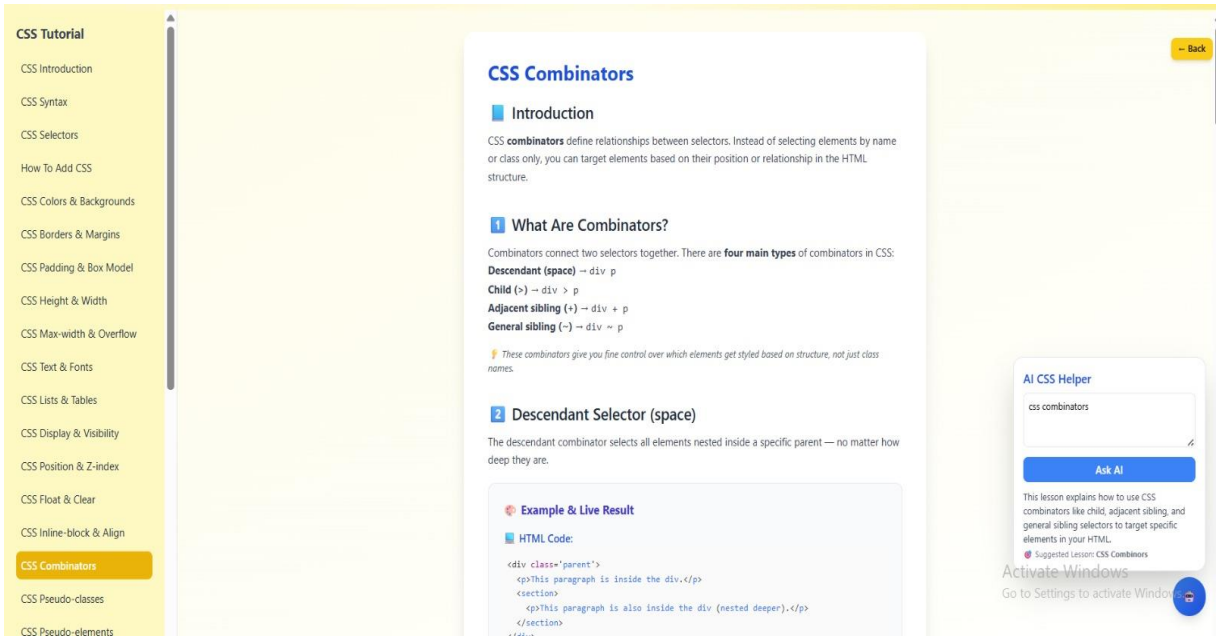
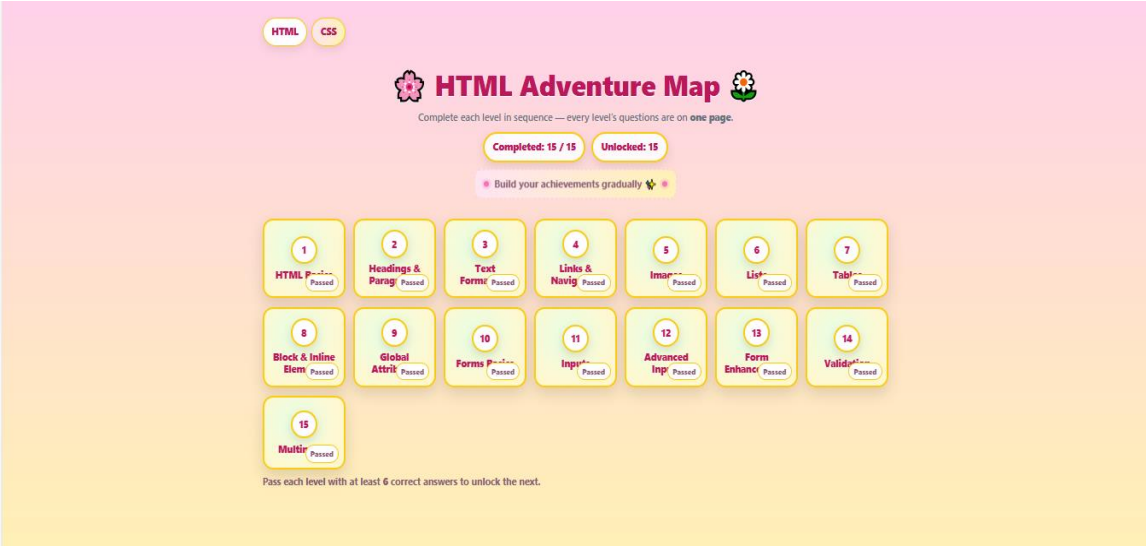


Figure 47 - CSS Tutorial

The Adventure Map (Quiz) page also provide an interactive method of evaluating a student on his/her understanding of the presented learning materials. The nature of assessment allows for a sequential approach to completing levels so that the prior level must be completed to unlock the next one. By providing a controlled sequence for students to access and learn about, this approach prevents students from bypassing important foundational concepts.

There are two different tracks: HTML and CSS. These allow for the evaluation of both skill areas separately. The GUI indicates the progress made by the students, which includes the amount of completed and unlocked levels, and uses adequate status indicators (e.g., passed and locked). Upon the completion of a level, a result dialog appears with the obtained scores and a notification if the level below has been unlocked. Once all the levels of a specific track have been completed, the system provides students with a certificate for both the HTML and CSS track.

In Web:



In mobile:

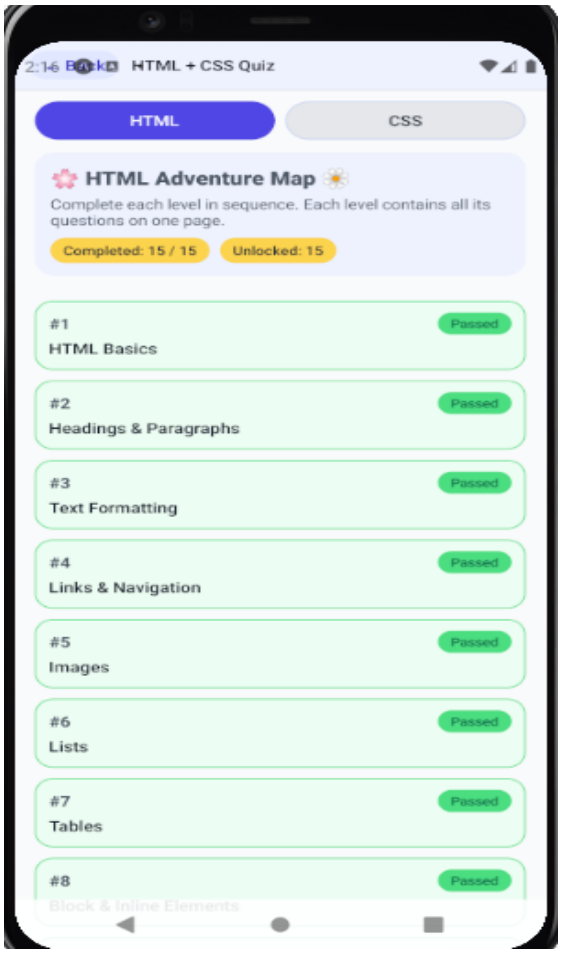
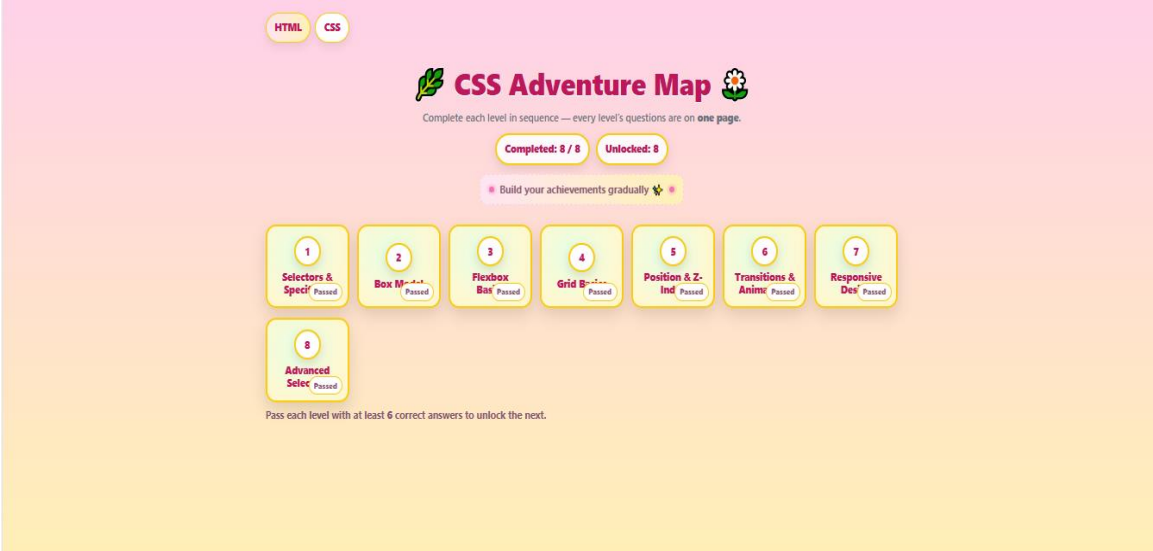


Figure 48 -HTML Quiz

In Web:



In mobile:

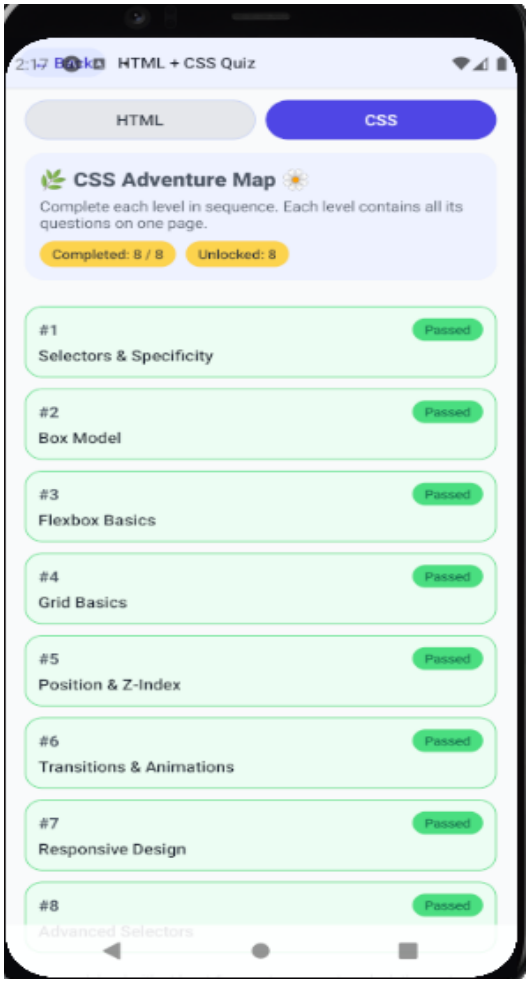


Figure 49 -CSS Quiz

After the student complete this quiz correctly this is the result :

In Web:

In mobile:

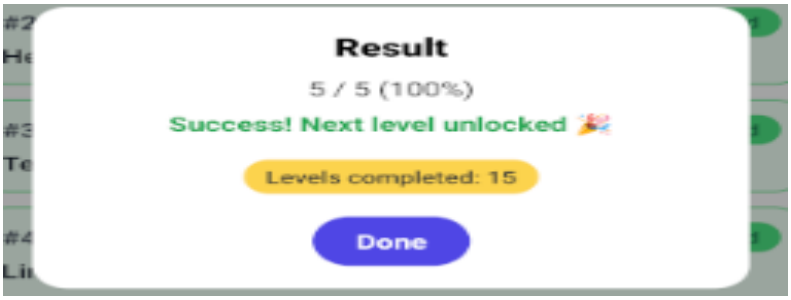


Figure 50 -Quiz Result

And after that the Certificate of Completion page appears automatically after the completion of all necessary quiz levels for a certain learning track on the part of the student. A different certificate would be provided for the HTML and CSS skills, thus providing an opportunity for recognition on the basis of mastery for all skill areas. The certificate would present the basic information of the student, completion dates, name, certification title, instructor, and a certificate ID.

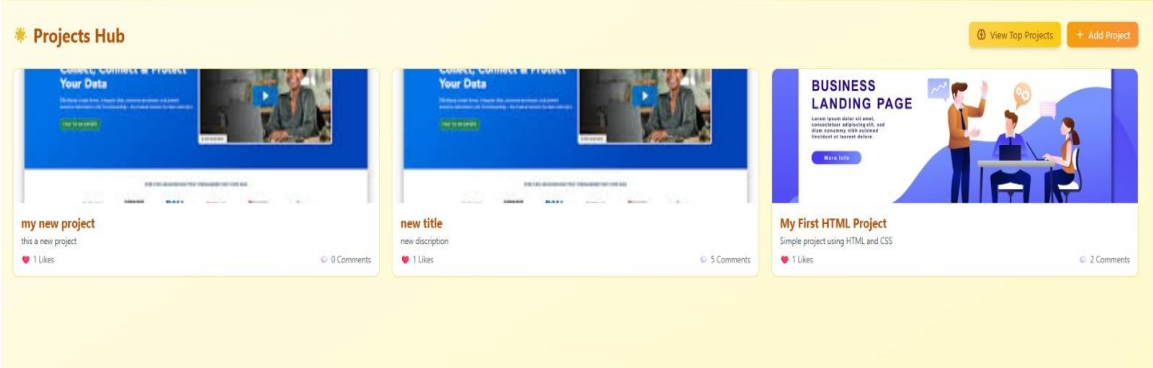
The Adventure Map (Quiz) page also provide the Advanced Project requires students to build a responsive HTML and CSS landing page and submit it for supervisor evaluation, demonstrating advanced web development skills.

Figure 51 -Advanced Project

- **Project Hub :**

The Projects Hub is a community showcase page for students to display their projects after completion as well as view projects undertaken by other students using the platform. This particular webpage is designed to showcase projects using cards that display information such as projects preview, name, description, as well as likes and comments. This webpage will enable students to display their projects to showcase their work done using HTML and CSS.

In Web:



In mobile:

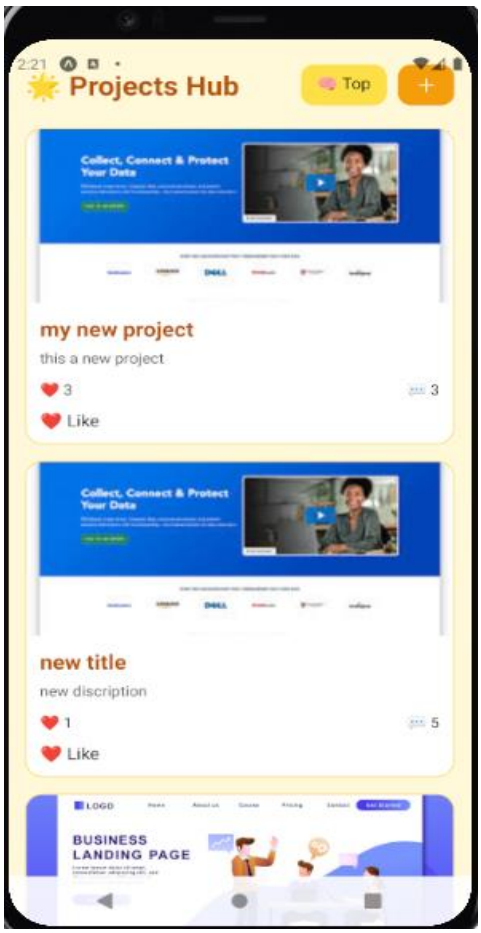


Figure 52 -Project Hub

Apart from uploading their own projects, students are also able to search for projects undertaken by other students, show their gratitude via likes, and participate in discussions via posting comments. Through this forum, students are empowered with a platform that is not only informative but also social. By integrating a social component with a platform for projects, the Projects Hub fosters a more engaging learning experience.

Figure 54 show how a student can upload a new project :

In Web:

In mobile:

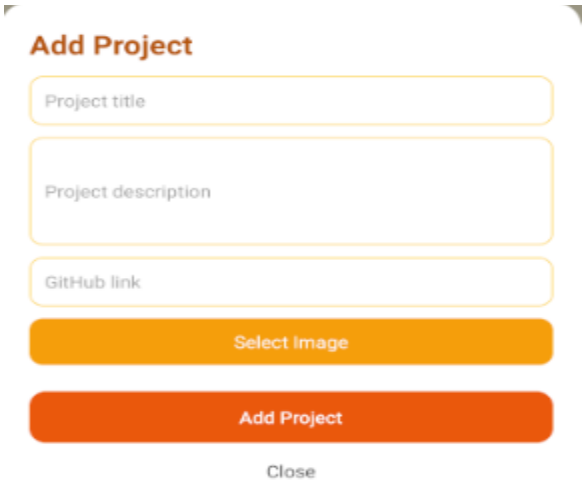
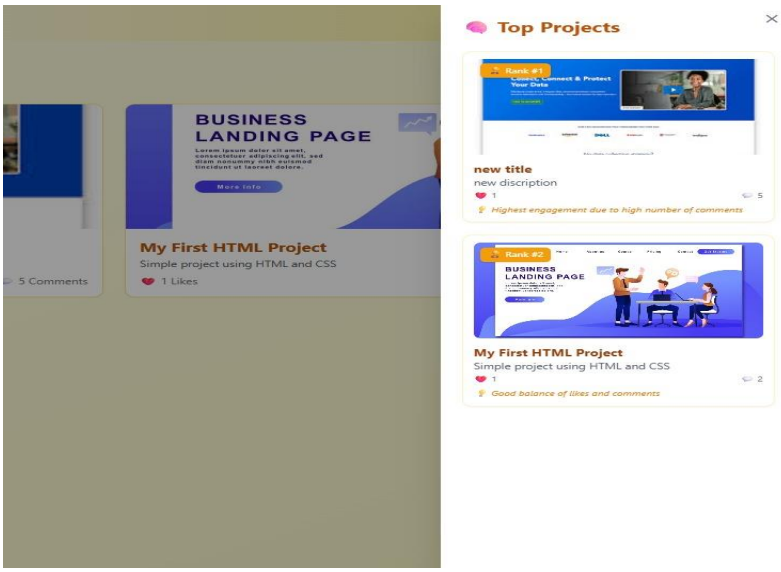


Figure 53 -Add new project

To identify the top-performing projects, the system uses AI-based ranking, where submitted projects are classified according to the number of likes received. Projects with higher engagement and positive feedback are ranked higher, allowing the platform to highlight the best-evaluated projects.

In Web:



In mobile:

Figure 54 -Top Project

- **Challenges Arena :**

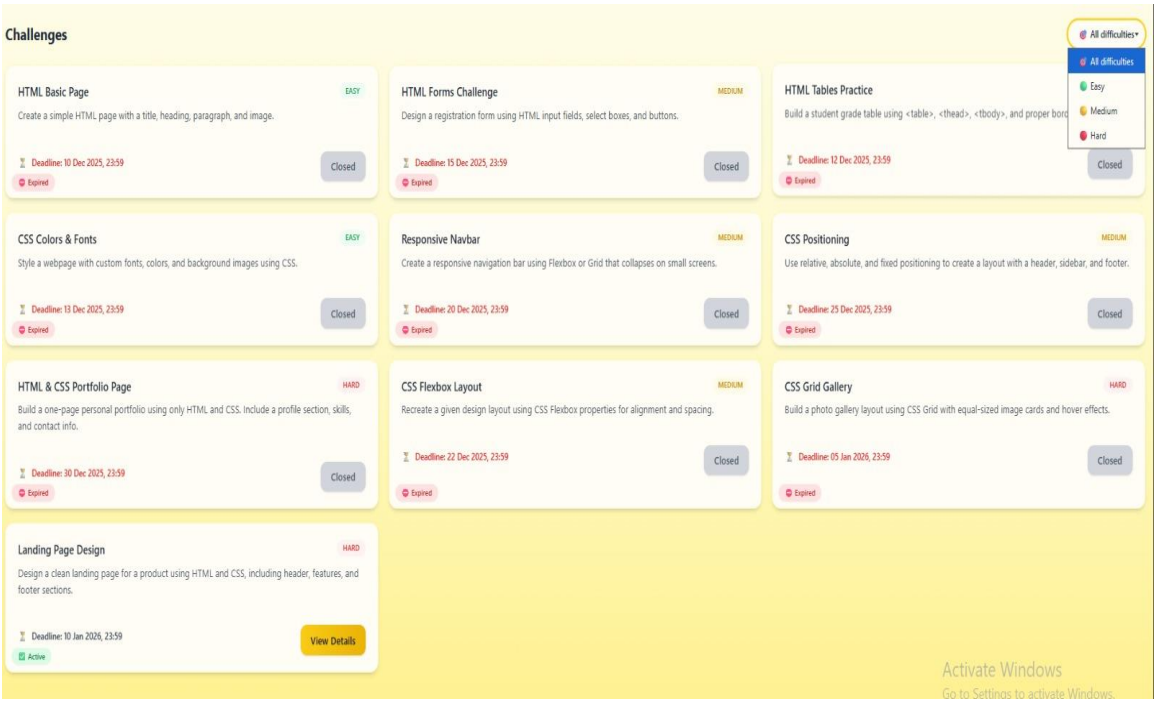
The Challenges page serves the intended function of facilitating active learning and healthy competition for the students in coding. The Challenges page consists of a list of coding challenges in HTML and CSS programming, where each challenge is outlined with a clear aim or goal, required difficulty level (which can be easy, medium, or hard),

deadline for completion, and status. The students are able to browse through these coding challenges and filter them according to the required level of difficulty.

Each of the challenges inspires the students to use theoretical knowledge in practical situations, hence developing practice skills. Also, the challenges and their deadlines are well outlined to allow the students to time their activities.

Apart from the personal issues, the Leaderboard page allows the submission of rankings of the students based on the points they have accumulated as well as the challenges they have completed. Apart from motivating the students based on the rankings shown on the leaderboard, the different levels of challenges allow the students to improve based on their performance.

In Web:



In mobile:

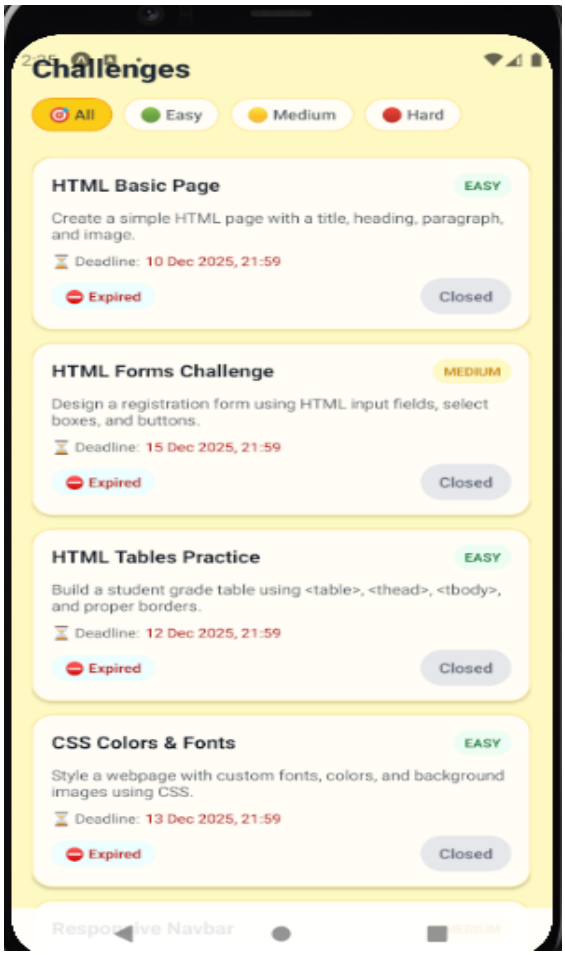


Figure 55 -Challenges Arena

When the user click view details for the open challenge the following page appear for him :

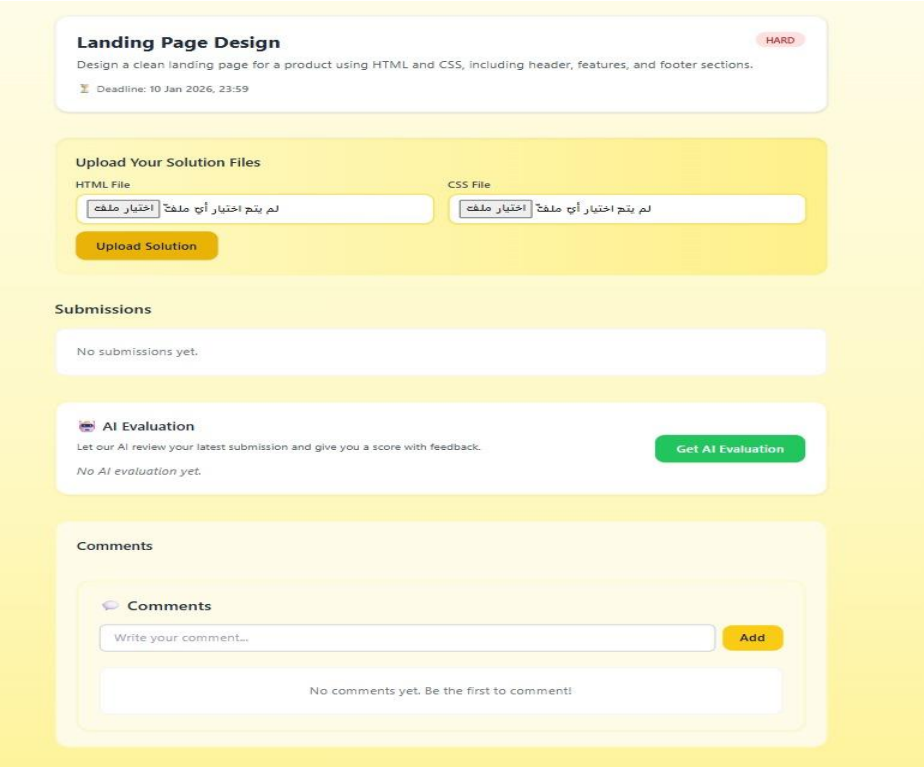


Figure 56 -Add the solution

When a student submits a challenge solution, the AI evaluates the submission and assigns a score based on predefined criteria. This automated assessment provides immediate feedback and helps students track their performance and improvement.

The leaderboard displays and ranks the best solutions according to their scores.

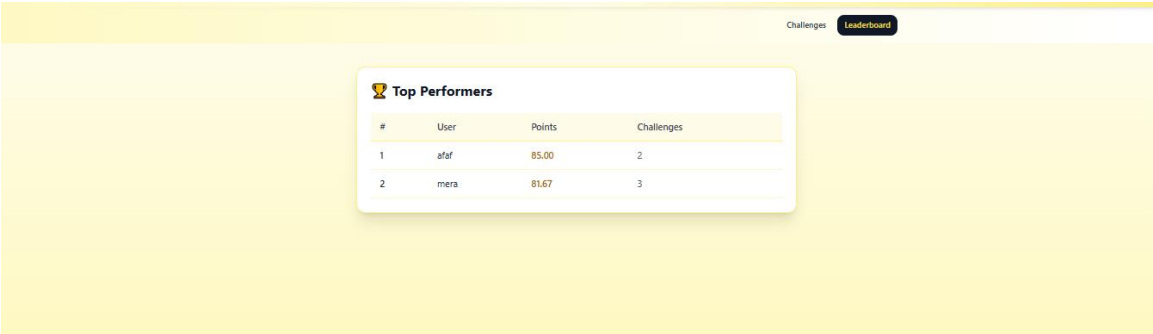


Figure 57 -Leaderboard

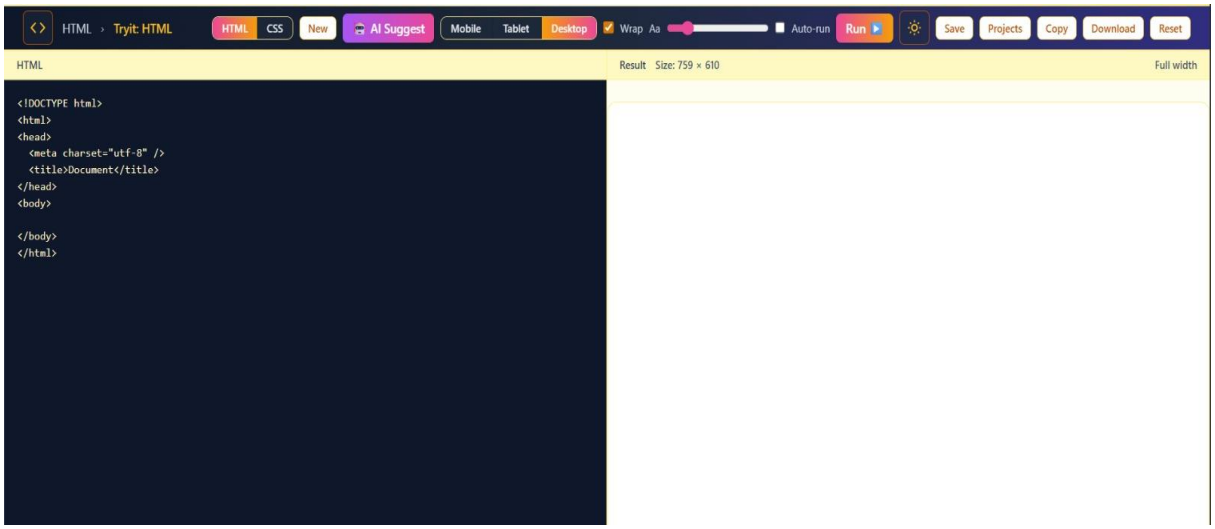
- **Code Editor :**

One of the system's primary interactive features is the Code Editor page, which enables users to create, modify, and run HTML and CSS code in real time. A code editor panel on the left and a live preview panel on the right, which allows for immediate visualization of the written code, make up the interface's two main sections. Through device view options (desktop, tablet, and mobile), users can adjust text wrapping, font size, and screen responsiveness in addition to switching between HTML and CSS editing modes.

The page offers a number of useful control buttons, such as the ability to run code, save progress, copy code, download files, reset the editor, and manage user projects. To lessen eye strain and enhance usability in low-light conditions, a dark mode feature is implemented through a dedicated toggle button that enables users to change the editor theme. In order to ensure effective project organization and continuity, the Projects button also opens a side panel that shows all previously created projects and allows users to open, rename, or delete their work.

All things considered, the Code Editor page combines code writing, instant feedback, theme customization, and project management into a single integrated interface to facilitate experiential learning.

In Web:



In mobile:

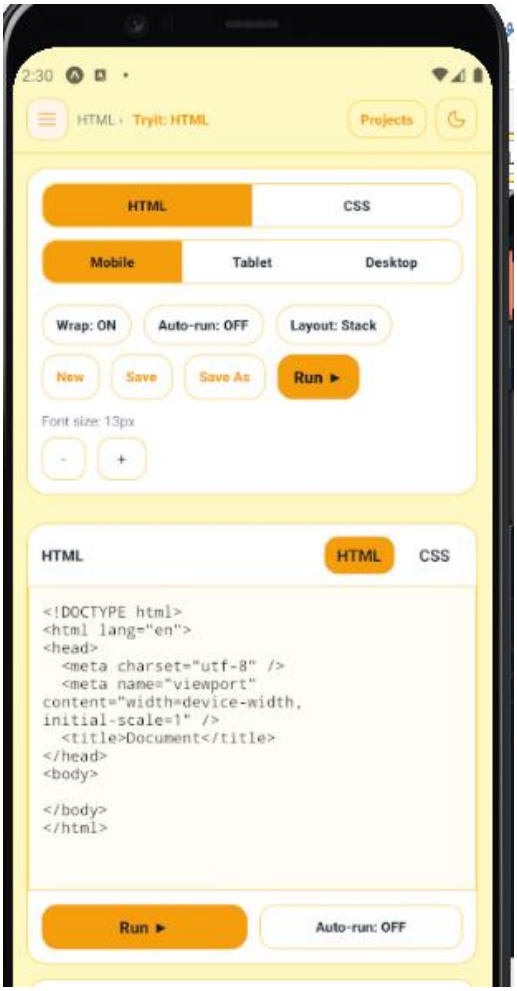
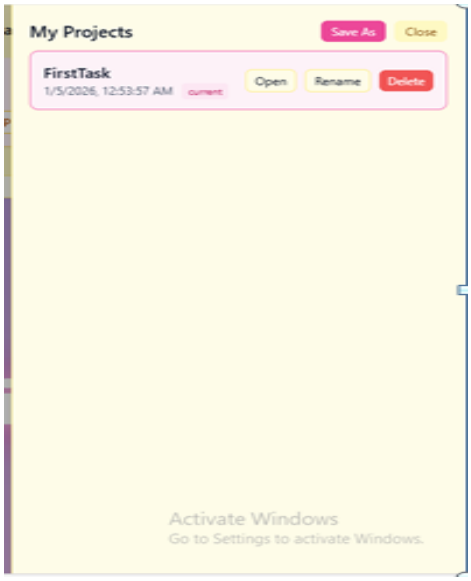


Figure 58 -Code Editor

When a Student click on projects he can see all the project for him :

In Web:



In mobile:

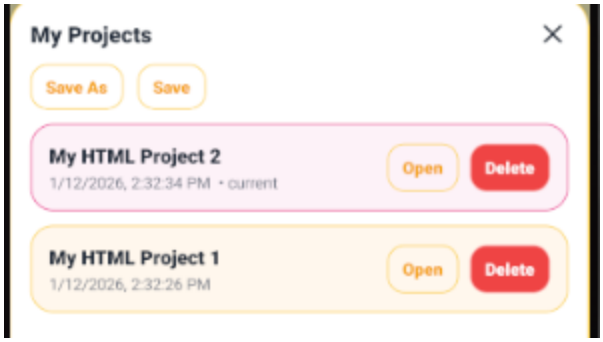


Figure 59-Student Project

When the student clicks on AI Suggest, the system provides intelligent suggestions to improve code quality and correct existing errors. This feature helps students write cleaner, more accurate code and enhances learning through instant feedback.

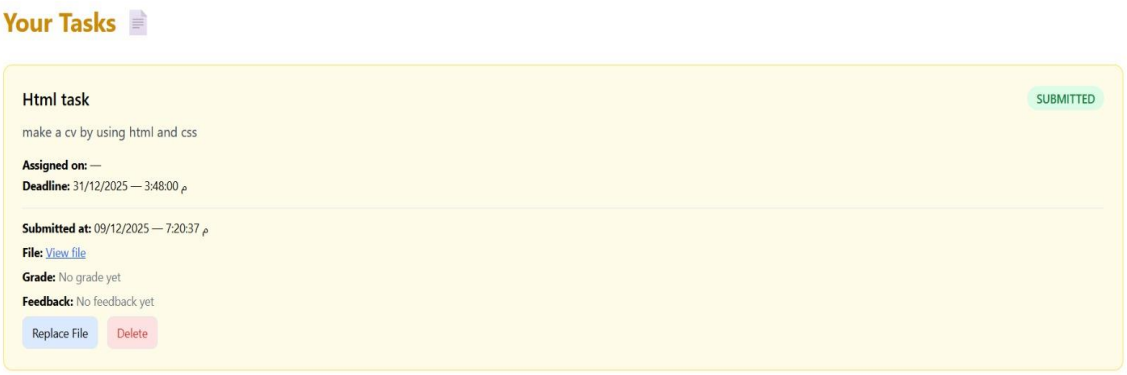
- **Student Task :**

The Student Tasks page is intended to show the assignments made by the supervisor and enable the students to organize the submission of their tasks efficiently. Every task card contains information about the task title, description, assignment date, deadline, and the status of the current submission.

Students can use this page to upload and submit the task files directly to the platform. Once the submission is made, the student has an opportunity to view the submitted file, replace it if need be, or delete the submission before it undergoes evaluation. After

evaluation, the supervisor will provide grading and feedback on the same page, enabling centralized management of tasks, tracking of submissions, and veracity of evaluation. This page enables students to keep track of their work, in an organized way, in good time, and after transparent evaluation.

In Web:



In mobile:

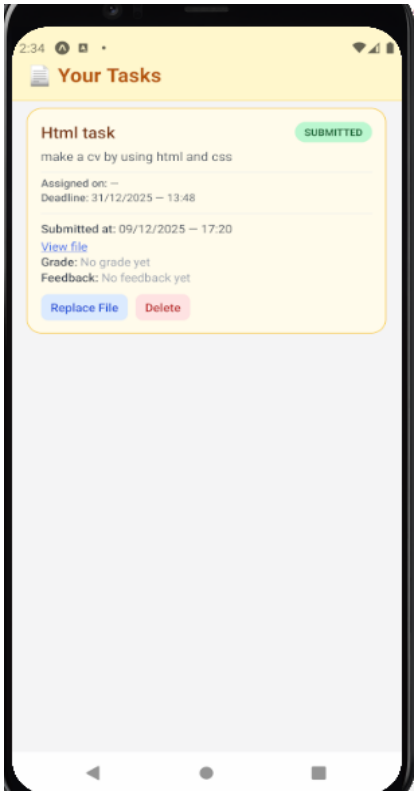
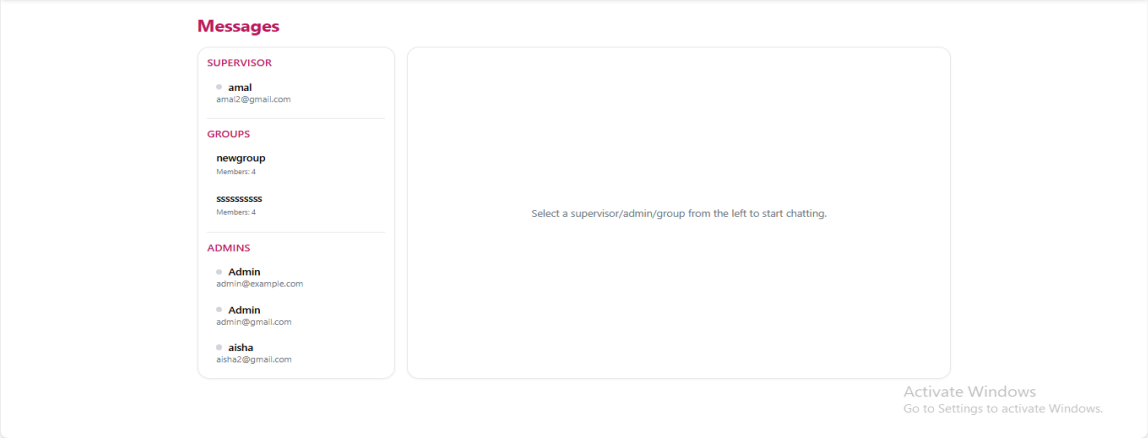


Figure 60 -Student Task

- **Chat :**

The Messaging page offers a real-time communication platform that facilitates productive interactions between administrators, supervisors, and students. WebSocket technology is used in the implementation of this page to provide real-time status updates and instant message delivery without requiring page refreshes. A contact and group list is located on the left side of the interface, while an active conversation panel is located on the right.

In Web:



In mobile:

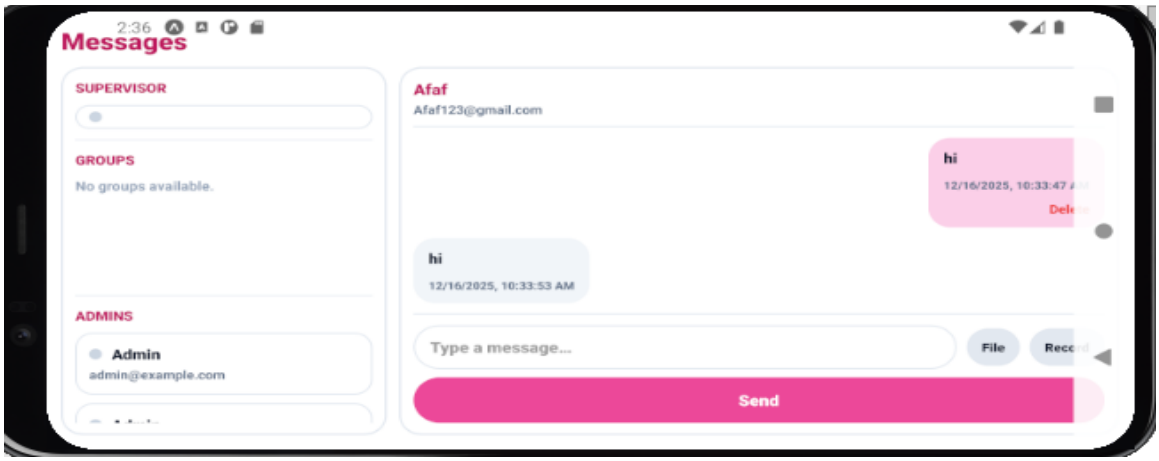


Figure 61-Chat Page

In addition to classifying participants into groups, administrators, and supervisors, the contact list uses activity indicators to show user availability. In addition to joining group chats that are started and run by supervisors, students can start private discussions with administrators or supervisors. Students can view other members of the group and, if allowed, leave the group during group chats.

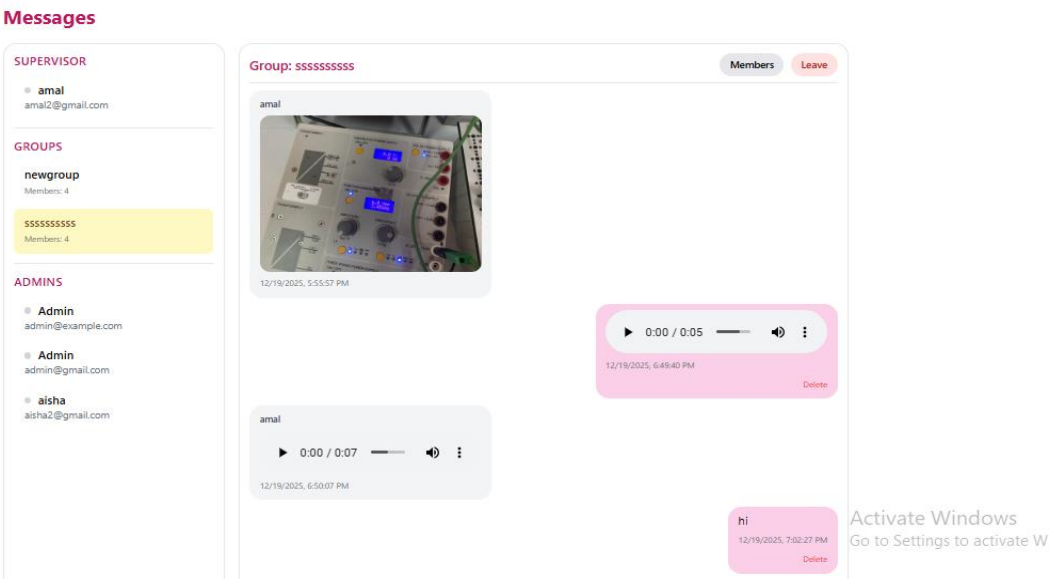


Figure 62 - Group Messages

The messaging system improves flexibility and teamwork by supporting various content types, such as text messages, file attachments, images, and voice messages. To preserve clarity and context, each message is shown with its timestamp and sender details. Overall, by offering a safe and quick real-time chat experience, the Messaging page improves coordination, communication, and engagement within the learning platform.

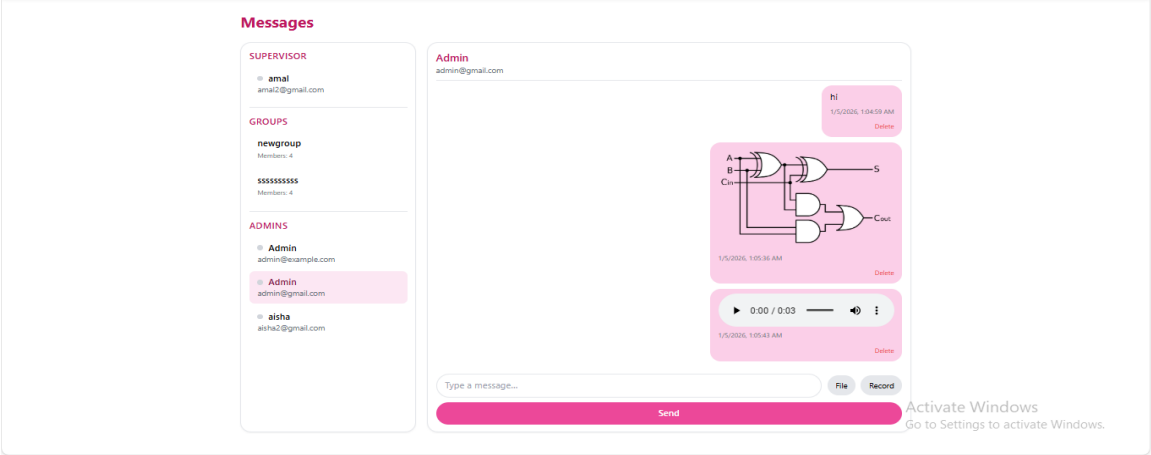


Figure 63 -Messages

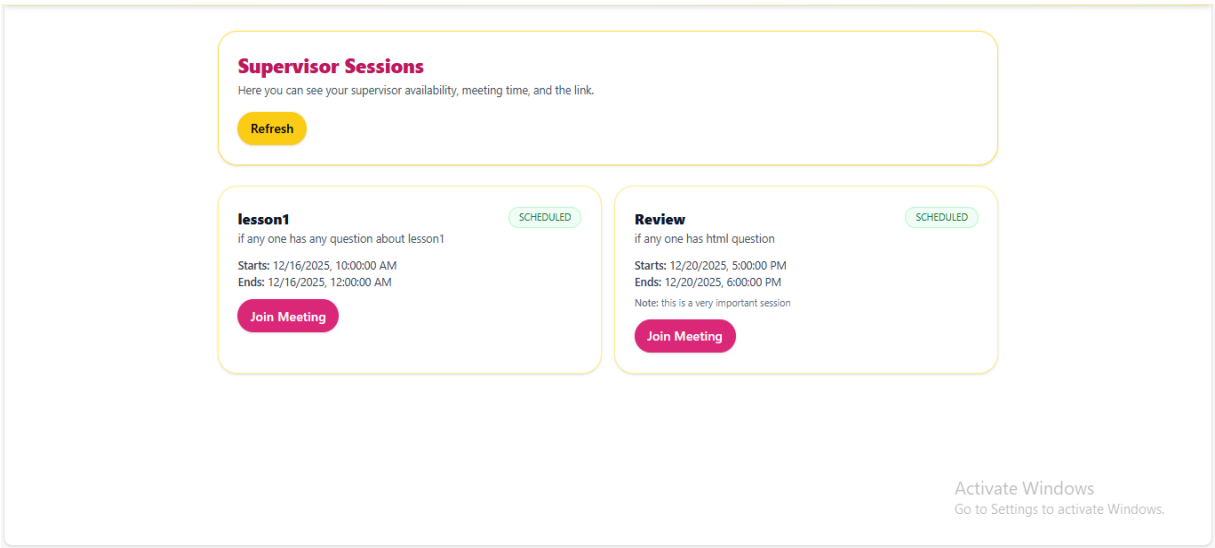
- **Sessions :**

The Student Sessions page lets students view and join online meetings set up by their supervisor. This page gives students access to session details, such as the session title, description, scheduled time, and meeting link. The listed sessions aim to support direct

communication between students and their supervisor when students have questions or need academic help.

Students can join the meeting directly through the platform by making use of the join link available, while the creation as well as management of the sessions is carried out through the supervisor. There is the refresh facility in order to make sure the student gets the latest updates regarding the sessions. The page is designed as a simple interface for the join functionality for live meetings without the management of the sessions.

In Web:



In mobile:

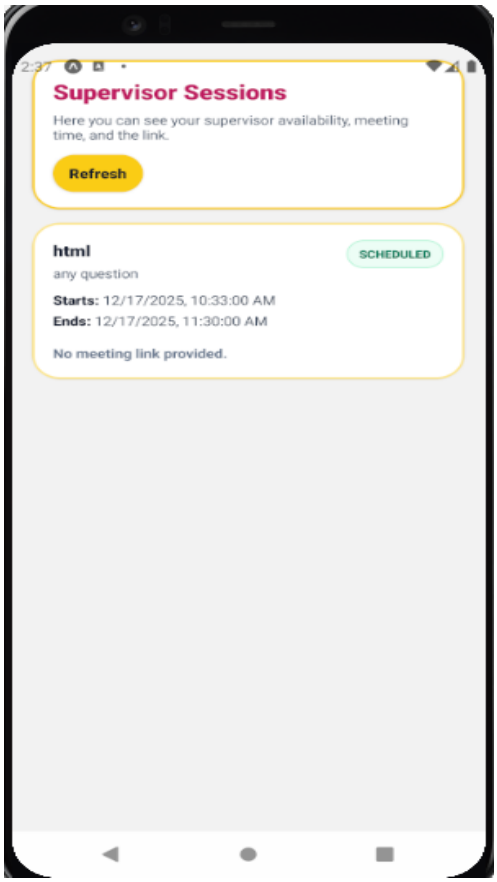


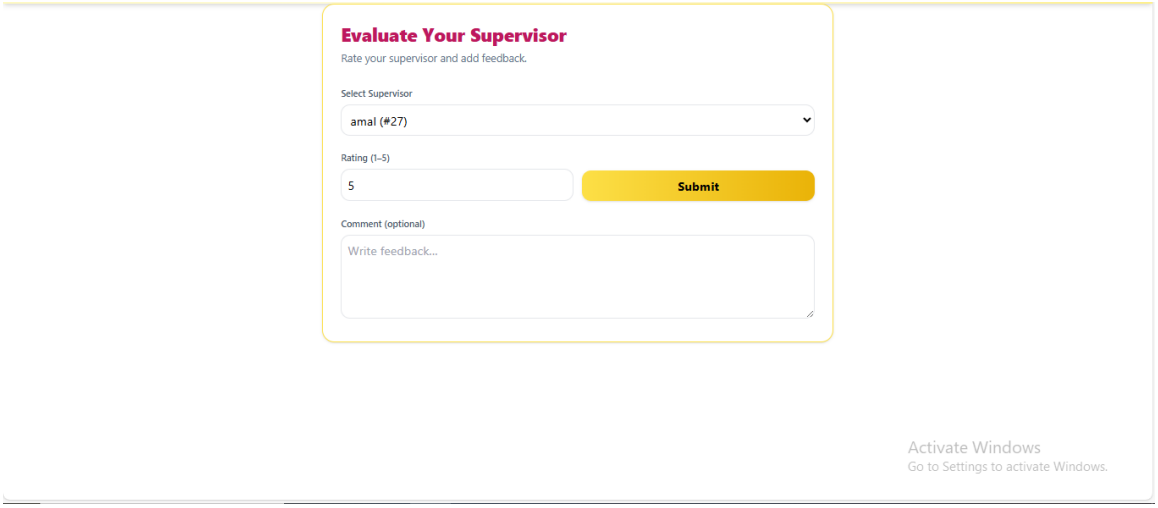
Figure 64 - Session Page

- **Evaluate Supervisor :**

The Evaluate Supervisor page allows the students to give a detailed feedback about their supervisors on the basis of their learning and communication experience. Using the page, it is possible for the student to choose the supervisor name from a dropdown list, give a numerical value on a predefined scale, and add comments, if needed, to convey their thoughts.

This assessment and review process enhances transparency and improvement as it allows the students to review the quality of the supervision carried out. In the form, simplicity and clarity are essential as it allows the students to review the experience truthfully. To conclude, this webpage helps in improving the supervision process as it allows the collection of student views in a rational way.

In Web:



In mobile:

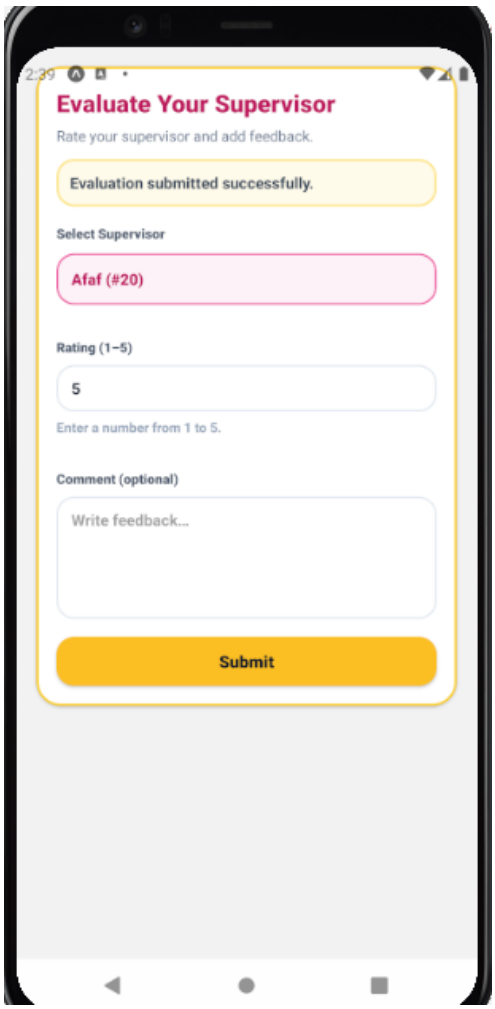


Figure 65 - Evaluate Supervisor

- **Notification System using Firebase Cloud Messaging (FCM):**

It uses Firebase Cloud Messaging for the delivery of real-time notifications to students on the occurrence of important actions on the platform. In such instances, students will be notified once a new task is assigned to them; when an admin or supervisor sends them a message or voice message; or when an assigned certificate has been issued once an assigned lesson or activity has been completed. These notifications enable students to stay updated with their responsibilities, communication, and successes so that they do not miss any important updates. Consequently, all notifications appear instantly in the student interface without the need to refresh the page, supporting smooth interaction and continuous engagement with the learning system.

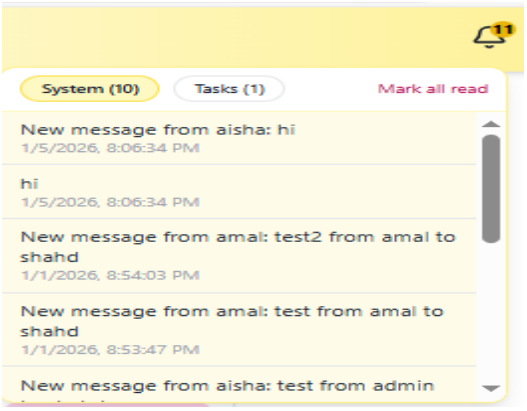


Figure 66 – Notification

For example when a new task assigned to the student :

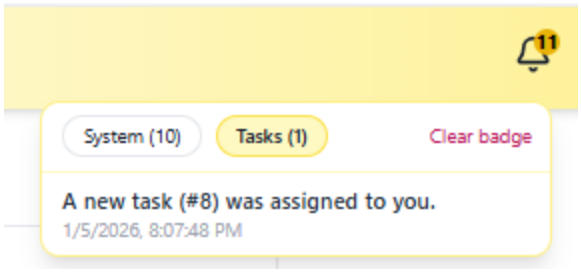


Figure 67 -New Task

- **Additional Feature :**

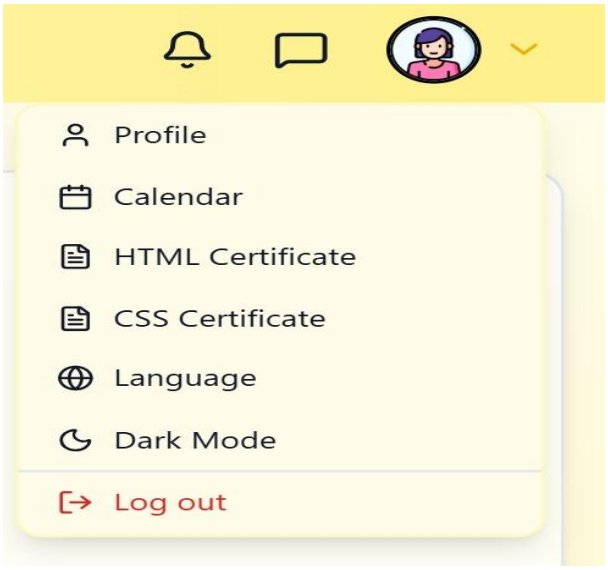


Figure 68 - Additional Feature

The menu allows students to access their profile, view challenge deadlines through the calendar, download certificates, change the interface language to Arabic using Google Translate, enable dark mode, and log out securely.

This is the Calendar :

Figure 69 – Calendar

And this is the Arabic Language with dark mode for the header :

Figure 70 - Arabic Language

Note : The mobile version of the system provides the same core functionalities as the web platform, with an interface adapted for mobile devices.

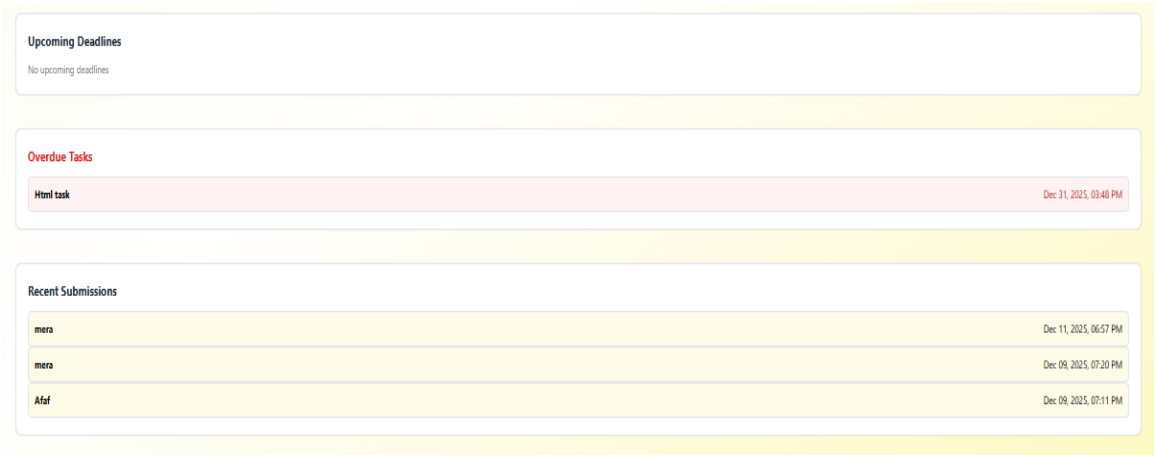
4.5 Supervisor Interface Results

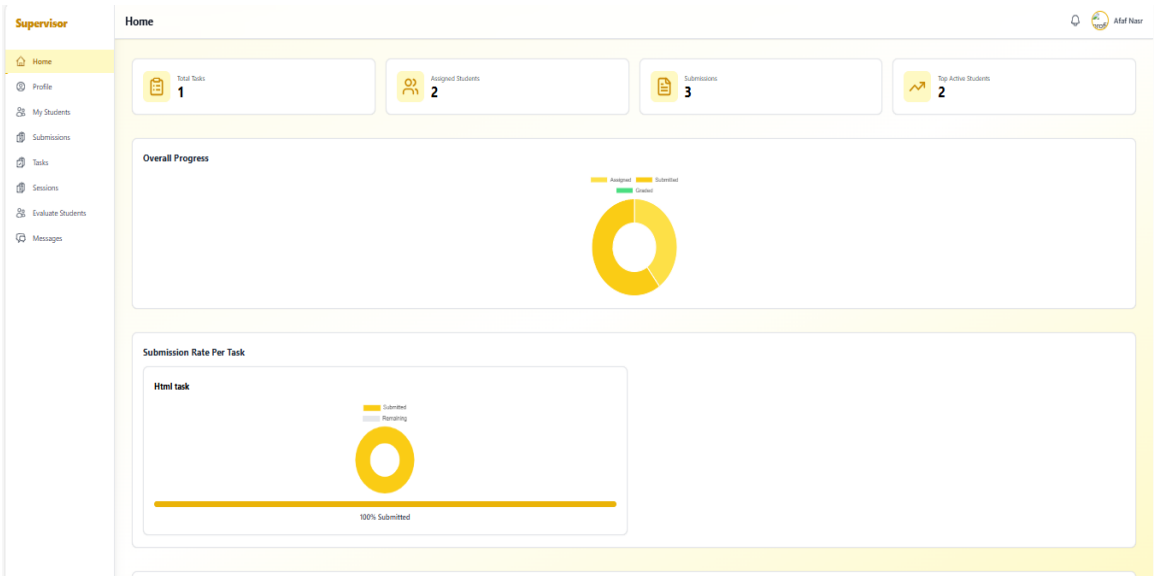
4.5.1 Supervisor Dashboard Page

This page enable the supervisor to get an evaluation of student activity, task management, and learning procedures. The Supervisor Dashboard Page shows performance measures, such as the total number of assigned tasks, students under supervision, received submissions, and the top students actively participating. The Supervisor Dashboard Page allows supervisors to get a system and student activity snapshot.

It does this by incorporating visual analytics that will support effective monitoring, such as progress charts showing the distribution of tasks assigned, submitted, and graded. Other sections show submission rates per task, upcoming deadlines, overdue tasks, and the latest student submissions. By this, a supervisor can identify critical issues on time and thus be in a position to act swiftly. Given this interface, supervisors can efficiently track the performance of students, manage academic responsibilities more effectively, and make informed decisions about how best to support and direct their students throughout the learning process.

In Web:


Upcoming Deadlines
No upcoming deadlines
Overdue Tasks
Html task
Dec 31, 2025, 03:46 PM
Recent Submissions
mera
Dec 11, 2025, 06:57 PM
mera
Dec 09, 2025, 07:20 PM
Afaf
Dec 09, 2025, 07:11 PM


Supervisor
Home
Afaf Nasr
Home
Profile
My Students
Submissions
Tasks
Sessions
Evaluate Students
Messages
Total Tasks
1
Assigned Students
2
Submissions
3
Top Active Students
2
Overall Progress
Submission Rate Per Task
Html task
100% Submitted

In mobile:

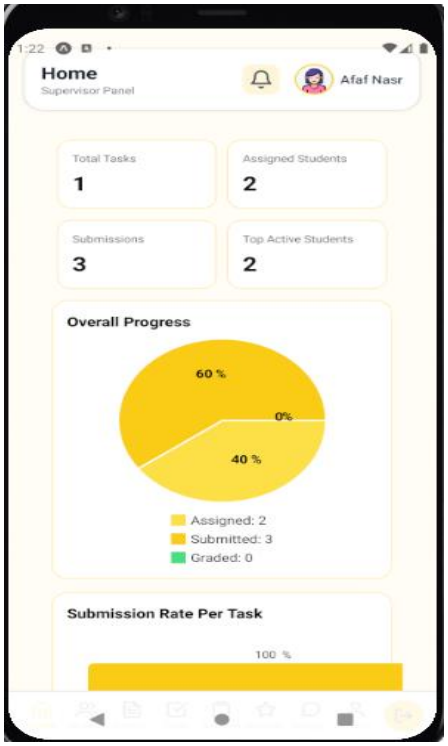


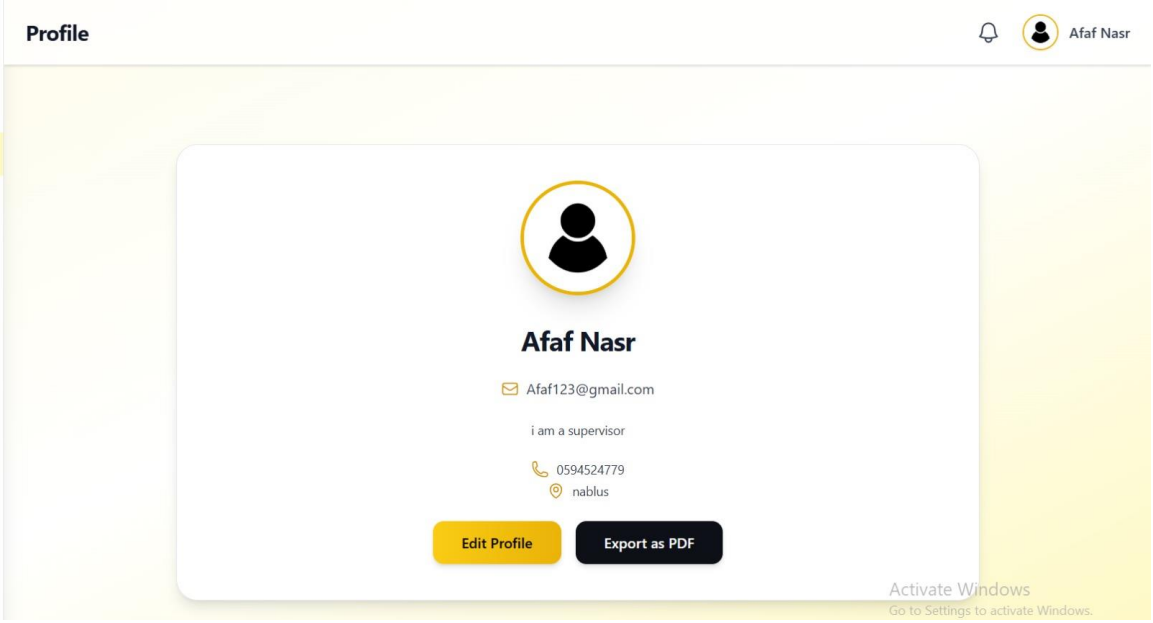
Figure 71 - Supervisor Dashboard

4.5.2 Supervisor Profile Page:

The Supervisor Profile Page permits the supervisor to access and manage their data on the platform. The supervisor's profile page displays the key information with regards to the supervisor's name, contact email, role, contact information, and location. The avatar section included with the supervisor's data adds a professional touch as it allows for better recognition.

The page also has an editable form for the profiles, which allows the supervisor to edit his/her information such as the password, biography, phone number, skills, and the external links to sites such as GitHub, a professional link on LinkedIn, and a personal website. The profiles can also be exported to a PDF file, which allows the supervisor to create a formatted resume for his/her professional profiles when needed. The page allows for viewing, editing, and exporting of profiles.

In Web:



In mobile:

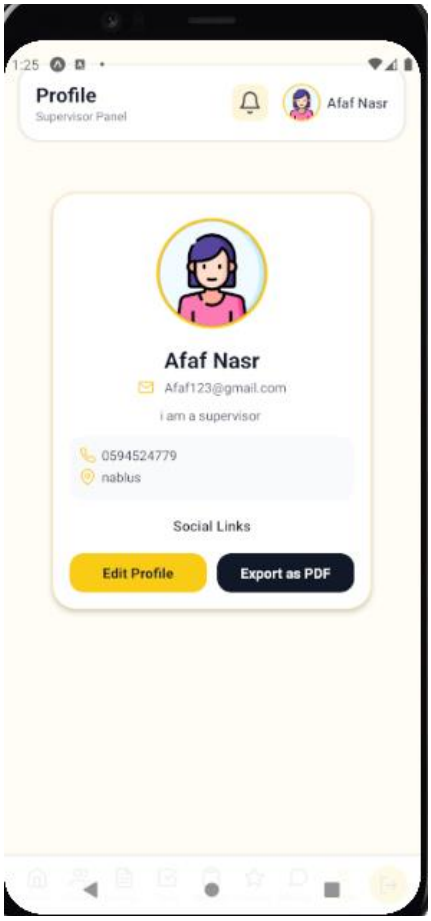
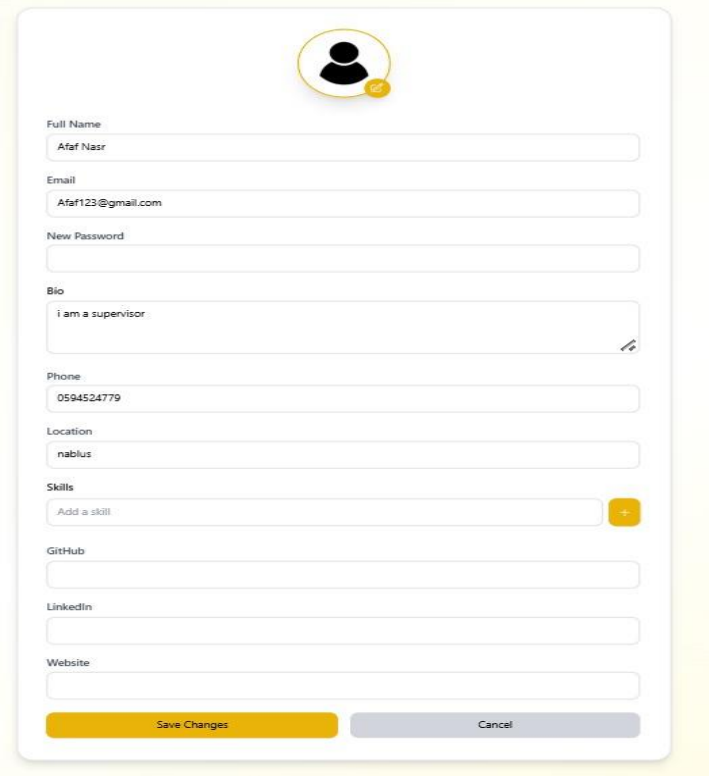


Figure 72-Supervisor Profile

The supervisor can edit his profile as the following :

In Web:



In mobile:

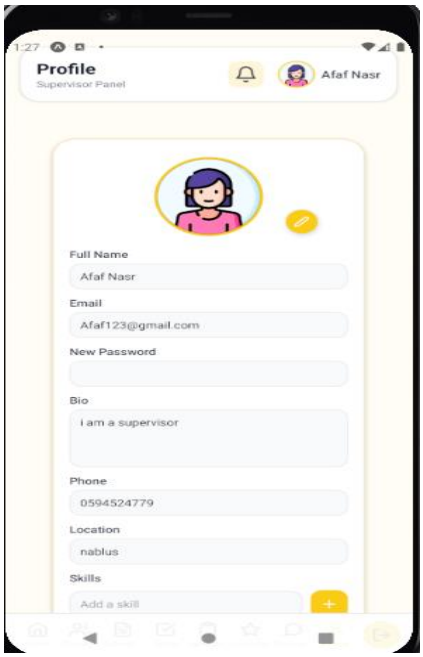


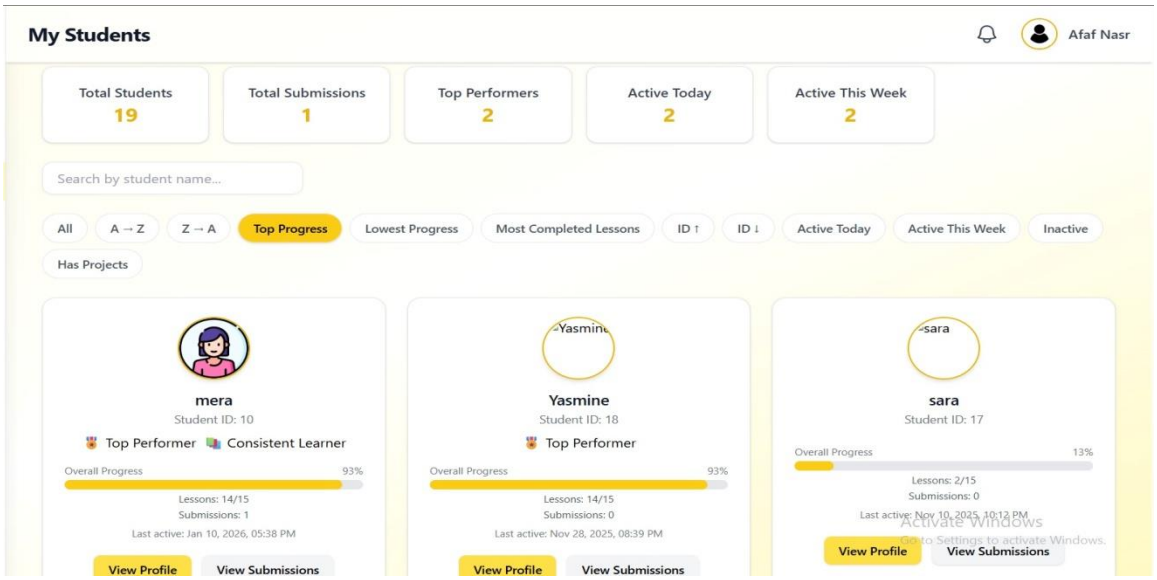
Figure 73-Edit profile

4.5.3 My Students Page (Supervisor):

The ‘My Students’ page allows the supervisor to effectively monitor and manage all the students assigned to them. A bird's eye view of the students' performance can also be obtained from this page, which lists the overall student count, overall submisison count, top students, and latest activities.

Students are viewed using individual profile cards with critical details such as a student’s name, ID number, level, number of submissions, and final activity status. There are advanced filtering and sorting options accessible for overseeing students depending on various parameters like student activity status, performance status for progress performance, completion status for lessons, and participation status for projects. Based on each student’s card, there are links for direct access to students’ profiles and their submissions.

In Web:



In mobile:

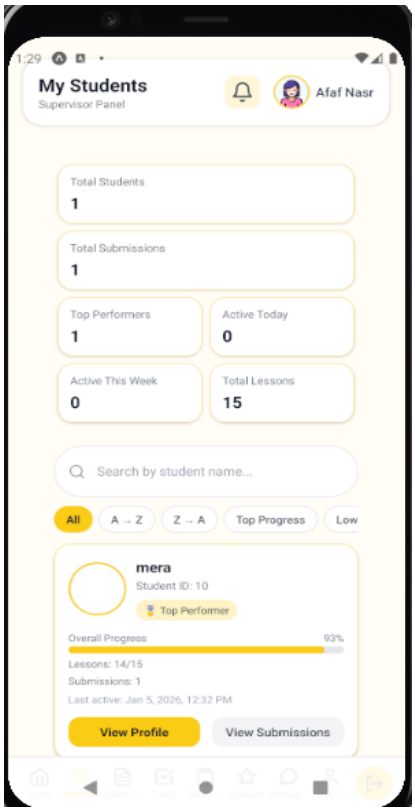


Figure 74-student list

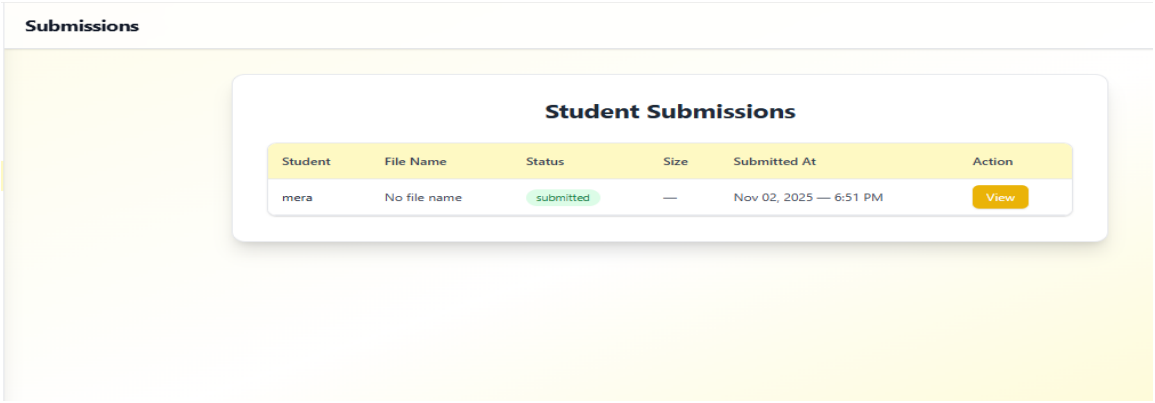
4.5.4 Student Submissions Page (Supervisor):

The Student Submissions page allows supervisors to review and manage assignments submitted by their students in a structured and transparent way. This page displays submissions in a tabular format, showing key information like the name of the student,

details about the uploaded file, the status of the submission, file size, and date and time of submission. Given this format, supervisors have the ability to quickly monitor submission activity to identify work completed or pending.

With the action controls provided in this action, the supervisors can see the submitted files and move on to the evaluation process. By providing the supervisors with a platform where all the submissions of the students are accessible in one place, this action assists in efficient evaluation of the assignments.

In Web:



In mobile:

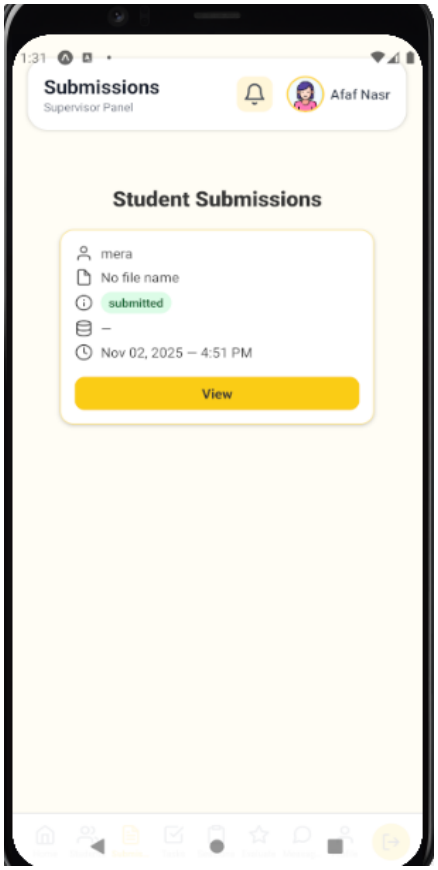
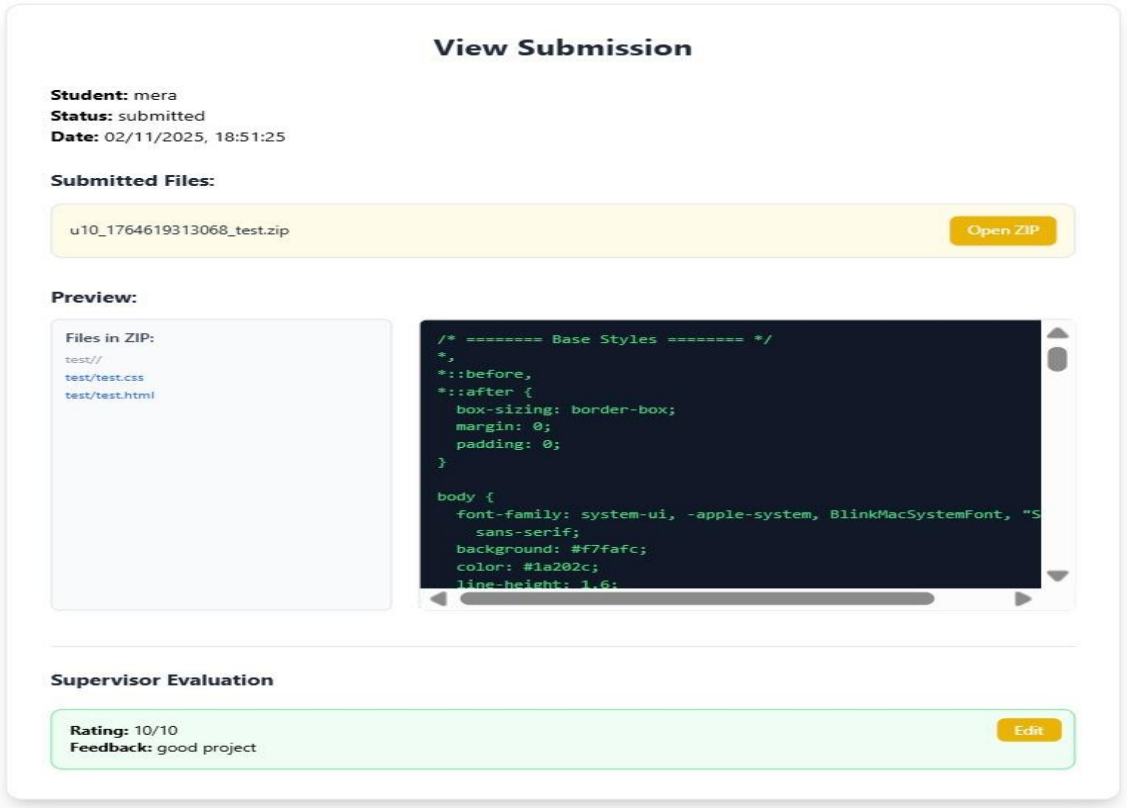


Figure 75 - student submissions

When he click on view :

In Web:



In mobile:

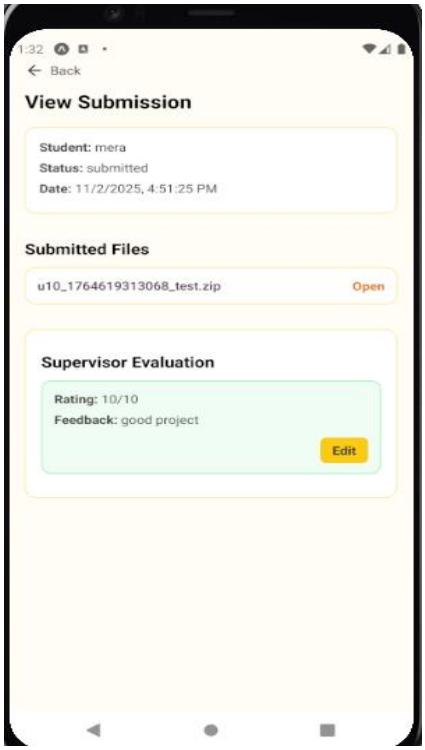


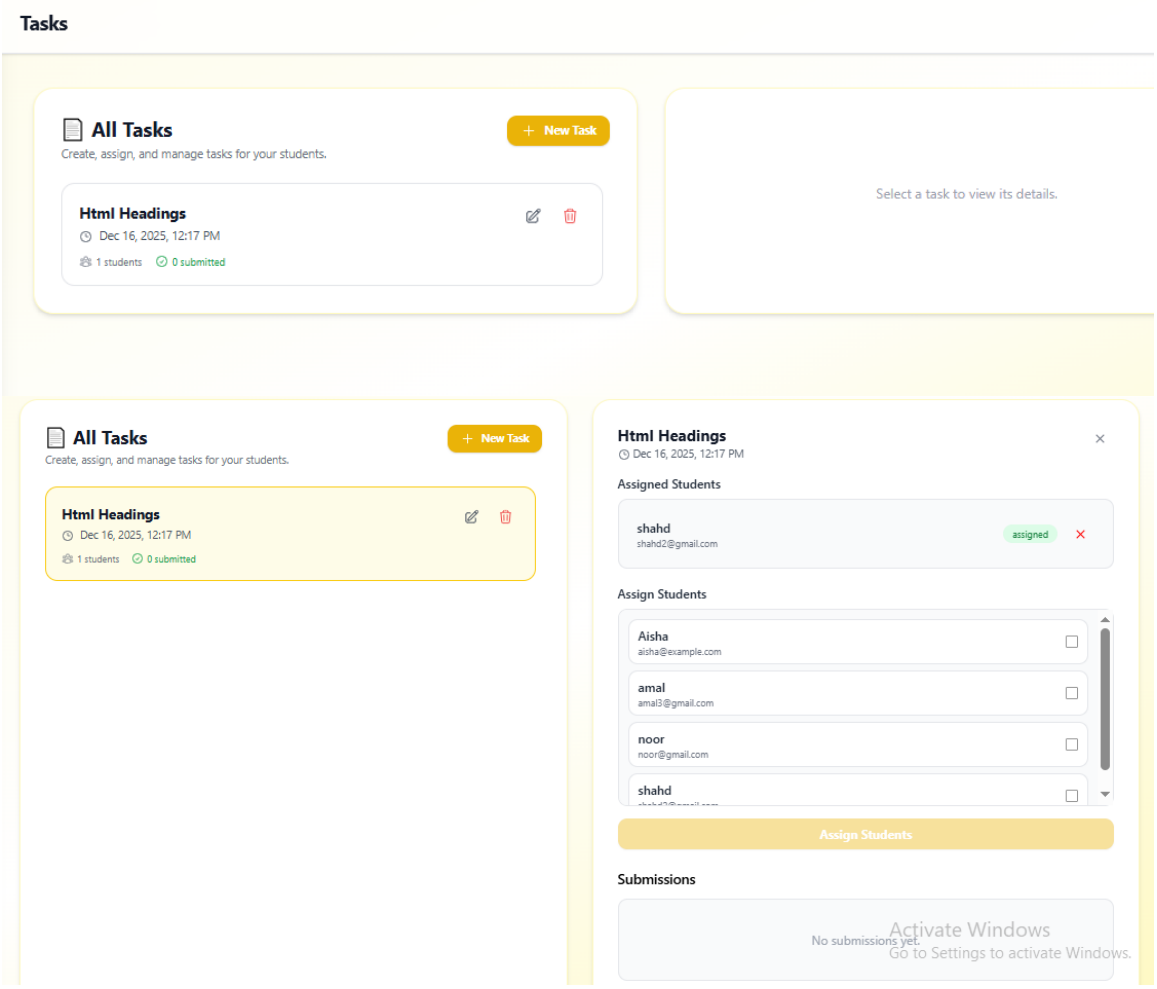
Figure 76 - view submission

4.5.5 Tasks Management Page:

The Tasks Management page is designed to help supervisors create, assign, or manage learning tasks for their respective students. This is made possible by a central interface where the supervisor can monitor all created learning tasks as well as information such as the task title, date created, the number of students assigned, as well as the current status of submissions.

Supervisors can use this page to add a new task, edit a task, or remove a task if needed. Choosing a task will allow supervisors to view a detailed version of that task, where they can check information regarding a specific task and its progress of submission. This page will help supervisors organize and manage tasks effectively, which will help generate effective communication of academic requirements.

In Web:


Tasks
All Tasks
Create, assign, and manage tasks for your students.
New Task
Html Headings
Dec 16, 2025, 12:17 PM
1 students
0 submitted
Select a task to view its details.
All Tasks
Create, assign, and manage tasks for your students.
New Task
Html Headings
Dec 16, 2025, 12:17 PM
1 students
0 submitted
Html Headings
Dec 16, 2025, 12:17 PM
Assigned Students
shahd
shahd2@gmail.com
assigned
Assign Students
Aisha
aisha@example.com
amal
amal3@gmail.com
noor
noor@gmail.com
shahd
Assign Students
Submissions
No submissions yet.
Activate Windows
Go to Settings to activate Windows.

In mobile:

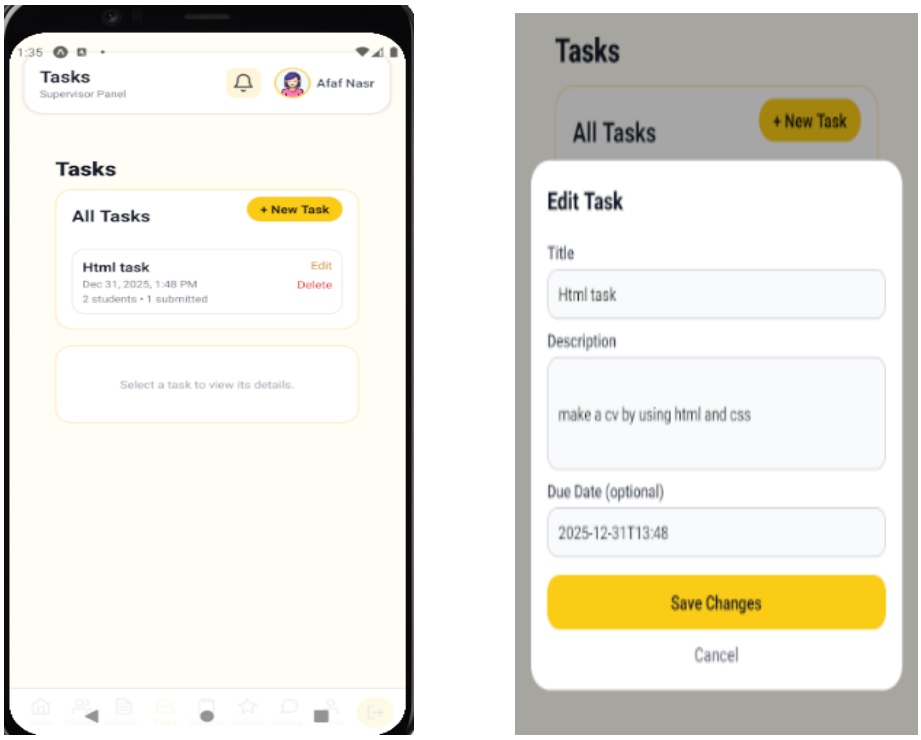


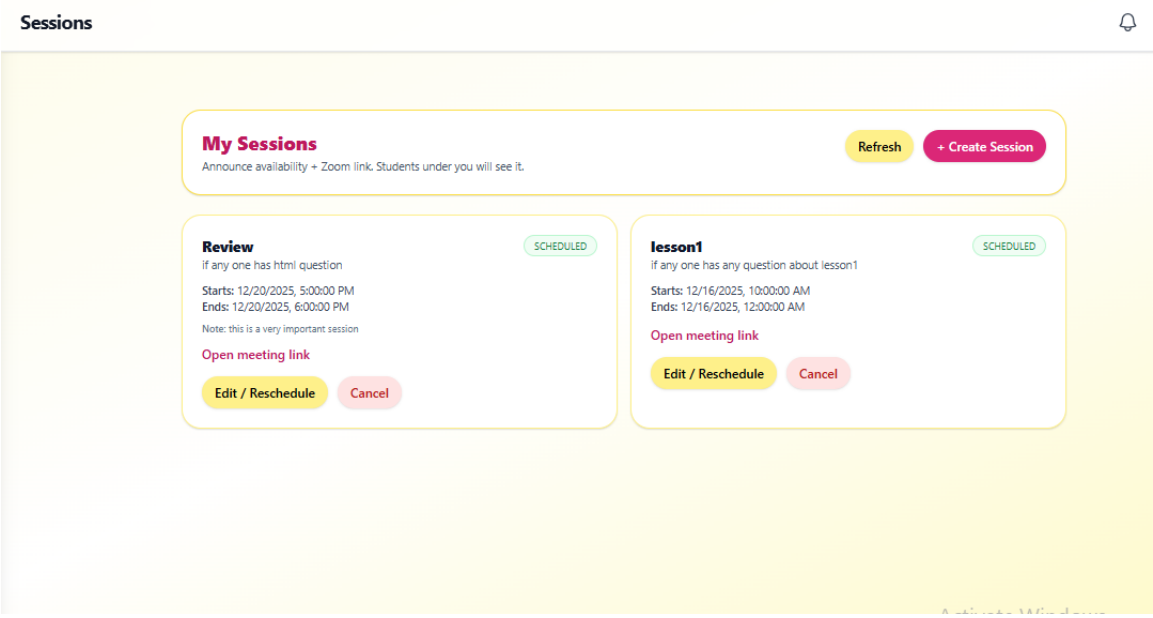
Figure 77 – Tasks

4.5.6 Sessions Management Page:

The Sessions Management Page allows supervisors to create and manage sessions for students allocated to them. On this page, a supervisor can create students' sessions, including session name, description of the session, timing of the session, and then a link for the session, which once created will be visible to students allocated to the respective supervisors to join a meeting.

The page offers a format with all the sessions in a cards format where the session status, such as the schedule for the session, is highlighted. Supervisors can reload the list of the session, edit and reuse the session, access the link for the meetings, and even cancel the session when needed. The page is useful for the smooth handling of the academic communication process by allowing full control of the session scheduling and management.

In Web:



In mobile:

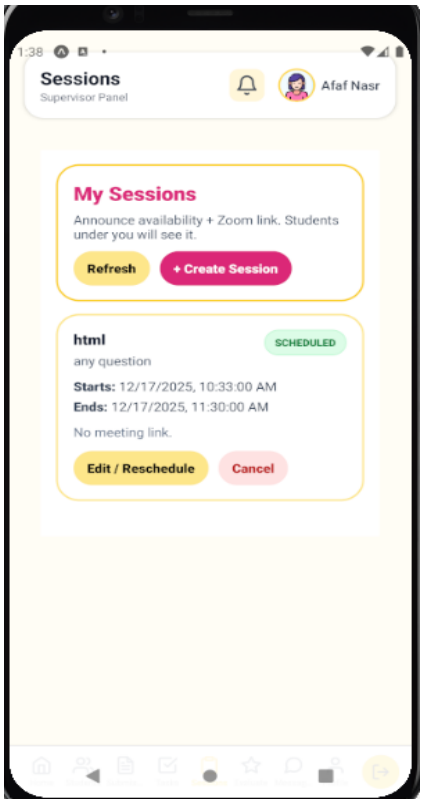
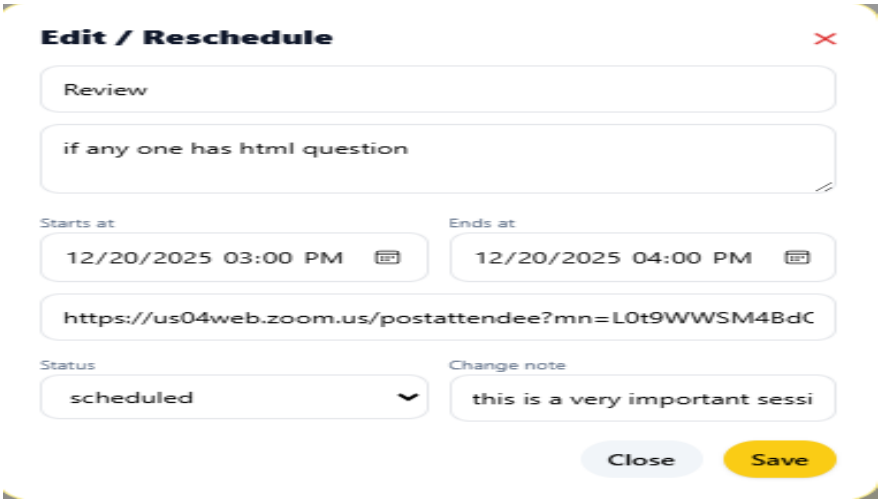


Figure 78 – sessions

In Web:



In mobile:

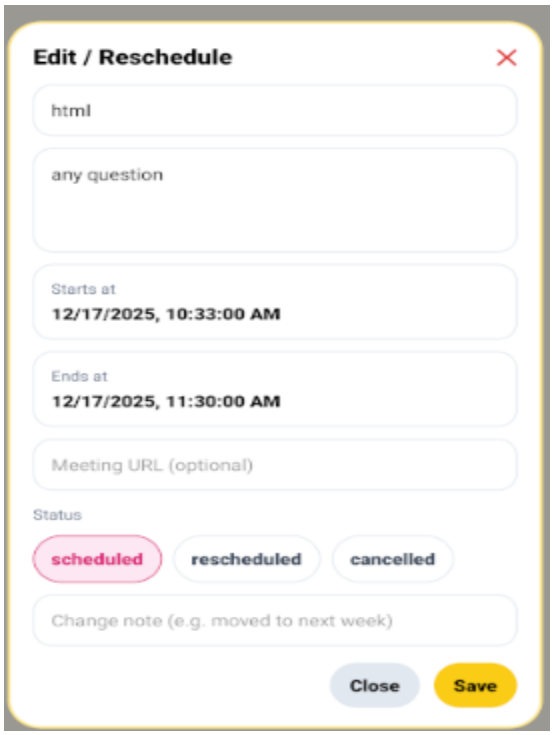


Figure 79 -Edit session

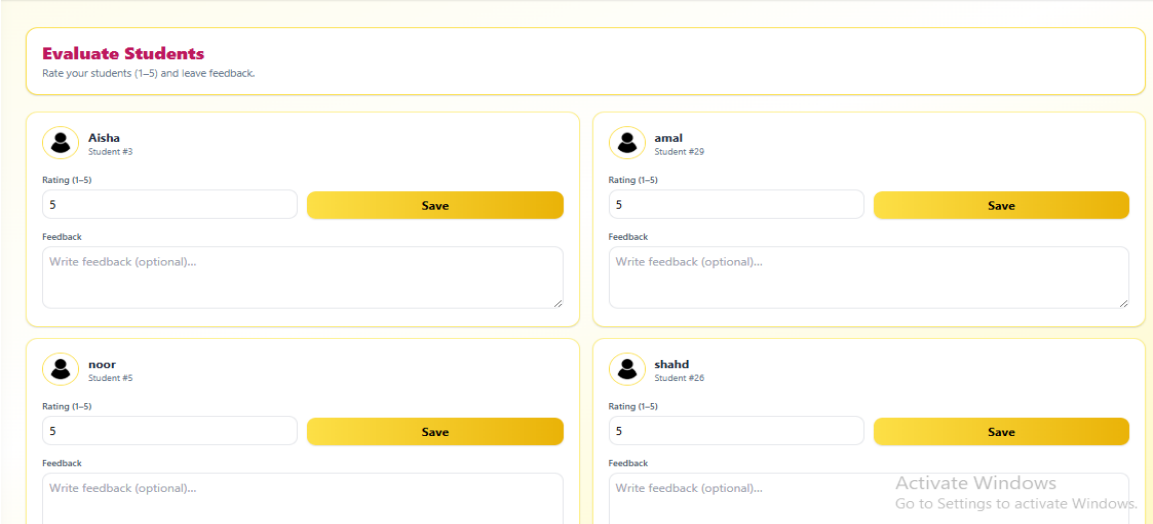
4.5.7 Evaluate Students Page:

The Evaluate Students page enables the supervisor to evaluate the performance of the students by assigning them a rating, as well as a descriptive comment. This page displays a list of students supervised by the user, with each student having their own card in the

evaluate students page. The user has the ability to assign the student a rating based on a scale, alongside a comment.

The design of the evaluation interface is meant to be user-friendly and efficient to enable supervisors to save their evaluations for several students on one webpage. This aspect helps to ensure there is constant monitoring of students' performance as well as feedback offered by supervisors to further educational interactions on the learning platform.

In Web:



In mobile:

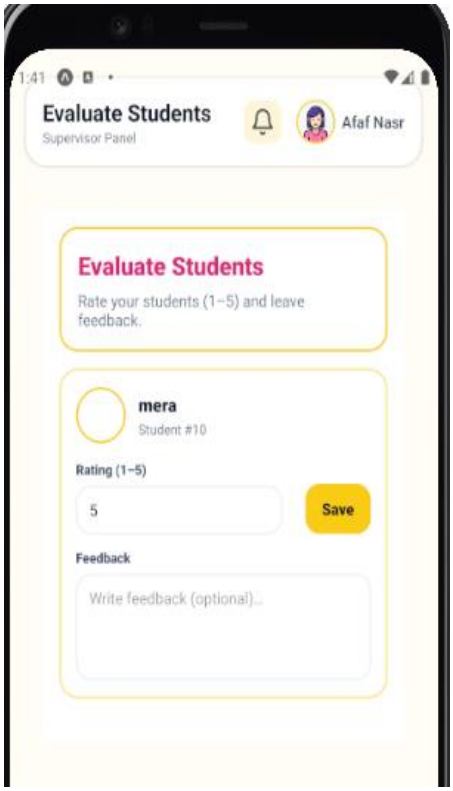


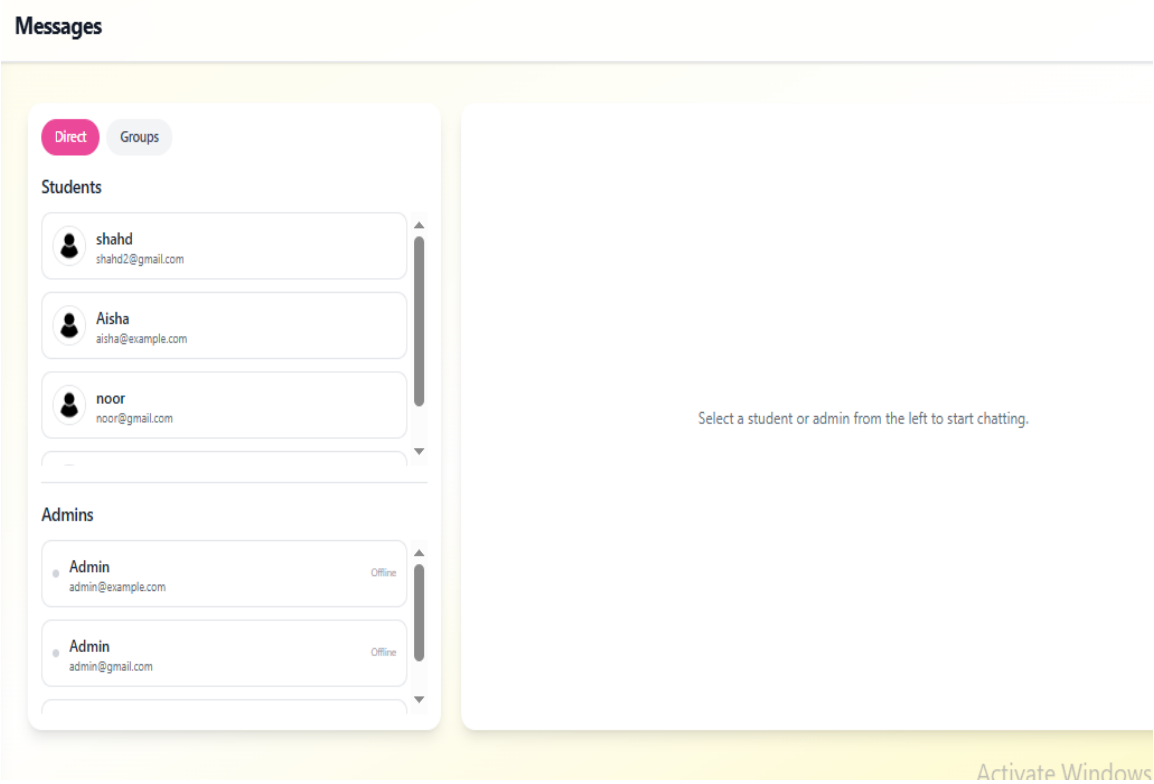
Figure 80 - evaluate student

4.5.8 Messages Page:

Messages page allows supervisors to communicate with students and administrators effectively as there is a real-time messaging system. The page is designed such that supervisors communicate with students one by one as well as with many students at a time via group chats. There is a distinct grouping of contacts, and the status of the person to be contacted is shown.

It allows supervisors to send and receive various message types, such as text messages, file attachments, images, and voice messages, giving flexibility in communication for effective academic guidance and support. Group messaging allows the supervisor to create a new group, add or remove members from the group, and develop conversations in the group. Each message will be displayed along with its timestamp and information about the sender to maintain the clarity of messages and flow of the conversation. The page integrates direct and group messaging into a single interface, enhancing coordination, timeliness of feedback, and frequency of interaction between supervisors and students within the learning environment.

In Web:



In mobile:

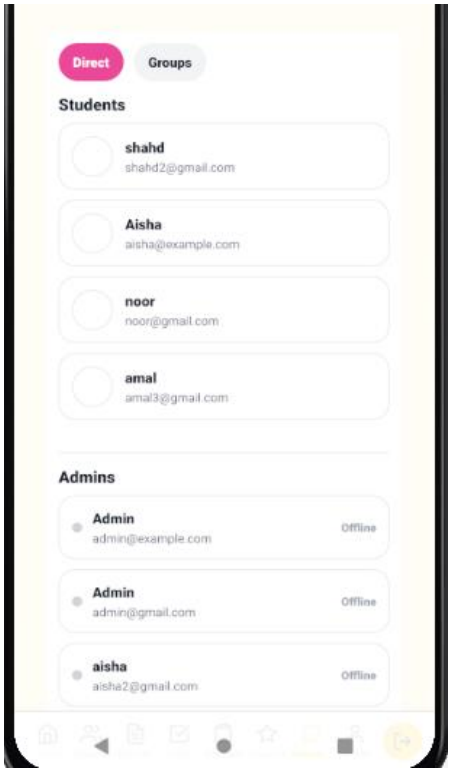
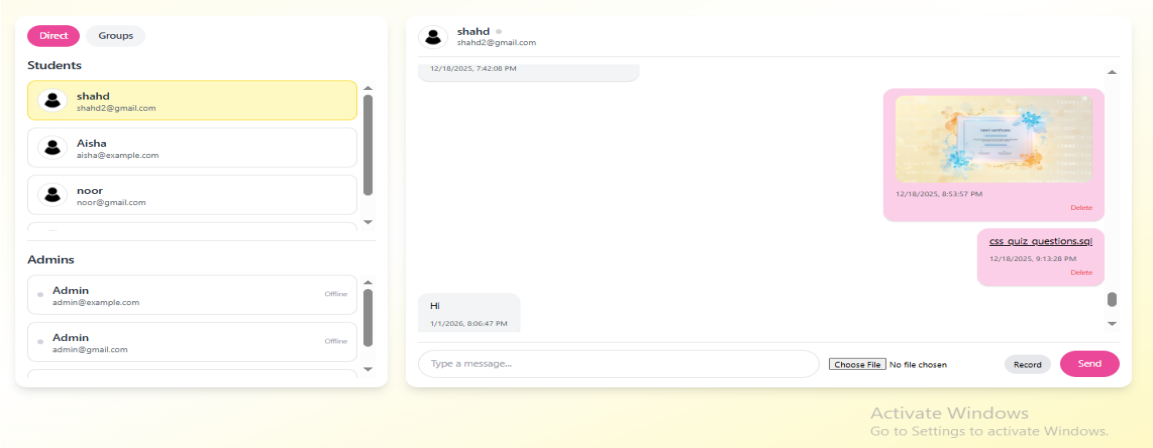


Figure 81 – Messages

In Web:



In mobile:

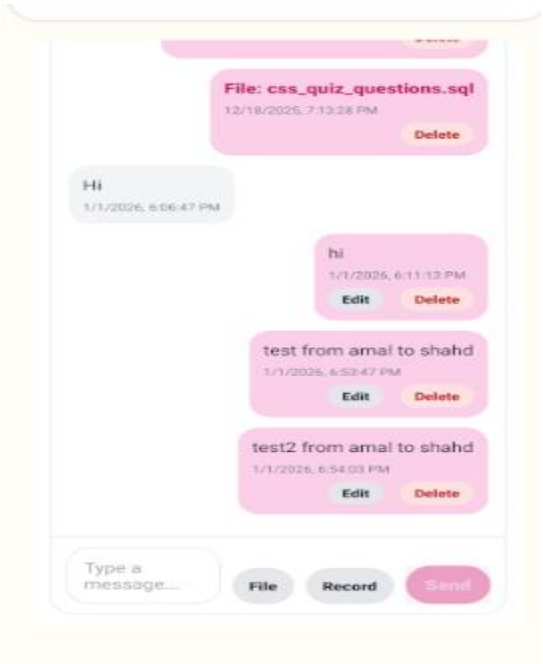
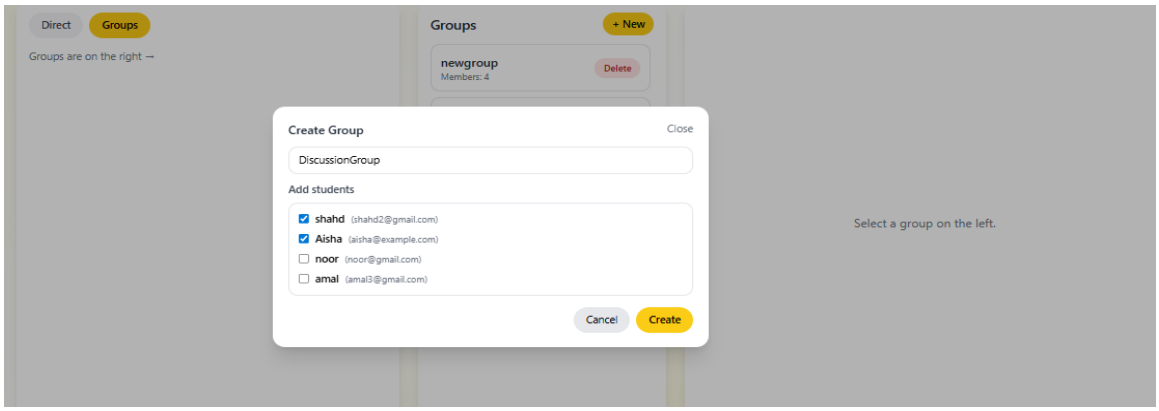


Figure 82 - Send Message

When the supervisor create a new group :

In Web:



In mobile:

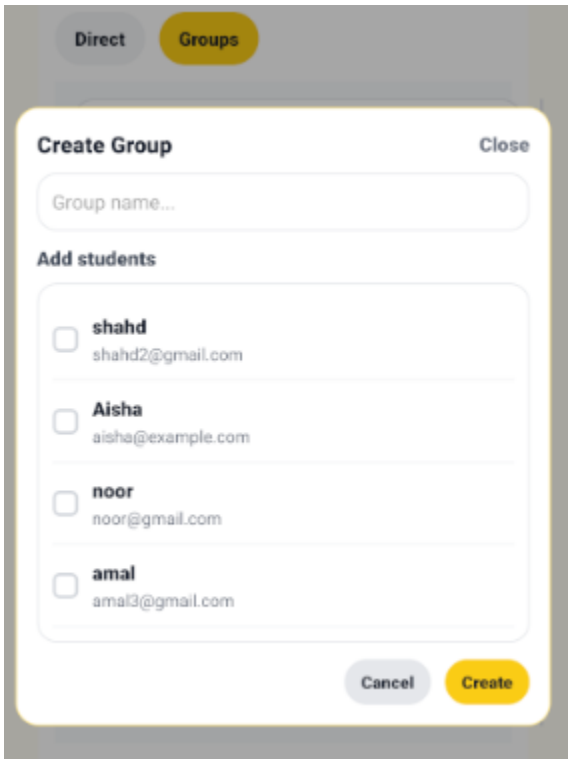
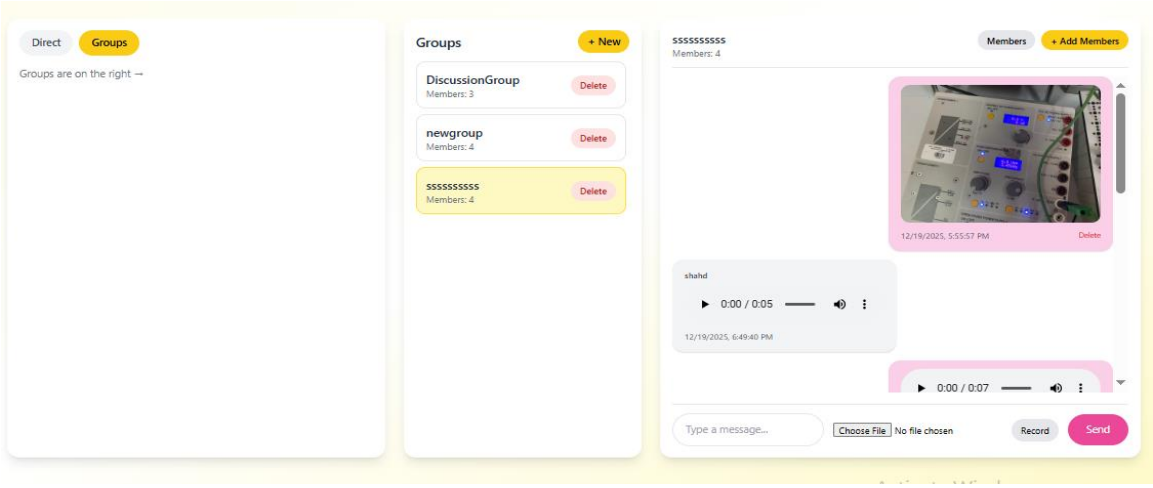


Figure 83 - Create group

This is an example of a group of student :

In Web:



In mobile:

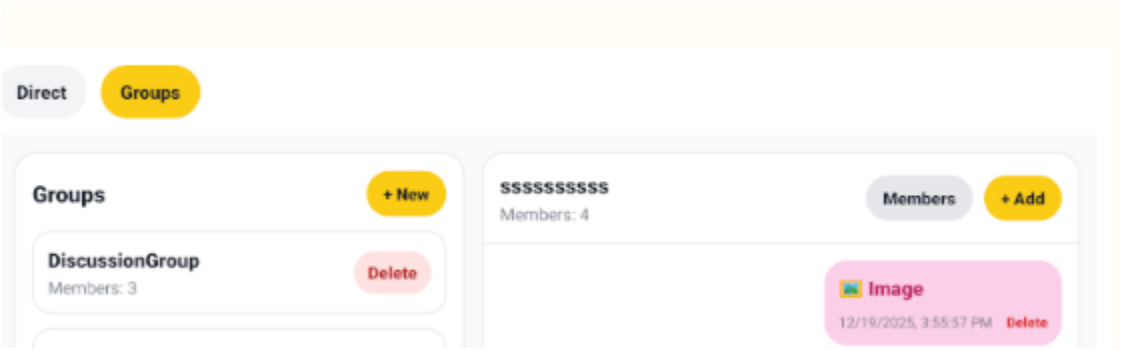
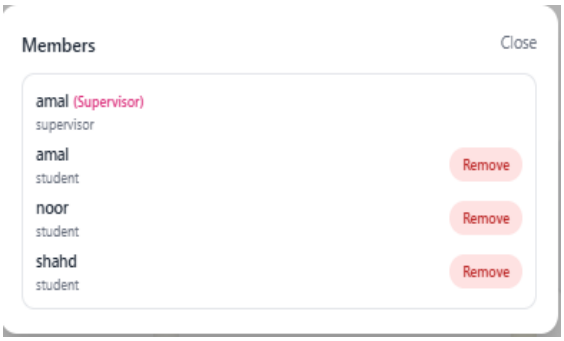


Figure 84 - Example group

He can remove a member from a group :

In Web:



In mobile:

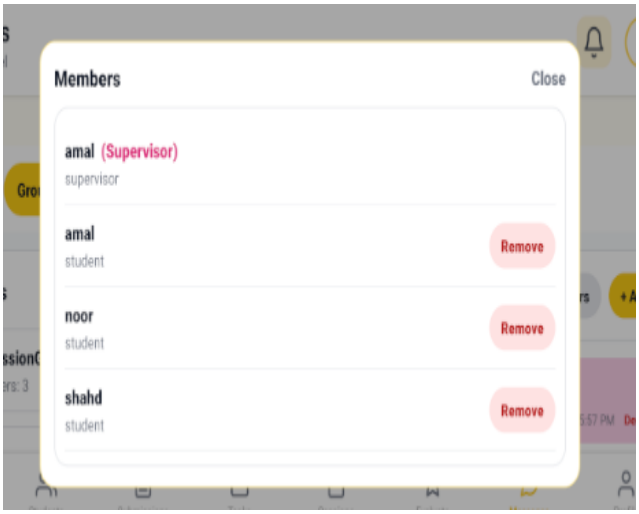
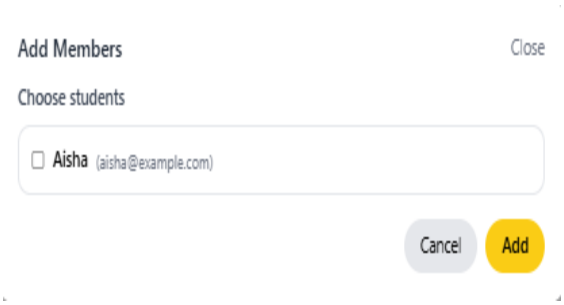


Figure 85 - Remove member

He can also add a member :

In Web:



In mobile:

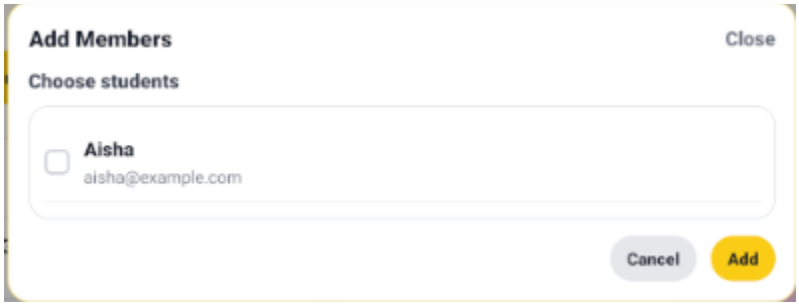
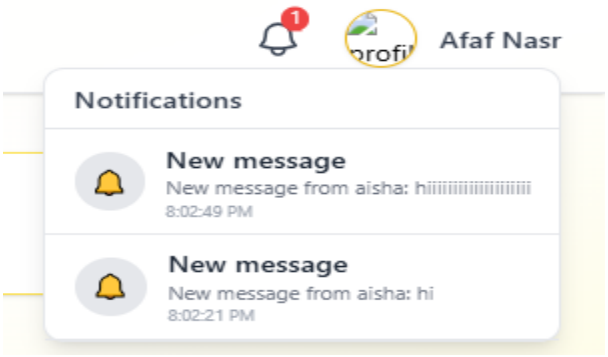


Figure 86 - add new member

4.5.9 Notification System using Firebase Cloud Messaging (FCM):

The supervisor is also able to receive real time notifications via Firebase Cloud Messaging as a means to keep them updated on the events pertaining to the students. Here, the actions that send notifications to the administrator include sending a message or voice note through the chat feature in the app, the submission of a task or assignment, as well as actions connected to the sessions and assessments.

In Web:



In mobile:

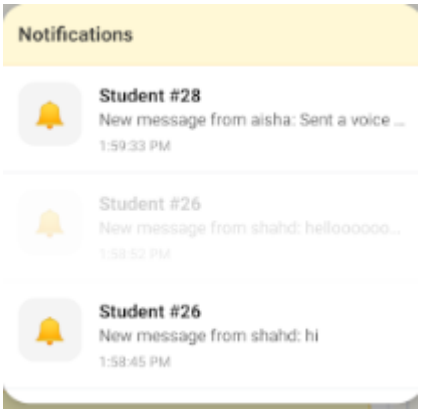


Figure 87- Notification

Note : The mobile version of the system provides the same core functionalities as the web platform, with an interface adapted for mobile devices.

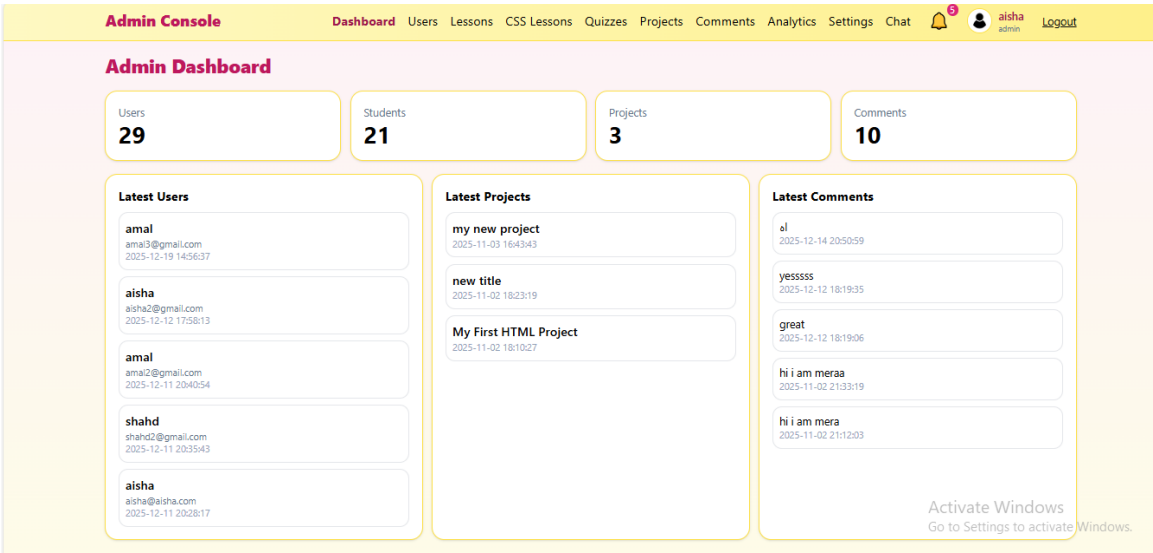
4.6 Admin Interface Results

4.6.1 Admin Dashboard:

The Admin Dashboard gives the admin a complete view of the learning environment, which enables them to track the activities of the learning platform and make efficient use of the core services of the platform. The admin dashboard gives the admin direct information on the total number of users, students, projects, and comments.

In addition, the dashboard encompasses recent activities in specific sections for recent registered users, recently added projects, as well as recent comments. This serves as a real-time information system where the administrator can monitor the interactions, creations, and engagement of users on the system. Such a dashboard plays a significant role in decision-making, monitoring, as well as system administration.

In Web:



In mobile:

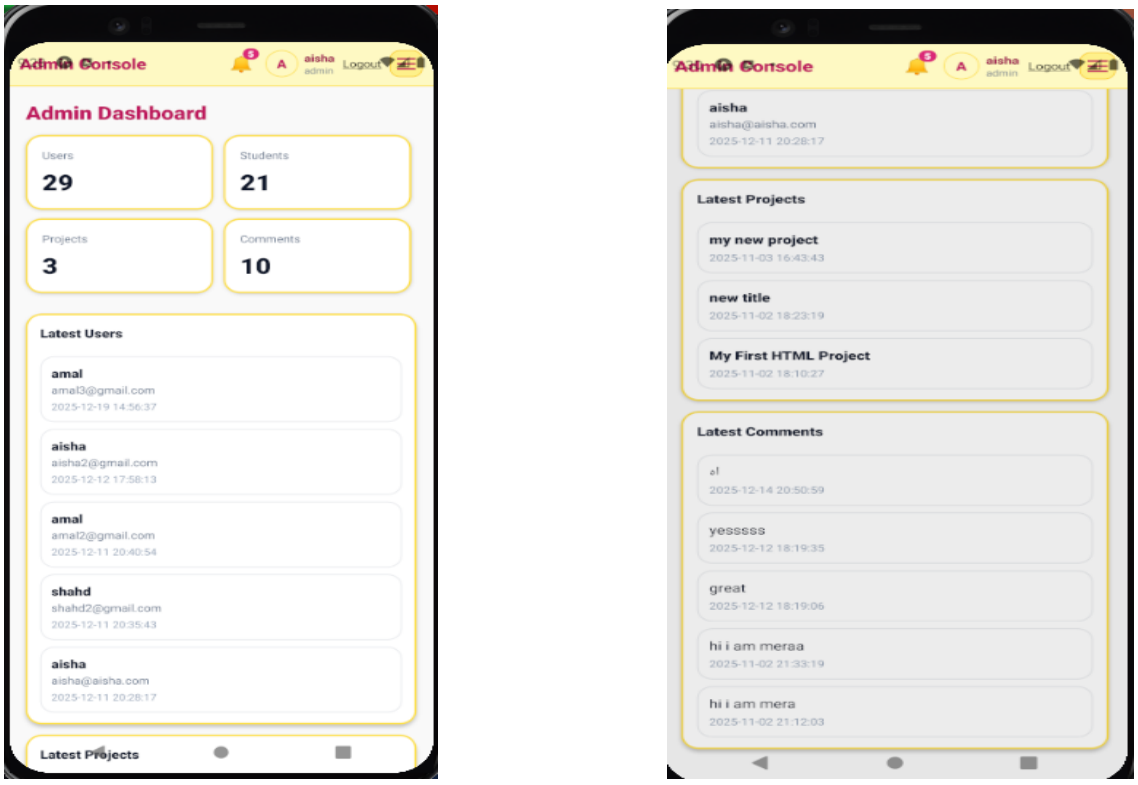


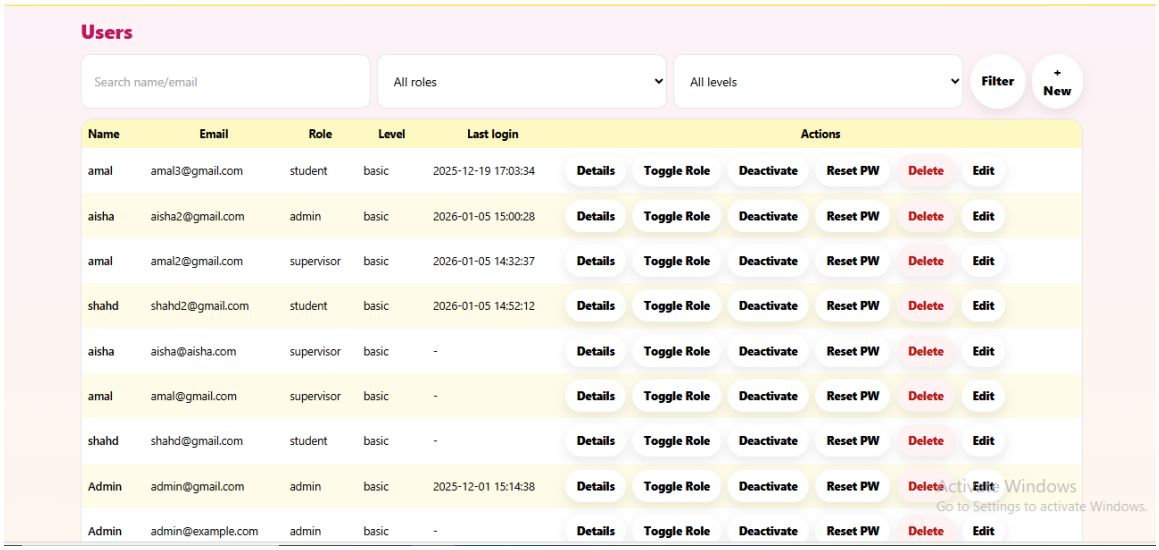
Figure 88 - Admin Dashboard

4.6.2 Users Management Page:

The Users Management page is a tool for administrators to handle all users of the platform from a systematic page. On this page, a comprehensive list is available that showcases vital information of the users such as their name, email address, role, level, or last-login time. Filtering or searching criteria available on the page assist the administrator in easily searching for the desired user according to their role, level, or detail.

Administrators have been able to undertake a variety of management tasks from this particular page, including viewing user information, modifying user information, switching user roles, deactivating user accounts, resetting user passwords, and deleting users from the system when deemed necessary. It can be noted that this page has played a crucial role in ensuring that system integrity, user organization, and overall system governance are effectively placed at this point by facilitating user control and monitoring.

In Web:



In mobile:

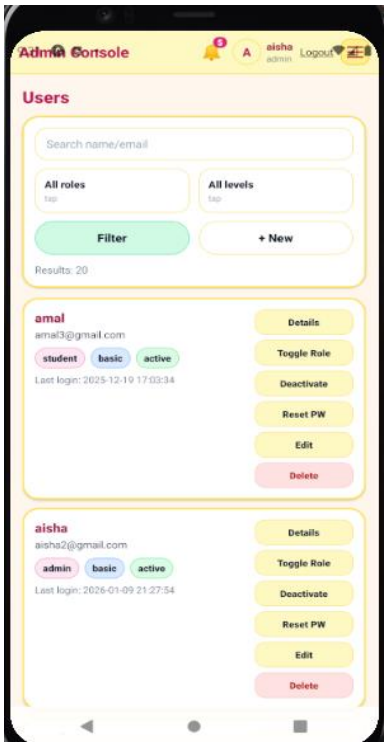


Figure 89 – Users

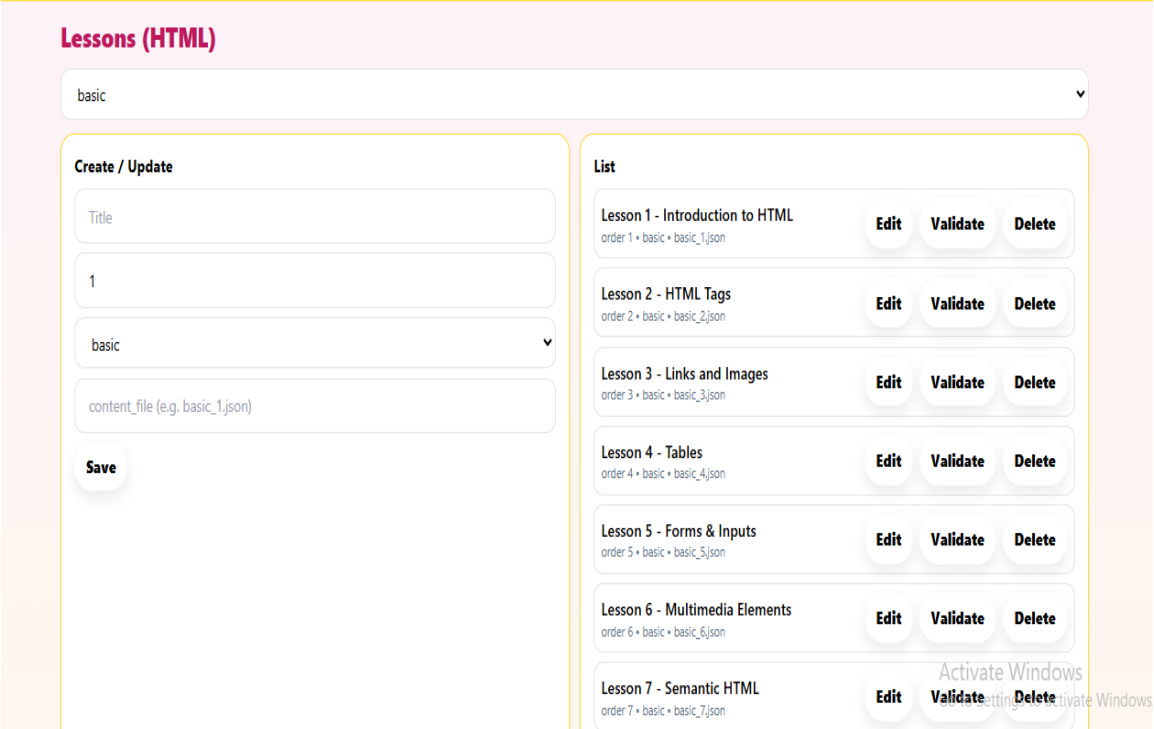
4.6.3 HTML Lessons Management Page:

The HTML Lessons Management page is a feature that enables the admin to create, edit, manage, and control all HTML-based learning contents on the site. The admin can specify the title and order of lessons, difficulty levels, and learning contents through this

page. This will ensure a systematic order where the learning lessons are also offered systematically.

This page also offers a full list of existing lessons, which allows administrators to make changes to the lessons, check the validity of lesson content, as well as delete a lesson when necessary. A lesson validation feature is very important as it allows for the verification of all the data concerning a lesson, as well as all related file content, to ensure that everything is appropriately set up for posting to students.

In Web:



In mobile:

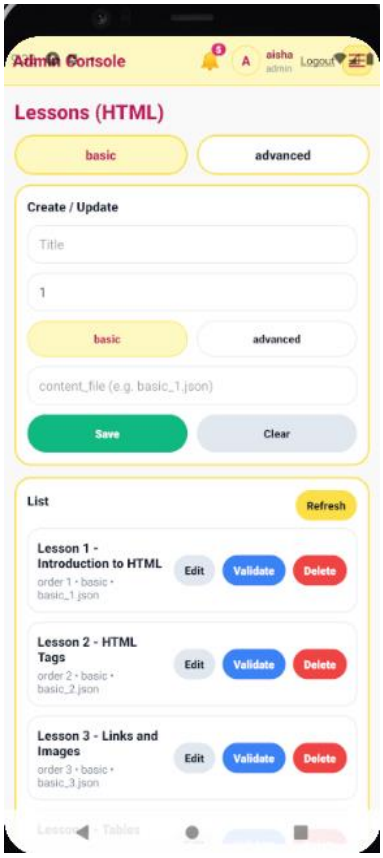


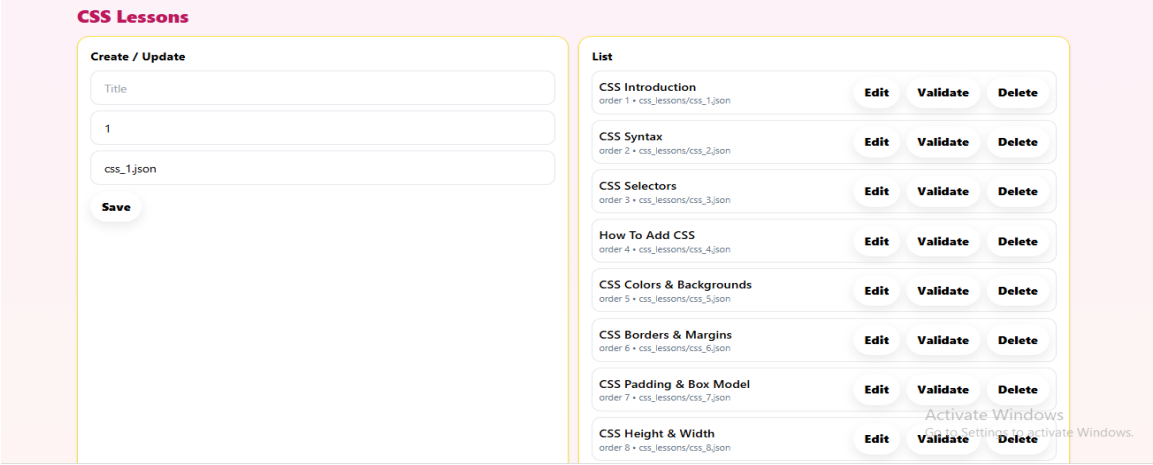
Figure 90- HTML Lessons

4.6.4 CSS Lessons Management Page:

The CSS Lessons Management page is an interface that helps administrators in the management of all Cascading Style Sheets (CSS) lessons and related contents within the platform. An administrator can create lessons and modify them through this interface by assigning a title to the lessons, a sequence of order, and a file for contents. This helps in structuring lessons related to CSS in a progressive manner.

The page also lists all the CSS lessons that already exist. This list gives administrators the opportunity to edit information about lessons, validate the content of the lessons, or delete the lessons if needed. The validation feature will ensure that the files containing the lessons are set up appropriately for distribution to students. This particular page will ensure that there is a uniform curriculum by providing efficient management of CSS lessons.

In Web:



In mobile:

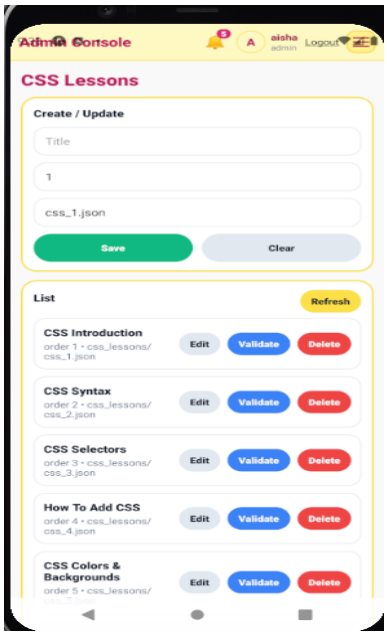


Figure 91-CSS Lessons

4.6.5 Quizzes Management Page:

The Quizzes Management page enables administrators to structure, control, and organize all the contents of the quizzes for the HTML as well as the CSS tracks. Using the page, the quizzes are broken into various levels, with each level indicating a certain topic or level of knowledge. Using the page, administrators can add and manage the various levels of the quizzes based on the order, name, description, and the required number of correct responses to proceed.

Moreover, the current page allows the administrator to create or manage various types of questions, for instance, multiple-choice questions or true/false questions. In this regard, the administrator can set up options for replying to the question, determine the right answer, as well as provide an optional explanation to facilitate better comprehension for the students. In this case, existing questions or levels can be modified or deleted to ensure improved reliability throughout the assessment content. Through this webpage, the administrator can help facilitate structured knowledge assessments, progressive learning, as well as harmony between learning content and assessment for the students.

In Web:

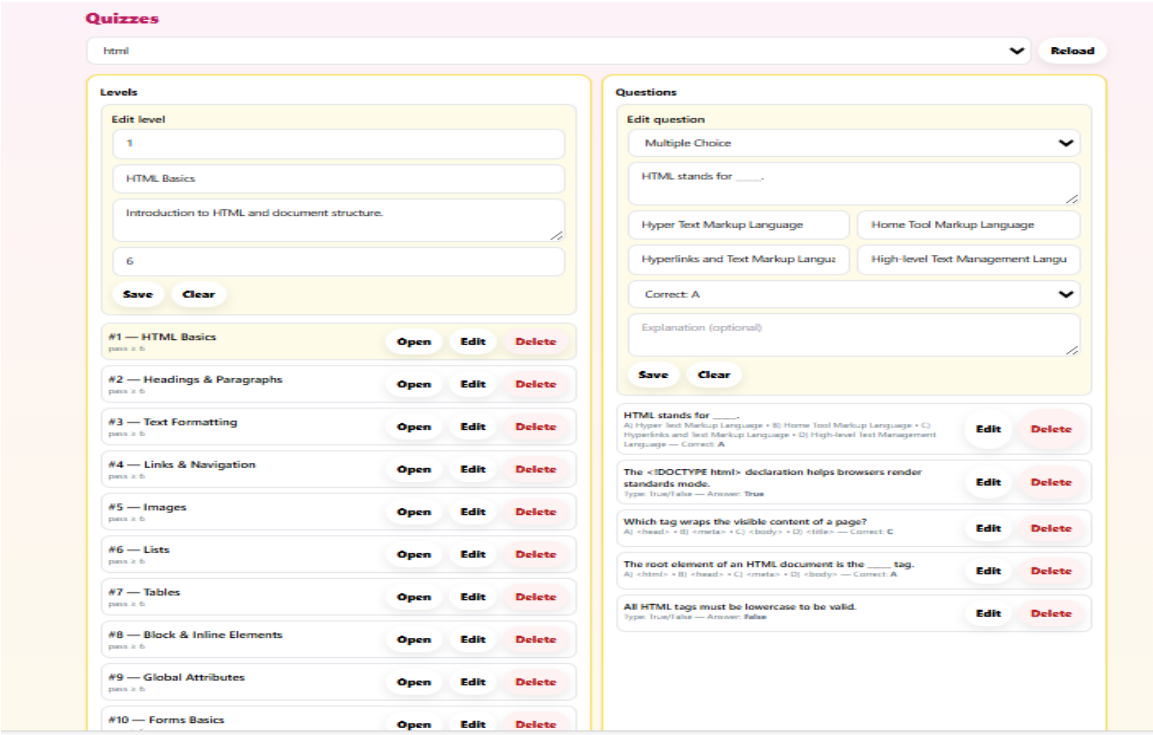


Figure 92 –HTML Quiz Management

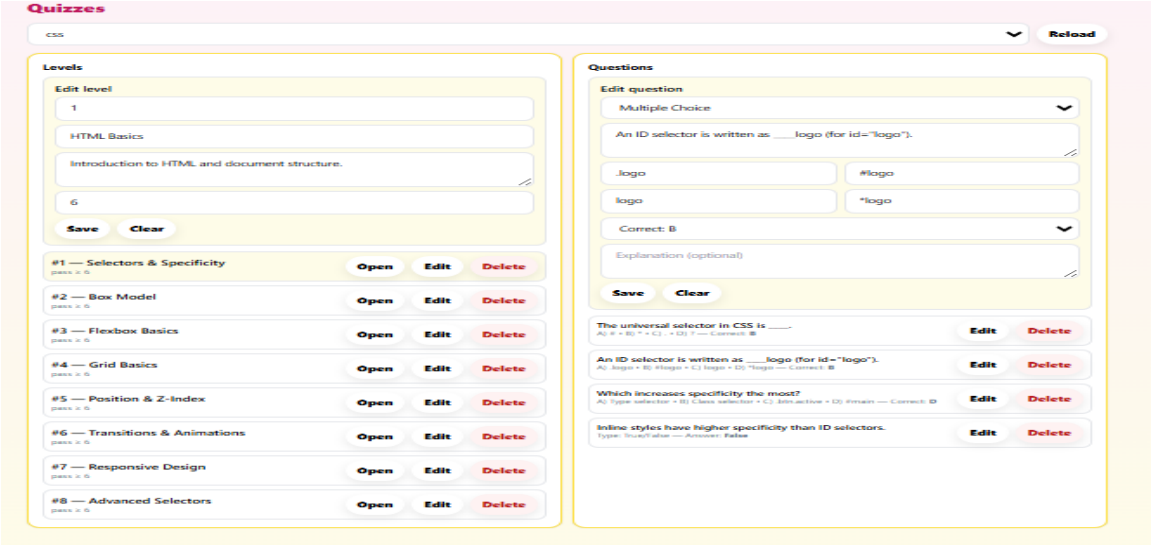
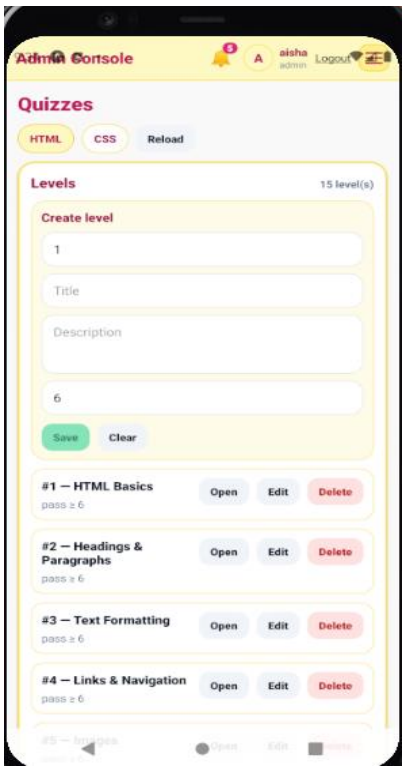


Figure 93 - CSS Quiz Management

In mobile:

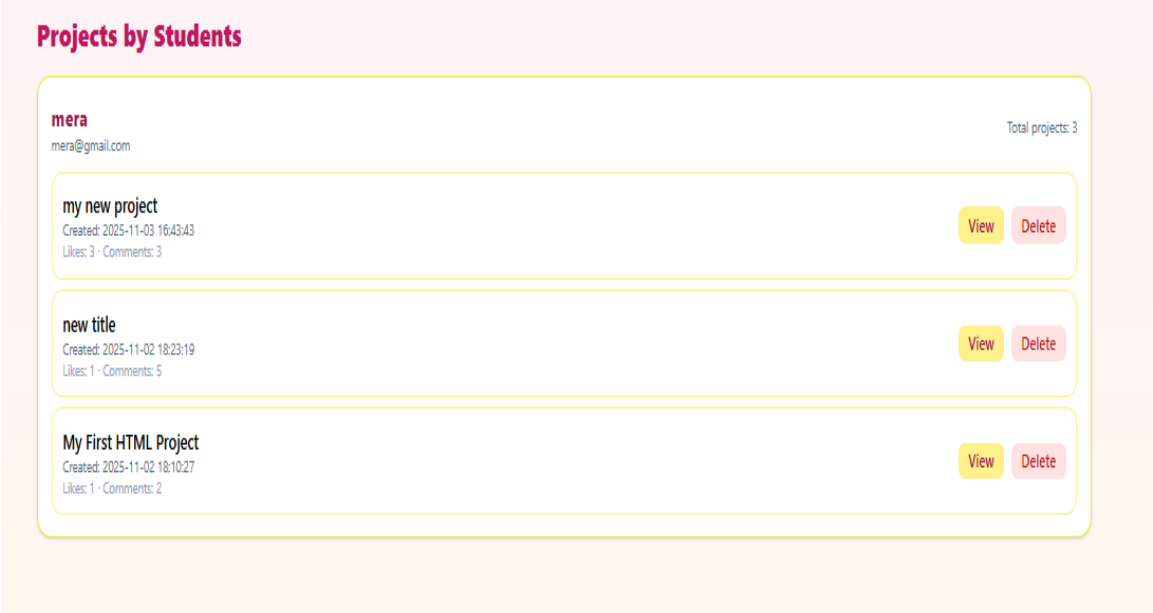


4.6.6 Projects Management Page:

The Projects Management Page allows administrators to view and control the management of projects that students have submitted to the site. The page categorizes the project submissions that students make, with critical information such as the name of the project, date of creation, and the number of likes for each project. Additionally, the administrators are provided with a summary of the total projects that a student is involved with.

Administrators can show each project in detail or remove projects when needed to assure the quality and compliance of the content on the platform. This centralized mechanism for moderation promotes effective supervision of the students' generated content, encourages responsible sharing of projects, and sustains a professional, organized learning environment. The platform has ensured that project monitoring, while integrated into the admin console, is transparent, assures accountability, and sets high standards for collaborative learning.

In Web:



In mobile:

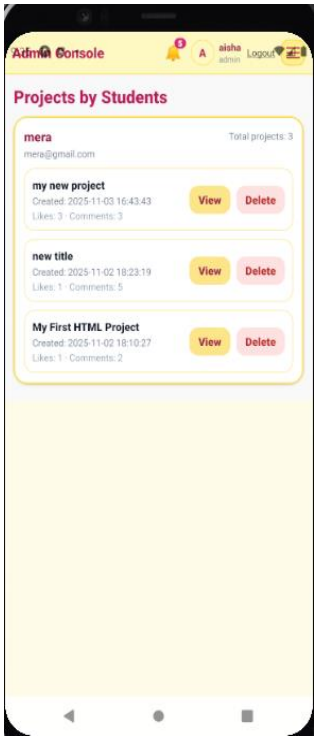


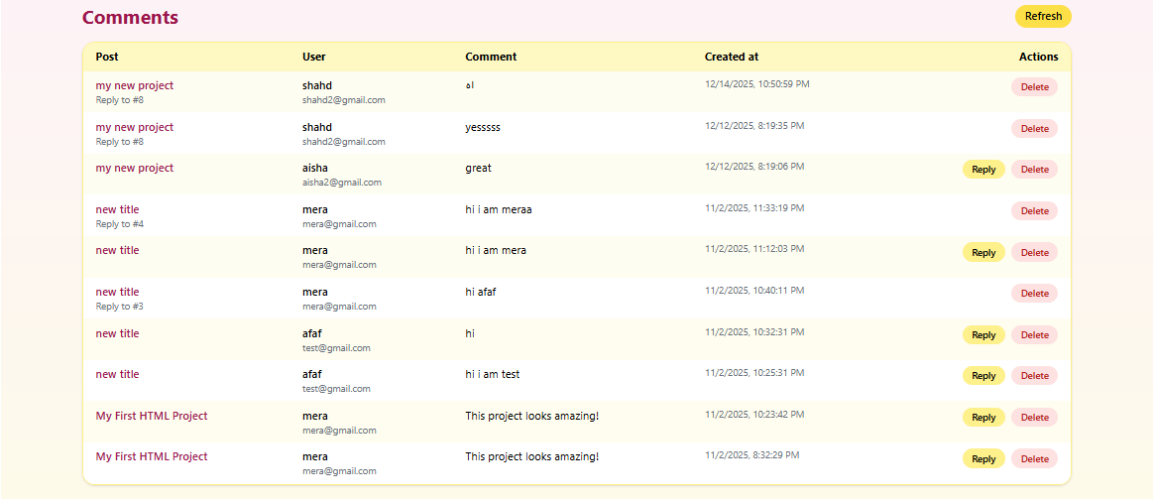
Figure 94 - Project Management

4.6.7 Comments Management Page:

The Comments Management page allows the administrator to track and manage comments left on student projects throughout the site. This screen displays detailed information for each comment, including associated project details, the name and email of the author, comment content, and creation date. Such organization provides a clear overview to the administrator of user interactions and engagement within the Project Hub.

The administrators are also able to respond to comments when needed and remove any comments that appear inappropriate or irrelevant in order to create a constructive ambient environment for knowledge acquisition. The Comments feature on the platform centralizes commenting processes in one place, thereby promoting positive interactions among users for constructive community management within the knowledge-commodity acquisition system.

In Web:



In mobile:

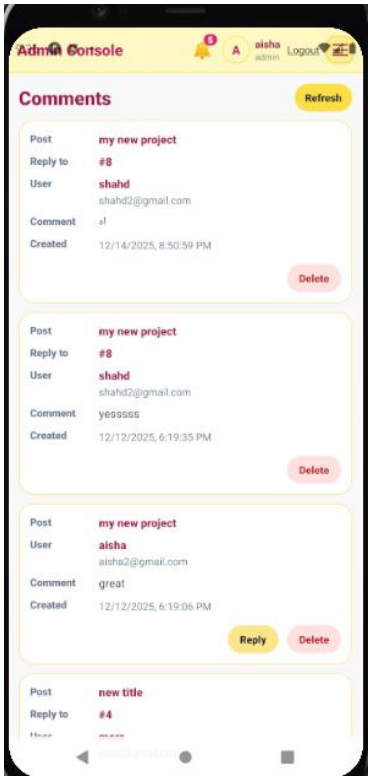


Figure 95 - Comments Management

4.6.8 Analytics and Reporting Page:

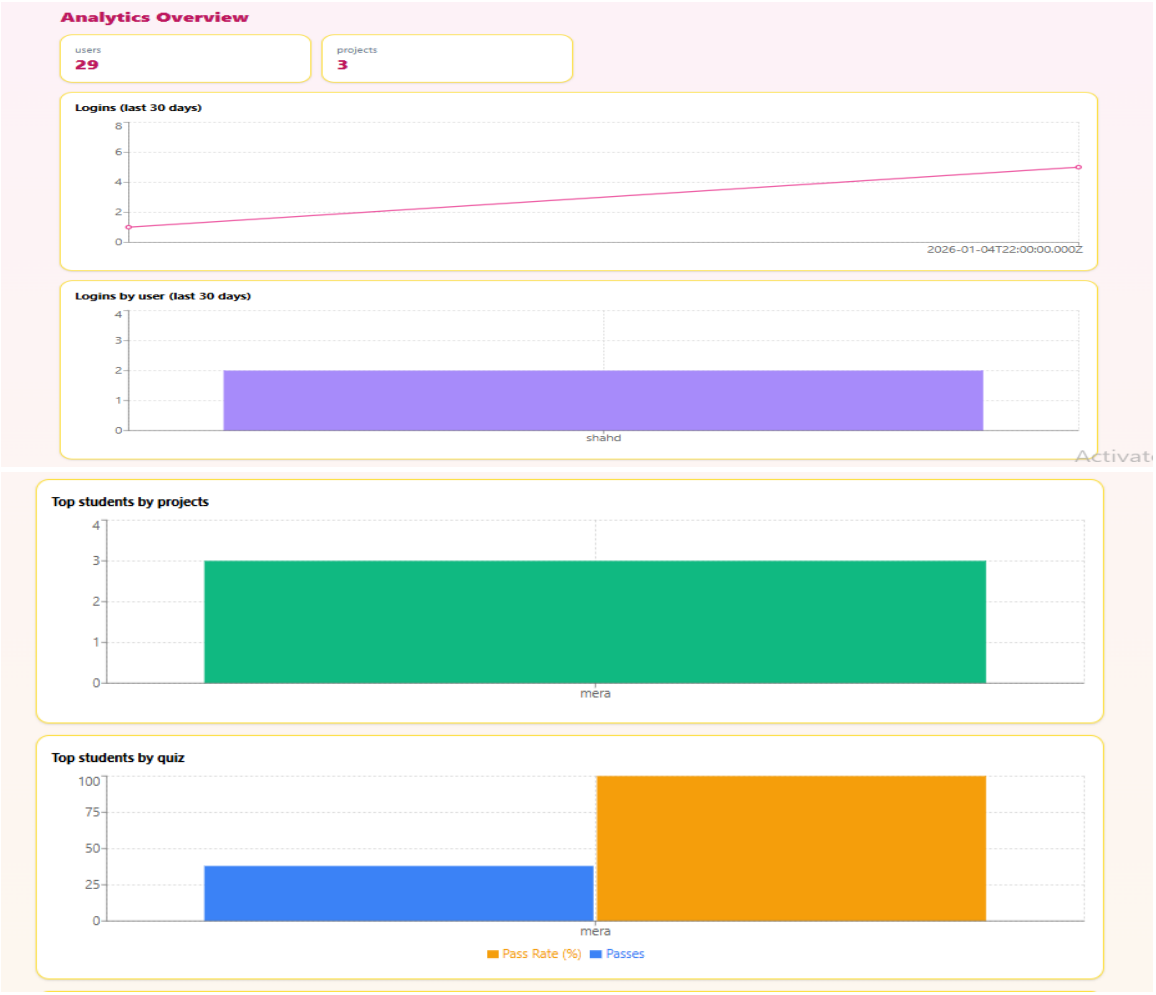
The Analytics & Reporting page offers administrators an overview of the use of the platform, as well as the performance of students. This page offers administrators the

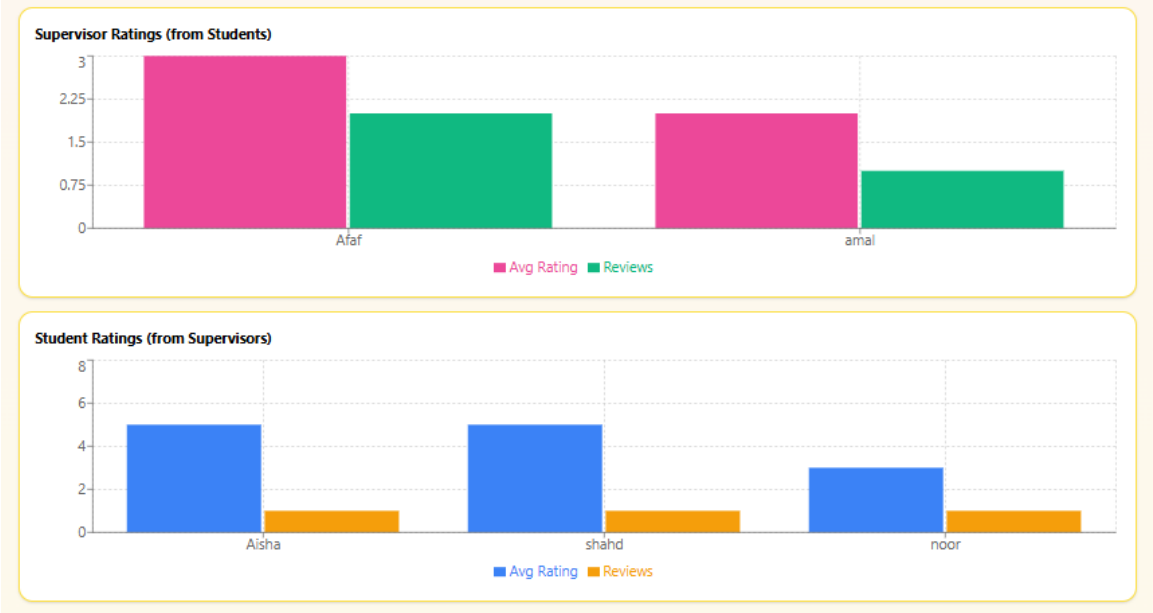
opportunity to view the total number of users as well as projects, and also offers analytics of login activity in the past 30 days, as well as the login activity distribution of users.

Additionally, the analytics dashboard provides information about the best-performing students in terms of project submissions and quiz answers, allowing for an informed assessment of their performance. This page contains evaluation statistics that indicate the assessments from the supervisors by the students and the assessments from the students by the supervisors. The role distribution charts further aid in the representation of the students, supervisors, and administrators in the system.

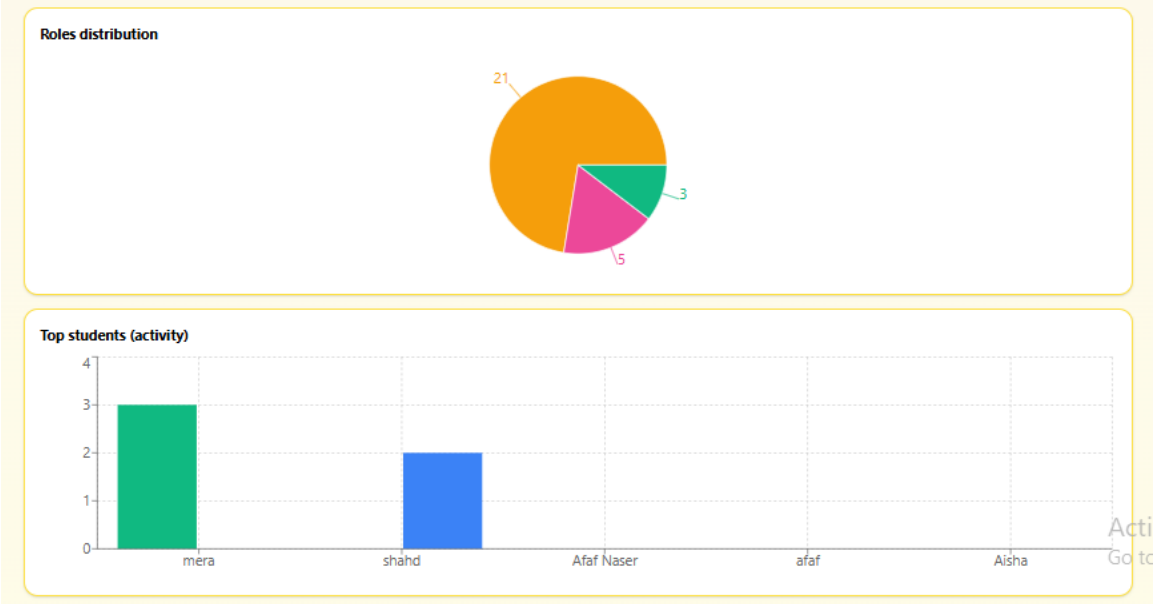
The combination of interactive charts and fetchable metrics on the analytics page facilitates informed decision-making, enhances academic tracking, and aids administrators in determining engagement trends, skill performance levels, and zones for improvement on the learning platform.

In Web:

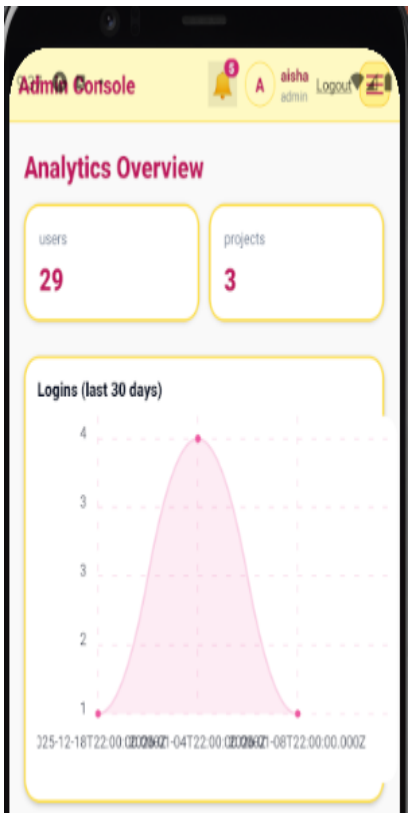


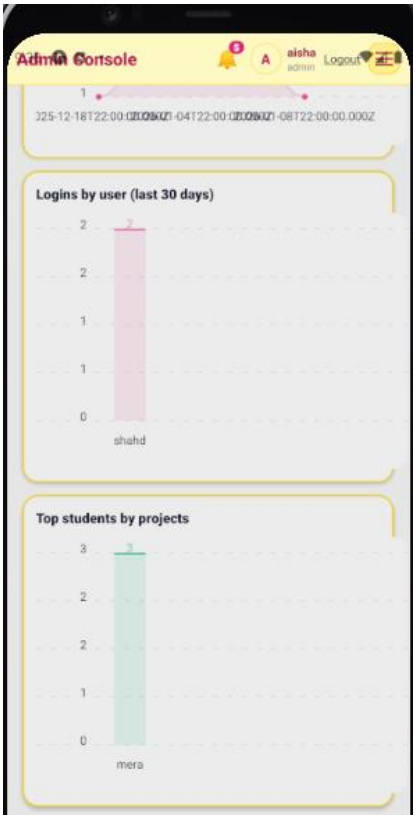

Supervisor Ratings (from Students)
3
2.25
1.5
0.75
0
Afaf
amal
Avg Rating
Reviews

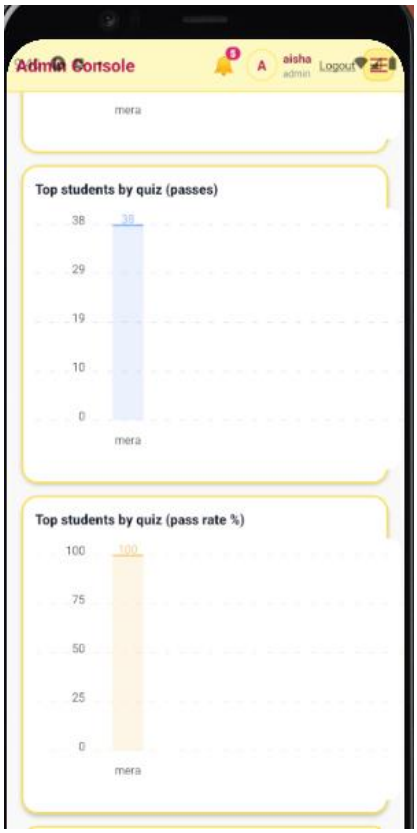
Student Ratings (from Supervisors)
8
6
4
2
0
Aisha
shahd
noor
Avg Rating
Reviews

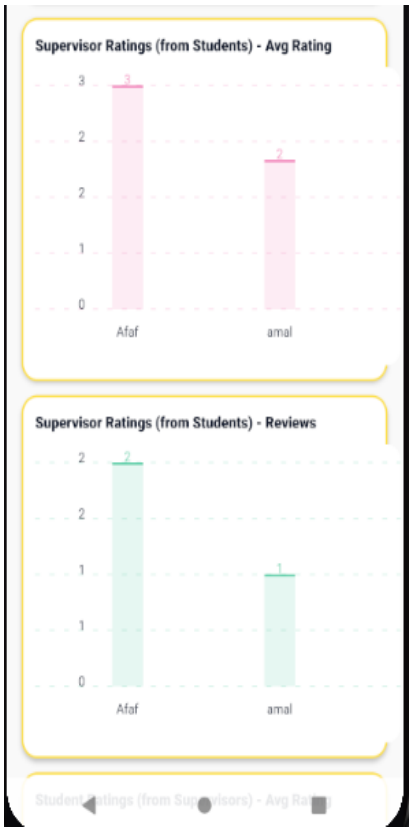

Roles distribution
21
3
5
Top students (activity)
4
3
2
1
0
mera
shahd
Afaf Naser
afaf
Aisha

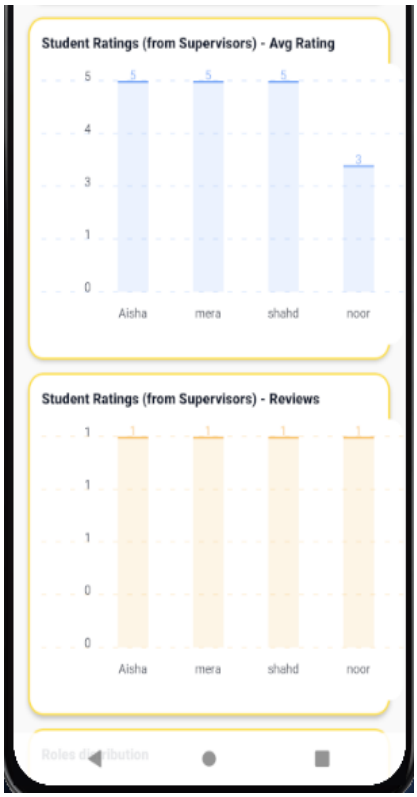
In mobile:

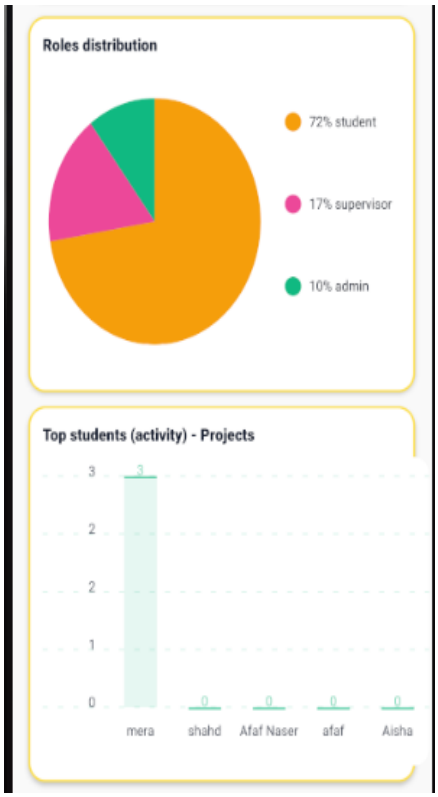

Admin Console
A
aisha
admin
Logout
Analytics Overview
users
29
projects
3
Logins (last 30 days)
4
3
3
2
1


Admin Console
A
aisha
admin
Logout
Logins by user (last 30 days)
2
2
1
1
0
shahd
Top students by projects
3
2
2
1
0
mera


Admin Console
aisha
admin
Logout
mera
Top students by quiz (passes)
38
29
19
10
0
mera
Top students by quiz (pass rate %)
100
75
50
25
0
mera


Supervisor Ratings (from Students) - Avg Rating
3
2
1
0
Afaf
amal
Supervisor Ratings (from Students) - Reviews
2
1
Afaf
amal


Student Ratings (from Supervisors) - Avg Rating
5
4
3
1
0
Aisha
mera
shahd
noor
Student Ratings (from Supervisors) - Reviews
1
0
Aisha
mera
shahd
noor


Roles distribution
72% student
17% supervisor
10% admin
Top students (activity) - Projects
3
2
1
0
mera
shahd
Afaf Naser
afaf
Aisha

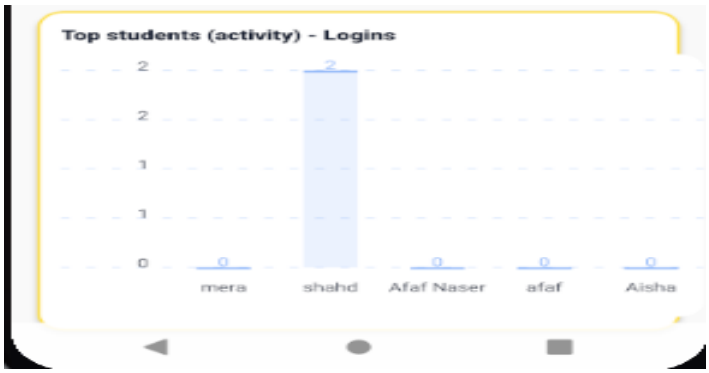


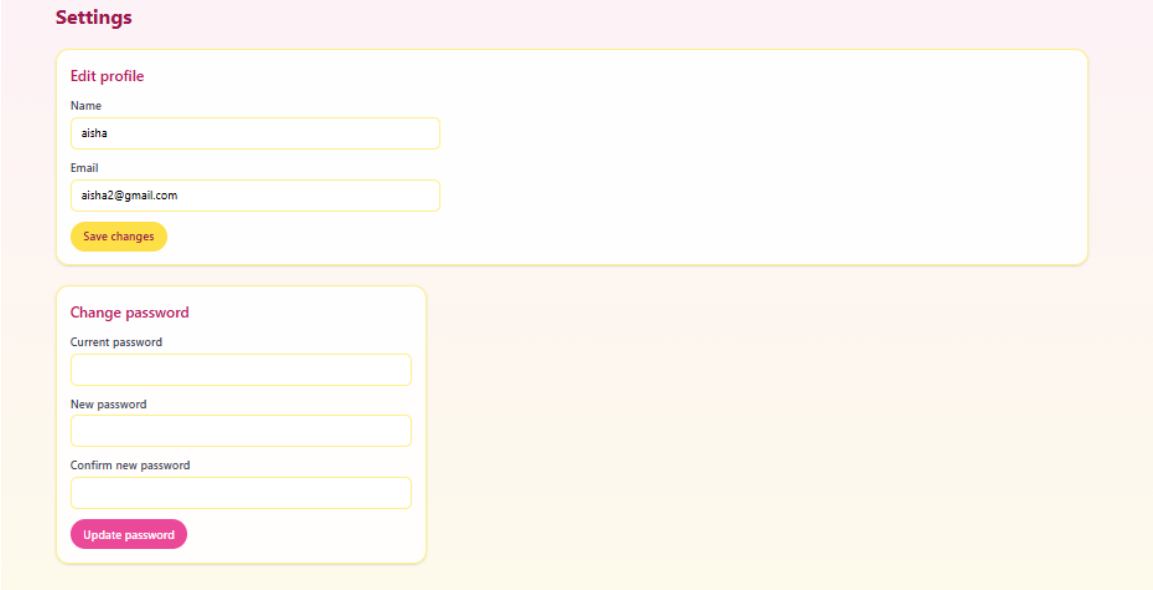
Figure 96 – Analytics

4.6.9 Account Settings Page:

The Account Settings page enables administrators to handle their own account details. From the page, administrators are able to edit basic profile information including their name, email, among other details. This is a measure to ensure that their account details are always up to date.

Moreover, there is a secure way of dealing with passwords in the settings page that allows administrators to reset their passwords by validating the old passwords and then resetting them. The function is a key area that boosts account security and adheres to recommended practices for securing administrative accounts. The settings page also guarantees that there is account flexibility while being in a secure and reliable administrative zone.

In Web:



In mobile:

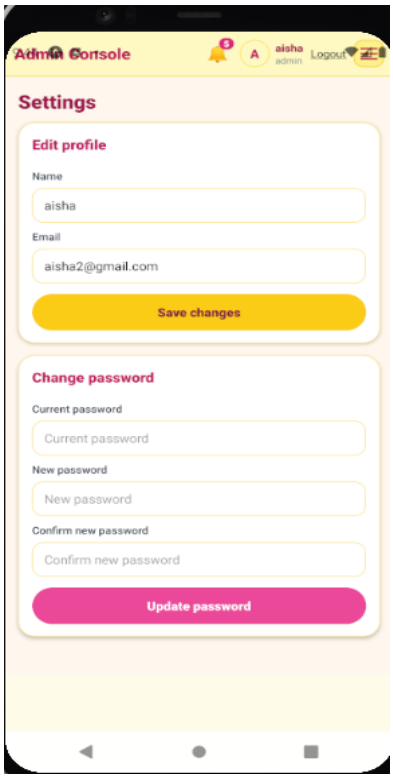


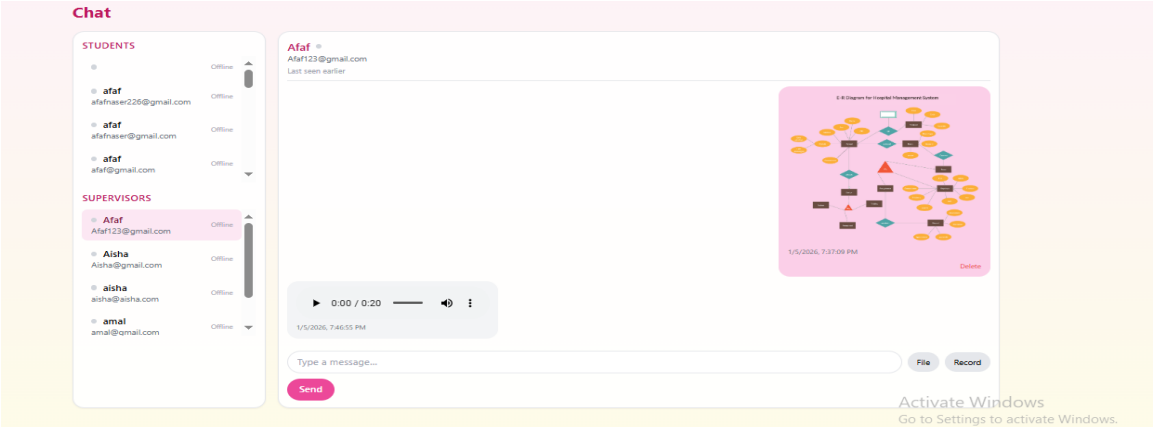
Figure 97 - Accounts Setting

4.6.10 Chat and Communication Page:

The "Chat & Communication" page allows the administrator to communicate with the students and supervisors in real-time messaging. The page has a categorized display of contacts where the administrator can select the users on the basis of their roles. The status of the users' availability in the system (online or offline) is also indicated for appropriate understanding in the course of communication.

The exchange via the chat interface is supported with the possibility of sending text messages, file attachments, images, and voice recordings for flexible and effective communication. By using real-time technologies, it provides instant message delivery and an easy flow of interaction for both administrators and other users of the platform. This module will improve coordination, facilitate academic and administrative discussions, and reinforce collaboration on the learning platform.

In Web:



In mobile:

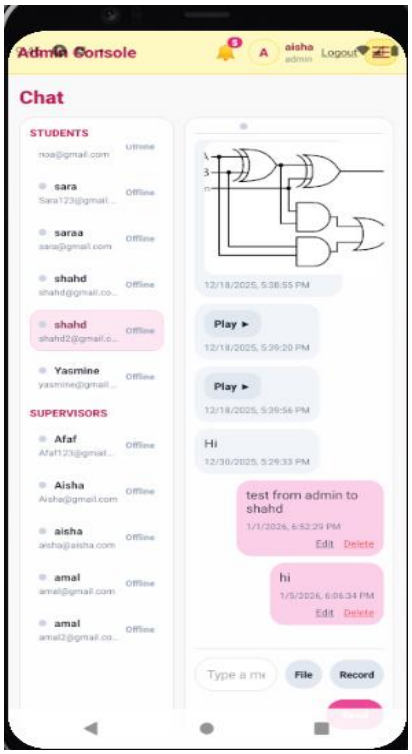


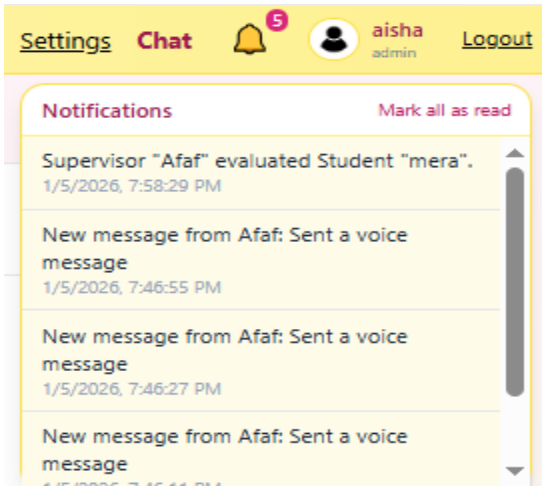
Figure 98 - Admin Chat

4.6.11 Notification System using Firebase Cloud Messaging (FCM):

The system incorporates the use of Firebase Cloud Messaging (FCM) in order to display real-time notifications for the admin when critical activities take place on the system. The admin receives a notification for each of the activities the student engages in, which may include the submission of a new project, writing a comment, carrying out an evaluation, or even the sending of a message or a voice message through the messaging

system. These notifications help the admin keep track of activities on the system while also keeping abreast of activities between students and the supervisors.

In Web:



In mobile:

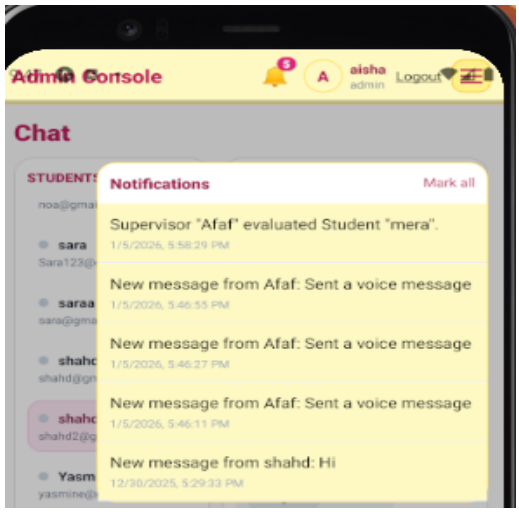


Figure 99 – Notification

Note : The mobile version of the system provides the same core functionalities as the web platform, with an interface adapted for mobile devices.

4.7 Testing Results and Observations

The system was put to the test after the completion of the implementation phase so that functionality and usability of the system were ensured. Various functionalities of the system that were validated were authentication functionality, lesson functionality, task functionality, sharing functionality of projects, communication functionality, and the functionality of the notice service.

This led to the conclusion that the main system functions were working well without any critical errors. User authentication systems for both students and administrators were functioning as expected. Role-based privilege controls guaranteed the individual could only view the functionality levels allocated to him or her. Functions associated with the progress of the lesson and the unlocking system for quizzes were also working as expected.

System stability was also tested during the evaluation. This was the ability to perform the same functions repeatedly without failing. This activity involved the processing of various messages and the submission of numerous tasks. No crashing or data losses were reported during the test period.

Additionally, the system was developed for both online and mobile platforms. The system was tested on these platforms, and the outcome proved that the system performed equally on both platforms, and all required features worked properly on both platforms.

4.8 System Evaluation and Discussion

On the basis of the test result and usage feedback received, the result is that the system is successful in accomplishing the intended tasks. The system helps in creating an interactive learning environment for HTML and CSS and promotes structured learning through the use of quizzes and challenges.

One of the key advantages of the system is the integration of the learning, evaluation, and communication processes in one system. This is made possible through the combination of tutorials, evaluations, AI aid tools, and notification systems. Moreover, the role-based system makes it easier for supervisors and administrators to handle contents, evaluations, and users.

Another strength found in the system is the support of multiple platforms in the system that enables the user to access the platform using both web and mobile interfaces without losing functionality or consistency in the process.

Despite such strengths, however, some areas exist where the tool could be improved in the future. These include the incorporation of additional functionalities in the AI component for more precise feedback, scalability to support more users, and the inclusion of analytics capabilities.

On a whole, the system has proven to be efficient, achieves its educational objectives, and offers scope for development in the future.

Chapter 5: Discussion

5.1 Interpretation of Results

The results shown in Chapter 4 prove the successful completion of the intended task by the devised platform, thereby providing a successful learning environment for learning HTML and CSS. System use patterns, interaction, and basic functionality of the system illustrate the structured learning, interaction, and effective management of the system offered by the devised learning platform.

Findings are consistent with the design of the system adopted. The level-based learning structure designed with the use of quizzes and challenges helped to facilitate structured learning for students, hence proving that having access to lessons sequentially aids in learning structure.

In addition, the engagement in tasks, projects, and other activities in the community illustrates the success of the combination of interactive and collaborative tools. Sharing projects, leaderboards, and interaction among peers promoted active learning as opposed to consuming content.

In terms of technology, the system worked properly on both web and mobile platforms. The fact that there were no critical functionality problems during system testing is a confirmation of the system's architecture being robust for supporting multiple user roles for real-time communication sessions.

In general, the above results directly relate to the initial purpose of the project, confirming that the platform was successful in fulfilling the functional-educative purpose by encouraging participation, systematic learning, and effective user interaction.

5.2 Problem Resolution and Achieved Objectives

The problem identified in the project was the absence of a comprehensive learning environment incorporating structured content, assessment, collaboration, and role-

controlled management in one system. This problem was successfully solved by the proposed system as it offered a comprehensive and interactive learning solution that improves learnability in web as well as mobile environments.

5.3 Contribution of the Proposed System

The problem identified in the project was the absence of a comprehensive learning environment incorporating structured content, assessment, collaboration, and role-controlled management in one system. This problem was successfully solved by the proposed system as it offered a comprehensive and interactive learning solution that improves learnability in web as well as mobile environments.

5.4 Strengths and Limitations

- **Strengths :**

The proposed system has many benefits. The structured learning process enables the step-by-step imparting of knowledge to the students in a continuous process. The addition of more interactive features like communication and notifications will boost the engagement levels of the users. This is in addition to the ability to be supported on different platforms, which will enable the system to be used in web and mobile platforms.

- **Limitations :**

Despite its many advantages, there are some drawbacks of the system. The current system uses predefined learning content and rules for evaluation. These might restrict personalization for different learning types. The scalability of the system has not been fully checked with a large number of users at a time. Some advanced AI functionalities might be more improved to give more in-depth feedback.

5.5 Implications of the Results

Results from this project indicate that structured learning, assessment, and interaction integrated within one platform will have significantly better effectiveness in online education. The observed student engagement and organized learning progress are indicative of better continuity in learning with such integrated systems than that of traditional platforms that house only content.

These results suggest that the developed method could be generalized for other technical and programming-related disciplines to achieve gradual skills development and continuous assessment. This system shows how a combination of role-based management, real-time communication, and interaction capabilities might influence the quality of e-learning environments.

Overall, the findings indicate that it is desirable to go beyond static learning content into interactive and managed digital learning environments that have the potential of enhancing motivation in learners and improving educational outcomes within online environments.

5.6 Future Work and Further Applications

In fact, future endeavors might focus on further improving the intelligent features to give more individualized feedback and adaptive learning pathways based on the performance of each student. More analytics tools could also be integrated to provide an in-depth view into learning behavior and progress.

It can also be further extended to other subjects than just HTML and CSS, and integrated with various external teaching tools and platforms. Further development of the system could be directed at scalability and performance for higher user loads. These extensions would make it even more appropriate and useful in various educational settings.

Chapter 6: Conclusions and Recommendations

6.1 Conclusions

This project presented the design and implementation of an integrated, interactive learning platform for HTML and CSS education. The system successfully combined structured learning content, assessments, projects, and real-time interaction within a single role-based environment.

Based on the results and discussion, it can be concluded that the proposed platform effectively enhanced student engagement and supported organized learning progression. The integration of quizzes, challenges, and projects encouraged active participation, while real-time communication and notifications improved interaction between students and supervisors.

The system demonstrated reliable performance across both web and mobile platforms, confirming its suitability for modern e-learning environments. Overall, the project

achieved its intended objectives and provided a practical solution that addresses limitations commonly found in traditional online learning platforms.

6.2 Recommendations and Future Work

To further improve the system, it is recommended to enhance personalization features by adapting learning content and feedback to individual student needs. Expanding the intelligent components to provide more advanced, AI-based analysis and recommendations would also improve the learning experience.

Future work may include extending the platform to support additional programming and technical subjects, as well as integrating external educational tools. Further performance and scalability testing under higher user loads is recommended to evaluate long-term system reliability and effectiveness.