Project Proposal - Gamification in Teaching Activities

1. Project Overview

Project Title: Gamified Quiz Center for University Learning
Objective: To stimulate student participation in educational activities through gamification, offering quizzes and learning challenges that encourage engagement and awareness.

2. Problem Domain

At the university level, students often experience low engagement and limited motivation in traditional courses. Gamification—integrating game-like elements into education—can improve motivation, participation, and overall learning outcomes. This project aims to develop a digital quiz platform that integrates gamified elements such as points, leaderboards, levels, and progress tracking.

3. Target Users

1. **Students:** Participate in quizzes to test knowledge and gain points or rewards.
2. **Teachers:** Create and manage quizzes, track student performance, and promote engagement.

4. Context of Use

The platform will be used on laptops, tablets, or mobile devices during and outside class hours. It should function well in both quiet and noisy environments, allowing quick quiz participation. The system should support both individual and classroom-wide use cases.

5. Main Challenges

- Designing an engaging yet academically relevant gamification system.
- Preventing academic dishonesty and ensuring fairness.
- Providing a clear and intuitive user interface for both students and teachers.
- Balancing simplicity and functionality in design.

6. Existing Solutions

Existing tools such as Kahoot, Quizizz, and Mentimeter support gamified quizzes but lack customization for academic analytics and classroom management. Our system proposes deeper analytics for teachers, tailored feedback for students, and React-based scalability.

7. Innovative Aspects

- Integration of a level system to reward consistent participation.
- Customizable progress tracking dashboard.
- Possibility of future integration with university LMS systems.
- Built using React for responsive, interactive, and modern web experience.

8. Phase 2a: Task Analysis Examples

Example 1: Student Takes a Quiz

- **User:** Student
- **Starting point:** Dashboard after login
- **Goal:** Complete a quiz to earn XP
- **Why:** To improve rank and prepare for exams
- **Context:** At home, limited time
- **Steps:**
    1. Open course
    2. Select quiz
    3. Answer timed questions
    4. Submit
    5. View results and XP update

Example 2: Teacher Creates and Publishes a Quiz

- **User:** Teacher
- **Starting point:** Teacher dashboard
- **Goal:** Create a new quiz for a class
- **Why:** To evaluate students and reward participation
- **Context:** Quiet office environment
- **Steps:**
    1. Click 'Create New Quiz'
    2. Add title and questions
    3. Set visibility and rules
    4. Save and publish

9. Phase 2b: Management Schedule

Time Interval	Team Manager	Notes
15.10.2025 & 19.11.2025	Cândea Ana	
22.10.2025 & 10.12.2025	Orosz Barbara	
5.11.2025 & 7.01.2026	Bogdan Gonda	
12.11.2025 & 14.01.2026	Todor Ioan	

10. Phase 3: Detailed Task Analysis

1. Admin Functionalities

Task 1: Managing Teacher Accounts

- **Starting Point:** Admin Dashboard.
- **User:** The Platform Administrator.
- **Action:** The Admin creates **classes** and adds **teachers** to the application.
- **Purpose:** To establish the initial structure (school/platform) and teaching staff.

2. Teacher Functionalities

Task 2: Enrolling Students

- **Starting Point:** A Class Page.
- **User:** A Teacher.
- **Action:** The Teacher adds **students** to their class
- **Purpose:** To grant students access to the class materials and quizzes.

Task 3: Creating Quizzes

- **Starting Point:** Teacher Dashboard.
- **User:** A Teacher.
- **Action:** The Teacher creates and saves new **quizzes** for their class.
- **Purpose:** To prepare assessment or practice materials.

Task 4: Managing Quiz Visibility

- **Starting Point:** Quiz Details Page.
- **User:** A Teacher.
- **Action:** The Teacher can **hide** a quiz so it is not visible to students.
- **Purpose:** To control when students can access a test.

Task 5: Sorting Quizzes

- **Starting Point:** The List of Quizzes within a Class.
- **User:** A Teacher, A Student.
- **Action:** Viewing the quizzes **sorted by the number of questions, by the attendance or so on**.
- **Purpose:** To quickly find or organize tests based on their length.

3. Student Functionalities

Task 6: Viewing Results and Export

- **Starting Point:** Quiz Completion.
- **User:** A Student.
- **Action:** The Student views the results (score, correct/wrong answers) and can **export** them (Excel).
- **Purpose:** To evaluate their performance and save the data.

Task 7: Retry Incorrect Questions Only

- **Starting Point:** Quiz Results Page.
- **User:** A Student.
- **Action:** The Student can **retry** only the **incorrectly answered questions**, until they get them all right.
- **Purpose:** To focus on weak areas and learn from mistakes.

Task 8: Retry the Complete Quiz

- **Starting Point:** Details Page of a Completed Quiz.
- **User:** A Student.
- **Action:** The Student can **retry the entire quiz** (all questions).
- **Purpose:** To re-test their knowledge on the complete material.

Task 9: Generating a Random Practice Quiz

- **Starting Point:** Practice Section.
- **User:** A Student.
- **Action:** The Student can create a **random quiz** using random questions pulled from **all available quizzes**.

- **Purpose:** To prepare for exams with a large variety of questions.

Task 10: Viewing Quiz Average Score

- **Starting Point:** Class "Information" Section.
- **User:** A Student, A Teacher.
- **Action:** The Student can view the **average** score obtained across all quizzes.
- **Purpose:** To track their overall progress in the course.

Task 11: Viewing the Leaderboard

- **Starting Point:** Quiz Details Page.
- **User:** A Student, A Teacher.
- **Action:** The Student views a **leaderboard** showing the **top performers** for that specific quiz.
- **Purpose:** To encourage competition and motivation.

4. Technical Requirement

Task 12: Ensuring Responsiveness

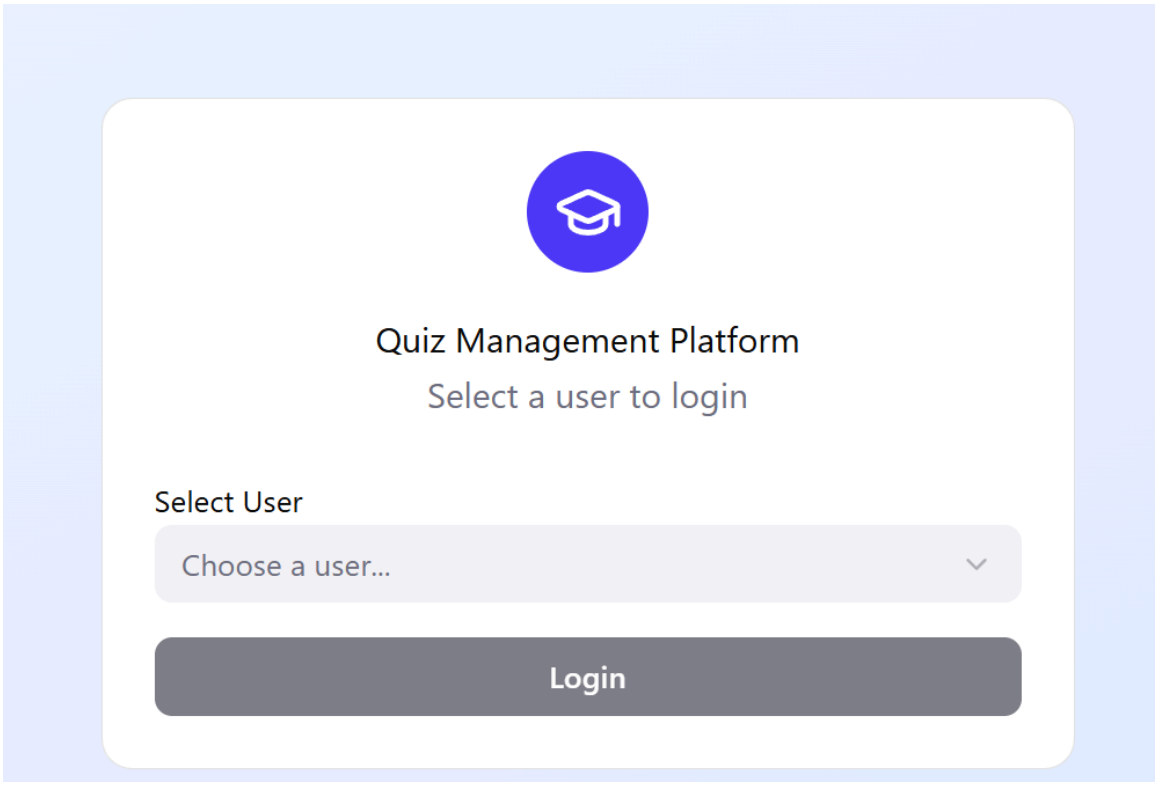
- **Starting Point:** Any application interface.
- **User:** All users (Admin, Teacher, Student).
- **Action:** The application provides a **good UI/UX experience on any type of device** (phone, tablet, desktop).
- **Purpose:** To ensure accessibility and ease of use regardless of the device.

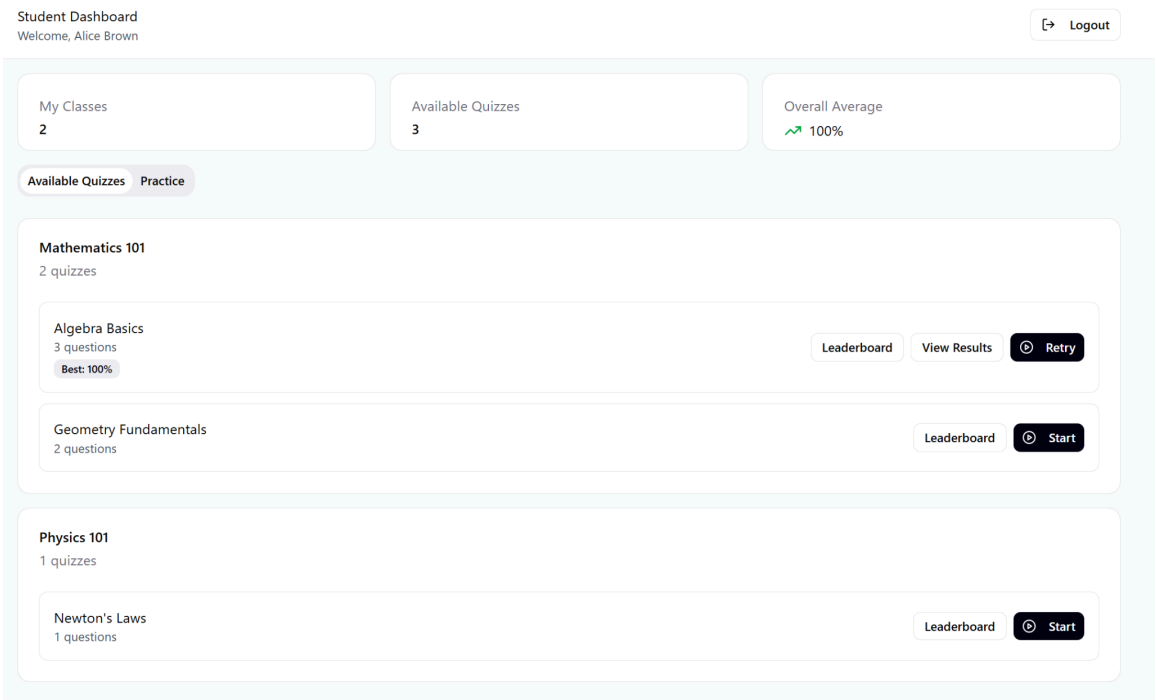
11. Phase 4: Low fidelity prototype

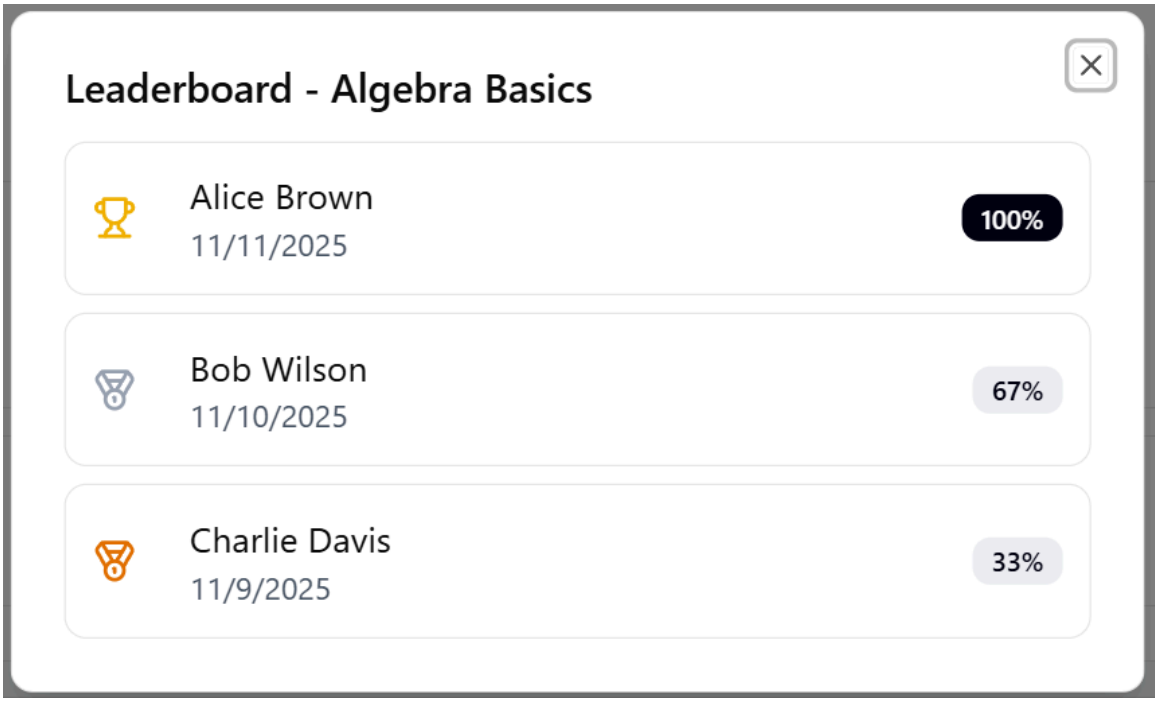
The prototype was developed as a frontend application in order not to have the usual drawback of the design's complexity being to hard to actually implement and having to recreate the design after the actual implementation. It is found at:
https://github.com/todoor17/UID_Quiz_Assignment

The low fidelity prototype was shown at the laboratory and received it's approval from the TA. In the next sections it will be shown in more and more detail.

Relevant pictures to show the overall flow of a user:


Quiz Management Platform
Select a user to login
Select User
Choose a user...
Login


Student Dashboard
Welcome, Alice Brown
Logout
My Classes
2
Available Quizzes
3
Overall Average
100%
Available Quizzes
Practice
Mathematics 101
2 quizzes
Algebra Basics
3 questions
Best: 100%
Leaderboard
View Results
Retry
Geometry Fundamentals
2 questions
Leaderboard
Start
Physics 101
1 quizzes
Newton's Laws
1 questions
Leaderboard
Start



Algebra Basics - Results
Review your performance

Back

Latest Score
100%

Best Score
100%

Average Score
100%

Actions

Export to Excel | Retry Complete Quiz | Retry Incorrect Only

Question Review

Question 1: What is 2 + 2?
Your answer: 4

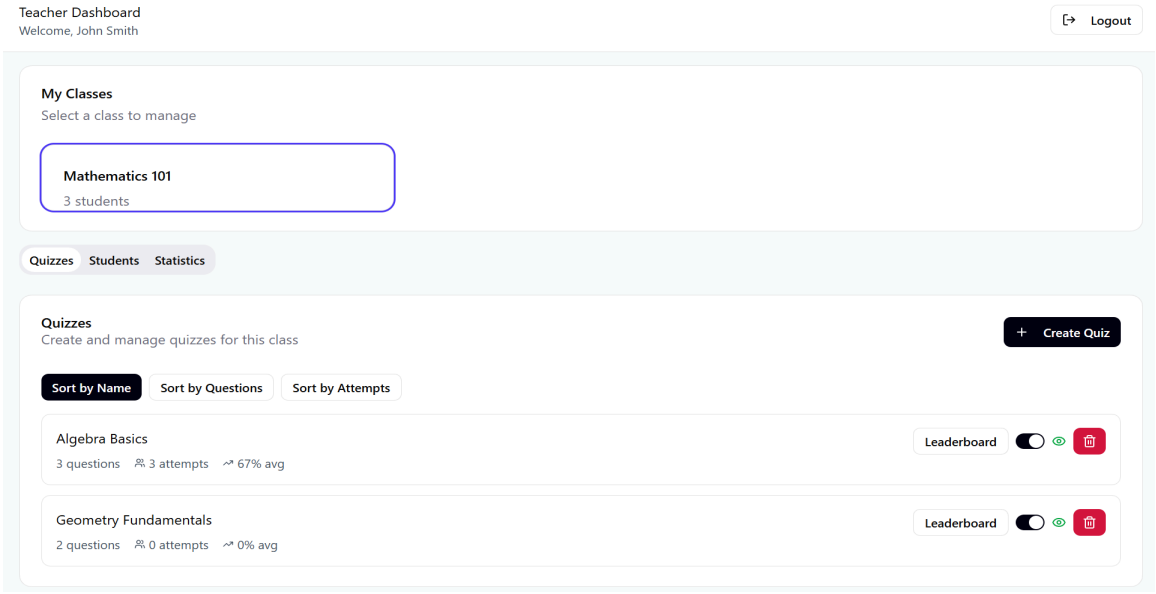
Question 2: What is 5 × 3?
Your answer: 15

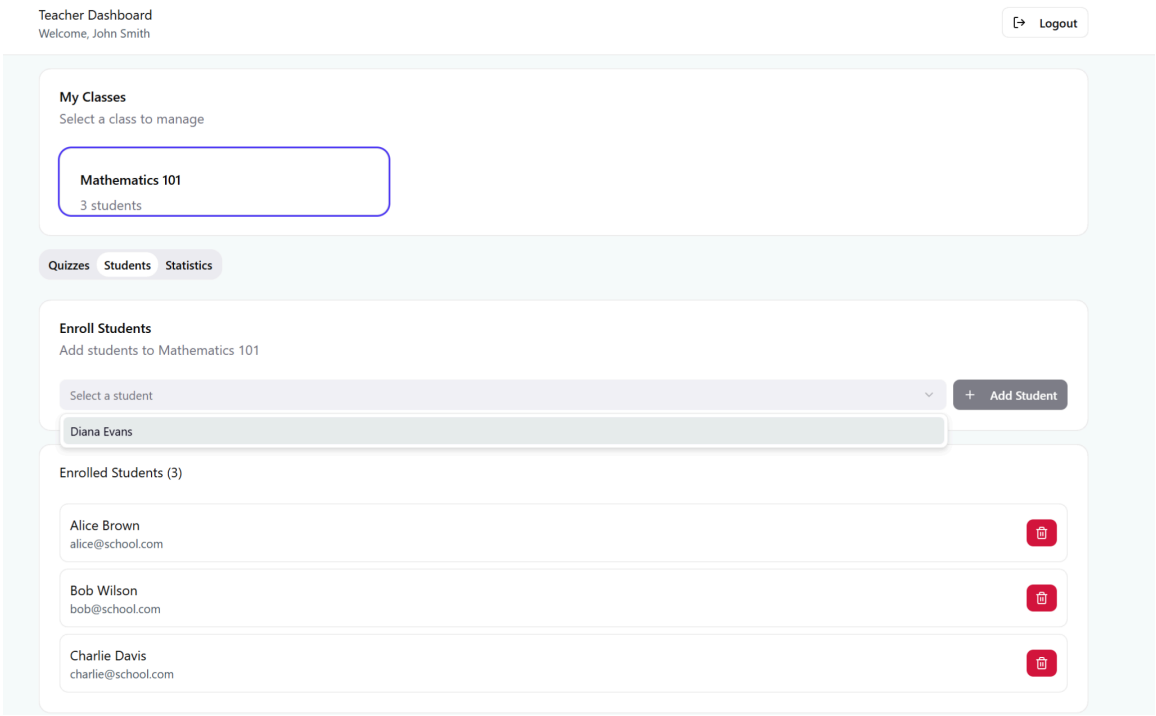
Question 3: What is 10 - 7?
Your answer: 3

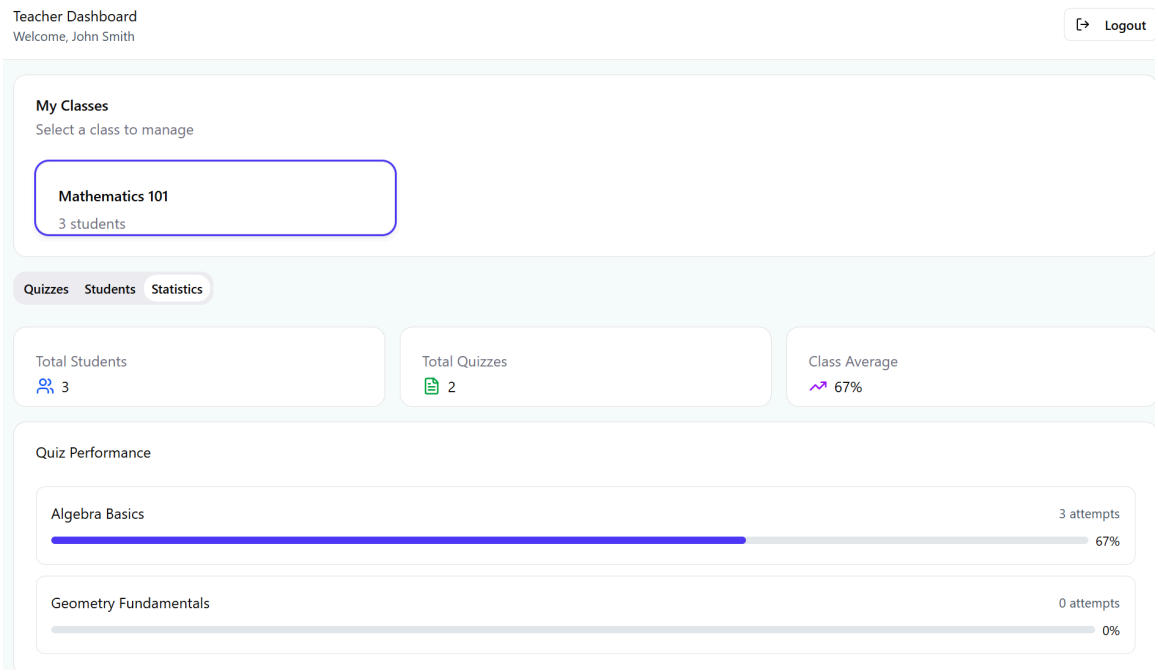
Attempt History (1)

11/11/2025, 8:02:56 PM
Latest
100%

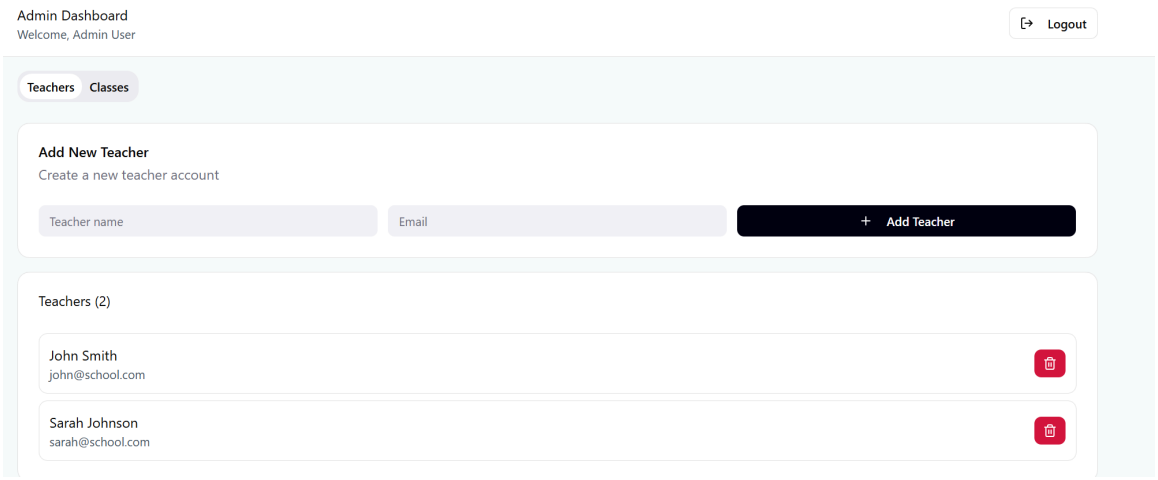
Relevant pictures to show the flow of a teacher:

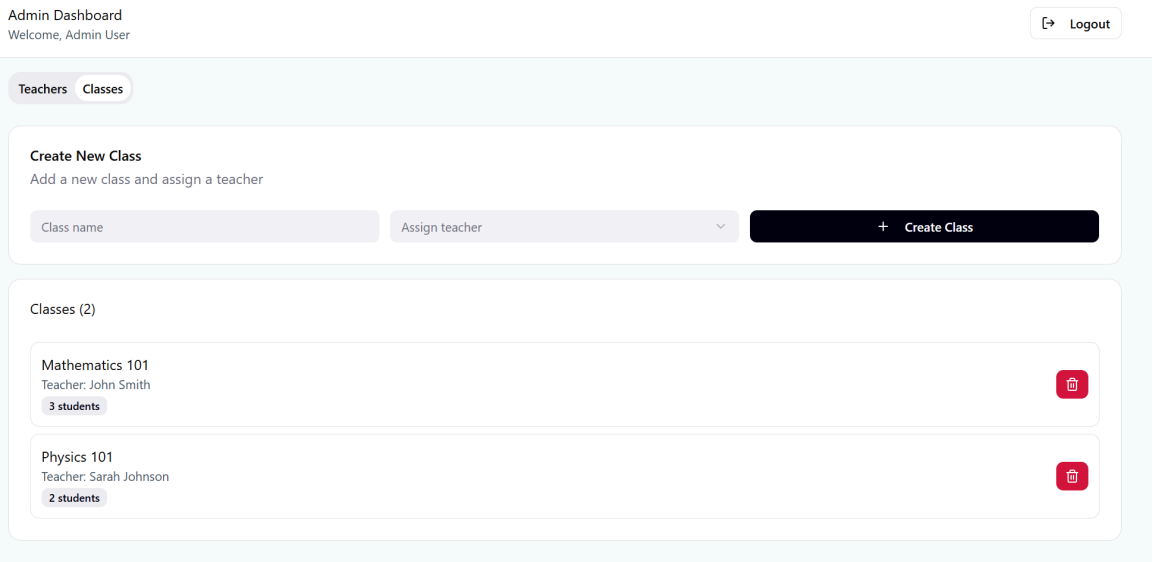






Relevant pictures to show the flow of an admin:





Every component it's designed to be as compact and concise as possible while also illustrating a modern UI look. The flows are very easy to understand for all users in all the tasks, this is especially beneficial for the students which are under stress and limited time while doing a quiz at the course and wouldn't want an unintended action to happen due to the application's complexity or ambiguity. It also has the advantage of being easily used by teachers of all disciplines, because computer expertise is not needed at all.

12. Phase 4a: Examples of scenarios for user tasks

Presentation of two user scenarios:

Task 1: Managing Teacher Accounts

- **User:** Platform Administrator
- **Starting Point:** Admin Dashboard.
- **Scenario:**
    1. The Admin logs in and is presented with the **Dashboard**, which has a navigation **sidebar**.
    2. The Admin clicks the **"Teachers"** item in the sidebar. The system displays a list of all existing teacher accounts.
    3. The Admin clicks the **"+ Add New Teacher"** button at the top of the list.
    4. The system opens a **modal form**. The Admin fills in the fields: **Name**, **Email**, and **Assigned Classes (dropdown multi-select)**.
    5. The Admin clicks the **"Create Account"** button.
    6. *Success:* The system closes the modal, adds the new teacher to the list, and displays a temporary green **toast notification** saying "Teacher account for

[Name] created successfully." The new teacher receives a welcome email with login instructions.

7. *Error:* If the email field is invalid or empty, the system highlights the field in red and displays an inline error message: "Please enter a valid email address." The "Create Account" button remains disabled until all required fields are valid.

Task 2: Enrolling Students

- **User:** Teacher
- **Starting Point:** A specific Class Page.
- **Scenario:**
    1. The Teacher navigates to a class page from their Dashboard. They see a **"Students" tab** and click on it.
    2. The system shows a list of currently enrolled students. The Teacher clicks the **"Enroll Students"** button.
    3. The system presents options as **large buttons**: **"Add Manually"**.
    4. A text **input field** appears. The Teacher types in the student's university email address.
    5. The Teacher clicks the **"+ Add"** button next to the field. The email is added to a **list** below the input field.
    6. After adding several emails, the Teacher clicks the **"Send Invitations"** button at the bottom.
    7. *Success:* The system clears the list and displays a confirmation message: "Invitations sent to 5 students." The students receive an email to join the class.
    8. *Error:* If an email is already enrolled, the system does not add it to the list and shows a brief warning: "[email] is already enrolled."

13. Phase 5: Scenarios for user tasks

Task 1: Managing Teacher Accounts

- **User:** Platform Administrator
- **Starting Point:** Admin Dashboard.
- **Scenario:**
    1. The Admin logs in and is presented with the **Dashboard**, which has a navigation **sidebar**.
    2. The Admin clicks the **"Teachers"** item in the sidebar. The system displays a list of all existing teacher accounts.
    3. The Admin clicks the **"+ Add New Teacher"** button at the top of the list.

4. The system opens a **modal form**. The Admin fills in the fields: **Name**, **Email**, and **Assigned Classes (dropdown multi-select)**.
5. The Admin clicks the **"Create Account"** button.
6. *Success:* The system closes the modal, adds the new teacher to the list, and displays a temporary green **toast notification** saying "Teacher account for [Name] created successfully." The new teacher receives a welcome email with login instructions.
7. *Error:* If the email field is invalid or empty, the system highlights the field in red and displays an inline error message: "Please enter a valid email address." The "Create Account" button remains disabled until all required fields are valid.

- **Design Motivation:** The design follows the principle of **Directness** (from Task-Centered Design). The primary object (Teachers) is directly accessible from the main navigation. The use of a modal for creation keeps the user in context without navigating away, reducing load. The clear feedback, aligns with the principle of providing **informative feedback**.

Task 2: Enrolling Students

- **User:** Teacher
- **Starting Point:** A specific Class Page.
- **Scenario:**
    1. The Teacher navigates to a class page from their Dashboard. They see a **"Students" tab** and click on it.
    2. The system shows a list of currently enrolled students. The Teacher clicks the **"Enroll Students"** button.
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    6. After adding several emails, the Teacher clicks the **"Send Invitations"** button at the bottom.
    7. *Success:* The system clears the list and displays a confirmation message: "Invitations sent to 5 students." The students receive an email to join the class.
    8. *Error:* If an email is already enrolled, the system does not add it to the list and shows a brief warning: "[email] is already enrolled."
- **Design Motivation:** This design offers flexibility which is crucial for teachers who may have student lists in different formats. The dynamic list provides a clear **visual representation** of the users about to be added, preventing errors. This is a best practice seen in modern admin interfaces (e.g., Google Classroom) and supports **user control and freedom**.

Task 3: Creating Quizzes

- **User:** Teacher
- **Starting Point:** Teacher Dashboard.
- **Scenario:**
    1. From the Dashboard, the Teacher clicks the **"Create New Quiz"** button, prominently placed.
    2. The system navigates to a **quiz editor page**. The Teacher enters the quiz title in a large **header input field**.
    3. Below, the Teacher clicks the **"+ Add Question"** button.
    4. A **question card** appears. The Teacher selects the question type (e.g., Multiple Choice) from a **dropdown**, types the question, and adds answer options. They mark the correct answer with a **radio button**.
    5. They repeat step 3-4 for all questions.
    6. Finally, the Teacher clicks the **"Save Quiz"** button in the top-right action bar.
    7. *Success:* The system saves the quiz and navigates to the quiz's details page, showing a preview. A confirmation message is displayed: "Quiz 'Introduction to Biology' saved successfully."
    8. *Error:* If the Teacher tries to save without a title or any questions, the system highlights the missing elements in red and displays a message: "Please add a quiz title and at least one question before saving."
- **Design Motivation:** The step-by-step, card-based question creation reduces overwhelm. This **chunking** of information is a key cognitive principle. The interface is modeled after successful tools like Google Forms and Quizizz, which are known for their intuitive creation flows. The persistent "Save" button provides a constant affordance, supporting **consistency and standards**.

Task 4: Managing Quiz Visibility

- **User:** Teacher
- **Starting Point:** Quiz Details Page.
- **Scenario:**
    1. On the Quiz Details Page, the Teacher sees a section titled "Quiz Settings."
    2. In this section, there is a **toggle switch** labeled "Visible to Students." The toggle is currently in the "ON" (blue) position.
    3. The Teacher clicks the toggle. It switches to the "OFF" position.
    4. *Success:* The system immediately saves the change. The page header or a key visual element (like a banner) updates to show "**Status: Hidden**". No further confirmation is needed for this simple action.
    5. *Error:* If a network error occurs, the toggle would revert to its previous state, and a red toast notification would appear: "Failed to update quiz visibility. Please check your connection."

- **Design Motivation:** A toggle is the standard, immediate-control UI element for binary states (on/off, show/hide). It provides **clear visibility of system status** by its very appearance. The immediate feedback and status update prevent user uncertainty about whether the action was registered.

Task 5: Sorting Quizzes

- **User:** Teacher / Student
- **Starting Point:** The List of Quizzes within a Class.
- **Scenario:**
    1. The user views the quiz list, which is initially sorted by newest first.
    2. Above the list, there is a **dropdown menu** labeled "Sort by". The default selection is "Date Created (Newest)".
    3. The user clicks the dropdown. The options are: "Date Created (Newest)", "Date Created (Oldest)", "Number of Questions", "Average Score", and "Title (A-Z)".
    4. The user selects **"Number of Questions"**.
    5. *Success:* The list instantly reorders itself, showing the quiz with the fewest questions at the top. The visual order of the **quiz cards** changes to reflect the new sorting.
    6. *Error:* N/A for this simple UI interaction under normal conditions.
- **Design Motivation:** Dropdowns are the conventional UI pattern for sorting, as they conserve space while providing multiple options. The instant re-sorting provides immediate feedback, adhering to the principle of **recognition rather than recall** (Nielsen) – the user doesn't have to remember their choice and submit a form.

Task 6: Viewing Results and Export

- **User:** Student
- **Starting Point:** Immediately after quiz completion.
- **Scenario:**
    1. After submitting the quiz, the system automatically navigates to the **Quiz Results Page**.
    2. The page displays a summary: final score, a **list of questions** showing their correct/incorrect status (with green/red highlights), and the correct answers.
    3. At the top of the results summary, the Student sees an **"Export Results"** button with a spreadsheet icon.
    4. The Student clicks this button. A small **menu** appears with options: **"Export as Excel (.xlsx)"** and **"Export as PDF"**.
    5. The Student clicks **"Export as Excel (.xlsx)"**.
    6. *Success:* The system generates the file and triggers a download. The browser's download manager shows the file "Quiz_1_Results_[Student_Name].xlsx" is being downloaded.

7. *Error:* If the export service is temporarily unavailable, a red message appears: "Export is currently unavailable. Please try again in a few moments."

- **Design Motivation:** Placing the export function on the results page follows the **Principle of Proximity**, keeping related actions and information together. Offering multiple formats (Excel, PDF) caters to different user needs , providing **flexibility and efficiency of use** .

Task 7: Retry Incorrect Questions Only

- **User:** Student
- **Starting Point:** Quiz Results Page.
- **Scenario:**
    1. On the Quiz Results Page, the Student reviews the list of questions, noting the ones marked incorrect in red.
    2. At the bottom of the page, there is a section titled "Practice These Questions" which only lists the incorrect ones.
    3. Below this section, there is a **primary button** labeled **"Retry Incorrect Questions"**.
    4. The Student clicks this button.
    5. *Success:* The system starts a new quiz session containing only the questions the Student got wrong. The interface is identical to a regular quiz but with a header noting "Practice Mode: Incorrect Questions."
    6. *Error:* If there are no incorrect questions, the button is disabled and visually greyed out, with a tooltip on hover: "No incorrect questions to retry."
- **Design Motivation:** This feature directly supports the project's objective of improving learning outcomes. It implements a core gamification and pedagogical principle: **learning from mistakes**. The button is placed contextually next to the list of incorrect answers, making its purpose clear and its benefit obvious.

Task 8: Retry the Complete Quiz

- **User:** Student
- **Starting Point:** Details Page of a Completed Quiz.
- **Scenario:**
    1. The Student navigates to the main page of a quiz they have already completed.
    2. Instead of the "Start Quiz" button, they now see a **"Retry Full Quiz"** button.
    3. The Student clicks this button.
    4. A **dialog box** appears: "This will start a new attempt. Your previous score will be saved, but this new attempt will be tracked separately. Continue?"
    5. The Student clicks the **"Continue"** button in the dialog.
    6. *Success:* The system starts the quiz from the beginning.
    7. *Error:* N/A.

- **Design Motivation:** The confirmation dialog prevents accidental retries, which could be frustrating. This supports **user control and freedom** and prevents errors . Differentiating between "Retry Incorrect" and "Retry Full" with clear labels avoids user confusion.

Task 9: Generating a Random Practice Quiz

- **User:** Student
- **Starting Point:** Practice Section (a dedicated section in the main navigation).
- **Scenario:**
    1. The Student clicks on the **"Practice"** tab in the application's navigation **sidebar**.
    2. They are taken to a page with a header: "Generate a Custom Practice Quiz."
    3. There is a **slider** to select the number of questions and **checkboxes** to select one or more course topics.
    4. The Student sets the slider to 10 questions and checks the boxes for "Topic A" and "Topic C."
    5. They click the large **"Generate Quiz"** button.
    6. *Success:* The system immediately creates and starts a new quiz with 10 random questions from the selected topics.
    7. *Error:* If no topics are selected, the "Generate Quiz" button is disabled. If there are fewer questions available than requested, the system uses the maximum available and shows a message: "Note: Only 7 questions were available from your selected topics."
- **Design Motivation:** This is an innovative aspect of the project. The interface gives the user control (slider, checkboxes) over the practice session, empowering them and catering to different study needs. This aligns with the gamification element of **customization** and supports self-directed learning.

Task 10: Viewing Quiz Average Score

- **User:** Student, Teacher
- **Starting Point:** Class "Information" Section (or a "Statistics" / "Progress" section).
- **Scenario:**
    1. The Student navigates to their specific Class page.
    2. They click on the **"Progress"** tab.
    3. The system displays a **dashboard** with various **data visualizations**.
    4. A prominent **stat card** at the top shows "Overall Quiz Average: 85%".
    5. Below, a **line chart** shows the average score trend over time across all attempted quizzes.
    6. *Success:* The information is displayed clearly and loads instantly.
    7. *Error:* If no quizzes have been taken, the stat card displays "N/A" and the chart is empty with a message "No data available yet."

- **Design Motivation:** Using a "Progress" tab and visualizations like stat cards and charts makes the data easily digestible. This supports the project's goal of providing "deeper analytics" and "tailored feedback." It leverages the gamification element of **progress tracking**, which is a powerful motivator.

Task 11: Viewing the Leaderboard

- **User:** Student, Teacher
- **Starting Point:** Quiz Details Page.
- **Scenario:**
    1. On the details page for a specific quiz, the user sees a **"Leaderboard" tab** next to the "Details" and "Questions" tabs.
    2. The user clicks the "Leaderboard" tab.
    3. The system displays a **ranked list (table)** of the top 10 performers for that quiz. The list includes rank, student name, score, and time taken.
    4. The current user's position is highlighted in the list if they are in the top 10, or appears in a "Your Rank" box at the bottom if they are not.
    5. *Success:* The list loads quickly and is easy to read.
    6. *Error:* If no one has completed the quiz, the tab shows a message: "No scores yet. Be the first to take the quiz!"
- **Design Motivation:** Placing the leaderboard on the quiz page itself provides context-specific competition, which is more meaningful than a global leaderboard. This is a key gamification element to **encourage competition and motivation**. The design follows the common pattern of leaderboards in games and apps like Kahoot, ensuring immediate user understanding.

Task 12: Ensuring Responsiveness

- **User:** All users
- **Starting Point:** Any application interface.
- **Scenario:** This is a technical requirement, not a single user task. However, a scenario can illustrate its success.
    - *Scenario:* A Student opens the platform on their mobile phone during a commute. The Dashboard, which on desktop shows a multi-column **grid of cards**, automatically reflows into a single column. All **buttons** and **touch targets** are large enough to press easily. The navigation **sidebar** collapses into a hamburger **menu**. The Student can start a quiz without zooming or horizontal scrolling, and the questions are displayed in a readable, vertical layout.
    - *Design Motivation:* This is a foundational principle of modern web development. Using a **React-based** framework with a responsive CSS library (e.g., Material-UI, Bootstrap) ensures the UI adapts to different viewports. This is critical for the

context of use, which includes mobile devices and varying environments, ensuring **accessibility** and a consistent user experience.

Task 5.2. Alternative Scenarios for 4 Selected Tasks

Task 3: Creating Quizzes - Alternatives

Alternative A: Use Template

1. Click **"Create Quiz"**
2. Choose **"Exam Template"** from options
3. System pre-fills with common exam settings
4. Teacher edits to fit their needs

Alternative B: Copy & Edit

1. Find old quiz in list
2. Click **"Duplicate"** button
3. System makes exact copy
4. Teacher edits the copy

Why These Work: Templates save time, copying reduces repetitive work.

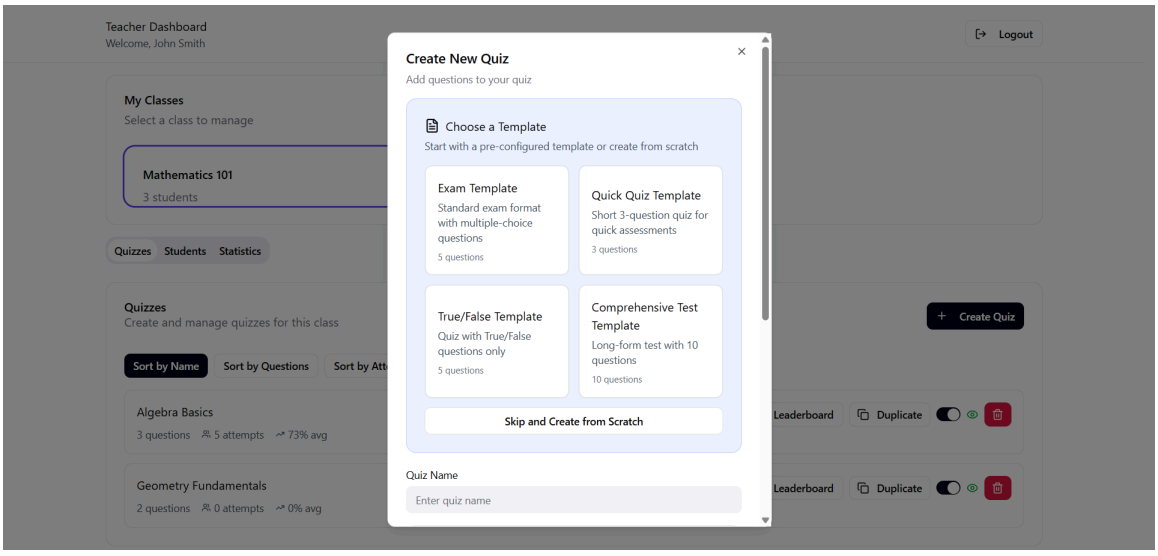

Fig. 1 - Create a quiz from template

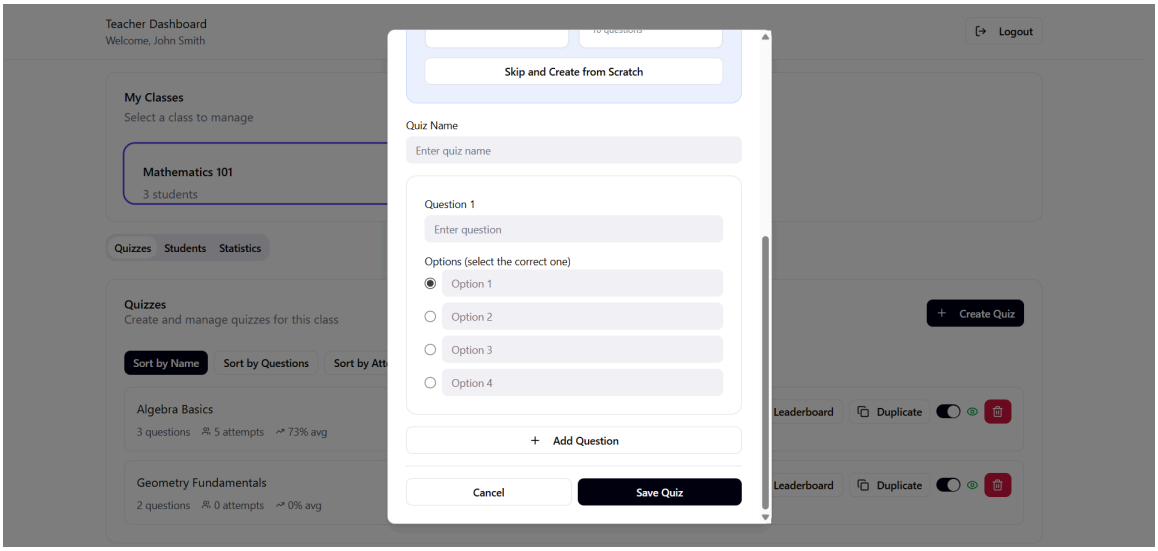

Fig. 2 - Create a quiz with custom questions

Task 6: Exporting Results - Alternatives

Alternative A: Auto-Export

1. After quiz, system automatically offers "Download Excel?"
2. Student clicks **"Download"** in popup

Alternative B: History Page

1. Student goes to **"Quiz History"** page
2. Finds quiz in list
3. Clicks **"Export"** button next to it

Why These Work: Auto-export is convenient, history page gives more control.

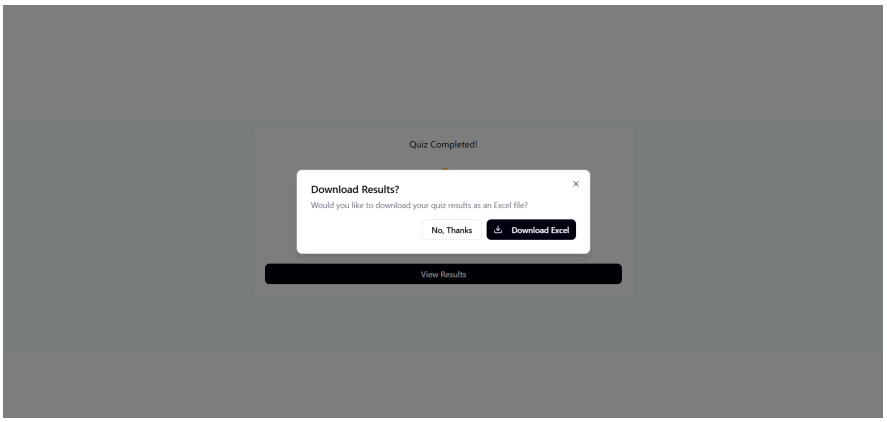

Fig. 3: Auto Export Option

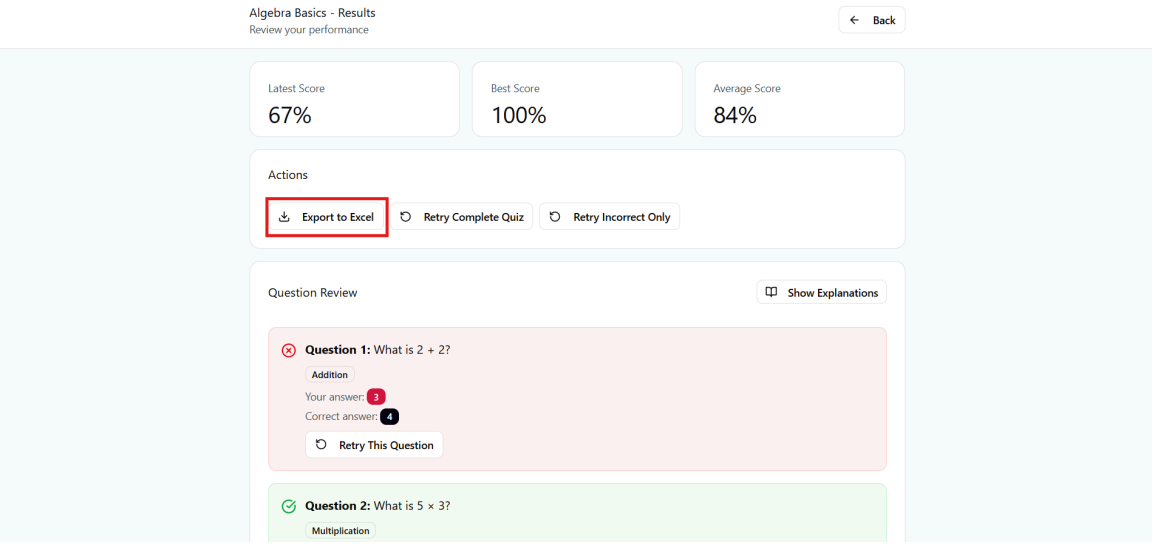

Fig. 4 - Manual Export Results

Task 7: Retry Wrong Answers - Alternatives

Alternative A: Per-Question Retry

1. On results page, each wrong question has **"Retry This"** button
2. Student can retry questions one by one

Alternative B: Study Mode

1. Click **"Study Mode"** instead of retry
2. System shows explanations first
3. Then lets student try again

Why These Work: More targeted practice, adds learning before retrying.

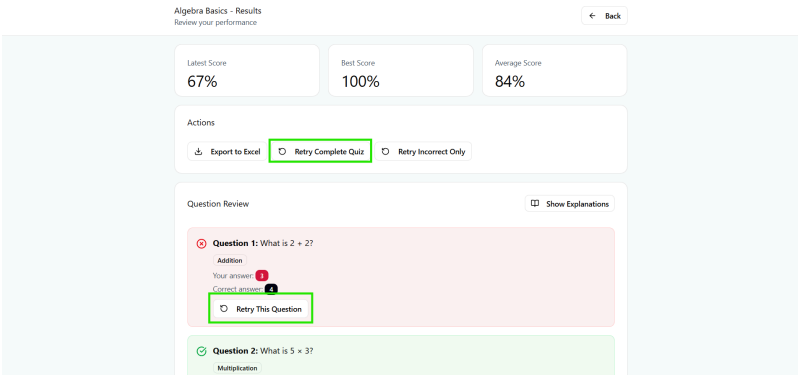

Fig. 5 - Retry Options

Task 9: Practice Quiz - Alternatives

Alternative A: Smart Practice

1. System automatically suggests topics student is weak in
2. Student just clicks **"Start Smart Practice"**

Alternative B: Quick Practice

1. One big **"10-Question Practice"** button
2. System picks random questions automatically
3. Zero setup needed

Why These Work: Removes decisions, faster to start practicing.

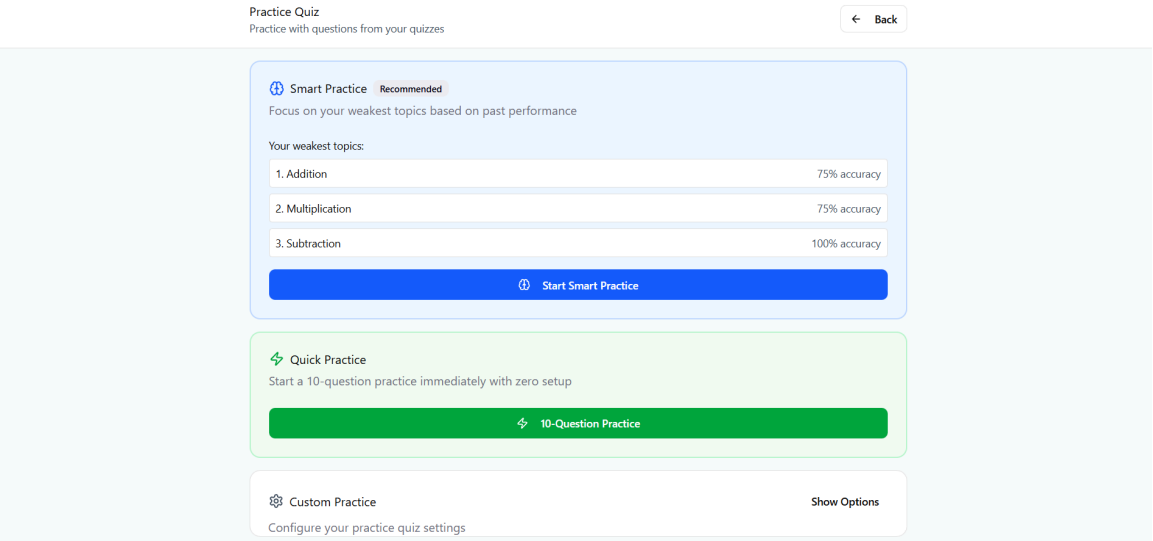

Fig. 6 - Practice Options

14. Phase 5a. Examples of walkthrough evaluation

Walkthrough 1: Teacher Creates a Quiz

User: Teacher
Scenario: A teacher needs to create a new graded quiz for their course, starting from the dashboard.

Step	Cognitive Walkthrough Analysis
1. Click the 'Create New Quiz' button on the Dashboard.	The user's primary goal is to create a quiz, and this button is the direct, prominent call-to-action. Its label is unambiguous, and its placement on the dashboard makes it the logical starting point. The user will confidently select this control to initiate the process.
2. Enter the quiz title in the provided header field.	Upon entering the quiz editor, the large, labeled field at the top signals that defining the quiz's identity is the first step. This follows standard conventions for form creation. The user will understand its purpose and proceed to input a title without confusion.
3. Click the '+ Add Question' button.	With the quiz named, the user's next objective is to populate it with content. The "Add Question" button is the clear mechanism for this. Its placement within the content area and familiar "plus" icon make it highly discoverable. The user will expect this action to generate a new question template.
4. Fill out the question card (select type, enter text, provide answers, mark correct one).	The dynamically generated question card presents a structured, self-contained form. The fields (question input, answer options, radio buttons) use standard web form elements. The user will intuitively understand how to interact with each component to build the question, as the workflow mirrors other form-filling experiences.
5. Click the 'Save Quiz' button in the top-right action bar.	After composing the quiz, saving is the final, necessary step. The persistent "Save Quiz" button in a conventional location for primary actions (top-right) will be easily located when the user is ready to finalize. The user will trust that this action will permanently store the quiz.

Conclusion for Task 1: The workflow for quiz creation is logically sequenced and employs standard UI patterns. The controls are clear, and the feedback is implicit at each step, resulting in a low cognitive load for the user. The design successfully guides the teacher from start to finish.

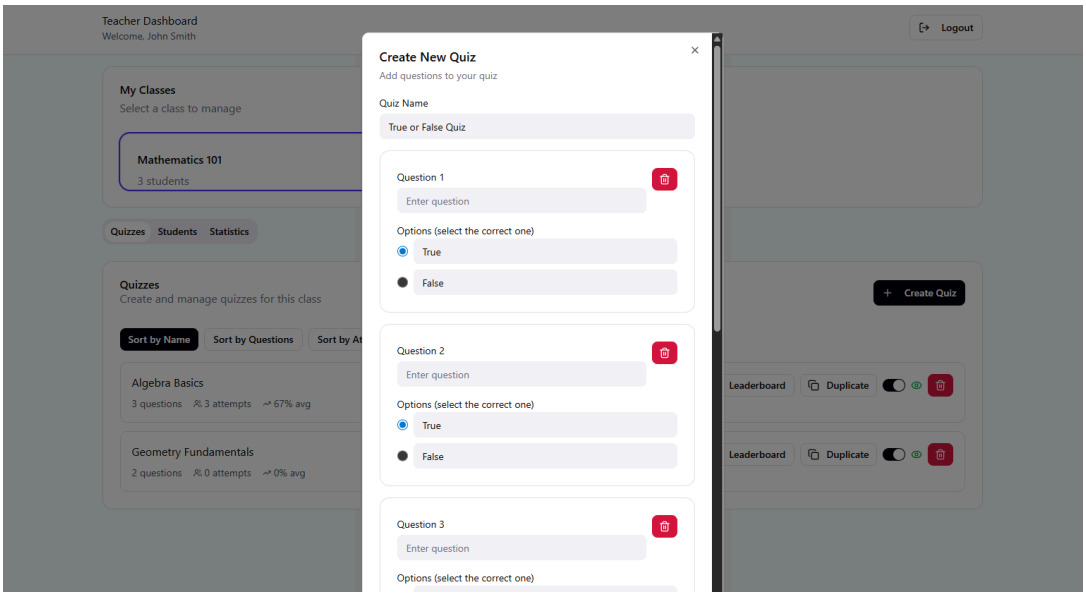

Fig. 7 - Create a quiz from template

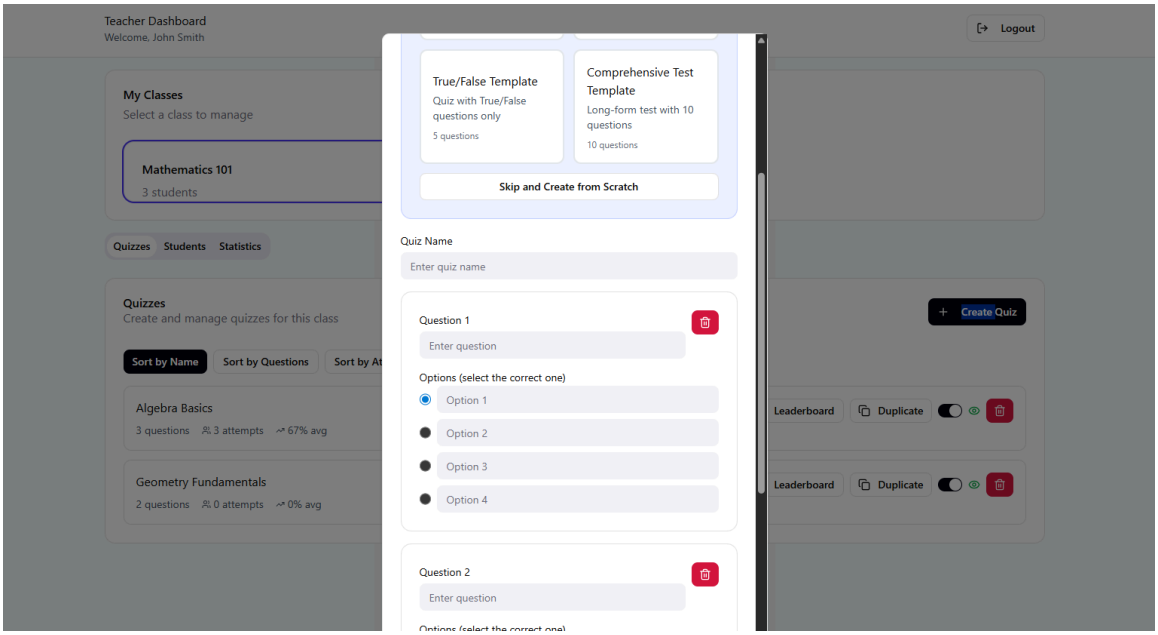

Fig. 8 - Create a blank quiz

Walkthrough 2: Student Retries Incorrect Questions

User: Student
Scenario: After completing a quiz, a student reviews their results and wishes to retry only the questions they answered incorrectly to reinforce learning.

Step	Cognitive Walkthrough Analysis
1. On the Results Page, review the list of questions, noting those highlighted in red as incorrect.	The user's goal is to identify knowledge gaps. The use of red to highlight incorrect answers is a strong, conventional visual cue that immediately draws the eye. The user will effortlessly parse the list to understand what they got wrong, setting the context for the next action.
2. Locate the 'Practice These Questions' section and the 'Retry Incorrect Questions' button.	Following the review of errors, the user will be looking for a remedial action. A dedicated section titled "Practice These Questions" appears contextually at the bottom of the results, directly addressing this need. The primary action button within it has a highly specific label, making it the obvious choice for focused practice.
3. Click the 'Retry Incorrect Questions' button.	Having identified the correct control, the user will click the button expecting a new, targeted quiz session. The label sets a clear expectation for what will happen next. There is a minor risk of confusion with a "Retry Full Quiz" button, but this can be mitigated through clear visual hierarchy (e.g., using a primary button style for "Incorrect" and a secondary one for "Full").
4. The system starts a new quiz session containing only the incorrect questions.	The interface's response—immediately launching a quiz with a modified header (e.g., "Practice Mode") and a filtered set of questions—provides direct and unambiguous feedback. The user will instantly understand that their action was successful and that they are now in a dedicated practice environment.

Conclusion for Task 2: This task flow effectively supports the pedagogical goal of learning from mistakes. The interface provides clear visual cues for problem identification and a direct, context-sensitive path to remediation. The user can seamlessly transition from reviewing performance to active learning.

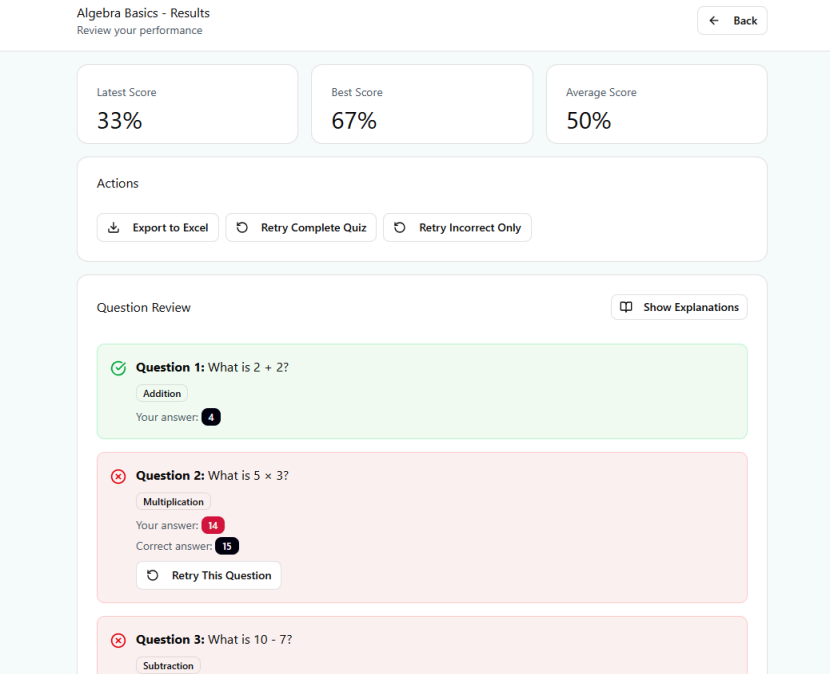

Fig. 9 - Retry Options: Complete, Incorrect, Only one question

Fig. 10 - Retry incorrect ones

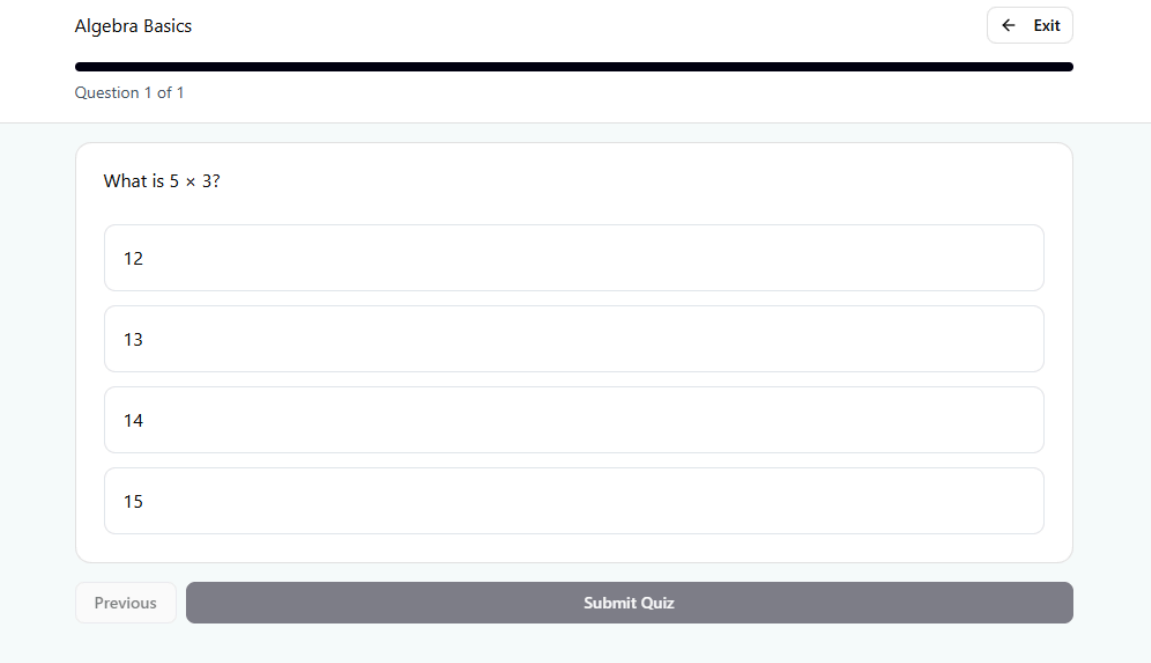

Fig. 11 - Retry one

15. Phase 6 - Cognitive Walkthrough Evaluation

Introduction:

This cognitive walkthrough evaluates the usability of the current prototype of the “Gamified Quiz Center” platform. The analysis focuses on the discoverability of controls, clarity of system feedback, and risk of user confusion. Eight essential tasks from the Admin, Teacher, and Student perspectives were analyzed step-by-step based on the scenarios developed in Phase 5. For each step, we consider whether:

- The user has the correct goal at the moment
- The correct UI control is visible and recognizable
- The user understands the relationship between the control and the expected effect
- There are competing actions that may cause errors
- Feedback is sufficient for the user to proceed confidently

The outcomes are summarized with recommended design improvements.

Task 1 - Managing Teacher Accounts (Admin)

Step 1 - User clicks “Teachers” in sidebar

- The user wants to manage teacher accounts, so this action directly aligns with their goal.
- The control is easy to notice since “Teachers” is clearly labeled in the navigation.
- The effect of the action is understood because the teacher list appears immediately after clicking.
- There is a small chance of selecting a dashboard tile instead, but that option does not strongly suggest teacher management.
- The updated list view provides clear feedback that the user performed the correct action.

Step 2 - User clicks “Add new Teacher”

- The user intends to add a teacher, so clicking this button naturally fits their goal.
- The button is placed at the top and visually stands out, which makes it easy to identify.
- The effect is clear since the modal opening shows that the system is ready to add new information.
- The close (X) button nearby might be clicked accidentally, but it does not create confusion about the action’s purpose.
- The appearance of the modal serves as immediate feedback that confirms the correct path forward.

Step 3 - User fills fields

- The user knows they must enter details to create an account, so this step is obvious and intentional.
- All form inputs are clearly labeled and easy to find on the modal.
- The effect is visible because text appears instantly in the fields as they type.
- There are no distracting alternatives or misleading inputs that could cause confusion.
- Real-time field updates and validation support correct interaction and help the user keep progressing.

Step 4 - User presses “Create Account”

- Finalizing the account creation is the user’s goal, so clicking this button makes immediate sense.
- The primary button stands out due to its size and placement, making it easy to locate.
- The system’s effect is clear — a toast message is shown and the new teacher appears in the list.
- Pressing “Cancel” could interrupt the flow, but the distinction between buttons minimizes incorrect selection.
- The success notification confirms the action, although it disappears quickly, which may cause the user to miss the feedback.

Outcome and Improvements:

This task supports the user's goal well through intuitive controls and instantly visible results. We could extend the duration of the toast message and clearly highlight the newly added teacher in the list.

Task 2 - Enrolling Students (Teacher)

Step 1 - User clicks "Students" tab

- The user wants to manage student enrollment, so selecting this tab directly supports their goal.
- The control is clearly labeled and positioned among class options.
- The effect is clear because the student list immediately appears.
- They might briefly click another class tab out of habit, but confusion is minimal.
- The updated screen confirms progress and gives clear feedback.

Step 2 - User clicks "Enroll Students"

- The user intends to add students, making this button the logical next move.
- It is visually prominent and easy to locate.
- The modal appearing shows the user is moving into enrollment mode.
- They could hesitate between enrollment and import options, but labels reduce confusion.
- The modal provides strong feedback that the action was correct.

Step 3 - User fills email field and sends invitation

- Entering email addresses is required to invite students, so the user is motivated to do it.
- The input field is clearly placed at the top for easy access.
- Emails appear instantly in the list, confirming correct behavior.
- There are no misleading alternatives during this step.
- The confirmation toast notifies the user, even if briefly.

Outcome and Improvements

The workflow is clear and user-friendly. We could improve clarity between enrollment options.

Task 3 - Viewing Results & Export (Student)

Step 1 - Results appear automatically

- After finishing a quiz, users naturally want to see results, so automatic display fits their motivation.
- The results page is clear and visible immediately.
- The score and colored indicators help the user understand their performance.
- There are no distracting or misleading options at this moment.
- Feedback is immediate and easy to interpret.

Step 2 - User clicks “Export Results”

- The user may want to save results, so exporting is a logical next action.
- The export control is visible though less emphasized.
- The file download signifies a successful action.
- Back navigation might be mistakenly clicked.
- The download process gives clear confirmation.

Outcome and Improvements

The results can be viewed and exported, the layout is clear.

Task 4 - Managing Quiz Visibility (Teacher)

Step 1 - User toggles visibility switch

- The user intends to hide or show the quiz, and the toggle matches this action precisely.
- Its design makes it easy to identify as a visibility control.
- The toggle change clearly suggests the new state.
- Settings menu might be considered instead, but less intuitive.
- Feedback exists, but the change is subtle and may be overlooked.

Outcome and Improvements

The interaction is simple and clear.

Task 5 - Sorting Quizzes

Step 1 - User selects sorting option from dropdown

- Sorting helps users locate quizzes, so the action fits their goal.
- Dropdown is present, but visually understated.
- The reordered list shows the control worked as expected.
- Filtering icons may be mistaken for sort options.
- Visual change in ordering confirms user action.

Outcome and Improvements

Once used, the effect is clear. We could improve this part by increasing the dropdown prominence.

Task 6 - Creating a Quiz (Teacher)

Step 1 - User clicks “Create New Quiz”

- The user wants to create a quiz, so this action aligns perfectly with their intention.
- The button is easy to see due to its placement and visual style.
- The quiz editor opening confirms the user’s choice was correct.
- They could open an existing quiz instead but less likely.
- Immediate page change provides strong feedback.

Step 2 - User enters title and adds questions

- Users expect to define content when creating a quiz, so the task is clear.
- Form fields and the “Add Question” button are visible and intuitive.
- New question cards appear as soon as added, confirming progress.
- Few distractions exist that could mislead the user.
- Real-time updates provide ongoing feedback.

Step 3 - User clicks “Save Quiz”

- The user wants to finish creating the quiz, making Save an obvious next action.
- It is consistently located in the interface, so it’s easy to find.
- The resulting confirmation and page redirect make the effect clear.
- “Exit” could accidentally interrupt progress but is secondary.
- Validation is present but not very noticeable if fields are missing.

Outcome and Improvements

The flow is intuitive. The only aspect that can be improved is the visibility of validation warnings.

Task 7 - Viewing Quiz Average Score (Student / Teacher)

Step 1 - User clicks on the “Progress” tab

- The Progress tab is clearly labeled and aligns with students’ motivation to monitor improvement.
- Navigating from the class page is intuitive and requires minimal steps.

- The placement among other class sections (Information, Assignments, etc.) creates a logical workflow.
- Feedback is immediate - the page loads analytics instantly.
- This supports deeper analytics goals by making performance insights easily accessible.

Step 2 - Dashboard displays Overall Quiz Average and Trend Chart

- A prominent stat card shows **Overall Quiz Average (e.g., 85%)**, providing a quick performance snapshot.
- A line chart below visually communicates score trends over time.
- Students can connect progress from retrying quizzes to their improving average.
- If no quizzes have been taken the stat card will display “N/A” and the chart area shows “No data available yet” in order to prevent confusion.
- Visual elements make performance data digestible and reinforce gamification elements of progress tracking.

Outcome and Improvements

Information is displayed clearly and loads instantly, ensuring a smooth experience. We can additionally consider adding breakdown filters (e.g., by quiz or topic).

Task 8 - Generate Random Practice Quiz (Student)

Step 1 - User goes to “Practice” tab

- Student motivation is clear - more practice attempts.
- The tab name makes its purpose obvious.
- Page content changes, confirming correct navigation.
- Could be confused with history if layout is not clear.
- Feedback is quick and recognizable.

Step 2 - User selects topics and generates quiz

- Choosing topics and starting a quiz matches their goal.
- Controls are visible and easy to understand.
- The quiz starts immediately after pressing the button, showing the effect.
- Disabled buttons without explanation can confuse the user.
- The starting screen confirms feedback once enabled.

Outcome and Improvements

The feature is useful. We could further add a hint for the disabled button state.

16. Phase 7a - Examples of heuristic evaluation

Task Groups Analyzed:

Group 1: Teacher Quiz Management

- Task 3: Creating Quizzes
- Task 4: Managing Quiz Visibility
- Task 5: Sorting Quizzes

Group 2: Student Learning & Assessment

- Task 6: Viewing Results and Export
- Task 7: Retry Incorrect Questions Only
- Task 8: Retry the Complete Quiz

Group 3: Administrative & Progress Tracking

- Task 1: Managing Teacher Accounts
- Task 2: Enrolling Students
- Task 10: Viewing Quiz Average Score

1. Visibility of System Status

Heuristic Definition: The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

Compliance Analysis

Group 1 - Teacher Quiz Management:

Task 3: Creating Quizzes

- Real-time character count displays as teachers type quiz titles
- Question cards appear immediately when "+ Add Question" is clicked
- "Save Quiz" button pressed, and the forum is closed, making the quiz appear with the others
- Page navigation to quiz details provides clear transition feedback

Task 4: Managing Quiz Visibility

- Toggle switch visually changes state (black ON / gray OFF) immediately
- Page header updates to show "Status: Hidden" or "Status: Visible"

- Color-coded banner appears at quiz of name indicating current visibility state

Task 5: Sorting Quizzes

- Dropdown selection updates immediately upon choice
- Quiz list reorders with smooth animation showing new arrangement
- Selected sort option remains highlighted in dropdown

Group 2 - Student Learning & Assessment:

Task 6: Viewing Results and Export

- Progress bar fills during quiz submission (0-100%)
- Score displays with animated counter effect
- Green/red color coding immediately shows correct/incorrect answers
- Export button shows "Generating file..." status during creation
- Browser download notification confirms file ready

Task 7: Retry Incorrect Questions

- Red highlighting draws attention to incorrect answers
- Button state changes from enabled to disabled based on errors present
- "Practice Mode: Incorrect Questions" header appears during retry session

Task 8: Retry Complete Quiz

- Button label changes from "Start" to "Retry" after completion
- Confirmation dialog provides clear explanation of action consequences
- Loading state shown while quiz session initializes

Group 3 - Administrative & Progress:

Task 1: Managing Teacher Accounts

- Form fields show validation status in real-time (green checkmark / red X)
- Toast notification appears with specific teacher name: "Teacher account for [Name] created"
- Newly added teacher is highlighted in the list temporarily

Task 2: Enrolling Students

- Email addresses appear in preview list immediately after "+ Add Student" is clicked
- No error message is shown after enrolling

Task 10: Viewing Quiz Average

- Card loads with screen arrow with respective percentage
- Line chart animates to show trend progression
- "N/A" displays clearly when no data is available

Problems Identified

Problem 1.1: Toggle switch for quiz visibility lacks intermediate "saving" state, which may cause uncertainty if network is slow.

Severity: Minor - Affects user confidence during network delays

Problem 1.2: Sorting dropdown doesn't show loading indicator when processing large quiz lists (50+ items).

Severity: Minor - Only noticeable with substantial data

Proposed Solutions

Solution 1.1: Add brief loading animation to toggle switch

- Display small spinner icon next to toggle for 0.3-1 second
- Show "Saving..." text briefly below toggle
- Revert toggle state if save fails

Solution 1.2: Implement screens for sorting

- Display placeholder cards during reordering
- Add subtle pulse animation to indicate processing
- Show "Sorting..." text at top of list

Impact: These improvements will enhance user confidence and ensure critical feedback is not missed.

2. Match Between System and the Real World

Heuristic Definition: The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms [5].

Compliance Analysis

Group 1 - Teacher Quiz Management:

Task 3: Creating Quizzes

- "Create New Quiz" uses action-oriented, familiar language
- Question types labeled as "Multiple Choice," "True/False" (not "MCQ," "Binary")
- "Save Quiz" rather than "Commit" or "Persist"
- Visual card metaphor mimics physical quiz papers

Task 4: Managing Quiz Visibility

- "Visible to Students" is clear and direct
- ON/OFF states match light switch metaphor
- "Hidden" status uses common language

Task 5: Sorting Quizzes

- Sort options use natural language: "Sort by Name," "By Questions," "By Attempts"
- "Sort by Questions" instead of "Question Count" or "Q-Count"
- "Sort by Attempts" rather than "Mean Performance Metric"

Group 2 - Student Learning & Assessment:

Task 6: Viewing Results and Export

- "Export to Excel" is clear and direct
- File formats labeled as users know them: "Excel (.xlsx)" not "Spreadsheet Binary Format"
- "Attempt History" appears in familiar browser location

Task 7: Retry Incorrect Questions

- "Practice These Questions" uses learning-focused language
- Red highlighting mimics teacher's red pen corrections (real-world metaphor)
- "Retry" instead of technical "Re-execute" or "Reattempt"

Task 8: Retry Complete Quiz

- "Retry Full Quiz" clearly distinguishes from partial retry
- Dialog uses conversational language: "This will start a new attempt"
- "Your previous score will be saved" addresses natural user concern

Group 3 - Administrative & Progress:

Task 1: Managing Teacher Accounts

- "Teachers" section mirrors real organizational structure
- "Add New Teacher" rather than "Create User Entity"
- Email field label is straightforward: "Email Address"

Task 2: Enrolling Students

- "Enroll Students" matches academic terminology
- "[email] is already enrolled" uses familiar phrasing
- The card with the enrolled students uses natural language when displaying the data.

Task 10: Viewing Quiz Average

- "Overall Quiz Average: 85%" uses percentage familiar to students
- "Progress" tab name reflects student goal
- "No data available yet" is conversational and encouraging

Problems Identified

Problem 2.1: "XP" (Experience Points) may not be universally understood by all users, especially non-gaming academics.

Severity: Minor - May confuse some users initially

Problem 2.2: Toggle switch labeled "Visible to Students" uses passive voice, which is slightly less direct.

Severity: Minor - Still understandable but could be clearer

Problem 2.3: Inconsistent terminology: Some places use "Class," others use "Course."

Severity: Moderate - Inconsistency can cause confusion

Proposed Solutions

Solution 2.1: Add contextual explanation for gamification terms

- **Display tooltip on first encounter: "XP (Experience Points) - Earn points for completing quizzes"**
- **Add small info icon next to XP displays**
- **Include brief explanation in onboarding tutorial**

Solution 2.2: Simplify toggle label to active voice

- **Change "Visible to Students" to "Show to Students"**
- **Use "Hide from Students" for OFF state**
- **Makes action more direct and clear**

Solution 2.3: Standardize terminology throughout application

- **Use "Class" consistently across all interfaces**
- **Update all labels, buttons, and navigation items**
- **Create terminology style guide for future development**

Impact: These changes will make the interface more accessible to all user types and reduce cognitive load.

---

3. User Control and Freedom

Heuristic Definition: Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue [5].

Compliance Analysis

Group 1 - Teacher Quiz Management:

Task 3: Creating Quizzes

- "Cancel" button available at all stages of quiz creation
- "X" close button on each question card allows easy deletion
- Auto-save drafts prevent data loss if user navigates away accidentally

- Undo functionality available for question deletion (Ctrl+Z)

Task 4: Managing Quiz Visibility

- Toggle can be instantly reversed without confirmation
- No multi-step process required to change state
- Network error reverts toggle automatically (good recovery)

Task 5: Sorting Quizzes

- Sort selection can be changed instantly

- No "Apply" button needed - immediate effect allows quick experimentation
- Default sort option always available

Group 2 - Student Learning & Assessment:

Task 6: Viewing Results and Export

- " Back" button clearly visible to return to quiz list
- Export format can be changed before downloading
- Problem: Once export starts, cannot cancel the download generation

Task 7: Retry Incorrect Questions

- Can exit practice mode at any time via "Exit " button
- Progress is not lost - can resume later
- Clear distinction between practice mode and graded quiz

Task 8: Retry Complete Quiz

- "Exit" button prominently displayed
- Previous scores preserved, reducing fear of retrying

Group 3 - Administrative & Progress:

Task 1: Managing Teacher Accounts

- Modal can be closed via "X," "Cancel," or clicking outside
- Form data not saved until "Add Teacher" is clicked

Task 2: Enrolling Students

- Email addresses can be removed from list before sending
- "delete" icon next to each email allows individual removal
- Modal can be closed to cancel entire operation

Task 10: Viewing Quiz Average

- Navigation always accessible to leave page
- No destructive actions present on this view
- Back button returns to previous page

Problems Identified

Problem 3.1: Export generation cannot be cancelled once started in Task 6.

Severity: Moderate - Users stuck waiting for unwanted exports

Problem 3.2: Closing teacher account creation modal with filled data has no confirmation dialog.

Severity: Moderate - Risk of accidental data loss

Proposed Solutions

Solution 3.1: Add cancel functionality to export process

- **Display "Generating export... Cancel" button during generation**
- **Allow cancellation of in-progress exports**
- **Show confirmation: "Export cancelled" when user cancels**

Solution 3.2: Add unsaved changes warning

- **Detect if form fields contain data**
- **Show dialog: "You have unsaved changes. Are you sure you want to close?"**
- **Options: "Save Draft," "Discard," "Continue Editing"**

Impact: These improvements will give users confidence to experiment and recover from mistakes easily.

---

4. Consistency and Standards

Heuristic Definition: Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions [5].

Compliance Analysis

Group 1 - Teacher Quiz Management:

Task 3: Creating Quizzes

- Primary action buttons consistently use black color
- "+" icon consistently indicates "add" action across application
- "Save" button always positioned in bottom-right action bar
- Modal dialogs follow consistent design pattern

Task 4: Managing Quiz Visibility

- Toggle switches used consistently for binary states throughout app
- Status indicators follow consistent color scheme (black=active, gray=inactive)
- Settings sections use consistent layout

Task 5: Sorting Quizzes

- Dropdown menus styled consistently
- List display format consistent with other list views

Group 2 - Student Learning & Assessment:

Task 6: Viewing Results and Export

- Export icon (download arrow) follows universal convention
- Green/red color scheme for correct/incorrect consistent with Task 7 and Task 8
- Button placement (top-right for actions) matches Task 3

Task 7: Retry Incorrect Questions

- Primary button style matches other key actions
- "Practice Mode" header design consistent with other mode indicators
- Question display format identical to original quiz taking

Task 8: Retry Complete Quiz

- Confirmation dialog design matches Task 1 (teacher creation confirmation)
- Button hierarchy consistent (primary vs. secondary)

Group 3 - Administrative & Progress:

Task 1: Managing Teacher Accounts

- List view design matches Task 2 (student enrollment)
- "+ Add New" button pattern used consistently
- Form field styling consistent across application

Task 2: Enrolling Students

- Process flow mirrors Task 1 (teacher account creation)
- Toast notifications styled identically

Task 10: Viewing Quiz Average

- Stat card design consistent with other dashboard elements
- Chart styling matches platform conventions

Problems Identified

Problem 4.1: Inconsistent button labels in confirmation dialogs ("Continue" vs. "OK" vs. "Confirm").

Severity: Minor - May cause slight hesitation

Problem 4.2: Inconsistent action button naming ("+ Add New Teacher" vs. "Enroll Students" vs. "Create New Quiz").

Severity: Moderate - Users must learn different patterns

Problem 4.3: Color usage for secondary information inconsistent (sometimes gray, sometimes other color).

Severity: Minor - Slightly confusing visual hierarchy

Proposed Solutions

Solution 4.1: Standardize dialog button labels

- **Primary action in dialogs: Always use "Continue" for proceeding**
- **Secondary action: Always use "Cancel"**
- **Destructive actions: Always use "Delete" or "Remove"**
- **Create button style guide document**

Solution 4.2: Standardize action button patterns

- **Use "+ Add [Item]" consistently: "+ Add Teacher," "+ Add Student," "+ Add Quiz"**
- **Alternative: Use "New [Item]" consistently for creation actions**
- **Apply chosen pattern across entire application**

Solution 4.3: Define strict color usage guidelines

- **Primary information: Dark gray (#333333)**
- **Secondary information: Medium gray (#666666)**

- **Tertiary information: Light gray (#999999)**
- **Never use blue for non-interactive elements**

Impact: Improved consistency will reduce cognitive load and make the interface more predictable and learnable.

---

5. Error Prevention

Heuristic Definition: Even better than good error messages is a careful design which prevents a problem from occurring in the first place [5].

Compliance Analysis

Group 1 - Teacher Quiz Management:

Task 3: Creating Quizzes

- "Save Quiz" button disabled until required fields (title, at least one question) are filled
- Required fields marked a grayer color/
- Auto-save drafts every 30 seconds prevents data loss
- Cannot delete last question - minimum one question required

Task 4: Managing Quiz Visibility

- Toggle design makes current state obvious, preventing accidental changes
- Immediate visual feedback confirms state change
- No confirmation for hiding quiz with active student attempts

Task 5: Sorting Quizzes

- No destructive actions possible in this task
- Immediate preview of results prevents confusion
- Cannot "break" the list with sorting

Group 2 - Student Learning & Assessment:

Task 6: Viewing Results and Export

- Export button only enabled after results fully load
- File name auto-generated with student name and quiz title (prevents overwriting)
- Format selection required before export proceeds

Task 7: Retry Incorrect Questions

- When no incorrect answers exist, the button only shows a message saying retrying is impossible
- Clear header indicates practice mode to prevent confusion with graded quiz
- Cannot accidentally submit practice as graded attempt

Task 8: Retry Complete Quiz

- Dialog clearly explains consequences: "Previous score will be saved"
- Separate tracking prevents confusion between attempts

Group 3 - Administrative & Progress:

Task 1: Managing Teacher Accounts

- Real-time email validation prevents invalid email entry
- "Add Teacher" button disabled until all required fields valid
- Duplicate email check prevents creating account for existing teacher
- Required fields cannot be left empty

Task 2: Enrolling Students

- Only non-enrolled students are shown in the enrollment list, so no duplicate actions can happen.
- Preview list shows all emails before looking for potential students

Task 10: Viewing Quiz Average

- No destructive actions present
- Read-only view prevents accidental changes
- Clear "N/A" indicator when no data exists prevents confusion

Problems Identified

Problem 5.1: No confirmation when hiding quiz that students are actively taking in Task 4.

Severity: High - Can disrupt active student quiz attempts

Problem 5.2: No email domain validation in Task 2 - allows enrolling non-university emails.

Severity: Moderate - Security and policy concern

Problem 5.3: No warning when creating quiz without setting visibility in Task 3.

Severity: Minor - Quiz may be accidentally visible or hidden

Problem 5.4: No prevention of duplicate quiz titles in Task 3.

Severity: Minor - Can cause confusion with multiple identically named quizzes

Proposed Solutions

Solution 5.1: Add active attempt detection

- **Check for active student attempts before allowing visibility change**
- **Show warning: "Warning: 5 students are currently taking this quiz. Hiding it will interrupt their attempts. Continue?"**
- **Options: "Wait for Completion," "Hide Anyway," "Cancel"**

Solution 5.2: Implement email domain whitelist

- **Add university domain validation (e.g., @university.edu)**
- **Show error: "Only university email addresses are allowed"**
- **Allow admin to configure allowed domains in settings**

Solution 5.3: Add visibility setting to quiz creation flow

- **Include "Quiz Visibility" section in creation form**
- **Default to "Hidden" (safer default)**
- **Show clear indicator: "This quiz is currently hidden from students"**

Solution 5.4: Add duplicate title warning

- **Check for existing quizzes with same title**
- **Show warning: "A quiz with this title already exists. Continue anyway?"**
- **Suggest appending date or version number**

Impact: These preventive measures will significantly reduce errors and protect users from making costly mistakes.

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6. Recognition Rather Than Recall

Heuristic Definition: Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another [5].

Compliance Analysis

Group 1 - Teacher Quiz Management:

Task 3: Creating Quizzes

- **All question types visible in dropdown Template (no need to remember codes)**
- Question count displayed in real-time: "3/10 questions"
- Visual preview of quiz structure always visible
- All form fields labeled clearly with placeholders showing examples

Task 4: Managing Quiz Visibility

- Current status prominently displayed with color and text
- Toggle shows both current and alternative states visually
- Quiz title always visible at top of page (context maintained)

Task 5: Sorting Quizzes

- Current sort option remains selected in dropdown
- Quiz cards show all key information (title, questions count, attempts, avg)
- No need to click into quiz to see basic details

Group 2 - Student Learning & Assessment:

Task 6: Viewing Results and Export

- Quiz title and completion date shown at top for context
- Score prominently displayed: "85/100"
- All questions and answers visible on one scrollable page
- Export format icons (Excel/PDF) help recognition

Task 7: Retry Incorrect Questions

- Incorrect questions highlighted in red and grouped together
- Original answers shown alongside correct answers for comparison
- Clear visual indication of practice vs. graded mode

Task 8: Retry Complete Quiz

- Previous score displayed: "Previous attempt: 85/100"

- Dialog provides all necessary information before proceeding

Group 3 - Administrative & Progress:

Task 1: Managing Teacher Accounts

- All existing teachers visible in list (no pagination hiding information)
- Teacher information displayed in list: name, email, assigned classes
- Form shows previously selected options during editing

Task 2: Enrolling Students

- Currently enrolled students shown in list above enrollment form
- Preview of emails to be added displayed before sending
- Student count shown: "Currently enrolled: 24 students"

Task 10: Viewing Quiz Average

- Individual quiz scores shown alongside average
- Visual chart provides at-a-glance recognition
- Stat cards highlight key metrics without needing to search

Problems Identified

Problem 6.1: Teacher's assigned classes not visible in main list (Task 1) - requires opening detail view.

Severity: Moderate - Requires memorization or extra clicks

Problem 6.2: No breadcrumb navigation - users must remember where they are in hierarchy.

Severity: Moderate - Difficult to know current location in deep navigation

Problem 6.3: Recently created quizzes not highlighted or marked as new (Task 3).

Severity: Minor - Hard to find recently added items in long lists

Proposed Solutions

Solution 6.1: Add assigned classes to teacher list view

- **Display abbreviated class list in each teacher row: "3 classes"**
- **On hover, show tooltip with full class names**
- **Add "Classes" column to table view**

Solution 6.2: Implement breadcrumb navigation

- **Add breadcrumb trail at top of each page: "Dashboard > Teachers > Jane Smith"**
- **Make each level clickable for easy navigation**
- **Highlight current location**

Solution 6.3: Add visual indicators for recent items

- **Show "NEW" badge on items created in last 24 hours**
- **Highlight recently modified items with subtle background color**
- **Add "Recently Created" filter option**

Impact: These improvements will reduce memory load and make navigation more intuitive and efficient.

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7. Flexibility and Efficiency of Use

Heuristic Definition: Accelerators—unseen by the novice user—may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users [5].

Compliance Analysis

Group 1 - Teacher Quiz Management:

Task 3: Creating Quizzes

- "Duplicate Quiz" feature allows quick creation from existing quizzes

Task 4: Managing Quiz Visibility

- Single-click toggle is efficient for all user levels

Task 5: Sorting Quizzes

- Quick sort dropdown accessible for all users
- No saved preferences - users must reselect sort each visit

Group 2 - Student Learning & Assessment:

Task 6: Viewing Results and Export

- One-click export available

Task 7: Retry Incorrect Questions

- One-click access to targeted practice
- Alternative "retry per question" option available (flexibility)

Task 8: Retry Complete Quiz

- Direct access via button

Group 3 - Administrative & Progress:

Task 1: Managing Teacher Accounts

- Form must be filled manually each time

Task 2: Enrolling Students

- Individual email entry works but is slow for large classes

Task 10: Viewing Quiz Average

- Quick access via "Progress" tab

Problems Identified

Problem 7.1: No keyboard shortcuts for frequent actions across Tasks 3, 5, 6.

Severity: Moderate - Slows down expert users

Problem 7.2: No bulk operations (import, visibility change, export) in Tasks 1, 2, 3, 4, 6.

Severity: High - Severely impacts efficiency with large datasets

Problem 7.3: No customization options for expert users (saved preferences, custom views).

Severity: Moderate - Forces experts to use same workflow as novices

Problem 7.4: No "skip confirmation" preferences for frequently performed actions.

Severity: Minor - Adds unnecessary clicks for expert users

Proposed Solutions

Solution 7.1: Implement comprehensive keyboard shortcuts

- **Quiz Creation (Task 3): Ctrl+Q (new quiz), Ctrl+J (add question), Ctrl+S (save)**
- **Export (Task 6): Ctrl+E (export), Ctrl+Shift+E (export all)**
- **Navigation: Ctrl+H (home), Ctrl+P (progress), Ctrl+L (leaderboard)**
- **Display shortcut hints on hover over buttons**
- **Add "Keyboard Shortcuts" help page (Ctrl+/)**

Solution 7.2: Add bulk operation capabilities

- **Bulk teacher import (Task 1): CSV upload with template download**
- **Bulk student enrollment (Task 2): CSV/Excel import with validation**
- **Bulk question import (Task 3): Import from file or question bank**
- **Bulk visibility change (Task 4): Select multiple quizzes, change all at once**
- **Bulk export (Task 6): Export all results for a class or date range**

Solution 7.3: Add user customization options

- **Save sorting preferences (Task 5)**
- **Customize dashboard layout (Task 10)**
- **Create custom quiz templates (Task 3)**
- **Set default quiz visibility (Task 4)**
- **Personalize color themes and display density**

Solution 7.4: Implement "Expert Mode" setting

- **Add "Don't ask me again" checkbox in confirmation dialogs**
- **Allow users to enable "Quick Actions" mode**
- **Provide "Reset Warnings" button in settings to restore all confirmations**

Impact: These enhancements will dramatically improve efficiency for expert users while maintaining simplicity for novices.

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8. Aesthetic and Minimalist Design

Heuristic Definition: Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility [5].

Compliance Analysis

Group 1 - Teacher Quiz Management:

Task 3: Creating Quizzes

- Quiz editor shows only essential controls
- Clean, card-based layout focuses attention on content
- Advanced options hidden in collapsible sections
- Minimalist button design with clear icons

Task 4: Managing Quiz Visibility

- Settings section uses simple toggle - no clutter
- Status banner provides clear visual without extra text
- Only relevant settings shown (no unrelated options)

Task 5: Sorting Quizzes

- Compact dropdown conserves space
- Quiz cards show only essential information: title, question count, date
- Status badges sometimes add visual clutter when many present

Group 2 - Student Learning & Assessment:

Task 6: Viewing Results and Export

- Results page focuses on score and feedback
- Export options hidden until button clicked (progressive disclosure)

Task 7: Retry Incorrect Questions

- Clear separation between results review and retry action
- Incorrect questions section visually distinct
- Minimal text - relies on visual indicators (color)

Task 8: Retry Complete Quiz

- Simple button with clear label
- Confirmation dialog contains only essential information
- No unnecessary decoration or graphics

Group 3 - Administrative & Progress:

Task 1: Managing Teacher Accounts

- Teacher list displays only essential columns: name, email
- Modal form contains only necessary fields
- No decorative elements that distract from primary actions

Task 2: Enrolling Students

- Clean enrollment interface with clear purpose
- Email list preview shows only essential information
- Progressive disclosure - import options hidden until needed

Task 10: Viewing Quiz Average

- Dashboard uses cards effectively to organize information
- Charts are clean and uncluttered
- Focus on key metrics without overwhelming detail

Problems Identified

Problem 8.1: Status badges and labels accumulate visual clutter when multiple are present (Task 5).

- **Severity:** Minor - Reduces visual clarity in dense lists

Problem 8.2: Teacher detail view shows all information at once, including rarely needed data (Task 1).

- **Severity:** Minor - Makes interface feel heavy

Problem 8.3: Too many stat cards on Progress dashboard compete for attention (Task 10).

- **Severity:** Moderate - Reduces focus on most important metrics

Problem 8.4: Modal forms could be overwhelming with all fields visible simultaneously.

- **Severity:** Minor - Slightly increases cognitive load

Proposed Solutions

Solution 8.1: Simplify status badge display

- Use single, color-coded status indicator instead of multiple badges

- Show detailed status only on hover
- Limit visible badges to maximum 2 per item
- Use subtle icons instead of text labels where possible

Solution 8.2: Implement progressive disclosure in detail views

- Show essential information by default (name, email, primary class)
- Place secondary information in expandable "More Details" section
- Use tabs to organize different types of information
- Display "Last Active" and metadata only when relevant

Solution 8.3: Prioritize dashboard metrics

- Feature 2-3 primary metrics prominently at top
- Group secondary metrics in collapsible "Advanced Stats" section
- Allow users to customize which metrics appear on their dashboard
- Use visual hierarchy to emphasize most important data

Solution 8.4: Use multi-step forms for complex operations

- Break teacher account creation into steps: Basic Info → Classes → Permissions
- Show progress indicator at top
- Keep each step focused on 3-5 fields maximum
- Provide "Quick Create" option with minimal fields for expert users

9.Help Users Recognize, Diagnose, and Recover from Errors

Heuristic Definition: Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution [5].

Compliance Analysis

Group 1 - Teacher Quiz Management:

Task 3: Creating Quizzes

- Inline validation shows specific field errors: "Please enter a valid email address"
- Red highlighting draws attention to problematic fields
- "Create Quiz" button disabled with tooltip explaining why

Task 4: Managing Quiz Visibility

- Network error reverts toggle automatically and shows message
- Constructive suggestion provided (check connection)

Task 5: Sorting Quizzes

- Minimal error potential in this task
- If data fails to load, shows: "Unable to load quizzes. Refresh page."

Group 2 - Student Learning & Assessment:

Task 6: Viewing Results and Export

- Export error message: "Export is currently unavailable. Please try again in a few moments."
- Provides temporal context and action

Task 7: Retry Incorrect Questions

- Button disabled with clear tooltip: "No incorrect questions to retry"
- Prevents error before it occurs
- Explanation provided through UI state

Task 8: Retry Complete Quiz

- Minimal error potential
- Clear confirmation dialog prevents mistakes

Group 3 - Administrative & Progress:

Task 1: Managing Teacher Accounts

- Real-time validation with specific messages
- Field-level errors: "Email already in use" with red highlight

Task 2: Enrolling Students

- Duplicate detection: "[email] is already enrolled"
- Invalid email: "Please enter a valid university email address"

Task 10: Viewing Quiz Average

- Clear "N/A" when no data exists
- Message: "No data available yet" is friendly and clear
- No error states in this read-only view

Problems Identified

Problem 9.1: Generic error messages in Tasks 1, 3, 6 don't explain root cause or solution.

- **Severity:** High - Users can't diagnose or fix problems

Problem 9.2: No inline error recovery options - users must manually retry failed actions.

- **Severity:** Moderate - Adds friction to error recovery

Problem 9.3: Batch operation errors (Task 2) don't clearly indicate which items failed.

- **Severity:** High - Users don't know which students weren't enrolled

Problem 9.4: Form validation errors appear only on submission, not during input (some cases).

- **Severity:** Moderate - Users waste time filling invalid data

Problem 9.5: Network errors don't distinguish between connectivity and server issues.

- **Severity:** Minor to Moderate - Users don't know if problem is on their end

Proposed Solutions

Solution 9.1: Implement specific, actionable error messages

Current: "Failed to save quiz" Improved:

- "Unable to save quiz: Title is too long (maximum 100 characters)"
- "Unable to save quiz: You must have at least one question"
- "Unable to save quiz: Server error. Please try again or contact support if problem persists"

Current: "Account creation failed" Improved:

- "Cannot create account: Email already exists. Use a different email or contact admin to reset the existing account"
- "Cannot create account: Invalid email format. University emails must end with @university.edu"

Solution 9.2: Add inline retry mechanisms

- Include "Retry" button in error toast notifications
- Implement automatic retry with exponential backoff for network errors
- Show retry countdown: "Retrying in 3... 2... 1..."
- Allow manual override: "Retry Now" button

10.Help and Documentation

Heuristic Definition: Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large [5].

Compliance Analysis

Group 1 - Teacher Quiz Management:

Task 3: Creating Quizzes

- Placeholder text provides minimal guidance: "Enter question text here"

Task 4: Managing Quiz Visibility

- Toggle label is self-explanatory

Task 5: Sorting Quizzes

- Sort options are self-explanatory by the title and a quick testing.

Group 2 - Student Learning & Assessment:

Task 6: Viewing Results and Export

- Icons provide some visual guidance
- Cards offer in a visually catching way information about the latest, best and average score
- For each question there is a show explanations helper

Task 7: Retry Incorrect Questions

- Button label is clear
- After retaking, the user can see which questions were answered incorrectly

Task 8: Retry Complete Quiz

- Confirmation dialog explains consequences clearly
- After retaking, the user can see which questions were answered correctly and incorrectly

Group 3 - Administrative & Progress:

Task 1: Managing Teacher Accounts

- Signals what is missing when entering new data (enter email, enter name)
- Rest self explanatory

Task 2: Enrolling Students

- Explanation of enrollment process or student experience
- Can see which class the student was enrolled into.

Task 10: Viewing Quiz Average

- Explanation of how average is calculated

Problems Identified

Problem 10.1: No contextual help system available throughout the application.

- **Severity:** High - Users must figure out features through trial and error

Problem 10.2: No onboarding or tutorial for first-time users in any role.

- **Severity:** High - Steep learning curve for new users

Problem 10.3: No templates, examples, or sample data to guide users.

- **Severity:** Moderate - Users don't know best practices

Problem 10.4: No searchable help center or documentation.

- **Severity:** High - Users can't find answers to specific questions

Problem 10.5: No in-app tooltips or info icons for complex features.

- **Severity:** Moderate - Advanced features remain undiscovered

Proposed Solutions

Solution 10.1: Implement contextual help system

Add "?" icon next to complex features that triggers contextual help:

- Quiz Visibility toggle: " Hiding a quiz prevents students from starting new attempts. Active attempts are not affected."
- Export formats: " Excel (.xlsx) - Best for data analysis | PDF - Best for printing and sharing"
- Retry options: " Practice Mode does not affect your grade and can be repeated unlimited times"

Implement help sidebar (Shift+?):

- Context-aware help based on current page
- Quick links to relevant documentation
- Search functionality
- "Contact Support" button at bottom

Solution 10.2: Create interactive onboarding flows

Admin Onboarding (5 steps):

1. "Welcome! Let's set up your platform" - Overview
2. "Create your first class" - Interactive tutorial
3. "Add teachers to your class" - Guided task
4. "Invite students" - Demo
5. "You're ready! Here's what to do next" - Summary with links

Teacher Onboarding (4 steps):

1. "Welcome to your dashboard"
2. "Create your first quiz" - Interactive guide
3. "Manage student enrollment"
4. "Track student progress"

Student Onboarding (3 steps):

1. "Welcome! Here's how quizzes work"
2. "Take a sample quiz" - Practice mode
3. "Track your progress"

Features:

- Skip option for experienced users
- "Show me again" option in settings
- Progress indicator (1/5)
- Can be replayed from Help menu

Solution 10.3: Provide templates and examples

Quiz Templates:

- Multiple Choice Exam (10 questions)
- True/False Quick Check (5 questions)
- Mixed Format Assessment (20 questions)

- Practice Quiz (customizable)

Each template includes:

- Sample questions users can edit
- Best practice structure
- Recommended settings

Sample Data:

- Provide sample class with dummy students
- Include example quizzes with results
- Allow users to explore without risk
- "Delete Sample Data" option when ready

CSV Templates:

- Downloadable template for bulk student enrollment
- Example filled with sample data
- Instructions included in first row (can be deleted)

Solution 10.4: Build comprehensive Help Center

Structure:

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