



An-Najah National University
Faculty of Engineering & Information Technology

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“Software Graduation Project”



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Disclaimer Statement

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Abstract

Memora is an innovative learning platform which is designed in order to enhance the student's educational experience through several tools. In the first place, it integrates flashcard-based learning with (SRS) to optimize long-term memory retention by scheduling card reviews based on the user performance. Correct answers extend the review interval, while incorrect answers shorten it to reinforce the learning process. Statistics and charts are used to track the user's progress.

In addition to that, there's a customizable Pomodoro timer based on the Pomodoro technique, where the user will be segmenting the study sessions into focused intervals followed by short breaks, enhancing productivity and concentration. Users can personalize these sessions, track completed cycles, and link them to specific learning tasks, promoting efficient study habits. A third feature included is a rich text note taking section where the user can store his notes efficiently.

The basic roles in this platform are **users(learners)**, **educators(instructors)**, **parents** and **administrator**. Learners' main aim is to focus on their study progress, educators create and monitor content, parents oversee their child's learning journey and administrators manage the overall system. By combining these features and roles, Memora offers a holistic, collaborative, and interactive learning environment, effectively addressing the diverse needs of users while promoting structured and effective learning.

Chapter 1

Introduction

1.1 Statement of the problem

Many students find it hard to remember what they learn and manage their time well. At the same time, teachers, parents, and school leaders don't have good tools to track progress and work together to help students. Old-fashioned ways of learning often don't adapt to individual needs or keep students interested. These problems lead to poor learning and make it harder to succeed in school. Memora solves these issues by combining Spaced Repetition (a method to remember better), a flexible Pomodoro timer (to manage time), advanced note-taking, and tools for different roles (like teachers and parents) into one platform. This helps students build better study habits, remember more, and allows everyone involved to work together more effectively.

1.2 Objectives of the work

Building a mobile application and a website that seeks to improve learning through Spaced Repetition for better recall, a customizable Pomodoro timer for time management, and rich-text note-taking for organization. All these features together support good study habits and create a conducive environment for learning.

1.3 Scope of the work

We wanted to create an environment with tools to enhance learning and collaboration among students, educators, parents, and administrators. Observing and creating content can be performed by educators; tracking a child's progress can be done by parents; and overall administration of the systems can fall into the hands of the administrators. Memora endorses personalized learning, tracking of progress as well as study habits, thereby encompassing all educational aspects.

1.4 Significance of our work

Developing an educational platform that enhances learning by improving memory retention, time management, and study efficiency through interactive tools. It assists students in developing effective study habits; it aids teachers with content creation and classroom monitoring; and it allows for parent tracking of progress. In cultivating cooperation among learners, teachers, and parents, Memora establishes a structured and supportive educational environment in which learning has become more inspiring and effective.

1.5 Organization of the report

The arrangement of this report comprises multiple segments. The introductory part offers an outline of the project and its goals. The subsequent section delineates the extent and limitations of the undertaking. Following that, the third part highlights the approach and steps undertaken to finalize the project. In the fourth division, outcomes and discoveries are showcased, encompassing any difficulties confronted and their subsequent solutions. The fifth section delves into the importance and potential influence of the project. Ultimately, the concluding remarks encapsulate the essential elements of the report and offer suggestions for future endeavors. Supplementary materials, containing pertinent data and information concerning the project, are enclosed in the appendices.

Chapter 2

Constraints, Standards/ Codes and Earlier course work

2.1 Constraints and limitation

1- Limited resources: The guides for Flutter and Spring Boot only explain the basics, so we need to do more research to reach our goals. Also, to use these tools, you need to know how to work with Android Studio and other libraries. Working with the Mongo database requires a lot of effort and study to get the best results.

2- Technical Challenge: Combining different tools like spaced repetition, a Pomodoro timer, advanced note-taking, and multi-role features into one smooth platform. It also needs to work well on both mobile (using Flutter) and web.

2.2 Standards and Codes

When creating the Memora platform, it's important to follow well-known rules and guidelines to make sure the platform is high-quality, secure, and works well with other systems. For the backend, the RESTful APIs in Springboot will follow the standards to ensure clear and organized communication between the server and client. The app and website will use Material Design Guidelines to provide a consistent and easy-to-use interface.

2.2.1 Flutter Front-end Application

For the front-end part of our graduation project, we chose to use the Flutter framework, a flexible UI toolkit created by Google. Flutter is great for building apps that work on mobile, web, and desktop platforms, all from one set of code. Its main advantage is the ability to create beautiful and smooth user interfaces using widgets. Flutter uses a simple and clear way to design UIs, making it easy to create flexible and expressive designs. The hot reload feature made our work much faster, allowing us to make changes and see results instantly.

Dart, the programming language used by Flutter, turned out to be strong and simple, making it easy to build the logic of our project without issues. The detailed guides and resources from Flutter were very helpful during development, giving clear instructions and making it easier for our team to learn. In the end, Flutter's ability to create a smooth and high-quality experience on different platforms made it the best choice for building the front-end of our app.

2.2.2 Database Back-end

To create a modern and efficient system for our project, we chose Spring Boot as our server-side platform. Spring Boot is a well-known framework based on Java, known for its ability to handle large-scale and complex applications. It offers features like dependency injection, fast development, and a wide range of tools, making it the best choice for our needs.

Many big companies, like Netflix, use Spring Boot because of its reliability. For our database, we picked MongoDB, a top NoSQL database. MongoDB is great for managing unstructured or semi-structured data, offering flexibility and the ability to grow as needed. Its document-based approach and adaptable structure matched our project perfectly. Additionally, the active MongoDB community provided us with helpful resources and support during development.

To add real-time chat features, we used Firebase Realtime Database in our backend. Firebase Realtime Database, created by Google, allows data to sync in real-time, which is perfect for adding real-time chat to our app. It's worth mentioning that while Firebase Realtime Database handled the real-time features, MongoDB was our main database for managing the rest of our data. By combining Spring Boot and MongoDB with Firebase Realtime Database, we built a strong and flexible backend system for our project.

2.2.3 Waterfall Model

- First, we used the Waterfall model to manage the project while developing the application. This method follows a step-by-step process. We started by deeply understanding the problem, gathering important requirements, limits, and data needed for development. After that, we analyzed everything in detail.

- Next, we moved on to reviewing the requirements we set in the first step. This helped us carefully plan the system design, which included creating algorithms and choosing the right programming languages to turn our ideas into reality.

- Third, the development stage started with making and testing small programs, called units. These units included different features like chat, notifications, user, parent and instructor's profiles, and the admin page. Each unit was tested carefully to make sure it worked correctly on its own.

-Fourth, the integration stage combined all the units into one complete system. This combined system was tested thoroughly to find and fix any problems or errors. Finally, the app was released to users in the Android Package (APK) format. Following the Waterfall Model step by step helped create a well-planned and detailed development process for the app.

2.3 Earlier coursework

During the studying process in the Computer Engineering Department, we learned many important ideas and skills that were crucial for creating this software. These included web programming, Data base course, algorithms, Artificial intelligence, critical thinking and research methods. In addition, we've seen documentations and watched online courses on Flutter, SpringBoot, MongoDB, and GitHub, which gave us the tools we needed to develop and improve our project.

Chapter 3

Literature Review

Educational technology has influenced teaching and learning activities wherein digital tools are used for the enhancement of knowledge retention and productivity. The more popular ones-in use these days would be flashcards, the Pomodoro technique, digital note-taking, zoom meetings and question-answer websites as these have proved effective in improving study habits. This paper reviews existing research concerning these different methods, their effects on learning, and how their combined integration into a single application could help the user.

Studies have shown flashcards to be an effective learning tool that applies spaced repetition for memory enhancement and retrieval. **Karpicke and Roediger [1]** found that active recall using flashcards led to substantially better long-term recall than passive revisiting. The efficacy of the Leitner System, a spaced repetition algorithm, is substantiated by the study conducted by **Cepeda [2]**. Recent advances in digital applications of flashcards such as Anki or Quizlet have further refined the effectiveness of learning by employing adaptive learning algorithms **[3]**. These studies suggest that flashcard integration within educational applications could personalize learning and facilitate better retention of knowledge.

This was said with reference to **Cirillo [4]**. Conventionally referred to either as time enhancing or concentration technique, the Pomodoro technique attempts to set a structured study time of usually 25 minutes followed by a short break. **Bailey and Konstan [5]** stated that the reduction of cognitive fatigue and improvement in average completion of assigned tasks were noticeable among practitioners of this technique. Additionally, **Mark et al. [6]** declared that consistent, scheduled breaks are essential for keeping an individual focused, particularly between tasks that require high mental effort. With the incorporation of Pomodoro timers in its learning applications, the Pomodoro technique will effectively keep students alert from burnout and promote longer and more productive learning intervals.

With the rise of digital note-taking, the traditional forms have been outmoded in favor of better organization, searchability, and multimedia integration. While several studies compare handwritten and digital note-taking, one finding shows that handwriting improves cognition more deeply, while digital notes show better efficiency and accessibility [7]. Applications like Evernote and Notion show that appropriately structured digital notetaking enhances knowledge retention. Note-taking integrated into a flashcard-based study app allows users to efficiently review and reinforce key concepts.

As we saw, this review have recognized the efficacy of flashcards, Pomodoro technique, and digital note-taking applications towards developing good study habits, but not many studies look at integrating all these methods into a single tool. Our application (Memora) hopes to help fill that gap by studying the effects of a standalone application that combines flashcard, Pomodoro, note-taking and other techniques on students and further the field of educational technology.

Chapter 4

Methodology

4.1 Tools, Methods and Programming Languages

4.1.1 Tools

- **Visual Studio Code:** This was the main tool used for writing and running the code. It offered important features and tools for editing code, fixing errors, and managing projects.
- **Android Studio:** It was used as a tool to test the mobile app on various virtual devices, making sure it works well and is compatible with different systems.
- **GitHub:** We used GitHub to work together on the project, manage our code, and keep track of changes.
- **Firebase:** We added Firebase to our project to use its real-time database and cloud storage features. This helped us store messages and images safely and quickly. We also used Firebase's messaging service to send notifications, making it possible for the web and mobile devices to communicate with each other.
- **Postman:** is a popular tool for testing APIs that makes the process easier and more straightforward. It has a simple interface for making and sending different types of HTTP requests, allows for automation, groups requests into collections, helps teams work together, and includes features for creating documentation and monitoring. Its flexibility makes it a must-have tool for effective API testing and development.

4.1.2 programming language

- The mobile app and website were made using different programming languages. For the frontend, we used Dart and the Flutter framework. Dart is a language designed for creating user interfaces, and Flutter provides many tools and features to help build beautiful and interactive mobile apps.
- For the backend, we picked Spring Boot as our main framework. It's a popular Java-

based tool that makes it easier to create standalone, ready-to-use applications. Spring Boot comes with many pre-set templates and libraries, helping developers build strong and scalable web services quickly. It's simple to use but also includes powerful features like dependency injection, configuration management, and integration tools. This makes it perfect for creating high-performance, large-scale applications while saving time during development.

4.1.3 Database

For our project, we chose MongoDB as our database. MongoDB is a cloud-based database service that takes care of everything for you. It's known for being able to grow with your needs, being dependable, and keeping your data safe. It provided the right tools to store and handle our project's data effectively.

Chapter 5

Results and Discussion

We will present in this section the final results of our project, showcasing the various functionalities and features through screenshots. Each section will focus on a specific aspect of the project, providing a comprehensive overview of its capabilities and benefits.

5.1 Memora Website

5.1.1 Main website page:

This page is displayed when the user first enter the website before signing up/logging in, the main purpose of it is to show the main features in the website, this is the content of it:

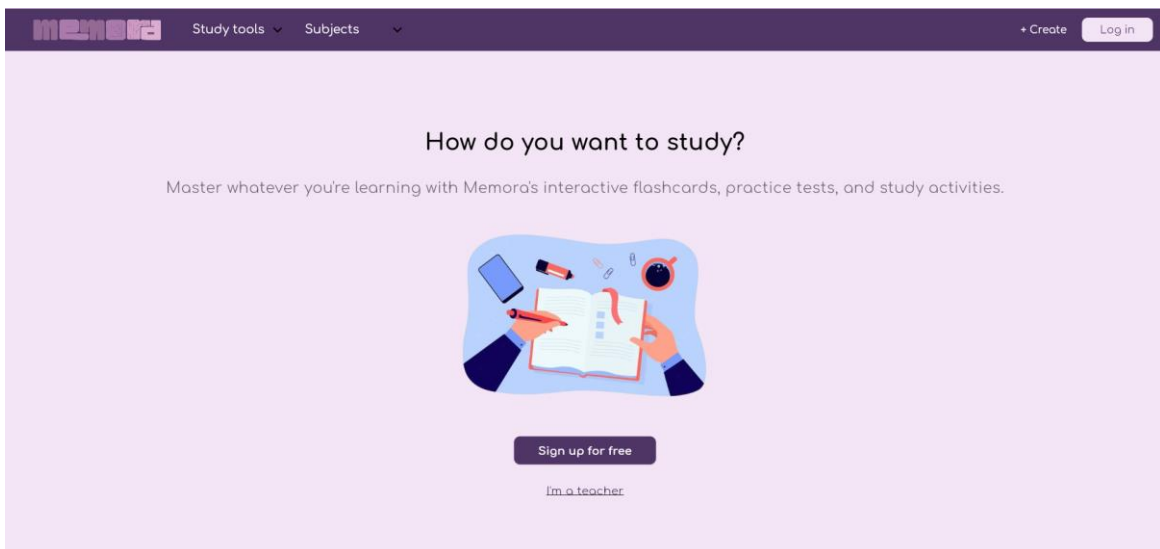


Figure 1: Main website page (1)

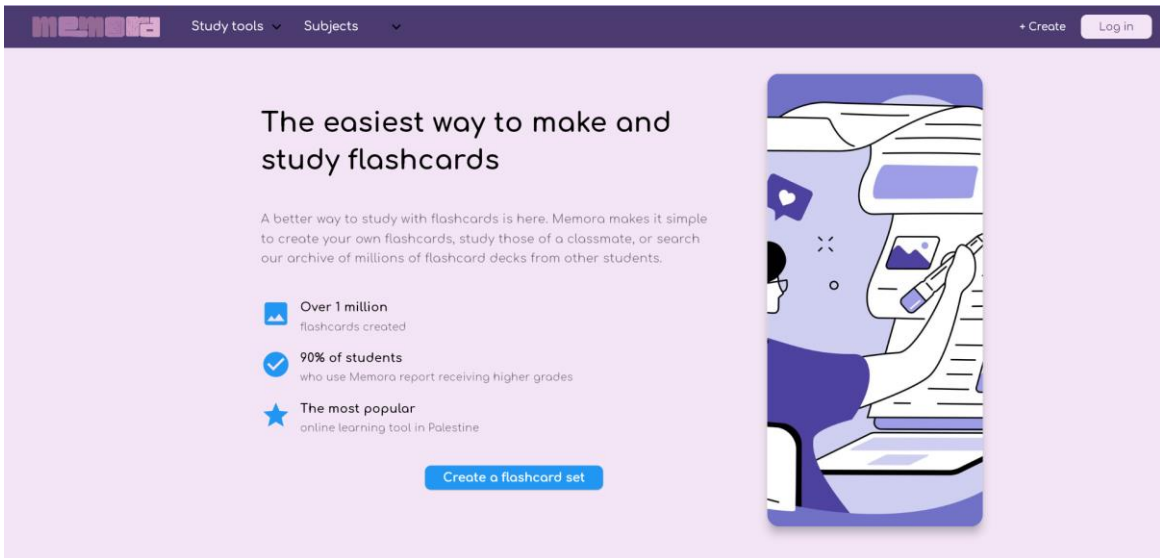


Figure 2: Main website page (2)

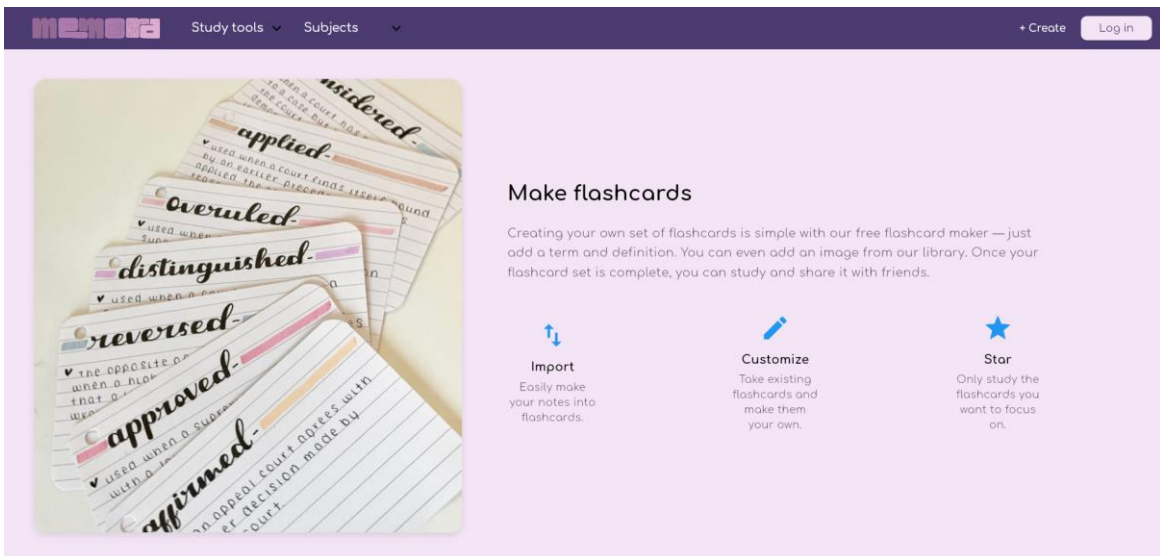


Figure 3: Main website page (3)

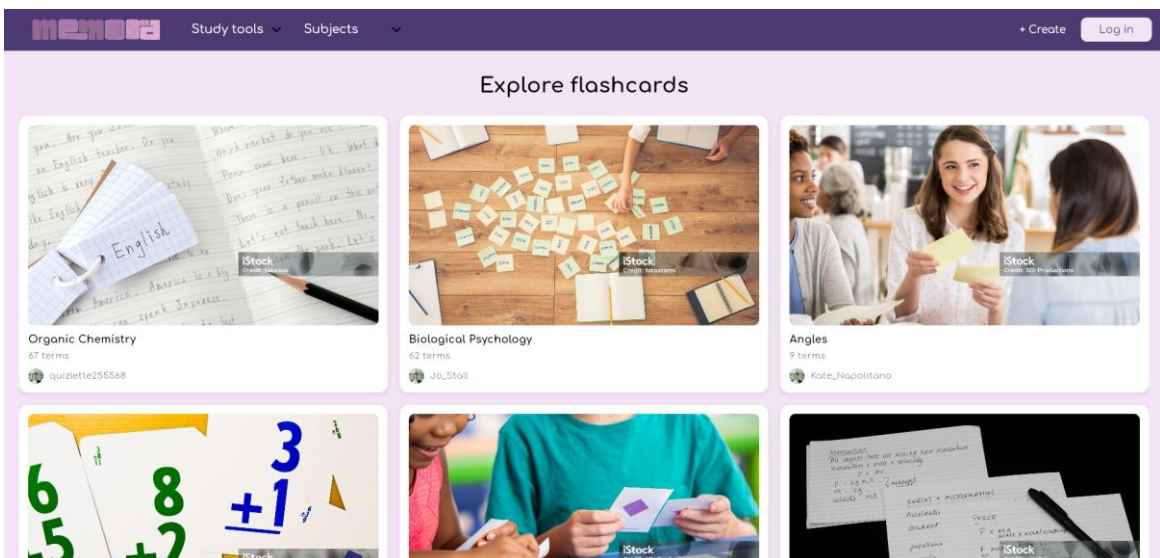


Figure 4: Main website page (4)

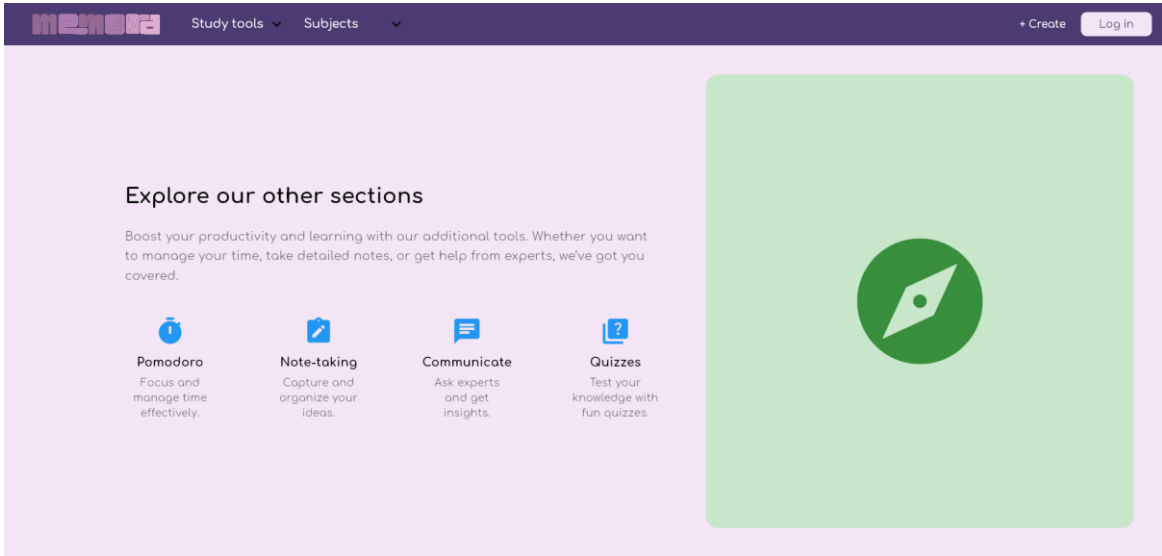


Figure 5: Main website page (5)

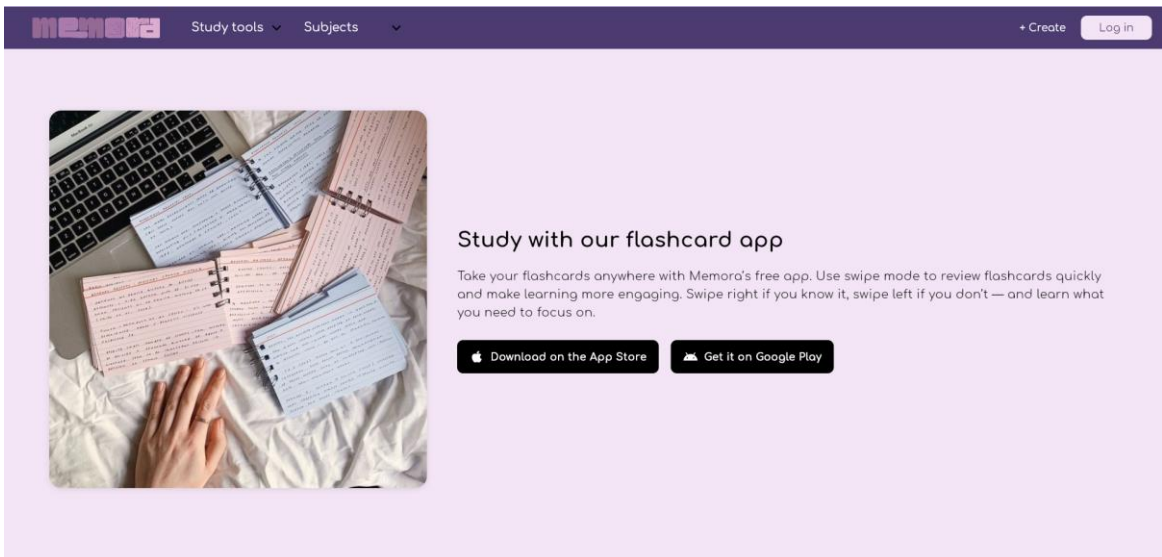
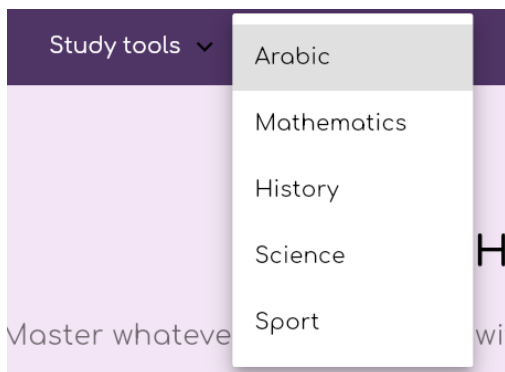


Figure 6: Main website page (6)

Available Subjects:



Available Study tools :

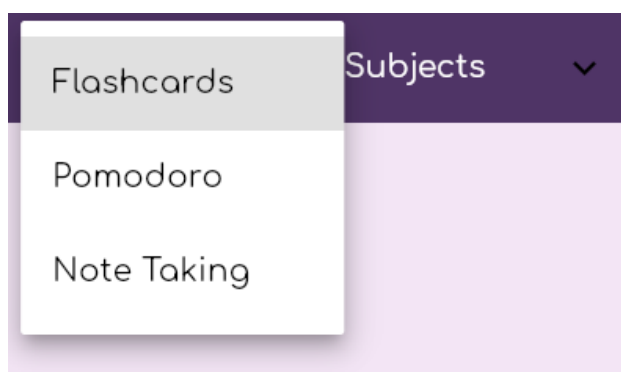


Figure 7: Main website page (options)

When pressing on any button on this page, login popping screen appears:

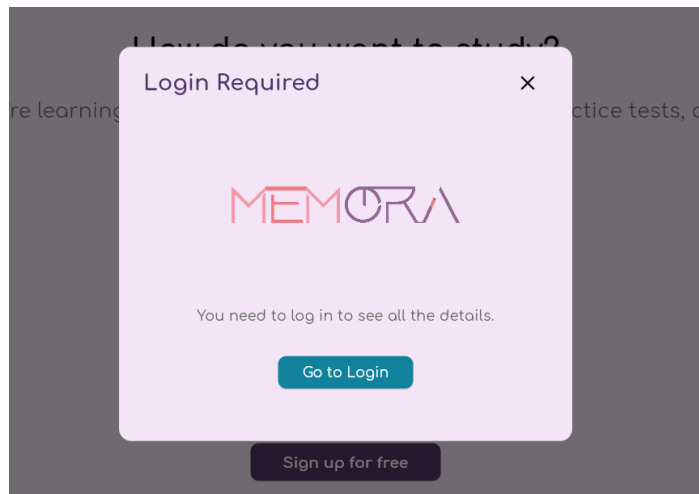


Figure 8: Main website (login popping screen)

5.1.2 Login page:

If the user has previously signed up to the website, he has to log in in order to reach his own dashboard:

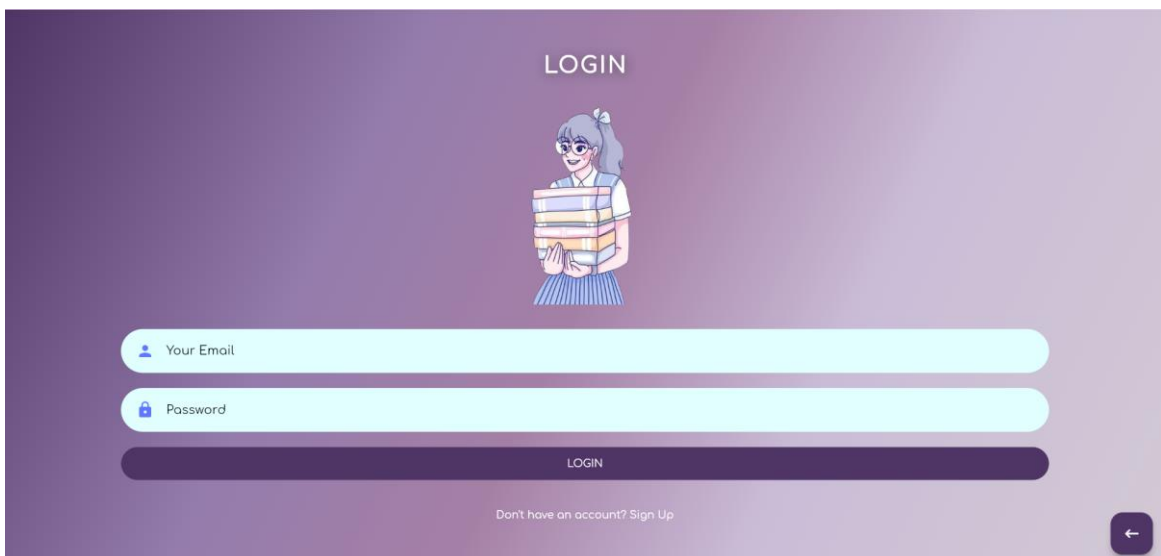


Figure 9: Login Page

- Empty fields:



Figure 10: Login notifications

- Wrongly-structured email:

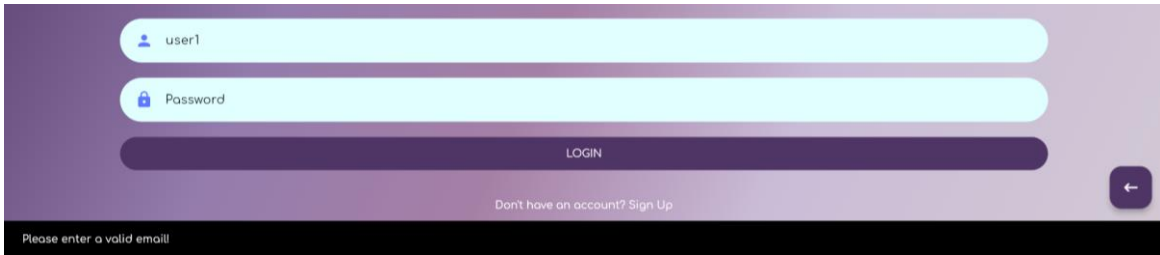


Figure 11: Login notifications (2)

- Empty password:

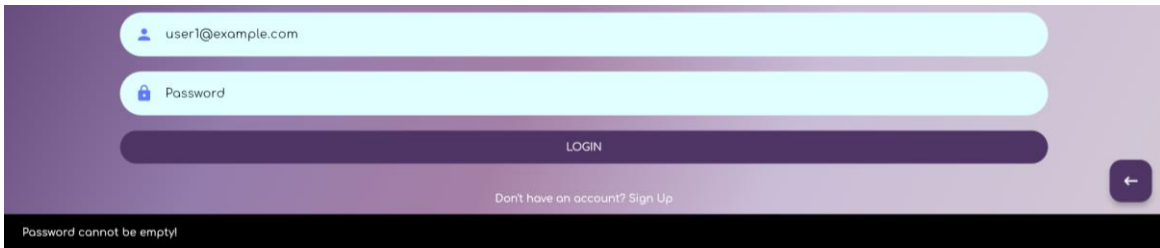


Figure 12: Login notifications (3)

- Empty password:

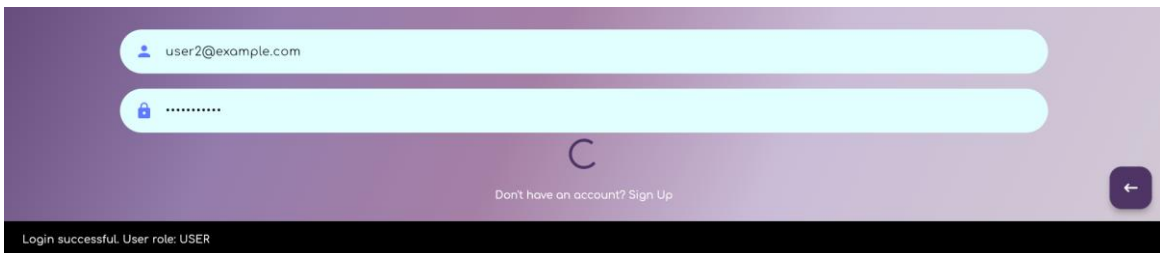


Figure 13: Login notifications (4)

5.1.3 SignUp page:

But if he is a new user, he has to create a new account. This is the sign up page screens.

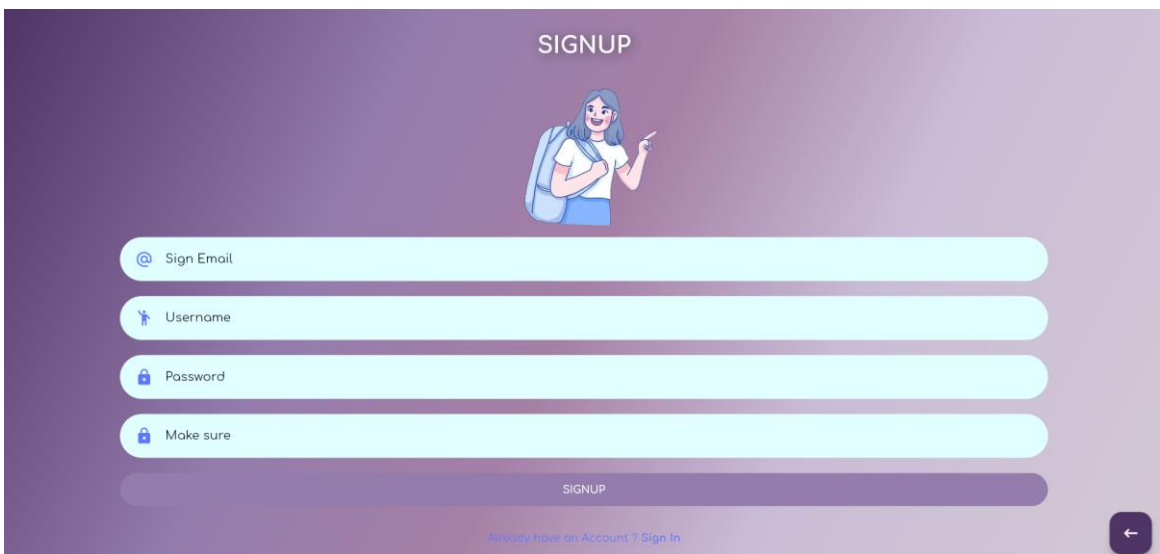
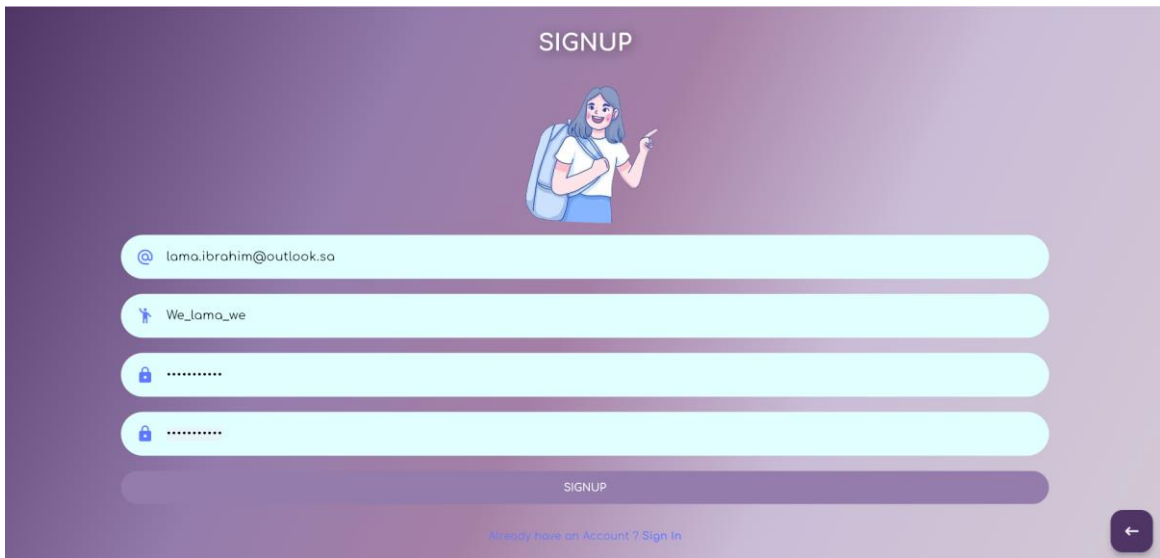


Figure 14: Sign up Page

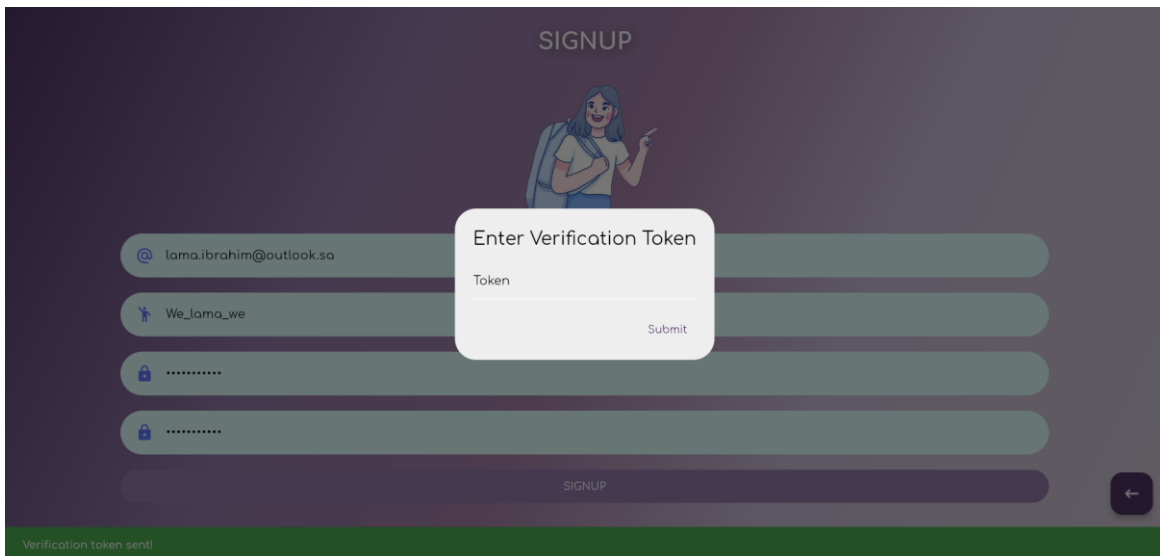
After filling the data:



The screenshot shows a purple-themed SIGNUP form. At the top, the word "SIGNUP" is centered in white. Below it is an illustration of a woman with a backpack. The form contains four input fields: an email field with "@ lama.ibrahim@outlook.sa", a username field with "We_lama_we", and two password fields, both containing dots. A "SIGNUP" button is at the bottom, and a link "Already have an Account ? Sign In" is below it. A back arrow is in the bottom right corner.

Figure 15: Sign up - data filled

And then pressing on sign up button, you won't be signed up until you enter the token that has been sent to your email:



The screenshot shows the same SIGNUP form as in Figure 15, but with a modal dialog box in the center. The modal is titled "Enter Verification Token" and has a "Token" input field and a "Submit" button. At the bottom of the screen, a green bar contains the text "Verification token sent!".

Figure 16: Email Verification

Email sent:

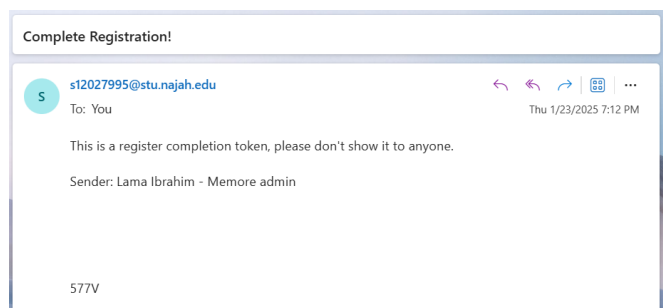


Figure 17: Token sent

After that the user will be asked to determine which role is he:

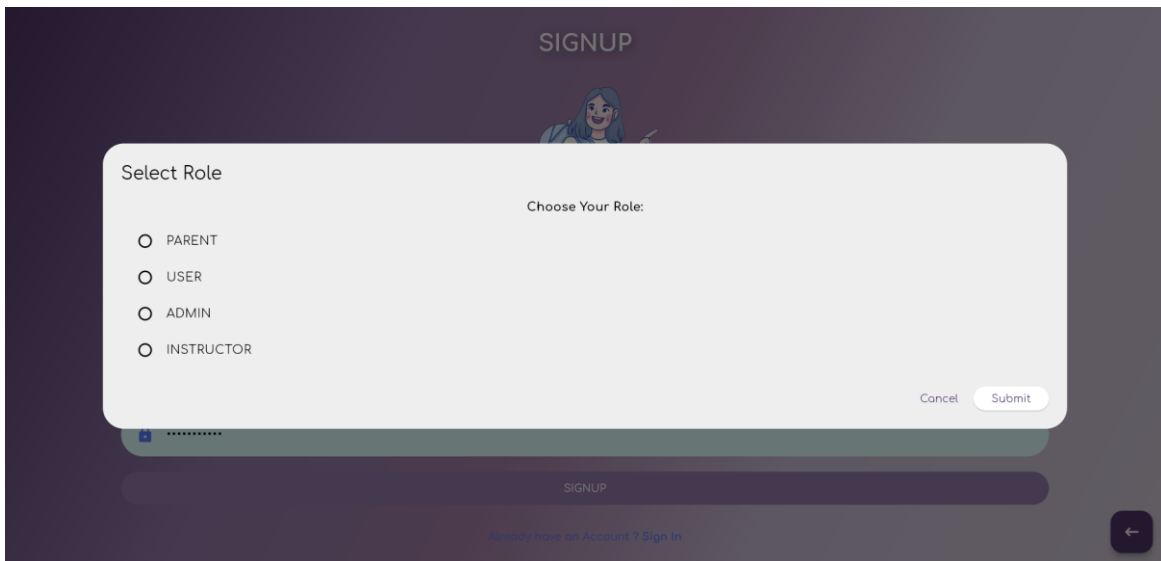


Figure 18: Role Selection

If he was a normal user, successful sign up operation notification will appear and he'll be directed to the login page. But if he was an Admin, he won't be registered until one of the app admins accept him.

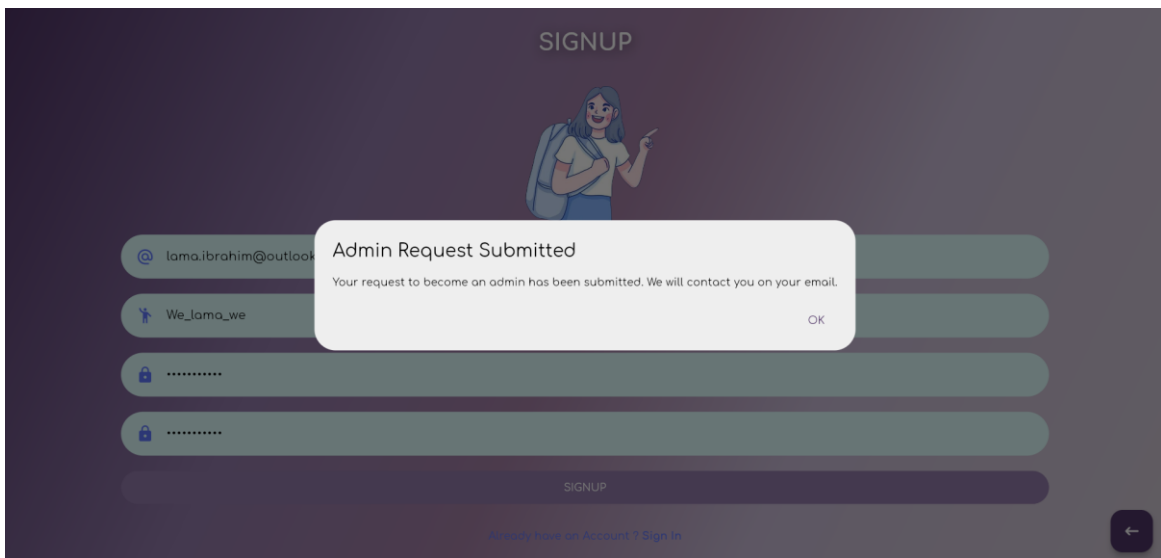


Figure 19: Admin Request Submission

5.1.4 Main Page:

This page contains a summary of main features provided in the application. This is where all public subjects provided by application users are seen:

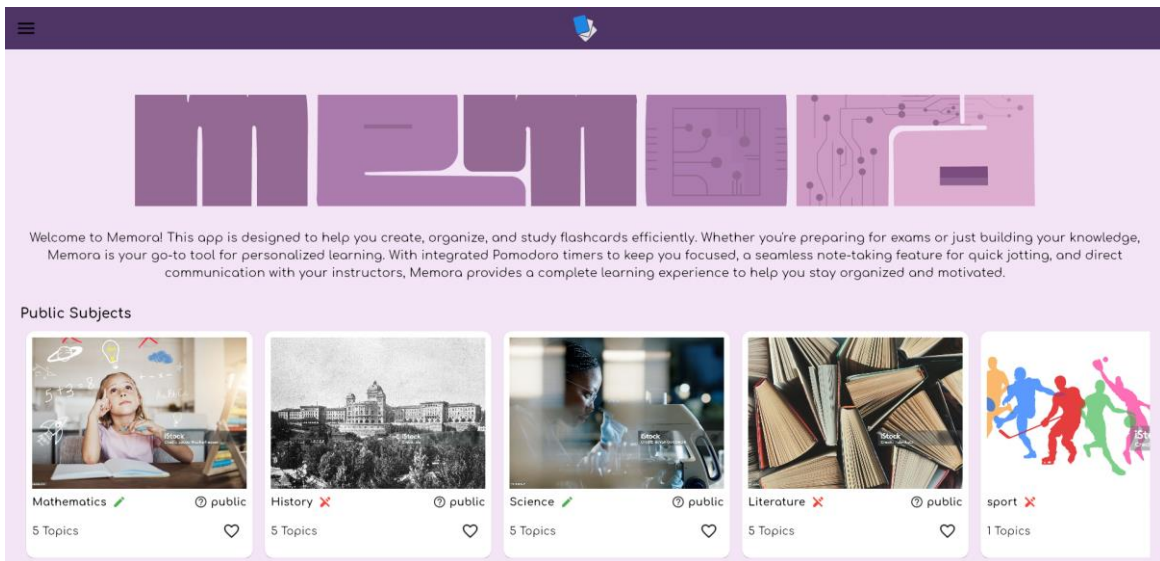


Figure 20: Main Page Sections (1)

Most recently opened topics by the users, as well as a section for the top creators in this application in order to encourage users to participate in the process of creating flashcards:

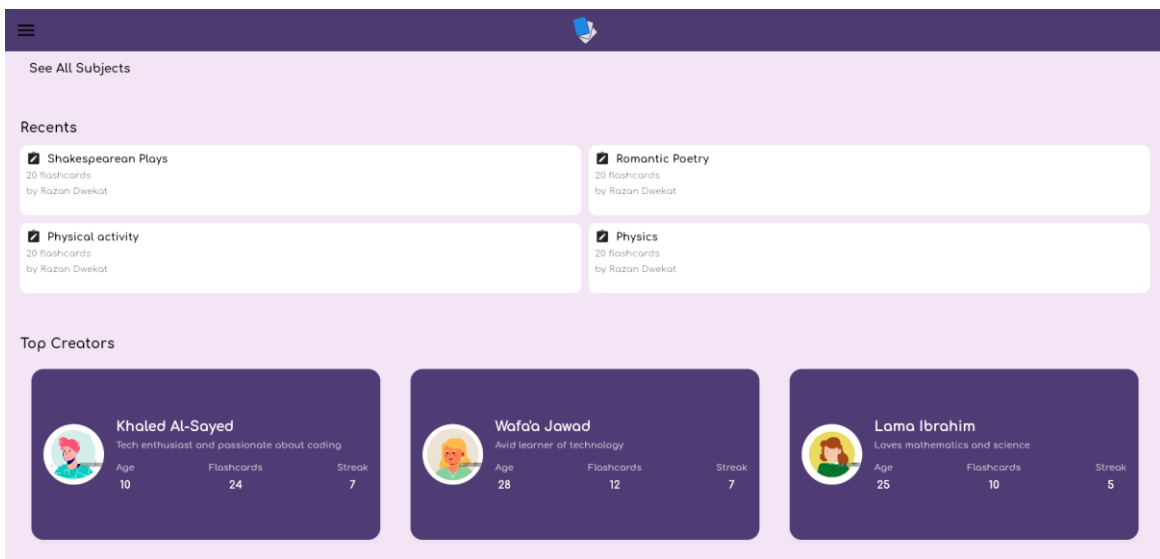


Figure 21: Main Page Sections (2)

In addition, a section for showing the most popular questions asked:

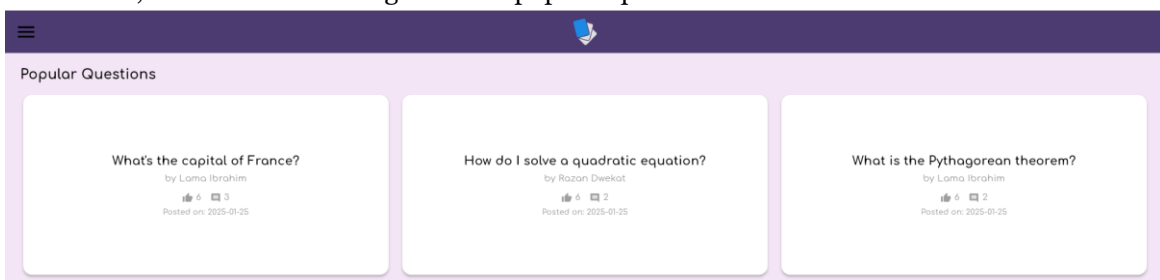


Figure 22: Main Page Sections (3)

Also, a card to lead you to the pomodoro section (You can do a quick pomodoro session here):

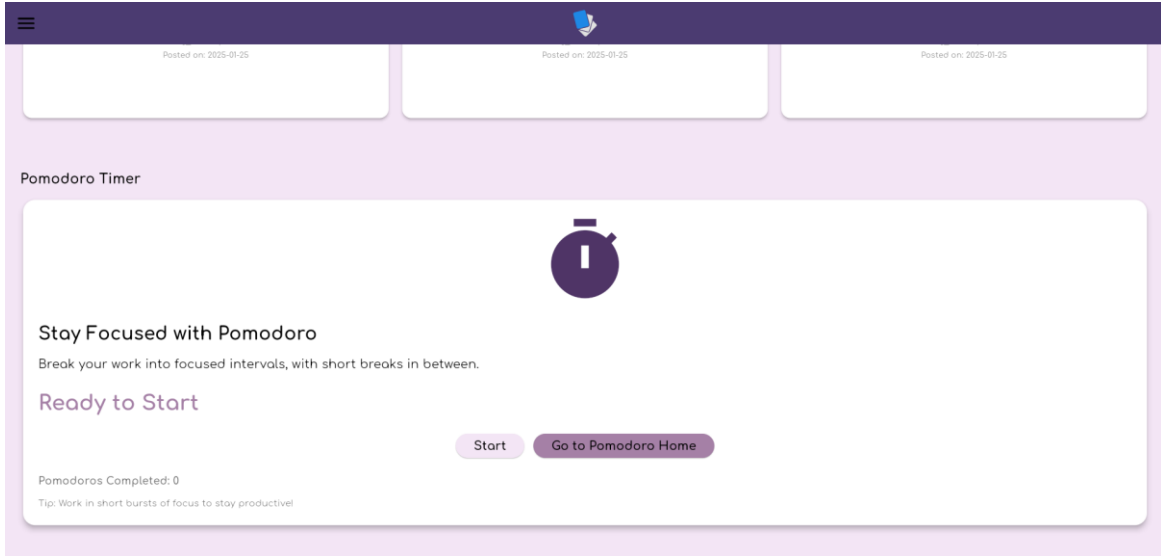


Figure 23: Main Page Sections (4)

The menu drawer:

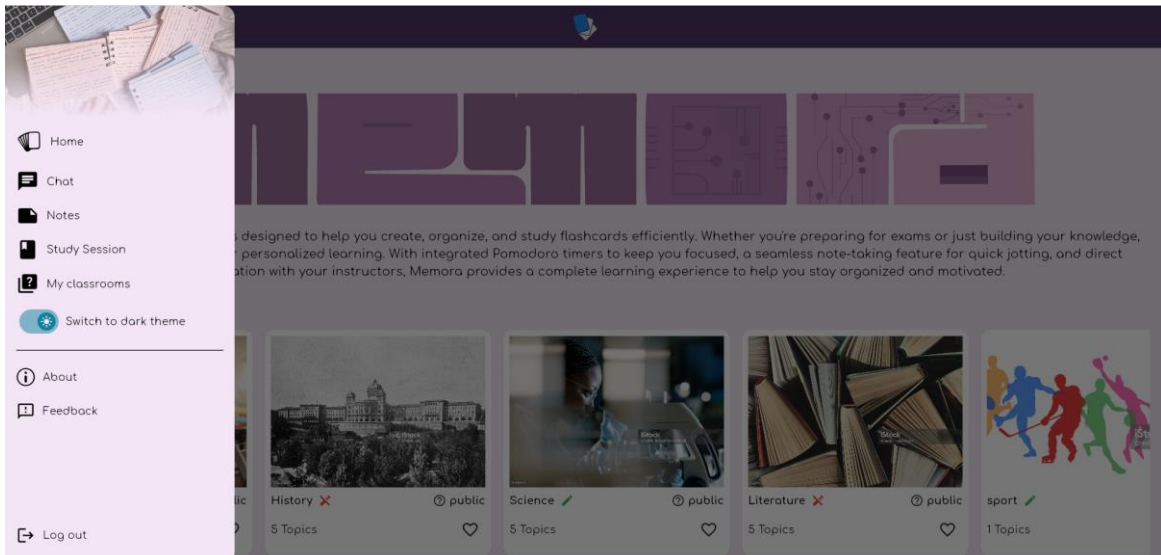


Figure 24: Drawer Menu

5.1.5 Subjects Page:

Flashcards are actually categorized into **topics**(decks or card sets), multiple topics create a **subject**. So when first pressing on “Show all subjects” in the home page, it will lead me directly to the flashcards subjects page which contains two tabs(All subjects and My own subjects):

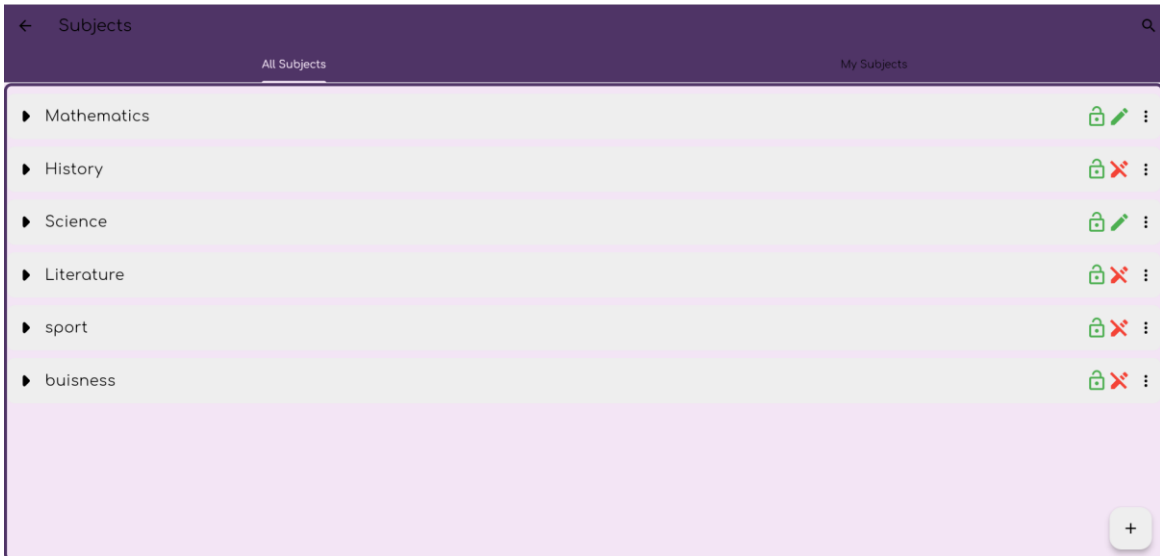


Figure 25: Flashcards - All Subjects

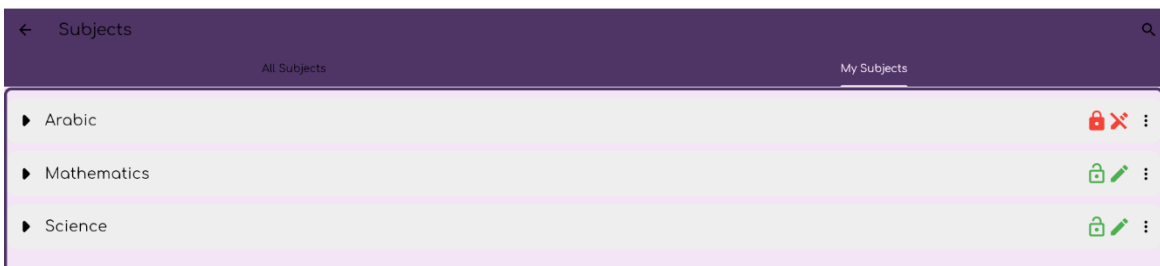
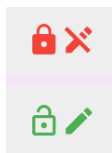


Figure 26: Flashcards - My Subjects

Where:



The red lock -> Private Set.
 The green lock -> Public Set.
 Red pen -> Uneditable(only preview)
 Green pen -> Editable.

Each subject can have multiple topics as shown:

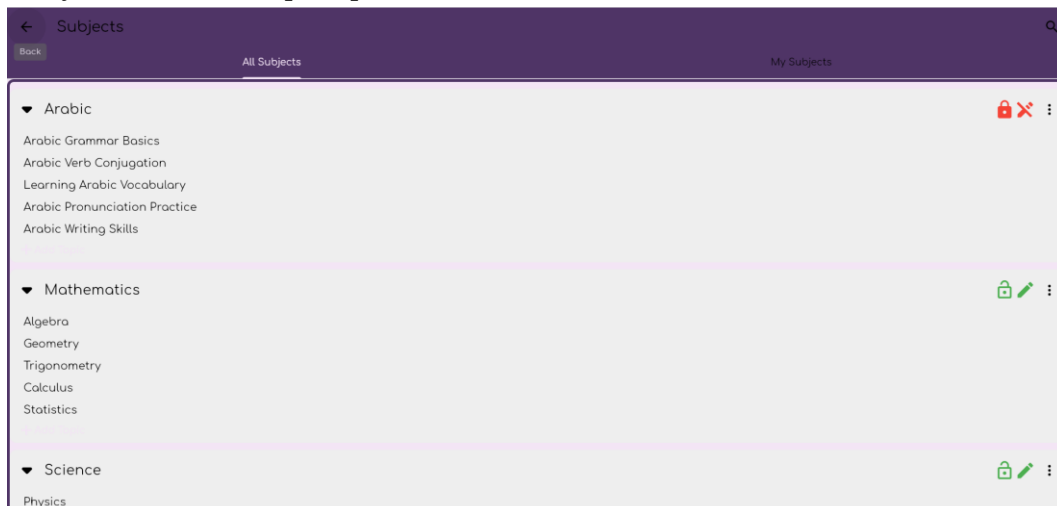


Figure 27: Flashcards - Available Topics

And I have the ability to :

1. Add new subject or modify an existing editable one:

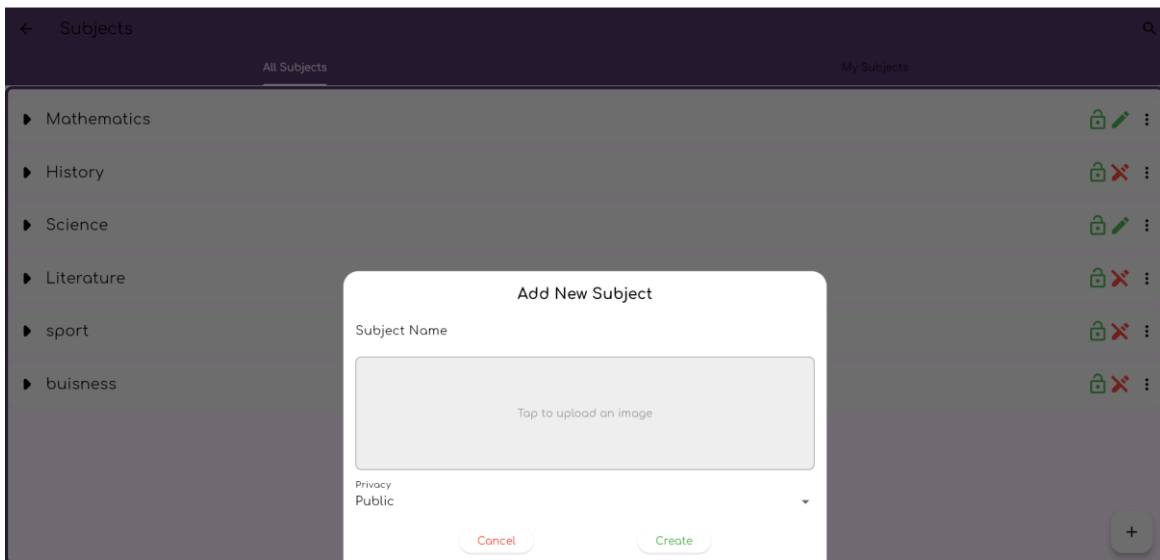


Figure 28: Flashcards - Add New Subject

2. Add new topic for a specific subject, or rename an existing one:

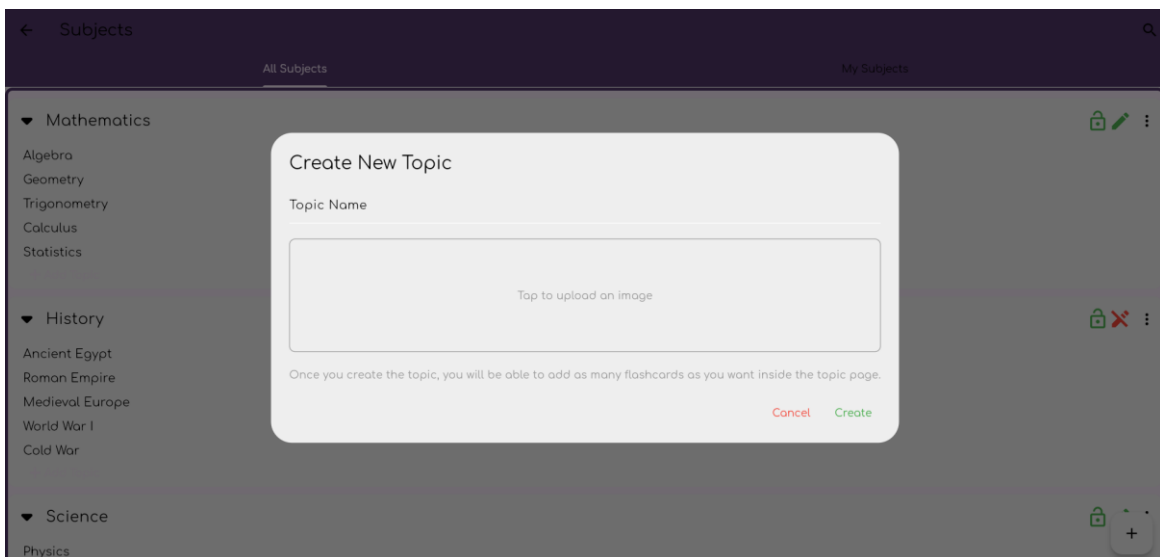


Figure 29: Flashcards - Add New Topic

5.1.6 Flashcard set/Topic page:

This is an example page of flashcard set called “Physics”, it shows the total number of flashcards provided, and the exact number of easy, medium and hard ones. It has multiple things to do. We will show them in details.

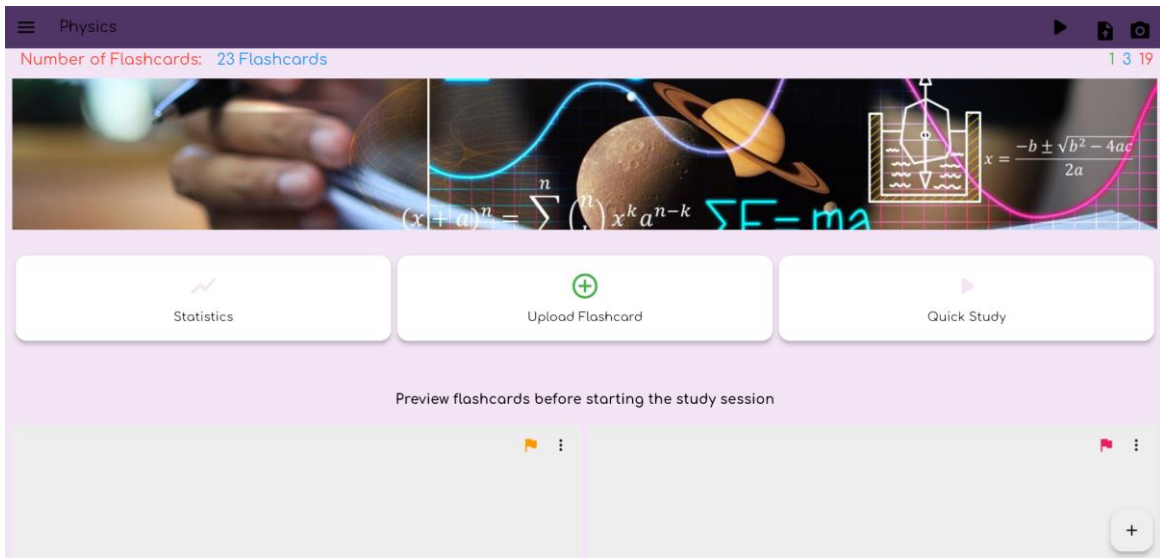


Figure 30: Flashcard Set

Here, you can see an example of two flashcards from this topic:

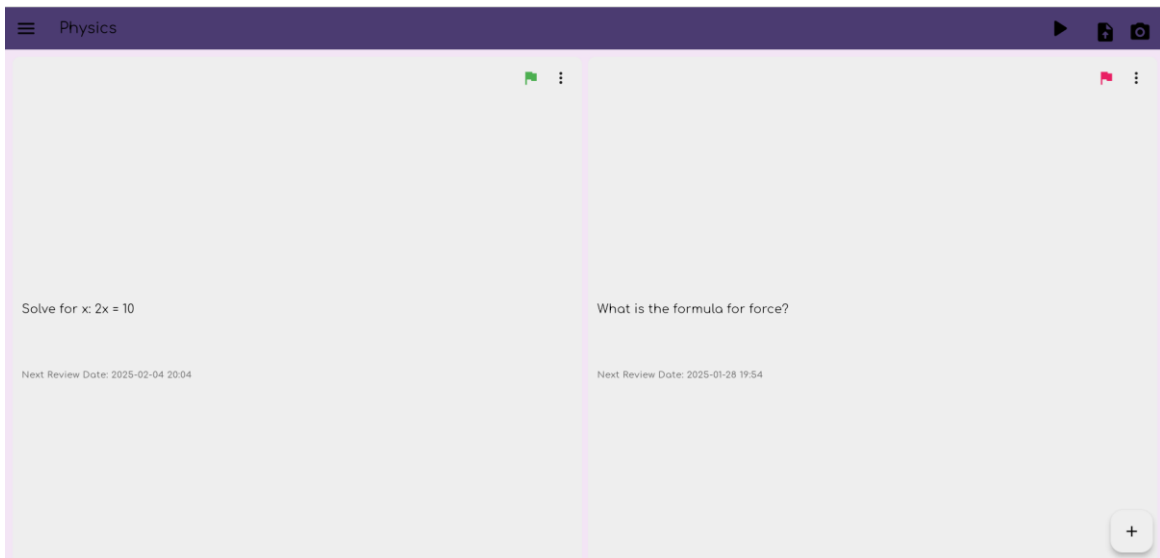


Figure 31: Flashcard Set (2)

You can create a new flashcard, where you can use a rich text editor, and upload an image if you want:

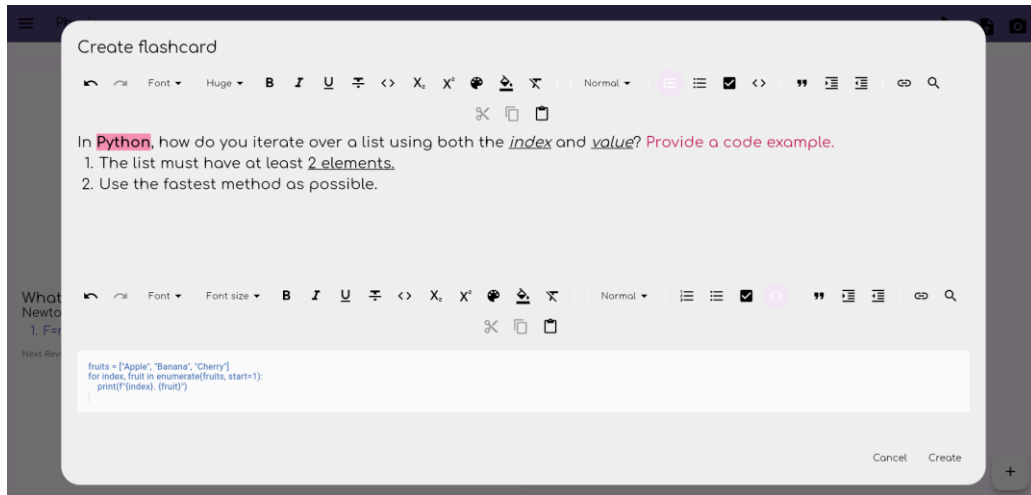


Figure 32: Create New Flashcard

When previewing it 

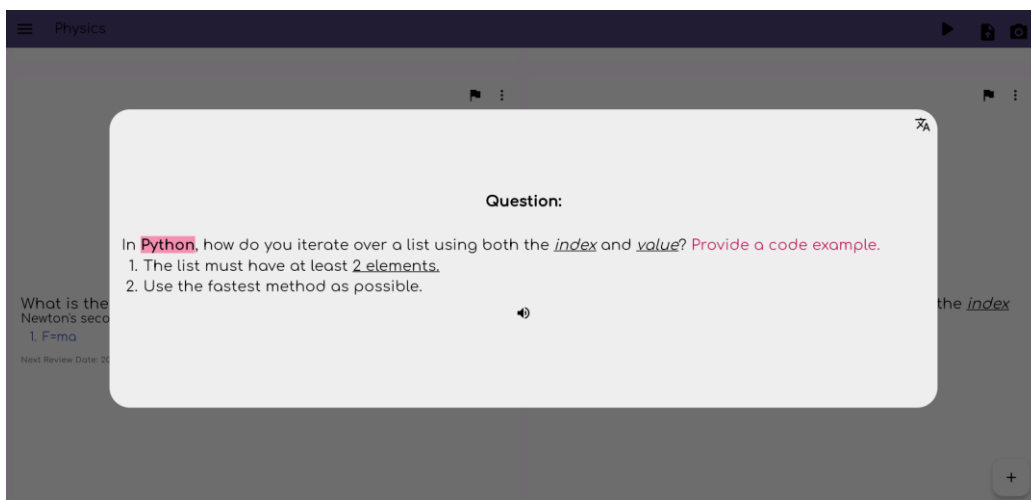


Figure 33: Flashcard Preview - Question Side

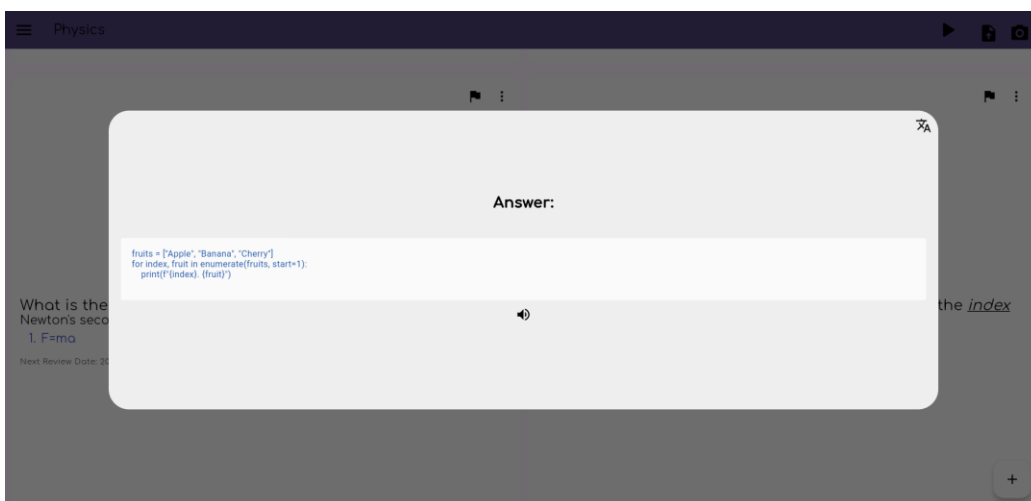


Figure 34: Flashcards Preview - Answer Side

As shown in the previous image, a flashcard can be read by an external voice, or translated to a new language:

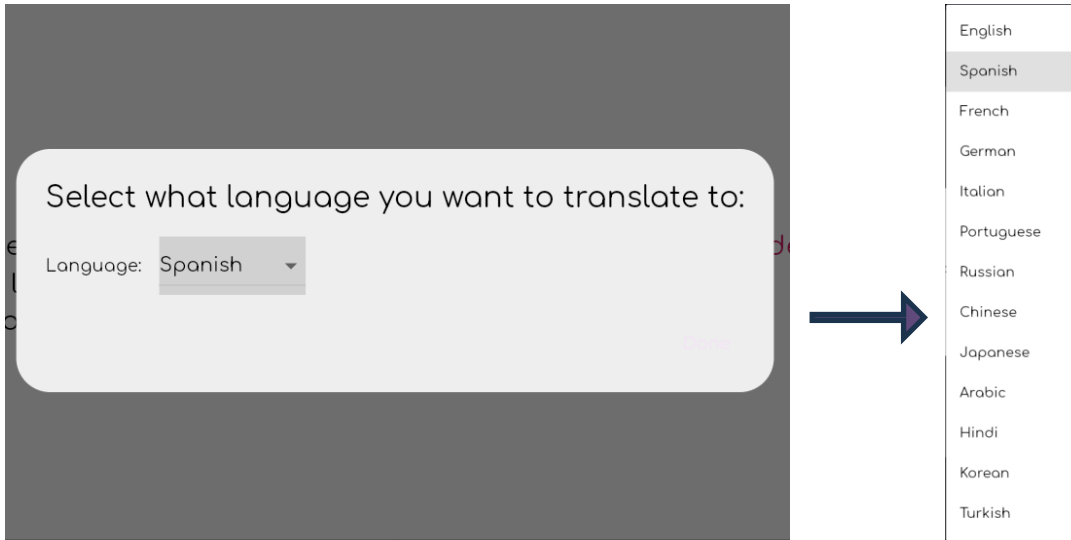


Figure 35: Flashcard Preview: Language Selection

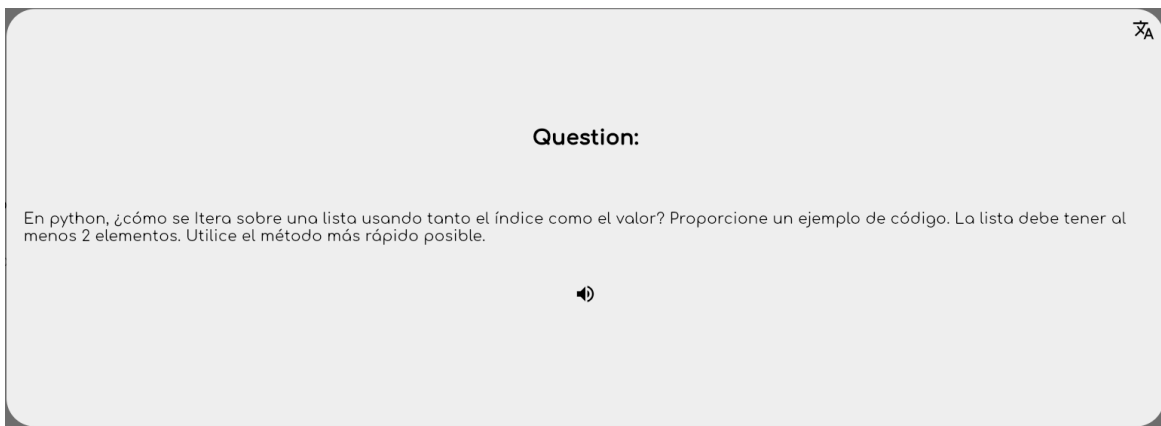
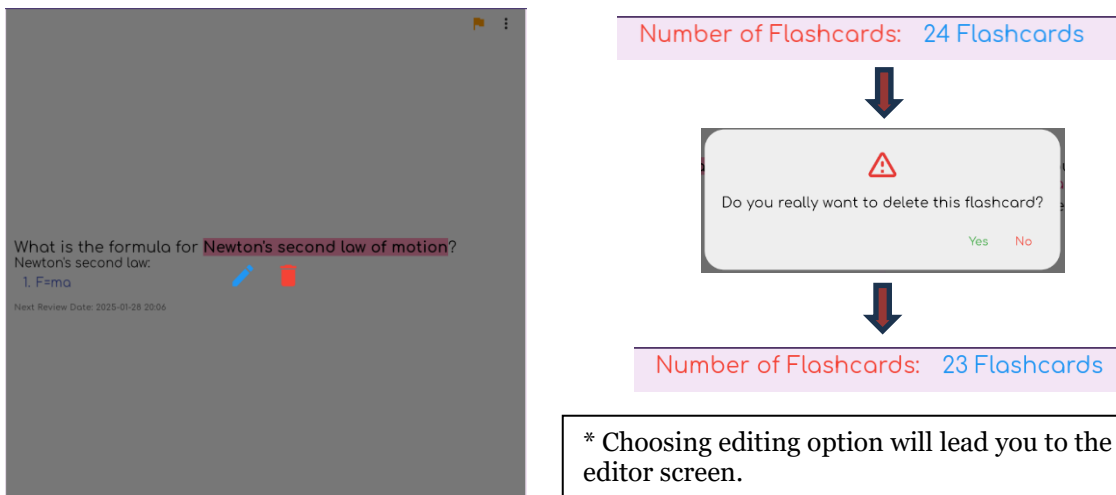


Figure 36: Flashcard Preview - New Translated Flashcard

When clicking a long click on the flashcard, I will have one of two options, either to delete the flashcard or to edit it:



* Choosing editing option will lead you to the text editor screen.

Each flashcard can be categorized using a specific flag color to make it easy for the user to reach the important ones. In addition, the user can :

- Download the flashcard.
- Share it with users in the same app.
- Generate QR code that can be scanned by other users.

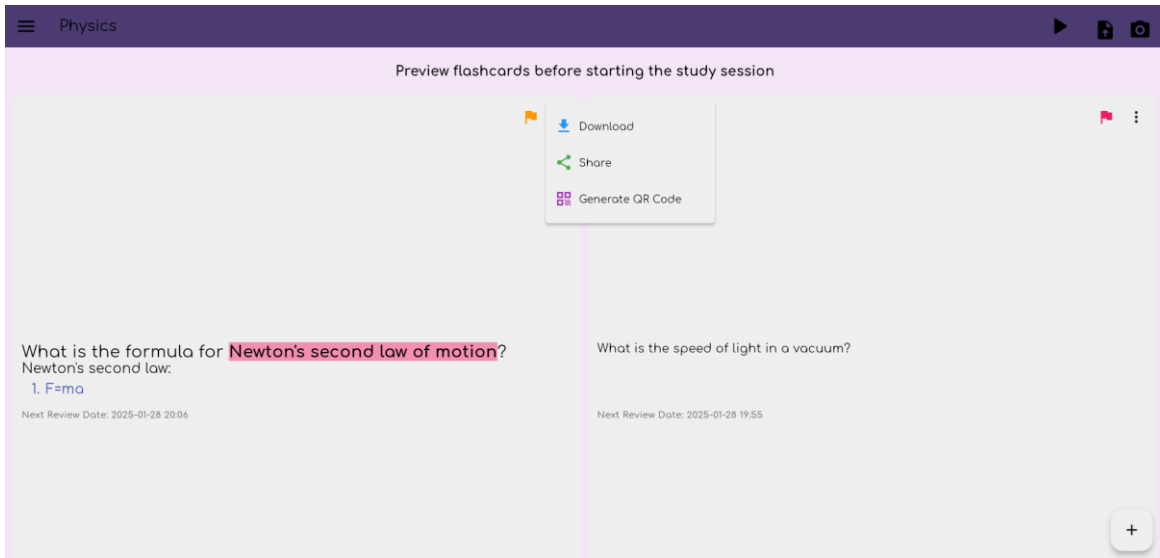


Figure 37: Flashcard Preview - Sharing Options

➤ **On download:**

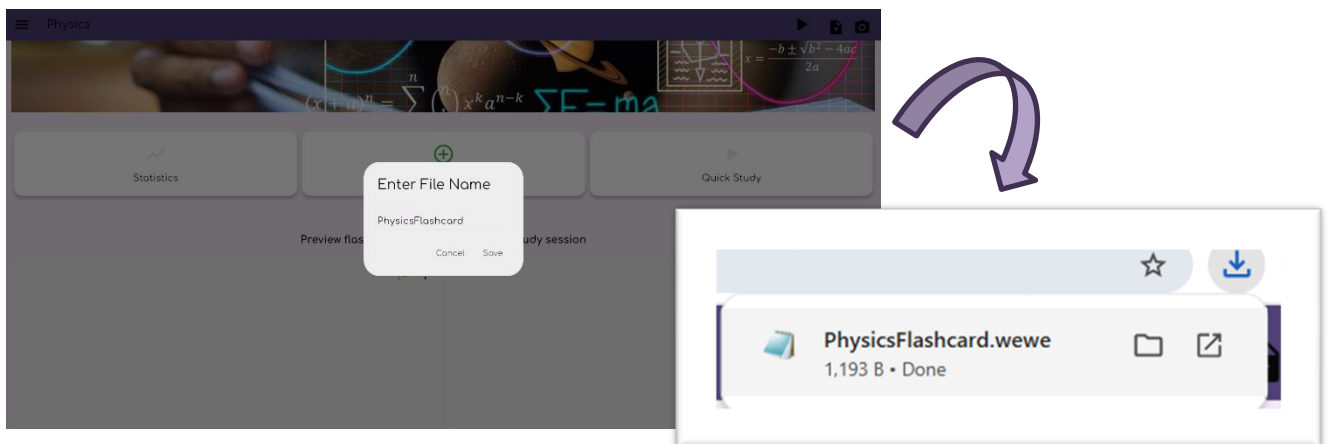


Figure 38: Flashcard Preview - Download

➤ **On share:**

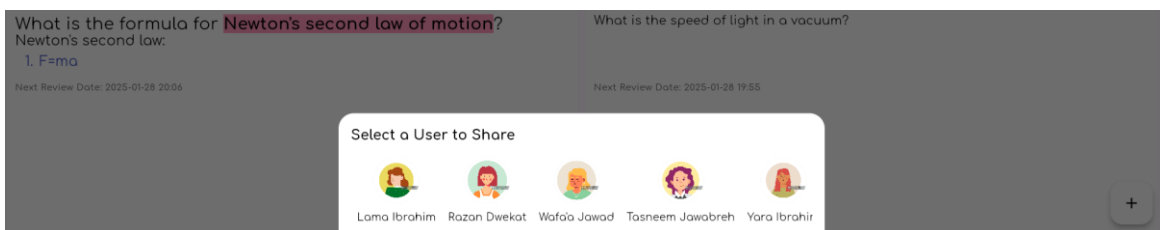


Figure 39: Flashcard Preview - Send As A Message

- Third option, a QR code will be generated for this flashcard, when it will be scanned by another device, it will be automatically opened on their device:



Figure 40: Flashcard Preview - QR Code

Now, let's start with the study sessions feature, where the user chooses to start reviewing all the provided flashcards one by one, and based on his answer the value of the easiness factor of this flashcard will be changed to determine when it's the best time to review this flashcard another time.

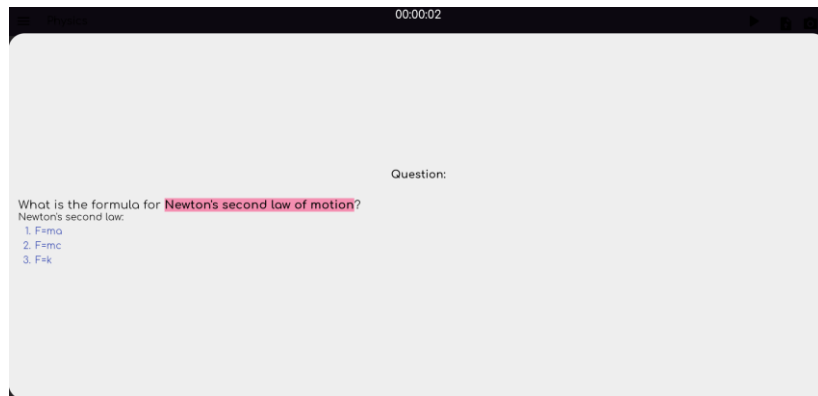


Figure 41: Study Session (1)

The user has to test himself whether he can answer it right or wrong, if wrong he will be taken directly to the next question, while if he answered right he will be asked to rate his answer out of 5:

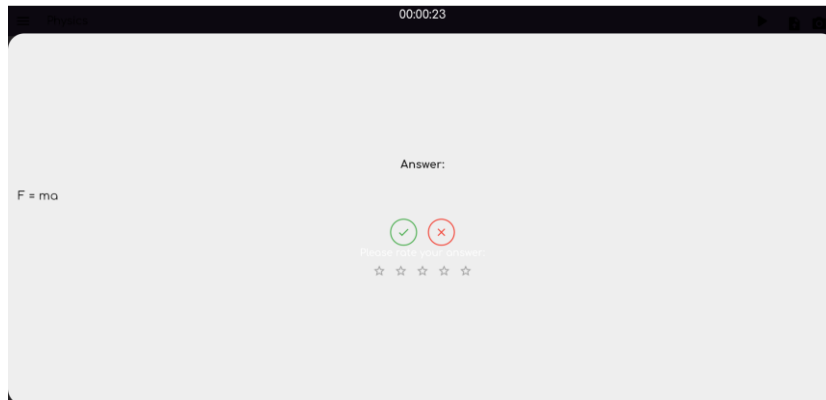


Figure 42: Study Session (2)

Once you go through all of the flashcards on this study session, a feedback will be shown:

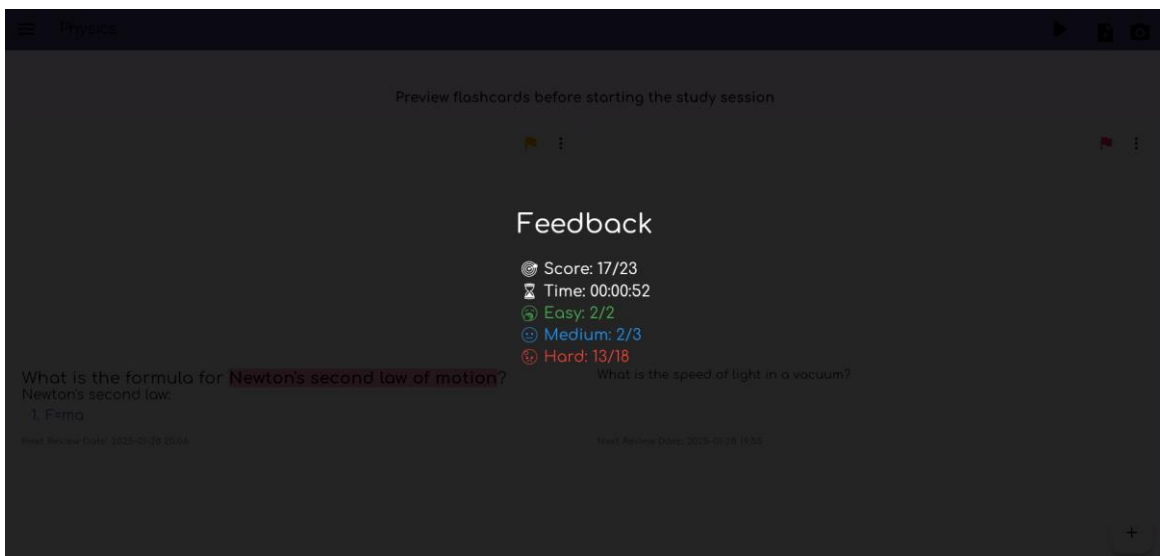


Figure 43: Study Session (3)

And the next review date for each flashcard will be changed based on the user's performance.
 Before: After:



Figure 44: Spaced Repetition Result

You can also do a quick study, the difference between this and the normal one is that your answers won't be taken in consideration, which means they won't affect the easiness factor of the flashcard. This option is used when the user wants to go only through a summary of the provided flashcards "Based on users ratings for those flashcards", or if he has an exam an wants to go through the most important info. You can see that only 10 out of 22 flashcards were shown here:

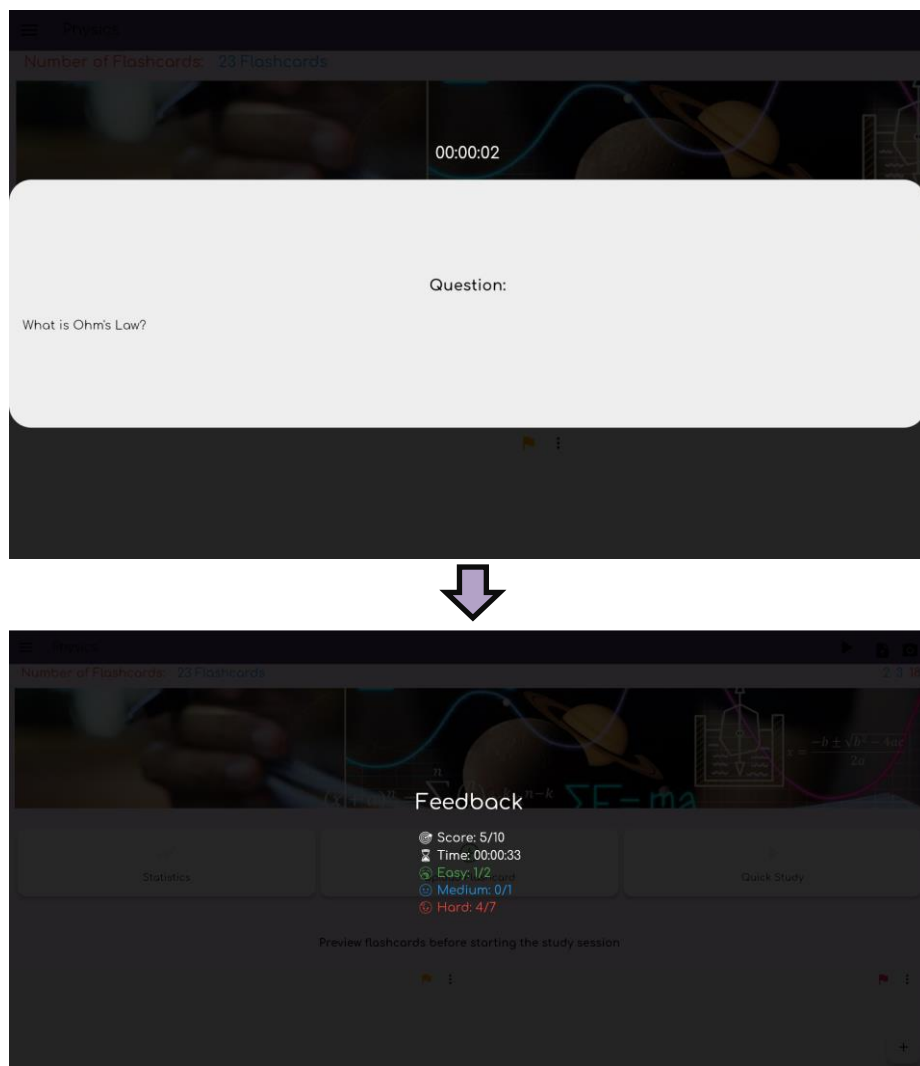


Figure 45: Quick Study Session

When you finish the study session, you can check the statistics of the previous study sessions that you've done for this set:

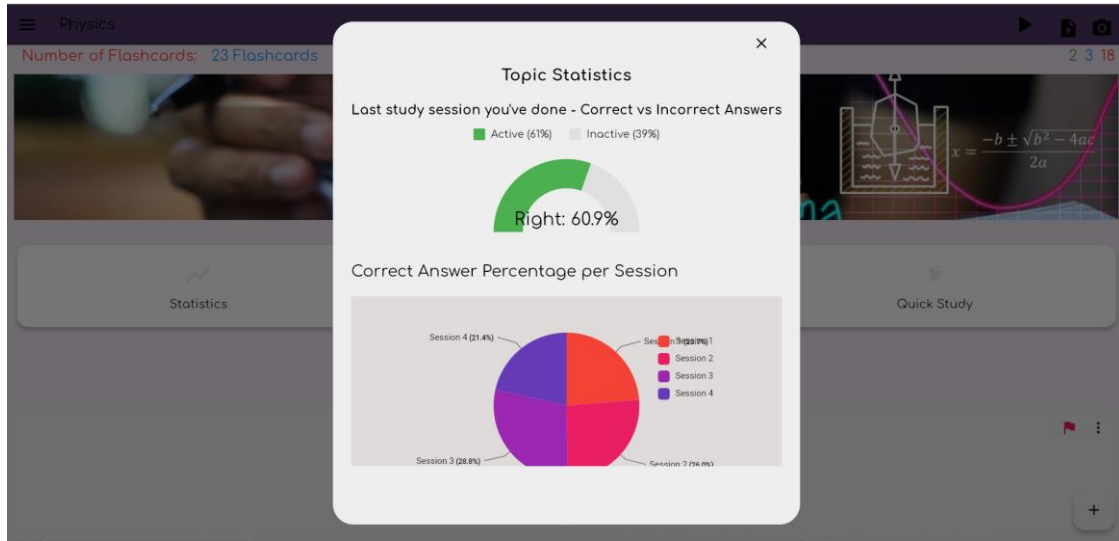


Figure 46: Study Session Statistics

And you can reach all previously done study sessions in the study sessions history option in the menu drawer:

Date	Subject	Score	Time
28	Statistics	60.00%	00:00:12
27	Algebra	50.00%	00:00:06
26	Algebra	50.00%	00:00:08
25	Algebra	100.00%	00:00:06
24	Algebra	0.00%	00:00:11
23	Algebra	0.00%	00:00:13
22	Algebra	50.00%	00:00:05
21	Algebra	50.00%	00:00:07
20	Algebra	50.00%	00:00:05
19	Algebra	100.00%	00:00:07
18	Algebra	100.00%	
11	Algebra	80.00%	00:00:12
10	Statistics	75.00%	00:00:10
9	Statistics	50.00%	00:00:13
8	Statistics	50.00%	00:00:13
7	Statistics	50.00%	00:00:11
6	Statistics	50.00%	00:00:10
5	Ancient Egypt	88.89%	00:01:21
4	Physics	55.00%	00:00:40
3	Physics	66.67%	00:00:56
2	Physics	60.87%	00:01:14
1	Physics	73.91%	00:00:52

Figure 47: Study Session History

You also can upload a previously downloaded flashcard that you already have and add it to this set:

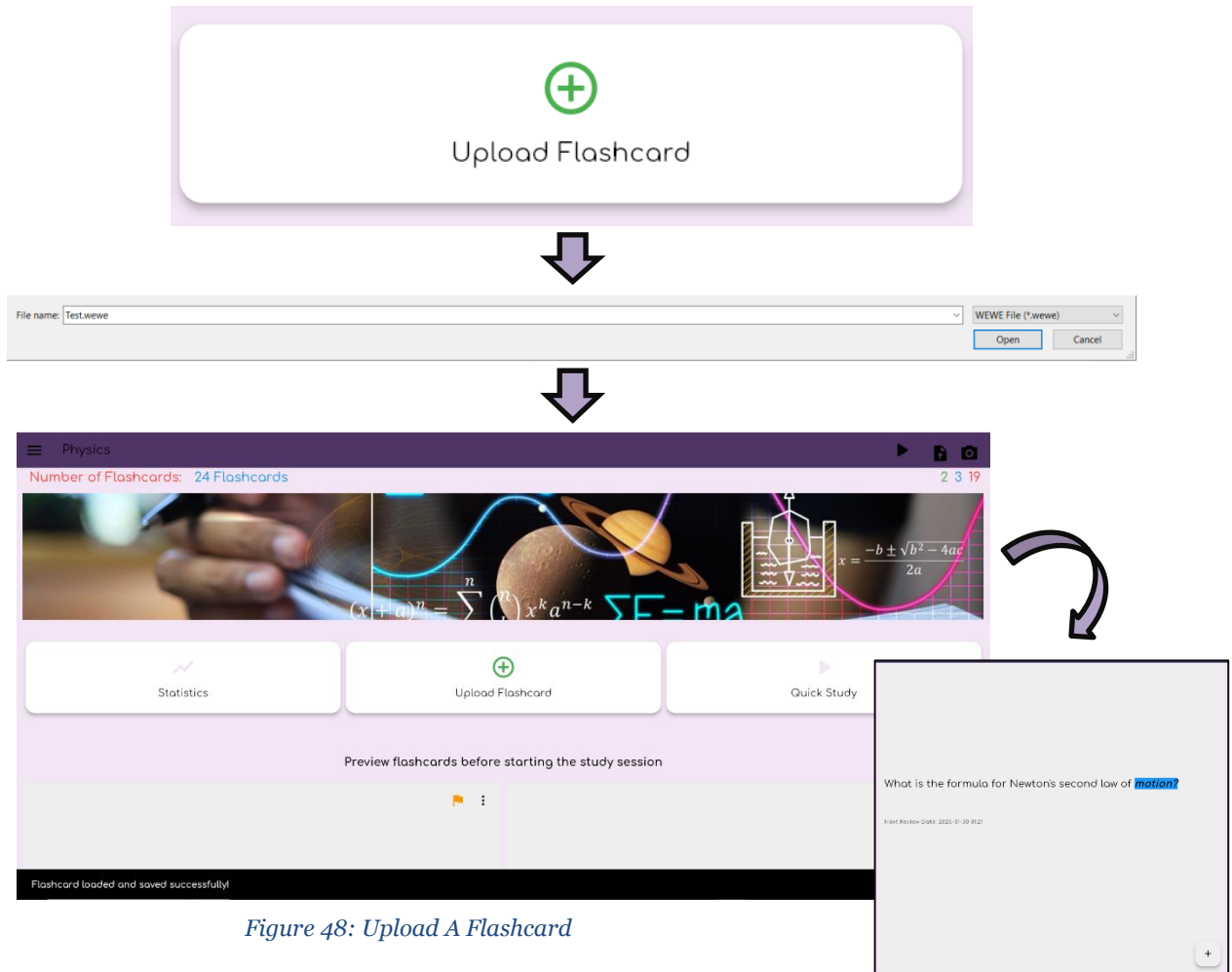


Figure 48: Upload A Flashcard

Last but not least, you can convert any pdf file you have into a set of flashcards. Once you upload your file, it will automatically be classified into the right subject and given a suitable topic using a trained AI model, where more than 4000 paragraphs with their corresponding subjects were used to train it.

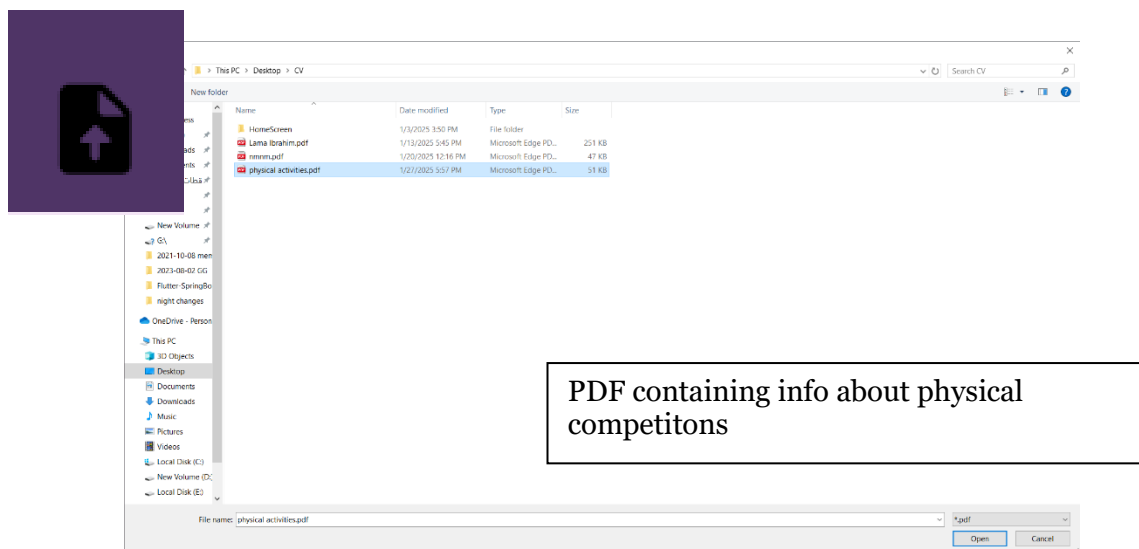


Figure 49: Upload A PDF File

Once this pdf was uploaded, this popping screen will appear:

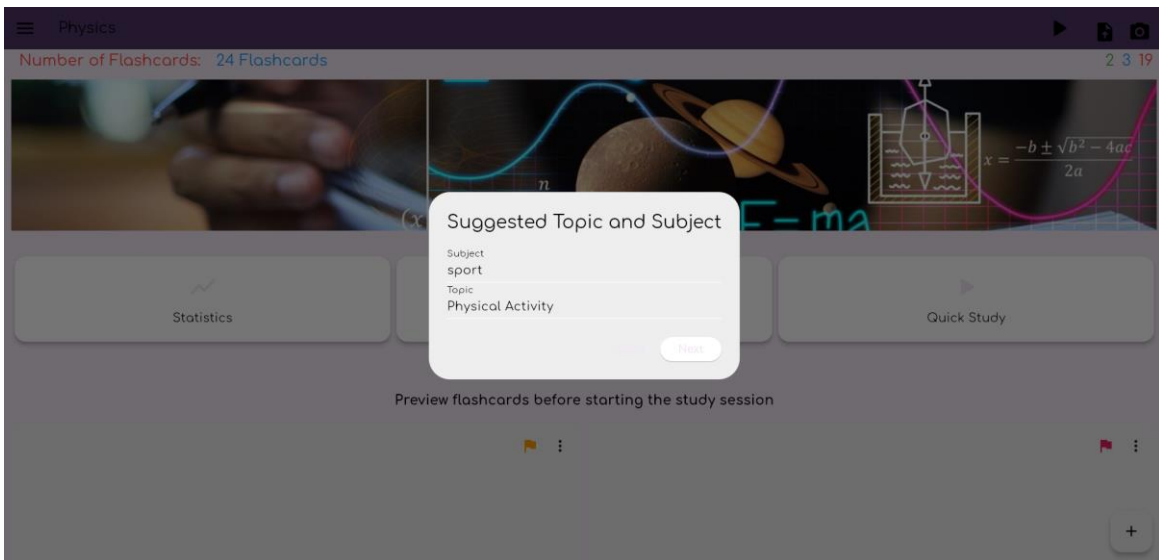


Figure 50: Subject & Topic AI Suggestions

The suggested topic and subject are taken by the AI, but you can change them if you want. After that, you should determine the quantity of the flashcards that you want to create, and the initial difficulty level:

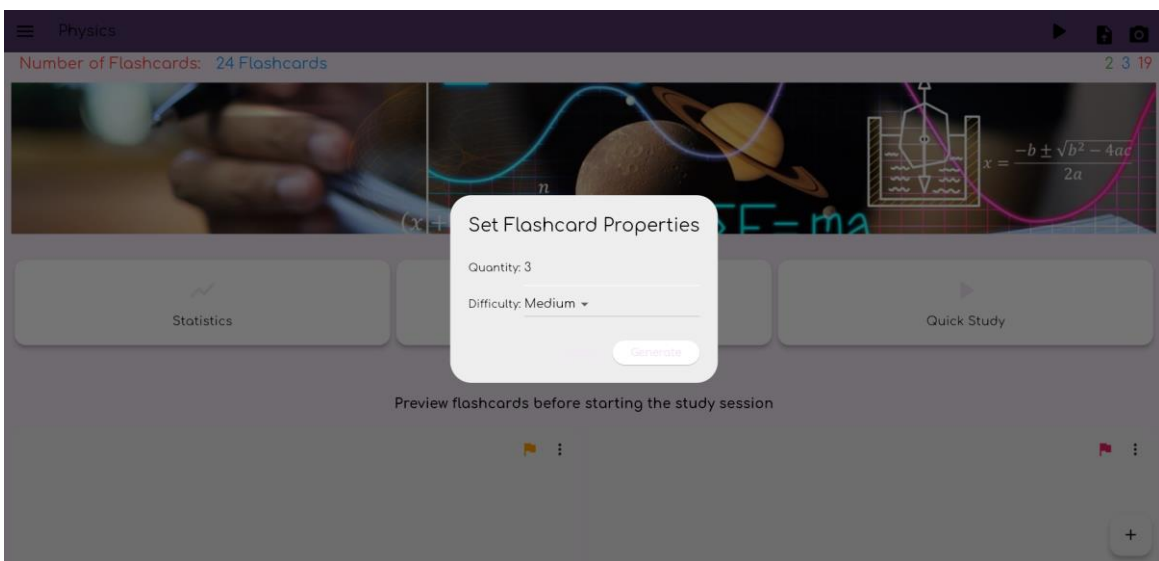


Figure 51: New Flashcards Initial Config



Flashcards generated successfully!



▼ sport
Physical Activity



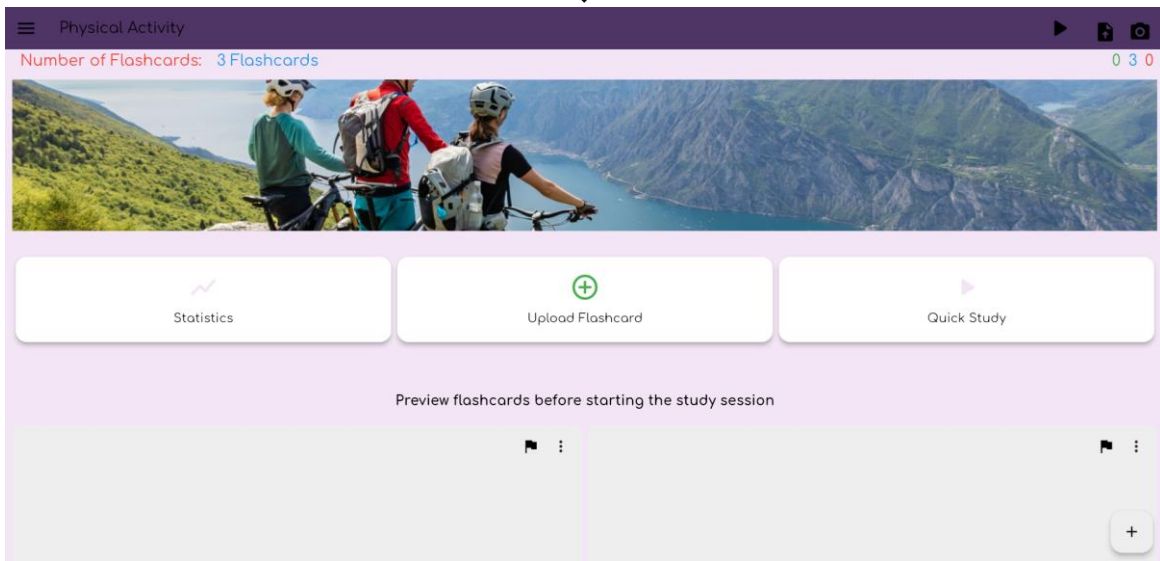


Figure 52: New PDF To Flashcards Set

Note: The uneditable topics you won't be able to add, edit or delete any of its contents. All you can do is to take normal study session, do a quick one or share its content.

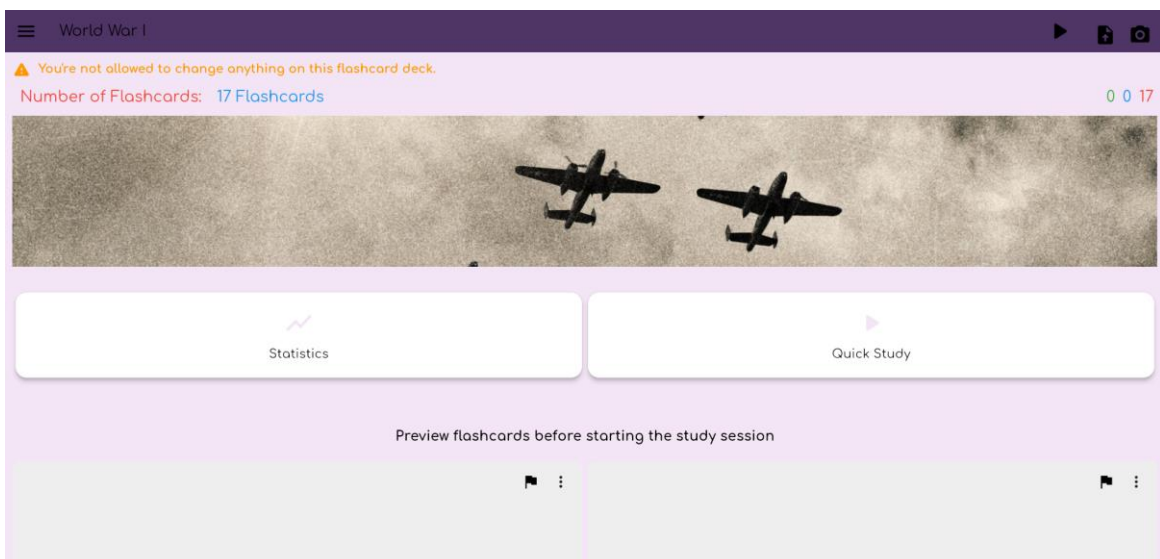
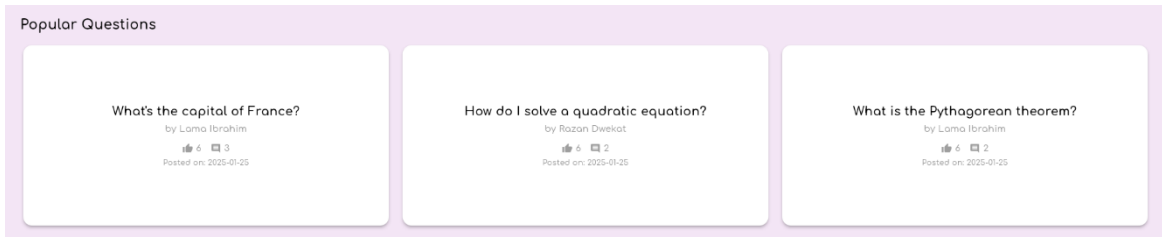


Figure 53: Uneditable Flashcard Set

5.1.7 Questions Dashboard



In this section, users can ask any question and others can answer them on it.

I'm Razan Dwekat, and I've previously asked a question, each question has corresponding tags to make it easy for users to search for questions related to that tag.



Figure 54: Question Preview

As a user, I can Like the post, Add a new comment or even reply to an existing one :

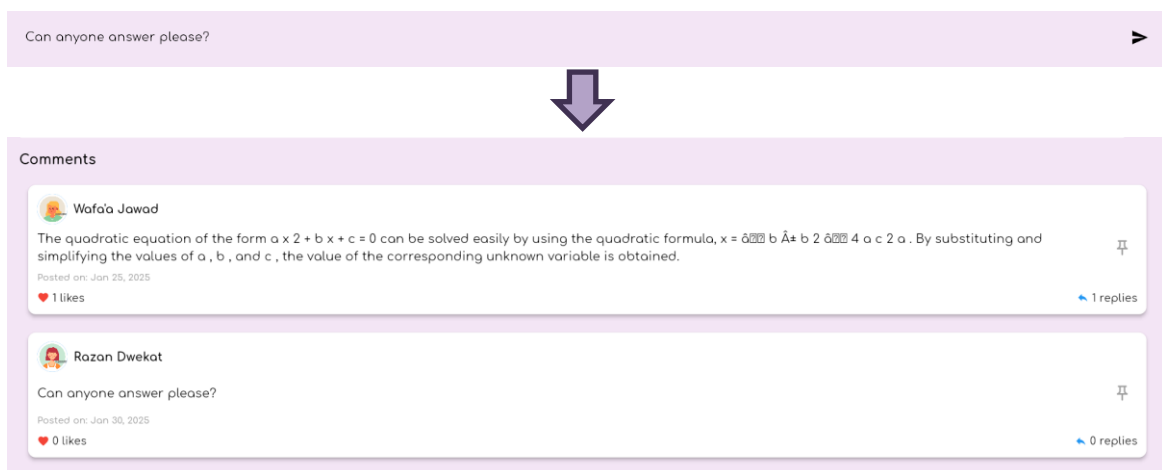


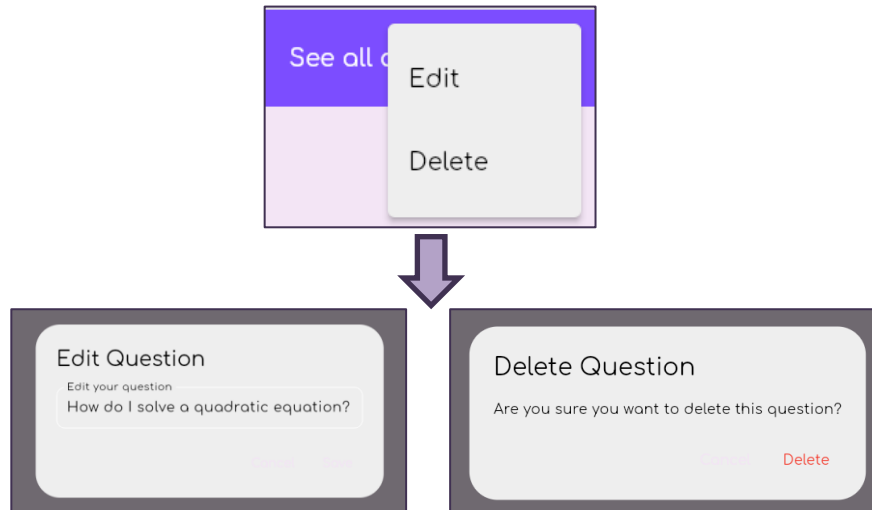
Figure 55: Add A New Comment

Once I find the best answer, I can pin this answer so that anyone can see it as the first one, and toggle the state of the question from being unsolved to solved, so that no one else can add a new comment :



Figure 56: A Solved Question Screen

I have an option to edit or delete the question as well.



Instructors can ask questions or add comments as well:

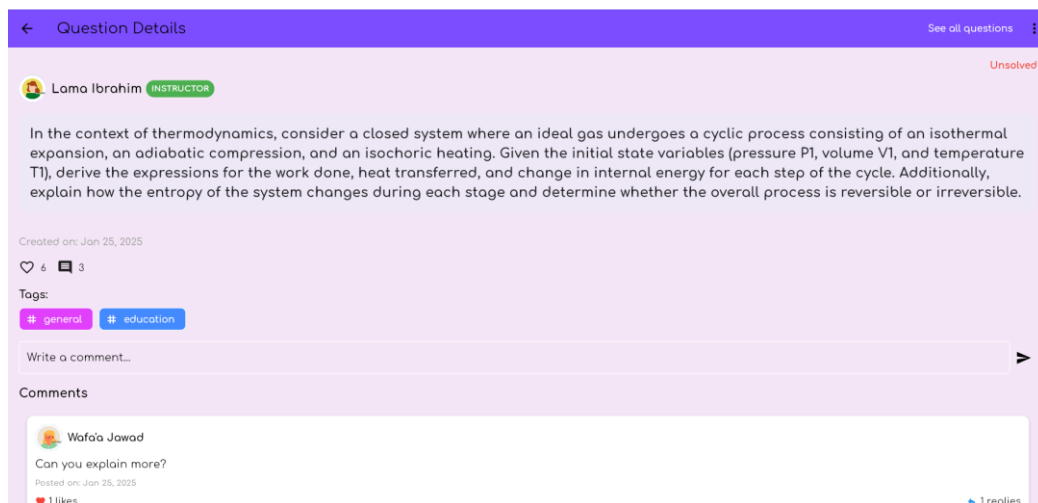


Figure 57: Instructor's Post

This is where all questions asked in the app appear, my own question or questions asked by others. I can post a new question if I want:

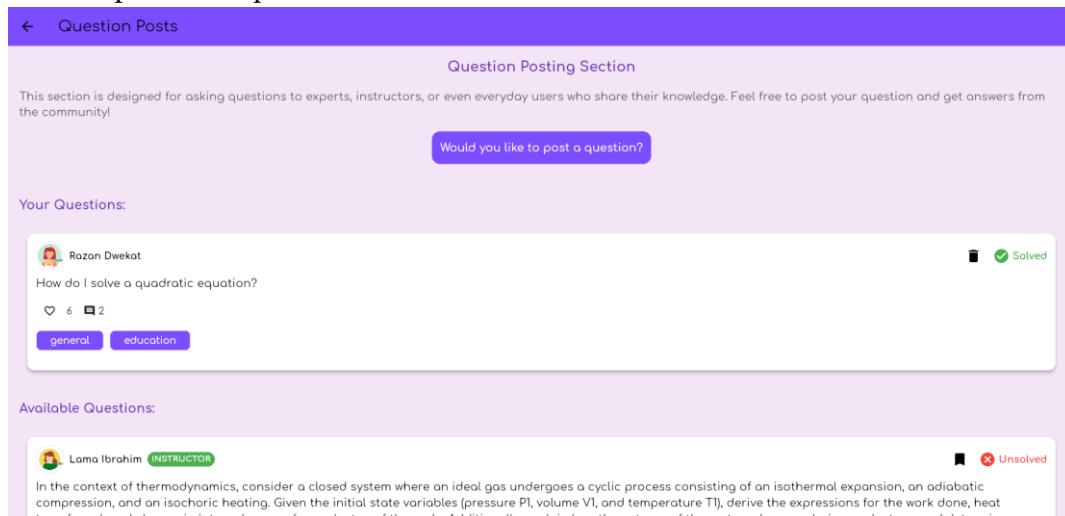


Figure 58: Questions Dashboard

When posting a question, I have the ability to insert an image, pdf file or upload an existing flashcard:

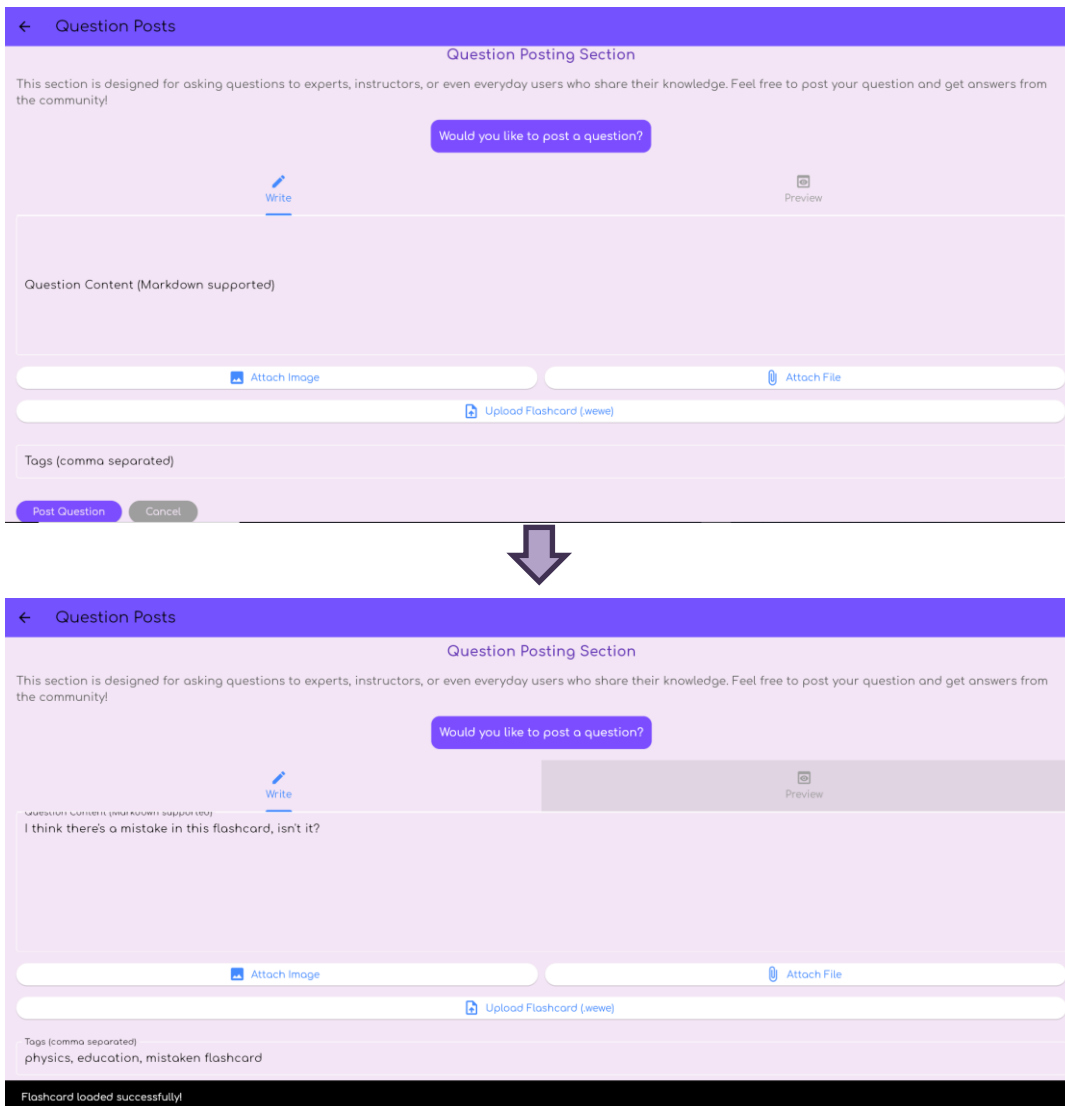


Figure 59: Posting A Question



Figure 60: New Question Post

By pressing on **“Go to this flashcards set”**, I can visit the set that this flashcard was taken from if it's public and exists in the app:

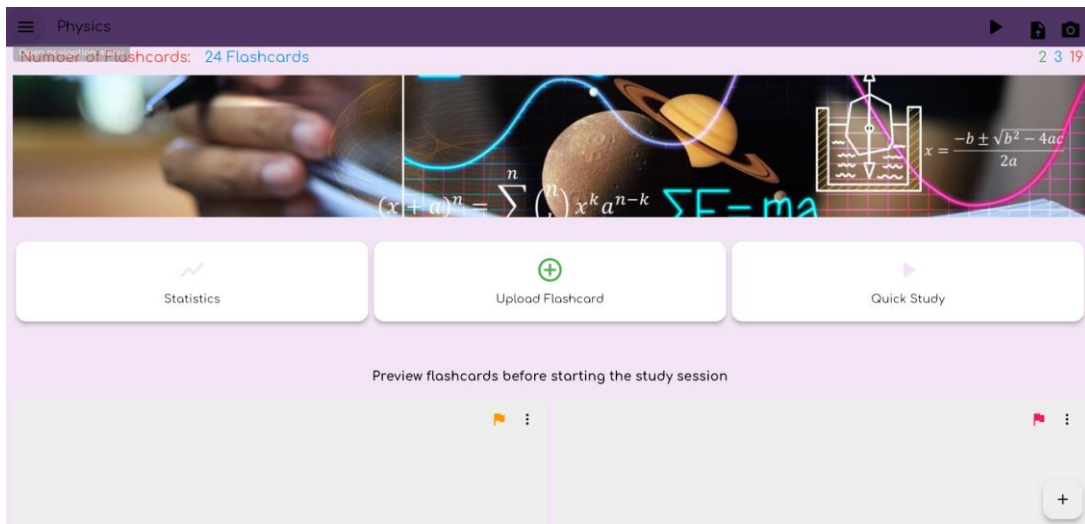


Figure 61: Navigating To A Flashcard Set

I have the ability to filter the questions provided in the app based on:

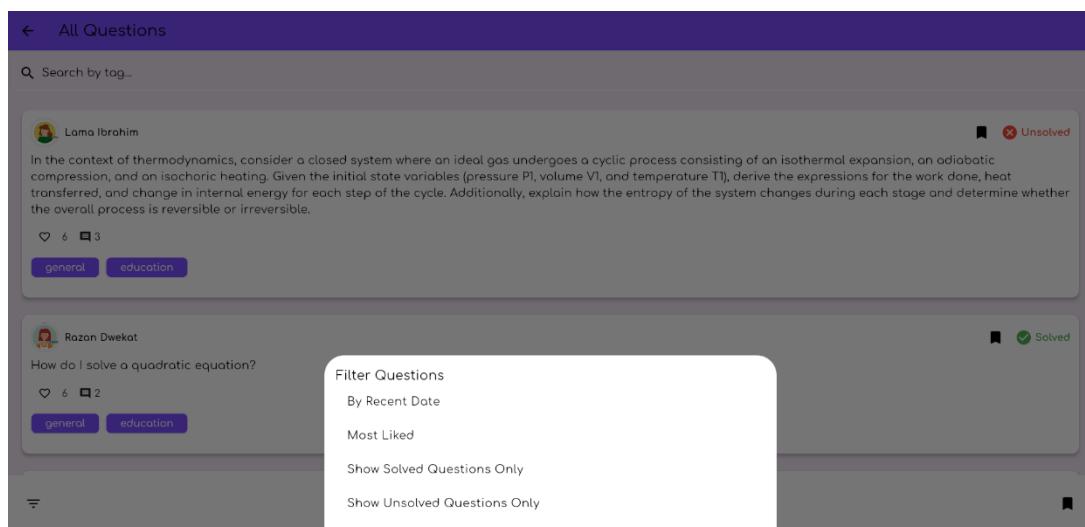


Figure 62: Filtering Questions

or based on a specific tag (topic), Or just go direct to flashcards I've previously saved them for later.

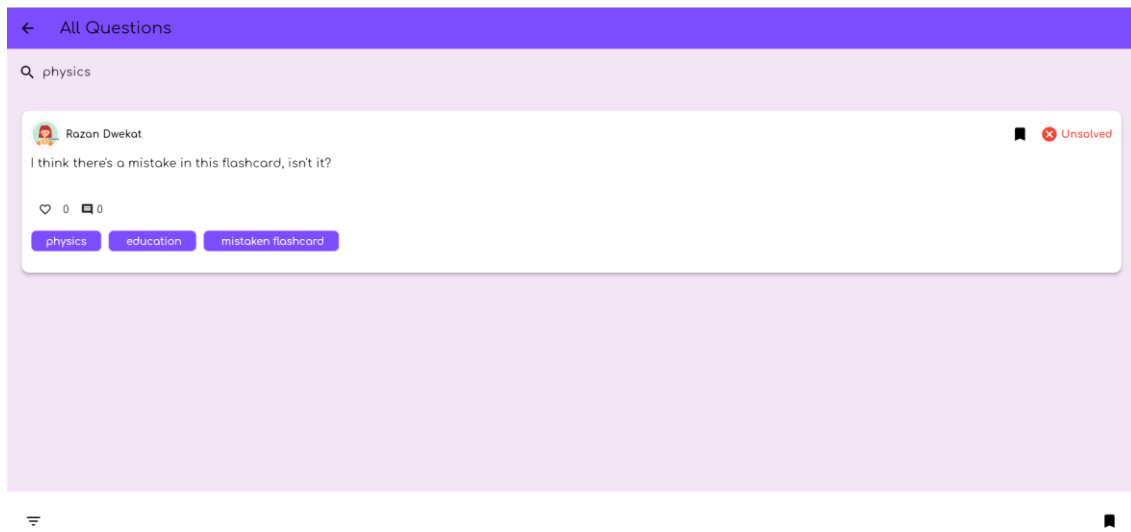


Figure 63: Filtering Questions (2)

5.1.8 Notes Page:

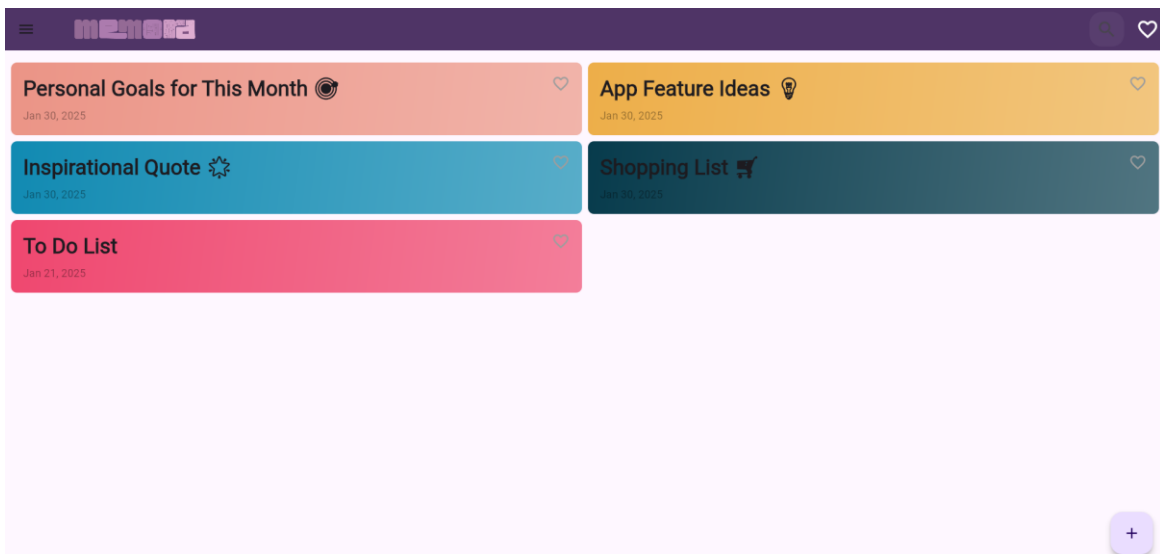


Figure 64: Notes Page

You can search for a specific note:

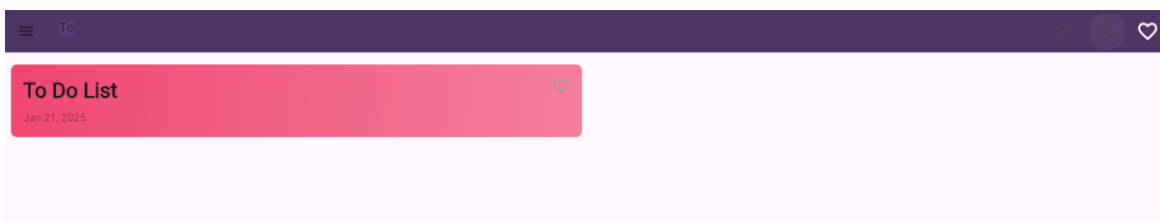


Figure 65: Notes Search Bar

The user have the ability to add a new note:

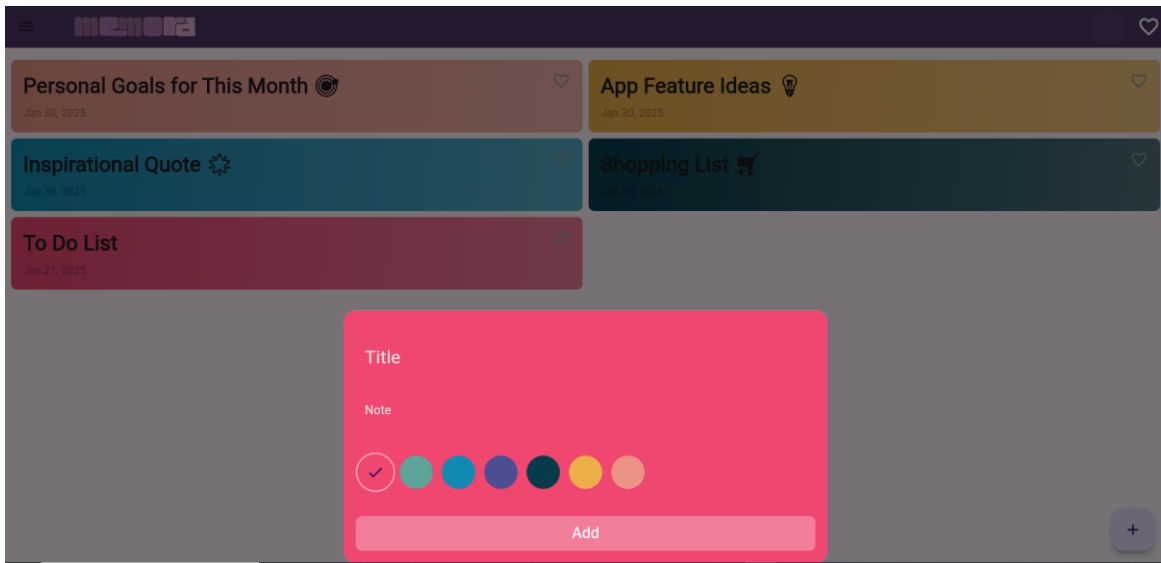


Figure 66: Add A New Note (1)

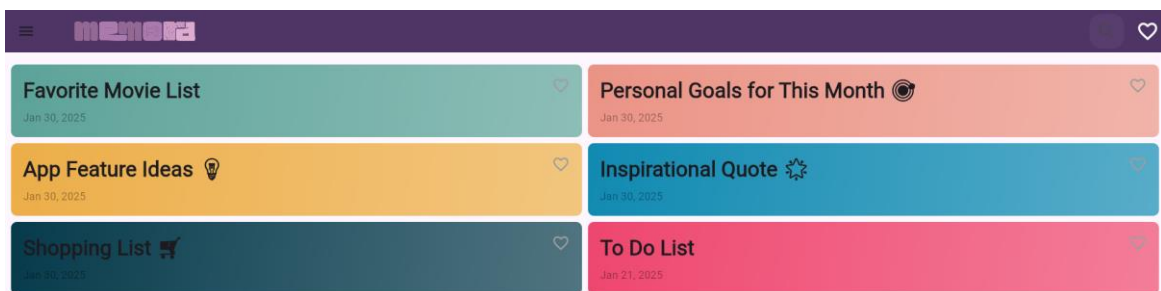
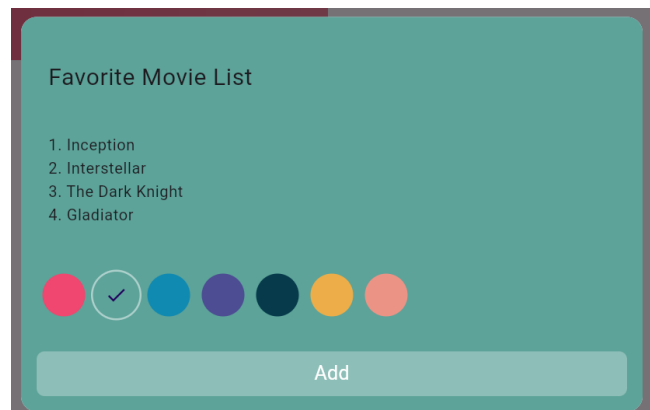


Figure 67: Add A New Note (2)

You can edit an existing note:

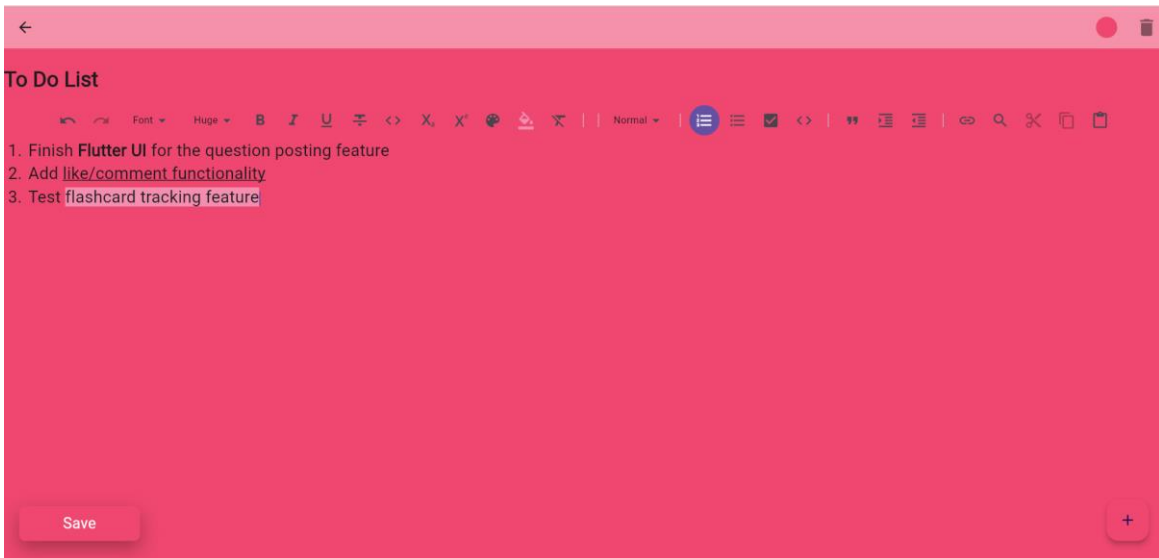


Figure 68: Editing A Note (1)

When clicking on (+), a canva will be opened so the user can draw anything he wants, and it will be saved with the note written content in the db.

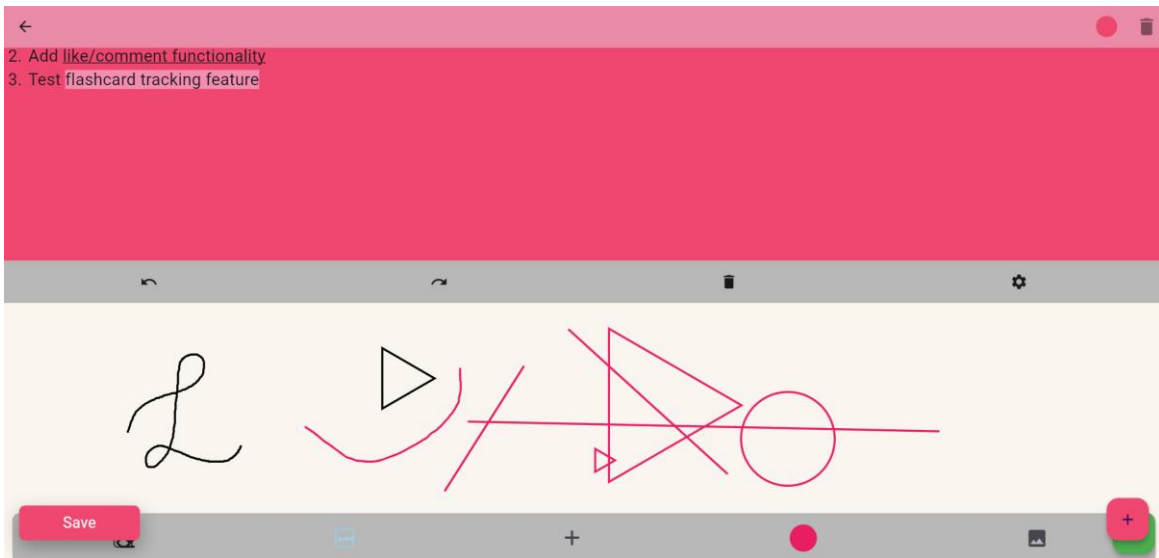


Figure 69: Editing A Note (2)

You have also the ability to download the canva as a JPEG or PNG image:

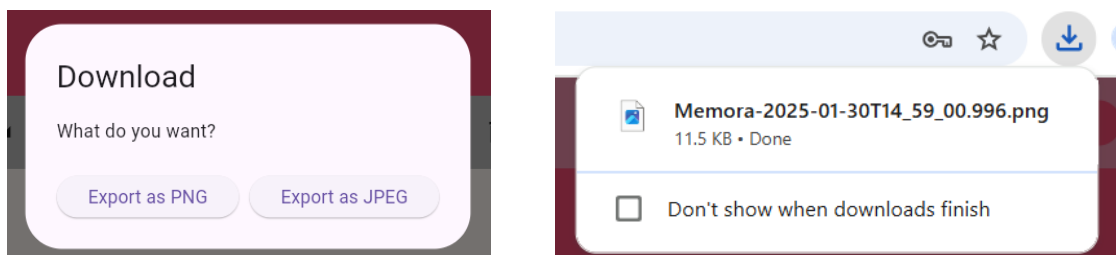


Figure 70: Download Canva

5.1.9 Pomodoro:

The Pomodoro Technique is a method that enhances productivity through the segmentation of work into intervals of concentrated activity, usually 25 minutes in length, followed by short breaks of around five minutes each. Longer breaks of between 15 and 30 minutes are permitted after every four cycles of work. The technique enhances concentration and prevents stagnation and burnout while promoting consistency in working time through intervals of intense focus and brief rest.

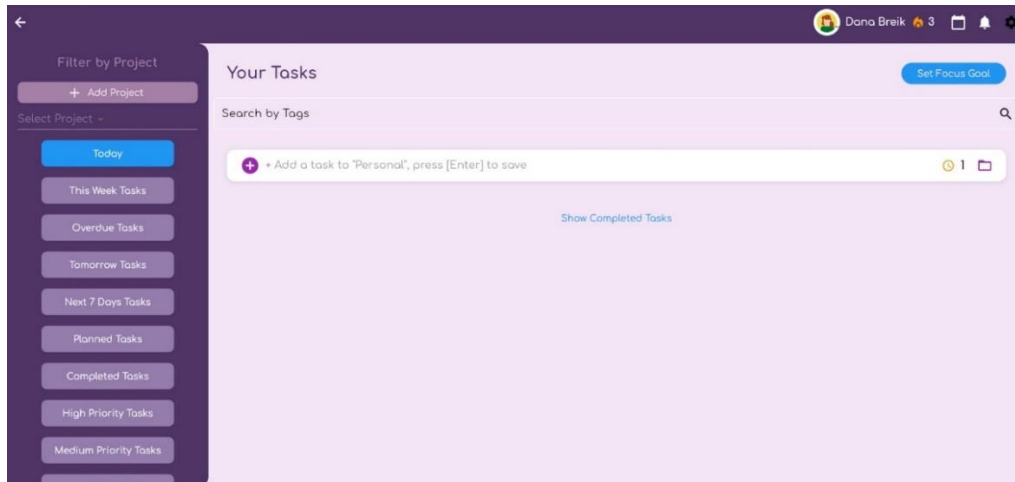


Figure 71: Pomodoro Page

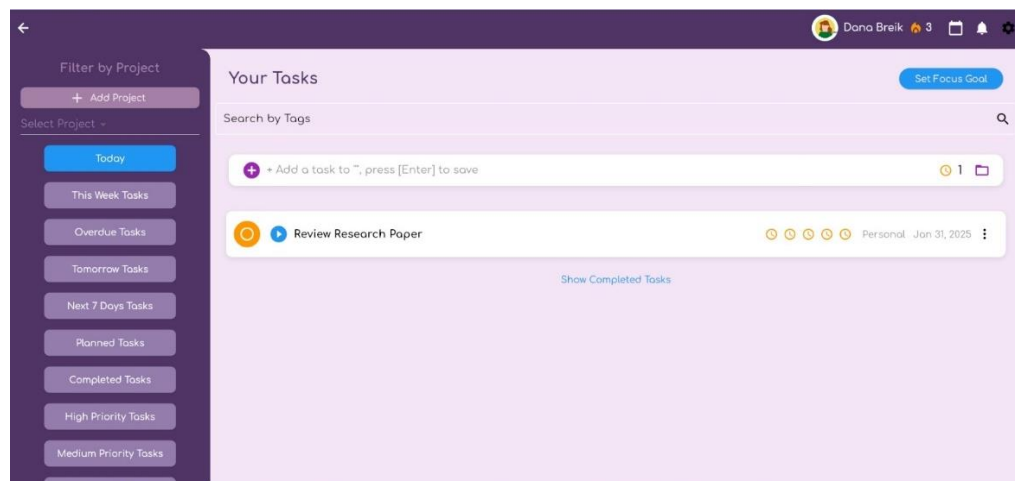


Figure 72: Pomodoro- Starting a Study Session

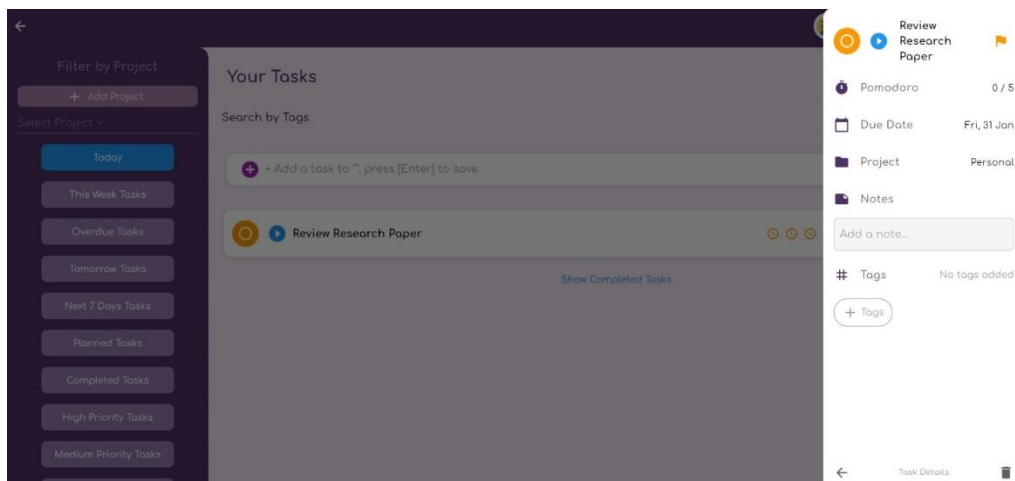


Figure 73: Pomodoro - Task Management

You can set the task details by yourself, like tags, selecting a specific project, determining the due date, as well as the number of needed Pomodoros.

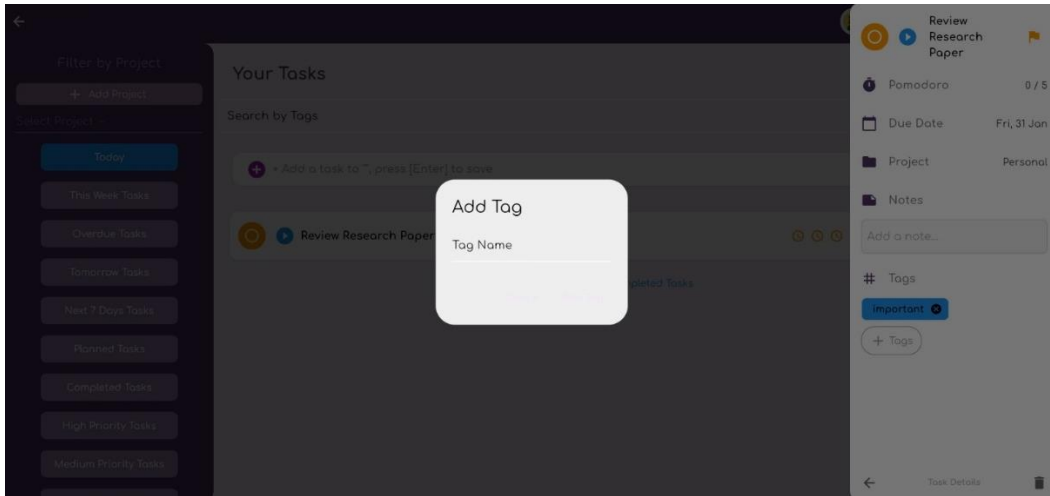


Figure 74: Pomodoro – Adding a tag

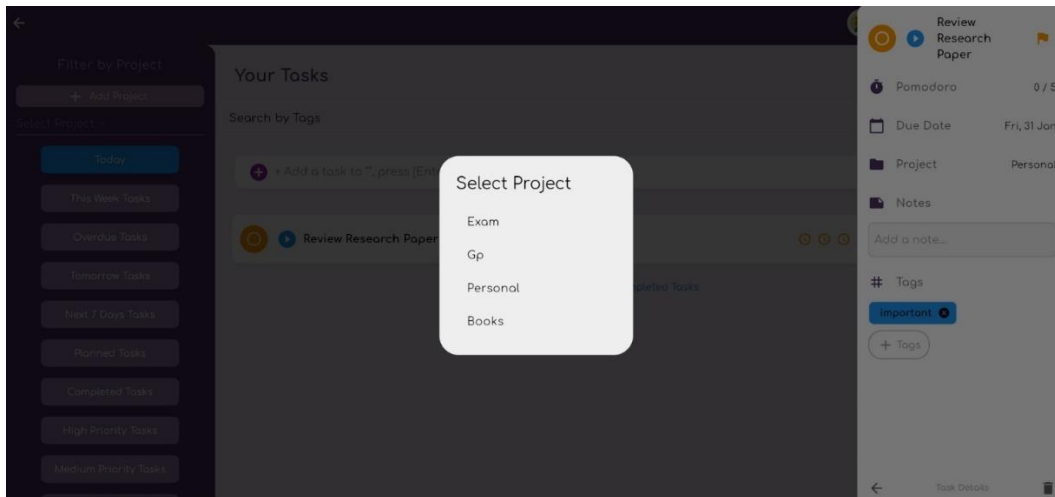


Figure 75: Pomodoro - Project Selection

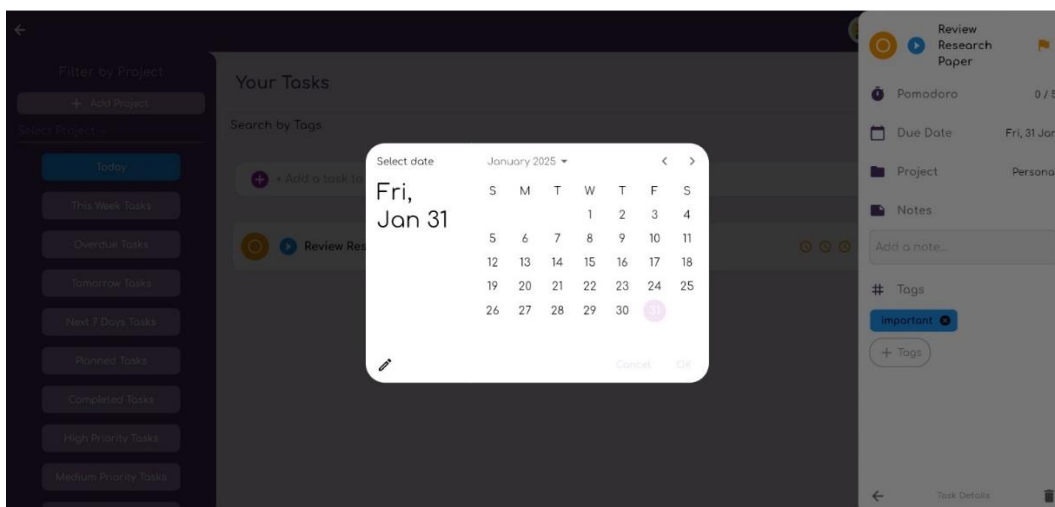


Figure 76: Pomodoro - Date Selection

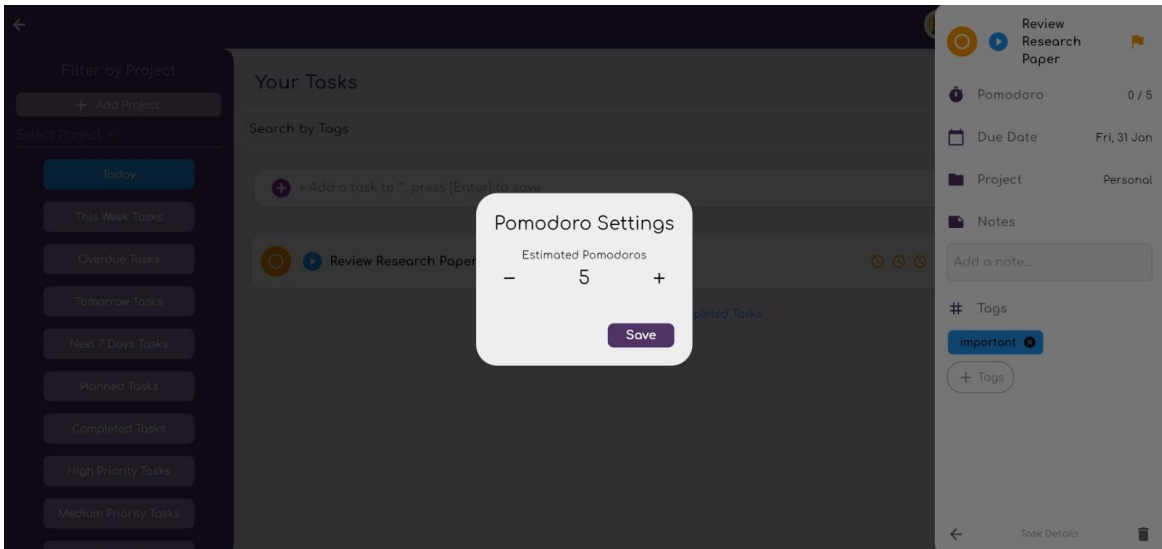


Figure 77: Pomodoro - Number of needed Pomodoros

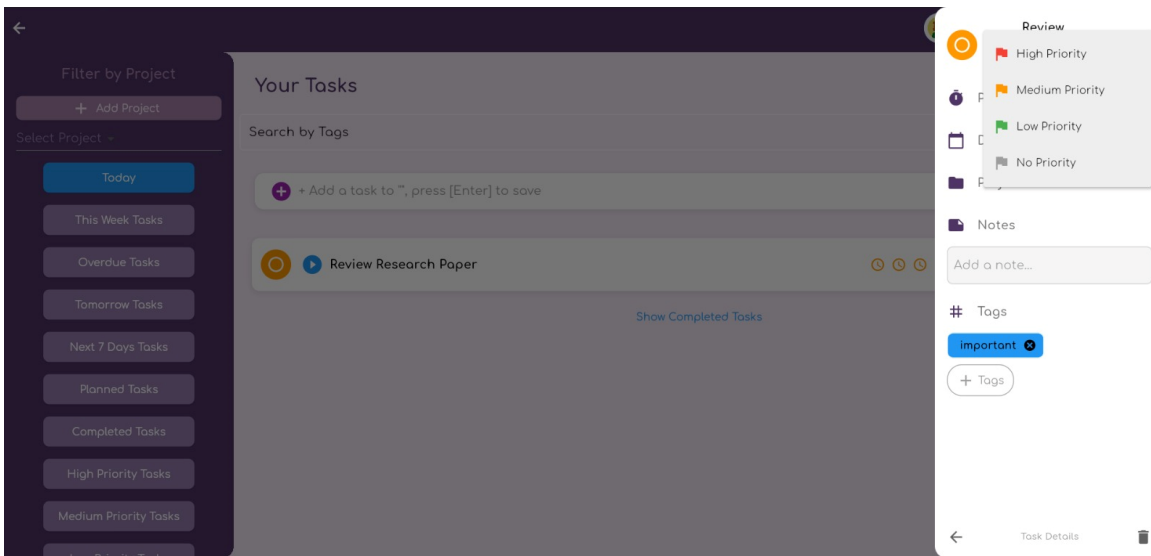


Figure 78: Pomodoro - Determining The Priority

You can create a new project:

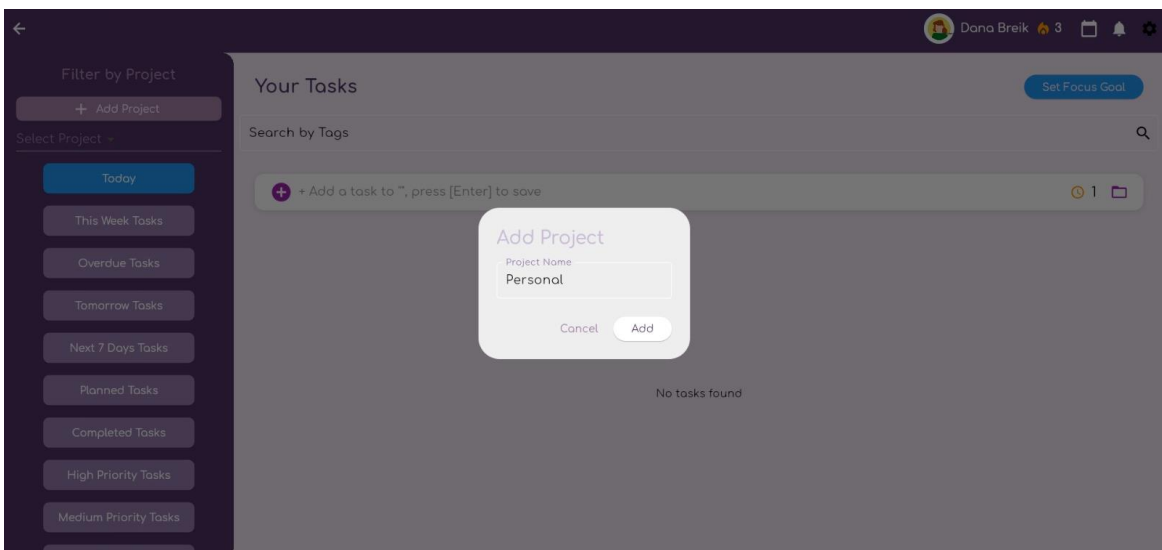


Figure 79: Pomodoro - Create A New Project

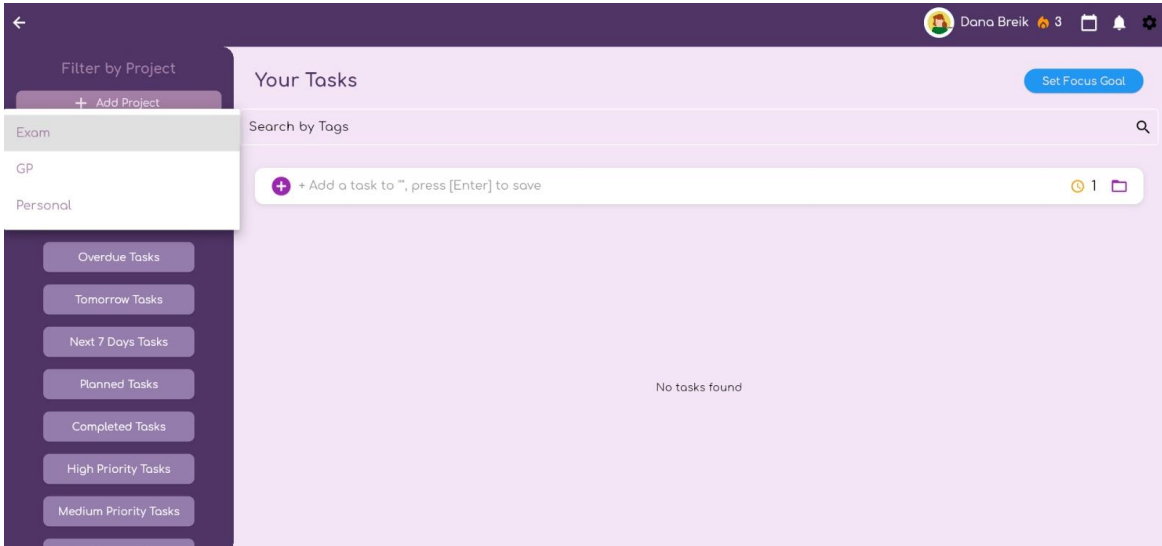


Figure 80: Pomodoro - Projects

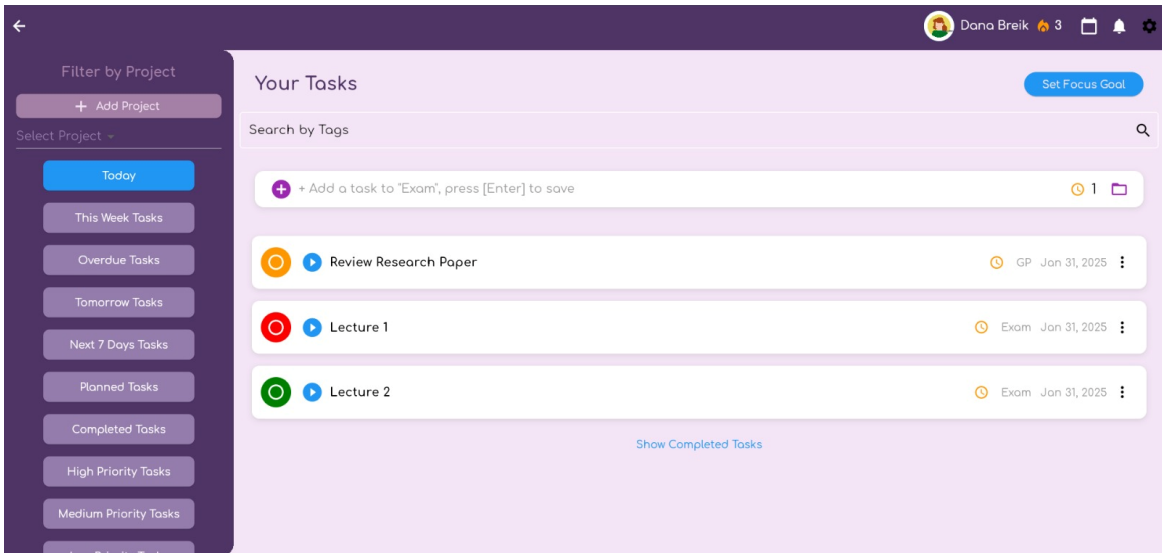


Figure 81: Pomodoro - Today's Tasks Connected With Projects

Once you clicked on start button for one of the provided tasks, a study session (First pomodoro) will start:

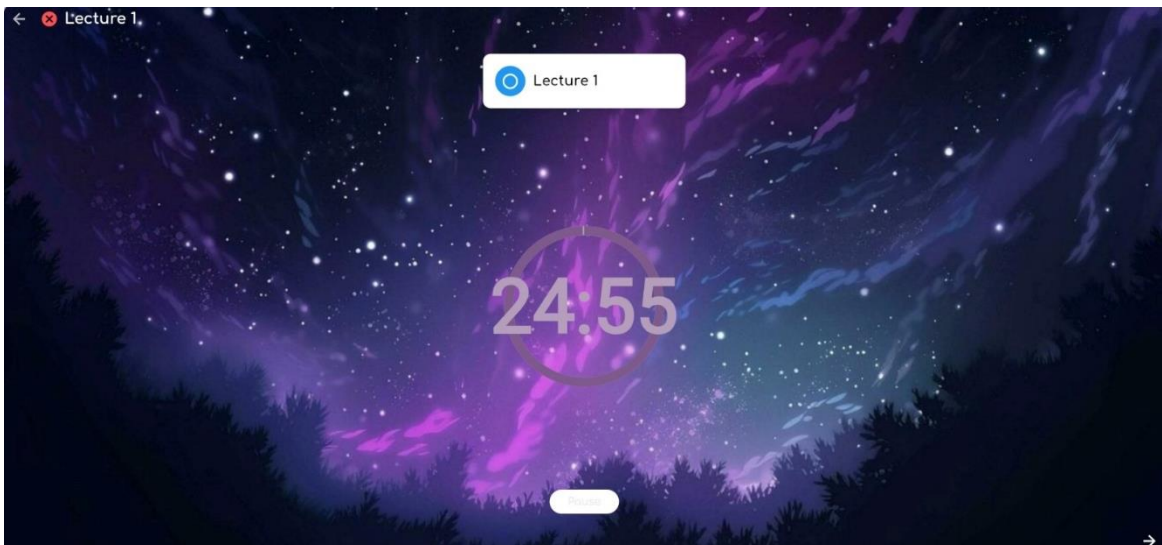


Figure 82: Pomodoro - Session Started

If you want to continue using the app while the Pomodoro session is on, you can do that.

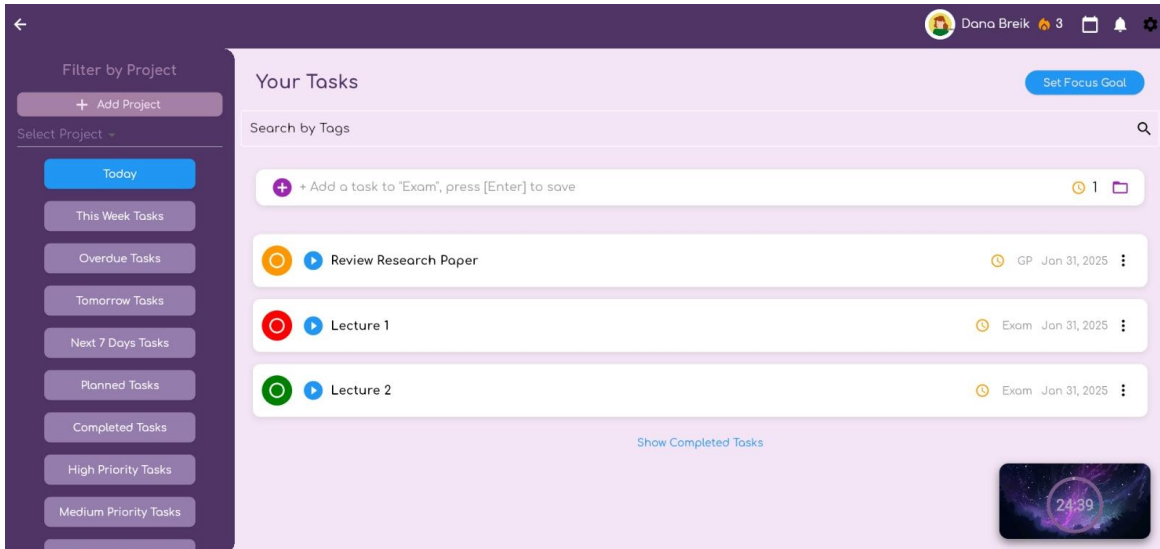


Figure 83: Pomodoro - Pomodoro Session

You can search for the tasks by their tags:

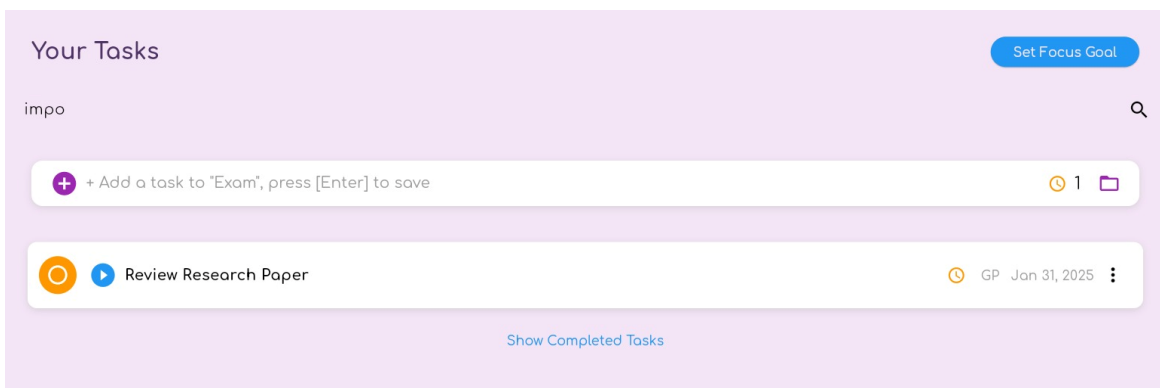


Figure 84: Pomodoro - Search By Tag

Each user has his own streak to encourage him keep the hard work up:

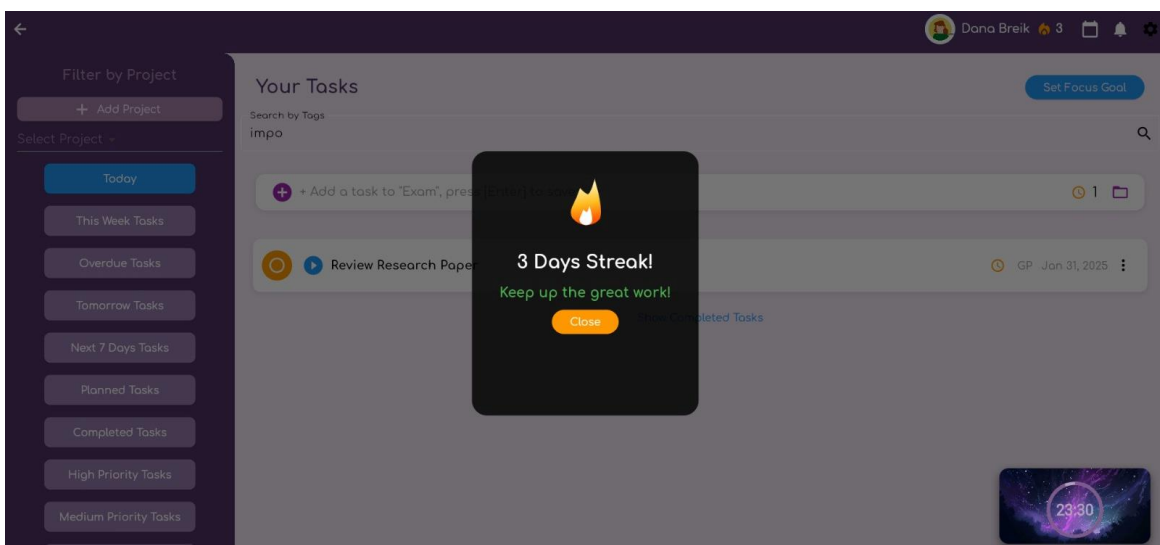


Figure 85: Pomodoro – Streak

You can also set a focus goal to encourage yourself to achieve the needed

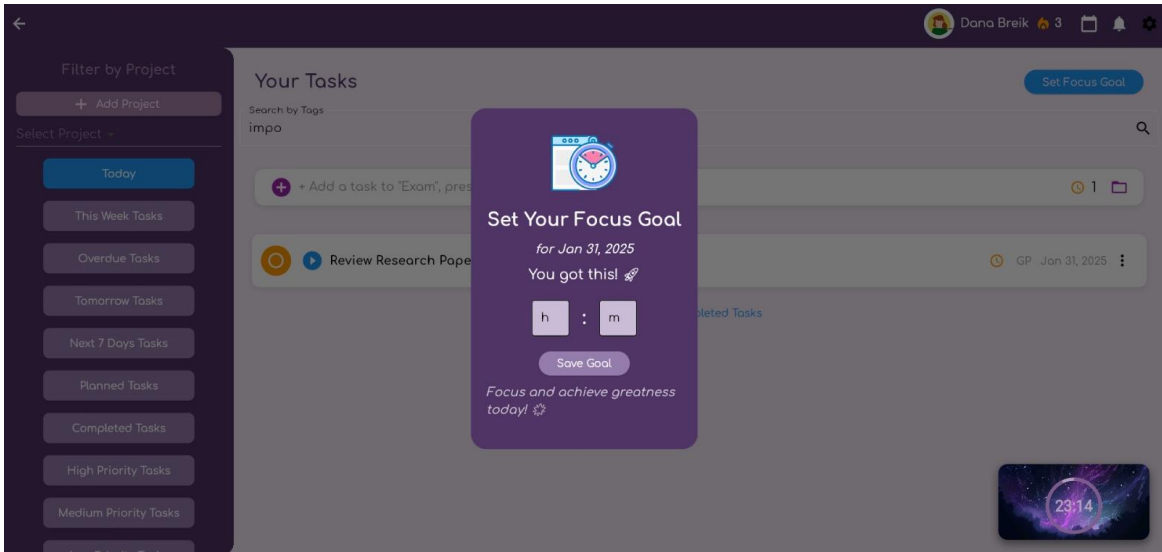


Figure 86: Pomodoro - Focus Goal

You can change the settings of the pomodoro timer:

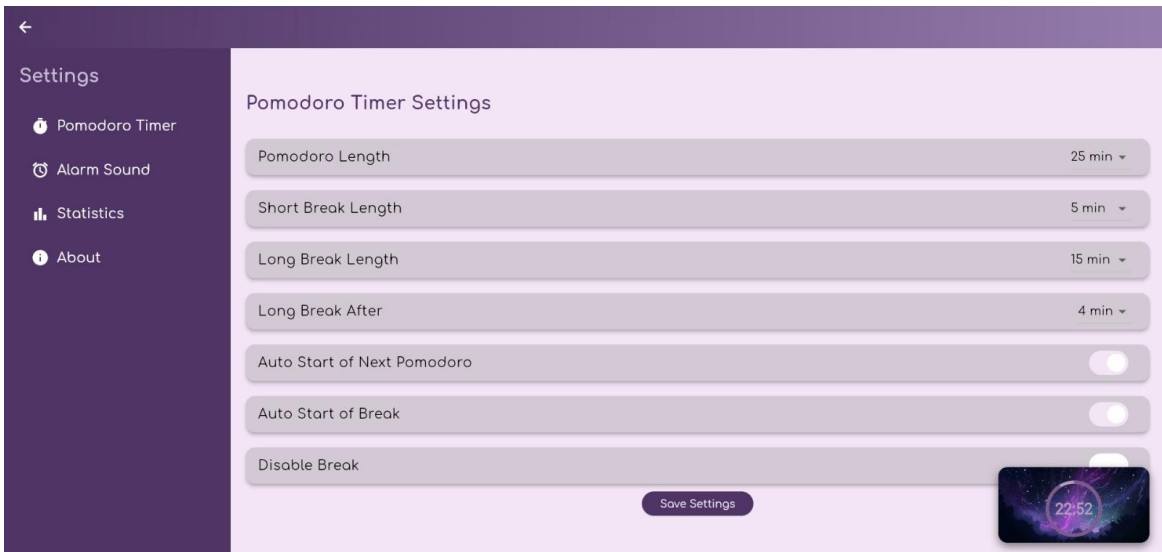


Figure 87: Pomodoro - Pomodoro Timer

Or change the alarm sound and enable/disable vibration:

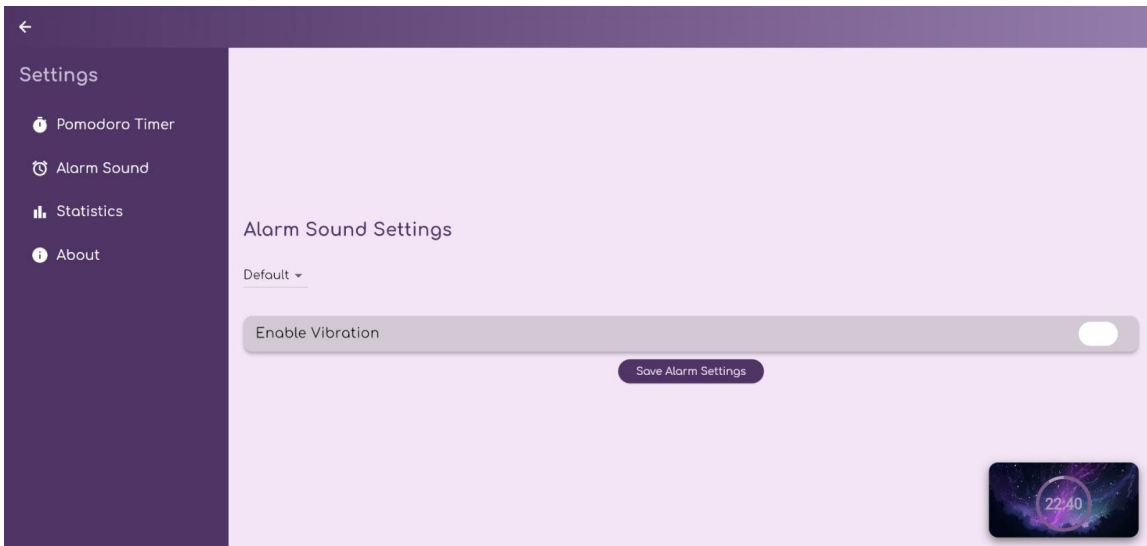


Figure 88: Pomodoro - Pomodoro Alarm

User can have more info about the Pomodoro technique in the about section:

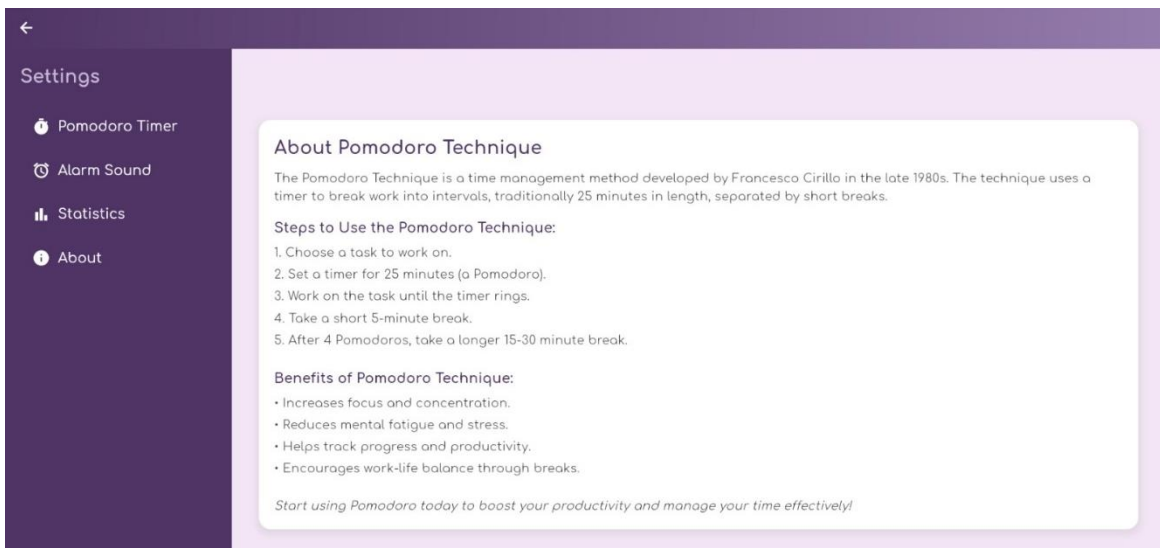


Figure 89: Pomodoro - About Section

Once I've finished my Pomodoro sessions, the task will be considered as completed task

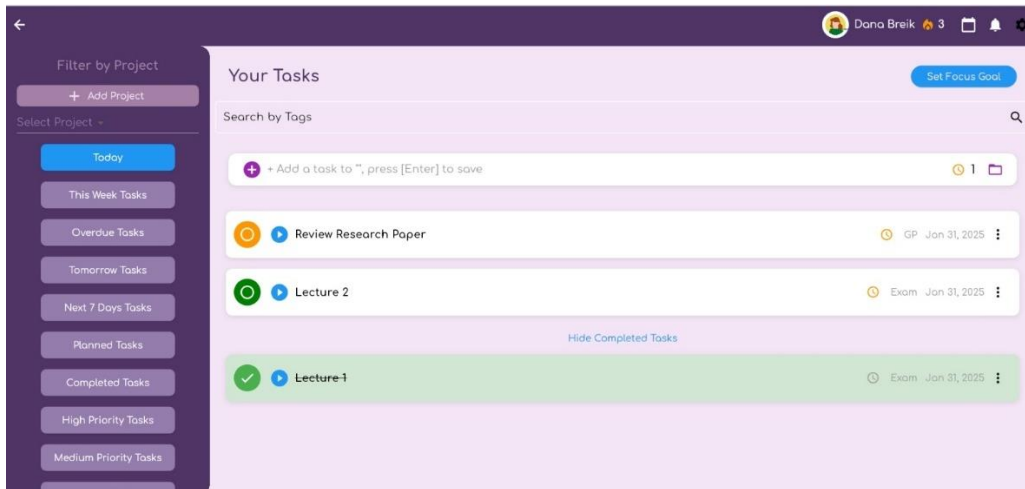


Figure 90: Pomodoro - Completed Tasks

To show the upcoming tasks in an easier way, a calendar indicating the scheduled tasks is implemented:

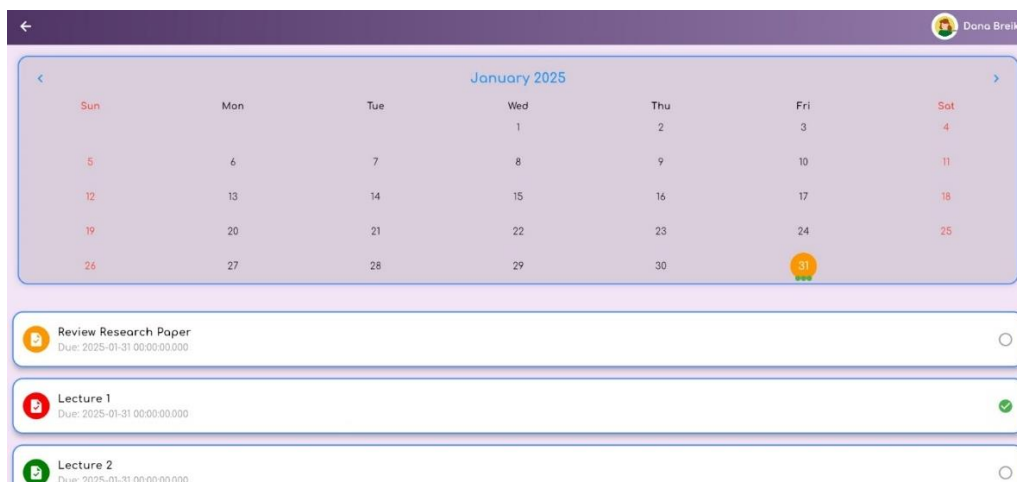


Figure 91: Pomodoro - Tasks On Calendar



Figure 92: Pomodoro - Tasks On Calendar (2)

5.2 App Roles

5.2.1 Instructor's Dashboard:

When logging in to the app as an instructor, all of the reminders will appear on the screen, as well as all classrooms that he has created with all users included in it will be shown:

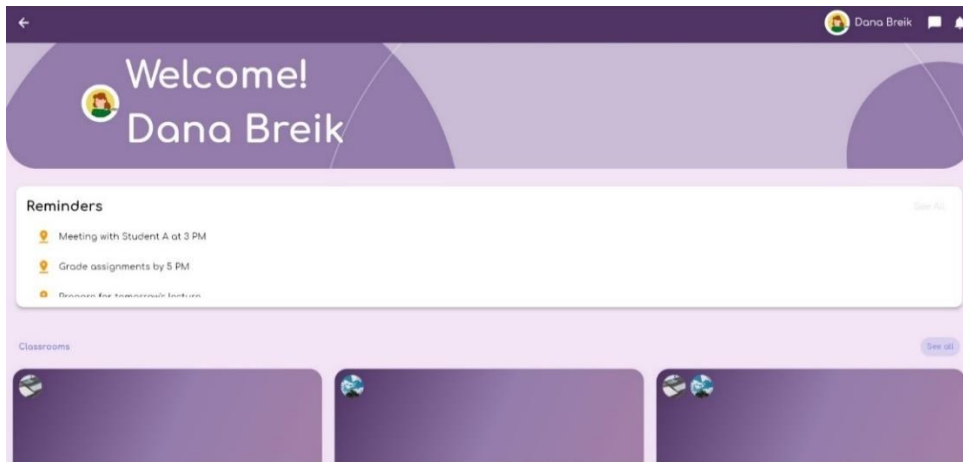


Figure 93: Instructor's Dashboard (1)

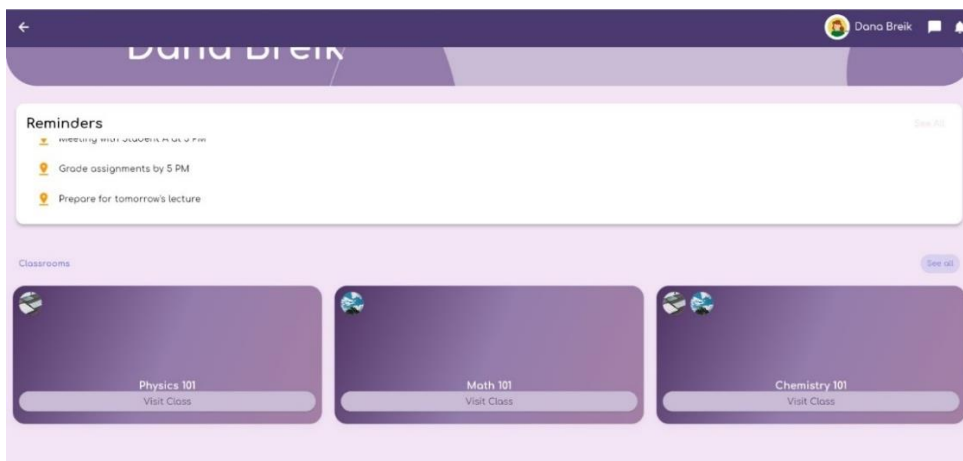


Figure 94: Instructor's Dashboard (2)

When the instructor enters one of the classes, he will be able to see all announcements related to that class from quizzes, meetings or even assignments announcements.

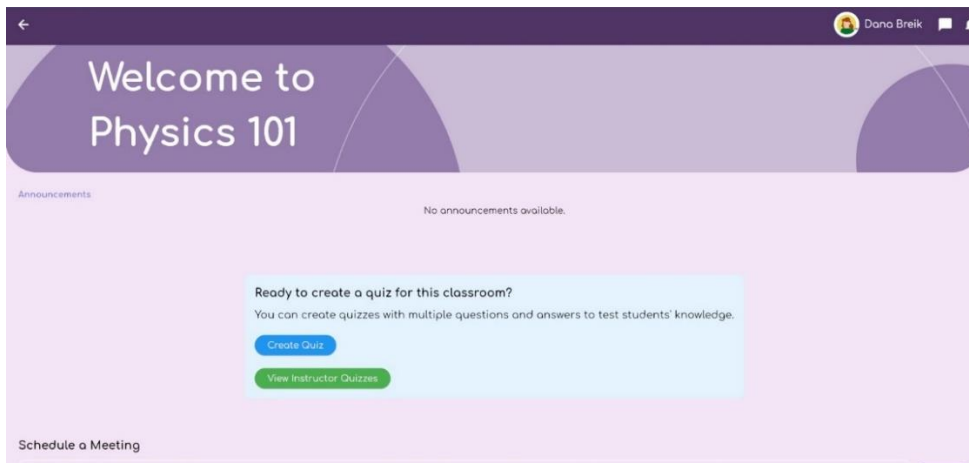


Figure 95: Class Interface (1)

He also will be able to create new quiz and publish it, schedule a meeting, create and publish flashcards or post an assignment:

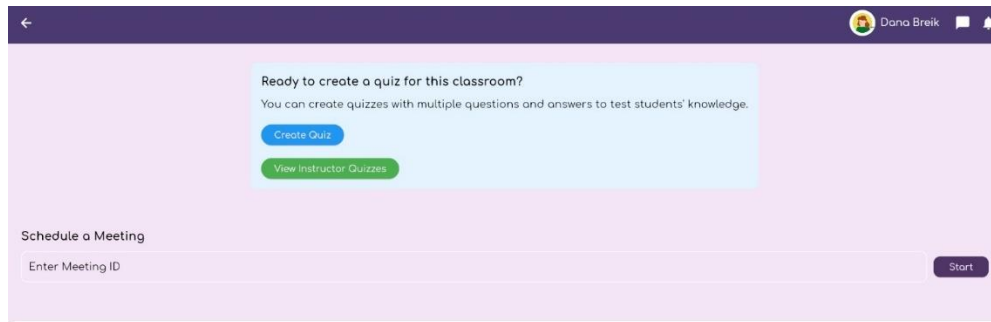


Figure 96: Class Interface (2)

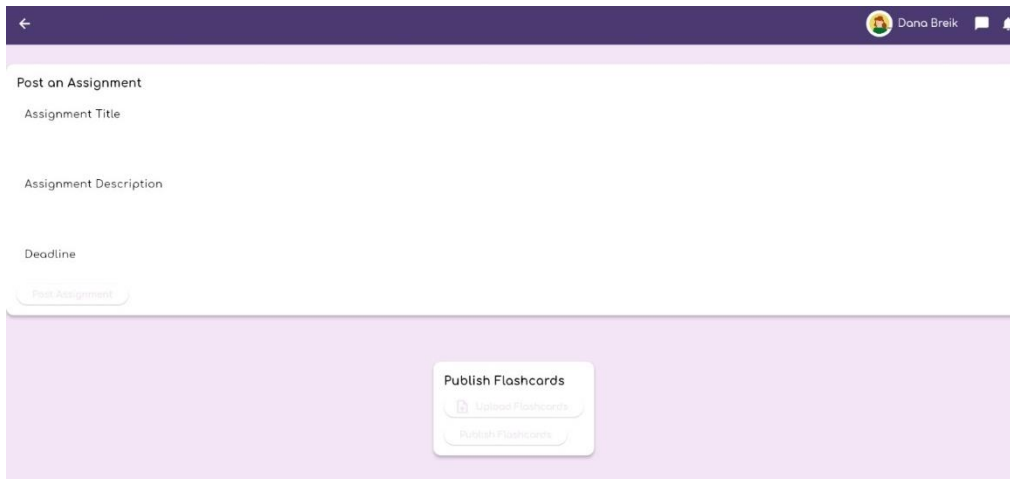


Figure 97: Class Interface (3)

When he wants to create new quiz:

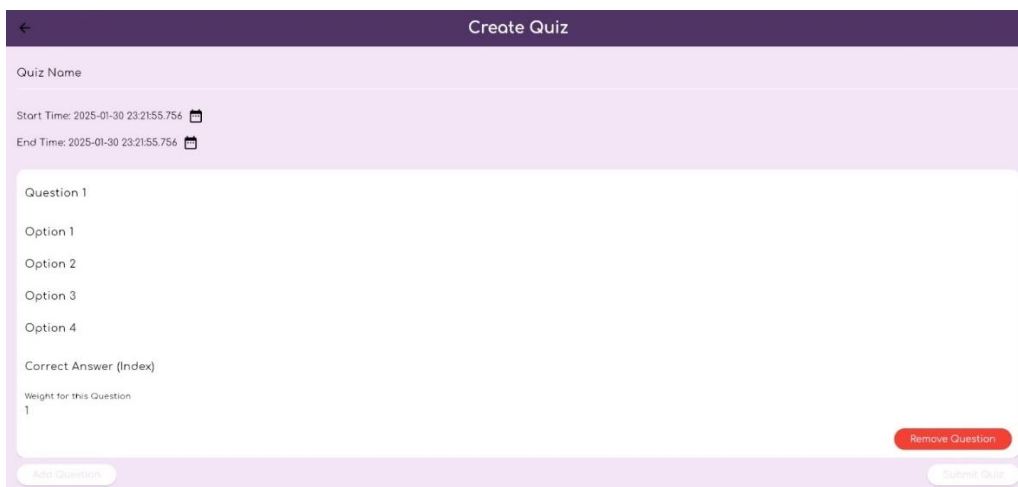


Figure 98: New Quiz (Instructor's Side)

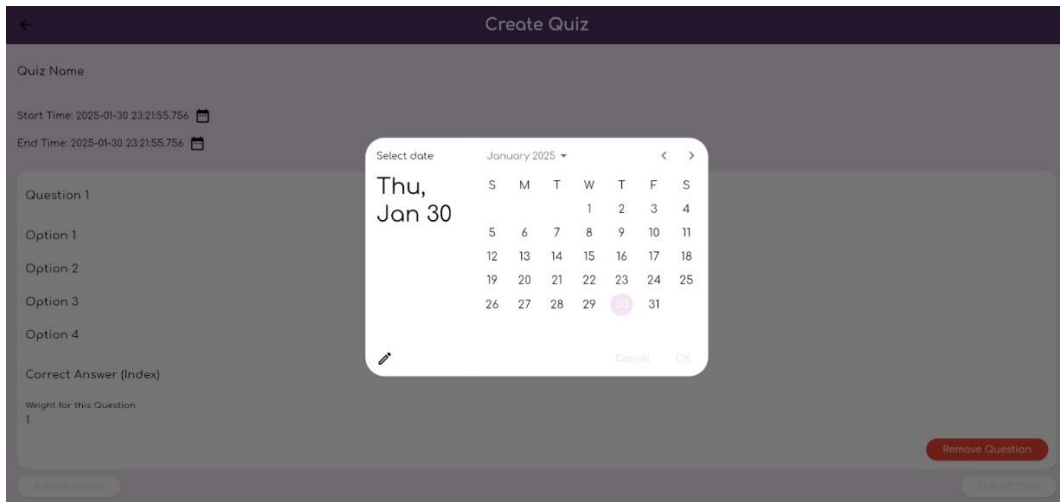


Figure 99: Quiz Date Determination (1)

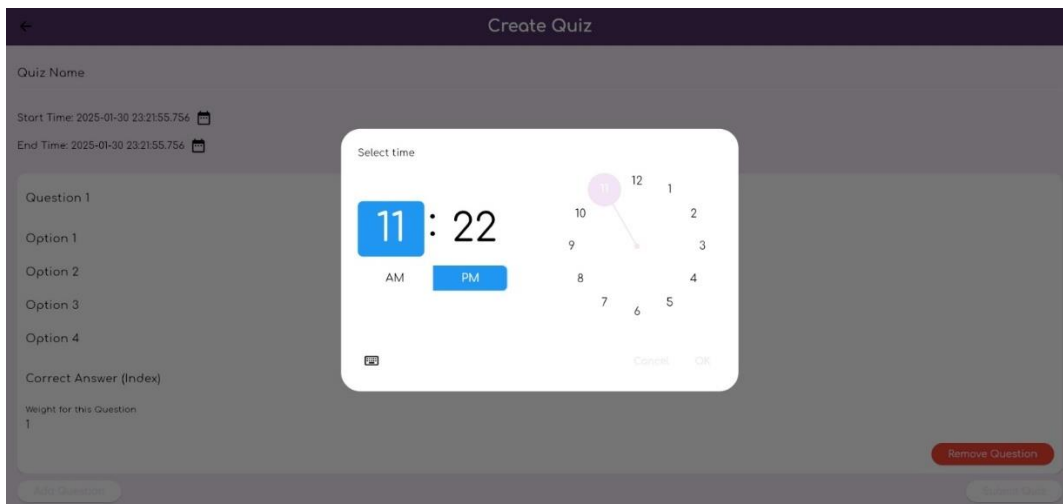


Figure 100: Quiz Date Determination (2)

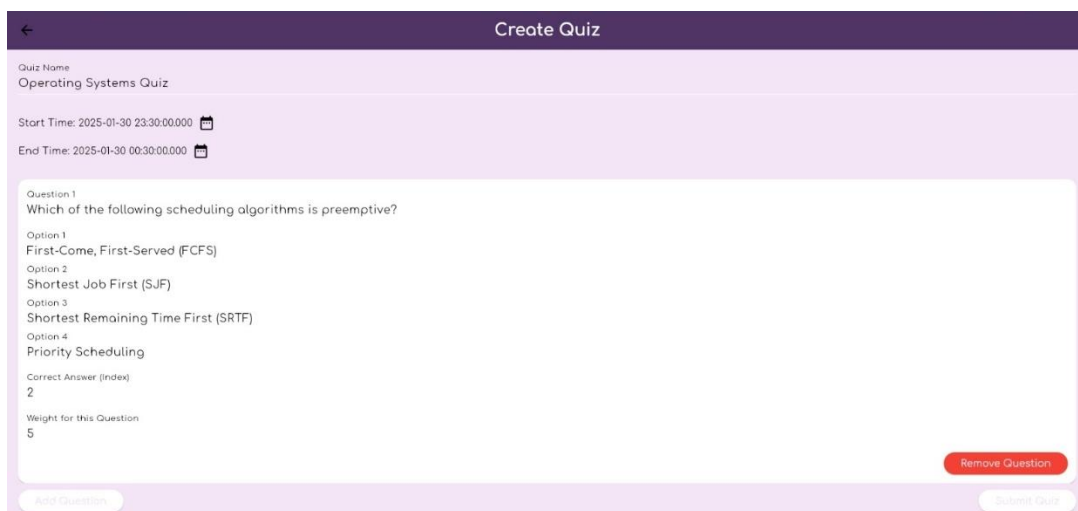


Figure 101: Quiz Question Example

As soon as the quiz is created:

Quiz created successfully!

It won't be seen for students in the classroom until it's published by the instructor:

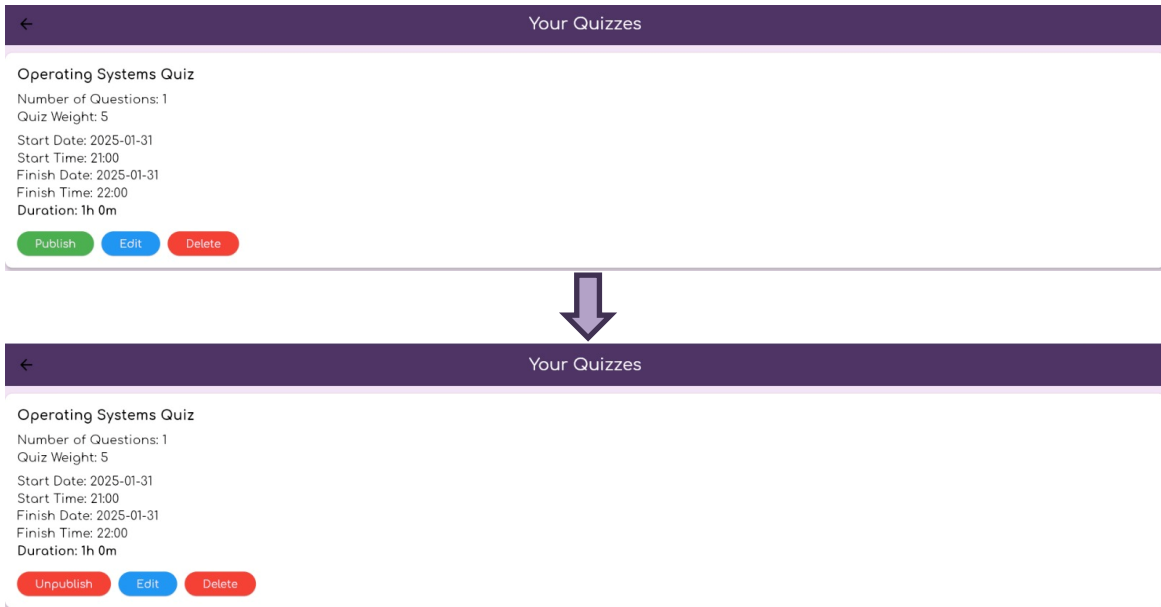


Figure 102: Quiz Publish

And it will be added to the announcements section:

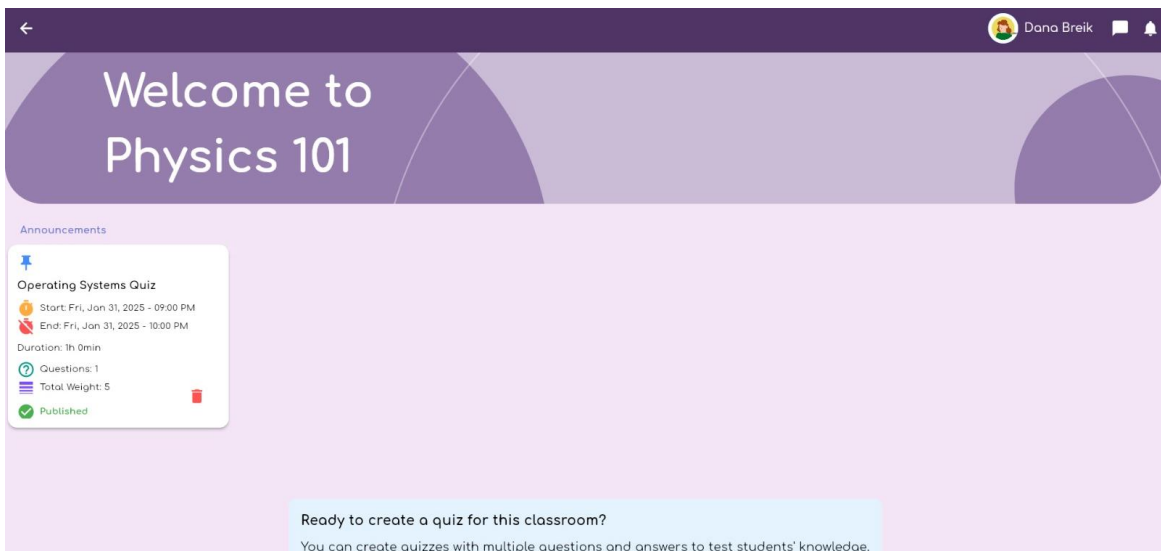
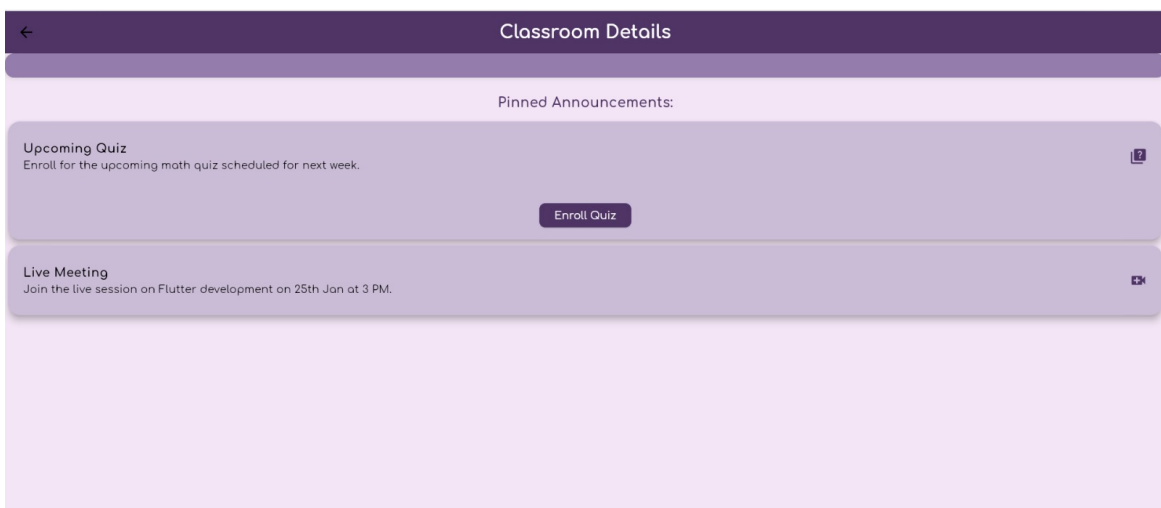
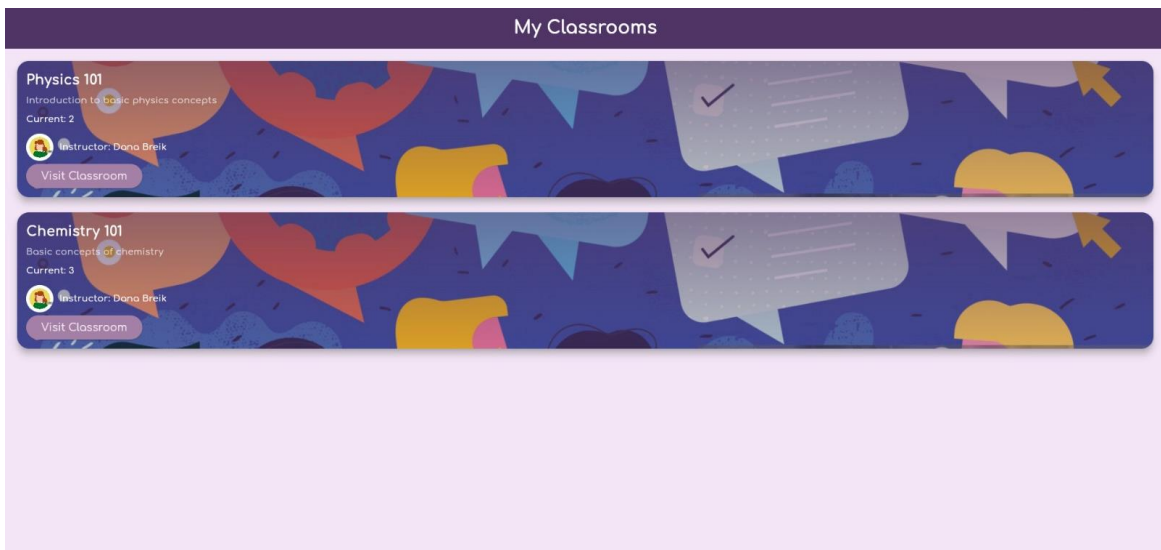


Figure 103: Classroom Announcements

- **Classrooms from user's side:**



5.2.2 Parent's Dashboard:

Now, when we login as parent, he will be able to see his children's progress, and gets notifications about their last achievements, as well as they will be able to send a message for intructors by their email.

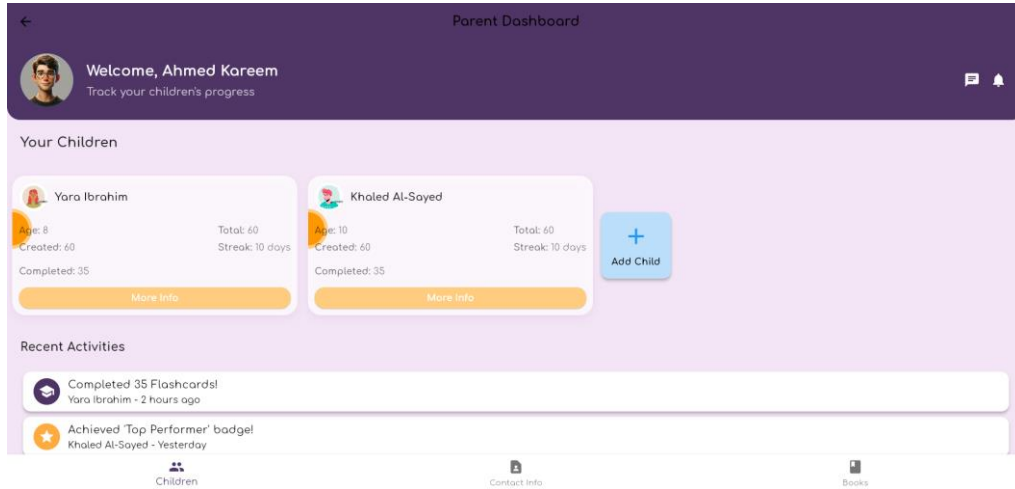


Figure 104: Parent Dashboard (1)

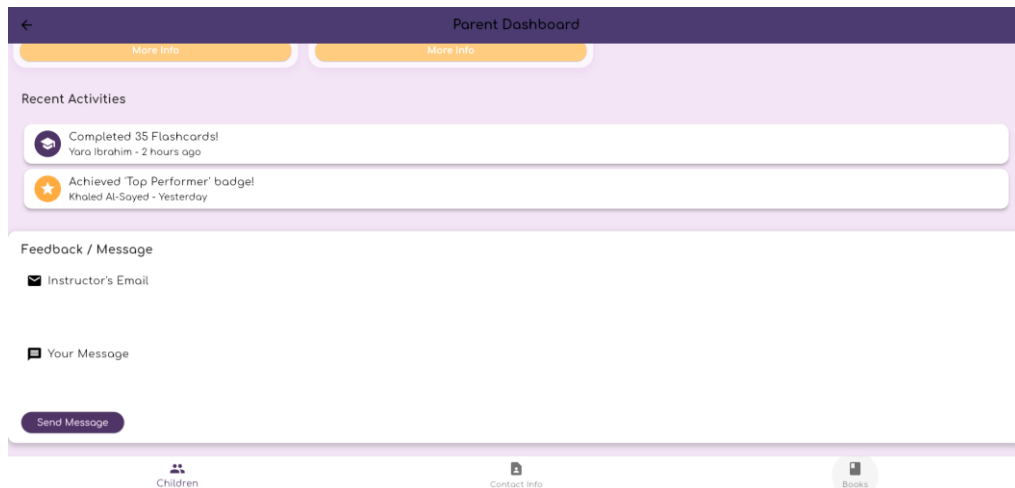
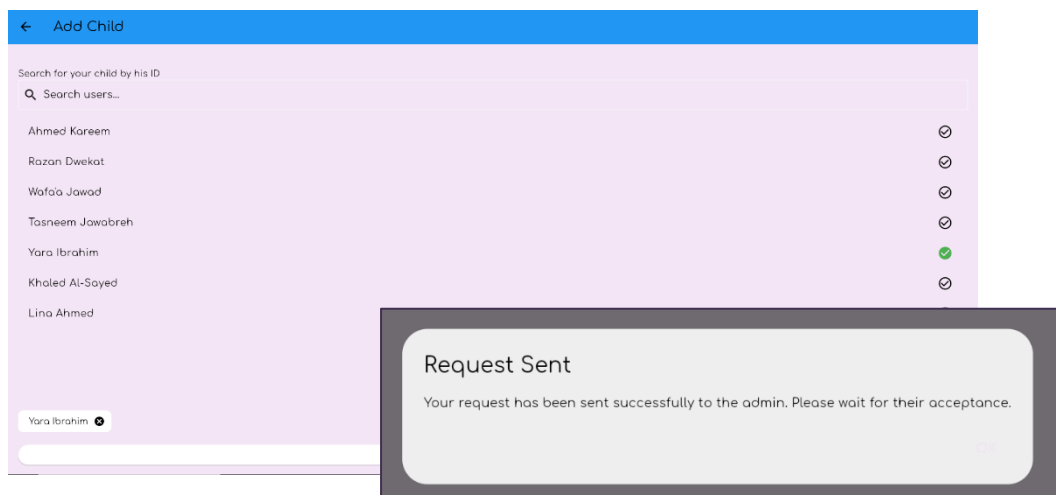


Figure 105: Parent Dashboard (2)

Parent can add his new children, but first an acceptance must be taken from the admin:



He also can edit his contact info:

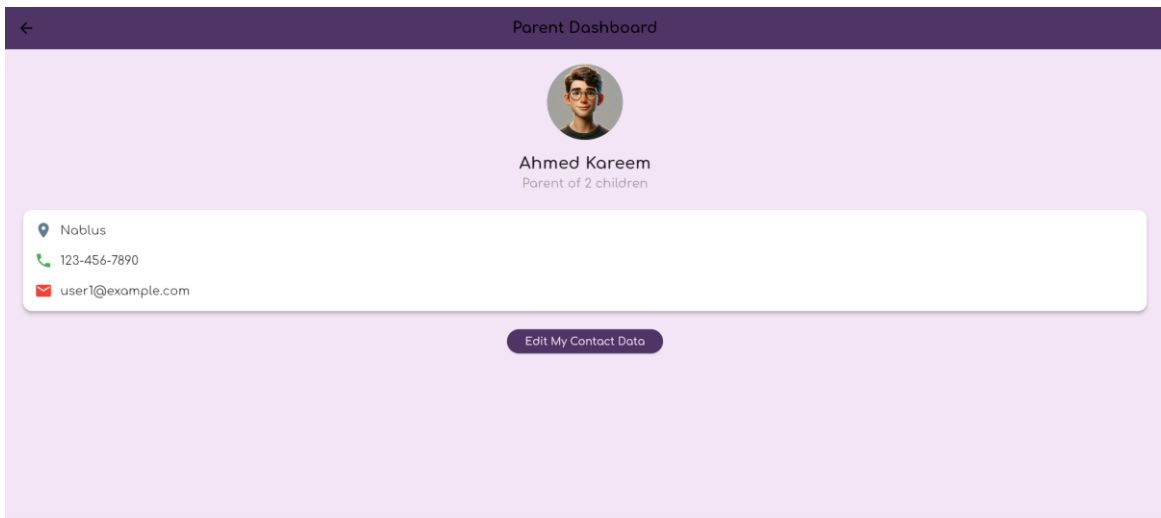


Figure 106: Parent's Contact Info

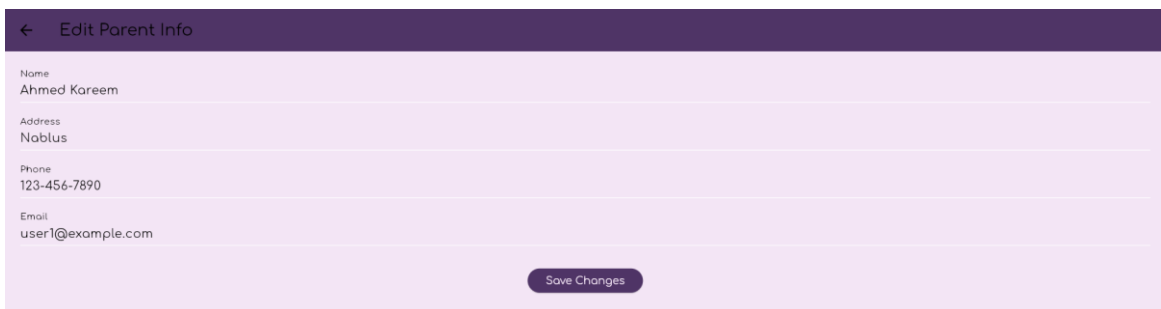


Figure 107: Parent's Contact Info – Edit

Here, we can find some suggested books based on his children ages, and a section for the parent to create flashcards as well, because why not?

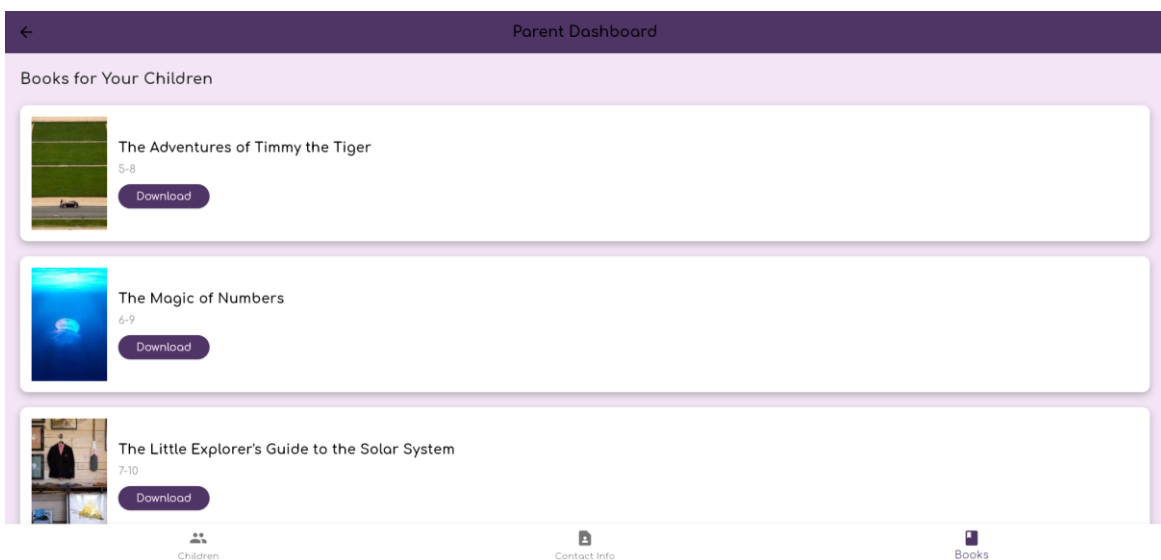


Figure 108: Suggested Books Section

5.2.1 Admin's Dashboard:

Admin has an overall look at all users in the app, he has the ability to delete anyone of them:

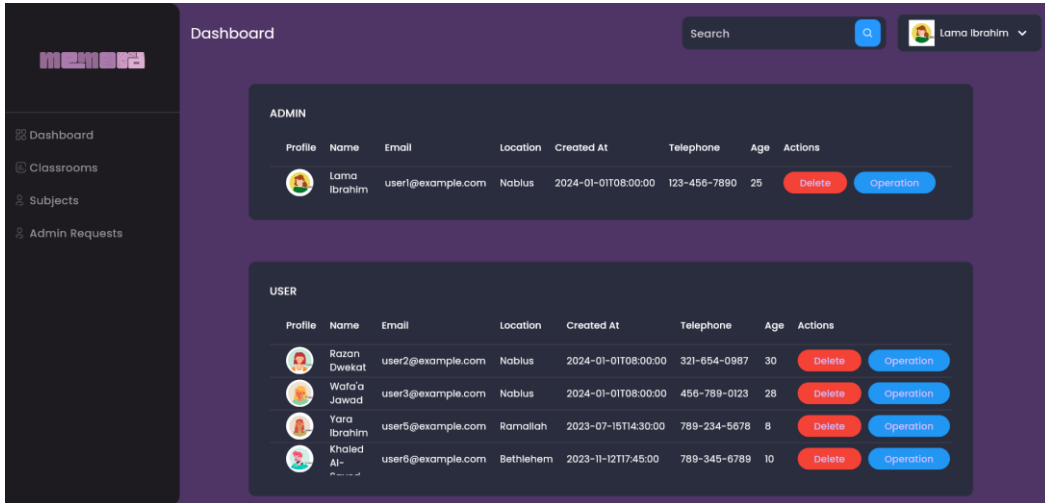


Figure 109: Admin - Users Preview

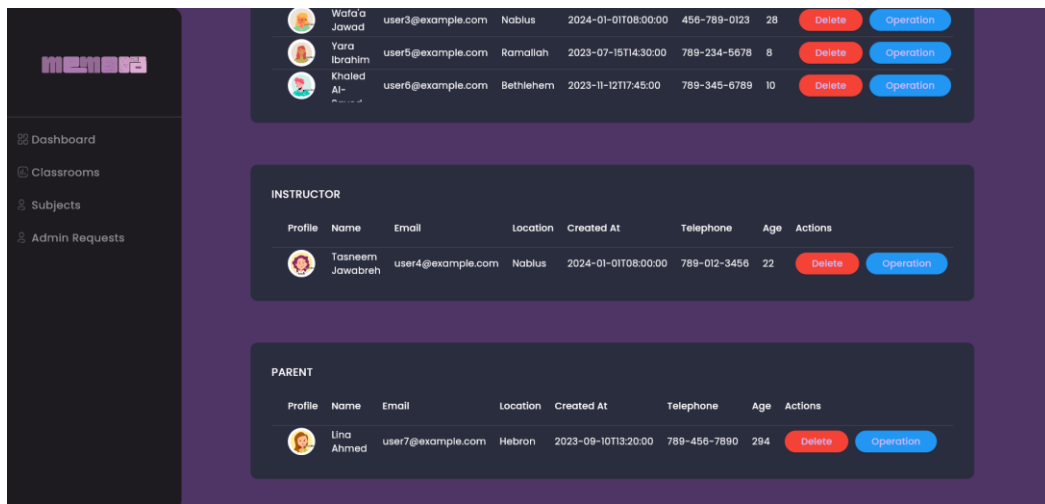


Figure 110: Admin - Users Preview (2)

He also have the ability to go through all subjects in the app and delete or edit anyone of them:

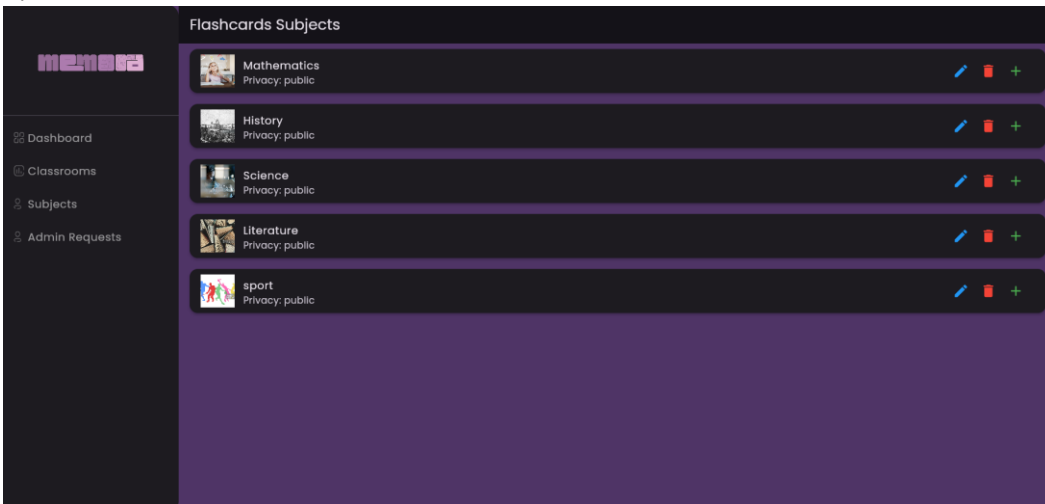


Figure 111: Admin - Subjects Preview

Or delete any FlashcardSet / Topic:

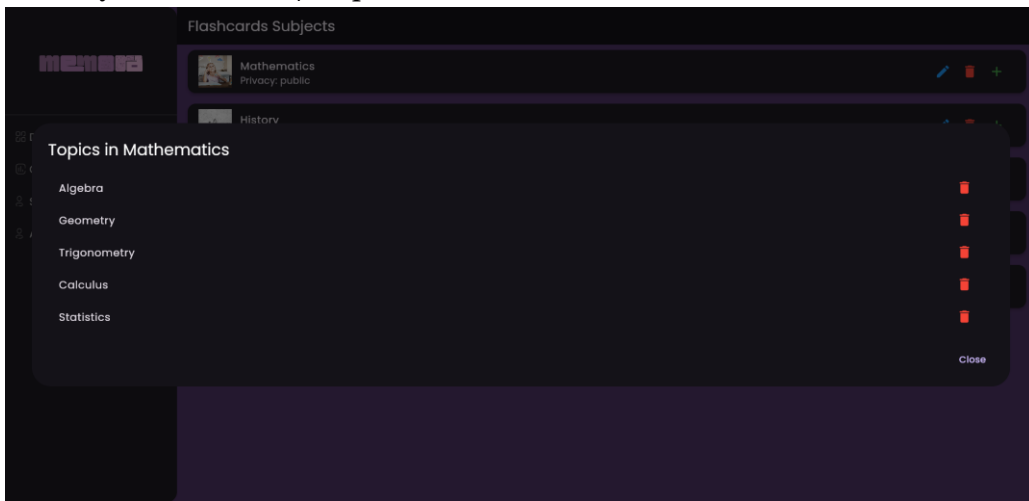


Figure 112: Admin - Topics

As we've mentioned previously, when someone signs up as an admin, his request won't be taken in consideration until one of the admins accept it:

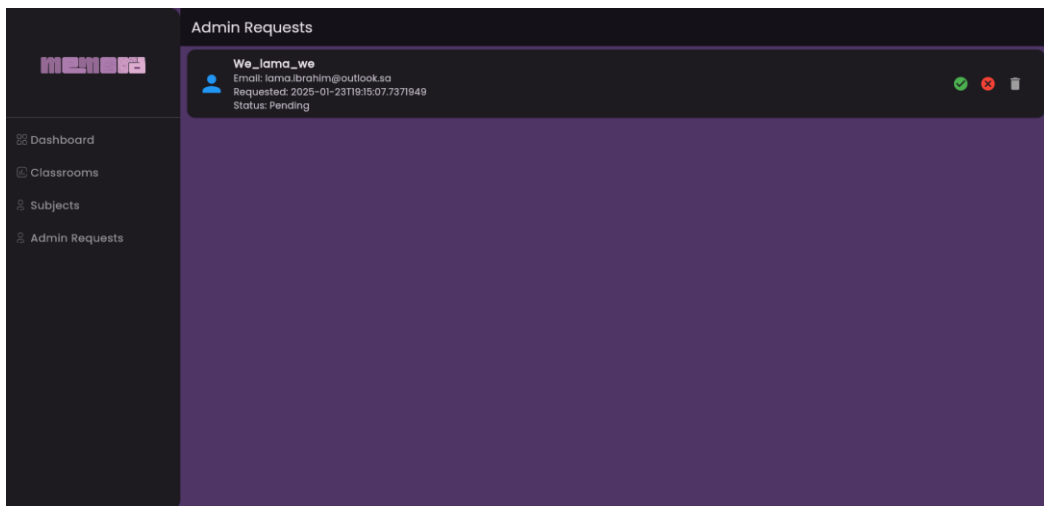


Figure 113: Admin - Admin Requests

Users in the application can communicate with each other through a chatting system “messages are stored using Firebase”:

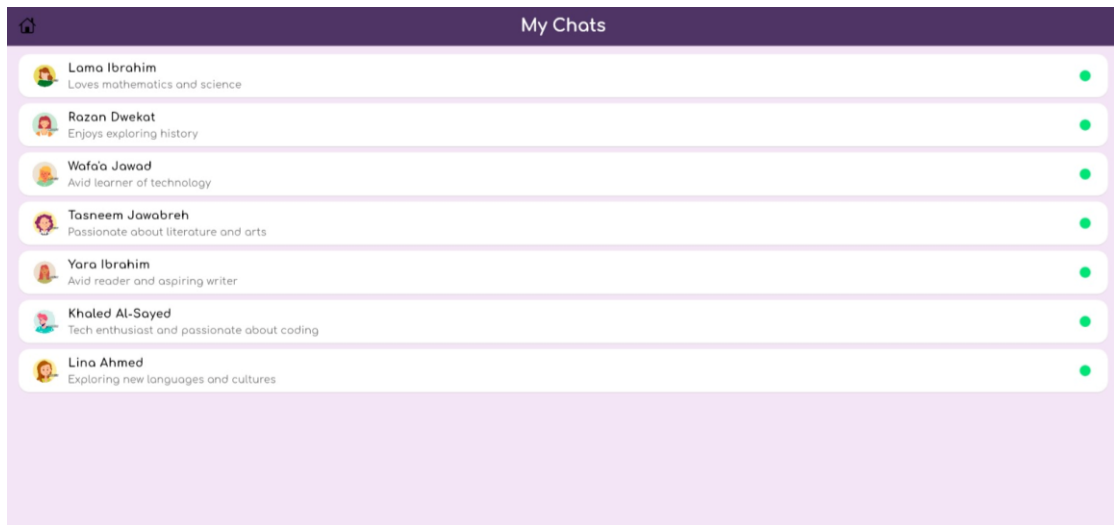


Figure 114: Chatting System

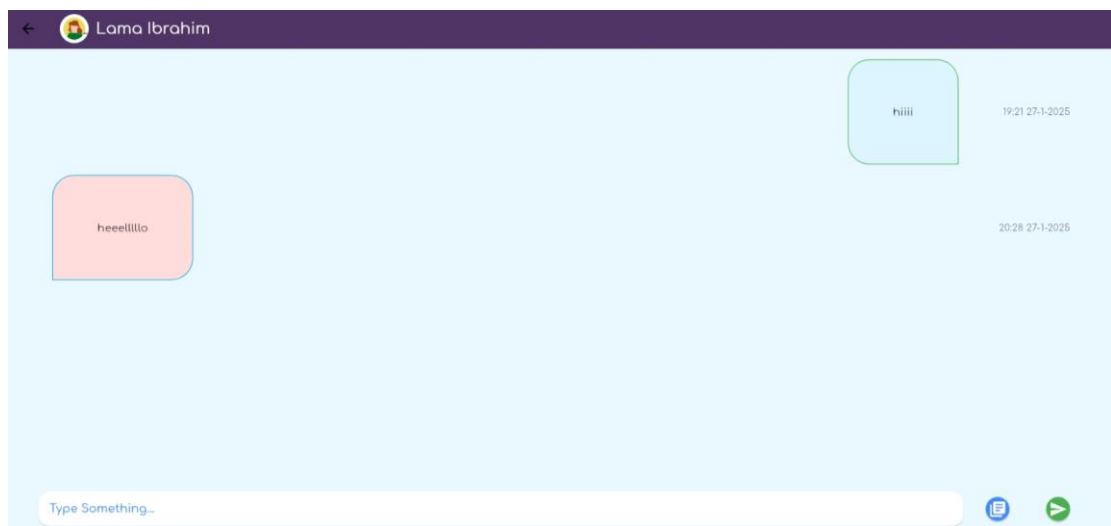


Figure 115: Conversation

5.3 Mobile Application



Figure 118: Mobile - Welcome Screen

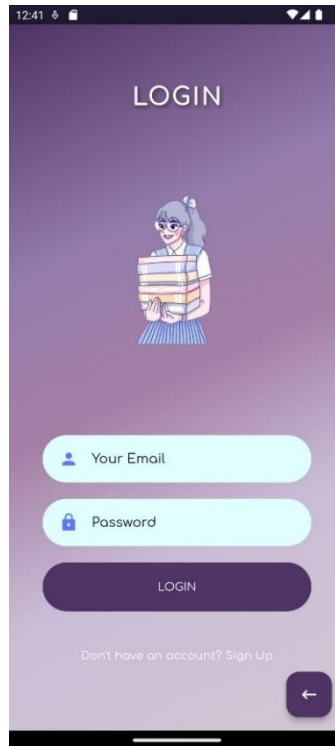


Figure 116: Mobile - Login Page

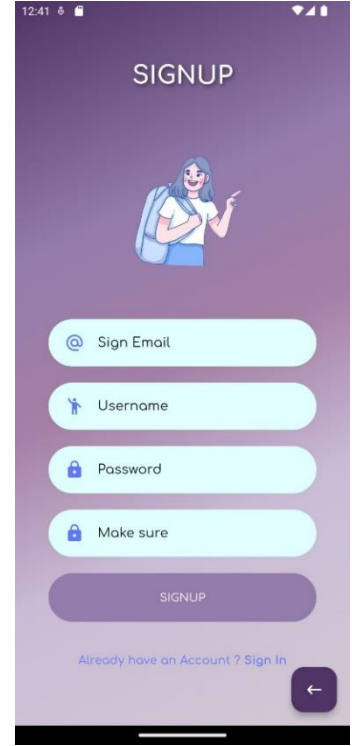


Figure 117: Mobile - Sign Up Page

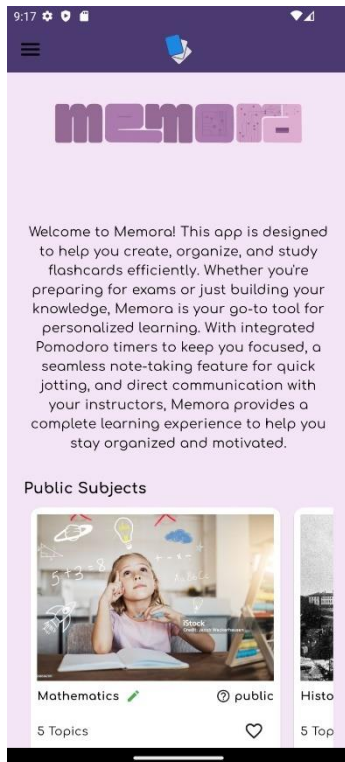


Figure 121: Mobile - Memora Main

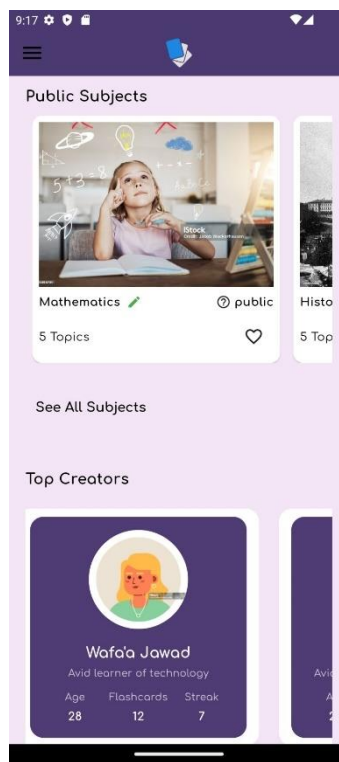


Figure 120: Mobile - Memora Main (2)

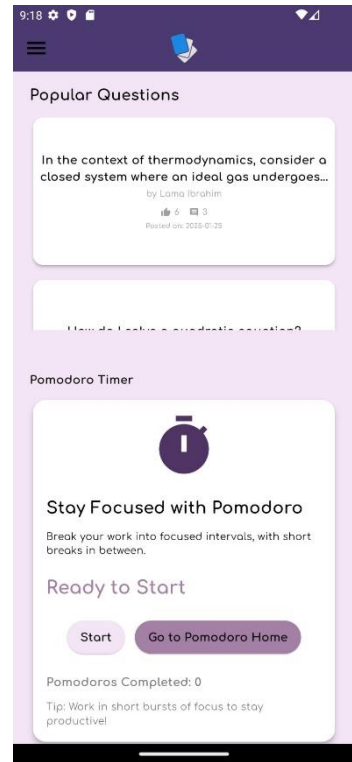


Figure 119: Mobile - Memora Main (3)

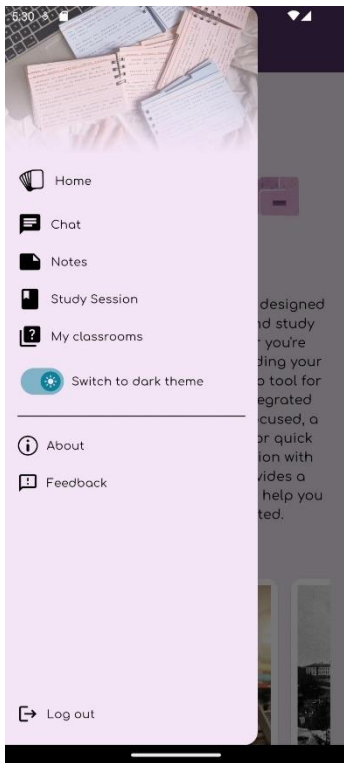


Figure 124: Mobile - Drawer Menu

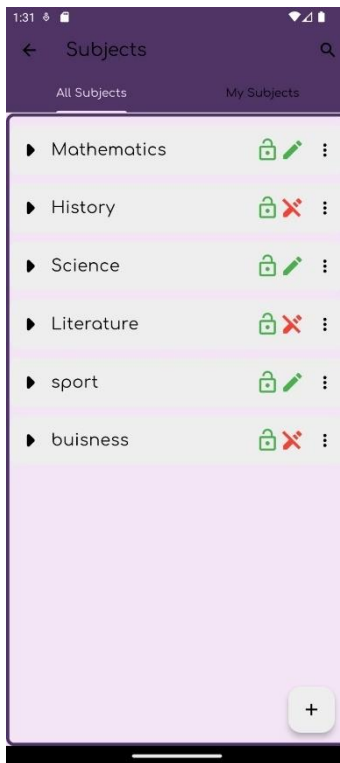


Figure 122: Mobile - All Subjects

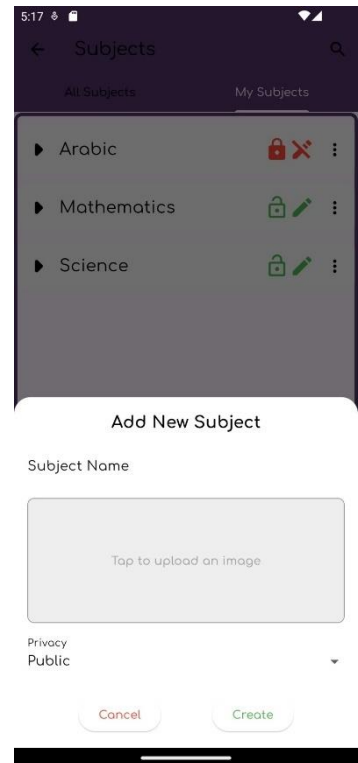


Figure 123: Mobile - Add Subject

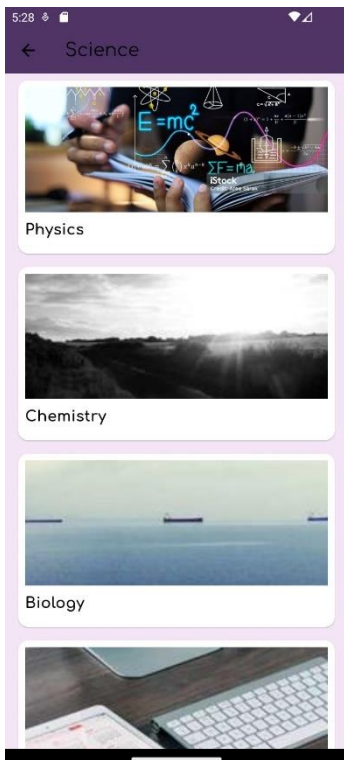


Figure 125: Mobile - Topics

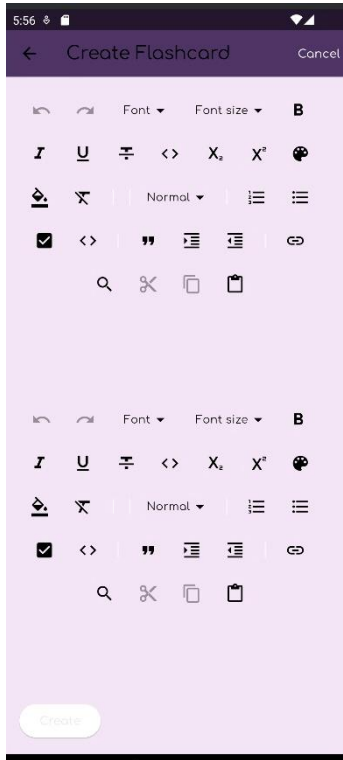


Figure 127: Mobile - Create Flashcard

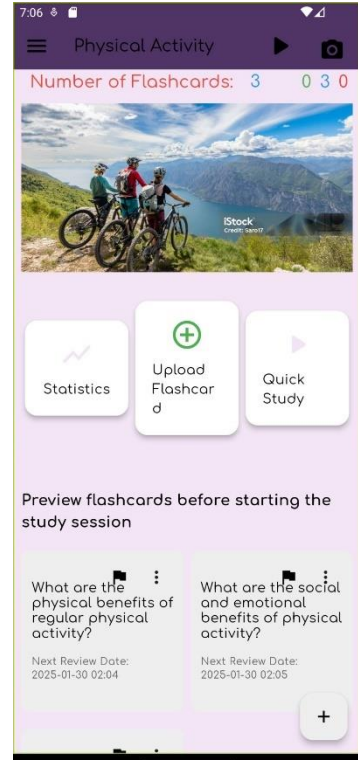


Figure 126: Mobile - Flashcard Set

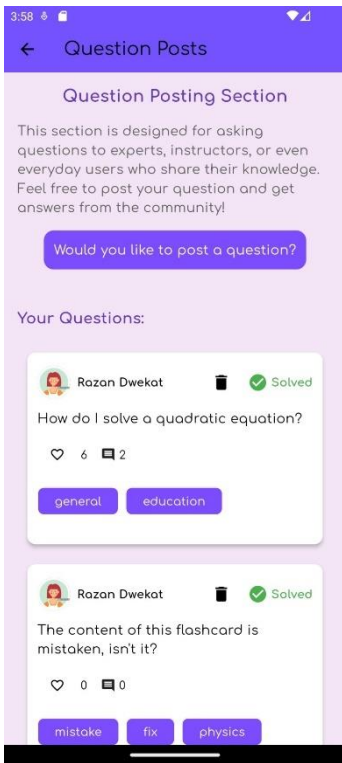


Figure 128: Question Posts

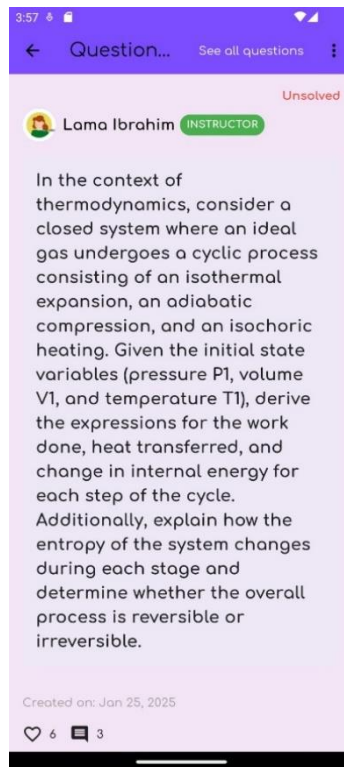


Figure 129: Mobile - Question View

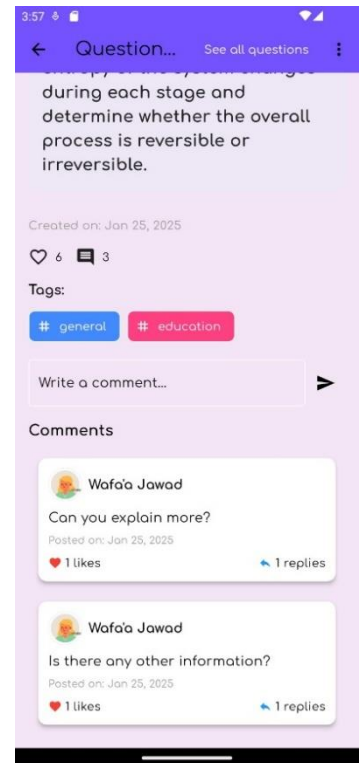


Figure 130: Mobile - Question Post Comments

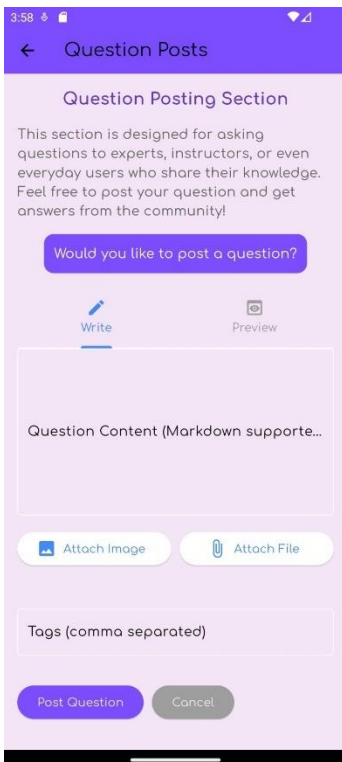


Figure 133: Mobile - Post A Question

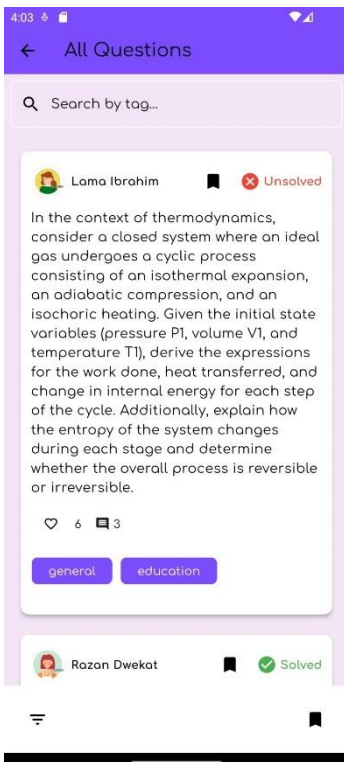


Figure 132: Mobile - Question Filtering Screen

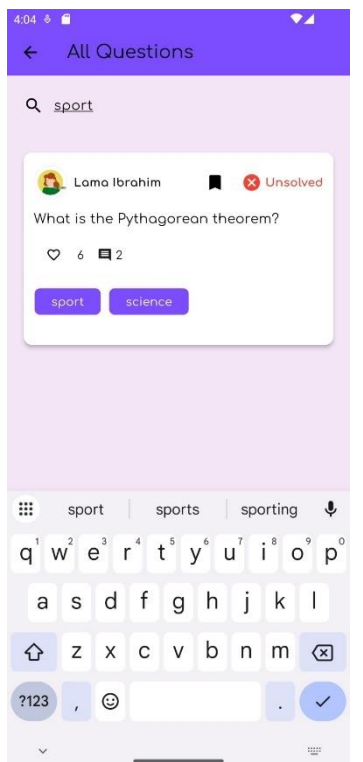


Figure 131: Mobile - Search By Tag

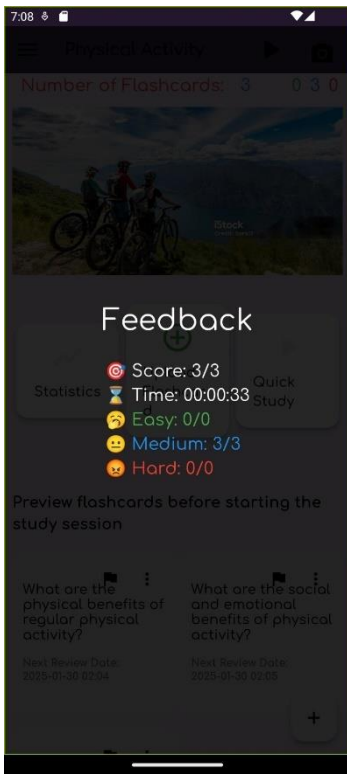


Figure 136: Mobile - Study Session Feedback

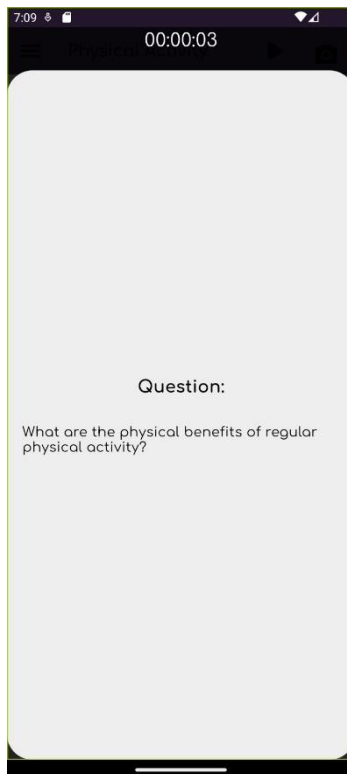


Figure 135: Mobile - Starting A Study Session

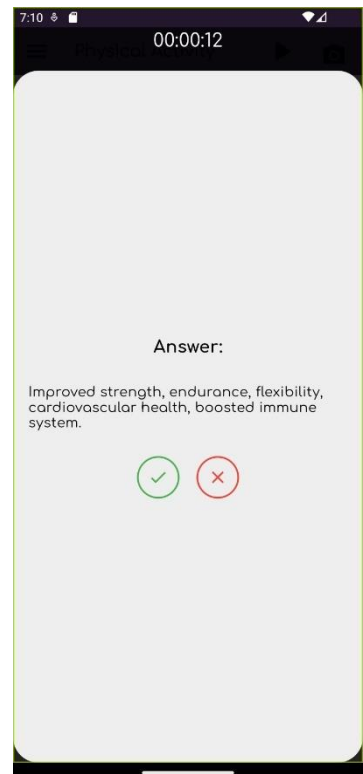


Figure 134: Mobile - Question Answer

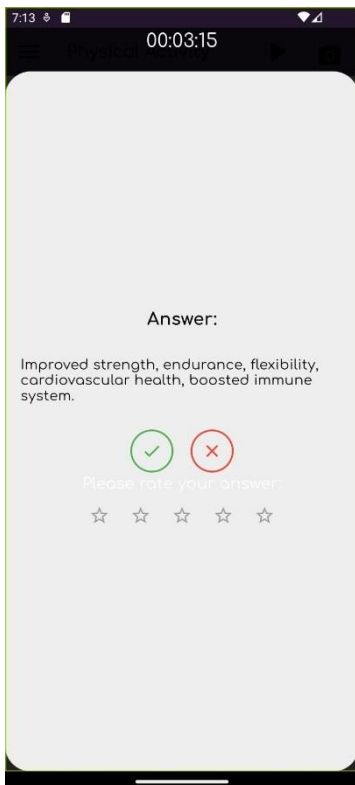


Figure 139: Mobile - Rate An Answer

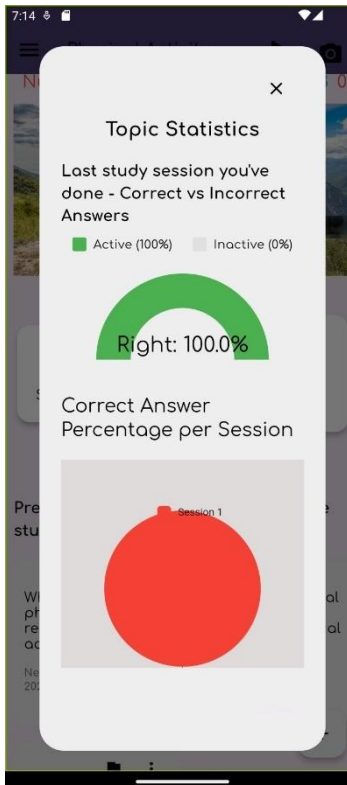


Figure 138: Mobile - Topic Statistics



Figure 137: Mobile - Rename/Delete An Existing Subject

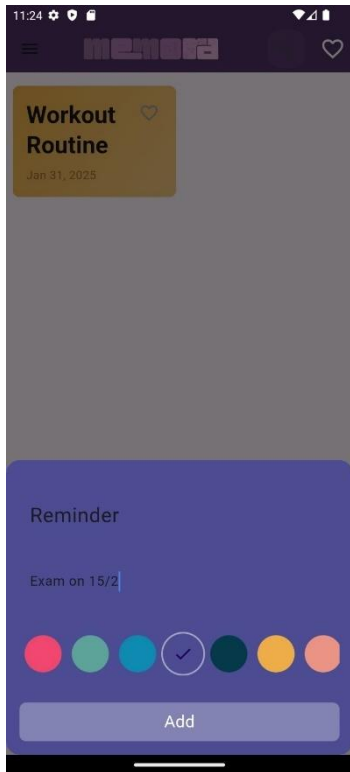


Figure 142: Mobile - Notes



Figure 140: Mobile - Note Added

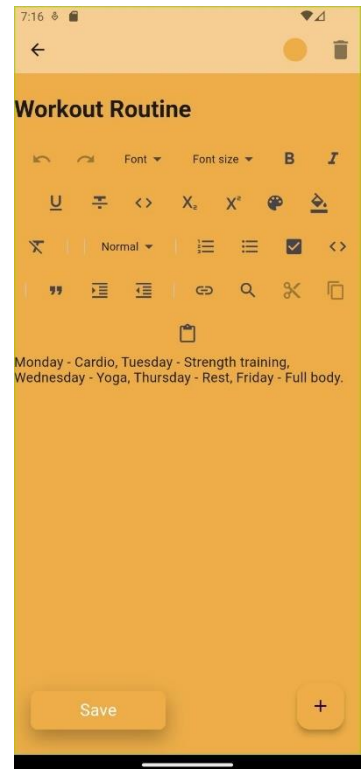


Figure 141: Mobile - Note Edit



Figure 144: Mobile - Note Preview

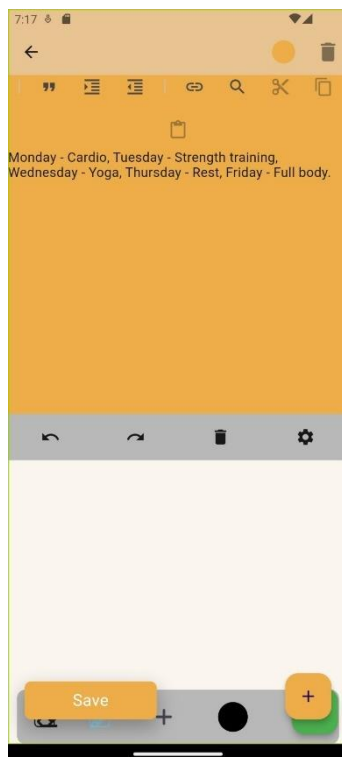


Figure 145: Mobile - Canva

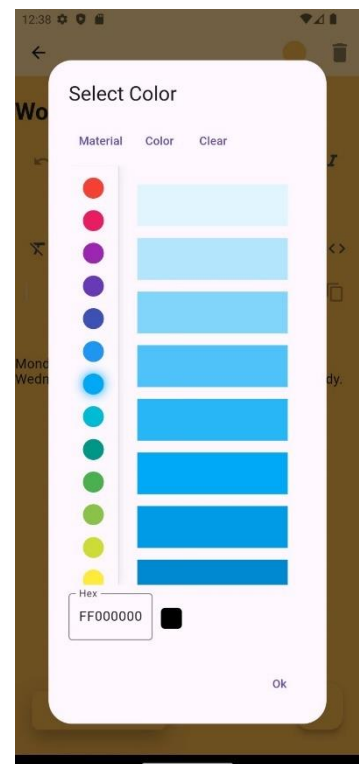


Figure 143: Mobile - Color Selection

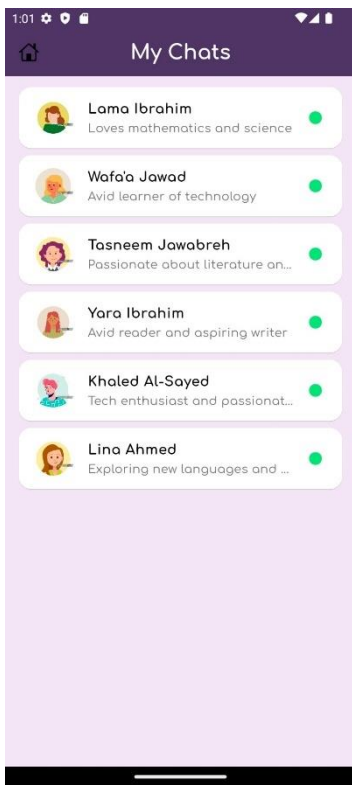


Figure 148: Mobile - Chatting Screen



Figure 147: Chat Screen

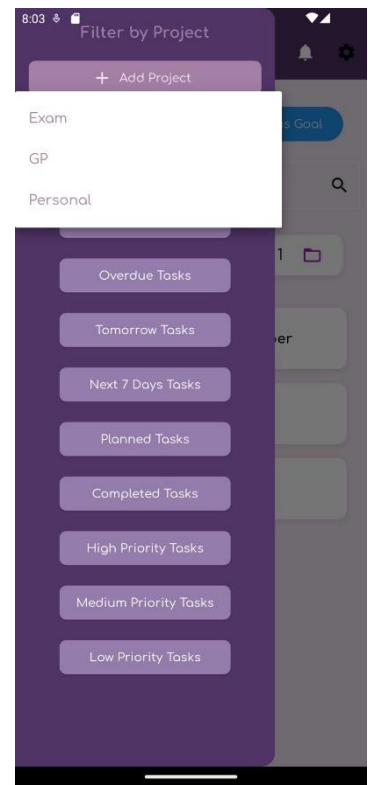


Figure 146: Mobile - Pomodoro Project

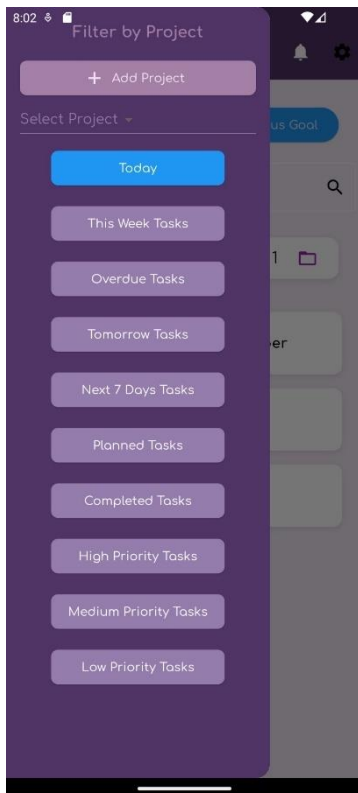


Figure 151: Mobile - Pomodoro Project(2)

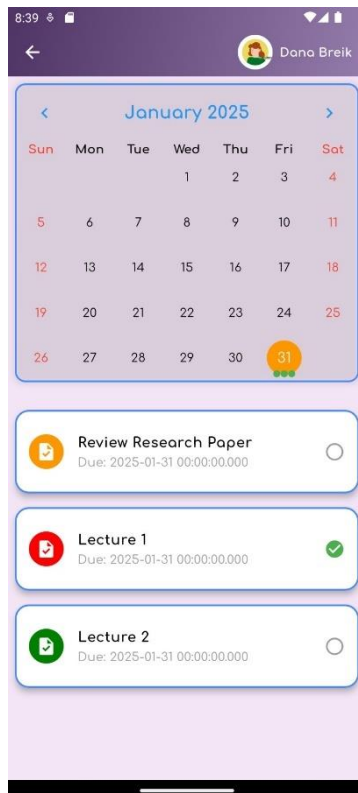


Figure 150: Mobile - Pomodoro Calender

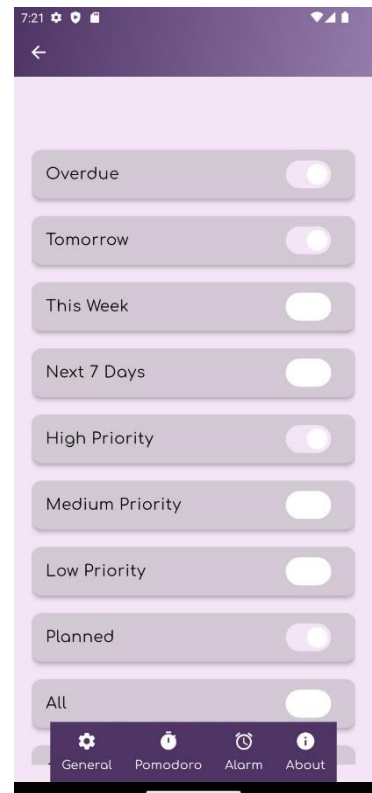


Figure 149: Mobile - Pomodoro Settings

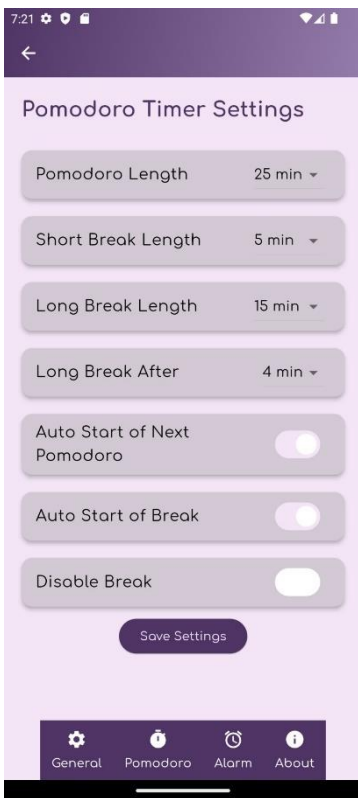


Figure 154: Mobile - Pomodoro Settings (2)

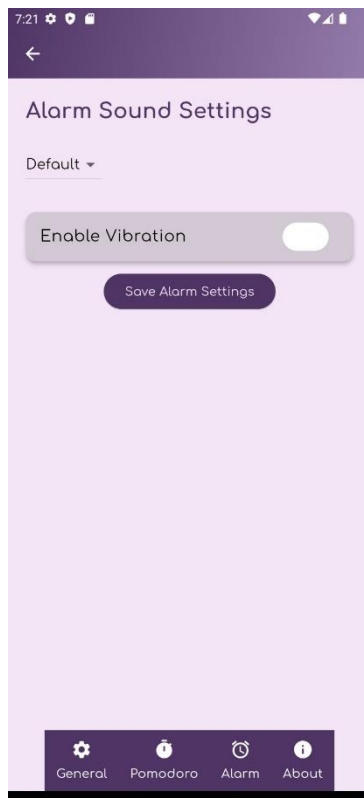


Figure 152: Mobile - Pomodoro Alarm Sound

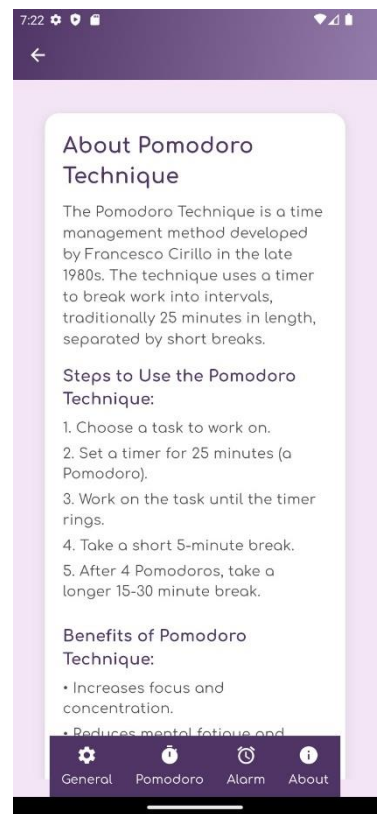


Figure 153: Mobile - About Pomodoro

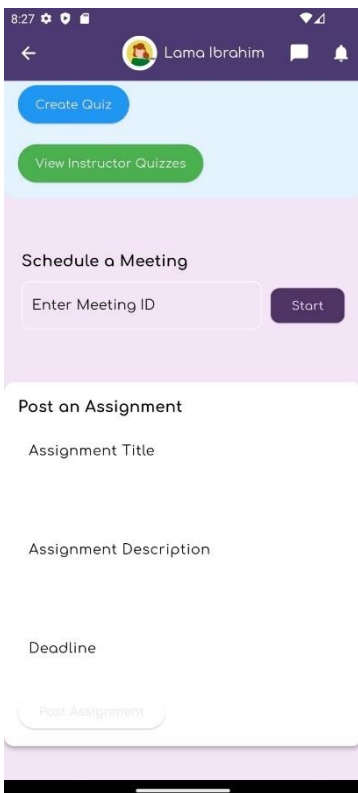


Figure 156: Mobile - Instructor's Dashboard

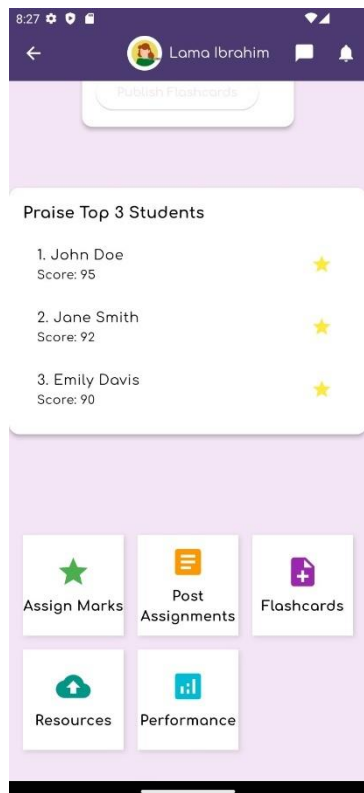


Figure 157: Mobile - Instructor's Dashboard (2)

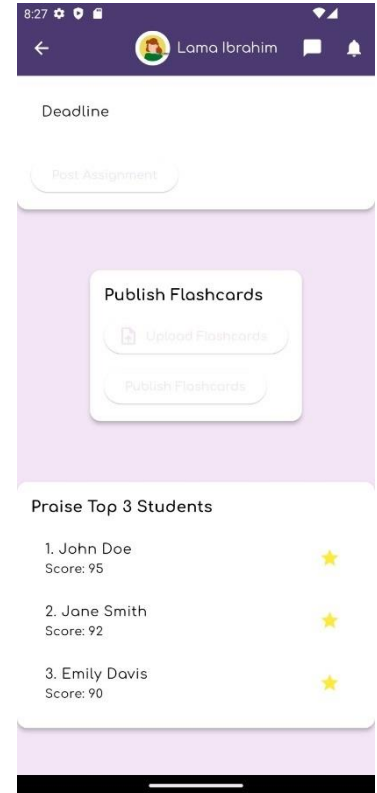


Figure 155: Mobile - Instructor's Dashboard (3)

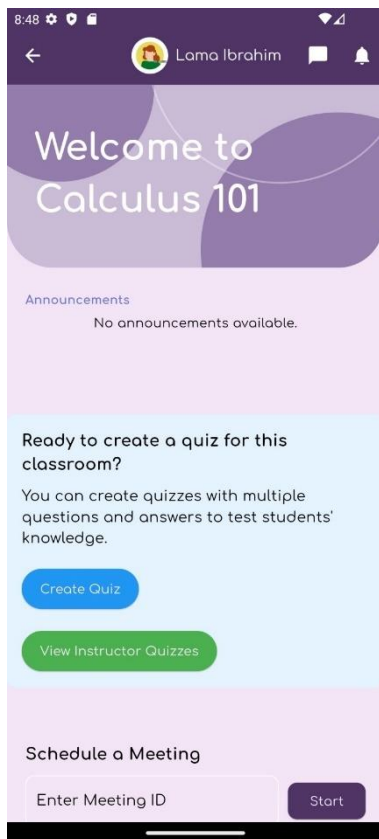


Figure 162: Mobile - Instructor's Dashboard (4)

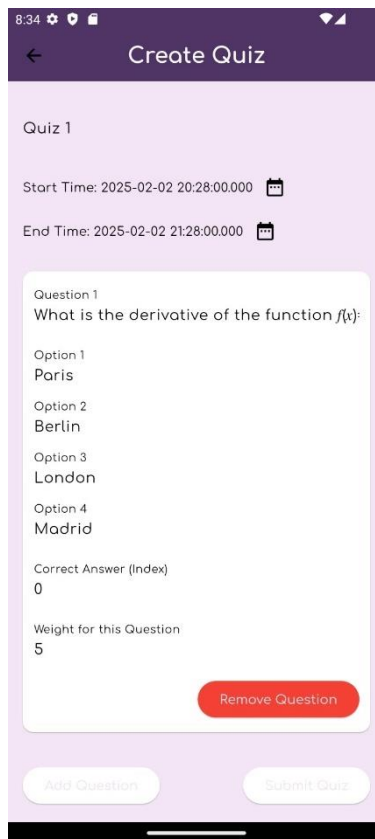


Figure 161: Mobile - Quiz Creation

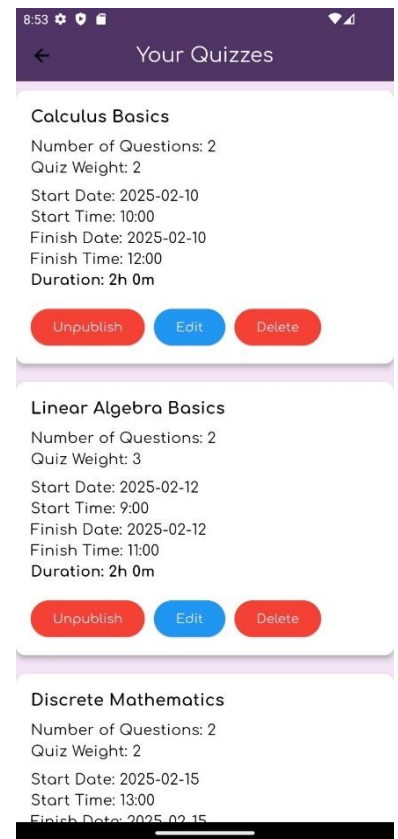


Figure 160: Mobile - Available Quizzes

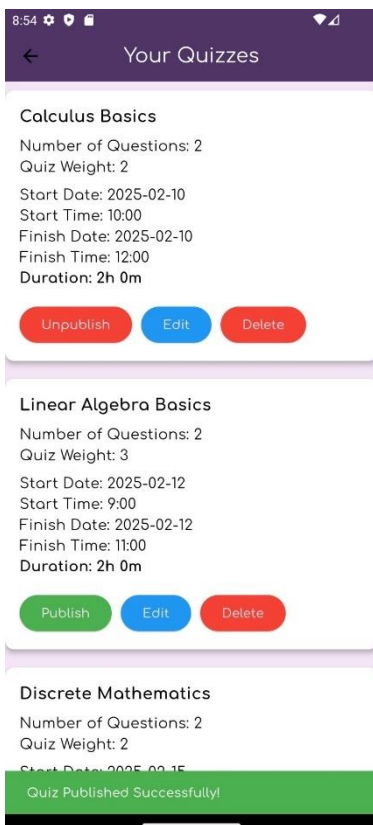


Figure 159: Mobile - Publish A Quiz

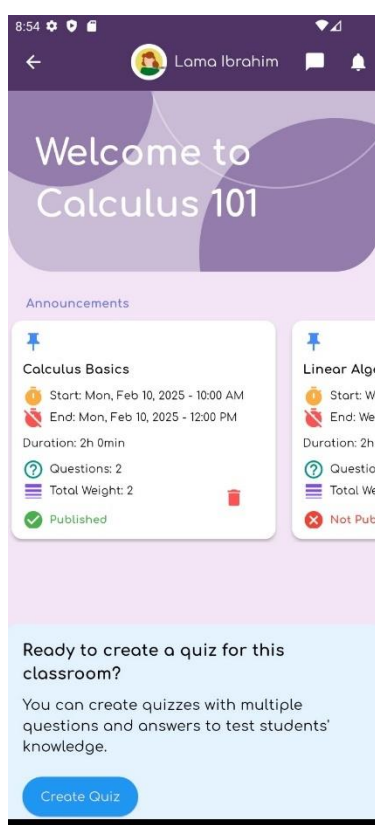


Figure 158: Mobile - Quiz Announced

Chapter 6

Conclusions and Recommendations

In this section we are going to show the conclusion summary and Future work in our project.

6.1 Summary

Memora is a brand-new educational platform that combines several tools to improve students' educational experiences. It combines flashcard learning with a spaced repetition system (SRS) to optimize retention of memory. A customizable Pomodoro timer helps learners enhance productivity by breaking study periods into focused sessions with breaks. With a rich text area for taking notes, the platform aids efficient organization. Memora engages different users such as learners, educators, parents, and administrators, with each having its own functions set to help influence progress tracking, content creation, and overall system management. Thus, Memora brings life to a collaborative as well as an interactive learning atmosphere.

6.2 Future Works

- 1- Augmented Reality (AR) Modules: Things that can be achieved with augmented reality technology are various forms of interactive lessons such as seeing complex concepts in biology, physics, or history as 3D models, thereby making the lesson more interesting and immersive.
- 2- Mind Map Integration – Link flashcards and notes into mind maps for better visualization of concepts.
- 3- Mind Map Integration – Link flashcards and notes into mind maps for better visualization of concepts.

References

- [1] J. D. Karpicke and H. L. Roediger, "The critical importance of retrieval for learning," *Science*, vol. 319, no. 5865, pp. 966–968, 2008.
- [2] A. Cepeda et al., "Spaced repetition and its effects on learning," *Psychological Science*, vol. 17, no. 8, pp. 631–636, 2006.
- [3] N. Kornell and R. A. Bjork, "A stability bias in human memory: Overestimating remembering and underestimating learning," *J. Exp. Psychol.*, vol. 138, no. 4, pp. 449–468, 2009.
- [4] F. Cirillo, *The Pomodoro Technique: The Life-Changing Time-Management System*, 1st ed. New York, NY, USA: Random House, 1980.
- [5] D. Bailey and J. A. Konstan, "Measuring the effects of interruptions on task performance in controlled environments," *J. Appl. Psychol.*, vol. 91, no. 4, pp. 682–690, 2006.
- [6] J. Mark et al., "Frequent breaks reduce cognitive fatigue," *Comput. Human Behav.*, vol. 30, pp. 123–130, 2014.
- [7] M. Bui et al., "The impact of note-taking format on learning and memory," *Comput. Educ.*, vol. 59, no. 2, pp. 556–567, 2013.