EthioQuiz

Exam Preparation Application for Ethiopian National Exam 10th Grade

Engs 86

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Overview

EthioQuiz is a mobile application designed to help students who will be taking the Ethiopian 10th grade national examination. Students are able to use the app to access and practice past paper questions. These past paper questions are compiled from exams and books. The exams span several years and subjects to give students a whole rounded resource. The app allows students to practice with real past paper questions and get instant feedback (included solution and explanation) as soon as they select their chosen answer. Other features of the mobile app include timed exam mode, app-wide leaderboard and region-wide leaderboard.

Context

Improving the quality of education is an important factor in reaching and sustaining a nation's development. Especially in developing countries, a well educated workforce is essential to spark development from within the country. Improving the quality of education translates to improving the ability of the workforce to deliver quality products and services. This application will help 10th-grade students in Ethiopia prepare for their national examination.

Students often study for their national exams by reviewing past papers. These past papers are usually acquired through connections with other students who have taken the exams. Students can also buy review books which usually cost a fortune. Additionally, these review books are not available in remote areas (the countryside). This gives students from the city who have access to these books an unfair advantage over students from rural areas.

The EthioQuiz application will provide these scarce resources for free. This eliminates the need to spend a fortune on exam preparation books. Additionally since the software is a mobile application, it will help in distributing these resources to remote areas where exam preparation books are not available.

The application will have questions coupled with answers and explanations for all courses spanning over several years. I will compile these past papers and build a database of questions, answers, and explanations. The backend will be built on the database to provide requests for specific questions by organized by subject, year, and topic. The frontend will include an interactive interface where students can create a secure profile and compose a plan to prepare for their exam. They are able to take past exams and see how well they are prepared.

Besides reducing cost and increasing availability, such a product also helps in increasing student engagement. Instead of reading boring books, students are able to interact with the app just like a game. The leaderboards introduce a competitive incentive which will motivate students to keep practicing and getting better!

Goals

This section outlines achievable technical goals with a timeline. The table shown below is a guide for how to approach the project. However, the timeline of the project will not exactly match what is written below. From a strategic view point, this project will be built in incremental stages/iterations. Each iteration will be fully tested and documented before the next one. This will ensure a smooth workflow. For now, I have listed planned iterations below. This list is subject to change.

Backend

1. A mongodb database that is able to handle simple CRUD mongo queries.
2. Build a RESTful API on top of the database to handle http requests.

Frontend

1. A bare bones frontend able to display questions by year and subject.
2. Add instant feedback. User is able to view answers and explanations after answering a question.
3. Once the iteration above is stable, I will start adding features mentioned above.

Weekly Checkpoints:

WEEK	CHECKPOINT
ONE	Research and analysis of existing similar educational tools. Are these tools in use? What are their advantages and disadvantages? Study state of the art educational apps that are being used in Ethiopia. Research alternative solutions or designs.
TWO	Building the database: collect, organize, and digitize past papers and other relevant educational materials. Using this data, build an organized NoSQL database. This will likely be a MongoDB database.
THREE - FOUR	Write the backend code that will allow the access of data in formalized queries. Building this backend should make the interaction of the database with the frontend seamless. I will use a combination of Python and Express to write this code.
FIVE - SIX	Write the frontend code: this will allow the user to access the resources. It will also provide additional functionality such as progress tracking and leaderboard competitions. I plan to use React Native, JavaScript, and CSS to build the frontend. Using React Native will allow me to deploy the product in both Android and IOS platforms.
SEVEN - EIGHT	User testing and building additional features as necessary. I plan to gather user

	feedback and iterate on my design to improve the product.
NINE - TEN	Finalizing the product. Full testing of features. Deploying the product for use in the real world. Preparing the final presentation and deliverables.

Alternatives

When proposing a solution to a problem, it is important to consider alternative or existing solutions. Doing so will prevent any unnecessary work and ensure the solution chosen is the best one. In this section, I brainstorm and rate alternative solutions to this problem statement. I will be using "Matrix of Alternatives" -- a technique thought in Engineering 21: Introduction to Engineering.

Matrix of Alternatives

To build this matrix (table), we need to identify the alternative solutions. Listed below are some of the alternative solutions to this problem.

1. This applicaiton - EthioQuiz Android
2. EthioQuiz IOS
3. EthioQuiz Web
4. EthioQuiz Desktop
5. Exam preparation books
6. Hardcopy past papers

In addition, we need to list specifications that will be used to quantitatively rate these alternatives.

1. cost
2. availability

3. ease of use
4. interactiveness
5. updateableity/durablity

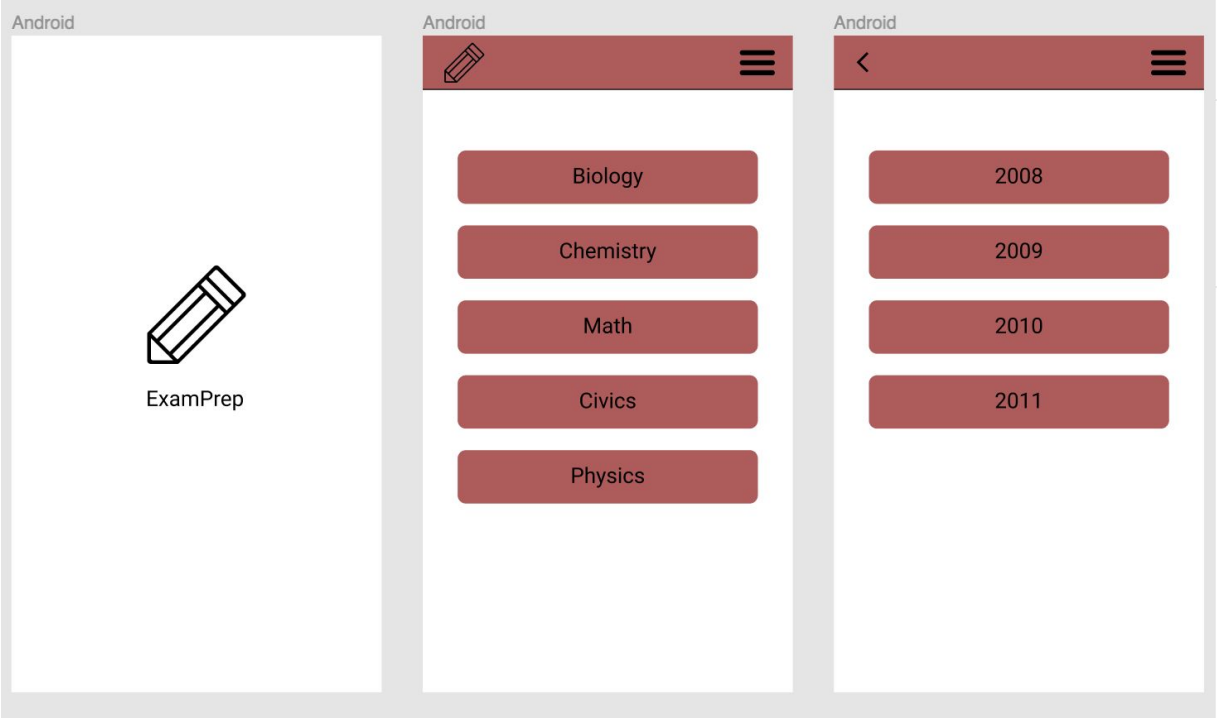
These specifications are given weights ranging from 1 to 3 depending on how important they are to the success of the project. As we can see in the table, cost, availability, and ease of use get high weight of 3 because our product should be cheap, widely available, and easy to use.

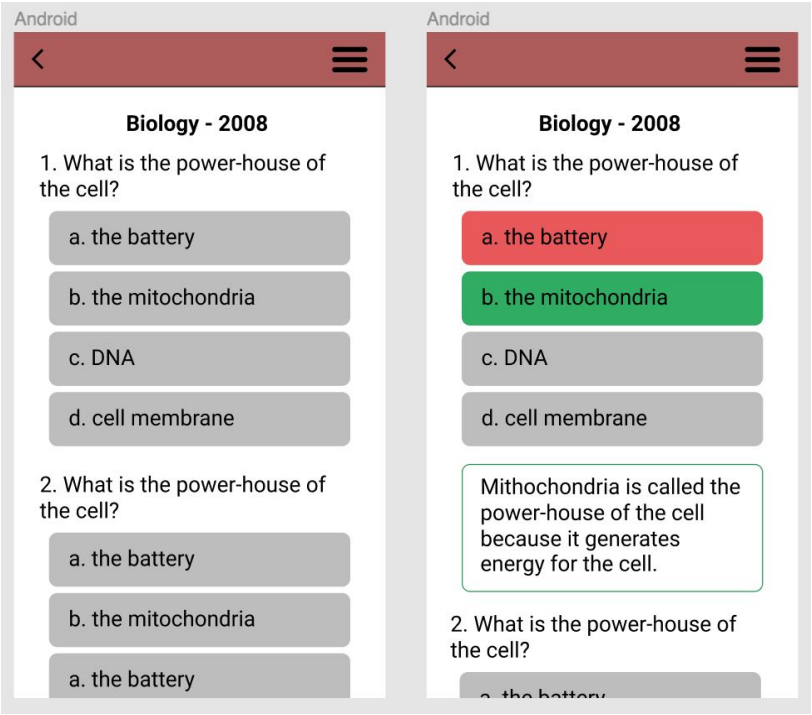
Each alternative implementation is rated on a scale from 1 to 3 depending on how well they deliver on each specification. This rating is multiplied with the respective spec weight and summed across all the specs to calculate the total.

	cost	availability	ease of use	interactive	update/ durability	Total
WEIGHTS (1-3)	3	3	3	2	2	
Android app	3	3	3	3	3	45
IOS app	3	1	3	3	3	33
Web app	3	3	1	1	3	26
Desktop app	3	1	2	3	3	30
Prep books	1	2	2	2	2	23
Past papers	2	1	2	2	2	23

As we can see from the matrix of alternatives, an android exam preparation application is the best solution to our problem statement. It got the best score on all of the specifications. On the other hand and IOS application scored low on availability since IOS devices are not widely used in Ethiopia. Web apps and desktop apps are not easy to use or interactive since they require access to a personal computer. Prep books and past papers are not widely available and can be very expensive. Over all, android app is the most optimal with regards to cost (because it would be free to download), availability (android phones are widely present in Ethiopian families), ease of use, interactiveness, and updateableity.

Iteration One

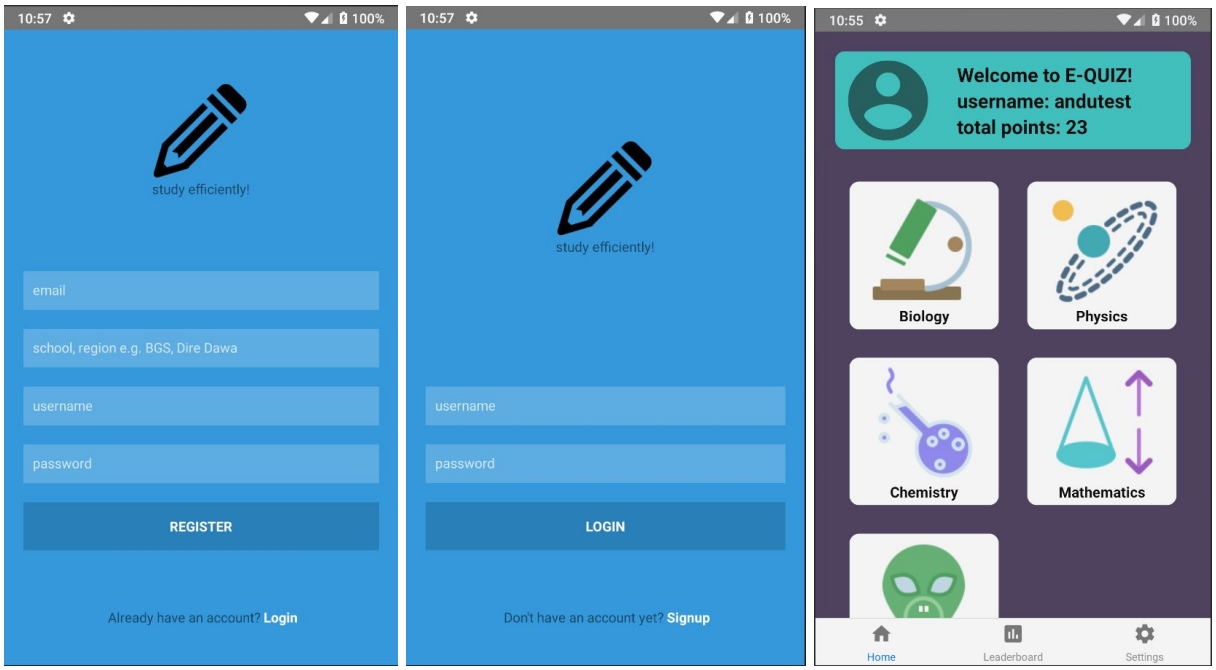


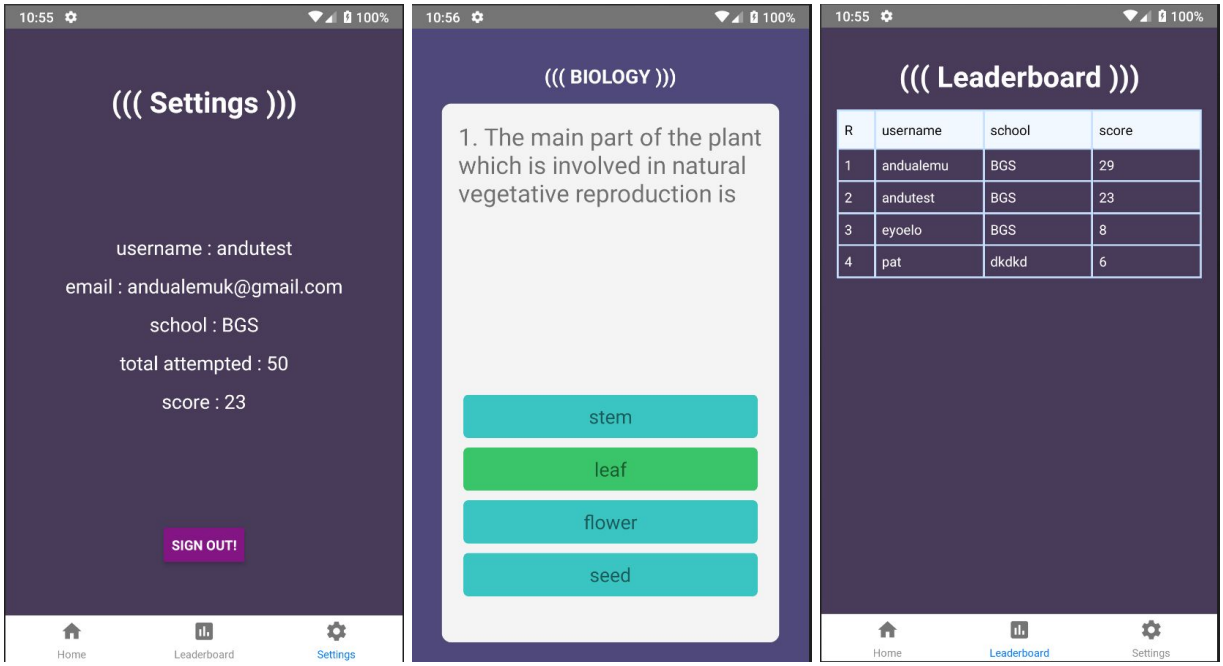


The screenshots above show the first iteration of the application. In this design, a user is able to select the year and subject of the exam they want to review. Then they will have access to a scrollview of all the questions from that year. They can interact with a question by pressing on one of the choices. This will reveal the correct answer and an explanation tab with further information about the correct answer.

Although, this version serves as a great resource, it does not provide an incentive for the students to keep coming back to the app and keep practicing. In the second iteration, I included a score and leaderboard system to incentivise user competition and practice. This method implements the reward and reinforcement learning that is explored in the slides attached.

Iteration Two





This iteration is designed to implement reward and reinforcement learning. Students are *rewarded* when they answer a question correctly by increasing their score. And if a student answers a question incorrectly, that question is more likely to show up again. This incorporates the reinforcement learning.

In summary, this iteration delivers the essential parts of what students need to prepare for their national exams: questions, answers, explanations, rewards and competition for fun and interactiveness. It delivers these elements in a small package that easy to download, install and use. The data usage of the application is very limited as all questions and answers are text-based and the app does not request more than five questions at a time. All these aspects set up EthioQuiz for success in the Ethiopian high school environment.