



ASHESI UNIVERSITY

**REVISE-ME: AN E-LEARNING SYSTEM THAT HELPS RWANDAN HIGH
SCHOOL STUDENTS TO REVISE ONLINE BY NAVIGATING THROUGH
THE CONTENT AND ASSESSING THEMSELVES.**

APPLIED PROJECT

B.Sc. Management Information System

Carine Sebarinda Iradukunda

2021

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APPLIED PROJECT

Applied Project submitted to the Department of Computer Science, Ashesi University in
partial fulfilment of the requirements for the award of Bachelor of Science degree in
Management Information System.

Carine Sebarinda Iradukunda

April 2021

DECLARATION

I hereby declare that this applied project is the result of my original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature:



Candidate's Name:

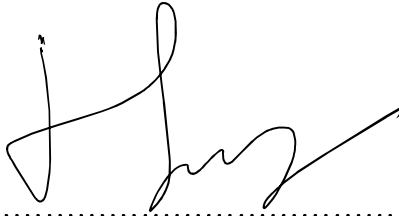
Carine Sebarinda Iradukunda

Date:

14th May 2021

I hereby declare that the preparation and presentation of this applied project were supervised in accordance with the guidelines on supervision of applied project laid down by Ashesi University.

Supervisor's Signature:



Supervisor's Name:

Eric Ocran

Date:

14/05/2021

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I would like to thank Almighty God, who granted me health and long life, without which I could not have completed my project successfully. I would also like to thank my supervisor, Mr. Eric Ocran, for his time, good feedback and constructive critiques.

Abstract

In 2020, covid-19 spread everywhere in the world. Covid-19 made people realize why technology is so important. Technology was the way of communication and getting all information. Schools were closed; some schools managed to move online, others were not able to do so. In Rwanda, they managed to put classes on TVs, Radios and the Rwanda Education Board platform. Students needed a more user-friendly system that can help them revise at home, assess themselves while following the Rwanda Education Board curriculum. In this paper, an e-learning system is proposed. Revise-Me is a user-friendly web application that is compatible with all smartphones. It has notes, textbooks and exercises, which are automatically graded by the system.

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Chapter 1: Introduction

On 16th March 2020, all schools in Rwanda were closed due to covid-19. Students went home hoping to go back to school after two weeks. Many did not go home with school materials like notebooks and textbooks since they usually leave them at school. After two weeks, Rwanda remained on total lockdown. When the lockdown measures were slightly lifted, schools remained closed until 23rd November 2020, hence eight months at home without studying. Rwanda Education Board has provided ways for students to catch up with studies by offering classes on national television, national radio station, and a website created for the purpose. Many reported that televisions and radios are not efficient ways of learning since everyone wants to use them for different leisure purposes. The website that Rwanda Education Board provided is not providing a good user experience for high school students.

“E-Learning environments may contribute to the process of teaching and learning but only if the integration is done within the framework of proper pedagogy, both educational and technological”[6]. In that case, the project I am working on is a web application called REVISE-ME, which is user-friendly with a good interface for students and can allow students to revise and navigate through different school content while assessing themselves. Self-evaluation is one of the strategies for effective self-regulated learning[2]. REVISE-ME also has a space for general questions not covered in class but helps students discover things outside the class content. The assessments will be done between the design and the students. A critical review of research on Student Self-Assessment describes what is self-assessment as a descriptive and evaluative act completed by the learner concerning his or her work and educational capabilities. Self-evaluation is performed because; students need to know where they stand while gaining knowledge [1].

Research shows that there is no difference between in-person classes and online classes [5]. The system will allow students to navigate through different course materials. The content

covers core courses like Mathematics, Physics, Geography, Chemistry, Biology, History, and Entrepreneurship. Grades covered on REVISE-ME are from senior one to senior six. The web application is compatible with smartphones, tablets, and computers.

Web-based applications are a particular type of software that allows users to interact with a remote server through a web browser interface. Web apps work on any device that can run on supported browsers and has an active Internet connection.

1.1. Requirements Analysis

The web application targets high school students in Rwanda, for which their schools follow the Rwanda Education Board curriculum. By the time of holidays or free time, students need to revise; some students may need the materials because their schools do not allow textbooks outside of school. More than 70% of those I asked provided that they were having access to mobile phones, tablets or computers, but they could not navigate the Rwanda Education Board platform. The web app will be user friendly and more attractive for students to be comfortable and not bored. It will allow them to assess themselves. The web application will enable students to create an account. After creating an account, they will be able to log in and choose the year and the course they want to learn. The information that will be collected is their phone numbers and names. For security purposes, only the system administrator will access the students' accounts or information.

Chapter 2: Requirements Analysis

The system will provide a user-friendly interface and experience to students. After a unit, students can do assessments about that unit. The system will help students to revise easily and find relevant content. There will also be different textbooks uploaded in the system for students to be able to access them. It will be easy to access it from any device; the web application will not need to be downloaded. The system will be a web application that can be accessible everywhere with just the internet.

When students go home on vacation, some do not take textbooks or notebooks with them. When a student wants to access online resources; It is hard for them to get relevant resources. All high school students whose schools follow the Rwanda Education Board curriculum will find relevant content on the web application.

2.1 Functional Requirements

- **ASSESSMENT:** Evaluating the progress and experience of students.
- **DESIGN:** the process of analyzing, planning and implementing specific approaches to e-learning.
- **ACCOUNT CREATION:** the system will allow students to create accounts
- **STUDENT LOGIN:** the system provides the facility to login into the system if they have accounts.
- **PRIVILEGES:** When users use a guest account, they cannot access the content; they will instead be redirected to a create account/login page.

2.2 Non-Functional Requirements

- SECURITY:
 - ✓ The use of HTTPS protocols is to ensure secure communication between the server and a client.
 - ✓ Ensuring sufficient password management; by getting them to create strong passwords and change them sometimes if possible.
 - ✓ It is using firewalls to protect the web application by blocking malicious connections that compromise security.
- MAINTAINABILITY:
 - ✓ Bug fixes
 - ✓ Investigating failures
 - ✓ Keeping its systems operational
 - ✓ Adding new features
- RELIABILITY:
 - ✓ Take users' experiences or insights to ensure that users are getting what they want.
 - ✓ It will have a back button if a student opens a course they do not want or an assessment.
- USABILITY:
 - ✓ Availability of user manual guide

2.3 Requirements Gathering

In the summer of 2020, some students discussed with me how they are revising. That is how they gave me ideas of what they needed. I could not speak to many students, so I sent a google form to different high school students to see if they are willing to use such an application. Of 513 respondents, 31% were senior five students, more than 50% do sciences, 98% revise at home, 70% can access electronic devices, and 99.8% are ready to use the web app and assess themselves. I discussed with students and teachers in person, and they gave me feedback about what to improve.

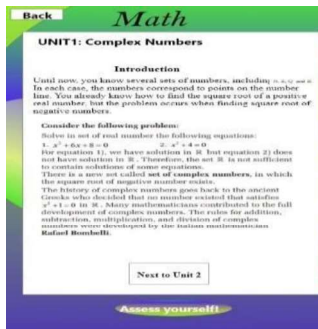
Main user



Problem



Payoff



Benefit/Advantage



Aline, a student in high school is at home. She wants to use online resources but she can't find relevant resources.

When Aline wants to learn at home; she uses REB e-learning platform which is a bit complicated to use and does not have all resources.

Using Revise-Me, now Aline is able to revise easily, do assessments and gets solutions.

Aline is excited as she is finishing all units and able to check her understanding.

Figure 2.1: 4-panel storyboard

Chapter 3: Architecture

3.1 Architectural Decisions

The methodology that *Revise-Me* will follow is Agile. I chose Agile because it promotes continuous iteration of development and testing throughout the project's software. In the Agile model, both development and testing activities are concurrent.



Figure 3.1: Agile methodology

3.2 Architectural Patterns

Revise-Me will follow the MVC pattern. M for Model, V for View and C for Controller.

MVC is a software pattern. It helps the system to separate information accordingly. It breaks the system into three elements; View, Model which connects to the database and controller. It is easier for the system to access data and communicate them to the user.

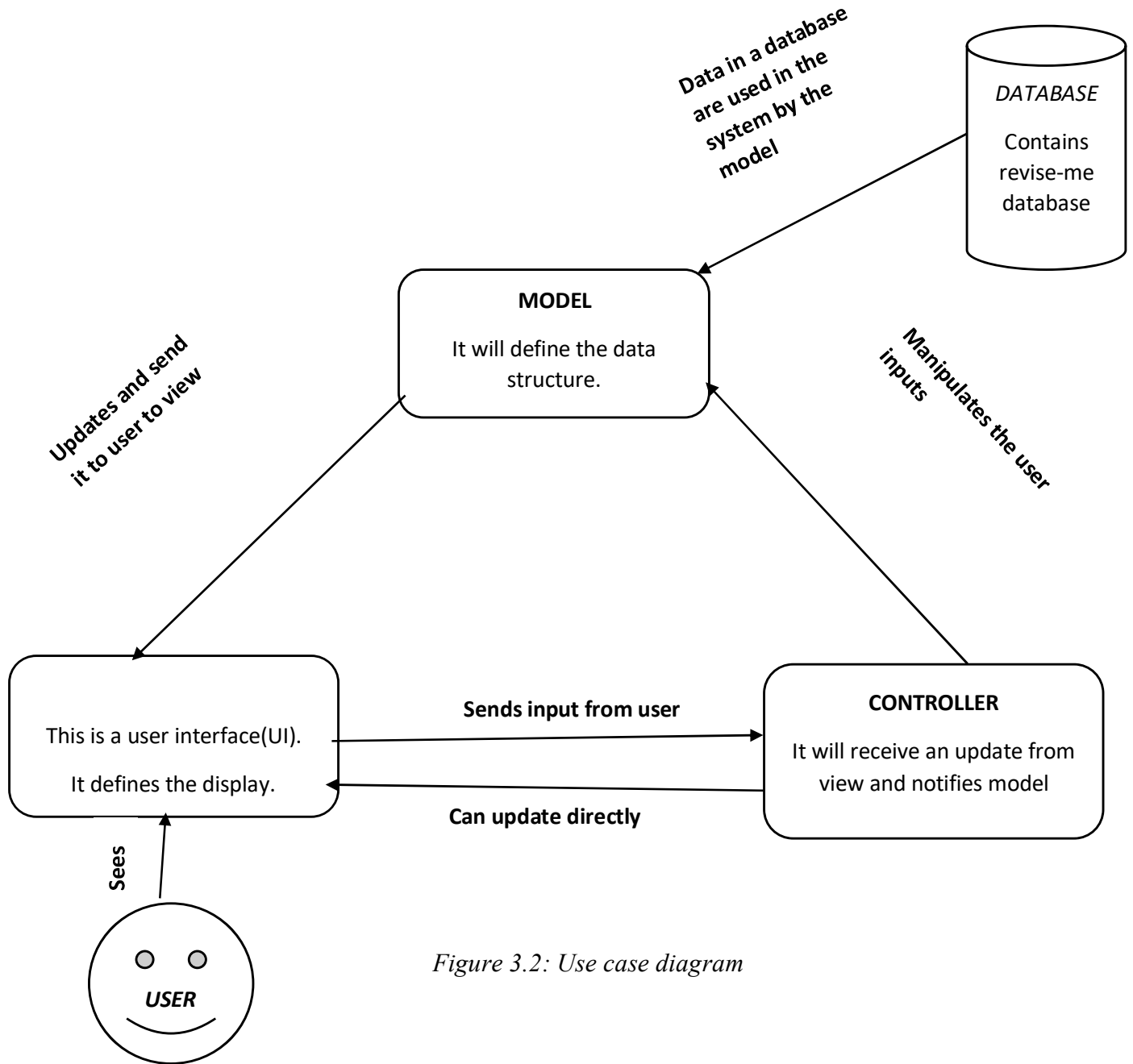


Figure 3.2: Use case diagram

Chapter 4: Implementation

4.1 Programming languages for REVISE-ME

The web application was designed using HTML, CSS and JS. It has a bootstrap framework implemented to make it responsive and looking good. PHP was implemented so that the application can make requests. And Finally, for the Database management, MySQL was used in phpMyAdmin.

4.2 REVISE-ME Design and Implementation

Chapter 4, part 2, is going to describe how REVISE-ME works. Figure 4.1 shows the initial design of Revise-Me interface. The design was later changed to Figure 4.2. The logic remained the same to what it looks like today; but the design changed.

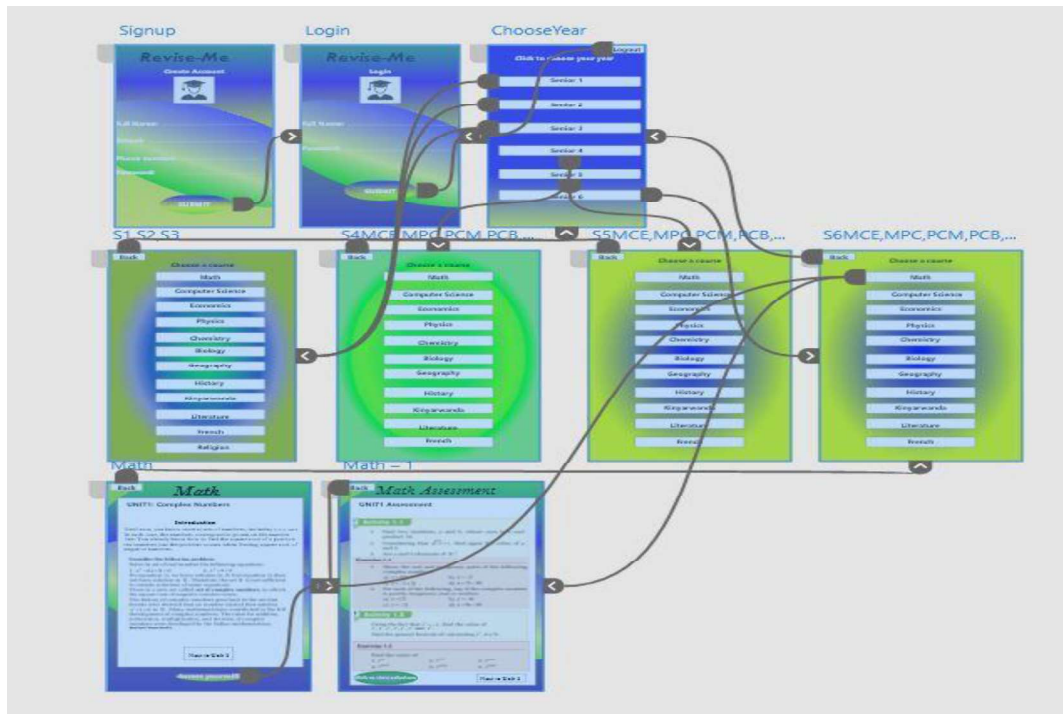


Figure 4.1: Early Design

Figure 4.2 shows the new design of the homepage which has a user manual guide button, a login button, a create account button and a guest account button.

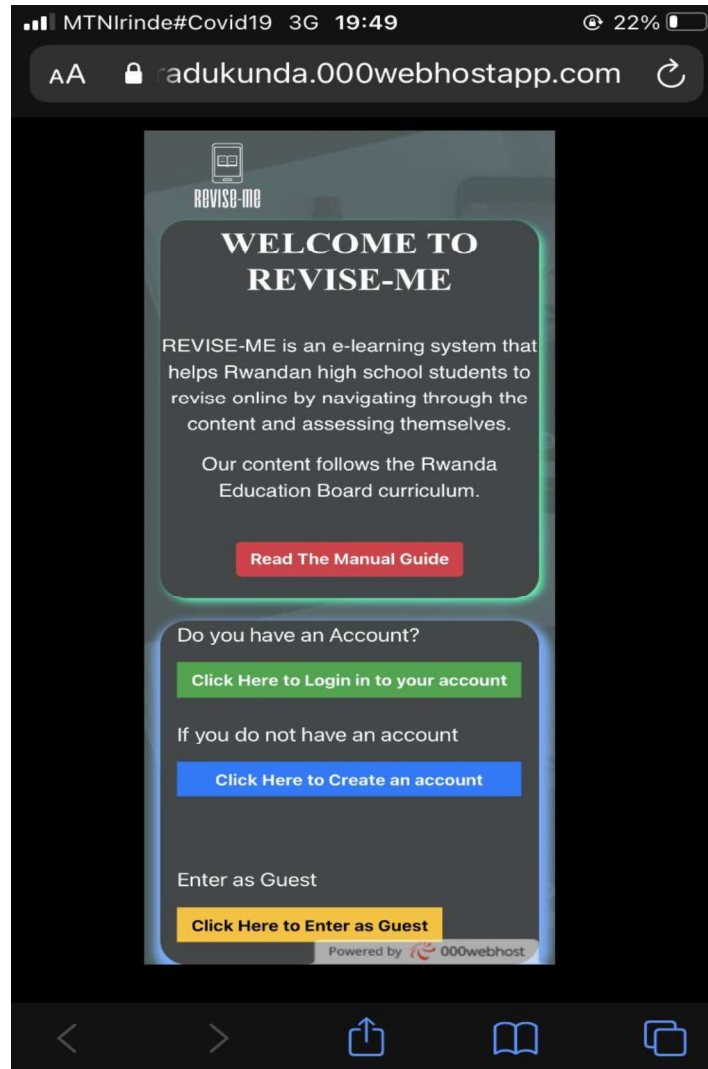


Figure 4.2: New homepage design

4.3 The Manual Guide

As a new user; one needs guidance on how to navigate a system. Revise-Me made it easy for students to know how to navigate it. On the home page there is a red button “*Read the Manual Guide*”; if the red button (shown on *Figure 4.2* is clicked, a pdf pops up. It has the whole process of navigating the system and explanations.

The manual guide was prepared by going through the manual guide, creating account, logging in, and doing exercises using a laptop. Snapshots were taken during the process.



REVISE-ME USER GUIDE

Revise-Me is an e-learning system that will help Rwandan high school students revise during vacation or anytime. It will follow the Rwanda Education Board curriculum.

Revise-Me can be accessed using smart phones, laptops, desktops and tablets. A user does not need to download anything. By using any of the above mentioned devices; you can just click the link.

NOTE: If you do not have an account you cannot access the notes, books or exercises.

! The process shown below will be the same for all devices.

<p>Step 1. Click the link to access the Revise-Me.</p>	
<p>Step 2. It is better for always reading the</p>	


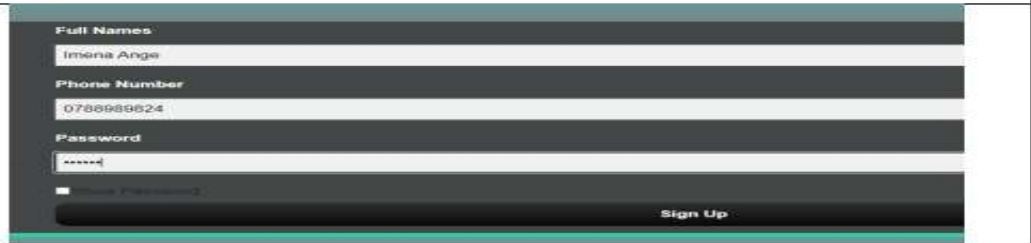
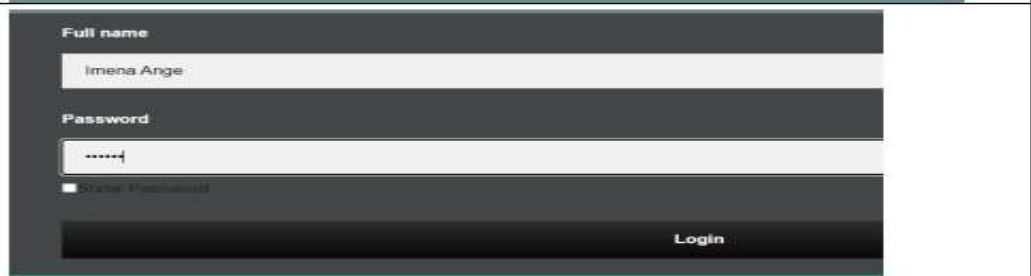
<p>Step 3. Create an account to register by clicking the blue button</p>	
<p>Step 4. Fill the form with the details asked and click on the Sign Up button.</p>	
<p>Step 5. You will be redirected to a login form and you will enter your details you used creating an account</p>	

Figure 4.3: User Manual Guide

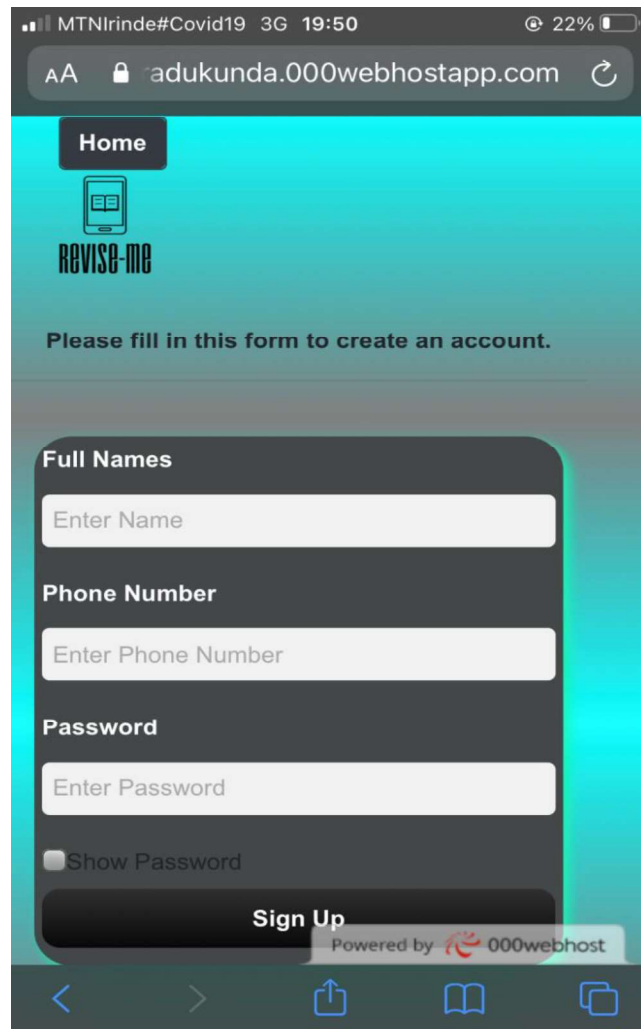


Figure 4.4: Create account page

A student can create an account using Full name, phone number (for password recovery, which may later change to e-mail and a password.

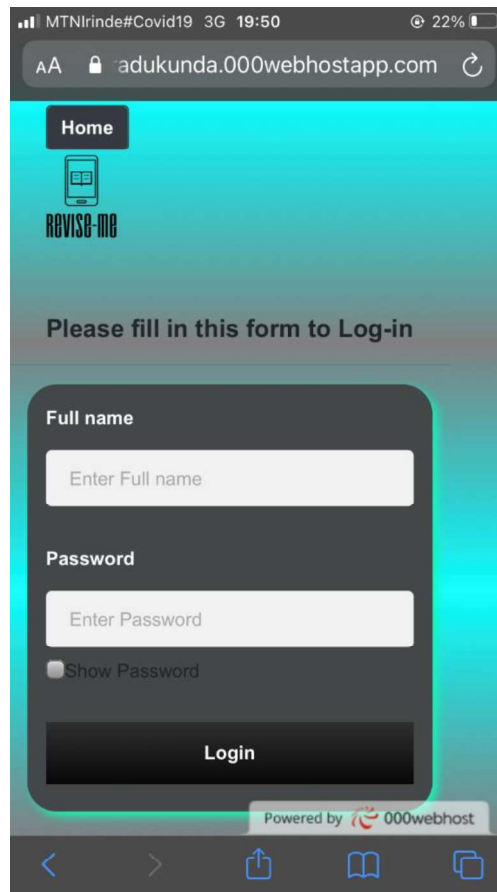


Figure 4.5:Login Page

After creating an account with the required details, they are directed to the login page, where they are asked to enter their Full name and the password they used while creating an account. Both pages contain a button that goes back to the homepage.

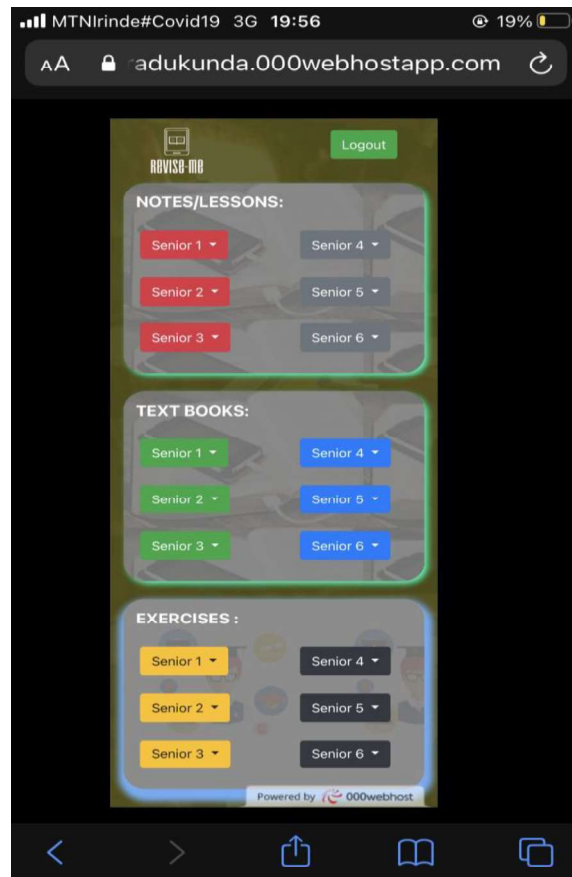


Figure 4.6:Content page

The content page contains Notes and Lessons in a pdf format, same as textbooks; all of these are available for all years in courses such as Mathematics, Physics, Chemistry, Biology, Geography, History. The page contains exercises about the courses mentioned above and from Senior one up to Senior six.

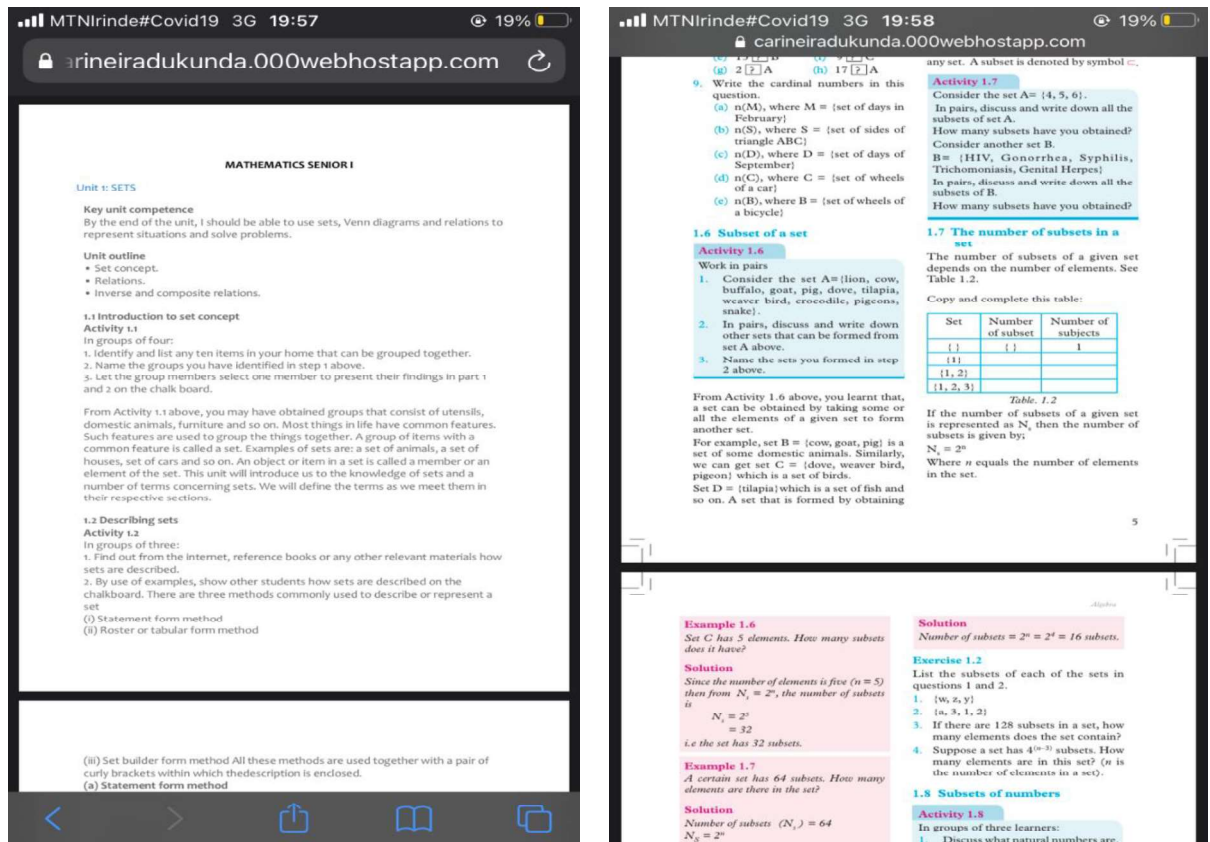


Figure 4.7: Notes & Textbooks pages

The left panel displays a mathematics notes page for senior One students. The notes are divided into units and they are in a .pdf format. The panel at the right displays a Senior One mathematics textbook in a .pdf format. For both pages, the download privilege was removed.

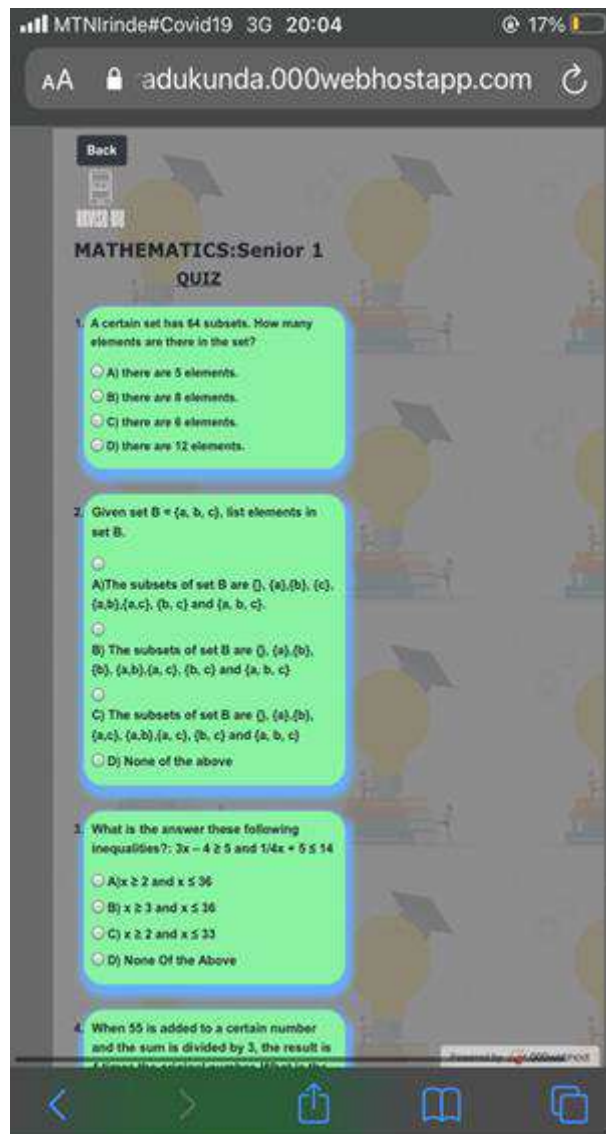


Figure 4.8: Exercise page

This figure displays Senior One mathematics exercises page. Questions are multiple-choice. All questions are compulsory; if not the system will not submit when an answer is missing. To submit the answers; a submit button is after the last question.

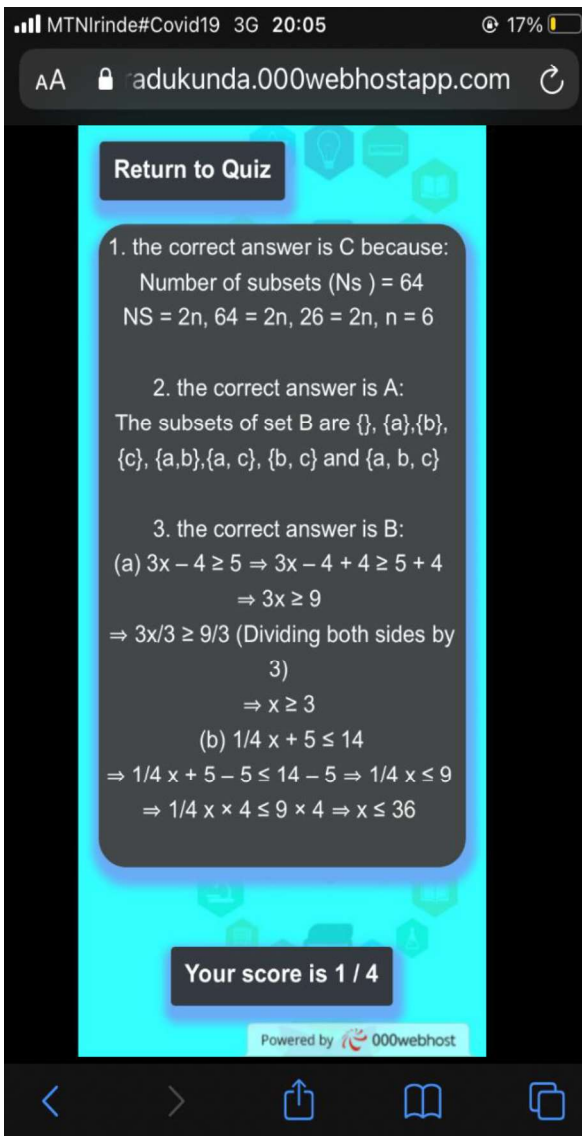


Figure 4.9:Exercise results page

After a student is done doing the exercise; they click on the submit button, which directs them to the results page. The results page displays a correction to only questions that were answered wrongly. The results page also displays the score that a student got.

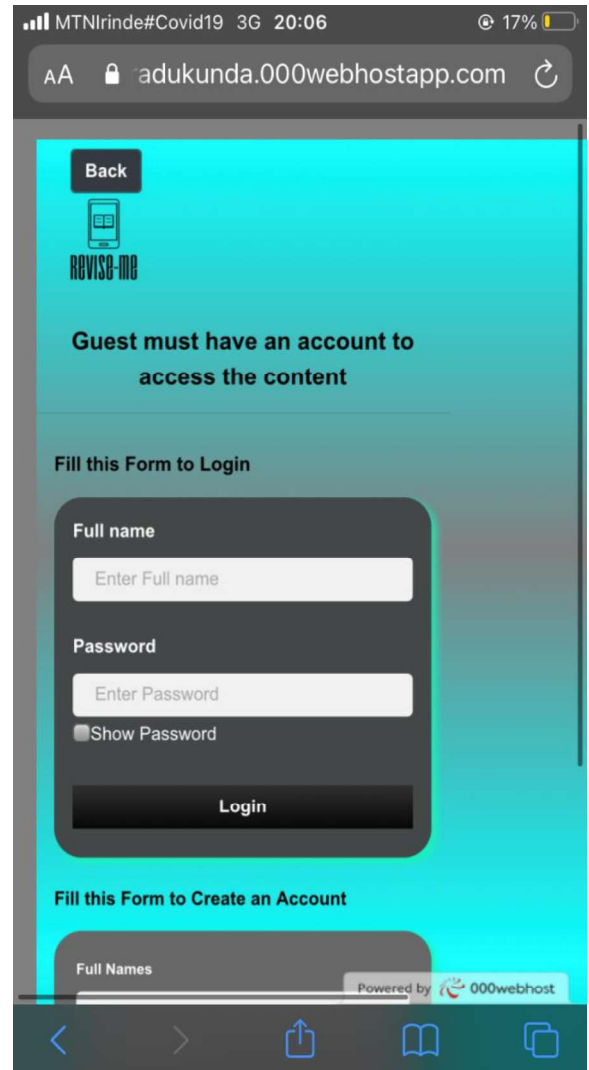
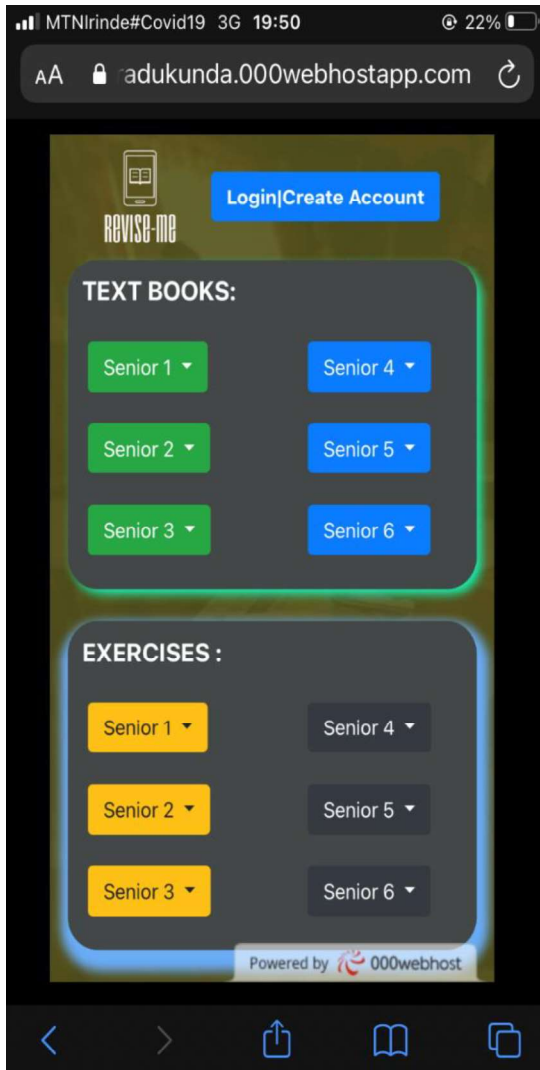
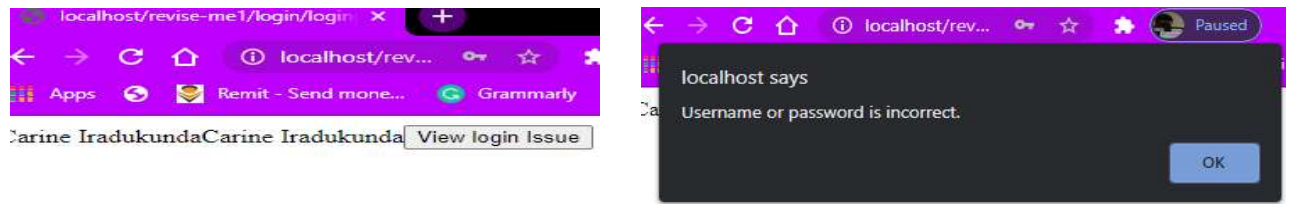


Figure 4.10: Guest pages

When a user clicks the yellow button for entering as Guest; they are directed to the left panel, where there is also a button in the top right corner to make it easier for a Guest to create an account. Guest accounts are not allowed to access the content. When one enters as a Guest and clicks on books or exercises they are directed to the page on the right picture. The page has a login and create account forms so that if a guest has an account; he or she can log in and if they do not have any they can create one.



 The image shows a login form with a teal header and a dark teal body. The header text is 'Please fill in this form to Log-in'. The form contains two input fields: 'Full name' with a placeholder 'Enter Full name' and 'Password' with a placeholder 'Enter Password'. Below the password field is a checkbox labeled 'Show Password'. At the bottom of the form is a dark teal button labeled 'Login'.

Figure 4.11: Wrong login credentials message

Left panel shows when a user enters a wrong username or password. A button with “*View login issue*” will come with the message and the user will be able to click it. After clicking the button, a message will pop up (shown on the right panel) which shows the user an issue they have. When they click the blue button with “*ok*” the will be redirected to a login form shown below the left and right panels.

Chapter 5: Testing

In this chapter, a process of testing is going to be broken into two parts; non-functional requirements testing and functional requirements testing.

5.1 Non-functional requirements testing

Testing Activity

Description

Security testing

The purpose of security testing was to evaluate how the system defends itself from unauthorized users [4]. Revise-Me security is still being enhanced, but so far, users with no account cannot access the content.

Reliability (in performance and compatibility testing)

Performance testing evaluates the response time and service availability. Compatibility testing evaluates how the web app behaves in different browsers [4]. Response time in Revise-Me is no question as it was tested in other devices, same as the compatibility in safari and Google chrome. The system is not advisable to be used in Internet Explorer.

Usability testing

Usability testing is to evaluate to what extent is the web app easy to use [4]. The system provides guidelines in the user guide document.

5.2 Functional requirements testing

Development testing is primarily used to discover bugs in the system. It has three levels; unit testing, component testing and system testing [3].

5.2.1 Unit testing

In Unit testing, objects or classes are tested.

```
<?php
//student_class.php

//connect to database class
require("../Settings/db_class.php");

//create student class
class stud_class extends db_connection
{
    public function add_student($b, $c, $d, $e){
        //Write the sql
        $sql = "INSERT INTO `student` (`student_name`, `student_pass`, `student_contact`, `user_role`) VALUES('$b', '$c', '$d', '$e')";
        //return the executed the query
        return $this->db_query($sql);
    }
}
```

Figure 5.1: Student Class

Class `stud_class{}` contains two functions; `add_student()` and `verify_login()`. `add_student()` function was used to add a student in the table student in the database. It stores the name, password, contact (phone number) and user role (admin or student).

```

public function verify_login($sname){
    echo $sname;
    //a query to get all login information based on username
    $sql = "SELECT * FROM `student` WHERE `student_name`='$sname'";

    //execute the query
    return $this->db_query($sql);
}
}
?>

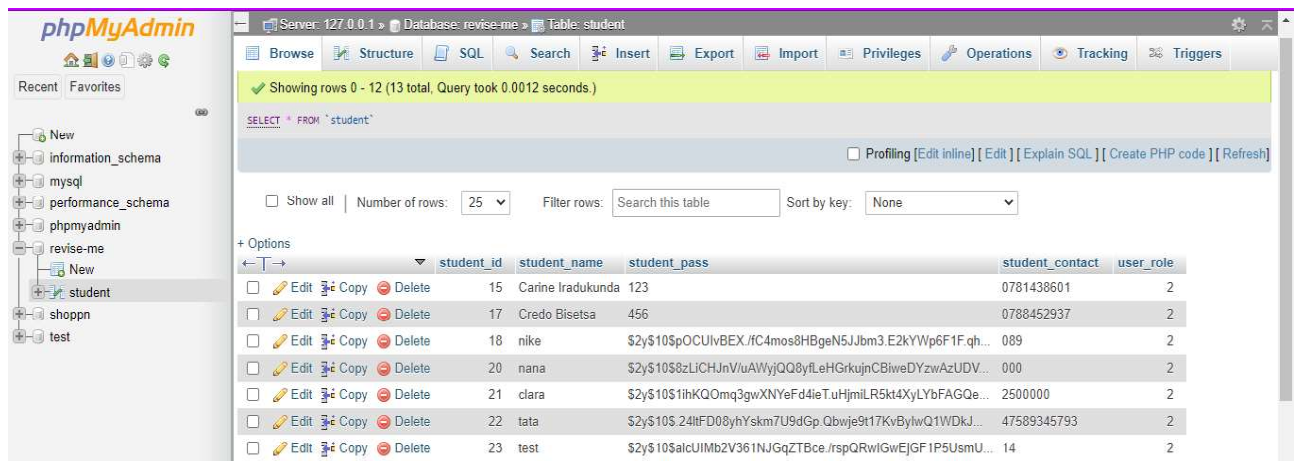
```

Figure 5.2: Verify login function

The second function in `stud_class {}` is `verify_login ()`. The function helps the web app verify the username entered in the login form and checks all the user information.

5.2.2 Component testing

Component testing is done individually on each component without integrating others.



Server: 127.0.0.1 » Database: revise-me » Table: student

Showing rows 0 - 12 (13 total, Query took 0.0012 seconds)

SELECT * FROM `student`

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

Show all | Number of rows: 25 | Filter rows: Search this table | Sort by key: None

	student_id	student_name	student_pass	student_contact	user_role
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	15	Carine Iradukunda	123	0781438601	2
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	17	Credo Bisetsa	456	0788452937	2
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	18	nike	\$2y\$10\$P0CUIvBEX/fC4mos8HBgeN5Jbm3.E2kYWp6F1F.qh...	089	2
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	20	nana	\$2y\$10\$8zLiCHJnV/uAWjyQQ8yflEhGrkujnCBiweDYzwAzUDV...	000	2
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	21	clara	\$2y\$10\$1ihKQOm3gwXNYeFd4ieT.uHjmlR5kt4XyLYbFAGQe...	2500000	2
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	22	tata	\$2y\$10\$24ItFD08yhYskm7U9dGp.Qbwje9t17KvBylwQ1WDkJ...	47589345793	2
<input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete	23	test	\$2y\$10\$alcUIMb2V361NJGqZTBce./rspQRwlGwEJGF1P5UsmU...	14	2

Figure 5.3: Student Database

Revise-Me database was tested using a web interface for MySQL, which is phpMyAdmin. All queries were run in table *student*, and there were no errors.

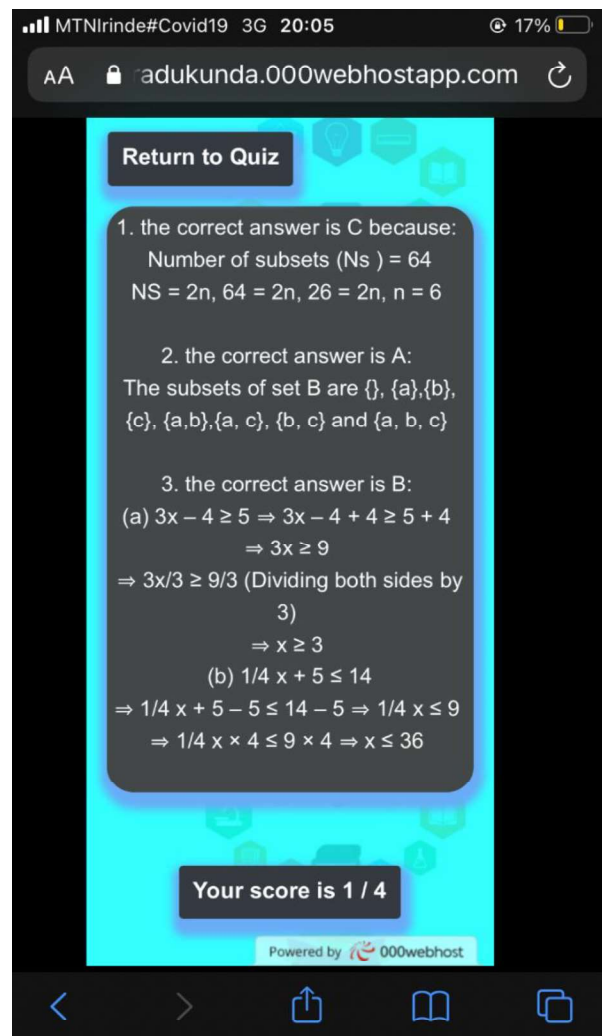
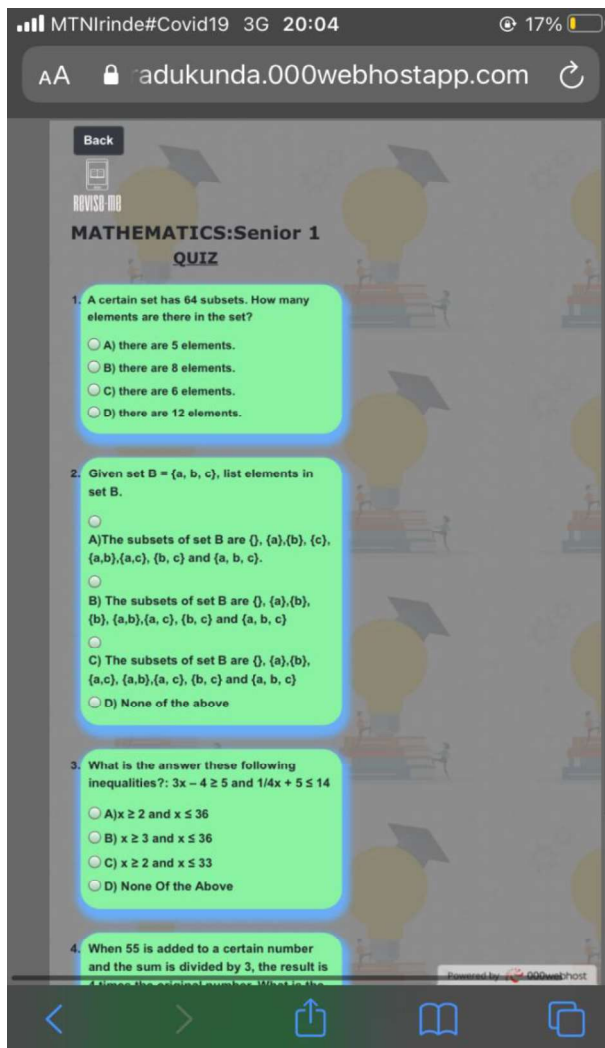


Figure 5.4: Quiz& Results Testing

The component testing was also done on quiz and results pages. When students are done with the quiz and click on submit, they directly access their score and the answers they answered wrong.

5.2.3 System testing

“system testing checks that components are compatible” [3]. The system as a whole was tested using both iOS and Android phones; all bugs reported were solved. The plan was tested using laptops and tested in Google Chrome, MS Edge and Firefox.

Chapter 6: Conclusions and Recommendations

6.1 Summary

The development of the Revise-Me satisfies all requirements described at the beginning of the write-up. The web application allows students in all years and combinations to revise using notes created and textbooks. The application also allows students to do exercises and get scores and correct answers with just one click. However, features like lab simulations, exercise levels, and progress checking should be added in real-time production.

6.2 Limitations

- *Security:* As the web application requires students to enter phone numbers, that can cause information leakages or other kinds of fraud using people's phone numbers.

6.3 Future works

- *Lab Simulations:* for students to get everything on one platform easily, lab simulations will be implemented. The lab simulations may be in video types or live simulations built.
- *Making the Revise-Me adaptive:* When students are done with learning or reading note and books, they go for exercises. Revise-Me will have exercises on different levels like easy, medium or difficult.
- *Progress checking:* After a student is done with a unit or a course, they will see how far they are with finishing the learning. Progress also will be measured in the total score a student is getting as they do the exercises.

6.4 Conclusion

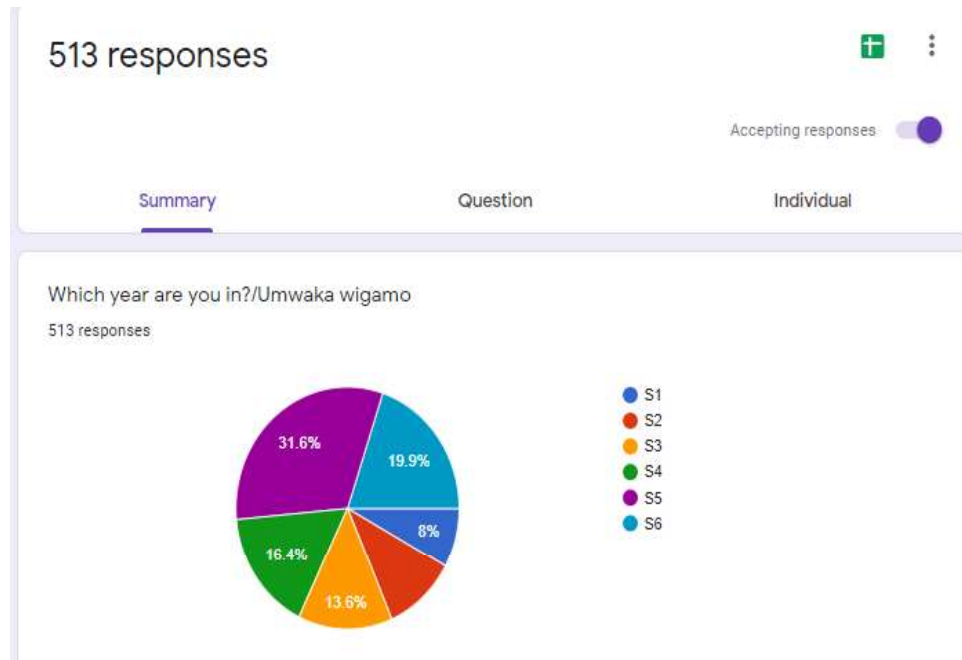
Technology is becoming an answer to many things. High school students are likely to go home without textbooks and other school materials. Revise-Me is a platform where Rwandan high school students can come learn at home without textbooks and acquire enough knowledge. It is not only in times like these of Covid-19 a student will need to revise, but also they need to access resources from any device while on holidays, at school or anywhere.

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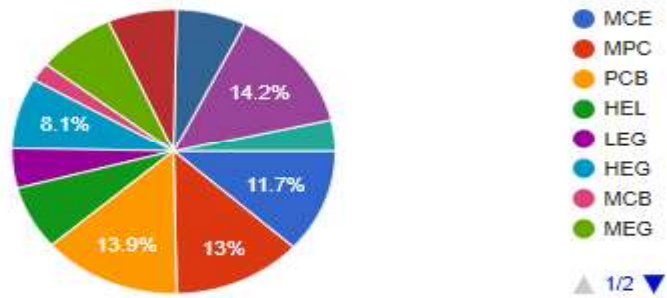
A. Appendix

A.1 Interview Questions And Results



Which combination are you doing?/combination wigamo

332 responses



Do you revise at home?/ujya ukora etude mu rugo?

513 responses

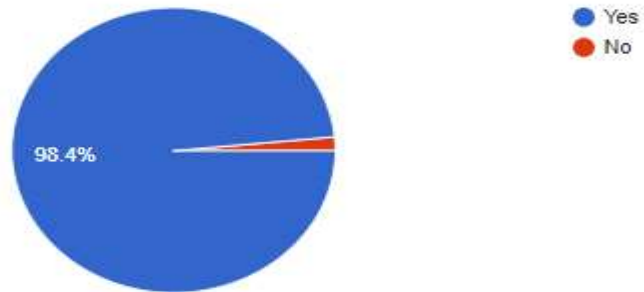




Figure A.1: Google form screenshots