

ASHESI UNIVERSITY COLLEGE

Tracking Teacher Absenteeism in Public Schools

Applied Project

Applied Project submitted to the Department of Computer Science, Ashesi
University College in partial fulfillment of the requirements for the award of

Bachelor of Science degree in Computer Science

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DECLARATION

I hereby declare that this Applied Project is the result of my own 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:.....

Date:5/03/2016.....

I hereby declare that preparation and presentation of this Applied Project was supervised in accordance with the guidelines on supervision of Applied Project laid down by Ashesi University College.

Supervisor's Signature:.....

Supervisor's Name:.....

Date:

Acknowledgement

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Also, I would like to thank the members of the Computer Science department of Ashesi University College, for their efforts that have brought us this far.

Abstract

Teacher absenteeism has become a canker in our society and it needs urgent measures to be put into place to curb it. There have been many attempts at monitoring teacher attendance using both traditional and technological approaches. This project proposes an application that uses an indirect approach to monitor attendance. On this platform, parents are allowed to submit an attendance status of the teacher of their children after they have inquired from the child as to whether the teacher was in school or not. Unlike other platforms, this application can measure if a teacher was absent part of the time. External educational officers have access to the attendance status and they can view attendance over a specific period in a particular school and generate a report of the degree of absenteeism in the school. This platform is made attractive to teachers and students as it provides an additional channel for teaching, learning and evaluating learning outcomes. The teachers post assignment and quizzes on this platform for the students to do. The students after submitting the assignment, can view their performance.

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CHAPTER 1: Introduction

1.1 Background

The quality of public school education in Ghana raises a lot of concern among stakeholders. This poor quality is most of the time attributed to lack of facilities and governments are always blamed for not doing their best to provide the right tools to help both teachers and students for a better classroom experience. However, lack of facilities may not be the only cause of the poor performance in public schools since this poor performance still exists in schools where there are facilities. Factors such as student absenteeism and teacher absenteeism can contribute to this falling standard of public basic school education.

Absenteeism cannot be left out of the reasons why students perform badly in school. Teacher absenteeism is a situation in which a teacher fails to report to school. Teacher absenteeism can be grouped into two: excused and unexcused. In the case of excuse absenteeism, the teacher notifies the authorities of his or her inability to report to school. This may be due to sickness, jury duty and funeral leave while the unexcused absenteeism is when the teacher fails to notify the authorities in advance and cannot give any tangible explanation for their absence (Basiru, 2013). In situations of excused absenteeism, a temporal provision of a substitute teacher is made in some situations; other teachers are made to teach the pupils in their spare time although this is not always effective. This project therefore seeks to address teacher absenteeism using technology to reduce the impact it has on the quality of education.

1.2 Motivation

A study by the World Bank in 2010 indicated that only 109 days out of 197 school days are operational as most teachers spend their time outside school or come to school without engaging the students. (Ghana News Agency, 2011). These 88 days of inactivity no doubt do a

lot of harm to the quality of education and academic performance. Performance in basic school examination has dropped from 60.4% to 46.93 between 2001 and 2011 (Ekow, 2013) and this can partly be attributed to teacher absenteeism. This abysmal performance means that many students cannot further their education. Again, when the foundation of a child's education is not strong, it goes a long way to affect the child's productivity. The child cannot be productive as expected as he moves up the educational ladder. Parents do not get good value for money when children do not get good education.

1.3 Related Work

Several measures have been put into place to curb the menace of teacher absenteeism both in Ghana and outside Ghana. This section discusses some of these measures and assess their strength and weaknesses in their attempt to deal with teacher absenteeism. These measures have been grouped into traditional and technology approaches.

1.3.1 Traditional Approaches

These traditional measures employ the use of other methods other than technology to track teacher absenteeism.

- **The sign up book**

The sign up book is used in many organizations to keep track of lateness and absenteeism. Public schools all over the country also use this traditional way to track teacher absenteeism each day. Teachers are made to write their names, the time they report to school and to sign against their entries. Teachers go through the same process when school is over before they leave the school premises.

Although this method can help in tracking absenteeism among teachers, it is however problematic and cannot be relied on. Teachers who know they cannot come to

school make other teachers sign up for them. The teachers forge the signature or simply write the initials of the names of their fellow teachers in place of the signature. Teachers can also sign in and leave the school for extended periods and children do not get any education while the teacher is out.

- **Zero Tolerance of Absenteeism**

A strategy to deter and discourage teachers from absenting themselves was proposed in 2014 by the minister of education in Ghana. As part of this policy, teachers who absent themselves from school for ten consecutive days will be sacked (Daily Graphic, 2014).

It is believed that because the educational system of Ghana is still in need of teachers and it is highly unlikely sacking teachers will occur. That notwithstanding, a teacher can choose to absent himself from school for eight days and appears in school on the ninth day if he does not want to be sacked. Zero Tolerance of Absenteeism has not yet been successful.

- **External Supervisors**

The educational system of Ghana has put some educational officers at post to supervise teachers' attendance at school. The work of these officers is to go to the schools assigned to them to review teachers' attendance using the sign up book and to do spot checks and head counts. Teachers who habitually report to school late are then queried.

This approach does not solve the problem because teachers who report to school late may not record the correct time at which they report to school. Again, teachers can also make an agreement with their fellow teachers to sign up for each other.

1.3.2 Technology Approaches

These measures employ technology to deal with teacher absenteeism or to provide online content to supplement classroom content.

- **CU@SCHOOL**

In Uganda, the government has decided to use technology to curb teacher absenteeism in the country by introducing the CU@SCHOOL mobile app. Head teachers collect data on the number of students and teachers throughout the week and submit the data to a database using a mobile phone. The data is then accessed by the district officials of education who are the monitors (Twaweza, 2010).

Although this app can help to track teacher absenteeism, the headmaster may not come to school himself every day to take attendance and cannot also rely on the attendance status in the sign up book. Besides, there may be collusion strategies to improve educational outcomes.

- **Mxit**

Mxit is virtual school which was initiated by the Department of Basic School and UNICEF in collaboration with Mxit social platform in South Africa. This app does not target absenteeism rather, it makes basic school education accessible to everybody and eliminates the educational inequality in South Africa (UNICEF, 2014). It provides online content for students and the general public in South Africa on their mobile phones.

Although Mxit provides quality content to students, it does not tackle the issue of teacher absenteeism.

- **Khan Academy**

Khan academy is online educational platform that provides learning materials for students at every level. Students can create an account and start learning on the platform. Quizzes for every subject are provided to test the knowledge of students.

Although Khan Academy produces a lot of supplementary content, Khan Academy does not make any provision to help educational systems to monitor teacher attendance. Therefore, it does not solve the problem of teacher absenteeism which interferes with the classroom experience of students.

1.4 Objectives

This project seeks to determine teacher attendance in an indirect way by using stakeholders in education different from those explored previously by others. Parents are the main stakeholders that are considered in this project because they are very interested in seeing their children excel at school and thus do what it takes to see their children well educated. The role of the parents in this application is to take attendance of teachers. Parent finds out from their children if the teacher has reported to school. The parent then logs into the application to log the findings. The external supervisors will no longer have to go to schools to find out if a teacher has reported to school, this application can be a useful supplement. Supervisors also log into the application to view attendance status and take the necessary steps against a teacher who absents himself. Attendance status is inferred from the collective submissions by parents. In the case where seven out of ten parents say a particular teacher was not in school, the system assumes that the teacher was truly not in school.

This app will let teachers promote online learning among their students as well. A teacher can set a quiz online for students. The students do the quiz and view their performance. Parents can also log into the application to see how their children are performing. The students

can also access online materials uploaded by their teachers. The app will also have a feature that will enable all in the system to interact with each other. Notifications will be sent to students whenever a teacher posts assignments of class materials online.

CHAPTER 2: Requirements

This chapter gives a description of the software to be developed. It also highlights the functional requirements and the various users and their corresponding functions.

2.1 Purpose

This section describes the features of the attendance tracking system such as its functionality and interface and how the application responds to external factors. It highlights the various constraints the application is subjected to.

2.2 Intended Audience

This section is meant for the users of the system namely: parents, school heads, teachers, educational supervisors and students as well as system administrators to have a clear understanding of how the system they are using actually works. It will also be available for developers who may want to implement a version of this application or improve upon it.

2.3 Scope of Product

The objective of this project is help reduce teacher absenteeism in public schools by providing a means to maintain teacher attendance while avoiding the challenge of collusion. The application is designed to measure teacher attendance indirectly using parents of students. The system allows teachers to post assignments, quizzes or course materials online for students at the end of every class. Their parents indicate online if a teacher was present or absent for that day. The application will allow students to interact with other students via instant messaging or video in the future. Teachers can also interact with the district directors of education who are the monitors of the system. Figure 2.1 below indicates how stakeholders interact with the system.

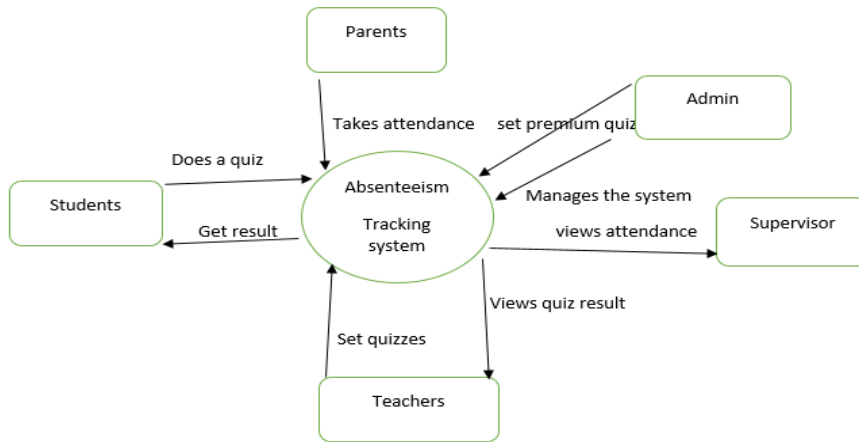


Figure 2-1: A context diagram that shows how stakeholders interact with the system

2.4 Product Perspective

This application is intended to augment or even replace the old and traditional system of dealing with teacher absenteeism in Ghanaian public schools. This application will help keep teachers in the class and also ensure that students do not waste their time outside school. The students will be asked to review subject materials the teachers will post online.

2.5 Product Functions

This app enables parents to login to submit attendance status of teachers of their children as well as have access to the academic records of children. The educational supervisors also logs in to have access to the attendance status submitted by the parents. They can generate a report of the degree of attendance within a specific period to know the degree of absenteeism in a particular school. Teachers will also use this app to imbue online learning in their students. Teachers are required to post assignment and quizzes online for the students to do. They also have access to the performance records of each of their students. The system generates reports for students after they have submitted their quizzes. The system has an administrator who adds

teachers, subjects, classes to the system and manages it. Teachers can add questions to the system.

2.6 User Classes and Characteristics

There are five main users of this system:

- **Parents-** mark the teachers present, absent or partly absent.
- **External Supervisors** -whose function is to monitor the system.
- **Teachers-** post the assignment and learning materials.
- **Students** -logs in to do the assignment.
- **System administrator** -adds teachers and students.

2.7 Operational Environment

The application consists of a mobile and a web application. It is able to function properly with browsers like Google chrome, Internet explorer Opera mini and Firefox. The technology that are incorporated in this application are Cascading Style Sheet (CSS), Hypertext Mark-up Language (HTML) and Hypertext Preprocessor (PHP) JavaScript and JQuery. Tools like Adobe Photoshop were useful in designing the logo and any other images that were used in this application. The figure below shows how the users interact with the system using both the mobile phone and the browser.

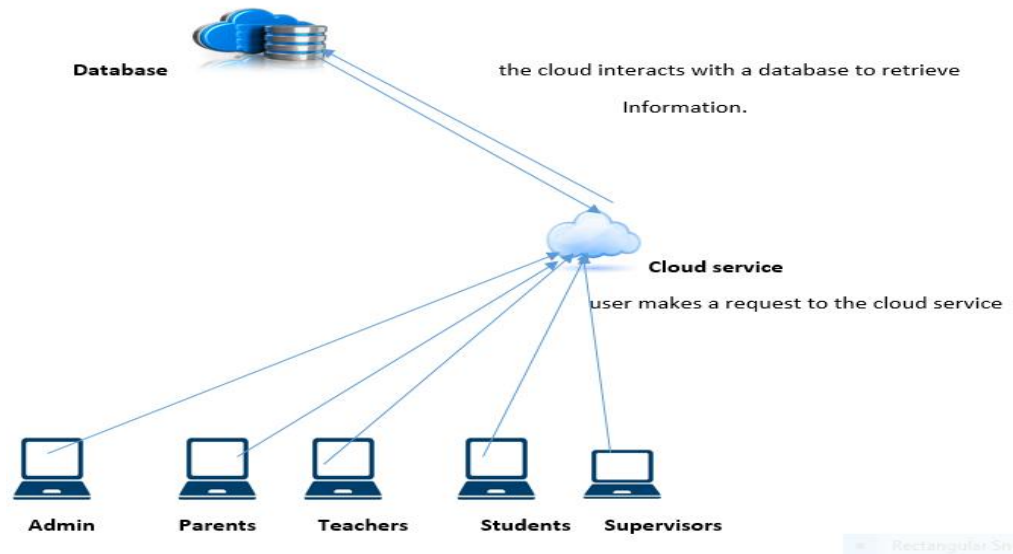


Figure 2-2: mobile and web application

2.8 Assumption and Dependencies

The success of the software depends on schools, teachers and students and parents. It is assumed that teachers will use the system to provide supplementary exercises for their students and student will also find the application as a useful application that will help them advance academically. It is also assumed that the schools will embrace the software and use it to track the activities of their teachers. Again, it assumed that teachers will have access to computers by their schools so they can post the assignment. Finally, it assumed that parents have smartphones or can afford computers and internet for their children at home.

2.9 External Interface Requirements

2.9.1 Software Interface

This software interfaces MSGH to send a message to a user whenever a user is added to the system. PHP Push Notification API can be used to send notifications to students whenever something is posted by the teacher. The app also made use of jQuery chart (chart.js) to create a

doughnut chart of the attendance status. PHPEXCEL can be used to upload bulk data from an excel sheet into the database instead of entering the data one after the other. For instance when the names of students or teachers have already been entered in an excel file, the system admin will just upload the excel file to submit the data into the database.

2.10 System Features/ Modules

2.10.1 Logging Attendance

The system allows parents to log attendance of the teachers. They provide their username and password for verification. Once they are verified the system allows them access to the attendance page where they log the attendance status of a teacher, choosing the teacher's name, school, and attendance status which have been provided in a dropdown menu and submit them into the database. This feature is of high priority because that is the main purpose of this application, tracking teacher absenteeism.

Functional Requirements

- **REQ-P1**-Parents must select school, teacher's name and attendance status for submission.
- **REQ-P2**-Parents can view the performance of their children.
- **REQ-P3**-Parents can interact with teachers using a chat feature on the platform.

2.11 Posting of Quizzes and Class Materials

Teachers can add questions and the corresponding answers of a particular subject to the system and also set a timed or untimed quiz for the students. The teacher is first verified and when the verification is successful, he/she will have access to his dashboard where he can start adding the questions. The system also makes it possible for teachers to add the students in their

classes. This feature is of high priority because it helps the teacher provide supplementary exercises to the students.

Functional Requirements

- **REQ-T1-** Teachers can add questions and their corresponding answers for grading purposes.
- **REQ-T2-** Teachers can view students' submissions.
- **REQ-T3-** Teachers can interact with students, teachers and parents using the chat feature that will be provided on the platform.
- **REQ-T4-** Teachers can set a quiz.
- **REQ-T5-** Teachers can add students in their class.
- **REQ-T6-** Teachers can edit students' information.

2.12 Students Taking a Quiz

Students will be able to view all the subjects they take in the school. They can choose a particular subject and visit the page of that subject. If there is a quiz, they can do it and submit it. They can also view the result of their quiz once they submit and review a quiz as well. This feature is of high priority because it helps boost academic performance among students.

Functional Requirement

- **REQ-S1-**Students can take a quiz.
- **REQ-S2-**students can review a quiz if it is not a timed quiz.
- **REQ-S3-** Student interact with each other and teachers using a chat feature on the platform.
- **REQ-S4-**Students can view past questions.

2.13 System /Account Management

The system will be managed by an administrator whose task is to create accounts for teachers and parents as well as add subjects and classes to the system. He will also manage the accounts he creates. Once he adds the user to the system, he will receive an alert as to whether the user was successfully added or not. This feature is of higher priority because all the other features depend on it.

Functional Requirement

- **REQ-A1-** The admin will add teachers and parents.
- **REQ-A2-** The admin will add subjects and classes.
- **REQ-A3-** The admin will edit account information of parents and teachers.
- **REQ-A4-** The admin will edit subjects and classes.
- **REQ-A5-** The admin can view parents, teachers, subjects and classes.

2.14 External Supervision

External supervisors will be able to view attendance status in a particular school and generate a report.

Functional Requirement

- **REQ-E1-** Supervisors can view attendance status.
- **REQ-E2-** Supervisor can generate a report on attendance in a particular school.

2.15 Signing Up, Logging In and Changing Passwords

Authentication cannot be left out of this application. Users must be authenticated before they can gain access to the system. The admin logs on before he can go ahead and start adding

other users. This feature is of high priority because it is important that users of the system are verified.

Functional Requirement

- **R1-** Users can sign up onto the system
- **R2-** Users can login
- **R3-** Users can change or reset their password

CHAPTER 3: Architecture and Design

3.1 Purpose

The purpose of the software design is to describe what will go into the development of the entire system. Thus, the architecture that will be used to implement the system, the system modules, interfaces and platforms. It will also include the data that will be used in the system development.

3.2 Assumptions

This system is developed on the assumption that public schools in Ghana will embrace it and use to track the activity of teachers. It is built on the assumption that both teachers and student will use it and the students especially will find it useful and take advantage it to boost their academic performance.

3.3 Constraints

The constraint here is the internet connection. This application cannot function everywhere because internet connection problems. The other constraint may be that parents may not own a smartphone or a laptop for use by their children.

3.4 System Architecture

The design of the system is based on the Model View Controller (MVC) design pattern. This pattern is more desirable due to the fact that the components of this pattern can be easily separated from each other. Each component is independent, making it easy to debug any of them without affecting the functionality of the others.

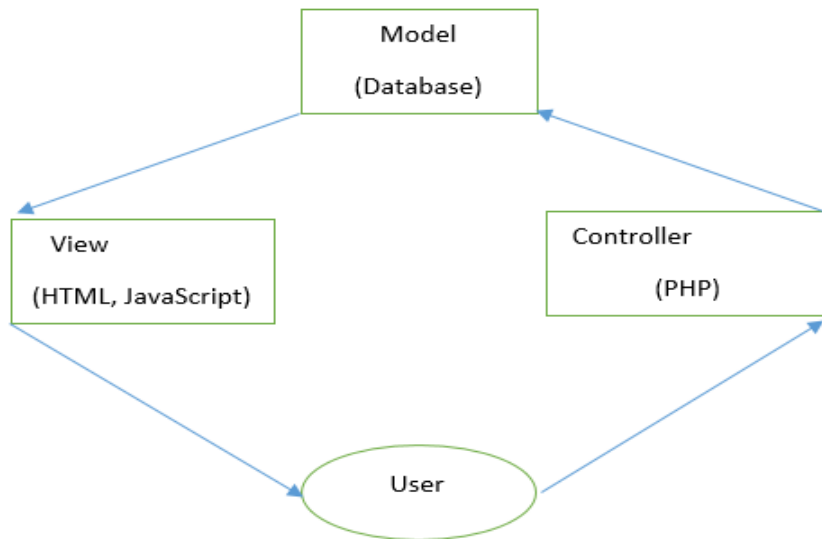


Figure 3-1: MVC architecture diagram

This architecture allows the user to issue a command to the controller (PHP) through the view (HTML and JavaScript). The controller interacts with model (database) and gives the response back to controller. The controller then displays the result to the user through the view.

3.5 Modules

This section discusses the key modules of the system.

✓ Attendance class

The Attendance class adds the status of a teacher's attendance to the system. It takes in attributes like the teacher's name, the school of the teacher, the attendance status, the date and the identity of the parent who is logging the attendance.

✓ Users class

The Users class is one of the modules in the system. It includes anything that pertains to the users of the system such as adding a user and deleting a user as well as updating the details of a user.

✓ **Questions and Answers class (QnA)**

The questions and answers module contains functions to add, delete and update questions as well as answers.

✓ **Authentication class**

The authentication class will have functions to verify a particular user before access to specific pages of the system will be granted as well as privileges to perform key functions in the system.

✓ **Database**

The database is another module to consider. It contains tables and schemas that will interact with the backend of the system.

✓ **User Interface**

The user interface contains a number of buttons to submit data to the database, delete and update. It also has a number of links to navigate to the other pages. It contains features that will help the user interact with the system.



Figure 3-2: Models interact of the systemt

The diagram above shows how the various models interact with each other. The user interface model provides the view for the user to add users to the system using the user class. The authentication class model works based on the user class. For a person to be authenticated and allowed into the system, he must exist in the user class. Once authentication is done, a user can interact with the questions and answer model to add questions and answers to the database.

3.6 Platform

✓ Front end

The framework that was used for the design of the front is **Bootstrap**. **Bootstrap** is a CSS framework that makes design easy for developers. It is easy to customize as compared to other frameworks.

✓ Back end

The backend will be developed using **PHP**. PHP is a server side scripting language that provides backend support for web application developers.

3.7 Activity Diagrams

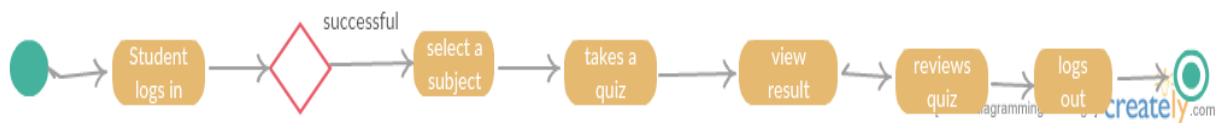


Figure 3-3: Students activity diagram

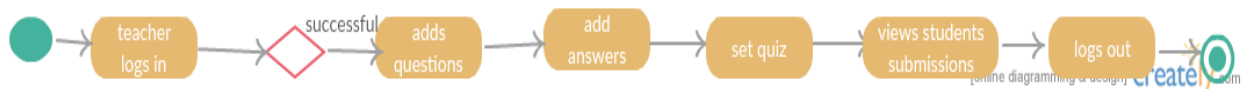


Figure 3-4: Teachers activity diagram

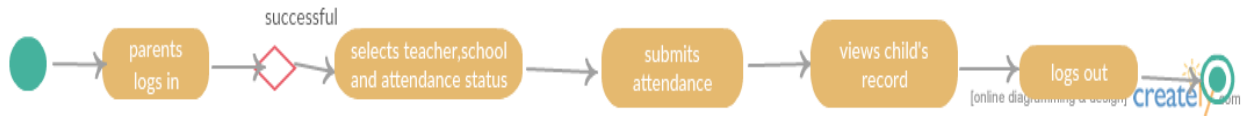


Figure 3-5: Parents activity diagram

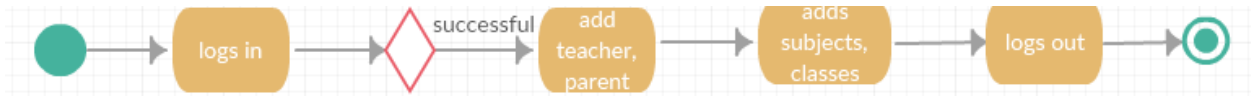


Figure 3-6: Admins activity diagram

3.8 Data Design

This section describes the data model of the database. It gives the table name, field/column name, the allowed data type, whether the column allows null values or not and the description of the column name.

Table 1: Data design

Table Name	Field Name	Data Type	Allow Null	Description
Users table	Name	string	no	It takes the name of the users of the system
	Username	varchar	no	This is what the users will use to login
	Password	varchar	no	It will be used to authenticate a user
	Email	varchar	no	It will be used for verification
	Role	varchar	no	This helps to identify the user as a student, parent, teacher or admin
	User ID	varchar	no	This will be a foreign key in other table to help identify a user
Authentication table	Username	varchar	no	This is what the users will use to login
	Password	varchar	no	It will be used to authenticate a user

Students, teacher and subject table	student ID	string	no	This references a student in the users table
	subject ID	varchar	yes	This reference the subject of a student in the subject table
	teacher ID	varchar	no	This references the teacher of the student in the users table
	Class ID	Varchar	no	This references class of the student in the class table
Attendance	Teacher's name	varchar	no	The name of the teacher whose attendance status will be submitted
	school	varchar	no	The school of the teacher
	status	varchar	no	The attendance status of the teacher
	Date	Date	no	This is the date on which the attendance is being submitted
	Parent's Id	varchar	no	The identity of the parent submitting the attendance
Subject table	Name	string	no	The name of the course
Class table	Name	String	no	Level of the student
Parent table	Parent ID	String	no	This is references the user ID in the users table
	Child ID	Varchar	no	This reference the student in the users table
Questions	question	varchar	no	This is the question that a teacher answers
	Question type	varchar	no	This is specifies the type of question. Whether it is multiple choice question or paragraph
	Answers	varchar	no	This is the correct answer to the a question
	class	varchar	no	The particular class the question belongs to
	subject	varchar	no	The subject that the questions are set to
	teacher ID	varchar	no	The ID of the teacher who is setting the question
	quizNum	varchar	no	The quiz number
Answers	question ID	varchar	no	The question ID which is a reference to the question ID in the question table
	answer	varchar	no	The possible answers of a particular question

3.9 Entity Relation Diagram

The Entity Relation Diagram gives a picture of the database design. The diagram contains details of each table such as the column name and the data type.

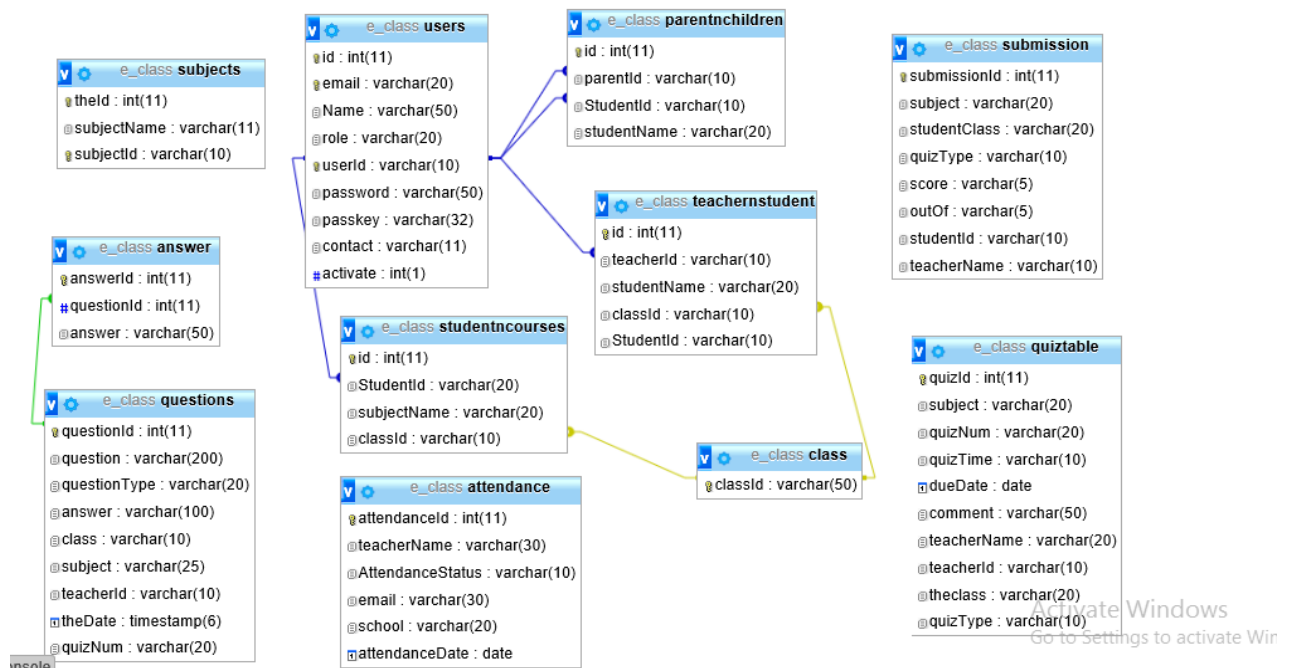


Figure 3-7: Entity Relation diagram

3.10 Use Case Diagrams

The use case diagrams give a representation of how each user interacts with the system or the functions that each user performs.

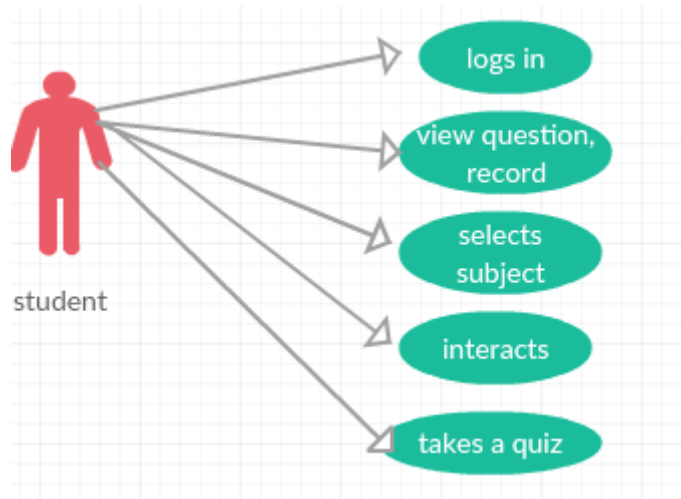


Figure 3-8: Students use case diagram

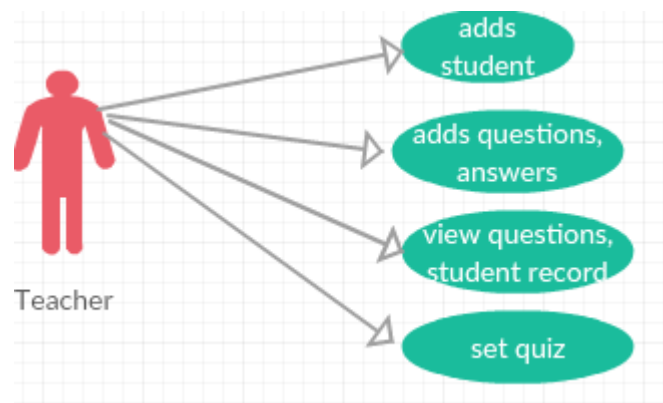


Figure 3-9: Teachers use case diagram

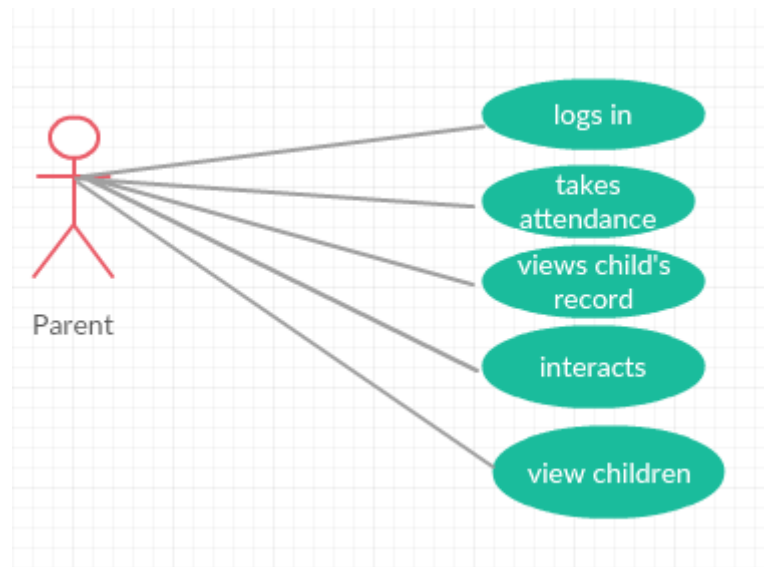


Figure 3-10: Parents use case diagram

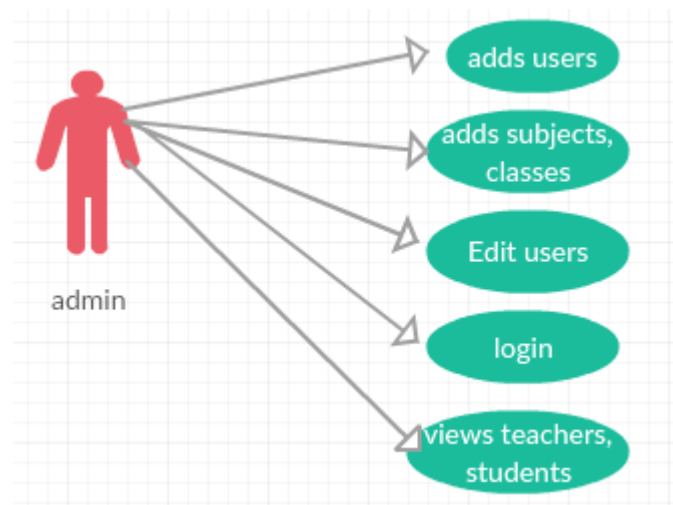


Figure 3-11: Admins use case diagram

3.11 Class Diagram

The class diagram contains the various classes, attribute, methods and their relations in the system.

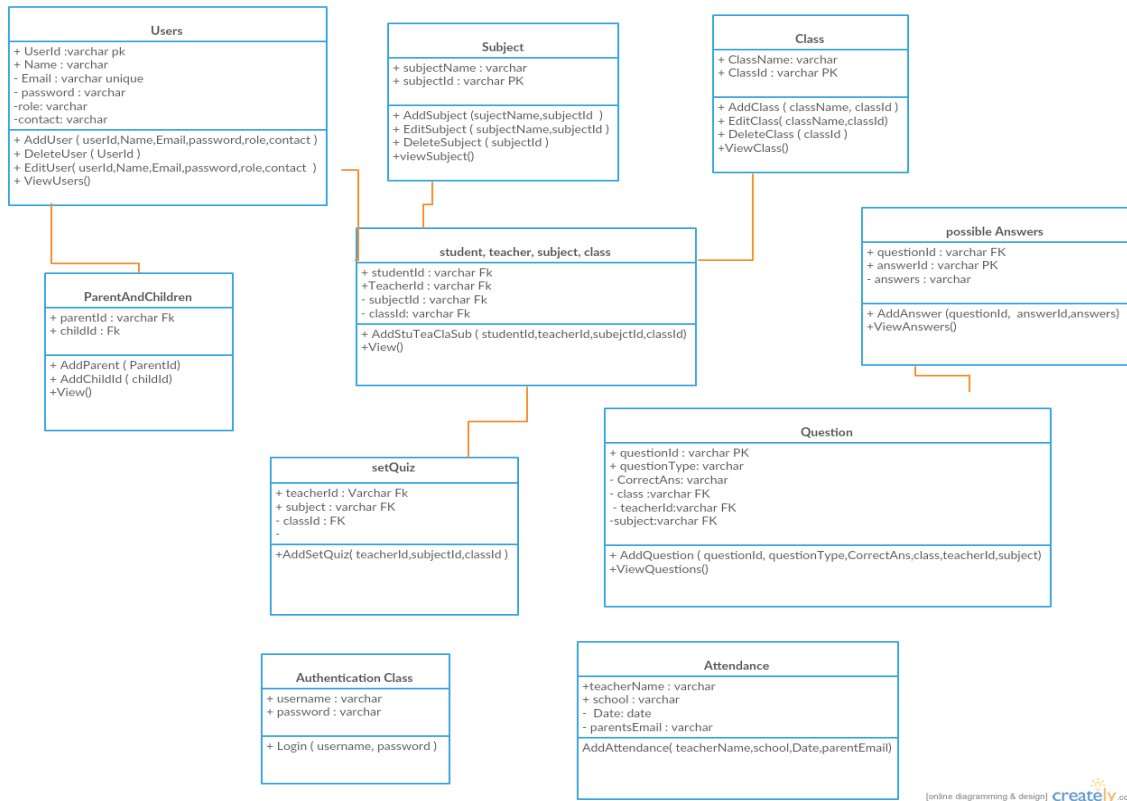


Figure 3-12: Class diagram

CHAPTER 4: Implementation

This project was implemented using a number of technologies. This chapter captures the different tools that have been used during the implementation process. Some of the methods and tasks that have been implemented will also be discussed in this chapter.

4.1 Functions Description

The table below shows some of the key functions that have been implemented in this project.

Table 2: Key functions

Functions	Description
AddQuestions(questionId,answer,teacherId Class, subject)	This function adds questions and their corresponding answers to the database.
AddAnswers(questionId, possibleAnswers, answerId)	This function adds possible answers to the database
AddAttendance(school,teacherName,status)	The AddAttendance function adds attendance status to the database
ViewAttendance(fromDate,toDate,schoolName)	This function displays the attendance of teachers of a particular school
SelectQuestions(teacherId)	This functions enables a teacher to see the questions that have been added

AddUsers()	Add users function adds users to the system
Quiz()	The quiz function makes a quiz available for students

4.2 Key Features Implementation

Adding Questions and Answers- This feature was implemented to add questions to the database. The teacher is expected to choose the subject for which he is adding the questions, the type of quiz (topic quiz or progress quiz), the identity of the teacher and the particular class. Clicking on the submit button in Figure 4-1 takes the teacher to the Figure 4-2 where he adds questions, questionId and the correct answer. Clicking on ‘Add answer options in Figure 4-2’ creates a text fields for possible answers. The teacher can add as many possible answers as he wishes by clicking on ‘Add answer options’. Clicking on submit in Figure 4.2 submits the question, correct answer and possible answers to the database. Figure 4.1 and 4.2 below show the interface for adding the question and answers.



Figure 4-1: Questions adding page

Figure 4-2: Questions adding page

Submitting attendance- This feature allows a parent to take attendance status of a particular teacher and submit to the database. The parent selects the teacher of interest, the school and the attendance status. Figure 4-3 shows the interface for submitting attendance.

Figure 4-3: Attendance taking page

Viewing attendance- This feature allows the educational supervisor to view attendance. The supervisor chooses a date range and a particular school to generate the attendance status from the database. Figure 4-4 shows the interface for generating the attendance status.

The image shows a web form for attendance. It has a light blue background. At the top, there are two date input fields, each with a placeholder 'mm/dd/yyyy'. Below these, there is a list of three radio buttons with labels: 'Presby Basic school', 'R/C Basic school', and 'Kwabenya basic school'. At the bottom of the form is a 'submit' button.

Figure 4-4: Attendance interface

4.3 Tools

- HTML

HTML (Hypertext Markup Language) is a standard language used for the structure of web pages. It is also used to create user interfaces for mobile applications and web applications. The pages and interfaces are structured with HTML tags. In addition to using this language for the interfaces of this app, it was also used as a medium for interaction between the user and the application through the creations of forms for user inputs.

- BOOTSTRAP

Bootstrap is a free and open source front end framework for designing web pages and interfaces. It contains well-designed collections of buttons, fonts, forms that have been created using HTML, CSS (Cascading Styling Sheet). It also contains JavaScript and jQuery extensions that enhance user experience. Bootstrap was used for this project due to its mobile friendliness and the fact that it can be easily customized it to meet the needs of the developer.

- JAVASCRIPT

JavaScript is a programming language that is used together with HTML to enhance user experience. It was used in this application to facilitate the collection of form data. The data collected is then submitted to the database by an AJAX request.

- JQuery

JQuery is an open source JavaScript designed to make the client-side scripting of HTML very simple. In this project, jQuery was used to facilitate an asynchronous request to the server by AJAX.

- AJAX

AJAX (Asynchronous JavaScript and XML). It is a development technique used by developers to make a request to the server. AJAX automatically refreshes the page when a change has been made to the data in the database. AJAX was used to send or receive data from the server in this application. The data is returned in JSON format.

- JSON

JSON (JavaScript Object Notation) is a lightweight data-interexchange format used in this application to return the result of an SQL query as an array.

- Sublime Text

Sublime text is a cross-platform source code editor. It support many programing languages such as JavaScript, PHP, CSS and markup language like HTML. Sublime text has different range of font colors that the developer can choose from. It has a way of distinguishing a function from a class and variables. Key words also have unique colors and this prompts developers when they are mistakenly using a key word as a name of a variable. Sublime text has an auto completing feature which completes entries as the user is typing.

- PHP

PHP (Hypertext Preprocessor) is a server side scripting language that enables users to develop dynamic web applications. It allows the user to interact with MySQL, the backend of the application. The PHP file can contain HTML, CSS and JavaScript. PHP collects user input from an HTML form and submits them to the database. Developers' use it create, read, delete, open, write, modify and close on the server. It is also used to control user access as well as to encrypt data.

- SMS GH

SMS GH is a messaging platform that makes it possible to for users to send SMS from their web applications. It is used in this application to send a text message to teachers, parents and students when an account has been created for them.

- CHART.JS

Chart.js is an HTML based JavaScript chart that is used to generate pie, bar, dough nut and line chart in a web applications. Chart.js was used due to its user friendliness. It is easy to understand and use. It generates the chart with just a few lines of codes. Chart.js was used to generate a pie chart for teacher attendance to school in percentage. This gives the educational officer who monitors the system a fair idea of the level of absenteeism.

- MySQL

MySQL is an open-source relational database management system developed for the purpose of storing data for database/web applications. It provides the backend/model of the applications for the user.

- SQL

SQL-Structured Query Language is a standard language for accessing and manipulating databases. It allows the developer to add and delete data to or from the database. SQL together with PHP is used to interact with MySQL database.

- APACHE

Apache is a popular web server software. It supports server side languages like PHP and python. The PHP script does not run without Apache.

- XAMPP

XAMP (X (Cross-platform) Apache MySQL PHP Pearl) is a web server solution stack. It consists of Apache, MySQL, PHP and Pearl. It also contains other servers like Mercury mail server, File Transfer Protocol such as FileZilla server. XAMPP allows developer to have a local web server for testing applications

- PHPMYADMIN

It is a free software for managing MySQL. It allows developers to create databases, tables, rows, columns and relations between tables. PHPMYADMIN also allows to alter a table, drop table.

- PHPEXCEL

It is a PHP library that is used to create, read and write excel document in PHP. This was used to enable data in excel to be submitted to MySQL database through PHP.

4.4 Implementation Techniques

The implementation technique adopted for this application is plan driven method of software development. This method was adopted because the software requirements, duration and functionality were already known before the implementation begun.

CHAPTER 5: Testing and Result

Testing was done to make sure that the software meets the requirements specified. In testing this software, two different approaches are employed: development testing and user testing.

5.1 Development Testing

Development testing was used during the development process. It involves testing each function by the developer during the development process. Each class and function has been tested during development. The following methods were used.

- **Unit testing**

The objective of the unit test is to make sure that the functions that are implemented meet the requirements. The test was done on the key functions in the system.

insertAttendance ()-this method allows parents to take attendance of the teachers of their children. They select the teacher's name, his school, the class and submit it to the database. This function returns true when it was tested for the first time.

```
<?php
class testAttendance extends PHPUnit_Framework_TestCase{
    function test(){
        include("function.php");
        $test=new e_class();
        $this->assertTrue($test->insertAttendance('Kofi
Maafo','absent','maku@gmail.com','04-11-2016','Presby
Basic school'));
        Return;
    }
}

?>
```

ViewAttendance () - this function selects attendance status over a particular period in a specific school and groups them into two categories (presence and absence).

These categories are then used to plot a graph to compare the degree of absence to the degree of presence. The testing code is provided below.

```
<?php
class testAttendance extends PHPUnit_Framework_TestCase{
    function testViewAttendance(){
        include("function.php");
        $test=new e_class();
        $this->assertTrue($test->viewAttendance('04-11-
2016', '04-05-2016', 'Presby Basic school'));
    Return;
    }}
?>
```

AddQuestions () – this method adds questions and their corresponding correct answers, class, subject and teacher identity to the database. It was tested by using it to add questions to the database. The function returned false because one of the columns in the database was misspelled in the code. This error was fixed and the test returned true. The code is provided below.

```
<?php
class testAttendance extends PHPUnit_Framework_TestCase{
    function testAddQuestion(){
        include("function.php");
        $test=new e_class();
        $this->assertTrue($test->addQuestion('what is the
capital of Ghana?',
'Accra', 'TeacherID', 'quizType', 'class', 'subject'));
    Return;
    }}
```

?>

StudentRecords ()-this method displays the result of a student's performance from the database using the ID of a particular student. This was no error when it was tested. But some of the columns were null while other columns were having the data. The error was detected and resolved. The testing code is provided below.

```
<?php
class testAttendance extends PHPUnit_Framework_TestCase{
    function testStudentRecord(){
        include("function.php");
        $test=new e_class();
        $this->assertTrue($test->selectRecord('S312'));
    }
    Return;
}
?>
```

AddAnswers () -this method adds possible answers to the database. It worked without any error, but produced a duplicate in the database. The sources of the duplicate was located in the code and the bug was fixed. The testing code is provided below.

```
<?php
class testAttendance extends PHPUnit_Framework_TestCase{
    function testAddAnswer(){
        include("function.php");
        $test=new e_class();
        $this->assertTrue($test->
        >addAnswers('Accra','Berekuso','Tema','Kumasi','q1','a1')
        );
    }
}
```

```
Return;  
}}  
?>
```

- **Component testing**

Component testing was done on the key modules to find out if they meet the functional requirements.

Student login-once a student logs in, his or her details are used to fetch the subjects that particular students takes and displays them on the subjects page. The test returns true, meaning the student was able to view all the subjects that he takes.

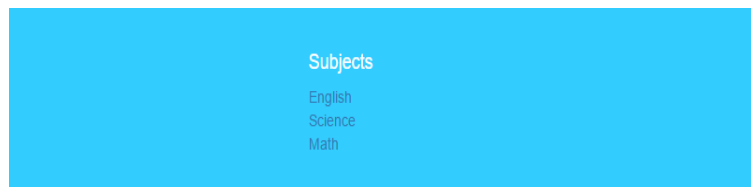


Figure 5-1: Subjects of a particular student

Subject page- the subject page displays the subjects of a particular students using the login details of the student. Each subject has a link to its specific page using the details of the subject provided by the subjects' page. The test failed at the first attempt. When the student clicked on English, a Mathematics page was rather presented because some of the details of subject provided were wrong. The bug was later fixed. Figure 5-1 above shows the subject of a particular student.

Figure 5-2: A timed quiz

Quiz page- this page displays a quiz belonging to a particular subject. It takes details provided by the page of a specific subject to fetch the quiz belonging to that subject and present it to the student. Figure 5-2 above shows the quiz page for a particular subject.

Subject	Class	Score	Out Of	Quiz Type	Teacher
English	grade 5	0	11	untimed	Nathan Ama

Figure 5-3: Record of a student

Student record- this page displays the academic performance of a particular student. It uses the login details of the student to fetch the record that belongs the student. Figure 5-3 above shows the performance record of a particular student.

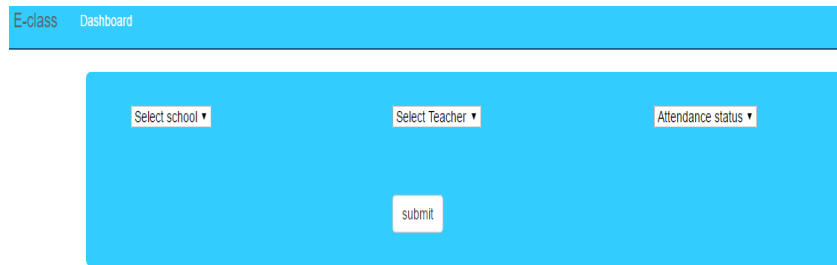


Figure 5-4: Attendance submission page

Parent login- once a parent logs in, his details are used to fetch the details of all his children and presented to him on his dashboard. The name of each child has a link to the student record page. Once a parent click on a child's name, details of the child are used to fetch the record of that child and presents it to the parents. The parent also has the privilege to submit the attendance status of a teacher of her child. Figure 5-4 shows the attendance page where parents can submit attendance status.

- **System Testing**

A test of the entire system was conducted by the process below:

Admin account-The admin feature of the system was tested. An account was created for an admin and the credentials were used to login. Access was not granted when a false password was provided. But upon the entry of a correct password, access was granted. The system was able to add a teacher, parent, subjects and classes.

Teachers' account- after the teacher was successfully added by the admin, the account details of the teacher were used to login. The login returns true and students was added to the system using the teachers account. Questions as well as answers were also added and a quiz was set.

Students' account- the students account has been used to access all the subjects that a student takes. The student can also take a quiz for a particular subject. The student can also view the result of a quiz.

Parents' accounts-The parent has been able to use the account to submit attendance status of a teacher and also to select a child to view his academic records.

Educational Officers' account-The test was successful. Choosing a range of dates, the officer's account has been used to view attendance status using the date provided.

1.2 User Testing

The user testing was performed by different group of mock testers to act as the admin, students, teachers and parents. These mock testers were briefed on functions of the parents, teachers, external supervisors and students after which the admin gave them their usernames and passwords to login.

Admin account-The developer played the role of an admin to test the system. An account was created for an admin and the credentials were used to login. Access was not granted when a false password was provided. But upon the entry of a correct password, access was granted. The system was able to add a teacher, parent, subjects and classes.

Teachers' account- The teachers account was tested by four different mock testers to add questions and to set a quiz. After logging in, the testers were presented with the teachers' dashboard. Figure 5-5 shows the teachers' dashboard.

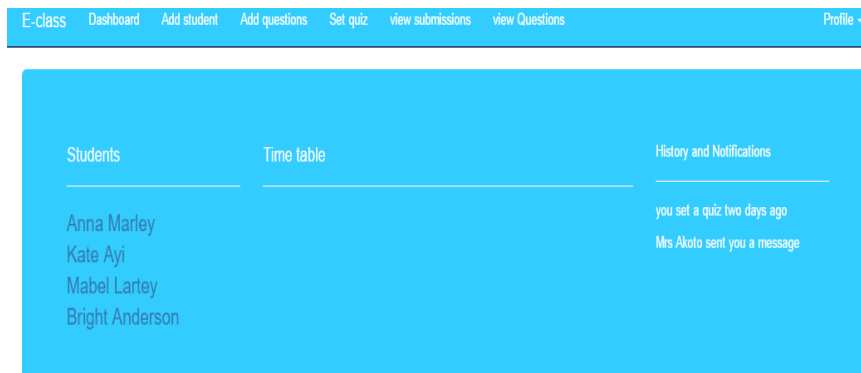


Figure 5-5: Teachers' dashboard

The testers then clicked on ‘add questions’ which takes them to the questions page to add questions to the database. They were also able to view questions that have been added by clicking on ‘view questions’. In all the test was successful. Each tester used the application three times and the time used in testing were recorded. An average of the lowest time the testers used was found to be 5 minutes and average of the highest time they used was found to be 9 minutes. The second and third test were easier and faster to each user than the first time test because they had some knowledge of how the system works and what they were expected to do. Figure 5-6 and Figure 5-7 show the view questions page and students’ submissions respectively.

Question ID	Question	Answer	Teacher ID
10	when did Ghana participate in their first ever world cup?	2006	T1
9	Malaria is caused by	Mosquitoes	T1
8	Who is the first black President of USA	Barack Obama	T1
7	when was the UN formed?	1948	T1
6	who is the President of Ashesi University?	Dr. Patrick Awuah	T1
5	which of these is not a city?	Berekuso	T1
4	how many times do Muslims pray a day?	5	T1
3	how many regions do we have in ghana?	10	T1
2	who was the first President of Ghana?	Dr. Nkrumah	T1
1	what is the capital city of Ghana	Accra	T1

Figure 5-6 : Questions

Subject	Class	Score	Out Of	Quiz Type	Student ID
English	grade 5	10	11	topic quiz	s4
English	grade 5	0	11	topic quiz	s2
English	grade 5	7	11	topic quiz	s1
Math	grade 5	6	11	topic quiz	s6
English	grade 5	8	11	topic quiz	S3

Figure 5-7: Quiz submissions

Students' account- The student account was tested by four students of Berekuso Basic School because they represent the students who will use the system. After they logged in, they were presented with the subject page where they chose the subject of interest. This took them to the page of that particular subject where they clicked on a link to the quiz page to take a quiz. The student encountered difficulties in using the system for the first time. Four of them did not know what exactly they were supposed to do until the admin briefed them on how to go about it. In all, each student used the system for two times. The average of the lowest time they spent was 20 minutes and the average of the highest time they spent was 23 minutes. Each student was made to use the system for two times. Learnability improved subsequently. Figure 5-8 shows the result of a student.

Subject	Class	Score	Out Of	Quiz Type	Student ID
English	grade 5	10	11	topic quiz	s4

Figure 5-8: Reasult of a student after taking a quiz

Parent’s account-The parents’ account was tested by two mock testers. After they logged in, they were presented with the parents’ dashboard where they clicked on ‘take attendance’ in order to submit the attendance status of a particular teacher. The testers did not encounter any difficulty in submitting the attendance. Each tester used the system twice. The average of the lowest time used by the testers was 2 minutes and the average of the highest time used was 3 minutes. They were also able to view their childrens record when they logged into the system. Figure 5-9 below shows the attendance page.

Figure 5-9: Attendance taking page

Subject	Class	Score	Out Of	Quiz Type	Student ID
English	grade 5	10	11	topic quiz	s4

Figure 5-10: A child's performance record

Educational officers’ account- The educational officer’s account was tested by two different testers. After they logged in, they were presented with a page where they needed to choose a date range to view attendance status of a particular school over that period. The first tester did not know he supposed to choose a date range when he was told to generate a report so it took him 3 minute to understand what he is expected to do. He spent less than 2 minute

on the second test because he already had an idea of what he was expected to do. The second tester spent an average of 1.5 minute to view attendance. Each of them tested for two times.

Figure 5-11 and Figure 5-12 show attendance status and a report respectively.

Present		
Teacher name	Attendance status	Date
Festus Jartu	present	2016-04-05
Grace Lawson	present	2016-04-05
Ama Akoto	present	2016-04-05

Absent		
Teacher name	Attendance status	Date
Lydia Roberts	absent	2016-04-05
Samuel Adotey	absent	2016-04-05
Jude Larley	absent	2016-04-05
Alex Forson	absent	2016-04-05

Figure 5-11: Attendance status of a particular school

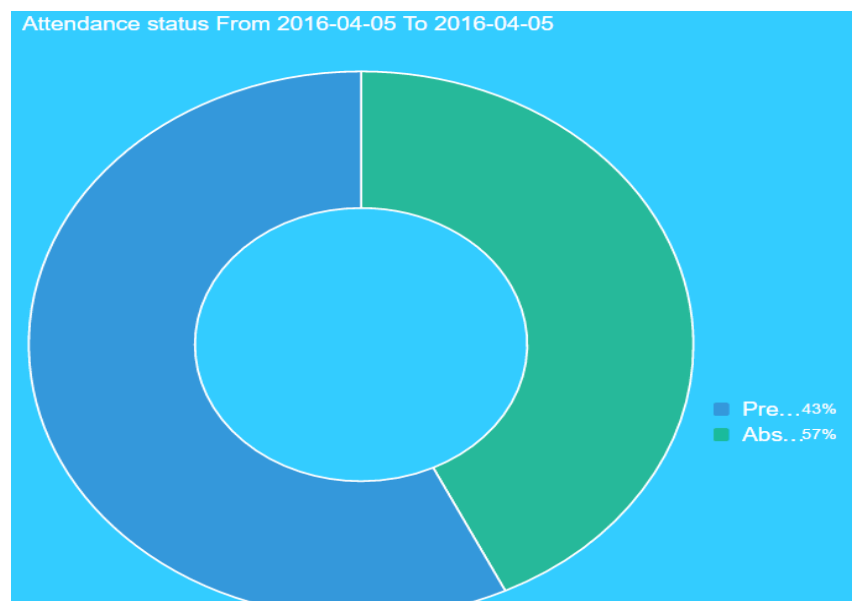


Figure 5-12: Attendance report

The time spent by the different user groups have been summarized in the tables below.

Table 3: Time used by students

	Test 1	Test
Student 1	24 min	20 min
Student 2	22 min	19 min
Student 3	22 min	21 min
Student 4	23 min	20 min

Table 4: Time used by Teachers (Mock testers)

	Test 1	Test 2
Teacher 1	9 min	5 min
Teacher 2	8 min	6 min
Teacher 3	10 min	5 min
Teacher 4	9 min	4.5 min

Table 5: Time used by Parents (Mock testers)

	Test 1	Test 2
Parent 1	4 min	3 min
Parent 2	3.5 min	2 min

Table 6: Time used by supervisors (Mock testers)

	Test 1	Test 2
Supervisor 1	3 min	1.5
Supervisor 1	2 min	1 min

CHAPTER 6: Conclusion and Recommendation

6.1 Conclusion

The purpose of this project is to reduce teacher absenteeism among teachers in public basic schools in Ghana. The application allows parents to log in everyday to take attendance of teachers. They select the teacher, the school of the teacher and the attendance status (present/absent). Parents can also view the academic performance of their children. The teachers post assignment/quizzes on the platform for the students to do and submit. The system automatically grades the quiz and generates a report. Teachers can view reports of students. The system also makes it possible for educational officers who go around the district to monitor attendance of teachers can stay in the comfort of their offices to view attendance of teachers in their districts and generate a report.

This system is better than the existing solutions that were mentioned in Chapter 1. It does not only enhance teaching and learning experience among teachers and students, but it also uses an indirect approach to track teacher absenteeism, a very important feature which the existing solutions lack. Educational officers can have a fair idea of attendance status by making an inference from the submissions made by parents.

6.2 Limitations

Although the purpose of the application is to reduce teacher absenteeism, it will be difficult to trust the system totally due to the possibility of parents not giving the true attendance status of a teacher. If a parent likes or dislikes a particular teacher, they may choose to provide wrong information to the system.

Again, the system cannot grade all assignment automatically. Only quizzes with multiple choice answers can be graded by the system.

6.3 Future work

- **Bulk data upload**

This application in the future will make provisions for bulk upload of data. In the case where the school already has the data in an excel database, they can just go ahead and upload the data from excel into the database.

- **Push notification**

A push notification system will be added to the application so that students can receive notifications whenever a quiz or a course material has been uploaded by their teachers.

- **Upload of course material**

Course material will be upload to the system by teachers in the future. This material will help the student to review course work.

- **Feature for interaction**

The system in the future will include a chat feature that will enable all users to interact with each other.

- **Admin sets premium questions**

The admin should be able to add premium questions where students will be asked to pay in order to have access to these questions.

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