MASTER OF INFORMATION AND COMMUNICATION STUDIES

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UNIVERSITY OF THE PHILIPPINES
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MASTER OF INFORMATION AND COMMUNICATION STUDIES

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The ENHS Student Attendance Monitoring System

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Faculty of Information and Communication Studies

25 January 2024

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The ENHS Student Attendance Monitoring System

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Acceptance Page:

This paper prepared by **BERNARD KENNETH T. LIM** with the title: **"The ENHS Student Attendance Monitoring System"** is hereby accepted by the Faculty of Information and Communication Studies, U.P. Open University, in partial fulfillment of the requirements for the degree Course.

_____ 01 March 2024

Ria Mae H. Borromeo, Ph.D.
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_____ 27 September 2024

Blancaflor P. Arada
Program Chair (Date)

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(Date)

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TABLE OF CONTENTS

ABSTRACT

Chronic absenteeism poses a widespread challenge in schools, prompting the need for an advanced attendance monitoring solution beyond the basic features provided by the Department of Education (DepEd) Commons. The Estancia National High School (ENHS), located in Estancia, Iloilo, which has more than 3,900 students and employs approximately 400 teachers, also encounters this problem. To address this issue, the ENHS Student Attendance Monitoring System (SAMS) was designed as a mobile application to streamline and automate attendance tracking processes. It was developed using the Flutter framework, Dart programming language, and NodeJS. It uses MySQL as the database and is currently hosted on an Amazon Web Services (AWS) EC2 Instance running Ubuntu Linux 22. The resulting system allows teachers to input student absences per day and generate monthly reports on student absences. An alert is created when a student reaches a certain number of absences. The alert prompts the teacher to take action according to the number of absences. This proactive monitoring and alerting on student absences benefits students, teachers, and parents. Student absenteeism problems can be easily caught, tracked, and remediated before worsening.

CHAPTER I

INTRODUCTION

The Department of Education (DepEd) has a strict directive on enforcing students' attendance, which requires teachers to submit a monthly report called the School Form 2 (SF2) Daily Attendance Report of Learners. The teachers are also required to notify the parents or visit the student's home to personally talk to the parents or guardians when certain numbers of absences are reached.

In detail, the ENHS SAMS aims to address the following problems:

1. The manual process of monitoring students' attendance and maintaining attendance records are time-consuming activities on the part of the teachers.
2. The manual process of monitoring students' attendance is prone to error.
3. There is no central repository to keep the history of students' absences, the reasons behind those absences, and activities performed by teachers. Each teacher keeps his/her own attendance records and reports. These data are mostly no longer useful or are lost after submission or after the school year or semester.
4. There is no facility in place that prompts teachers to act on chronic absenteeism. Once action has been taken, it is easy to forget what happened as it is not recorded anywhere.

DepEd provides some automated systems to enhance the efficiency of educational processes, such as the Learner Information System (LIS), the Enhanced Basic Education Information System (EBEIS), and the Electronic Class Record (ECR), but these systems are not designed to facilitate the attendance monitoring processes.

The ENHS Student Attendance Monitoring System (SAMS) addresses the need to automate the processes involved in monitoring the students' absences. The system enables the teachers to see monthly reports and view student absences per month. It also has an alerting feature that prompts teachers to act on those alerts, such as to contact the student's parents/guardians or to perform home visits.

The ENHS SAMS is a user-friendly mobile application that allows teachers to easily select the absent students in the list, select the date (which defaults to the current date), review the selected absent students, and submit.

The reporting feature allows teachers to select the month and view student absences for the month. Reports can be viewed per date or per student. This helps teachers to analyze absenteeism patterns.

The alerting feature creates an "alert" when the student reaches a certain number of absences (i.e., 3, 5, and 10 absences). The alert is displayed in red, and prompts the teacher to act, such as to contact the student's parents/guardian or to visit the student's home. The alert's status changes to "Action taken" when the teacher has entered information on the absenteeism reason and what action that the teacher has taken. The alerting feature will be of vital importance for the school's effort to eradicate absenteeism problems.

The ENHS SAMS will be the central repository of student attendance data. An automated attendance management system will reduce manual tasks, improve efficiency, reduce errors, allow access to historical and current attendance information, and improve attendance monitoring and analysis.

CHAPTER II

REVIEW OF EXISTING ALTERNATIVES

TeacherKit is a student information system that provides useful and advanced functionalities to manage students, classes, grades, attendance, reports, and communication with students, teachers, and parents. This is a complete package for a student information system. However, the total subscription cost for 4000 students is too high, considering that we do not need all the features that it offers.

Google Classroom can be used to record students' attendance, manage assignments, communicate, and collaborate with students and teachers. Its many complex features are too much for the specific need that we would like to solve at this point.

ClassDojo is a web and mobile application that can be used to manage attendance, students, and class, and facilitate communication among parents, students, and teachers. However, this is a costly alternative, and lacks specific requirements on alerts and reports generation.

PowerSchool is a web-based student information system that can be used to track students' attendance and manage classes, schedules, grades, and reporting. Similar to ClassDojo, it is also a costly alternative, and lacks specific requirements on alerts and reports generation.

The ENHS SAMS is a user-friendly mobile application that is custom-built according to DepEd's Track and Strand course, and according to the requirements set by ENHS teachers. Functional and usability testing on the part of the teachers resulted in favorable feedback. There is a huge positive expectation of the benefits that ENHS SAMS will bring to the school.

CHAPTER III

PROJECT DETAILS

Overview

The diagram below shows an overview of the functionalities and components for the Student Attendance Monitoring System.

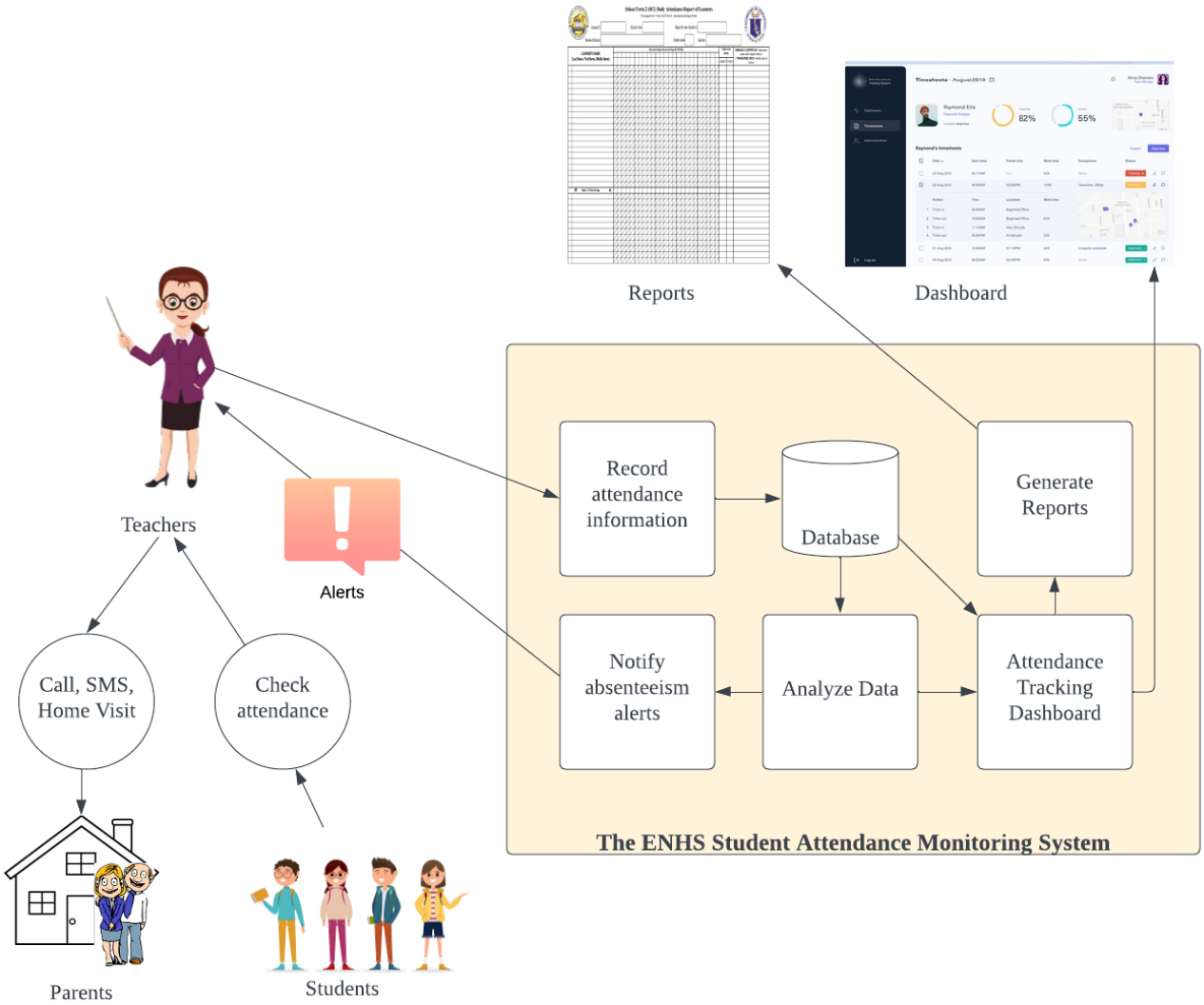


Figure 1. The ENHS Student Attendance Monitoring System

Theoretical Framework

The theoretical frameworks and the software design and development processes used for the development and implementation of the ENHS Student Attendance Monitoring System are as follows.

1. Systems Development Life Cycle (SDLC)
2. Agile Development Methodology: Kanban development
3. Data Flow Diagram: Level 0 (context), level 1 and level 2 DFDs
4. Data Modeling: Entity-relationship diagrams, logical and physical schema designs
5. Use Case Modeling: Use Case Diagrams, Sequence Diagrams
6. System and User Interface Design: User-Centered Design
7. Object-Oriented Programming (OOP)

Technologies Used

The following technologies will be used in the design, implementation and operation of the proposed student attendance monitoring system.

1. Software Design Tools
    a. LucidChart and Draw.io were used to create diagrams such as Data Flow Diagrams, Entity-Relationship Diagrams, Use Case Diagrams, and database schema design. These diagramming tools are user-friendly and provide a rich collection of ready-to-use shapes for our design requirements.
2. Software Development Tools

a. Android Studio is the main software development tool that was used. Android Studio on Windows OS was used to build the Android version of the mobile application. Android Studio on MacOS (MacBook) was used to build the iOS version of the mobile application.
b. Flutter framework and Dart programming language were used to develop the mobile application.
c. Visual Studio Code was used to code NodeJS API code.
d. Postman was used to test the NodeJS web service APIs.

3. Databases
    a. MySQL Database was used for the database.
    b. MySQL Workbench was used to develop and test MySQL SQL code.
4. Cloud Platforms
    a. Amazon Web Services (AWS) EC2 Instance running Ubuntu Linux 22 was used to host the MySQL database and the NodeJS web services on the cloud.

System Design

These are the features and functionalities that the system supports.

- User Registration and Management
    - Users (teachers or school administrators) can register new accounts with the following information and manage user information.
    - Users can manage their own profile information.
- Student Registration and Management

    - Teachers can register students. Parent/guardian information is also registered so that teachers can contact them.
    - Teachers can manage student information in case of changes.
- Class Management
    - Teachers or system administrators can manage the school year, semester, classes, subjects, teachers, tracks, and strands.
- Subject Management
    - Teachers or system administrators can create and manage the subjects and classes that they belong to.
- Attendance Management
    - Teachers can check attendance and use the system to input the absent students on that date (or another date).
- Attendance Alerts
    - The system generates an alert when a student reaches a certain number of absences. The teacher is prompted to contact the parents/guardians. The teacher enters the reason for absenteeism and the actions that he/she has taken.
- Attendance Reports
    - Monthly attendance reports can be viewed in various formats.

Flowcharts

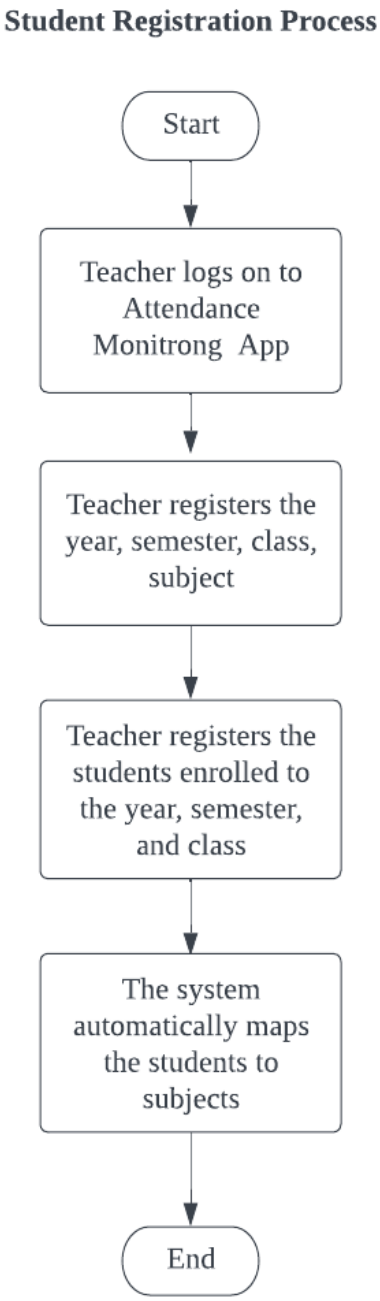


Figure 2. Student Registration Process Flowchart

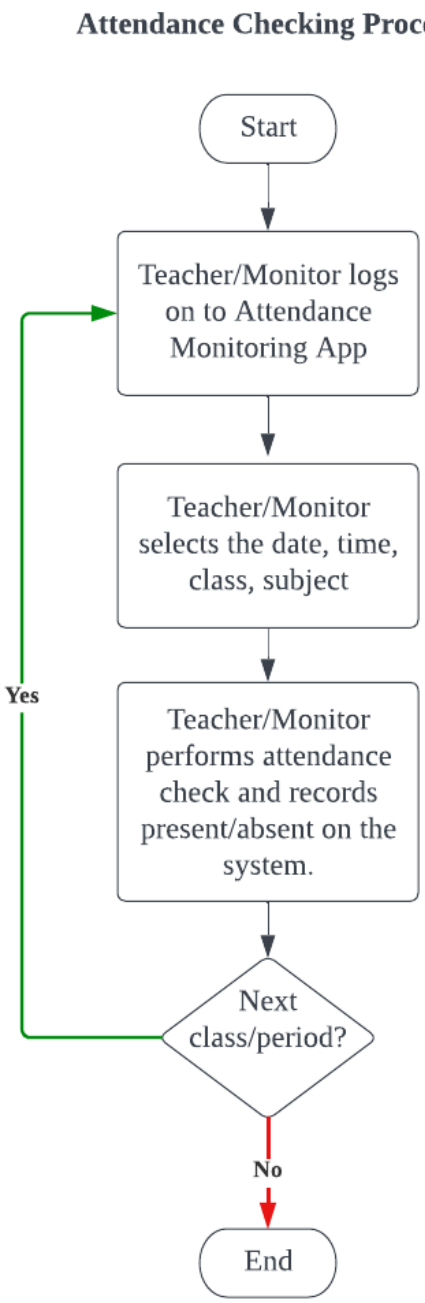


Figure 3. Student Attendance Checking Flowchart

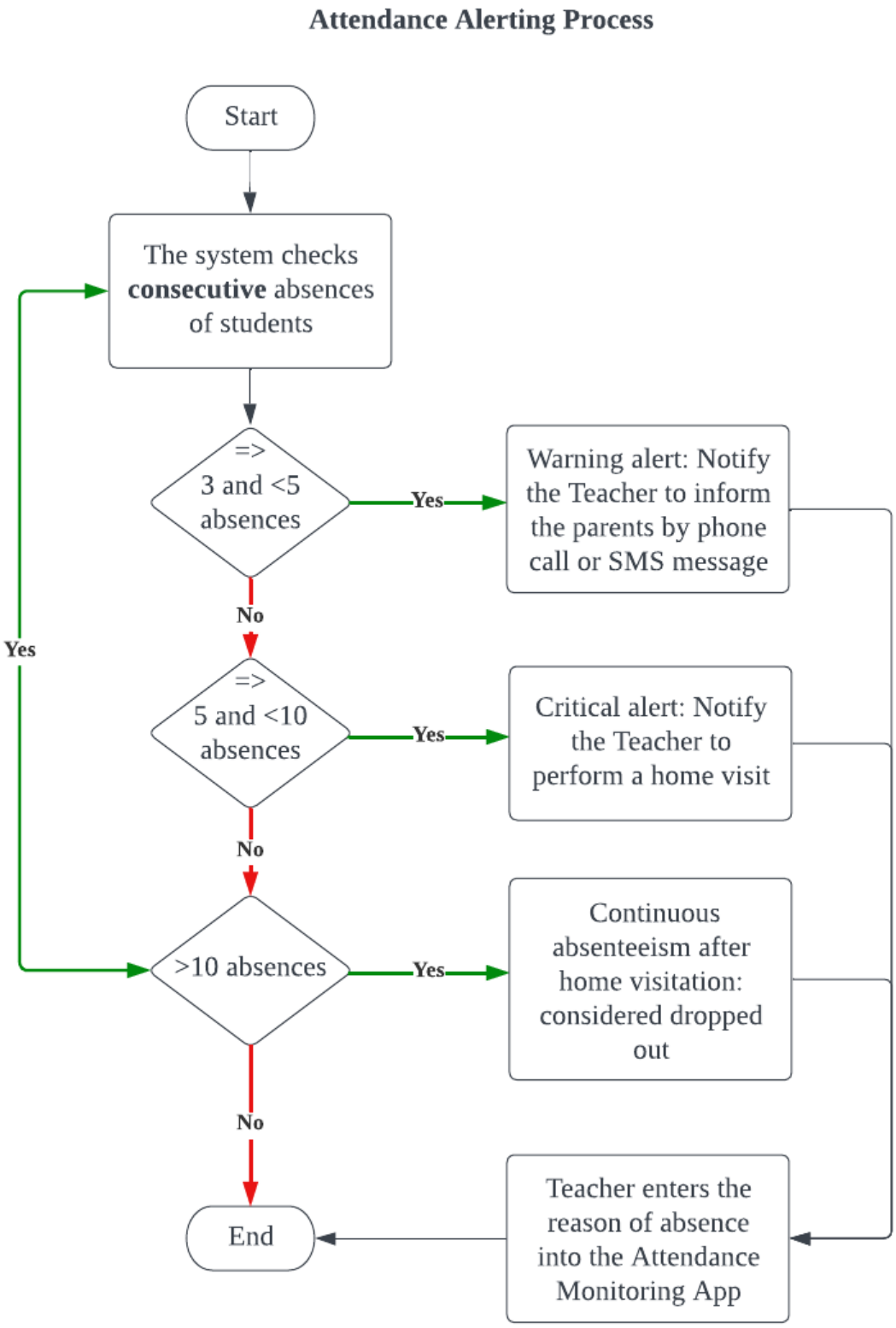


Figure 4. Attendance Alerting Process Flowchart

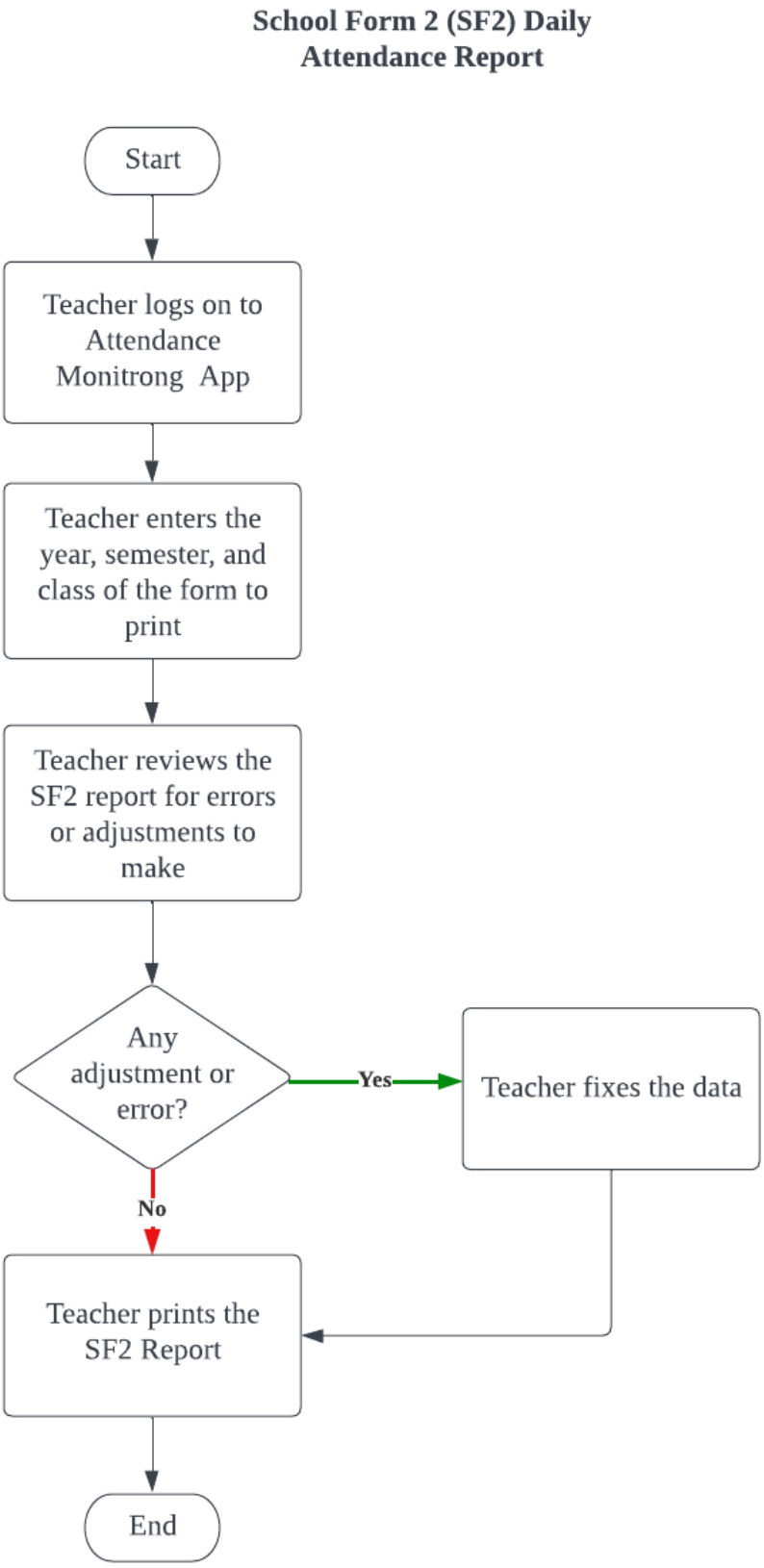


Figure 5. Report Printing Process Flowchart

Data Flow Diagrams

Context Diagram

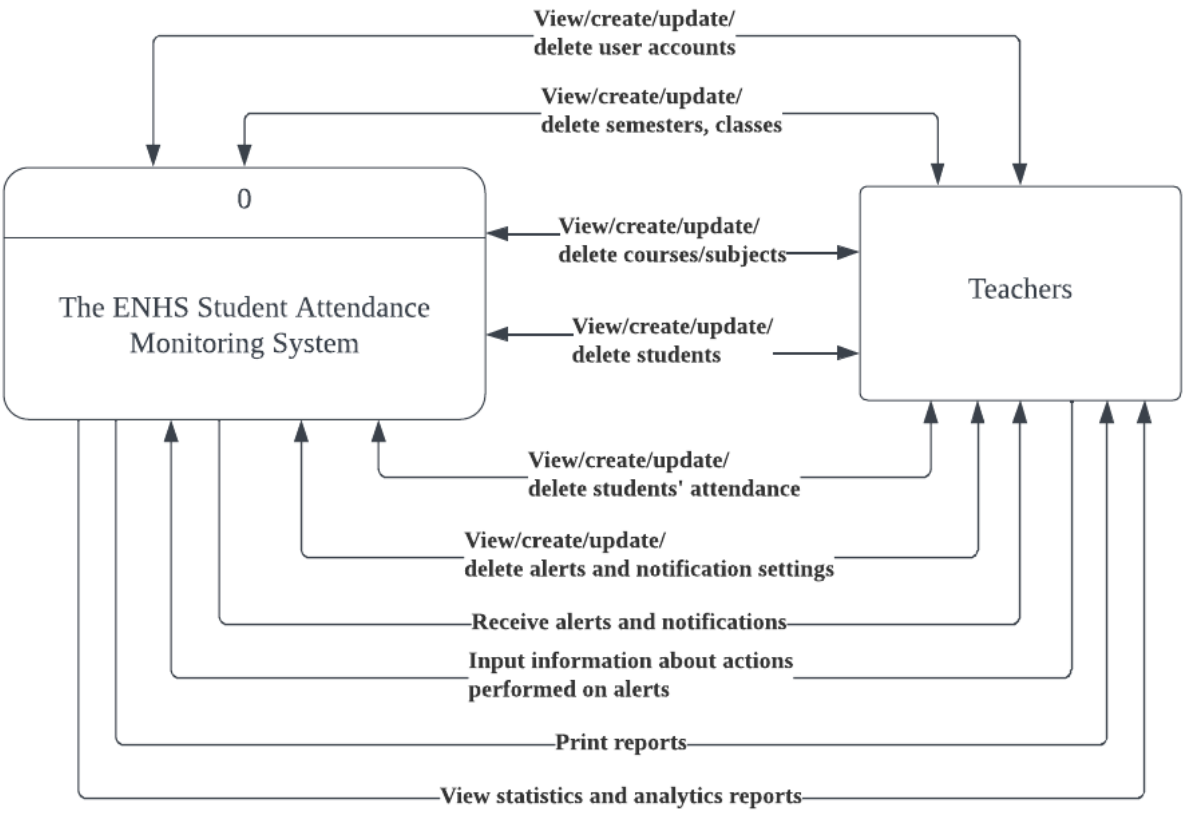


Figure 6. Context Diagram or Level-0 DFD

The Context Diagram shows the high-level overview of the interaction between the entities and the Student Attendance Monitoring System.

Level-1 DFD

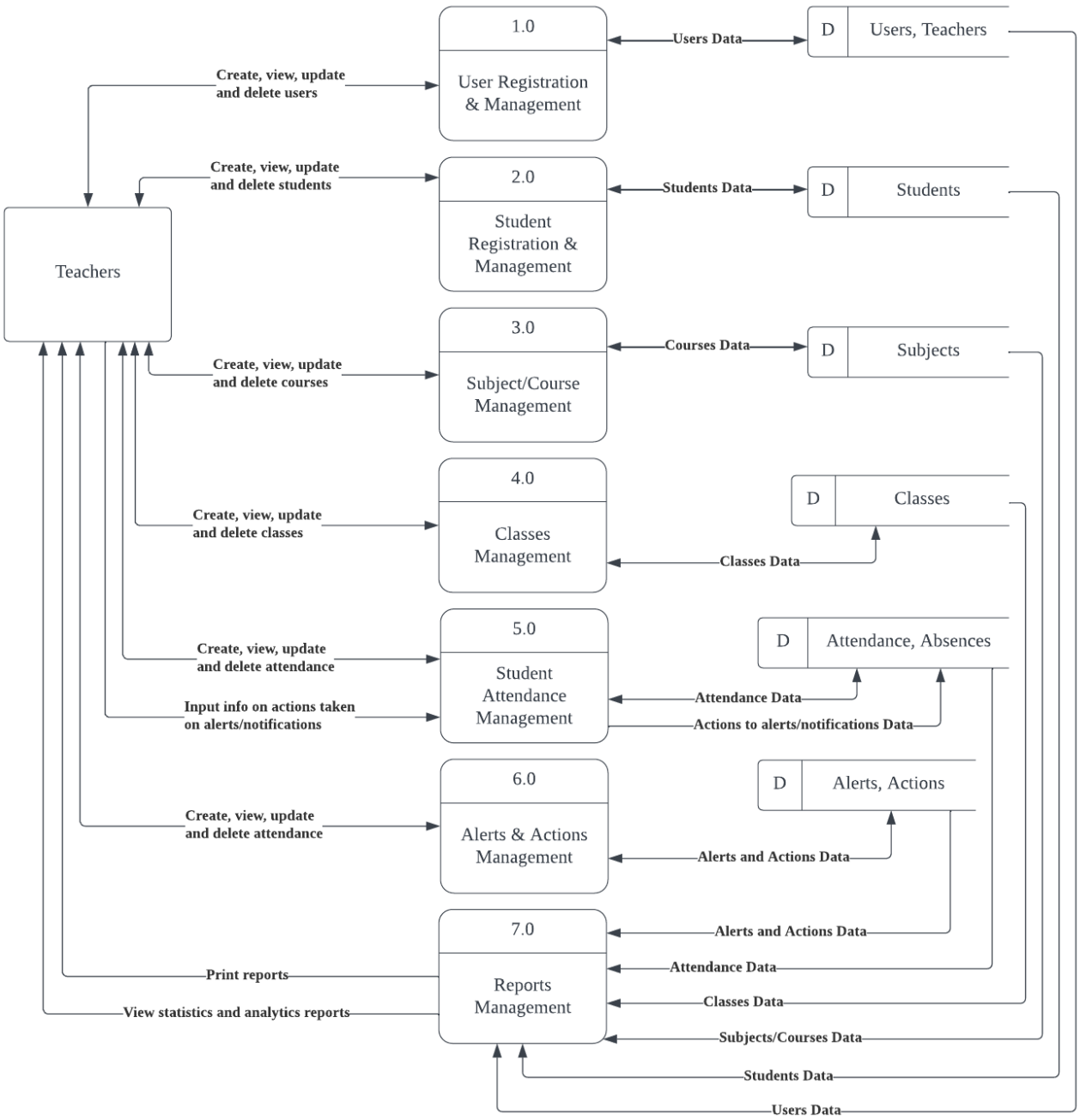


Figure 7. Level-1 DFD

The Level-1 DFD provides more details about the processes that handle the input and output data. These processes either receive/fetch data from or write/output data to external entities or data stores. Data stores represent database tables.

Entity Relationship Diagrams

The Entity Relationship Diagram (ERD) and the logical schema design of the entities (tables) and the relationships among them provide useful references for creating the database. The DFDs in the previous section have been very helpful in creating the ERD in this section.

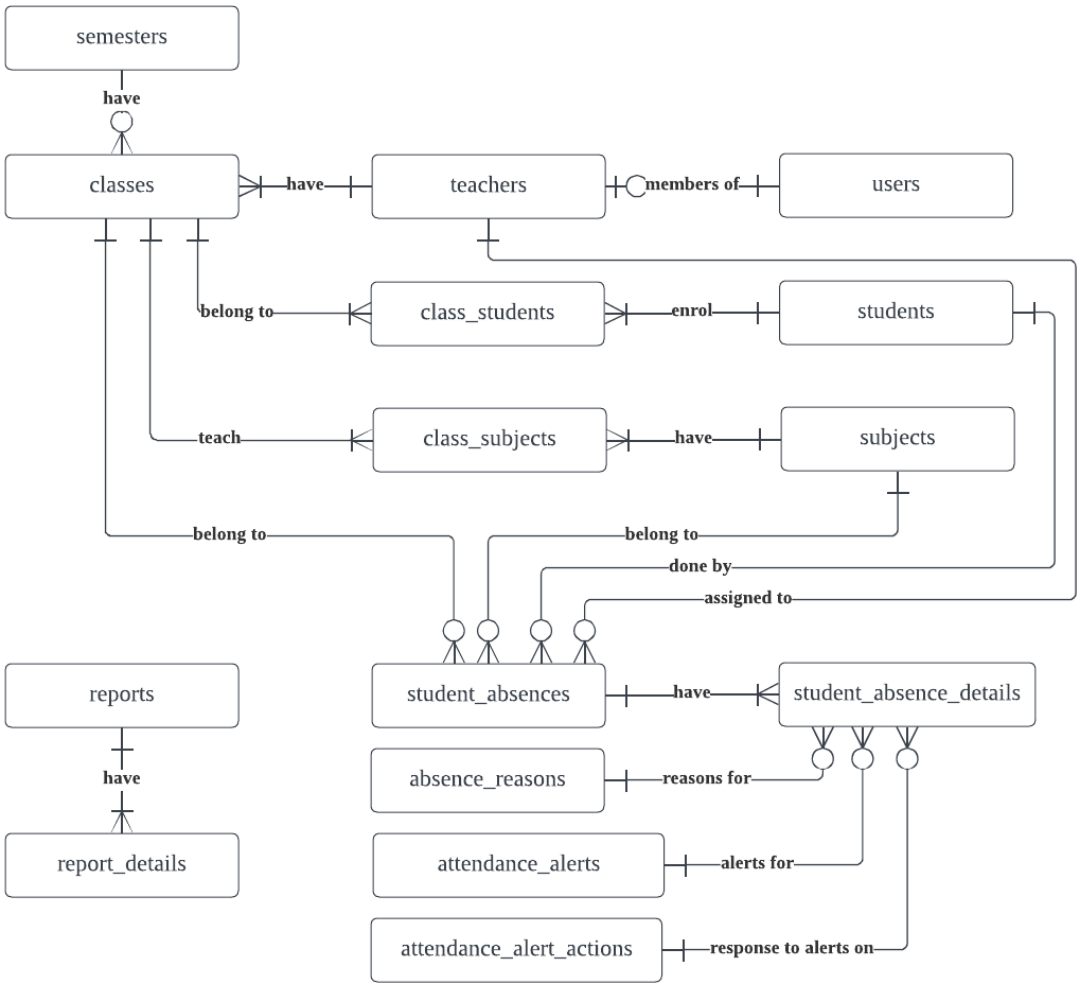


Figure 8. Entity Relationship Diagram

Use Case Model

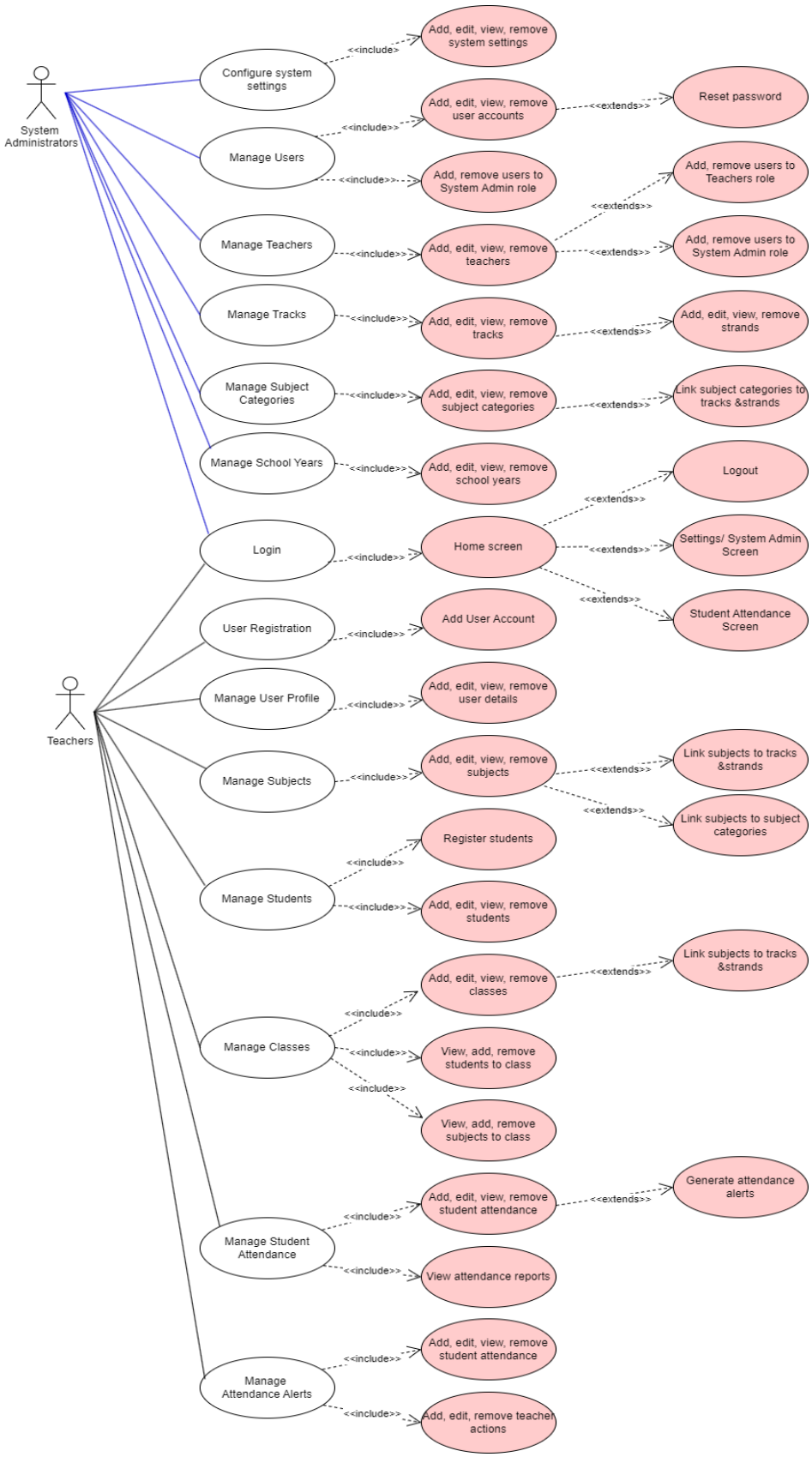
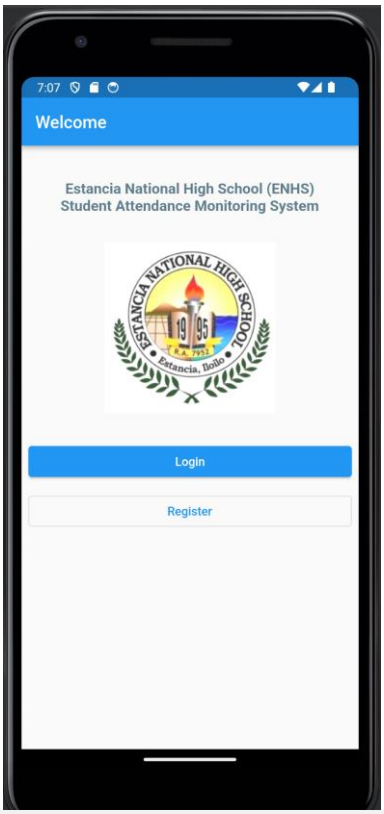
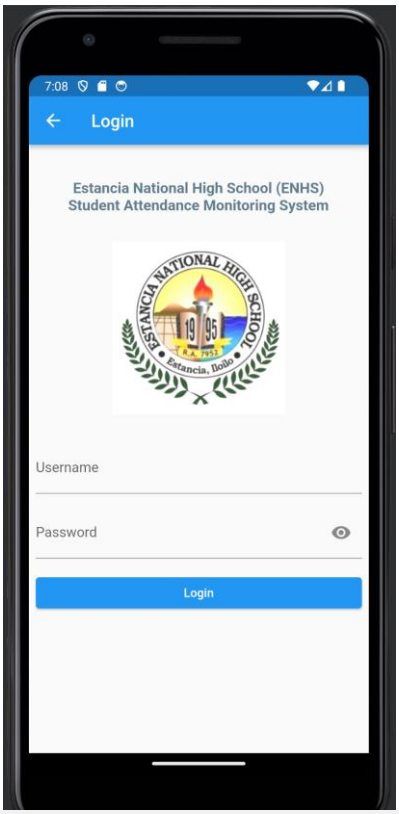


Figure 9. Use Case Diagram

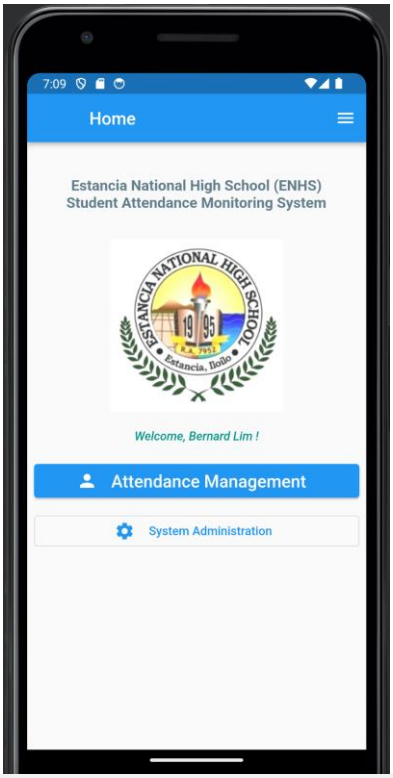
User Interface Design



Welcome Screen

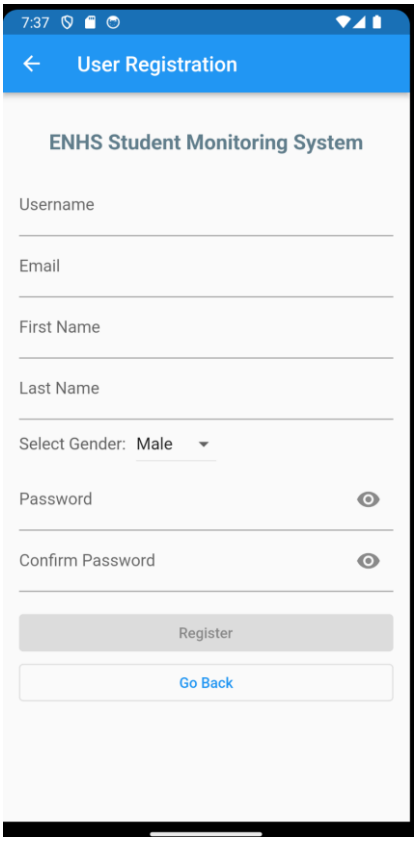


Login Screen

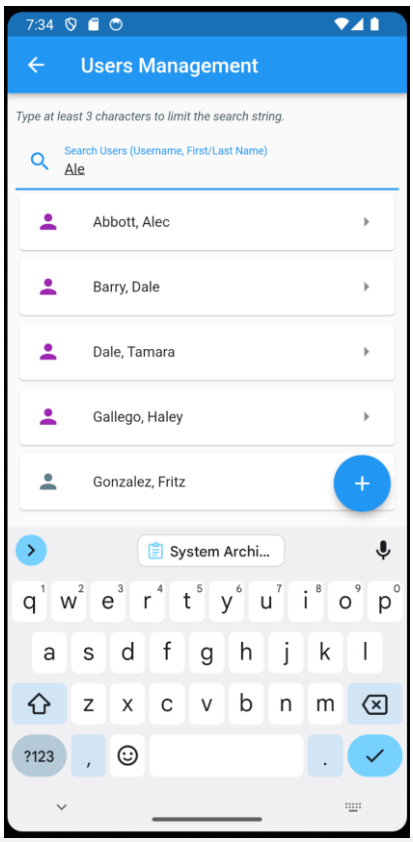


Home Screen

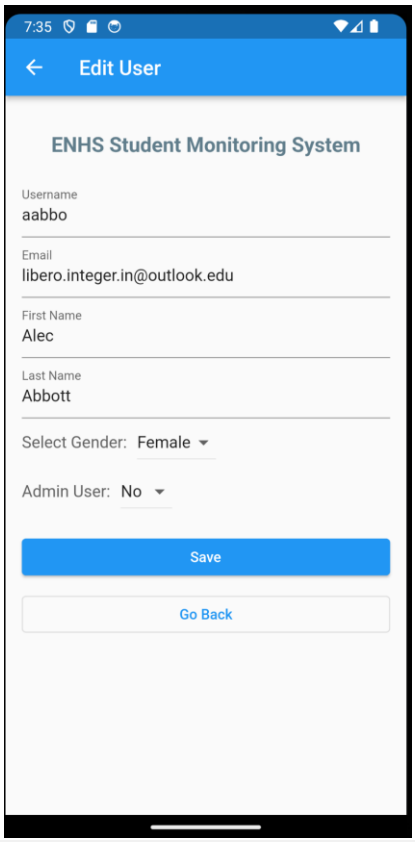
Guest User Home Screen



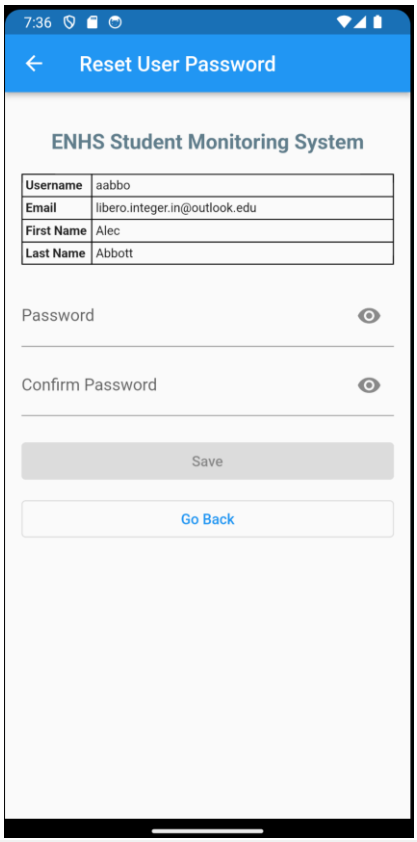
User Registration Screen



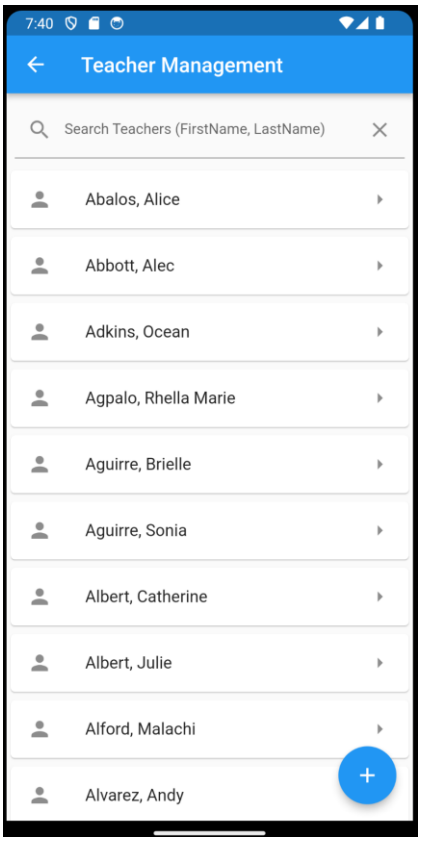
User Management Screen



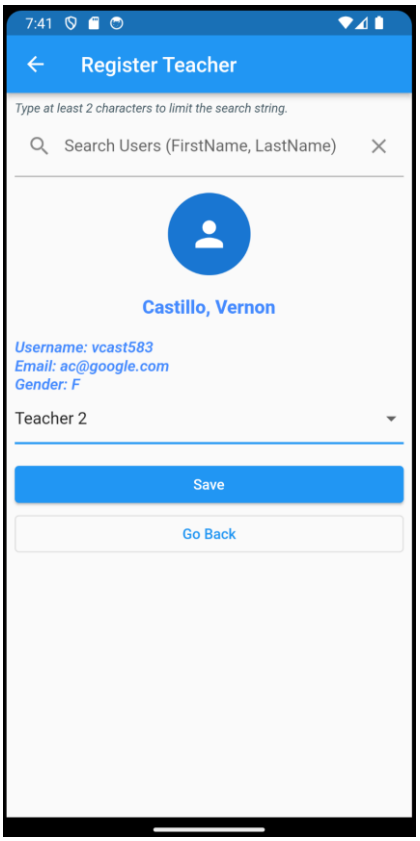
Edit User Screen



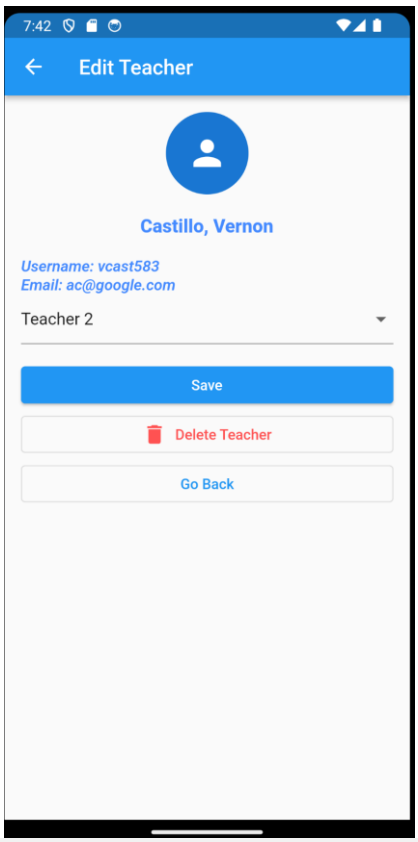
Reset Password Screen



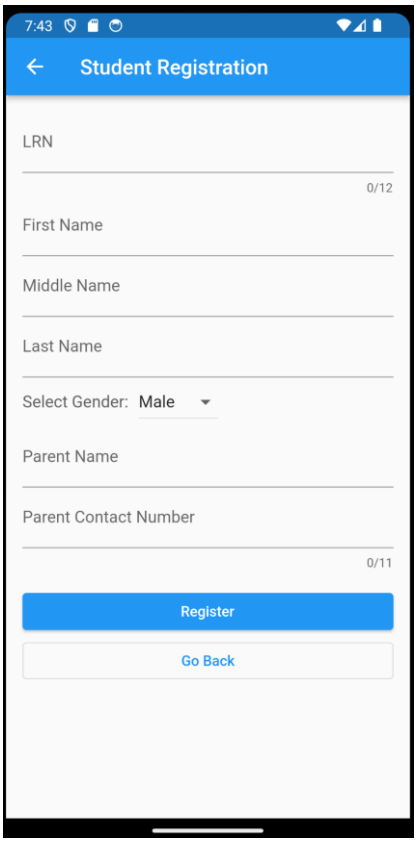
Teacher Management Screen



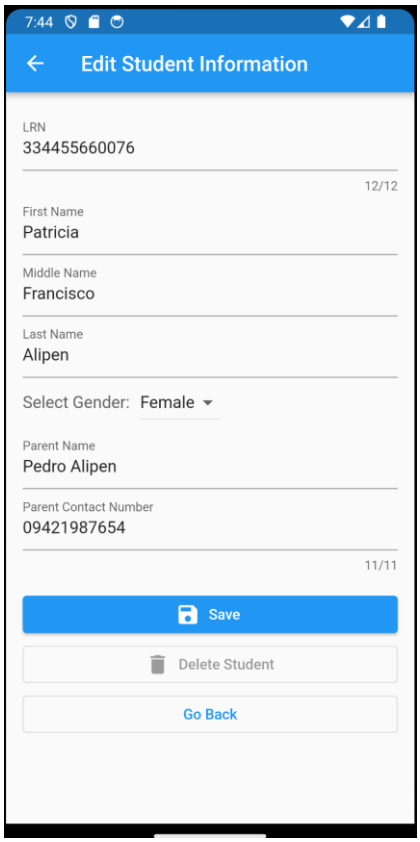
Teacher Registration Screen



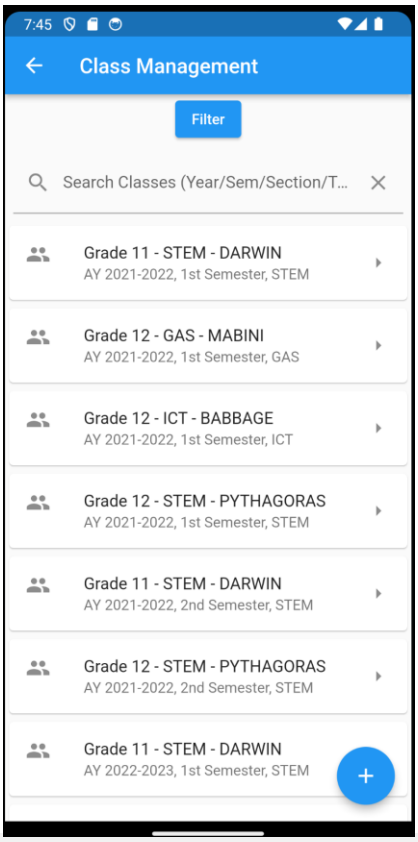
Edit Teacher Screen



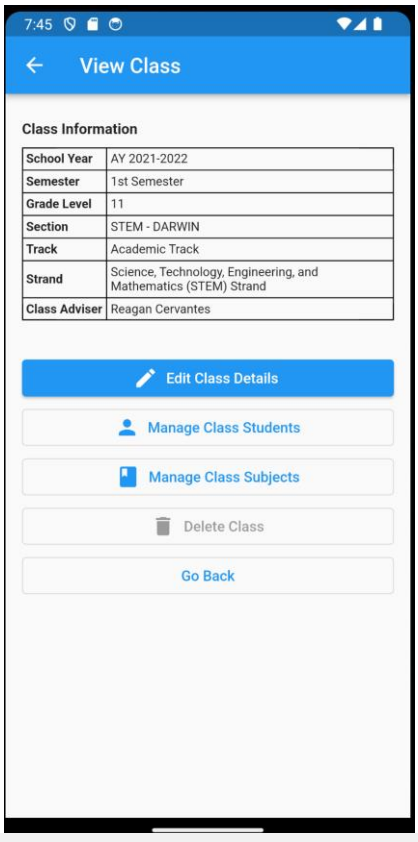
Student Registration Screen



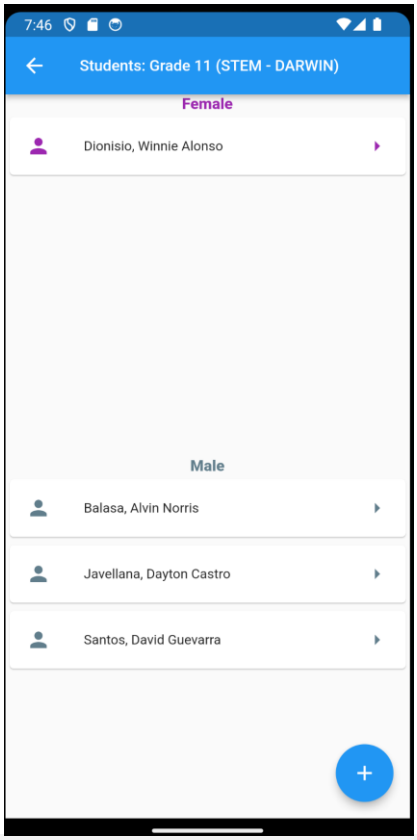
Edit Student Screen



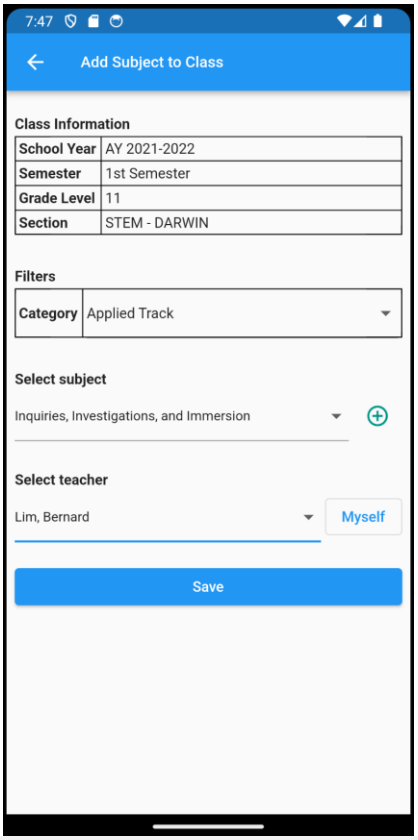
Class Management Screen



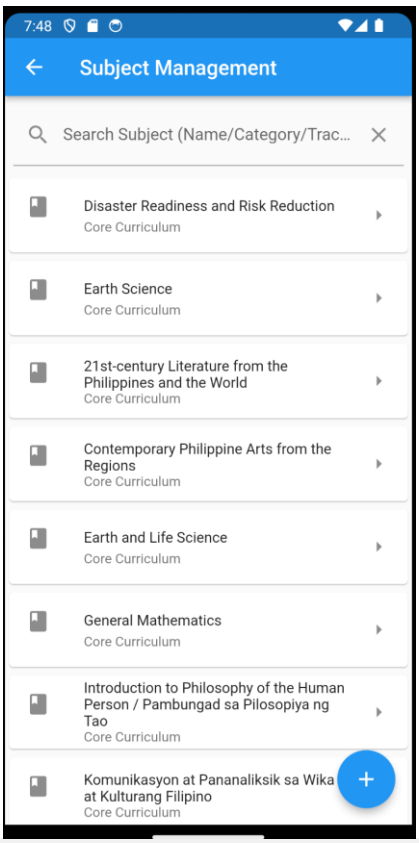
View Class Screen



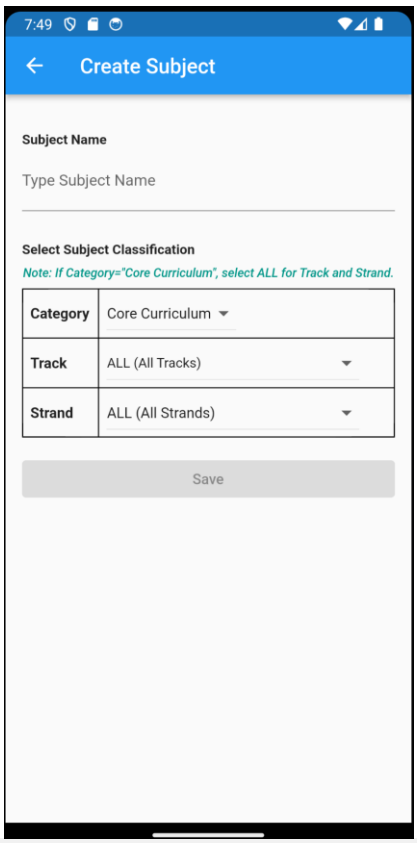
Add Student to Class Screen



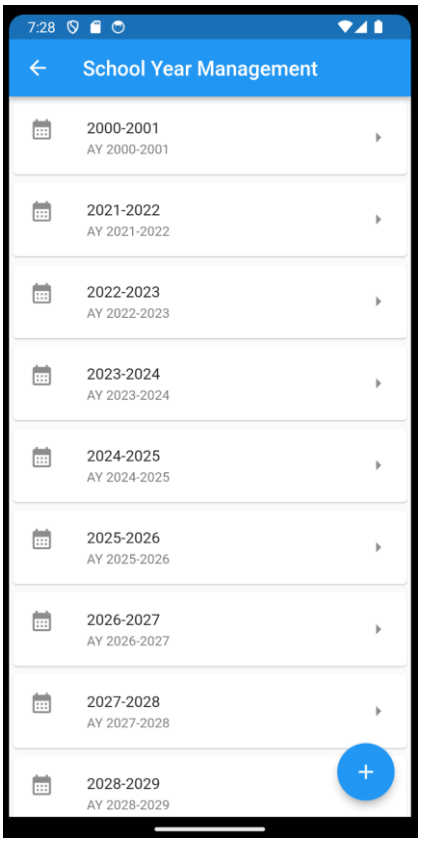
Add Subject to Class Screen



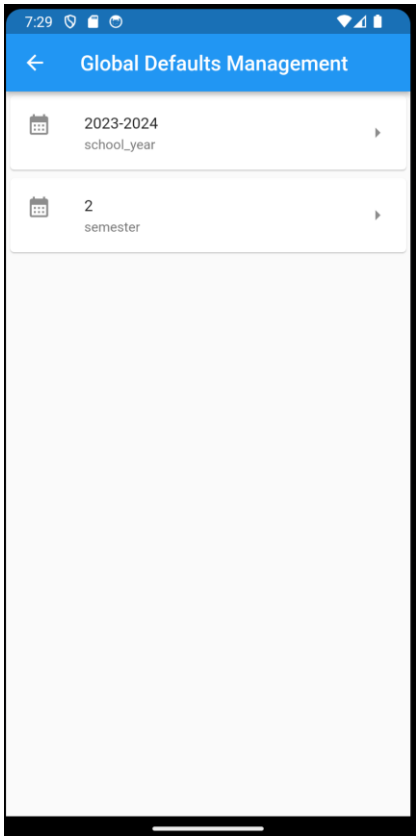
Subject Management Screen



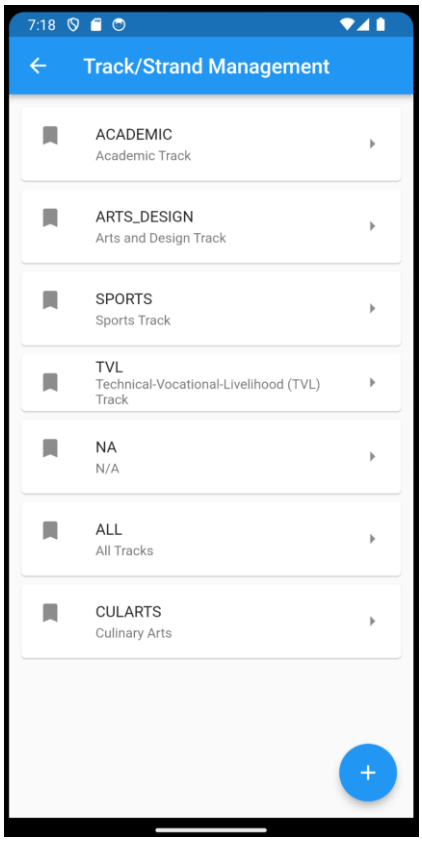
Create Subject Screen



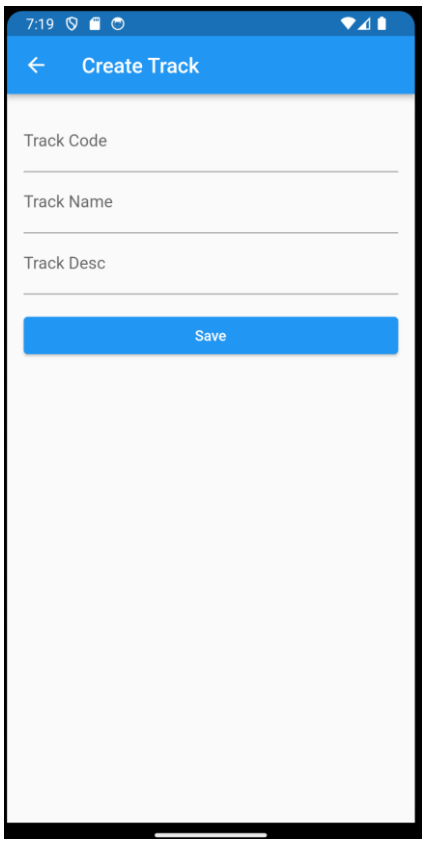
School Year Management Screen



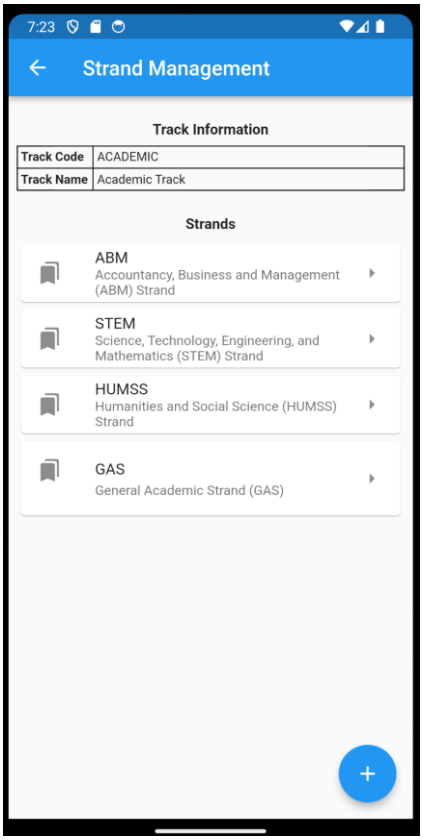
Global Defaults Screen



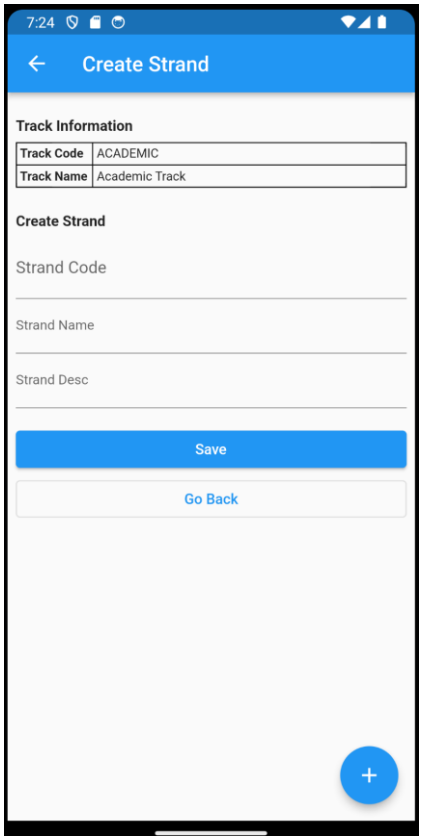
Track Management Screen



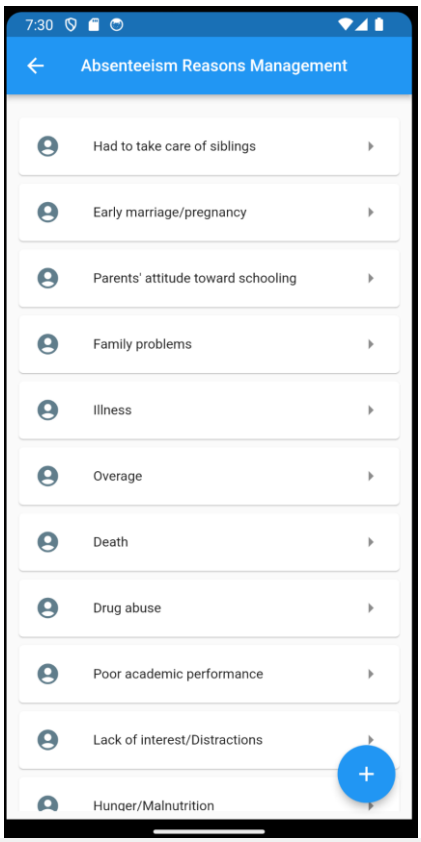
Create Track Screen



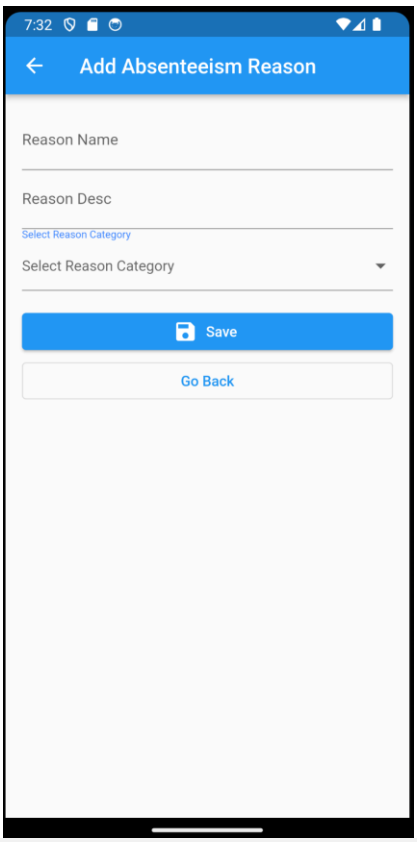
Strand Management Screen



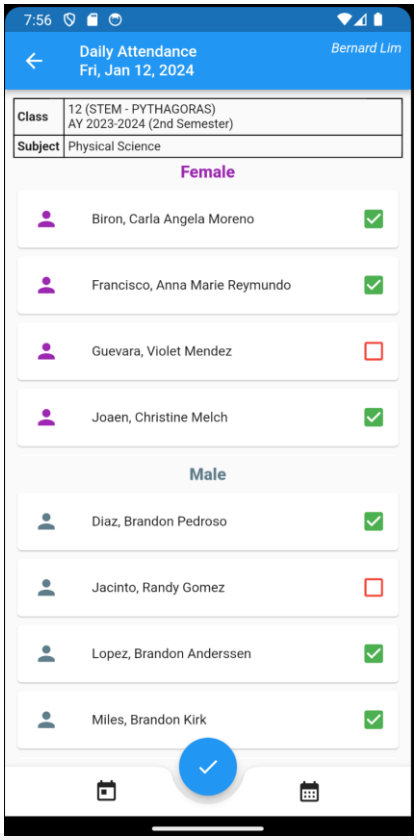
Create Strand Screen



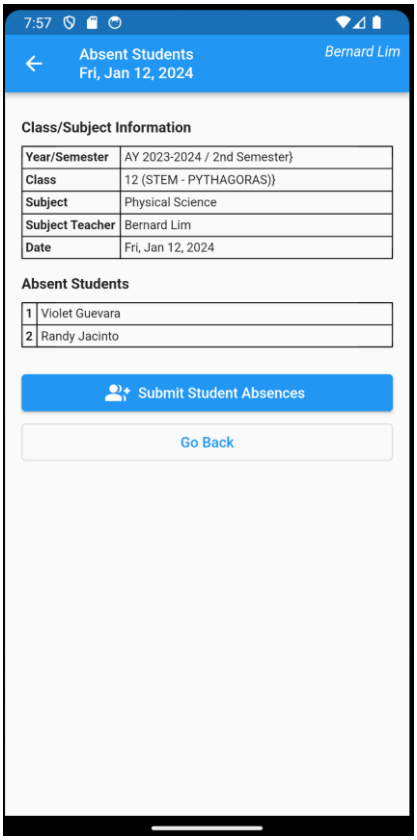
Reasons Management Screen



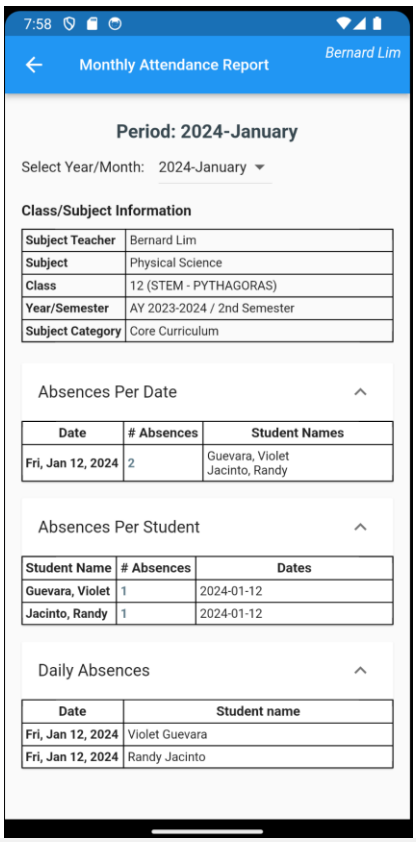
Create Reason Screen



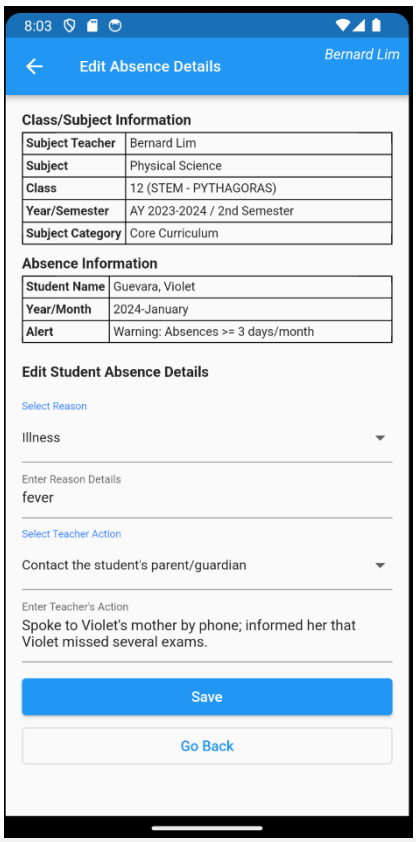
Attendance Management Screen



Attendance Management Screen



Absence Reports Screen



Absence Alerts Screen

Implementation

The ENHS Student Attendance Monitoring System is an initiative by one of the teachers in Estancia National High School to help solve the student absenteeism problem of the school.

Requirements gathering was conducted through video calls during the design, development, testing and implementation stages.

LucidChart and Draw.io diagramming tools were used to create system design diagrams such as the Data Flow Diagrams, Use Case Diagrams, Entity Relationship Diagrams, Behavior Diagrams and the Logical Database Schema. User interface design and database models were mostly created on paper at first, and then created using LucidChart and Draw.io. Having a strong system and database design helped a lot during the software development process. They also proved very useful in creating documentations that were required for IS-295a.

Flutter Framework and Dart programming language were used to develop the mobile application. MySQL database was used as the backed database. NodeJS APIs were used to facilitate communication between the Flutter application and the MySQL database.

Android Studio on Windows PC was used to develop the ENHS SAMS mobile applications. Visual Studio Code was used to program NodeJS APIs, and Postman was used to test to the API calls. I used MySQL database installed locally on the PC, and MySQL Workbench as the GUI Tool to create database objects, and to create and test SQL queries/transactions that were later used for API calls.

The database and APIs were deployed to AWS cloud by the 2nd week of January. User testing was performed on the 2nd week of January, with some comments for improvement and functionalities. Having implemented the requested

changes and improvements, as well as further bug fixes, the user (teacher) has agreed with the application to be used at school for dry run. Future improvements will be made as they continue to use the mobile application and feedback on any improvements or changes that they need.

CHAPTER IV

PROJECT ASSESSMENT

User Testing

Five teachers were involved in the user testing. The mobile application for Android device was used during user testing.

These are the features and functionalities that were tested.

- User Registration and Management
    - Users (teachers or school administrators) can register new accounts with the following information and manage user information.
    - Users can manage their own profile information.
- Student Registration and Management
    - Teachers can register students. Parent/guardian information is also registered so that teachers can contact them.
    - Teachers can manage student information in case of changes.
- Class Management
    - Teachers or system administrators can manage the school year, semester, classes, subjects, teachers, tracks, and strands.
- Subject Management

- Teachers or system administrators can create and manage the subjects and classes that they belong to.

- Attendance Management
  - Teachers can check attendance and use the system to input the absent students on that date (or another date).
- Attendance Alerts
  - The system generates an alert when a student reaches a certain number of absences. The teacher is prompted to contact the parents/guardians. The teacher enters the reason for absenteeism and the actions that he/she has taken.
- Attendance Reports
  - Monthly attendance reports can be viewed in various formats.

The System Usability Scale (SUS) was used to rate the users' feedback. Rating ranges from 1 (Strongly Disagree) to 5 (Strongly Agree).

Rating Table

Score	Description
1	Strongly Disagree
2	Disagree
3	Not Sure
4	Agree
5	Strongly Agree

System Usability Scale (SUS) Questionnaire

Full Name	1	2	3	4	5	6	7	8	9	10
	I think that I would like to use the ENHS SAMS frequently.	I found ENHS SAMS unnecessarily comples	I thought ENHS SAMS was easy to use.	I think that I would need the support of a technical person to be able to use ENHS SAMS.	I found the various functions in ENHS SAMS were well integrated.	I thought there was too much inconsistency in ENHS SAMS.	I would imagine that most people would learn to use ENHS SAMS very quickly.	I found ENHS SAMS very cumbersome to use.	I felt very confident using ENHS SAMS.	I needed to learn a lot of things before I could get going with ENHS SAMS.
Raquel Francisco	5	2	4	2	5	1	5	1	5	1
Rhella Marie Agpalo	5	1	4	1	5	1	5	2	5	2
Aneleen Malco	4	2	4	1	4	1	4	2	5	2
Jericah Ramirez	5	3	3	2	4	2	4	1	5	1
Krisa Mae Layda	5	1	5	2	4	1	5	1	5	1

Measuring and Interpreting System Usability Scale (SUS)

SUS Score	Grade	Adjective Rating
> 80.3	A	Excellent
68 - 80.3	B	Good
68	C	Okay
51-68	D	Poor
< 51	F	Awful

Computation and Result

	X = Sum(Odd)-5	Y = 25-Sum(Even)	SUS Score = ((X + Y) x 2.5)	Average SUS Score
Raquel Francisco	19	18	92.5	**88.5**
Rhella Marie Agpalo	19	18	92.5	
Aneleen Malco	16	17	82.5	
Jericah Ramirez	16	16	80	
Krisa Mae Layda	19	19	95	

The Average SUS Score is 88.5%, which qualifies under Excellent Rating.

CHAPTER V

DISCUSSIONS

Requirements gathering was conducted through video calls. One of the interesting things I learned is the structure and classification of subjects and classes in Senior High School (SHS) using Tracks and Strands, as per the K2 to 12 guidelines provided by DepEd. The Junior High School (JHS) program does not have these tracks and strands.

System design started after requirements were identified. Data Flow Diagrams, Use Case Diagrams, Entity Relationship Diagrams, Behavior Diagrams were created using LucidChart and Draw.io diagramming tools. User interface design and database models were mostly created on paper first before creating with LucidChart and Draw.io.

As this is my first time creating a mobile application, I spent a lot of time watching tutorial videos online and tried creating simple mobile applications. I decided to use Flutter Framework with Dart programming language to develop the mobile application because it is easy to understand and is capable of building Android and iOS mobile applications using the same source code.

I experimented with various databases to use as the backend, such as Firebase, MongoDB, SQLite, and MySQL. I decided to use MySQL database as it is free and offers the relational database features that I needed for this project. Database operations were exposed via NodeJS API calls.

There were several challenges in setting up the development environment. My old MacBook Pro (2016) no longer supports the latest Xcode. The Xcode problem was resolved by installing an older version of Xcode. However, the older version of Xcode was not compatible with my iPhone's iOS version. A Windows gaming PC was the

perfect tool for the job. Android Studio was installed on it, and the high GPU capacity of the PC was perfect for running the Android simulator on the PC. I used Visual Studio Code to program and NodeJS APIs, and Postman to test the API calls. I used MySQL database installed locally on the PC, and MySQL Workbench to create database objects and SQL queries/transactions that were later used building the API code.

With all the challenges in the mobile app development knowledge and environment setup, it was not until November that I started developing screens for this project. By the first week of January, the mobile app was about 80% done, and finally completed by the 2nd week of January.

I deployed the MySQL database and NodeJS APIs to AWS cloud by the 2nd week of January. User testing was performed on the 2nd week of January, with some comments for improvement and functionalities. Having implemented the requested changes and improvements, as well as further bug fixes, the user (teacher) has agreed with the application to be used at school for dry run. Future improvements will be made as they continue to use the mobile application and feedback on any improvements or changes that they need.

CHAPTER VI

CONCLUSIONS

Student absenteeism is a problem faced by the Estancia National High School or any other schools. The ENHS Student Attendance Monitoring System (SAMS) is the result of an initiative to help alleviate this problem using a simple mobile application. It is a tool that will facilitate student attendance management activities, from data input to generating reports and alerts.

The ENHS SAMS mobile application will offload the student attendance management activities, which are mostly manual at this time. By having a central repository of attendance data, historical data on student attendance can be readily retrieved. This is a great help in analyzing absenteeism patterns. Teachers acting consistently on attendance alerts generated by ENHS SAMS will promptly correct absenteeism problems.

CHAPTER VII

FUTURE WORK

Future improvements to the ENHS Student Attendance Monitoring System application include new features, such as bulk upload mechanisms and web console, as well as improvements to existing functionalities. In detail, these are as follows:

- Attendance Reports
    - History of all absences per student, which will enable the teachers to know the absenteeism habits of the student from the previous years and understand the reasons for his past and present behavior.
    - Automatic generation of the SF2 Monthly Attendance Report.
- Attendance Alerts
    - App notification when new alerts are created.
    - App notification to remind the teacher to check students' attendance 10 minutes before the class ends. This also requires a modification on application to indicate the days and start and end times for each class.
    - Add the student's address (for home visitation)
- Bulk upload of student data using csv files

- Web version of the application to facilitate functionalities that require extensive typing tasks, such as student registration.
- Documentation
    - User guides for teachers and system administrators
    - Installation guide
    - Troubleshooting guide
- System administration, security hardening and documentation are some of the other aspects that will be prioritized.

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