



Android-Based Class Record System

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Abstract

Portability allows a teacher to bring his or her mobile phone wherever he or she may go particularly into a classroom, which would guide him/her to efficiently manage a class. Today, mobile phones can be used to increase students' organization, hastening collaboration, and maximizing portability of technology. In this study, an attempt has been made to develop an Android-Based Class Record System which will focus on achieving mobility in managing and monitoring student class record. Its main purpose is to create an archive of consolidated and secured record of student information, assessment results, and attendances stored in android-based mobile phones. With the use of mobile phones, recording, searching, viewing and updating of a student's pertinent academic information will be faster, handy, and just a click away.

Subject Areas

Information Retrieval, Mobile Computing Systems

Keywords

Mobility, Class Record System, Android, Attendance, Classroom Management

1. Introduction

In the era of globalization, developments in information technology played an important role in various sectors of human life and mobile phones are the main actors in today's era [1]. Recently, mobile phones have started to be used in education and research. As an example, Motiwalla [2] discussed a framework for "m-learning" (mobile phone-based learning), a subset of e-learning, as a way of enhancing traditional classroom-based teaching. The widespread use of mobile phones in the field of education and classroom management becomes a great help to a teacher in particular and to the academic institution in general. The teacher, being one of the major sources of information, makes sure that the

pieces of information they impart and handle are systematic and organized. They have to strictly record attendances and monitor the academic performances of their students, thus, proper classroom management is therefore very vital. Not being able to do so will greatly affect the effectiveness and efficiency of a teacher which would, in turn, somehow impact on the development of the student.

Some faculty members claimed that the maintenance and management of student academic information such as their attendances and assessment results is a tiring process. In the traditional way, the attendance and grade entry of all the students are first recorded manually in a log book, and then again manually entered in a desktop application for computation. Such work as to record each student's assignment, quizzes, attendance, examinations, oral recitations, projects and/or reports, adds a heavy workload to a teacher. Many of them feel that the time they take in recording and computing for the grades of their students is a time that could better be spent elsewhere, like in preparing for lessons, researching or meeting with their students. The manual method employed by the teachers in regard to the recording, updating, and retrieving of students' academic information results in frequent errors in data manipulation, data entry, and sometimes a total loss of it.

The rapid development of electronic devices and wireless communications technology provides a foundation for improving the learning and teaching environments through the use of new technologies. Extensive work has already been done in this area. A lot of mobile applications that help a teacher-educator in managing student records on a daily basis already exist.

Ebenezer, *et al.* [3] developed the "Android Application for Student Activity Register" that reduced the lecturer's workload in maintaining academic related information of the students. This application consisted of various systems, such as attendance system, mark entry system to maintain and update the marks taken by the students, auto-calculation system to calculate the cumulative attendance, internal marks, average grade point and average cumulative grade point, and report generation system to generate reports of the cumulative attendance, individual performance, and class performance of each student.

Rastogi and Gupta [4] developed an application to record attendance through mobile devices. The aim of their project was to create an Android mobile application for attendance system that can be used by all teachers for their respective courses. The design of the application was that the data, details of the courses allotted to the respective faculty, and the students enrolled in the courses are to be fetched from the server using an internet connection and store it in the mobile database. This application stores the attendance in the mobile internal database, where the faculty can view and update the attendance whenever required. Furthermore, the researchers concluded that the attendance system through mobile devices is a very effective tool which can be used to a great extent. The system is portable and can easily be installed and used on any mobile phone supporting an Android operating system (OS). The use of this system results in a

reduction in the number of hours spent in feeding attendance details into the server database. It also provides an interface which is easy to understand by the users and greatly helps in adapting the use of this system.

The study “Mobile Based Attendance Management System” conducted by Reddy, *et al.* [5] aimed to automate attendance management using mobile devices to reduce the dependencies on paper resources and also provide a way of communication between parents and teachers. Furthermore, the teacher takes the attendance on his/her mobile phone and marks the attendance; the record is then stored in the database so that it can be fetched later on when required. The mobile generates the short message service (SMS) and sends it to the parents or guardians of the students informing them about the attendance status of their child in the class.

The study “Student Attendance Tracker System in Android” [6] sought to develop an android application to manage student attendance on mobile phones. The main objective of this project was to add mobility and automation to the existing attendance process. This system helps teachers take attendance through mobile phones and also keep in touch with students in some aspect. This system allows teachers to take attendance, edit attendance, send important documents in portable document format or pdf format, such as exam time tables, question banks and others, and also helps teachers to inform students about the events the college is going to organize. Furthermore, the researchers reported that the application offers reliability, time savings, and easy control.

Motivated by these excellent results, the researcher proposed the development of an Android-Based Class Record System which will provide efficiency in managing a class record, cater to all faculty/teachers with different mobile phones in different Android OS versions, and allow easy operation management.

2. System Design

The proposed Android-based Class Record System will be installed in the faculty member’s mobile phone and will be used to take attendance, record grade entry and update students’ academic information even in an offline mode, which is even when there is no network connectivity. The application fetches the details of the subjects allotted to the respective faculty and the list of students enrolled in a subject using Local Area Network (LAN) connection from the server. Once the information has been fetched, the application stores it in the mobile phone’s internal database and the faculty member can now record, view, and update student’s attendance and grade entries wherever and whenever required. As the semester ends, the faculty member may simply do the grade computation in their mobile phones.

2.1. System Architecture

Android-Based Class Record System, as shown in **Figure 1**, was designed based on three-tier architecture. Three-tier architecture is commonly known as client-

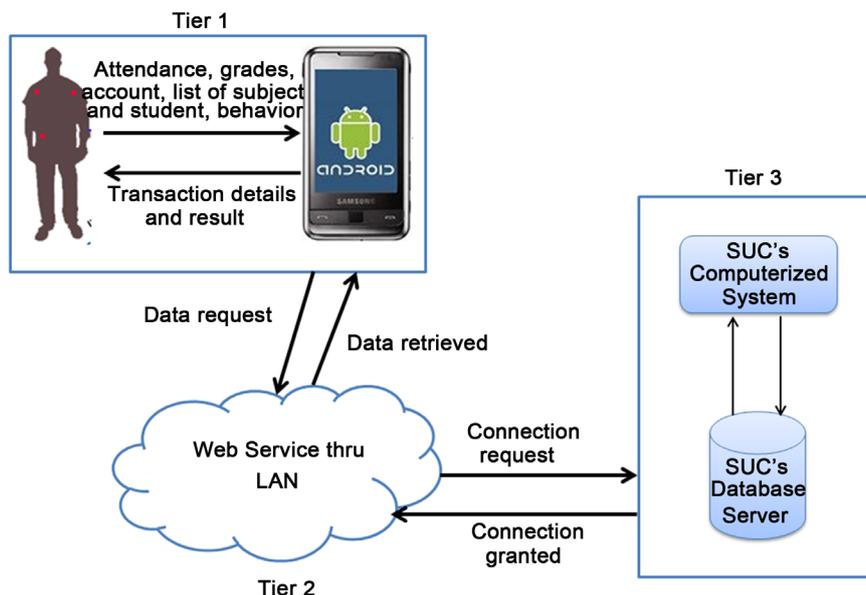


Figure 1. System architecture of android-based class record system.

server architecture, where the client is the consumer or requester of services, whereas the server side is the provider of services [7]. The third layer, which is the middle layer, converts the user request into server understandable form.

The figure above shows the client side of the system which composes of an android application written in Java programming language and will serve as its front end. The middle layer, which connects the client side to the server side, is a web service developed in Visual C# language and will be used in fetching the necessary data from the server. The server side is the university's computerized system and its database server. Data communication between the client to the web service and the web service to the server will be established with the presence and connectivity of a local area network.

2.2. Functional Modules

2.2.1. Create New Module

The function “take new attendance” allows the faculty to get and record the attendance of the students in a particular day. Upon opening the application, the faculty can select the class list option which brings up the list of subjects handled by the faculty. As the faculty selects a certain subject, the system displays the list of enrolled students in that particular subject. To mark a student as present, the faculty simply selects the name of the student resulting in a change in its font color. “New grade entry” function on the other hand, enables the user to record earned scores of the student in a particular activity. However, the system does not allow raw scores; therefore, it should be in its percentage equivalent. After opening the application, the faculty selects a subject in which a particular activity was performed and selects “new grade entry” option to initialize the function. The system will require the faculty to input the name of the activity and the score earned by a student. “New grade group” function is used to create student

performance evaluation criteria. This function is a prerequisite action of the function “compute final grade”. The “take picture” function resolves the difficulty in memorizing the faces of students due to the enormous number of students in a class. These student pictures are stored in a file folder created by Android Developers Tool (Figure 2).

2.2.2. Update Module

The “update” function involves processes that bring new data and information on to the system. These processes include addition, modification, and deletion of existing data to make the system current or up to date. In this study, data that may need to be updated are the student attendances, grade entries, and grade group.

2.2.3. View/Search Module

This module shows the list of data and information that can be accessed, viewed, and searched by the faculty user. These data are the subjects handled by the faculty, the students who are officially enrolled in those subjects, the attendances and grade entries earned by these students, the student evaluation criteria and its percentage, and lastly the school calendar currently stored in the mobile phone.

2.2.4. Utilities Module

This module contains sub-functions which allow the faculty members and the proposed application to access the database server. It includes the download-fetching necessary data such as subject and student lists and checking new school calendar year; upload actual submission of student final grades to the database server with the use of mobile phone; and lastly, restores backed-up class record.

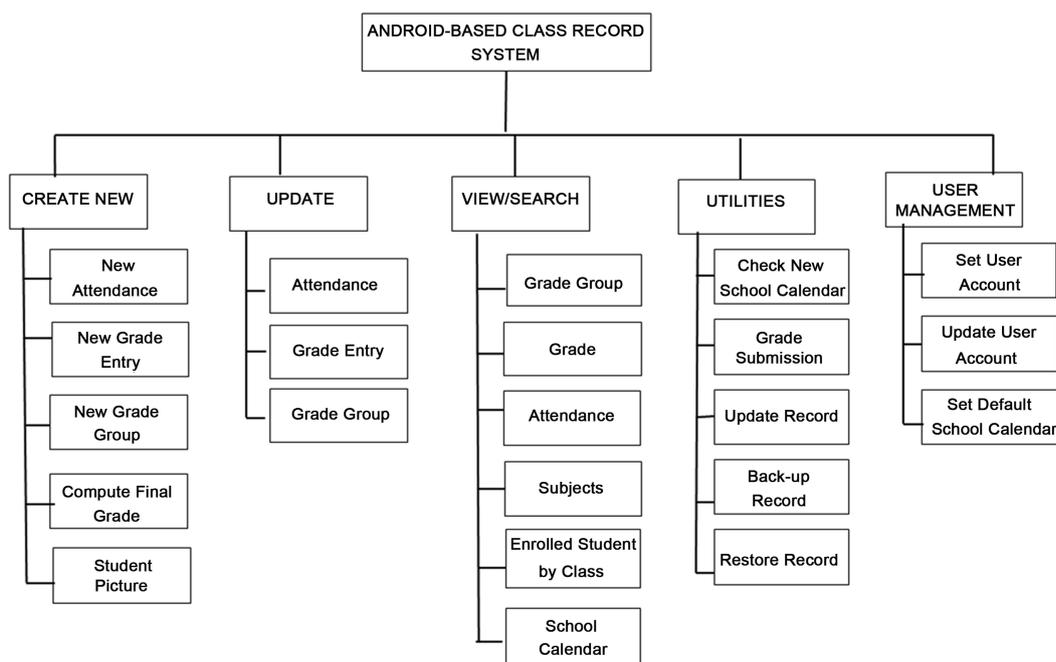


Figure 2. Functional decomposition diagram of android-based class record system.

2.2.5. User Management Module

Setting up a member account after installation is required to validate if the user is a legitimate faculty of the university. The system checks if the inputted account matches an existing valid account in the school's databases. Moreover, if there is a necessary change in the accounts, the system allows its resetting and updating. Every semester of each school year, a faculty member usually handles new subjects, thus, to facilitate the download of new class lists, update record function is provided. But first, a user checks if new school calendar is available. A new school calendar means a new set of subjects for that current semester and school year. The user selects a default school calendar before hitting the update record function.

3. Requirement Specifications

The development and implementation of the Android-Based Class Record System requires technical resources and requirements such as hardware and software resource. Hardware requirement refers to computer and device specifications used both in system design and system implementation. These requirements are necessary to effectively provide enough processing power for the system. Following are tables that show the hardware, and software resource specifications for the system.

3.1. Hardware Specifications

Table 1 shows the hardware requirements for smart phones to be used in the implementation phase. The faculty/teacher is encouraged to use a quad core mobile phone with 2 gigabytes RAM and an available space of 4 gigabytes storage capacity to ensure best performance from the system. It is also recommended that the device have at least 5 inches of LCD display and a camera that will be used in taking student pictures.

Table 2 presents the required specifications of the computer device to be used in system development and coding.

Shown in **Table 2** are the hardware requirements used in the actual coding and development of the Android-Based Class Record System. A computer with these requirements is where the application will be built, designed, and hard-coded. The device should have a 400-gigabyte disk space for the Android Soft-

Table 1. Deployment (mobile device) hardware specifications for android-based class record system.

HARDWARE	RECOMMENDED
Processor	Quad Core ARM Cortex-A53
Random Access Memory (RAM)	2 GB
Storage	At least 4 GB available space
Wireless Local Area Network (WLAN)/Data	Any compatible WLAN/Data Connectivity
Display	5' Super Liquid Crystal Display (LCD)

Table 2. Development phase hardware specifications for android-based class record system.

HARDWARE	RECOMMENDED
Processor	Intel i7-4790 @ 3.60 GHz
RAM	16 Gigabytes (GB)
Hard Disk	400 Gigabytes (GB)
LAN Card	100 Mbps Ethernet
Mouse	QWERTY mouse
Keyboard	Ergonomic keyboard
Monitor	1280 00 screen resolution

ware Development Kit (SDK) emulator and Java Development Kit. These requirement guarantees a faster and more reliable system development and data processing.

3.2. Software Specifications

Software requirement refers to programming and application languages used as a platform and tool of the Android-Based Class Record System. Following is the software and tools to be used in the development and implementation stage.

As shown in **Table 3**, the mobile device to be used in the implementation and deployment is a “Kitkat” version of an Android mobile operating system. Since android apps require enough processing power, mobile devices below recommended specifications may still use the application, but may encounter some hang ups or lags. Moreover, all the data and information fetched from the server will be stored in the mobile internal database using its pre-installed SQLite.

The table below presents the optimum software requirements to be used in system software design, coding, and debugging stages. These software will serve as tools for the realization of the proposed Android-Based Class Record System.

Table 4 shows the list of software requirements throughout the development of the Android-Based Class Record System. Visual C# is used in creating a web service because of its flexibility, ease in user’s interface development and the ability to access database from applications. A web service is a program or method used to fetch and download the required data from the school’s database server. Instead of creating a new feature for the application with which the user inputs all the subjects handled, the students enrolled in each subject, as well as its time and room schedules, the researcher will take the liberty of creating and invoking a web service that will access the database server of the university, and from it, all the necessary data be retrieved and downloaded with ease. Java will be used for creating commands and functions for data manipulation in the users’ mobile phone. Toolkits such as JDK, Android SDK, ADB plug-in, and Android Studio IDE were used in coding, testing, and debugging of the application. With these requirements, Android-Based Class Record System ensures its best benefit of faster and reliable development.

Table 3. Mobile device software specifications for android-based class record system.

SOFTWARE	RECOMMENDED
Operating System	Android OS v4.4 (Kitkat) or higher
Database Software	SQLite

Table 4. Development phase software specification for android-based class record system.

SOFTWARE	RECOMMENDED
Operating System	Windows 10 64-bit
Programming Language	Visual C#, Java and XML
Development Toolkit Software	Java Development Kit (JDK), Android SDK with Android Debug Bridge (ADB) plug-in, Android Studio Integrated Development Environment (IDE)

4. System Implementation and Testing

The Android-based Class Record System aimed to somehow improve teacher's instruction and classroom management with the use of information and communication technology. It is a dynamic application program designed to simplify the process of taking student attendances and handling their academic records. It is a mobile-based application program designed to run on any android mobile phone. A faculty member who wishes to use this application is therefore required to install this app.

Figure 3 shows the screen that will be displayed when the application is activated. The faculty/teacher clicks the Setting button to display the validation interface of the system. It is a user's log-in screen that enables the application to connect to the schools' database server. Concurrently, this also validates if a user is a legitimate faculty member of the said school. Hitting the save button stores the data in the internal database of the mobile phone which will be used later on for the checking of new school calendar and for the updates of the record.

Figure 4 shows the interface for checking the new calendar year. Before the start of the semester, the faculty/teacher is required to update the application. When the user hits the Check New School Calendar button, and if the username, password, and IP address inputted earlier match the one stored in the server, current and active calendar years will be displayed automatically. With that, data such the subjects and the list of students enrolled will be made available for download. However, if there is a mismatch with the entry, no display will be made possible. Furthermore, the faculty teacher requires setting a new calendar year by pressing a little longer with the display. Once done, the default calendar year will be displayed in a neon green color to make it stand out among the rest.

Update Record button in home screen is used to download data such as subjects assigned to a faculty teacher and the lists of students enrolled from the server and stored in the mobile phone's internal database. The lists of subjects and students to be downloaded are based on the default calendar year set a while ago.

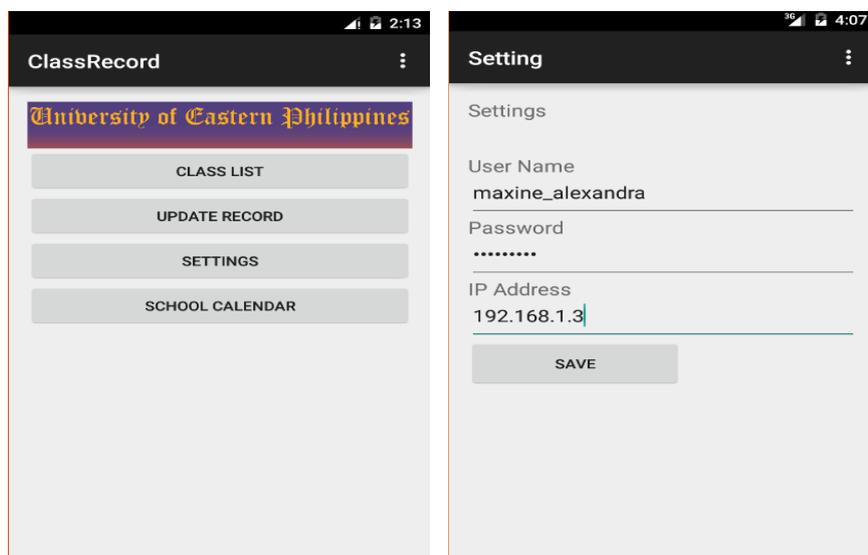


Figure 3. Home screen of android-based class record system.

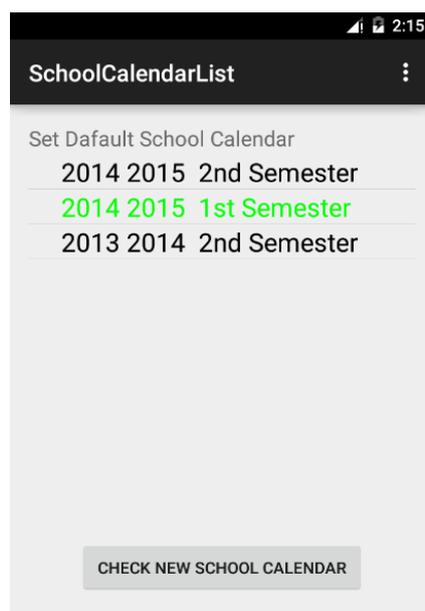


Figure 4. School calendar screen of android-based class record system.

Class List button in home screen is used to display the subject assigned to the faculty teacher. The display is based on the default school calendar year, thus, every time you update and make necessary changes on the default calendar year, the list of the displayed subjects will also be updated (**Figure 5**).

When the faculty user hits one of the class names or subject names in Class List Screen, the Class Menu Selection which holds the major functions of the application such as the taking of attendance, recording of student evaluation results, updating these pertinent data and the computation of final grades will appear (**Figure 6**).

Figure 7 appears when a faculty user clicks on the New Attendance button in the Class Menu Selection screen (**Figure 6**). This interface: 1) displays the name

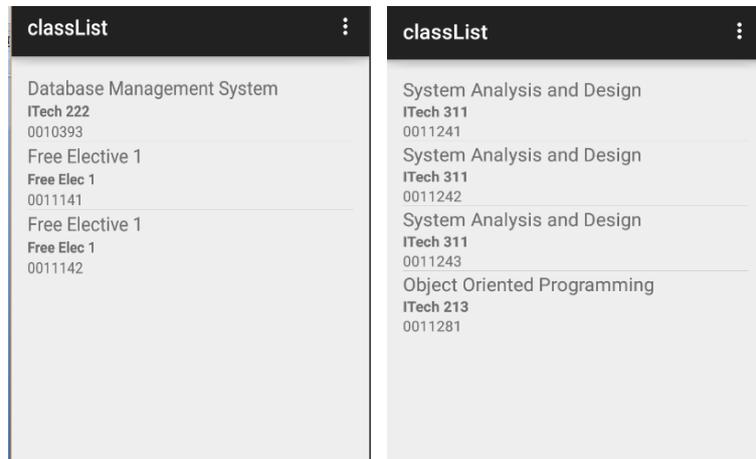


Figure 5. Class list screen of the android-based class record system.

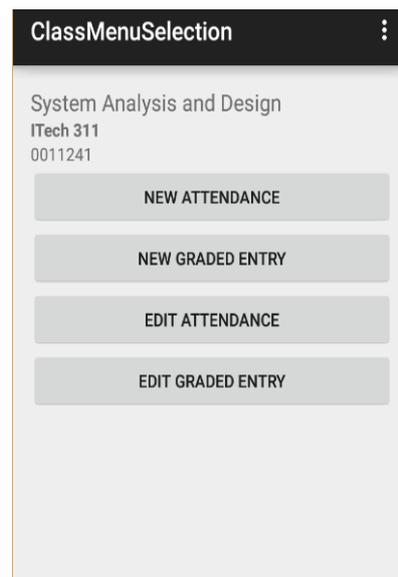


Figure 6. Class menu selection screen of android-based class record system

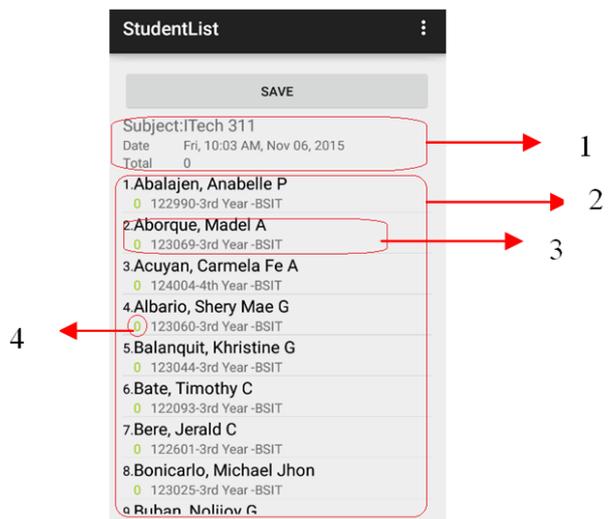


Figure 7. Student list for attendance screen of android-based class record system.

of the subject, its schedule, the date of current attendance that will take place, and the total number of meetings/attendances of the class. In addition, 2) it also shows a complete list of the students enrolled in a particular subject. 3) Along with the names of the students, it also displays their student identification number, course, and year. If the faculty user decides to take the attendance of the class, he/she may simply click the name of the student if present. Color display of student names will turn blue to indicate that the student is present in a particular class session. 4) A number that appears below the name of the student indicates the number of attendance in which the student is present. To end the process, the faculty user may click the save button to save and store the data.

Tapping the New Graded Entry button in the Class Menu Selection screen (**Figure 6**) triggers the figures to display. These interfaces were used to record the results and/or scores of students from their evaluation activities. Right after a faculty user hits the button, a 1) display dialog box appears. The name of the activity to be recorded is entered in this data entry form. As the user presses the OK button, another screen display appears. 2) This screen display is a Grade Student List which shows the list of enrolled students of that subject. As the faculty user presses the name of the student, 3) another form appears to be used as data entry point for grade entries. The faculty user inputs the result of the student for a particular evaluation and simply clicks the OK button to exit the form. After all student evaluations have been entered, the faculty user clicks the save button to store the data in the database.

Update is a process which allows the data to be changed, added or deleted. When a faculty user taps the Edit Attendance button from the Class Menu Selection screen (**Figure 6**), the Attendance List screen appears. This interface shows the lists of dates where meetings or attendances of a particular class occurred. Whenever a faculty user feels to modify or update the attendance, he/she may just simply press the date of attendance for the Student List screen (**Figure 7**) to appear. From that, the faculty user may now update the attendance of a particular student in a particular date and class.

Figure above is an interface used for the updates of grade entries and the computation of each student's final grades. All of the recorded evaluation activities and results were stored in the internal database of user's mobile phone. Once the Edit Graded Entry button of the Class Menu Selection (**Figure 6**) is tapped, those activities will be displayed and listed in the Grade List screen under Unassigned Entries. If the faculty user wishes to update the evaluation result of a student in a particular activity, he/she may just simply press the activity name for the Student List Grade Entry screen to appear (**Figure 8**). From that, the faculty user may now update the corresponding results of a particular student for a particular evaluation activity. Clicking the Save button saves all the changes in the internal database of the user's mobile phone.

Figures 8-11 are the graphical interfaces for the update of grade group. If the faculty wants to modify the student performance evaluation criteria, the faculty member simply clicks the edit entries, Edit Group or Delete Group and the dialog interface will be on display.

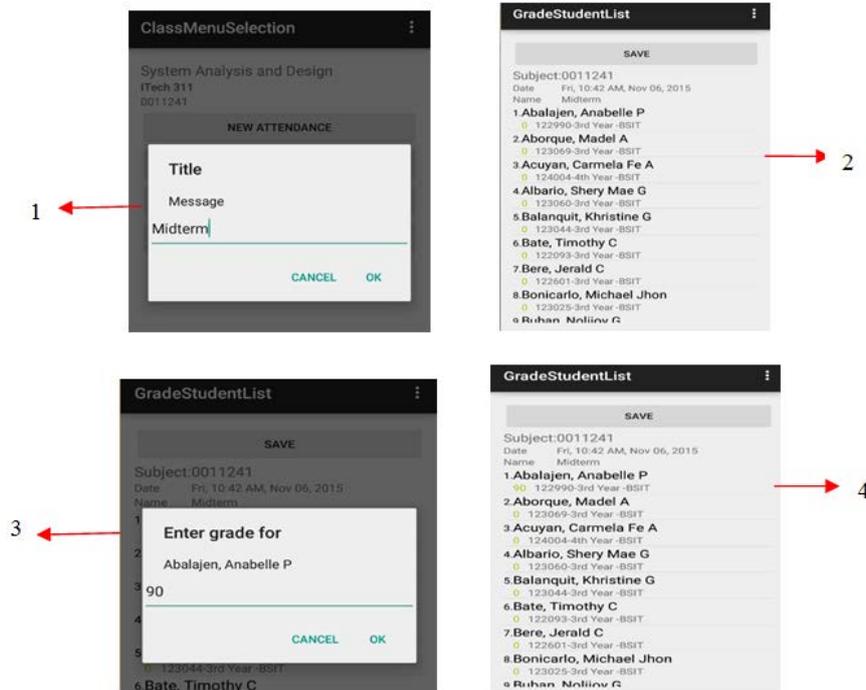


Figure 8. Student list for grade entry screen of android-based class record system.

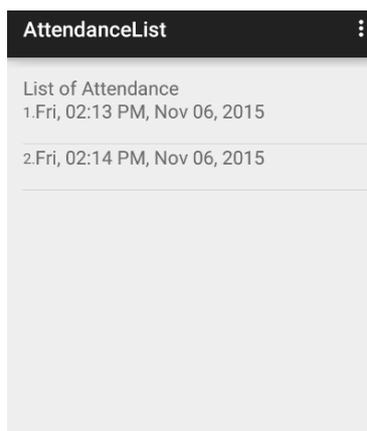


Figure 9. Attendance list screen of android-based class record system.

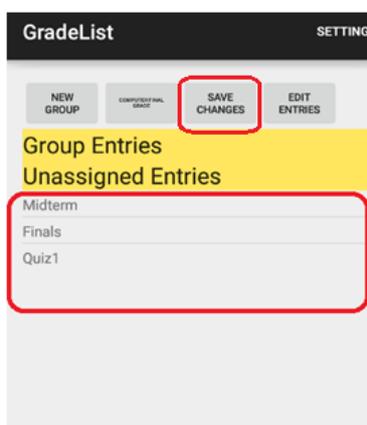


Figure 10. Grade list screen of android-based class record system.

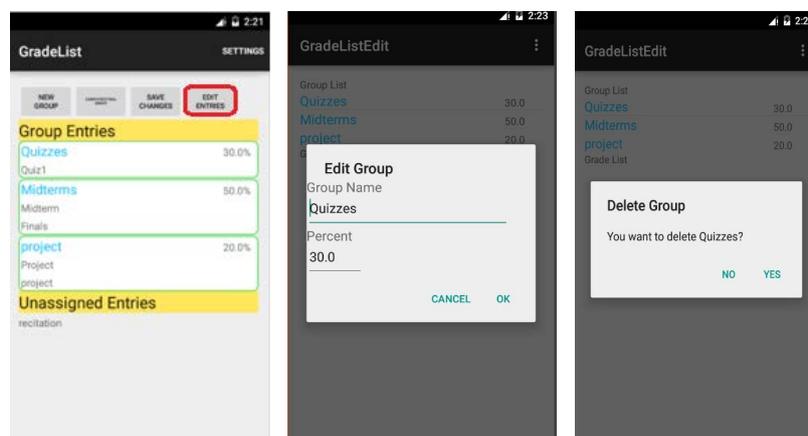


Figure 11. Update grade group screen of android-based class record system.

As the semester ends, a faculty teacher computes all the evaluation results of the students to arrive at a final grade. This activity, computation of final grade, has already been addressed by the system. However, it can only be possible if certain sub-activities are implemented. These sub-activities includes creating new grade group and assigning each evaluation activity, such as midterm, final, quizzes, and others to a certain group. The above figures show the interface for creating new grade group. Grade group is used to group related activities into one and assign each group with its equivalent percentage. 1) When the faculty user clicks on the New Group button, 2) a data entry form is displayed. The faculty user inputs the name of the grade group (midterms, finals, or quizzes) and the corresponding percentage equivalent. If all inputs are entered, the faculty may simply click on the OK button to terminate the form. 3) The grade group created earlier will be displayed in the Grade List screen under Group Entries. 4) To group unassigned entries under a certain grade group, the faculty user just clicks and holds a particular unassigned entry and drags it into a particular grade group under group entries. If the faculty user wants to ungroup and/or regroup an entry, he/she may simply click on and hold the entry and drag it back to unassigned entries or new grade group. Clicking the save button will save the data and some changes in the internal database. Lastly, 5) the proposed application also popped up a warning message if user inputs an evaluation criteria percentage exceeding to a hundred percent (100%). These activities are all in preparation for the computation of student's final grades (**Figure 12**).

Figure 13 shows the interface in the computation of students' final grade. To trigger the display of these interfaces, 1) faculty user clicks on the Compute Final Grade button in the Grade List screen. After tapping the button, 2) the Grade Final List screen appears, displaying the final grade of the student. This final grade is based on the evaluation results entered by the faculty user along with the allocated percentages of each grade group. 3) To display the details of the final grade, that is the final grade equivalent in each grade group, the faculty user may simply click on the name of the student from the Grade Final List screen. 4) Once computed final grade was generated, the faculty member may submit it to the University database server by clicking the submit button.

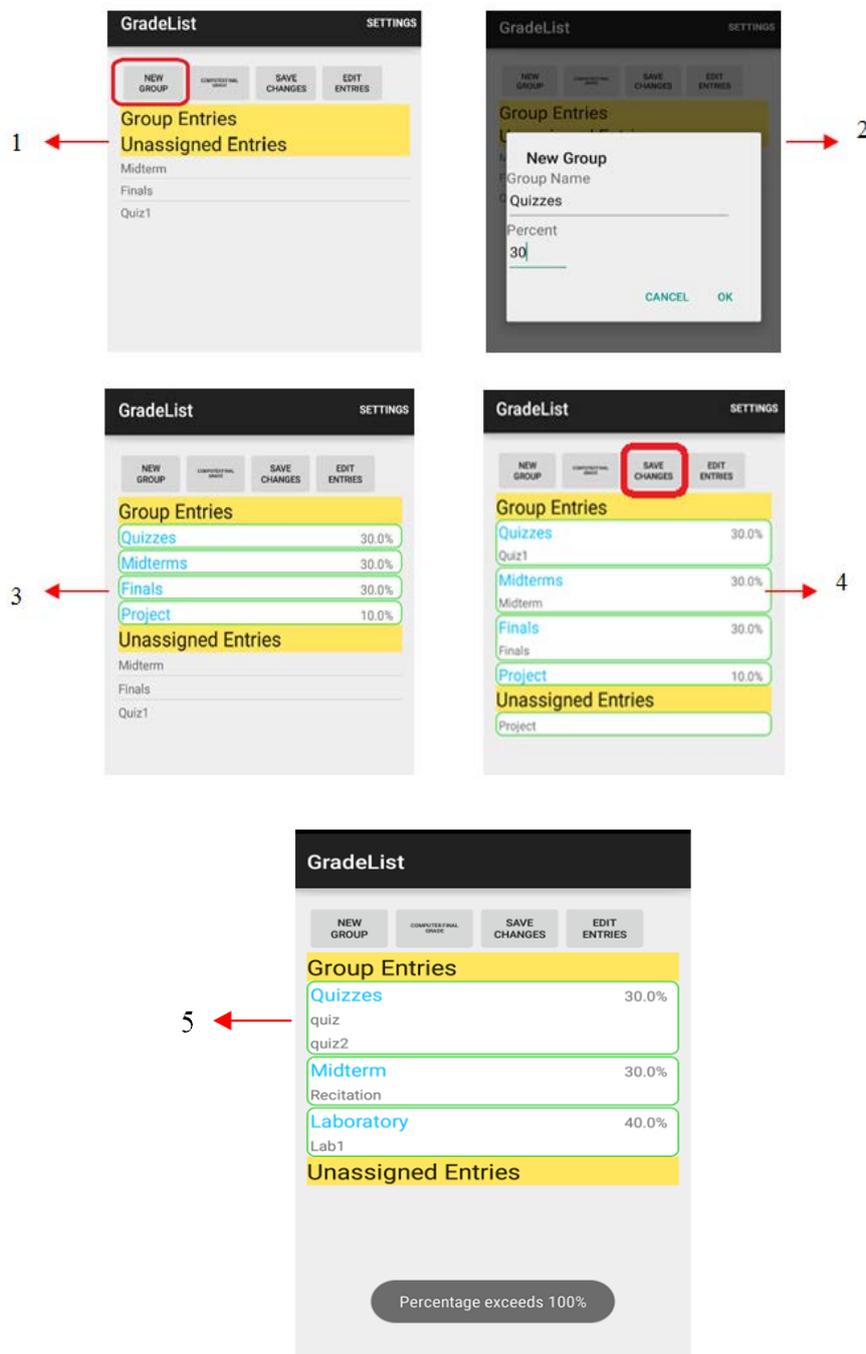


Figure 12. Grade list screen of the android-based class record system.

Figure 14 shows the interface used for backing-up a class record copy to the data server. User simply clicks the back-up button and whenever he/she wants to re-download the copy, restore button should be clicked.

5. Conclusions

In this paper, the researcher discussed the current problems encountered in traditional approaches of class record management, and further offered a solution through the development of the proposed system.

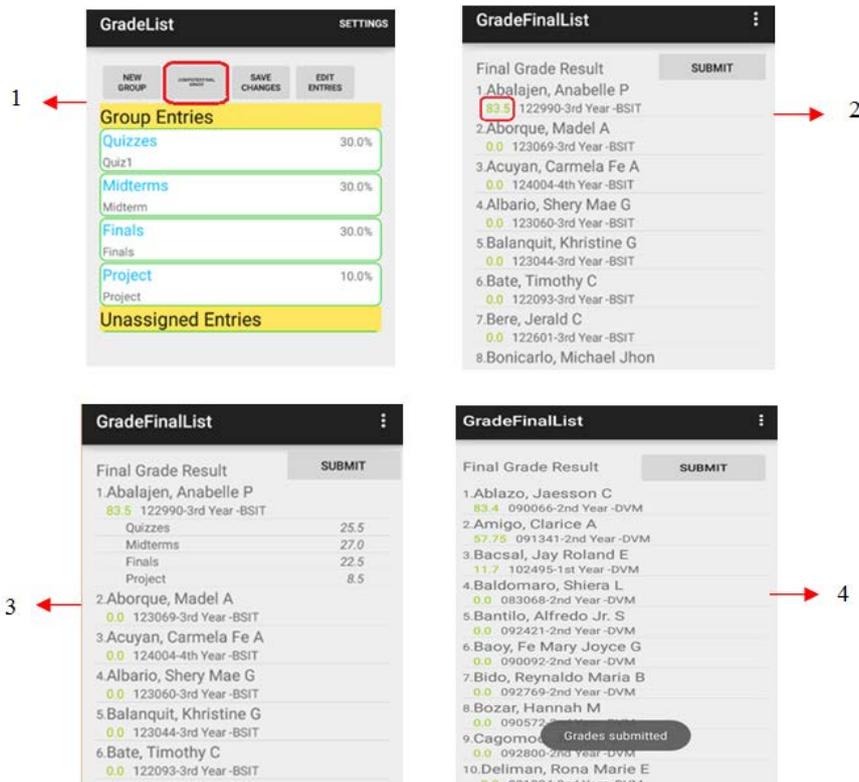


Figure 13. Grade final list screen of the android-based class record system.

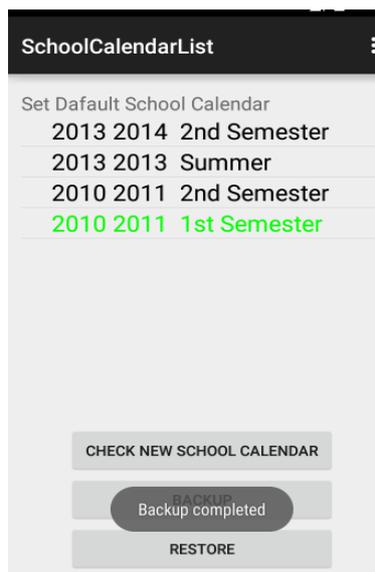


Figure 14. Screen for back-up/restore of the android-based class record system.

With the Android-Based Class Record System, mobility in recording student attendances, assessment results and grade computation was attained. The system simplified the process of taking student attendances and handling their academic records. It further caters to the needs of the faculty for an efficient tool in managing class records, thus, providing an accurate source of student academic information. All of the usual processes and activities in maintaining a class record

from input of data to output of information were adopted by the system.

The Android-Based Class Record System may be considered as an alternative system for users who do not have a mobile phone as recommended; but one thing is for sure: this application will be a productive tool if used in a classroom setting.

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