

Chapter 1

THE PROBLEM AND ITS BACKGROUND

Introduction

Mobile Application is a worldwide trend in computing and software development. Studying includes lots of terminologies and concepts to memorize for the student to excel on the topic. This research seeks answer to the question “With the use of modern technology, can the students improve their competency and performance?”

Background of the Study

Today, we are surrounded by billions of Mobile Applications. According to Techopedia (n.d.), a Mobile Application, or simply an app, is application software intended or designed to run on a mobile platform such as phones and tablets. One of the most popular mobile platforms is the Android Phone. Android Phone is more preferred by users according to the article of Larsen, (2015), the Customizability, Variety, Interface, and Google support. Handheld devices are a trend nowadays. People want their tasks done in an instant or at the moment. Mobile apps are used in the field of Medicine, Entertainment, Engineering, Business, Education, etc.

Educational Software is designed for teaching and learning support. According to National Center for Technology in Education (2008), Educational Software can be divided into two categories: Content-free Software and Content-rich Software. Content-free software refers to tools used in schoolwork such as Word Processing applications, Graphic designing tools, Concept mapping, and the

like. Content-rich Software is intended for teaching and learning in order to have a deep-understanding on a topic such as Simulation software in order to explore concepts in electricity, retrieving information on multimedia encyclopedia, and learning number and math concepts in drills and practice programs.

Zhang (2003) stated that e-learning can be defined as a process whereby knowledge is passed through electronic devices and the Internet. E-learning can be considered as an emerging process that helps individuals to gain knowledge prepared by professionals and experts anytime. The letter “e” in the word e-learning represents the term “electronic”.

Many experiments have been conducted regarding faculty adaptation of e-learning technologies in classrooms. Only a few were able to identify the extent to which college students accept e-learning tools; that prompts and interest of research in this area. Quite a number of experiments carried out have failed to consider computer access as a main factor regarding computer technology acceptance. (Khalid et al., 2006)

Statement of the Problem

This study seeks to compare the learning of a student in the classroom setting and proposed system.

1. How do the respondents assess the traditional classroom setting and proposed system in terms of;
 - 1.1. competency and
 - 1.2. performance?
2. How do the respondents evaluate the proposed system in terms of;

- 2.1. Functionality,
 - 2.2. Reliability,
 - 2.3. Usability,
 - 2.4. Efficiency,
 - 2.5. and Portability?
3. What framework is best described for the implementation of mobile application?

Hypothesis

Based on the problem stated, the researchers formulated the hypothesis that will be tested at 0.05(5%) level of significance:

- There is no significant difference between the traditional classroom setting and the proposed system in terms of:
 - a. competency
 - b. and performance?

Objectives of the Study

General Objective

The objective of the system is to develop a Learning Management System (LMS) that will help the students and teachers to improve the students' performance and to serve as an additional tool for the students that have exams and quizzes, for them to be prepared.

Specific Objectives

Specifically, the study sought to answer the following:

1. To assess the performance and competency of the student in traditional classroom setting and proposed system.
2. To evaluate proposed learning management system in terms of:
 - 1.1. Functionality;
 - 1.2. Reliability;
 - 1.3. Usability;
 - 1.4. Efficiency;
 - 1.5. and Portability.
3. To evaluate the selected framework for LMS.

Scope and Limitation of the Study

The system has the following major features:

- **Performance Assessment.** The system will assess the performance of each student with the score obtained by answering the quizzes.
- **Competency Assessment.** The system will assess the competency of the student by their Reading Comprehension – this is obtained by assessing the time the students spend in reading a lesson and answering a quiz.
- **Modules.** The student module is a mobile application. The instructor module is web-based.
 - **Student Module.** The student module has the following functions:
 - Registration of a new student.
 - Reset password and account recovery.

- Joining multiple groups or classes by a group code given by the instructor. The class has a particular subject.
- Reading lessons provided by the instructor in a class.
- Taking quizzes after a lesson or a chapter provided by the instructor in the class.
- Viewing their records and assessment in a class.
- Reviewing lessons without the presence of an internet connection.
- **Teacher Module.** The student module has the following features:
 - Registration of a new teacher.
 - Reset password and account recovery.
 - **Class Management.** The teacher can manage classes, students, and activities.
 - Creating and deleting a class.
 - Assigning a subject to a class.
 - Generating a group code to be given to the students. The group code is unique, and has 6 alphanumeric characters.
 - Approving students that join the class.
 - **Subject Management.** The instructor can manage a subject and its contents.
 - Creating and deleting a subject.

- Uploading and deleting lessons.
- Creating and deleting quizzes using quiz creation online or questions uploaded from .txt file
 - **After-Lesson Quiz.** Quiz taken after every lesson.
 - **Chapter Quiz.** Quiz taken after every chapter.
- Setting an expiration date for answering each quiz.
- Extending the expiration date.
- **Records and Assessment.** The instructor can see the student's records and their performance in the class.
 - Viewing the class record. The class record contains the performance of the student and their competency.
- **Item Analysis.** The questions in the quizzes are given an analysis that states that the content of the question must be given emphasis, taught thoroughly, and clarified.
- **Security.** The student and instructor must have an email account so that they can be registered. The registration is confirmed using their email.

The following are the limitations of the study:

- **Android Platform Only.** The system's student module can run on smartphone devices which has an Android Operating System (OS) with a version of 5.0 or Lollipop or higher only.
- The credentials used in registration to the system do not use any student or faculty ID of an educational institution. The purpose of this is for the universality of the system.

Significance of the Study

Upon the implementation of the proposed system, the following are the prospective beneficiaries:

- **Society.** This system suggests an efficient way of learning and instruction.
- **Students.** This mobile learning management system is an educational tool for students who study for school without stress and boredom.
- **Educators.** This methodology helps teachers/instructors to impart their knowledge in the discipline in a technological approach.
- **Future Researchers.** This study serves as a reference and guide for those who conduct the same study.

Operational Definition of Terms

For a better understanding of the readers, the following terminologies were defined by the researchers:

- **Android Platform** – the platform that is used for the system's student module.
- **Assessment** – the process of gathering and discussing information from multiple and diverse sources in order to develop a deep understanding of

what students know, understand, and can do with their knowledge as a result of their educational experiences.

- Class – a group of students led by the instructor.
- Competency – measured using reading comprehension.
- Efficiency - the performance of the system with respect to the resources (storage, internet connection, memory etc.).
- Functionality – the sum or any aspect of what the system can do for the user.
- Lesson – the material viewed by the student in preparation for the assessment.
- Performance – the student's scores in the quiz.
- Portability – the quality that refers how the system adapts to an environment and device.
- Quiz – the questions after studying a particular topic. This is used to assess the knowledge of the student in the subject.
- Reading Comprehension – measured using the time it takes for the student to read a topic and answer a quiz.
- Reliability – the quality of the system that evaluates the capability of the system to maintain data and its features.
- Usability – the quality that evaluates the system as easy to use.

Chapter 2

RELATED LITERATURE AND STUDIES

The researchers have found the following studies and literature as relevant to the system being proposed. This section includes the fundamental parts of conducting literature. It also discusses the significance of the researched materials to the study. This is to convey the readers what knowledge and ideas have been established on the study. Related Literature was obtained through different books, magazines, journals and internet. This section also shows important parts of the researched studies and discusses the significance of the researched materials.

Review of Related Literature

Local

This report concentrates on profiling the mobile web and app users, their purchasing power, way of life and utilization pattern. The findings and experiences are drawn from a survey conducted in the six key nations - Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam. The Mobile Internet Consumer report is designed for media organizers and brand advertisers. It will also help app developers, content providers, Original Equipment Manufacturers (OEM) and telecom service providers in understanding the developing mobile consumer. It is made with the goal to help brands plan their media technique for achieving the right target audience through Mobile Web and Apps. The Mobile Internet Consumer report is accessible for India, Southeast Asia, Middle East and Africa and Latin America. (Mobile Marketing Association, 2013)

According to Dacanay (2010), the coming of new technology and the Internet has opened-up a radical new scope of chances for upgrading learning. The joining of Information and Communications Technologies (ICT) into education and training (e-learning) has been perceived as an intense tool for enhancing learning at the most astounding political level. Numerous schools, colleges and training universities are adapting to present circumstances, incorporating ICT, changing their procedures and executing authoritative change. The Institute of Computer Science is constantly enhancing and building up its educational conveyance through completing and coordinating IT tools. Since the beginning of fast advances in technology, conveyance of learning in education and industry has been upheld by electronic devices. The training field is experiencing a development from a specialty based to technology-bolstered training to oversee and convey instructional arrangements. One of these innovation arrangements is the improvement and foundation of e-learning tools.

In the Philippines, the legislature has set the needs and vital support for the advancement of e-learning as a creative instrument in creating an information-based society. These endeavors have been authorized and exhibited in the section of significant laws, directions, and approaches.

Making systems that give quality training to all, notwithstanding when interest exceeds human and capital assets, is a test. In any case, there is a pressing need to give training that goes past teaching fundamental literacy and numeric abilities. New methodologies and procedures for change are required and computers, negotiated connection, and related educational advancements are an essential piece of this methodologies and techniques.

The Department of Education (DepEd) and Smart Communications Inc. (Smart) collaborated for a mobile app that supports the Alternative Learning System (ALS). This aims to help the ALS teachers especially the more than 6000 teachers with students residing in remote areas. The app is free with included low-cost tablets with Internet Connection. According to BALS (Bureau of Alternative Learning System) director, Dr. Carolina Guerrero, the tablet app is better than the books and other teaching paraphernalia that the teachers carry when they go to school. Smart department head, Darwin Flores, said that they will also introduce mobile learning to students. (eGov Innovation Editors, 2013)

Intelligent Tutoring Systems were learning environment that make utilization of artificial intelligence to draw in students in profound thinking in view of a comprehension of students' knowledge and behavior. Large portions of today's ITSs provide assistance to the students with the use of clues or by separating an unpredictable issue into more straightforward strides for the students to unravel exclusively. In numerous ITSs, the students does not have to endeavor a settled number of issues, however keeps on taking care of issues until he accomplishes dominance of the related aptitudes. As it were, the PC continues showing a great many problems for as long the student's aptitude is not as much as authority level. Beck and Gong (2013) named this phenomena "wheel turning". It refers to students who neglect to ace an expertise in a computer mentor in a convenient way. (Rodrigo & Beck, 2014)

Foreign

Learning Management System supported and improved learning in many organizations. Institutions choose to start with a commercial LMS but face

difficulties such as linguistics, assessment, appropriateness, and cost. However, Open Source LMS is cost-effective, user-confident, flexible, innovative, and secure – that makes it suitable for Distance Learning or learning without a face-to-face encounter with the teacher. Among the Open Source LMS examined, Moodle's features improved the quality of learning and embodied the requirements of an LMS. The edge of Open Source LMS over the commercial is the free-access but still maintain the quality and tools for e-Learning. (Aydin & Tirkes, 2010)

As the reconciliation of ICT in cutting edge educational exercises is making different study ways, e-Learning has ended up a standout among the most noticeable ideas inside the advanced education foundations of today. E-Learning has turned into an exceptionally alluring instructive technique, as the utilization of electronic apparatuses decreases the expenses of sharing inconceivable amounts of information, lessens correspondence limits and geographical distance gaps between people, builds intellectual flexibility in advanced education, furnishes individuals with defect to have better access to advanced education, and permits littler establishments to increase universal visibility through study programs on the web.

E-Learning faces, nonetheless, certain difficulties. As e-Learning is reliant on the ICT as the dominant instructing and learning device, the essential for an efficient e-Learning procedure is that learners have sufficient ICT experience, and project suppliers have sufficient professional capability and sufficient educational techniques to oversee distance programs with the electronic tools. Hence, it should be highlighted that e-Learning is only efficient just as long as the learning content is updated consistently and the teaching strategy utilized as a part of the distance

programs helps the learners to ace the learning material and to gain knowledge.
(Grifoll, J. et al., 2010)

In-depth book provides the concepts and code that is needed to start building smartphone applications with Android programming environment as indicated to Lombardo, J., Mednieks, Z., Meike, B., & Rogers, R. (2010). Developers want a commercial application for smartphones or a mobile mashup for personal use, Android Application Development shows how to design, build and test applications that are innovative portable and profitable. Developers will learn the tools that write programs using Eclipse, run application on the Android emulator, and carry out debugging, tracing, and profiling. Since this material was produced on the year 2009, the problems stated like for smartphones was surely solved because of rapid development of technology. Today, there are millions of Android mobile phone users in the world. Almost all of the problems stated were unlocked. The study explores the facts presented that let the future developers unfold and learn to create significant applications.

Mobile applications have had a huge increment in ubiquity in the most recent couple of years and this interest is as yet developing among clients, Mobile working frameworks are accessible for smartphones as well as tablets too, hence expanding the conceivable business sector quota for these applications.

Android programming has a features that makes it charming for developer such as it is an open source application and it has a certain level of community-driven development. Android with its competition with IOS and XCode, IOS presented itself as a more centralized development environment. The new IDE Android Studio makes this centralization finally available for Android Developers

and makes this tool indispensable for a good Android developer. The book guides the user with the android studio environment. (Zapata , 2013)

The E-Learning is useful to web and increasingly explored and it has been widely accepted that the hyper-medial structure of the web could promote learning. E-Learning is define those initiatives as “training or educational initiatives which provide learning material in online repositories, where course interaction and communication and course delivery are technology mediated”

In this context, e-learning initiatives continue to grow as they expand into a wide range of educational needs, with a variety of teaching and learning modes, approaches and styles, underlining the broad range of both its use and “complexity”

The evaluation of e-learning initiatives is not a straightforward process. Many factors contribute to the success of e-learning systems in general and Learning Content Management Systems (LCMS) in particular. Such a technological learning environment should present innovative learning opportunities, thus extending and not just replicating traditional learning approaches. Control and responsibility of the learning process should be gradually shifted from the educators to the learners. In this context, socio-cultural theories influence considerably the learning procedure and have strengthened the perceptions of the educational community towards adoption and effective integration of open and distance learning (ODL) systems in the educational process. (Lee, 2010)

Review of Related Studies

Local

By forming Perdigana board into Perdigana mobile through as operating system can expand players since usage of mobile technology rises and can be more affable utilizing as Android platform rather than boards in the study of Santos & Tuan (2013). Based on the discoveries, the mobile game can be easily and effortlessly operated by the client or users and has easy to understand tutorials for news. Proof of this is the high evaluations given on the classifications of "Interface and Operability", "Accuracy and Reliability" and the "Portability" of the mobile game. The analysts could build up a mobile game that offers better approaches to play Perdigana.

According to Filoteo, Lacambra & Lim in their study entitled Nihonggo Sensei (2013), that with the use of four different types such as animated text, graphics, sounds and videos, Computer Aided Instruction will stand out enough to get the user's attention and interest. It demonstrates that learning experience is made more significant by the technique of instructional material utilization.

They have attracted a few focuses to further enhance the general functionalities of Computer Aided Instruction software which were: 1. Include a speech recognition wherein the users could talk the current topic's terms and the software will figure out whether the statement the user said is right. 2. Build up an enhanced set of animations and sounds for the advantage and entertainment of its users. 3. Make it more important as a teaching aid, by including more lessons.

In the study of Daliwan, B. et al. (2013), Education in a form of a game made the learning of preschoolers effective, interactive, and fun. The students enjoyed

the simple yet appropriate design and interface – this includes activities, sounds, and visuals that children enjoy. The system also includes management features for the teacher such as choosing the activity that the students are going to do and viewing the score of the children after each activity. A recommendation in the system says that the activities must be based on the book or module provided for the children's grade level.

The study of Cambaya, Liwanag & Molina (2013) observed the effects, impact, benefits and the problems with Electronic Learning or e-Learning. The parameters examined are Clarity, Accuracy, Appropriateness, Interactivity, and Organization. The study concluded that the students have difficulty in the e-Learning material because it is not clear and understandable and it influences the ease of students to use the tool. Students are willing to use e-Learning if they improved the clarity of the system.

Virtual environments present an essential learning for practice of the future, exploiting technology in design teaching, researching the nature of design communication and processes, and searching for ways to improve the educational experience of student as indicated to Santos & Tuan (2013), .

Argate, Ancheta, & Gonzales (2012) studied that this software is not a replacement to conventional way of teaching but rather serves as an option or tool to aid comprehension of lessons related to General Physics.

The software is used to help the students and even the teachers in learning General Physics while extending the use of technology. They have recommended to further research, enhance and add some features that will help the software to

be successfully useful for the users. This feature includes the addition of 3D animation and voice recognition.

Foreign

Educational technology, even in the early stages, empowers curriculum change in accordance with meet the students' learning and life circumstances. It additionally gives other options to common educational strategies and improves advanced education lectures. For instance, new technology kills dimensional and materialistic pressure, as students and teachers needn't be in the same classroom, or even inside the same place, to trade information or educational material, although can be in any place without blocking their work. Moreover, the performing cost of schools and colleges decreased, since all course materials can be introduced utilizing low-cost technology, through the screens of electronic gadgets.

A mobile phone could change the way we learn in practice. For instance, when students realize that everything is recorded or can be effortlessly recorded, it changes their conduct. Thus, we should concentrate on exercises and rationalistic relationship between the student and the technology and not on individuals or technology independently. The center of learning through mobile phones is that it permits the students to be in the correct spot at the perfect time, so they can pick up involvement in an accurate learning environment, wherever that is. The technology of mobile phones must check that the point is not to simply exchange material to a littler screen however to make learning incentives, so that learning through gadgets does not turn into a victim of its success as indicated by Semertzidis, K. (2013).

According to Guo, W. et al. (2012), the benefits of mobile learning are it's convenient, easy to use, and interesting. The study also enumerated the limitations of mobile learning such as the high cost, inadaptability to other syllabi, lack of promotion, lack of self-willingness to study, and issues with intellectual property. Students are open to the idea of Mobile Learning but they are not ready to adopt it. They look at a mobile device and its ease-of-use but not for learning purposes.

In the study of Parsons, D. & Petrova, K. (2013), the increasing sophistication of mobile phones means that many students now have access to smart phones with touch screens, location awareness, video, internet access, large amounts of memory and powerful processors. This makes it possible for us to design mobile learning experiences, using students' own devices, which were simply not realistic in the past. Many previous mobile learning projects that included the creation of area aware increased reality games relied on the provision of costly and unusual devices by the learning supplier, making such exercises limited in their scalability and reusability. Presently, we can send complex mobile learning devices tools to everyday devices. This study describes the current phase of a long-term project to create a reusable, configurable mobile learning game.

The best way to learn foreign language? The best way to learn foreign language is by the use of E-Learning in Foreign Language because it sometimes includes emotions and step by step procedure. It is also cover the role of the teacher in their strategies in performing inside the room according to Geary, D., (2012) that what is t. The findings of the study were quite surprising: 1.) Foreign Language addition is not a simple matter of learning grammar. 2.) Many different

teaching methods and activities must be part of the lessons. 3.) Learning a foreign language requires a long period of time.

The imaginable transition from desktops toward mobile computing is currently on a trend. The Google and Apple are currently dominating the world of technology with its Android and iOS respectively. Android somehow has won the competition with its open platform feature while the iOS remains a secured program. However, due to Googles' open developing features, some programmers are taking its advantage to a negative way. Like desktop system, the mobile computing systems also stores important data. With androids' open source developing, this important data invites crime and surveillance, privacy invasion and preservation, in a word, forensics. The goal of the paper is to elaborate the forensic techniques used to acquire important data from Android devices and then to demonstrate a relevant defense as indicated by Defreez, D. (2012).

Synthesis of the Reviewed Literature and Studies

After the analysis of related studies, all of the studies are related to the advancement of technology in terms of learning. It is a battle between mobile phones and computers in terms of electronic learning. In addition, one study discussed the android forensic that gave knowledge in securing and protecting your smartphones. Based on the conclusions and the recommendations of those studies, the researchers acquired ideas that innovates this research.

One of the acquired features from the gathered related literature and studies is the Open Source feature explained by Aydin and Tirkes (2010). This feature will make the system cost-effective. Another feature is the Teacher Management Feature by Daliwan, B. et al. (2013) where the teacher can monitor the progress

of the students. Online teaching and learning is a wonderfully liberating development that is increasing access to education dramatically. However, students want success as well as access so good online learning must be supported by online contact between students and teachers.

Theoretical Framework of the Study

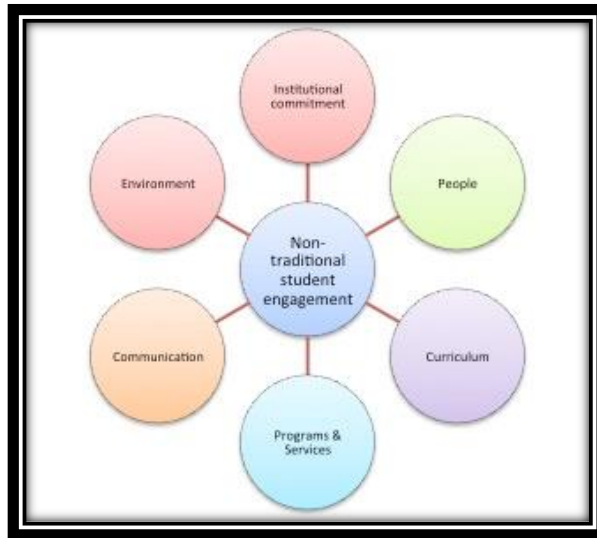


Figure 2.1: Theoretical Framework of the Proposed System (Chughtai, 2015)

According to (Chughtai, I. 2015), instructional strategies that are interesting to learners are best for e-learning students. Methods that permit e-learning students to discuss and utilize their past encounters, work together with associates, and reflect are regularly more successful. According to tacit theory of Kenner C. and Weinerman, J., learners get their metacognitive skills from associates, instructors, and the local culture. An illustration incorporates tutoring where instructing happens through role modeled behaviors. Educators of non-traditional students tend to gravitate to this framework because it facilitates learning in the absence of a traditional academic setting.

A successful instructor can moderate the demands of employment by drawing in students by means of non-traditional teaching strategies, for example, distance learning or "e-learning," and in this manner expanding the "perceived quality of [the learning] experience." The study of Gilardi S. and Guglielmetti C. says that by making a flexible instructing/learning process, the e-learning learner is persuaded to endure through the rigors of advanced education. The e-learning student will meet learning objectives when he/she sees the instructional will result in a meaningful learning experience. Repetition, presenting information in similar, but not duplicate environments, is fundamental to strengthen course material. One study by Wyatt LG. found that successful e-learning students regularly used social supports, programs, and services to conquer time constraints. Social supports included study groups and online communication with teachers. E-learning students likewise benefit from online-lectures or forums which enables remote participation without having to physically be available on campus.

Conceptual Framework of the Study

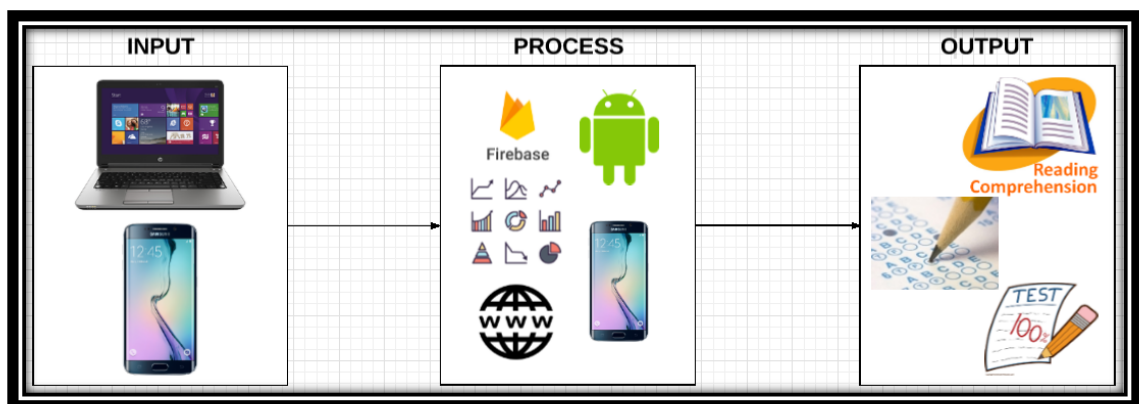


Figure 2.2: Conceptual Framework of the Proposed System

The conceptual framework of the proposed system is represented using an I-P-O (Input-Process-Output) diagram. The proposed system is the input. The

input is processed using the software tools and methods used to develop the proposed system. The output is the student's competency and their performance.

Chapter 3

RESEARCH METHODOLOGY

This chapter process on the methods of research used in making the study, which is a mobile learning management system. It is needed to have a clear and deeper understanding on how system was developed. By using the different methodology that clearly discusses the method used, the instruments used in the gathering of data, analytical tools, the software design, development and implementation of the system in software and product evaluation.

Research Method

The research method used on the study is Experimental Research. Experimental Research is usually taken to be the most scientific of all methods, the 'method of choice'. It is the only method of research that can truly test hypotheses concerning cause-and-effect relationships. It represents the most valid approach to the solution of educational problems, both practical and theoretical, and to the advancement of education as a science. Experimental is an experiment where the researcher manipulates one variable, and control/randomizes the rest of the variables. Experimental Research has a control group, the subjects have been randomly assigned between the groups, and the researcher only tests one effect at a time. It is also important to know what variable(s) you want to test and measure.

Project Development

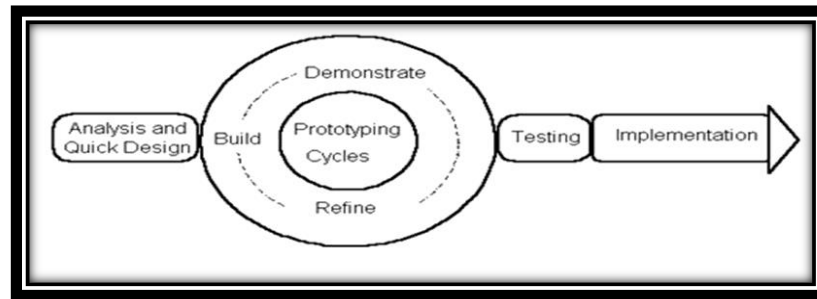


Figure 3.1: Prototyping Development Model (Sharma, 2014)

The Prototyping model is used in the development of the proposed LMS. In this model, the software application is developed from a prototype or an early working model of software that shows its functionalities but without a finalized logic.

Prototyping became very popular in the field of software development due to its rapidness and accuracy because it has a continuous interaction with the clients. An initial prototype is being built and demonstrated to the software users. If there are improvements on the prototype according to the user, the prototype is revised and demonstrated again to the users, and if there are improvements, the prototype is revised again. This process repeats until the users are satisfied-these sets of activities are called Prototyping Cycles. The final software is tested, and if the system works well, the software is implemented or deployed.

Project Planning and Management

Gantt chart

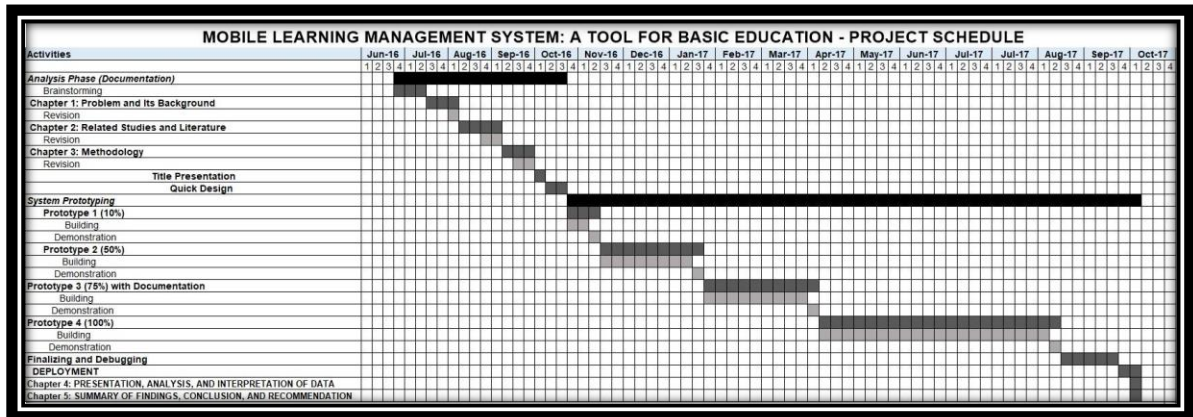


Figure 3.2: Gantt chart

Work Breakdown Structure per Researcher

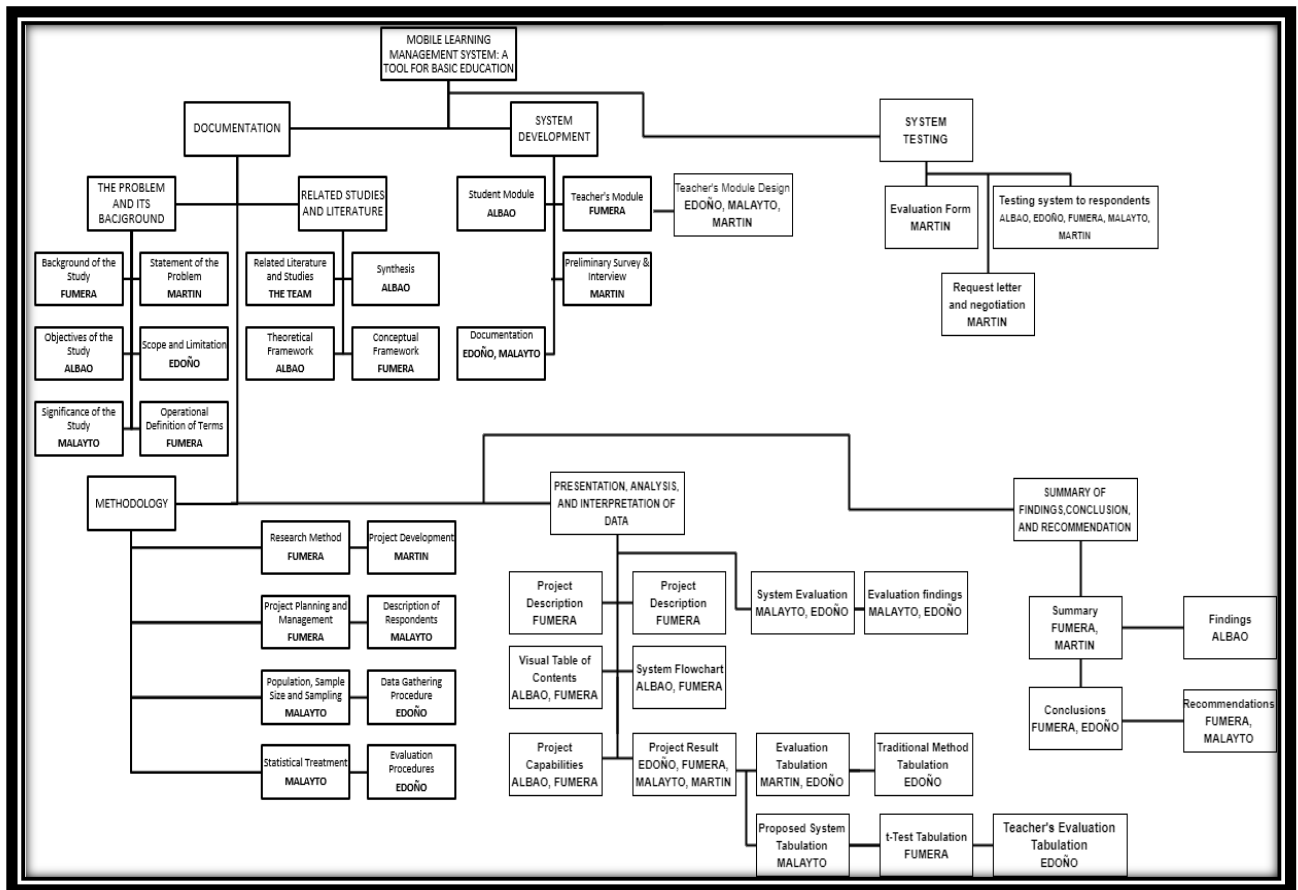


Figure 3.3: Work Breakdown Structure

Respondents

- **General Biology Instructor** – a selected educator from STEM Program of UE-Caloocan Senior High School (SHS) Department. He may give recommendations and evaluation on the content and outline of the proposed system.
- **Students** – those who are taking up General Biology in the STEM Program of UE Caloocan SHS. Students evaluate the usefulness of the proposed system and its improvement over the traditional method of teaching Biology.

Population, Sample Size, and Sampling Technique

The population involved in the study is composed of 30 students of STEM Students in UE Caloocan, taking up General Biology 1 and 1 General Biology instructor of STEM Program. The researchers used Purposive Sampling. This method selects a sample based on the characteristics of a population aligned with the objective of the study.

Data Gathering Procedure

The students are tested using two different methods: First is using the traditional classroom method and next is using the proposed system. They will be evaluated by their performance and competency. The teacher monitors the traditional classroom setting and the proposed system.

The respondents answer an evaluation form. The researchers prepared a set of criteria for determining the technical and operational functionalities of the proposed system.

Statistical Treatment of Data

After collecting the data needed, the researchers tabulated and analyzed the gathered data with the help of statistical tools. The following are the statistical tools used in this study together with their corresponding formulas. To interpret the gathered data, the researchers will use the following:

Percentage. This is used to describe the number of respondents in a data group.

$$P = \frac{F}{N} \times 100$$

Where:

F = Frequency

N = Number of Respondents

P = Percentage in %

Mean is the numerical average of a data set. This is the summation of data in a set divided by the number of data in the set.

$$\bar{x} = \frac{\sum x}{N}$$

Where:

x = numerical data in the data set

N = Number of Respondents

\bar{x} = Mean

t-Test. t-Test is a statistical test that is used to differentiate the mean of two groups.

The researchers used T-test to compare the performance and competency of students using the mobile application and the traditional method of learning.

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{N_1} + \frac{s_2^2}{N_2}}}$$

Where:

\bar{X}_1 = mean for the first variable

\bar{X}_2 = mean of the second variable

S_1^2 = variance of \bar{X}_1

S_2^2 = variance of \bar{X}_2

N_1 = total number of operations of the first variable

N_2 = total number of operations of the second variable

Testing and Evaluation Procedures

Criteria for Student Assessment

1. Competency
2. Performance

Criteria for System Evaluation

1. Functionality
2. Reliability
3. Usability
4. Efficiency
5. Portability

The Likert's 4-Point Scale is used to evaluate the user's description of the system.

Verbal Interpretation	Weight	Range
Strongly Agree	4	4.0
Agree	3	3.0 – 3.9
Disagree	2	2.0 – 2.9
Strongly Disagree	1	1.0 – 1.9

Hypothesis Testing

The researchers tested the hypothesis by first stating the null hypothesis (H_0) and the alternate hypothesis (H_1).

Null Hypothesis (H_0). It states that there is no statistical significance between the two variables in the hypothesis.

Alternative Hypothesis (H_1). It states that there is statistical significance between two variables.

The level of significance that the researchers formulated is 5% or $\alpha = 0.05$.

The researchers used the T-test formula which is same as what they used for the statistical treatment of data as the test statistic.

By computing using the t-test formula, the researchers concluded that there is no significant difference between the traditional classroom setting and the proposed system in terms of competency and performance.

Chapter 4

PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA

This chapter is dedicated to describe and illustrate the research project. Another is to enumerate and visualize the data gathered in the research using graphs and tables.

Project Description

The study of different learning management systems and the traditional classroom setting lead to the development of a mobile learning management system. The research aims to compare the traditional classroom and the proposed system of the two important parts of a classroom: The teacher and the student. The teacher may start accessing the system through registration. The registration must be first confirmed through email and in case the teacher forgot his/her password he/she may also recover it by email. The teacher may create, update, deactivate/activate, or delete a class. In creating a class, a group code is generated that has 44,261,653,680 permutations and composed of 6 alphanumeric characters. This serves as a ticket for the student to join the class. The student cannot simply join a class unless the teacher approves his/her request. Subject management is also a feature of the teacher's module. In this module, the teacher may create, update, and delete a subject under the teacher's advisory. A subject is composed of chapters that the teacher may create, update, and delete. Lessons may be uploaded, updated, and deleted for each chapter. Creating and deleting quizzes is also a part of the subject management. The quizzes in the system have two types: After-Lesson (taken after every lesson, will

not end unless you got all the questions right and score is greater than 50), Chapter Quiz (taken after every chapter, 50 is the lowest grade). The student may start accessing the system through registration. The registration must be first confirmed through email and in case the student forgot his/her password, he/she may also recover it by email. The student can join a group using a group code provided by his/her teacher. After applying for a request to join the group, he/she must wait for the teacher to approve his/her application. Once the teacher approved his application. He/she may now read lessons provided by the teacher and take up quizzes specifically, After-Lesson Quizzes and Chapter Quizzes. The student can only take up quizzes once the teacher starts the quiz and before the expiration date of the quiz announced by the teacher. The student can view the result of his/her quizzes.

Project Structure

Visual Table of Contents

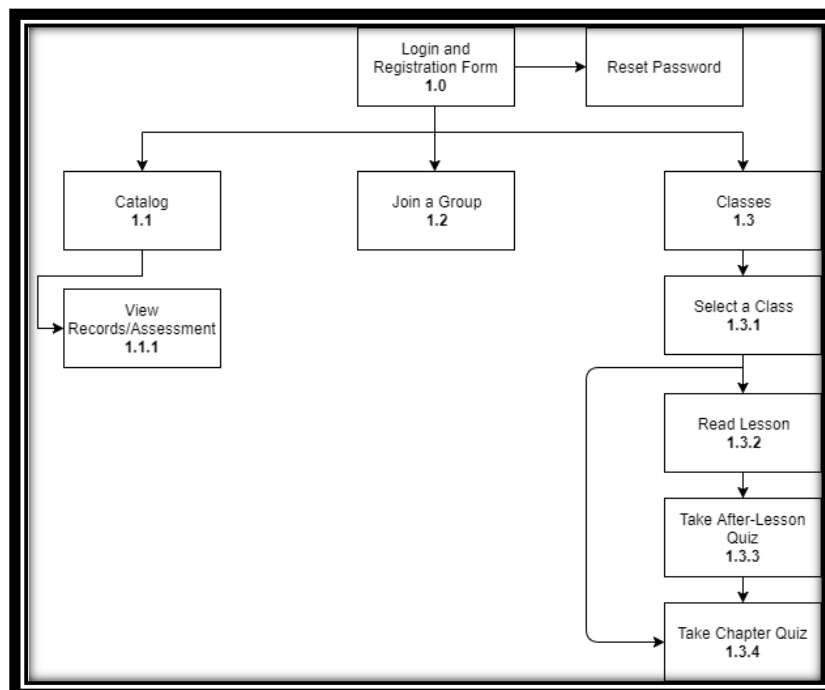


Figure 4.1: Visual Table of Contents of Student Module

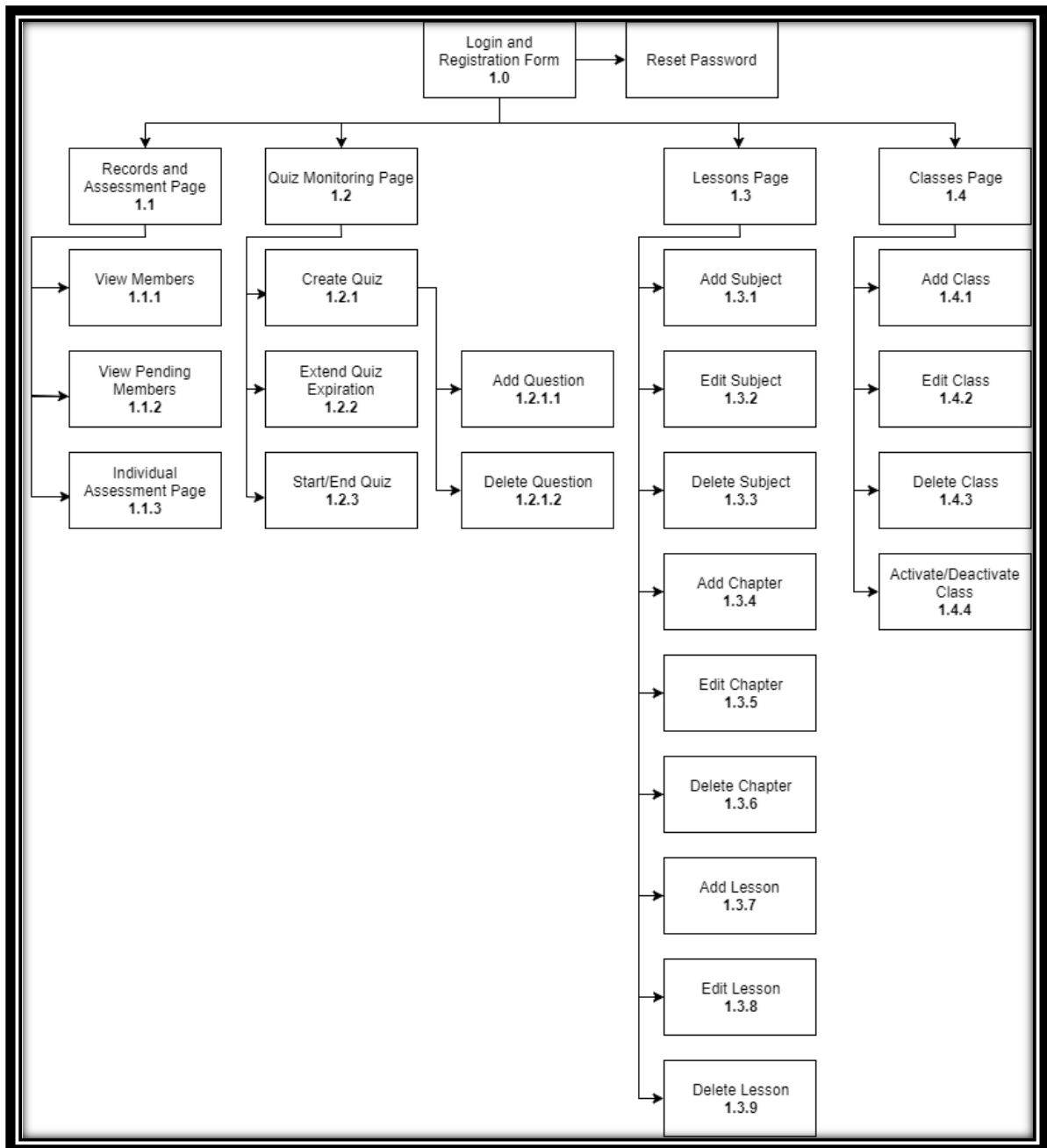


Figure 4.2: Visual Table of Contents of Teacher Module

System Flowchart

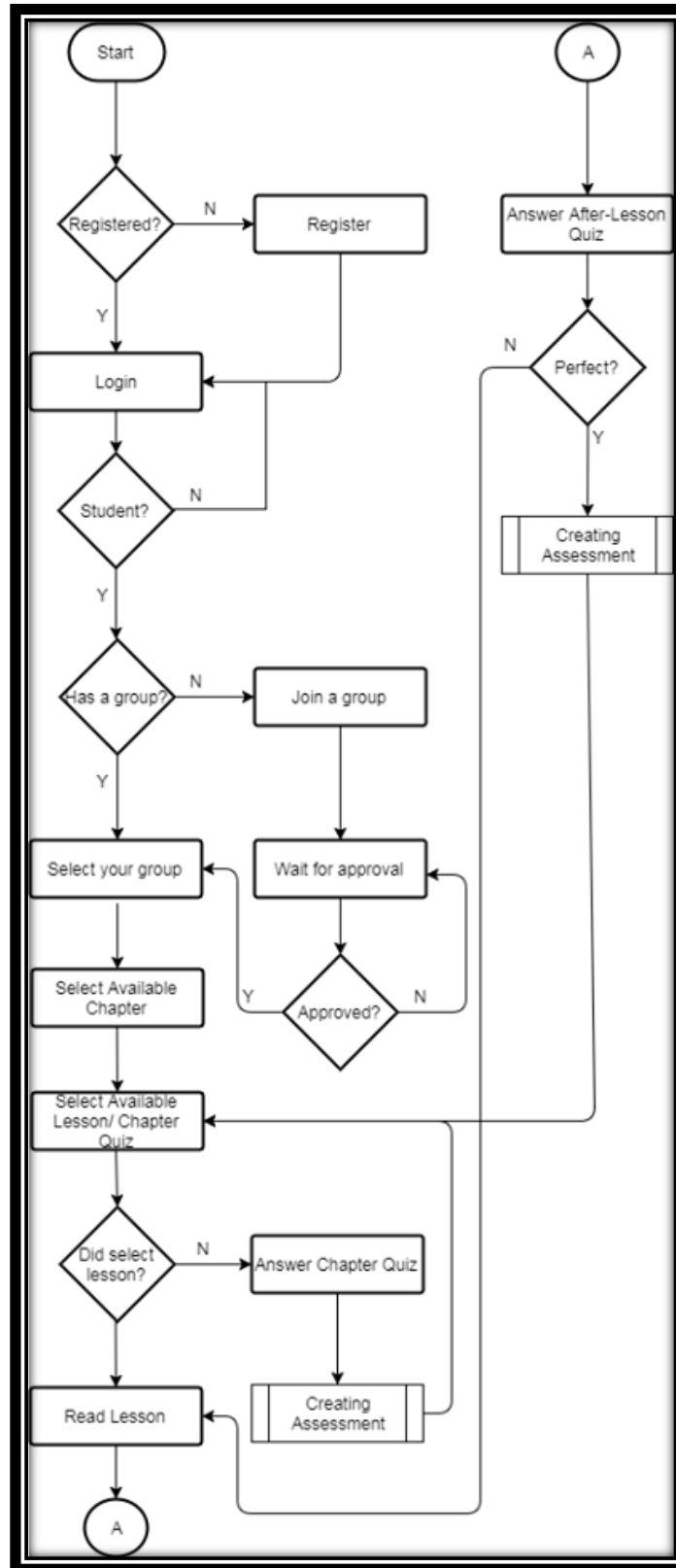


Figure 4.3: System Flowchart for Student Module

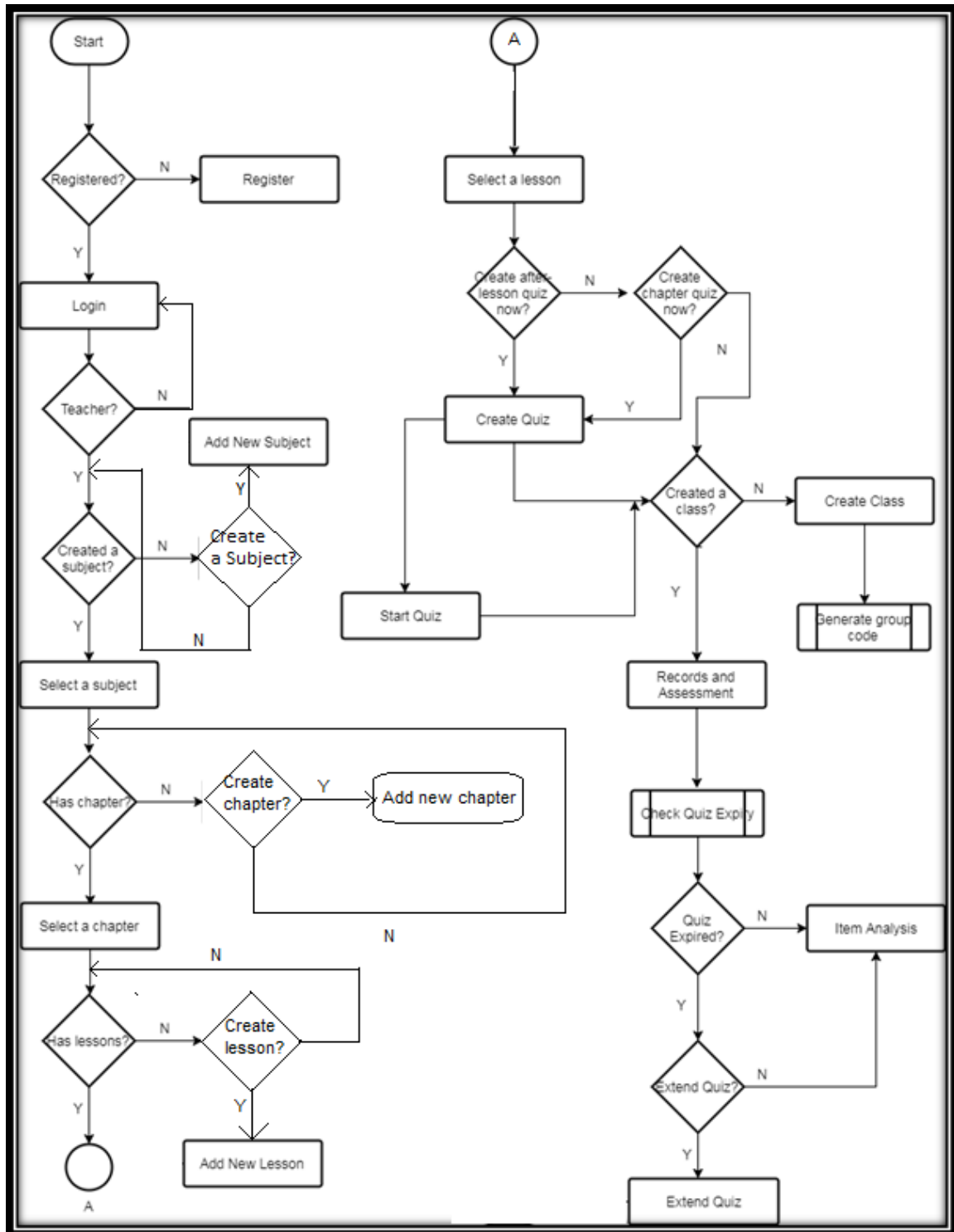
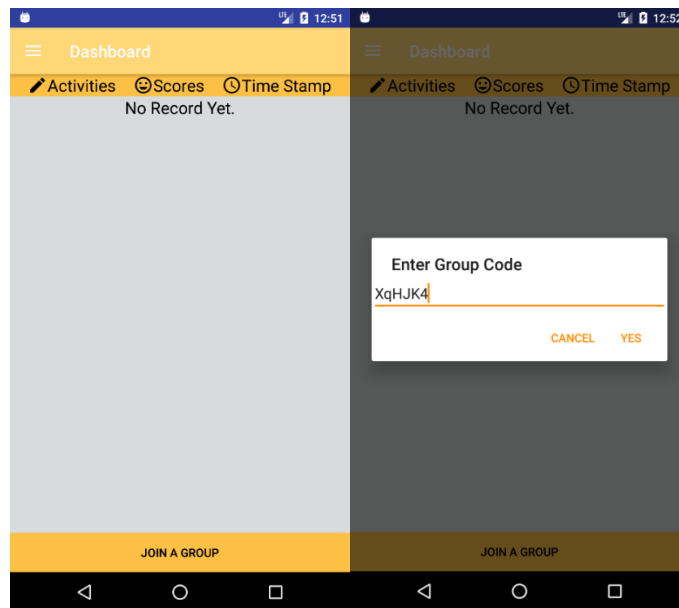


Figure 4.4: System Flowchart for Teacher's Module

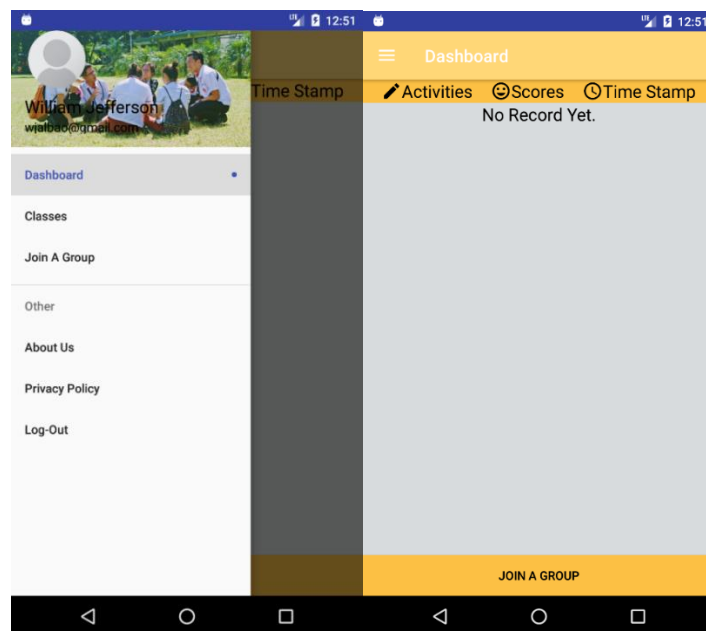
Project Capabilities

Student

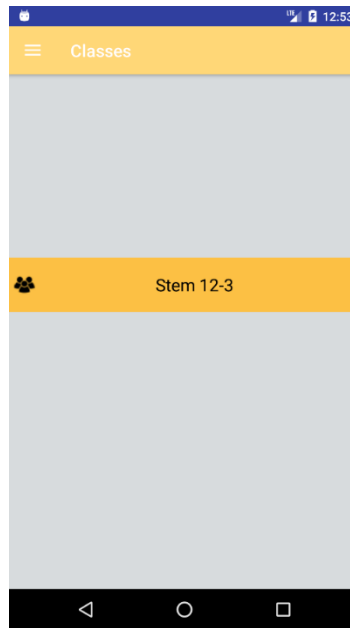
- Once the students have logged in, they may apply to join a group/class using the group code provided by the teacher.



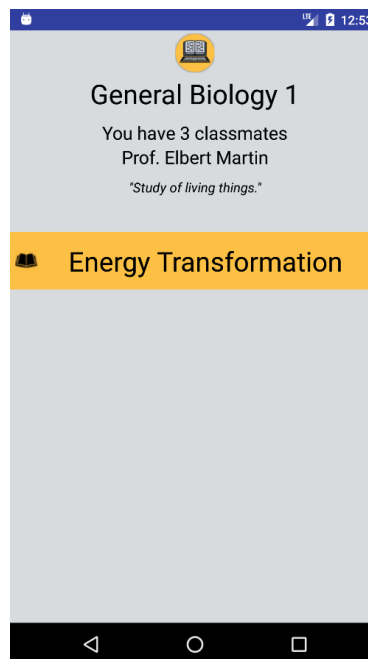
- On Dashboard, the student can see his/her records.



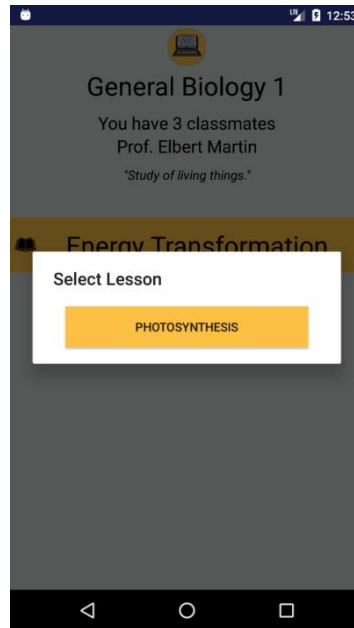
- On Classes, the student can see all his group/s.



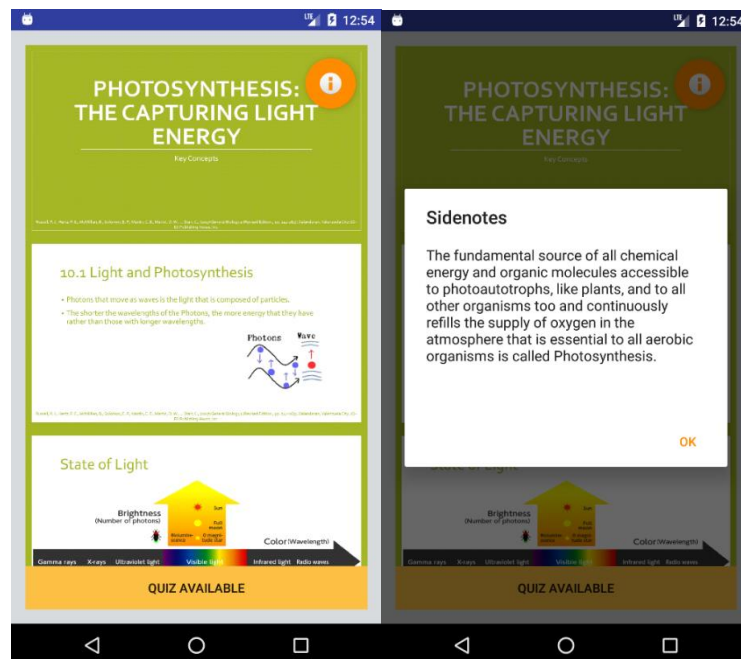
- After selecting a class, the student can see the subject, subject description, number of classmates, his/her professor, and the chapter or chapter quiz available.



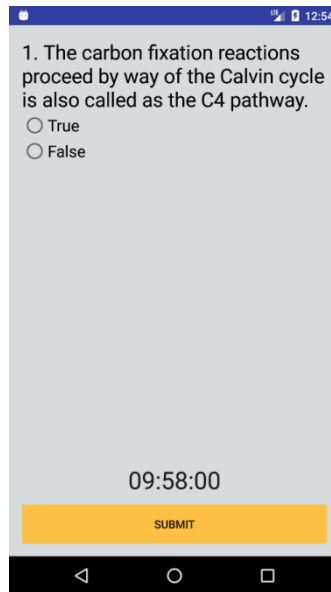
- After selecting a chapter, a pop up dialog will appear, the student can select an available lesson.



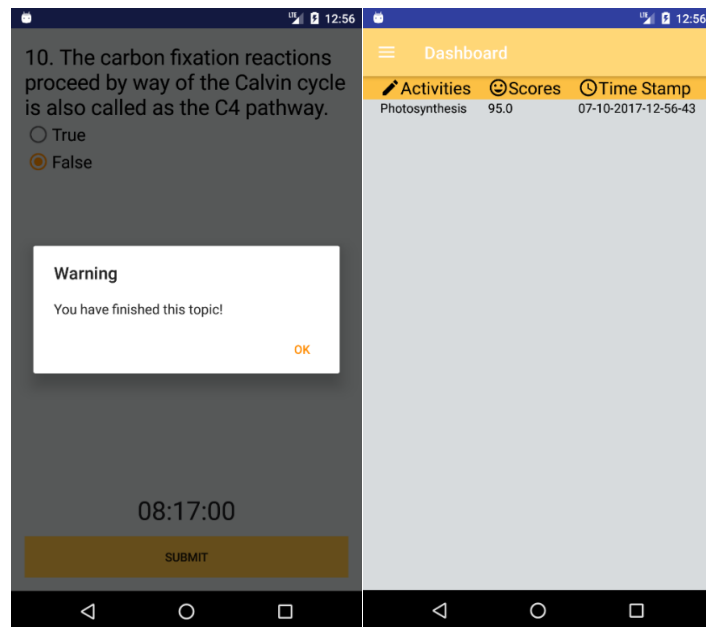
- After selecting a lesson, the student can now read the available lesson material. Upon reading, the student can take the quiz if the quiz is still available or if the quiz has already started.



- Upon taking the quiz, the student must answer all the questions correctly to finish the quiz.



- If the student has answered all the questions correctly, the student's assessment will be recorded, specifically his/her taken time on reading and answering. He/she will be redirected back to the available chapter screen.




Teacher

- The system displays and describes the assessment of each student.

Christine Anne Edono

Activity	Time to Read(minutes)	Time on Quiz(minutes)	Score	Timestamp
Photosynthesis	8.70	1.67	95.0	02-10-2017-02-55-27
Time on Read Description				
Minimum Time To Read(minutes)		8.70		
Maximum Time To Read(minutes)		8.70		
Average Time To Read(minutes)		8.7		
Time on Quiz Description				
Minimum Time On Quiz(minutes)		1.67		
Maximum Time On Quiz(minutes)		1.67		
Average Time On Quiz(minutes)		1.67		
Performance Description				
Minimum Score		95		
Maximum Score		95		
Average Score		95		

- The system displays the quizzes in a subject.



Quizzes

Select Class

General Biology 1

1. Energy Transformation

1.1 Photosynthesis

Quiz Available until: 10/4/2017, 12:37:00 PM

Item Analysis

Quiz expired. Extend?

Delete quiz

+ Create Quiz For This Chapter

- The teacher may create a quiz for a lesson or a chapter with expiration and randomization.

Quiz Properties

Quiz Title: Energy Transformation

Quiz Type: Chapter Test

Time Limit(minutes): 30

Number of Items: 20

Expiration Date: 16/2017 08:04 PM

☒ Randomize

Question 1

[Delete Question](#)

Question

Question?

Type

Multiple Choice

Right Answer

Answer2

[+Add Choice](#)

Answer1 [This is the right answer](#) [Delete this choice](#)

Answer2 [This is the right answer](#) [Delete this choice](#)

- A simple item analysis is generated by the system based on the number of students who answered the question incorrectly.

Item Analysis

Show entries

Search:

Question	Difficulty
_____ in plants is the last electron acceptor in noncyclic electron transport.	15%
A few of the energy seized by chlorophyll is used to divide _____ in photolysis.	15%
Chemiosmosis produced ATP and generated NADPH or oxygen.	Percentage of difficulty cannot be assessed.
Chlorophyll is found in the chloroplast at its?	5%
Electrons that have been energized by light give their energy to increase phosphate to ADP, creating ATP. All of these are in _____.	5%
Photoautotroph gets energy from light and carbon from carbon dioxide (CO2).	5%
Photophosphorylation is the ultimate source of all chemical energy and organic molecules available to photoautotrophs, such as plants, and to virtually all other organisms as well is called.	Percentage of difficulty cannot be assessed.
The carbon fixation reactions proceed by way of the Calvin cycle is also called as the C4 pathway.	5%
Thylakoid lumen is the thylakoids that are set out in stacks.	Percentage of difficulty cannot be assessed.
When CO2 reacts with _____, the Calvin cycle starts.	5%
Expected number of Examinees:	20
Formula(for each question)	Difficulty = Wrong/Total Number of Students in the Group

Showing 1 to 10 of 10 entries

[Previous](#) [1](#) [Next](#)

- The teacher may add a new subject.


+ Add New Subject

Subject Title: Analysis and Design of Algorithms

Subject Description: Introduction to fundamental techniques for designing and analyzing algorithms, including asymptotic

[+ Add Subject](#) [Cancel](#)

- The teacher can view the chapters and lessons under a chosen subject (like a syllabus). Edit and delete functions are also available.

 Syllabus

[+ Add Subject](#)
[Edit Subject](#)
[Delete Subject](#)

Subject

General Biology 1

1. Energy Transformation	
1.1 Photosynthesis	Quiz Already Created for this Lesson Edit Lesson Delete Lesson
+ Add Lesson	
+ Create Quiz For This Chapter	
Edit Chapter	
Delete Chapter	

[+ Add Chapter](#)

- The teacher may add a new chapter on a subject.

Subject

General Biology 1

+ Add Chapter

Chapter Title

Introduction to Algorithms

[+ Add Chapter](#)
[Cancel](#)

- The teacher may add a new lesson under a chapter.

Subject

General Biology 1

Energy Transformation

+ Add Lesson


Lesson Title

What are Algorithms?

Lesson File/Material

[Choose File](#)
LEC3_AminoA..._08-ppt.pdf

Sidenotes



YES

[Save Changes](#)
[Cancel](#)

- The teacher may add/edit class.

+

Add Class

Group Name

Stem 12-15

Subject/Curriculum

General Biology 1

Academic Year

2017

2018

Group Capacity

40

Group Code

608AFR

Generate

Add Class

Cancel

Project Results

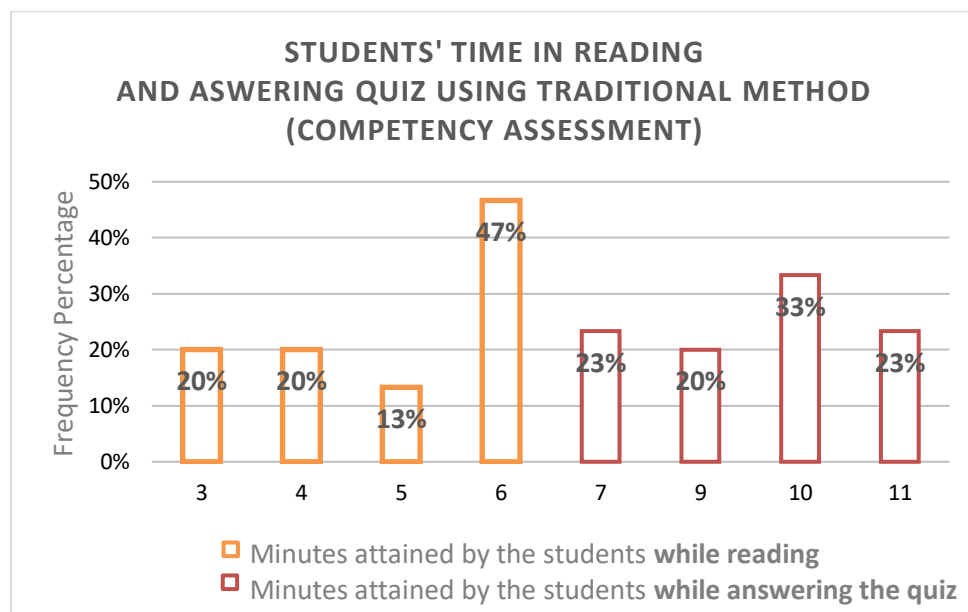


Figure 4.5: Students' time in reading and answering the quiz using the Traditional Method (Competency Assessment) Bar Graph

This bar graph shows the assessment of 30 students based on their competency by recording the time in minutes that they spent reading a lesson and answering a given quiz using the traditional method of learning. As seen in the graph, most of the students at 47% spent 6 minutes reading the lesson, 20% had read the lesson at 3 minutes as well as those other 20% with 4 minutes. And 13% of them read the lesson at 5 minutes. While answering the quiz,

33% took 10 minutes, 23% answered the quiz at 7 minutes and another 23% for 11 minutes and 20% for those who finished answering at 9 minutes.

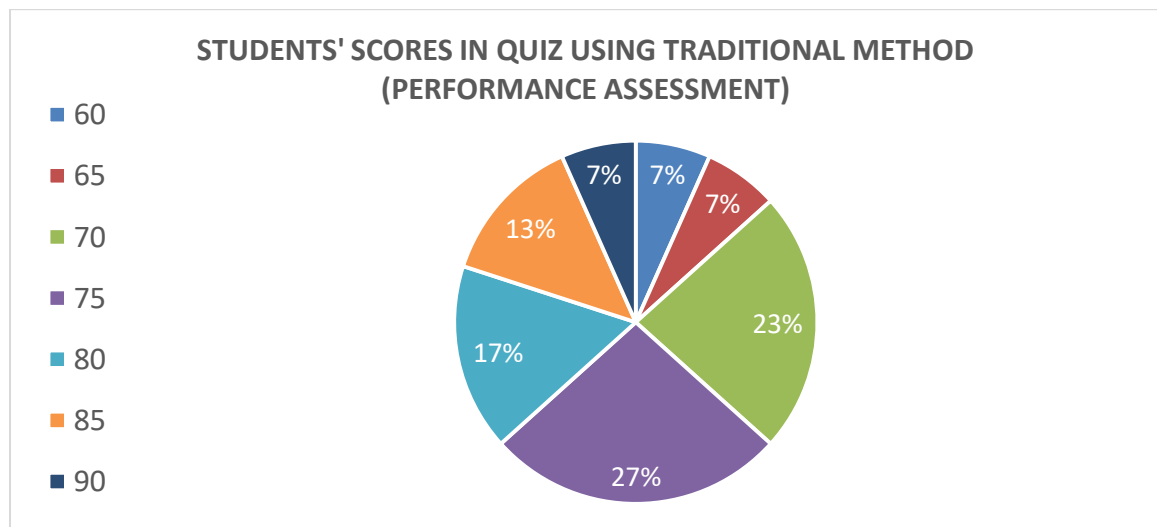


Figure 4.6: Students' scores in quiz using the Traditional Method (Performance Assessment) Pie Chart

The pie chart illustrates the performance assessment of 30 students after taking a quiz using the traditional method of learning. It can be seen that only 7% of them got 60 as well as those who got 65 and 90. 13% of the students got 85, 17% got 80, 23% attained 70 and 27% got half of the total score which is equivalent to 75.

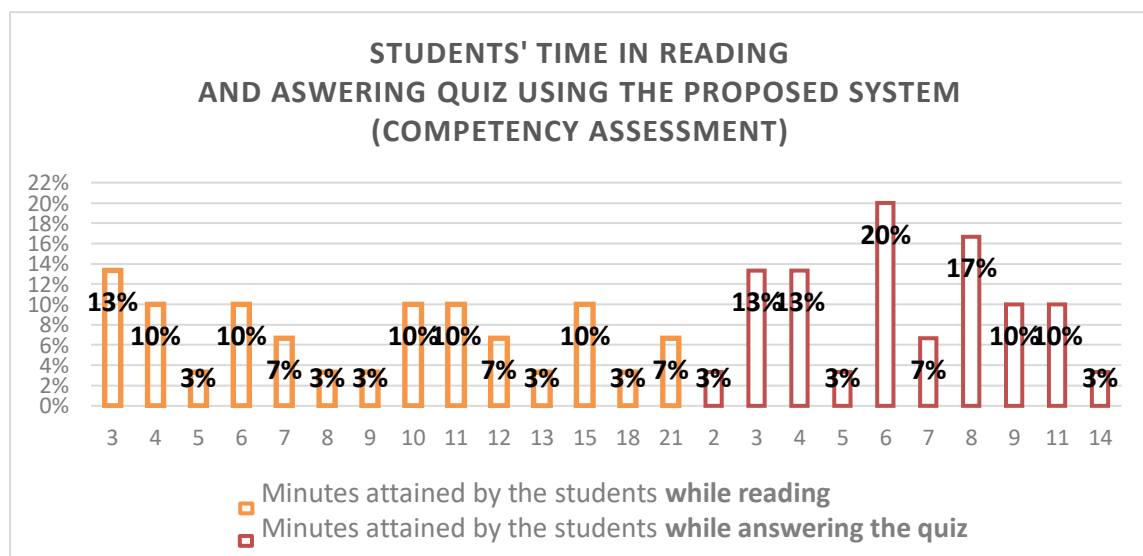


Figure 4.7: Students' time in reading and answering the quiz using the Proposed System (Competency Assessment) Bar Graph

This Figure 4.7 bar graph shows the competency assessment of 30 students by recording the time in minutes that they spent reading a lesson and answering a given quiz using the proposed system. As per the reading time which is the orange outline in the graph, 13% read the lesson for only 3 minutes, 10% read for 4 minutes as well as those who read at 6 minutes, 10 minutes, 11 minutes and 15 minutes. 7% for students who read the lesson at 7 minutes as well as those who read 12 minutes and 21 minutes, only 3% of them had read the lessons at 5 minutes as well as those who got read the lesson at 8 minutes, 9 minutes, 13 minutes and 18 minutes. For the given time of answering which is the red outline in graph, 20% of them read the lesson at 6 minutes. 17% students who read at 8 minutes, 13% read at 3 and 4 minutes. 10% for the students who read at 9 and 11 minutes, while 7% read at 7 minutes and only 3% read the lesson at 5 minutes as well as those who read at 14 minutes.

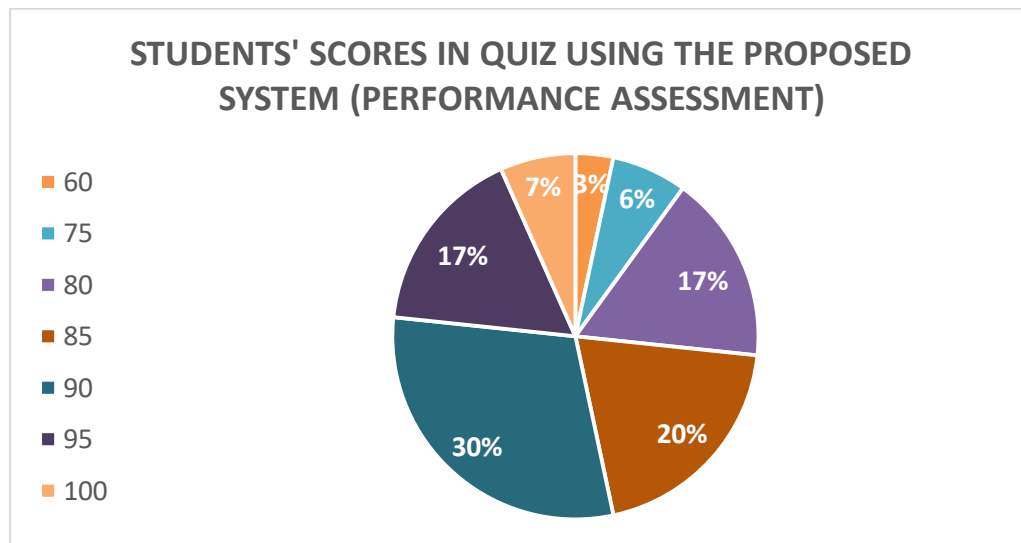


Figure 4.8: Students' scores in quiz using the Proposed System (Performance Assessment) Pie Chart

This pie chart illustrates the assessment of 30 students based on their performance after taking a quiz using the proposed system. As seen in the chart,

most of the students at 30% got 90, 20% of the students got 85 and 17% of them got 95 as well as those who got 80. 7% of the students got 100, 6% got the half score which is equivalent to 75 and 3% attained 60.

Table 4.0: Competency t-Test Results. t-Test: Paired Two Samples for Means

	<i>Traditional</i>	<i>Proposed</i>
Mean	14.23333333	16.06666667
Variance	2.805747126	44.27126437
Observations	30	30
Pearson Correlation	0.970064241	
Hypothesized Mean Difference	0	
df	29	
t Stat	-1.990324304	
P(T<=t) one-tail	0.028027635	
t Critical one-tail	1.699127027	
P(T<=t) two-tail	0.056055269	
t Critical two-tail	2.045229642	

In Table 4.0, the t-value of 0.028 in one-tailed test is compared with the t Critical one-tail value of 1.70. In the mean competency, or the totality of reading time and quizzing time, of 14.23 of the Traditional has been prolonged into 16.07 in the proposed system.

Table 4.1: Performance t-Test Results. t-Test: Paired Two Samples for Means

	<i>Traditional</i>	<i>Proposed</i>
Mean	75.33333333	86.83333333
Variance	61.95402299	69.79885057
Observations	30	30
Pearson Correlation	0.147699343	
Hypothesized Mean Difference	0	
df	29	
t Stat	-5.943130333	
P(T<=t) one-tail	9.30974E-07	
t Critical one-tail	1.699127027	
P(T<=t) two-tail	1.86195E-06	
t Critical two-tail	2.045229642	

Table 4.1 denotes the increase in performance of the students from Traditional System to Proposed System. The t Critical one-tailed value of 1.70 has been increased into computed 9.31 one-tailed t-value.

Table 4.2: Longitudinal Analysis for Competency

Group Means		Grand Mean	15.15
Traditional	14.23333333	k	2
Proposed	16.06666667	n	30
		N(k * n)	60
		SS-Total	1415.65
		SS-Treat	50.41667
		SS-Error	1365.233
		df-total	59
		df-treat	1
		df-error	58
		MS-treat	50.41667
		MS-error	23.53851
		f-value	2.141881
		Crit f-value	4.01

Table 4.2 gives the 2.14 f-value which is lower than the critical f-value of 4.01, demonstrating its treatment effect. Like in Figure 40, a prolonged reading and quizzing times are observed through proposed system.

Table 4.3: Figure 4.12: Longitudinal Analysis for Performance

Group Means		Grand Mean	81.08333333
Traditional	75.33333333	k	2
Proposed	86.83333333	n	30
		N(k * n)	60
		SS-Total	5804.583333
		SS-Treat	1983.75
		SS-Error	3820.833333
		df-total	59
		df-treat	1
		df-error	58
		MS-treat	1983.75
		MS-error	65.87643678
		f-value	30.1131952
		Crit f-value	4.01

In Table 4.3, we can see from the means that the performance has been increased. There is a big treatment effect observed from the f-value (30.11) and the critical f-value (4.01).

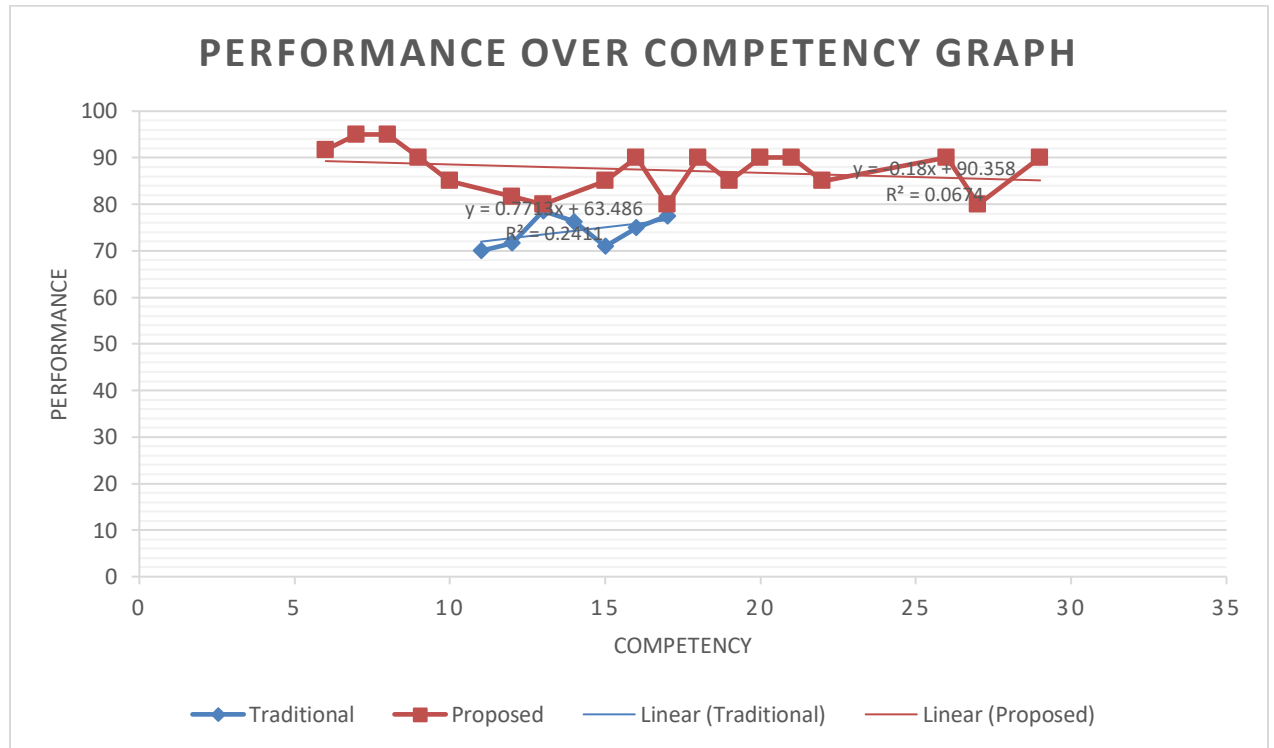


Figure 4.13: Performance over Competency Line Graph

Figure 4.13, shows the difference in terms of regression between the traditional and the proposed system. In the traditional system, the competency slope of 0.7713 is higher than the proposed system but the performance intercept of the proposed system is 90.358 which is higher than of the traditional system.

SYSTEM EVALUATION

Students' Evaluation

Table 4.4 Overall Mean Table of the Functionality Criteria

Question #	Mean	Evaluation
1	3.17	Agree
2	2.93	Disagree
3	3.77	Agree
4	3.00	Agree
5	3.17	Agree
6	3.20	Agree
7	3.50	Agree
Overall Mean:	3.25	Agree

The table shows the response of the students to the functionality of the proposed system. Based on the Likert's scale, the overall mean 3.25 goes under "Agree", that means they approve to the proposed system's functionality.

Table 4.5: Overall Mean Table of the Reliability Criteria

Question #	Mean:	Evaluation:
1	3.50	Agree
2	3.43	Agree
3	2.59	Disagree
4	3.10	Agree
Overall Mean:	3.16	Agree

The table shows the response of the students to the reliability of the proposed system. Based on the Likert's scale, the overall mean 3.16 goes under "Agree", that means they agree that the proposed system is reliable.

Table 4.6: Overall Mean Table of the Usability Criteria

Question #	Mean:	Evaluation:
1	3.50	Agree
2	3.43	Agree
3	3.50	Agree
4	3.50	Agree
Overall mean:	3.48	Agree

The table shows the response of the students to the usability of the proposed system. Based on the Likert's scale, the overall mean 3.48 goes under "Agree", that means that the proposed system is usable as per the respondent's evaluation.

Table 4.7: Overall Mean Table of the Efficiency Criteria

Question #	Mean:	Evaluation:
1	2.40	Disagree
2	3.53	Agree
3	3.07	Agree
4	3.40	Agree
Overall Mean:	3.10	Agree

The table shows the response of the students to the efficiency of the proposed system. Based on the Likert's scale, the overall mean 3.10 goes under "Agree", that means they agree that the proposed system is efficient.

Table 4.8: Overall Mean Table of the Portability Criteria

Questions #	Mean:	Evaluation:
1	3.63	Agree
2	3.70	Agree
Overall Mean:	3.67	Agree

The table 4.8 shows the response of the students to the portability of the proposed system. Based on the Likert's scale, the overall mean 3.67 goes under "Agree", that means that they agree that the proposed system is portable.

Instructor's Evaluation

Table 4.9: Overall Mean Table of the Teacher's Evaluation

Criteria	Overall Mean	Verbal Interpretation
Functionality	3.86	Agree
Reliability	3.75	Agree
Usability	4.00	Strongly Agree
Efficiency	3.33	Agree
Portability	4.00	Strongly Agree

The table shows the response of the instructor to the functionality, reliability, usability, efficiency and portability of the proposed system. Based on the Likert's scale, the overall mean for the functionality is 3.86 that go under the interpretation "Agree", that means that he agree that the proposed system is functional. For the reliability of the proposed system, the overall mean is 3.75 that go under "Agree" as well and that means that he agree that the proposed system is reliable. He strongly agrees that the proposed system is usable because the overall mean for the usability is 4.00. The proposed system is efficient because the overall mean for the efficiency is 3.33 which fall under the "Agree" verbal interpretation. Lastly, he strongly agrees that the proposed system is portable for the computed overall mean is 4.00.

Chapter 5

SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATION

This chapter summarizes the research and its findings. From the summary, a conclusion is drawn and recommendations are also stated for future researchers.

Summary

The study aims to compare the traditional classroom and the proposed system in terms of assessment in performance and competency. Another is the evaluation of teacher and student to the proposed system. The researcher hypothesized that there is no significant difference between the traditional classroom and the proposed system in terms of competency and performance. To meet the objectives of this study, an experimental research is performed. A class of 30 students is assessed using both the traditional and the proposed system. After assessment, the teachers and the student answer an evaluation form for the system. Longitudinal Analysis is used to determine the effect of the proposed system and t-Test is also used to compute the difference of traditional classroom and the proposed system.

Findings

In Table 4.0, the t-value of 0.028 in one-tailed signifies that there is no significant difference between the traditional and proposed system in terms of competency. Table 4.1 denotes the significant difference between the traditional and the proposed system. The t Critical one-tailed value of 1.70 has been increased into computed 9.31 one-tailed t-value. Table 4.2 gives the 2.14 f-value which is lower than the critical f-value of 4.01, demonstrating its treatment effect

which means that the reading and quizzing times are prolonged. In Table 4.3, like in Table 4.1, we can see from the means that the performance has been increased. There is a big treatment effect observed from the f-value (30.11) and the critical f-value (4.01). Figure 4.13, visualizes the difference in terms of both competency and performance between the traditional and the proposed system. In the traditional system, the competency slope of 0.7713 is higher than the proposed system but the performance intercept of the proposed system is 90.358 which is higher than of the traditional system.

Conclusions

- According to the Competency t-Test result, the traditional result is 14.23 while the proposed system's result is 16.07 so therefore, there is no significant difference between Traditional Classroom and the Proposed System in terms of Competency.
- As per the Performance t-Test result, the traditional result is 75.33 while the proposed system's result is 86.83 so therefore, there is a significant difference between Traditional Classroom and Proposed System in terms of Performance.
- Based from the overall mean 3.25 that falls under the "Agree" verbal interpretation of the Likert's 4-point Scale for the functionality of the system, the proposed system is functional but needs improvement.
- According to the overall mean of the reliability of the proposed system which is 3.16, the researchers concluded that the reliability of the proposed system is good but needs fortification.

- As per the evaluation of the respondents, 53% strongly agreed that they can easily use the system on their device so therefore; the system is easy to use but needs enhancement.
- According to the overall mean table of the efficiency criteria, the overall mean is 3.10 which fall under “Agree” so it means that the efficiency of the proposed system is sufficed but needs improvement.
- Based from the overall mean of the portability of the proposed system which is 3.67 and of the usability which is 3.48, the researchers concluded that the proposed system is device friendly or usable.
- From the results of the study, the software model used for Learning Management System is effective but some factors are needed to be implemented.

Recommendations

- Develop a version of the Student module for other lower Android versions and iOS.
- Use a relational database for more organized data.
- Improve the system's efficiency over slow internet connection.
- Choose a database with automated backup.
- The system must send a notification when a student gets approved.

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