MOBILE DEVICE: WI-FI BASED CLASSROOM MANAGEMENT SYSTEM

A Thesis

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of the Requirements for the Degree

Master of Science in Information Technology

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APPROVAL SHEET

This thesis entitled **"MOBILE DEVICE:WI-FI BASED CLASSROOM MANAGEMENT SYSTEM"** prepared and submitted by **MARK ANGELO S. BATHAN** in partial fulfillment of the requirement for the degree **MASTER of SCIENCE in INFORMATION TECHNOLOGY,** has been examined and recommended for acceptance and approval for ORAL EXAMINATION.

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MAKIE

DEDICATION

I am dedicating this humble piece of success to:

GOD,

To my parents- Marilyn and Nelson Bathan,

To my Wife- Sherry Mae Pajanostan Bathan,

To D'Chimpz Family,

To Samar State University.

ABSTRACT

This study aimed to develop a customized teaching and learning offline e-classroom system that is in conformity with the educational processes of the target client which can be accessed by any platform. The study aimed also to maximize the use of students' mobile devices as a learning tool. This study used the Incremental Model as the software process model for the development of the system. In summary, the workability and acceptability of the designed and developed system is found to be generally acceptable by both the end-users and technical experts. The workability and acceptability encompass the functionality of the system, technical merits and the associated processes. The system is found to be very efficient based on the evaluation results having an efficiency level indicator of 3.0 which has a descriptive rating of 'very efficient'. In particular, the level of efficiency has been evaluated by observing the performance of the system while it is on its actual operations and used. Observation has been made by technical experts following the rubrics that defines the different efficiency parameters. The developed system contains features of classroom management such as giving quizzes, uploading instructional materials, checking attendance through QR technology, and monitoring students' performance which are not present on the existing system. It was recommended that the system use high-end system materials such as a high-end Wi-Fi Router and a server where the system database will be installed.

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CHAPTER I

THE PROBLEM AND ITS SETTING

Introduction

Mobile device is a technology widely used today and the population of the people using this technology is continuously growing because of its hi-tech features and capability. It is used not only for texting and for calling, but also to connect to the internet, play games, read books, make transactions, watch and take videos and photos.

Thus, cell phones have presented another age of instructive devices that bear the cost of imaginative use and moment access to abundance of assets. Indeed, the 21st century instructive set-up, PCs, cell phones and related innovations are increasing earth shattering in the lives of the youthful and turning into a piece of training in school. At the point when innovation is utilized successfully in the study hall, it empowers understudies to be inventive while growing new abilities and furnishes students with cutting edge data (Saxena, 2013).

Further, the quality of instruction improves when technology is used in many ways. A key example is the used of Smart Classroom coined by Yau, et al., (20013) where it structures little gatherings to take care of explicit issues or create bunch venture through the utilization of circumstance mindful PDA which trigger correspondence action among the students and the teacher for gathering dialog. In fact, mobile technologies already become a necessity in the lives of most teachers and student today (Laura et al., 2004).

Thus, it now becomes the challenge for educators and designers to understand and explore how best these resources will support learning.

Mobile technology uses in both private life and schools indicates a sea change in the way student's process information. It has been contended that, before the advanced insurgency, it was essential to have data in your mind; however, at this point it is imperative to know where the data is and how to rapidly get to it. On this context, it is therefore imperative to exploits the use of these technologies in instruction with the primary objective which is to improve the quality of education.

On the different context, mobile devices are being governed by Wireless Communication System. Its operations primarily depend on Cellular Communication and wireless technology such as WiFi, and Bluetooth maximizing the potential of Mobile devices in instruction purposes. Liu et al., (2003) developed a Wireless technology enhanced classroom (WiTEC) which integrates wireless LAN, wireless mobile learning devices, an electronic whiteboard, an interactive classroom server, and a resource for classroom management. On this note, the use of WiFi and LAN are also found to be feasible to be utilized as a Communication and network platform in the realization of the so-called off-line e-classroom which is one of the objective of the study.

In the present, there are proprietary e-classroom softwares that are available. Google Classroom, Sakai, and Chamilo are some of the Learning Management System (LMS) that is available for free, while Edmodo, Moodle, and Schoology are some of the LMS that needs payment to unlock its full functionality.

This LMS (free/for sale) existing today has its own uniqueness and also generic functionality. The system developed in this research carries some of the functionalities that the above mentioned LMS have. However, this system was aligned to the standard and needs of the institution who will be using it. The system's flexibility is also a factor since the current system is developed locally and the necessary changes of its features will be easily incorporated. On the other hand, functionalities offered by other related systems are limited. This means that if any feature has been proposed, the same cannot be integrated since these LMS are proprietary and cannot be reprogrammed or changed.

According to Akamai (2017), the Philippines continue to lag behind all other Asia Pacific countries in terms of average internet speeds. In terms of broadband penetration, the Philippines has the lowest among Asia Pacific countries. The slow internet connection becomes a nightmare to almost all Filipinos especially to those who work online and study online. One of the most affected areas when slow internet connection strikes is the online classroom.

At present, traditional classroom is still present up to this day. It is a learning space in which the teacher provides face-to-face instruction to students and communication between and among teacher and students is face to face (IGI Global, 2009). This setting does not need internet but requires a lot of manual task like, paper and pen quiz or examination and manual recording and computation of grades.

From the scenario mentioned above, the researcher developed a system that bridged the gap between the online classroom and traditional classroom setting. The researcher established an electronic classroom that could be used offline intended to none

distant learning students. Mobility of learning would be possible using the system since the students use their own mobile phones. The system has a standalone sever and accessible by just simple connecting the mobile phone to a local WiFi. Once the students have already accessed the system, they would also have an access on the subject's downloadable instructional materials and with this, teacher's job on monitoring the student's performance would be easily done since the system has a function of recording computerized activity, quiz and examination.

Objectives of the Study

This study aimed to develop a customized teaching and learning offline e-classroom system that is in conformity with the educational processes of the target client which can be accessed by any platform. The study aimed also to maximize the use of students' mobile device as a learning tool. Specifically, the study sought to answer the following objectives:

1. What are the different e-learning platforms used by faculty in Samar State University?
2. What local Wi-Fi based classroom management system based on the existing design constraints:
    1. Accessibility and security;
    2. Accessibility of the instructional materials; and
    3. Student evaluation and monitoring?
3. What is the functionality and acceptability in terms of:
    1. Interface Design;

2. Input design; and
3. Output Design?

4. What is the Processing Performance of the developed system in terms of:
    1. Efficiency;
    2. Effectiveness; and
    3. Security?

Theoretical Framework

This study is anchored from Lutz and Huitt's (2003) Information Processing and Memory: Theory and Application affirmed that by making the instructions more accessible and meaningful to the students, it connects the previous and new learning experience which result to retention and the information received is stored in long-term memory.

The theory of planned behavior (TPB) is another theoretical anchorage of the study. TPB deals with the intention for use of technology. Which assumes that for an individual to adopt an innovation, he must display the willingness to use the said innovation. The said theory models out that the willingness to use technology coupled with the current trend of using ICT among students and teachers for teaching learning process will eventually improve classroom management thereby improving the quality of education (Asjen, 1976).

Moreover, the Technology Acceptance Model (TAM) found bearing to the study. TAM stated that user acceptance of the new technology is affected by perceived usefulness and perceived ease of use (Davis, 1989). Perceived usefulness is defined as the

degree to which a user believes that using a particular technology would improve his job performance. Moreover, perceived ease of use is defined as the degree to which a person believes using particular technology will be free of effort (Davis, 1989). The model suggests that when an individual is presented with new technology, a number of factors come into play. Among the factors, perceived usefulness and perceived ease of use will determine how and when the individual would use the technology which is true as the use of technology becomes dominant in teaching and learning process.

Conceptual Framework

Figure 1 shows the conceptual framework of the study. This will provide a direction on how the development process was conducted.

The conceptual framework starts with the first box which includes the Requirements or Outline Description that entails all the requirements and details that are needed for the study should be completed in this phase. If completed, it goes to the next phase which is the Build 1. Build 1 has 3 boxes. The first box is the Design and Development. In this phase, the researcher schemed out the flow of the system based on its usability according to the data gathered to project the output of the software and after which, the development process follows. The second box is testing. The designed and developed software was tested according to its functionalities and also to test if there are still bugs to be fixed. The third box is the implementation stage. This is the stage is where the system was implemented wherein, the system would be used in the actual setup with live data to be processed. After the build 1 stage, the system was evaluated based on the user's feedback. This would help to further improve the system and add features that is

still absent in the system. The building process would repeatedly executed until the researcher would be able to come up with the final version of the product.

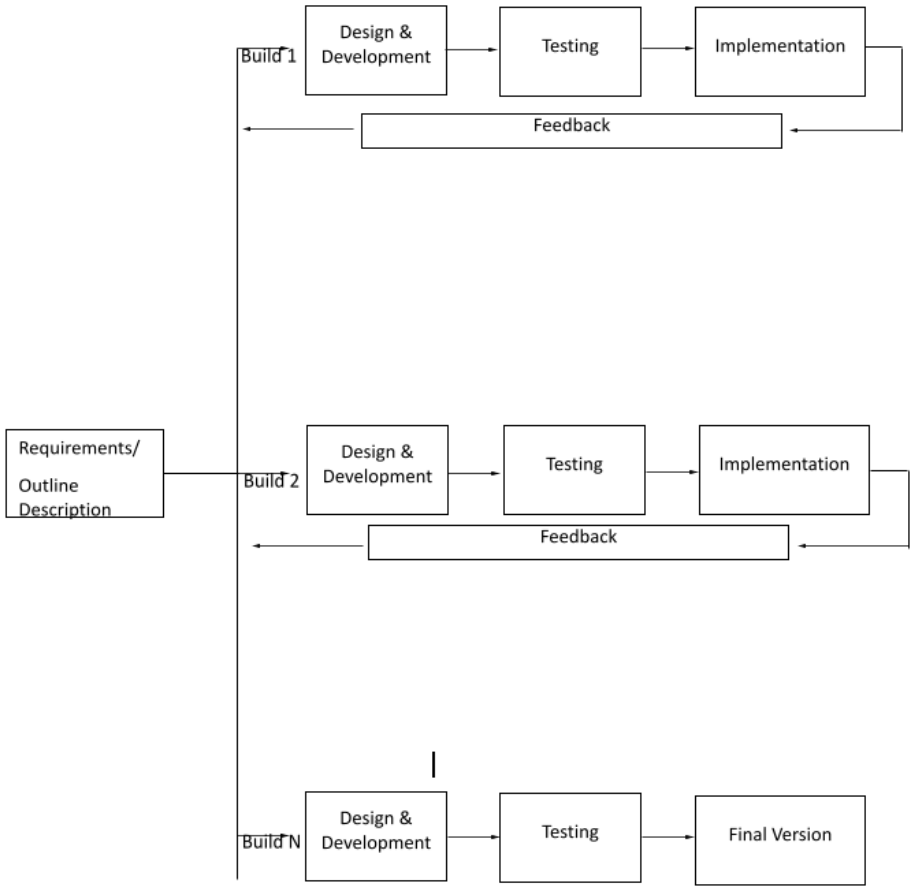

***Figure 1*. The Conceptual Framework of the Study**

Significance of the Study

This study will benefit the following:

Students. This study would capture student's interest since they would be using their own mobile devices as a learning tool. Mobility of learning is possible since the students will be using their own mobile devices; files like instructional material and video tutorial can be easily downloaded and stored it in the phone. The mobile devices can also receive notifications from the server once it is connected to the network for information dissemination purposes.

Faculty. This study would help reduce the amount of teacher's tasks since it has a feature that automatically record most of the student's activities like quizzes and exams that can be generated to an excel format for easy transfer. An item analysis per subject can also be generated by just few clicks. The students can continue any task required by the subject even the teacher is away like attending a meeting or on travel by simply connecting their mobile device to the server. This study would also help the teacher monitoring individual or even the general class performance

University. This system might be also the solution of classroom shortage since the students can still take up the class even without a room as long as the mobile devices are connected to the server, viewing of instructional materials and taking up the assessment is possible. The study does not require internet connection since it is design to work using local area network.

Scope and Limitation

This study focused on developing a system that would bridge the gap between a traditional classroom and online electronic classroom.

The system has the capabilities of an online classroom management system to be used inside the classroom without internet connection. With this, automating things like recording of scores, monitoring of student's attendance and performance, generation of item analysis result and sending notification to the students will be possible. Also, by using student's mobile devices in taking quizzes and examinations, viewing and downloading instructional materials made easy as long as the device is connected to the server.

In accessing the system, it only limits those devices who is inside the local area network range. Outside the Wi-Fi zone the system will not be accessible.

Definition of Terms

Mobile Device. A portable computing device such as a smartphone or tablet computer (Oxford, 2018).

Wi-Fi. A facility allowing computers, smartphones, or other devices to connect to the Internet or communicate with one another wirelessly within a particular area (Oxford, 2018).

QR code. a machine-readable code consisting of an array of black and white squares, typically used for storing URLs or other information for reading by the camera on a smartphone (Oxford, 2018).

Effectiveness. The degree to which something is successful in producing a desired result; success (Oxford, 2018).

CHAPTER II

REVIEW OF RELATED LITERATURE AND STUDIES

Books, journals, internet reference materials and unpublished thesis books related to the present study have been carefully reviewed to be used as reference in this chapter. Ideas, findings, conclusions and recommendations taken from its sources are cited correctly.

Related Literature

E-Learning can be viewed as an innovative approach for delivering well-designed, learner centered, interactive and facilitated environments to anyone, any place, anytime by utilizing the attributes and resources of various digital technologies along with other forms of learning materials that are suited for open, flexible and distributed learning environments. The role of learning management system (LMS) in pedagogical practices has expanded in recent years. Blended Learning which uses education technology tools is proving to be influential in helping both students and teachers to flip their classroom management from didactic approach towards blended learning through LMS that is more student-centered and constructivist (Brioso, 2017).

According to Burgess (2003) technology such as WebCT (an online proprietary virtual environment) is useful for the students who are comfortable using technology. The students who were technologically inclined embraces the new or emerging electronic formatted text-based or graphic-enhanced media. Some struggles in uploading assignment, checking post, using bulletin board and features. For them, it is very

challenging and time consuming. However, majority of the students quickly adjust to the technology with enthusiasm.

In facilitating higher-level learning, technology like e-learning really helps. It pushes students to critically think and be creative enough to innovate (Jingyao, Wang and Wang, 2014). In conformity, the study of Scibora (2018) entitled "The Influence of iPads on Course Performance and Student Perceptions of Learning in Human Anatomy", stated that the capability of iPad, together with smartphones, tablets and other portable devices to be interactive and to be visually interesting, open up new doors in learning for the students. As cited by Scibora(2018), portability of learning through iPad or other mobile devices captures the interest and increases student's positive attitude in learning because aside from its basic functionalities it can also be used in data collection, information storage and retrieval, knowledge acquisition, social connectivity, and collaboration. For the integration of this portable devices into the classroom to be successful, the study suggested that a guidelines of how the students will be evaluated based on their knowledge and skill should be incorporated.

In the mobile internet era, mobile phones have been widely used as a tool in communication. The ownership and the usage rate of mobile phones are ascending especially to the students in primary and secondary level. But the problems still exist in universities. At the present time, there are several types of counterpoint of these problems such as disallowing students in bringing their mobile phones and confiscation of mobile

phones to the students. Nevertheless, such problems only occur to the poor implementation management of the campus (China Patent No. 107529178, 2017).

In tradition, in informal education, Mobile Learning is effectively to be developed. Even in the formal education field, there is an increasing interest in Mobile learning in the past years and it will only be successful if the teaching body would accept the essence of mobile technologies (Sanchez-Prieto, Olmos-Miguelanez, & Penalvo, 2016). Moreover, the important connection of technology to every people's daily lives is obvious all over the place, even in the instructive setting. People's actions and work could not disregard the existence of technology. The everyday usage of mobile technologies becomes more effective in learning purposes for the teachers and students. Mobile technologies as of now is more interactional. The unchanging development of mobile technologies, education found a chance to upgrade and engage with the advancing progress of technologies. Online education is on trend and grows quickly. The beginning was just from a website, then transformed to desktop application and now, m-learning is starting to gain attention in the education arena. (Calimag, Miguel, Conde, & Aquino, 2014)

The above mentioned studies helped the researcher identify the problems related to the current study. The researcher was able to detect the gap between the traditional classroom setup and computerized classroom. Further, all the data gathered in different studies were used to formulate a solution innovating teaching and learning process.

Related Project Studies

The study entitled "User Interface for Classroom Management" of (United States of America Patent No. 20180213079, 2018) expresses that teachers can manage students devices during class hours in order to amplify the learning capability of the students. The set-up of this system is a peer-to-peer management where in a teacher can monitor the attendance based on the broadcast. The teacher's device can control the functionalities of the system to minimize and remove the capabilities of a user and can be resumed when a user is able to use the functionalities of the system.

This study has a similarity with the current study in the sense of managing the student's mobile devices in teacher and learning process. The current system has a capability to limit the topics being displayed on the student's mobile device depending on the teacher's discretion. However, the presents study is always accessible and ready to use even outside the class hours of the specific subject.

The study entitled "Centralized School Admission Application and Data Exchange System and Process" of (United States of America Patent No. 20170287091, 2017)states that systems provide application management, data exchange, and controls for accredited users. A server or a cloud-based system offers variety of functionalities to the users through the use of a network. The said system can register a Teacher as the primary user which would be the controller of the system and the system can also enroll students to be the secondary users of this system. The system also enables to access different forms

and data from the users. In this case, the system can save and retrieve information from the users.

The present study is similar to the above-mentioned study entitled “Centralized School Admission Application and Data Exchange System and Process”. However, the current study is focused on how the student’s will utilize the mobile devices in teaching and learning. Also, the current study is a local area network based system. Meaning, this doesn’t need internet connectivity to work, only a network that can connect client’s devices to the server.

Mobile devices are widely used by students as of now. This has transformed the kind of extraordinary education and start a new method of e-learning also known as m-learning. The purpose of this study is to calculate the penetration of mobile devices for educational purposes in higher education and to classify the key treatment patterns. To that end, the paper used two opposite procedures: web control mining and a questionnaire survey. Web control mining was accomplished to gain data from University's learning management system (LMS) in order to discover modern technology's usage development for the past four educational years and to recognize the key patterns of behavior. A questionnaire survey of 460 students was handled to reveal about the student-declared level of m-leaning penetration. The outcome is decisive: 25% of LMS entree was made from mobile devices and 75% of students used mobile devices for educational purposes. The result of this study have important implication not only

for the proponents and lecturers, but also for the organization aiming to implement this kind of teaching process (Lopez & Silva, 2014).

The researcher targets those students with mobile devices to be respondents of the present study. The implementation of the current study is possible since most of the students today are already using smartphones, and the population of the students who uses this device continuously grow.

Another study by Young (2008) entitled "Using Technology in the Public School Classroom" desires to prove the importance of adding technology tools into a teacher's instruction method. According to Young (2008) when teachers add technology tools to proven instructional strategies in their curriculum, students could be more excited about learning, their attitude could be positive about technology, they could be more engaged in lesson, and their test scores could improve. However, the fact classrooms contain computers with an abundance of software does not mean teacher technology use and student technology use will have an immediate and sustained positive effect on student grades and attendance. For these benefits to occur, instructors must undergo professional development in combining use of the technology tools with effective instructional strategies.

Similar to Young's (2008) study, the present study aims to make students more excited about learning. It intends to capture students' interest by using the thing they said they cannot live without which is the mobile device. Further, for the present study to be

effective the system must undergo a detailed and scrupulous development combining technology and effective instructional strategies.

In more particular aspect, Samar State University- Student Information and Accounting System is one of the most relevant studies. SSU existing system stores all the information of the students. The system is controlled by the Information Technology Services under the Research and Extension office. The system serves as a repository of the students' information, such as but not limited to the students' financial statements, subjects, grades, and other relevant records. The system also allows the faculty members of all departments in SSU to enter the grade of the students into the system's database. Only the faculty members has access to the system. The system can be accessed through the university-shared local area network. This existing process is limited to saving the students information such as subjects and grades. The system serves as a data warehouse of relevant student data.

On the other hand, the proposed system WiFi Based Classroom Management System is a separate entity from that of the existing system of the university. The proposed system caters not only saving the grades of the students but also features such uploading instructional materials such as power point presentations and pdf files, uploading video tutorials, giving quizzes to the students, computing of grades, checking of attendance through QR technology. The system focus is on the classroom management of faculty members of all their subjects. Using the system, the faculty can manage the materials and methods of teaching the topics to the students.

CHAPTER III

METHODOLOGY

This chapter presents the methods and materials used in the development of the study.

Research Design

This study used the Incremental Model as the software process model for the development of the system. Incremental Model, an agile approach in the development of the system, is best described by its continuous progress of the system by developing several versions until a suitable system has been developed (Sommerville, 2011). Under this model, the developer of the system develops a version, exposes such version to the users for feedback and suggestions, and incorporates these recommendations in the development of the next version. Each increment or version of the system includes some of the functionality that is needed by the customer. Under this approach, system specification, system development, and system validation are concurrent activities so that these software engineering activities can be conducted simultaneously or in an interleaved order rather than a sequenced one.

The researcher used this model since the requirements of the proposed system can be dynamic and the end-user requirements would necessarily depend on the prospective users of the system. Consequently, the researcher released an initial version and intermediate versions to the users for evaluation so that the users may propose changes to the systems or propose additional functionalities to be added on the next version. This process goes on a loop until an adequate system has been developed to address both the

user requirements and system requirements. By using this model, system changes or recommendations given by the users during system validation cannot be incorporated easily as it is being developed.

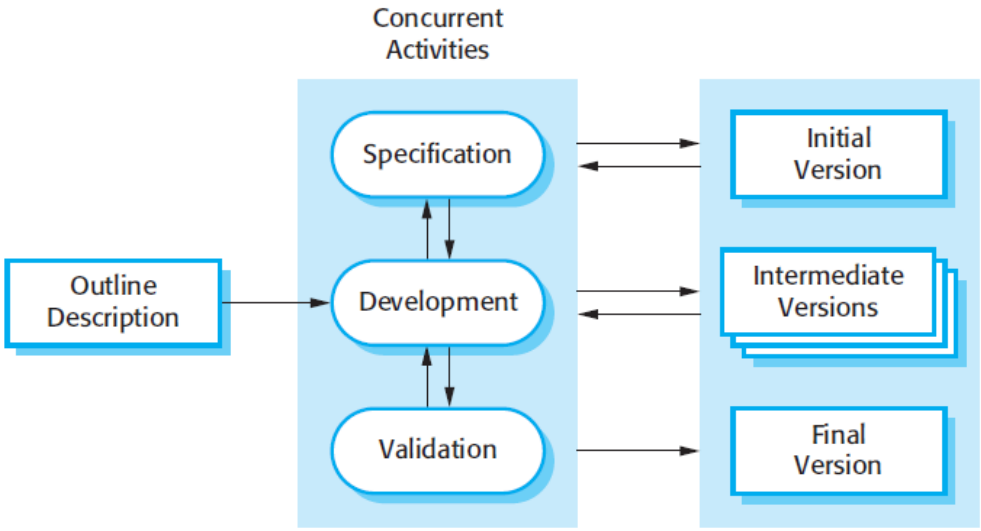

Figure **2. The Incremental Model**

Outline Description

In conformity to the incremental design method used on this study, the outline description, which is the equivalent of requirement analysis, has been undertaken. In this phase, functional and non-functional requirements are identified and analysed. A vast majority of the requirements for the development of an offline e-classroom accessible to any platform utilizing students' mobile device as learning tool was captured by analysing the existing technologies related to this study. Later, as defined in the process model, an initial version is to be developed, so as initial design would be communicated to the stakeholders and that additional requirements would be suggested and incorporated.

In particular, the following system requirements comprising both hardware and software are as follows:

Table 1

Minimum Required Hardware and Software

Component/ System Requirement	Specification/ Description
System Unit	Server type computer
WiFi Access Point	Ubiquiti Nano Station M5 GHz
Mobile Device	Mobile phone, Tablet, Laptop
Sublime Text Editor	Software
XAMMP	Software

Table 1 list the minimum required hardware and software for the system. The components and its corresponding specification refer to the minimum requirements of the systems in conformity to the projected system functions and operations. However, it is an advantage if higher-level specification were utilized in order to attain maximum level of operations.

Conversely, a considerable software identification and selection process has been undertaken prior to development. While system performance and fairness continue to be an important consideration and in order to develop best system software, a parallel analysis has been undertaken along with the needed system hardware to ensure hardware – software compatibility.

Specification

This phase together with development and validation, are interleaved software process activities under the incremental model. This means that as new versions of the system are developed or increments, such version or increment may need to undergo any

of the phase under the concurrent activities. In the beginning, the initial version of the system is developed using the requirements identified during the outline description. With the release of the initial version, should any of the suggestions include a revision of the requirements of the system; a requirement specification is conducted. This is to check whether such recommendation is compatible with the requirement set out in the outline description.

In the study, the researcher developed the first version of the system. The initial version have the basic features of an e-classroom, which includes saving the details of students, faculty members, and subjects to the database; assignment of the subjects to the faculty members and subject enrolment for the students; Automation of quizzes. And with the release of the first version, recommendations where given. The recommendations identified were the addition of a feature that determines where to set the semester and the school year, and the functionality to add the feature that the system be able to check the attendance of the system and have the attendance automatically recorded in the system. Another suggestion is for the system to have an automatic computation of score based on the date of the quizzes, exams, attendance and other grade matrices found in the system. In its entirety, there were three intermediate versions that were released by the researcher.

Development

The development phase of the system included both the system design and programming. System design was based upon the existing patterns and tools of Classroom Management as indicated in the literature review of this study. It also adhered to program and database development standards. As defined in the system requirement, a sublime text editor and XAMPP would be used where a PhP programming language, MySQL database and Java Scripting are integrated.

An offline WiFi based e-classroom Management System is to be designed in manner that it can interact with the server – its database and business logic engines to customize a response in an offline manner. The system hardware architectural definition is being reflected as shown in figure 3.

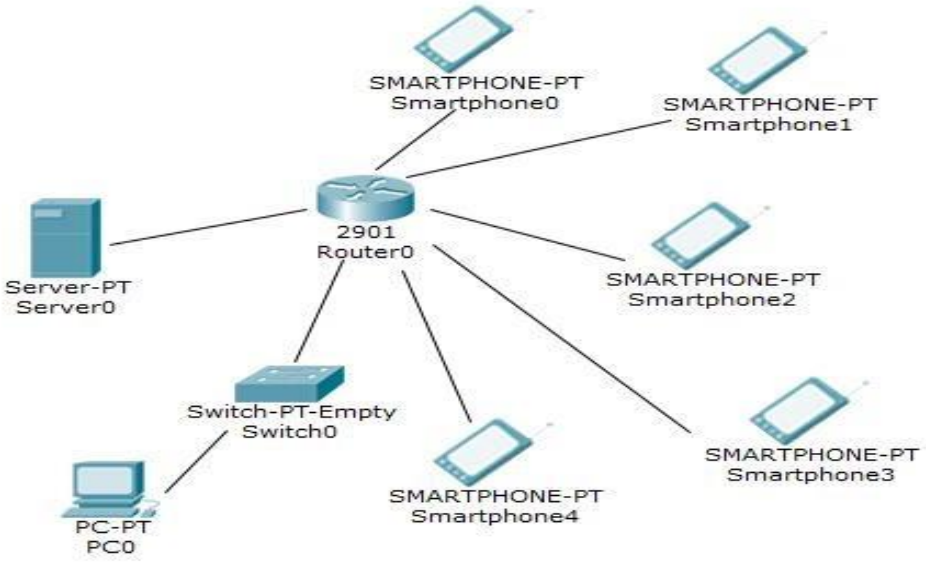

Figure 3. **System's Architecture**

Data Flow Diagram

The complexity of the processes inside the proposed system necessitates the presentation of the data flow diagram. In this diagram, the flow of the data to and from the system is shown as well as the flow the data from different modules inside the system.

Figure 4 represents the Level 0 Data Flow Diagram. This shows the system as on process and focuses on the data the go into and goes out of the system. Here, the data provided are mainly coming from the students while the data that goes out of the system is sent to the faculty members.

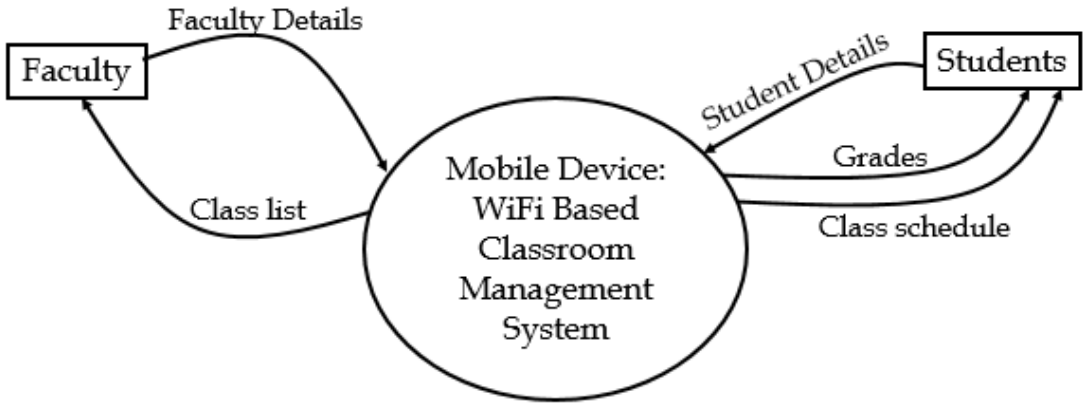

Figure 4. **Level 0 Data Flow Diagram**

Figure 5 depicts the Level 1 of the Data Flow Diagram; here the system is shown to be subdivided into modules. These modules represents the main features of the system and the flow of the data between these modules.

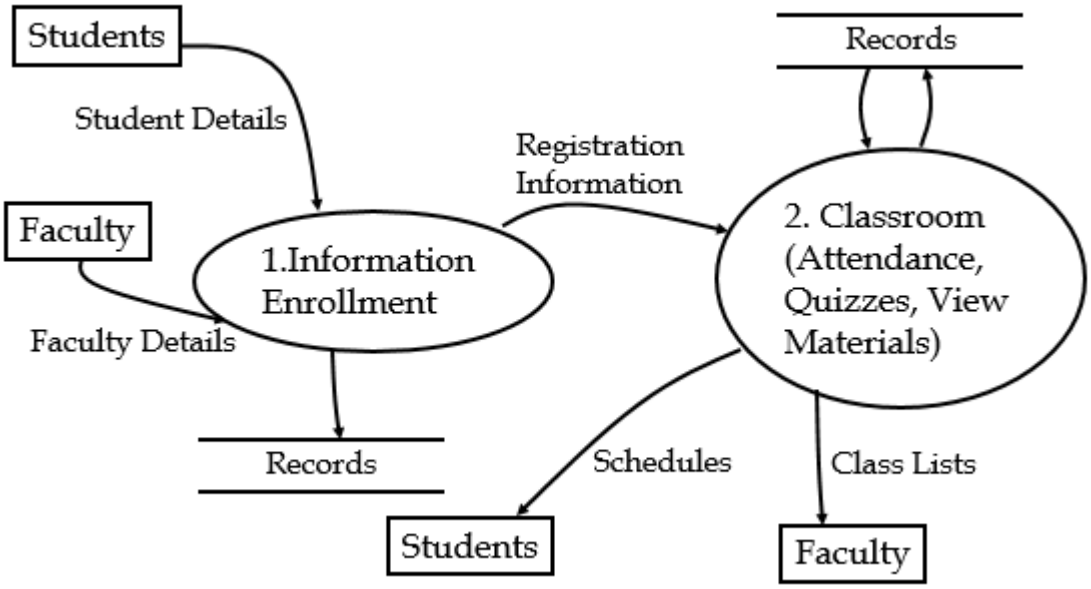

Figure 5. **Level 1 Data Flow Diagram**

Software Design

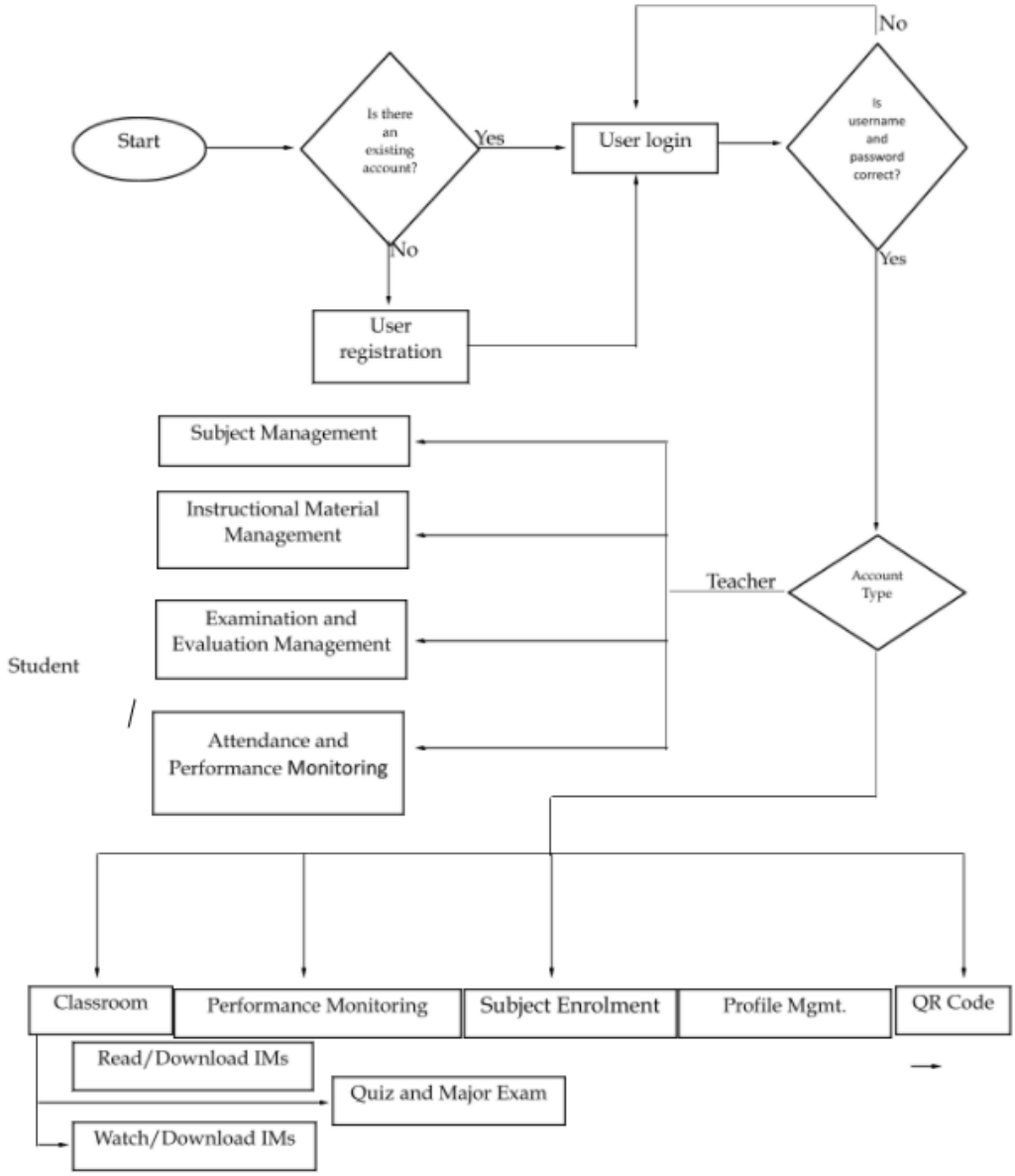

Figure 6. **System Flow Chart**

Database Schema

Database schema represents logical view of entire database. It defines the entities of the database, how data is organized and what the relationships among the entities are. It also formulates all the constraints that are to be applied on the data. The database used

in the system is MySQL. It is a relational database model that stores all data in table and establishes relationships between entities through primary keys and foreign keys.

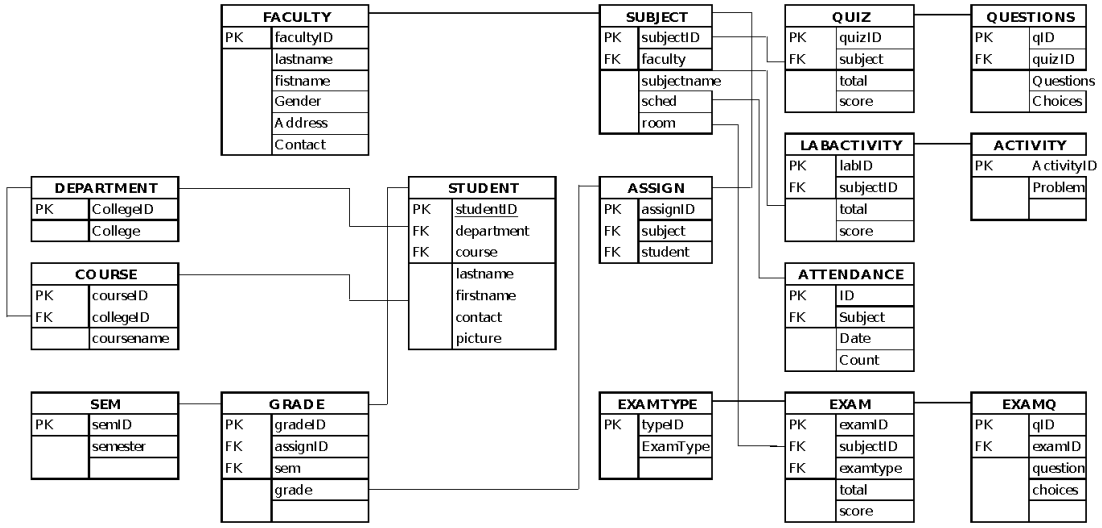

Figure 7. **Database Schema**

Validation

In this phase, system versions or increments were introduced to users and prospective users of the system to evaluate the system as to whether the system meets the requirements and the objectives laid. In the initial version, students and faculty members of Samar State University, College of Arts and Sciences evaluated the system. The evaluation resulted to the addition of other necessary features as discussed earlier under the specification stage. The recommendations were incorporated during the next increment. In the next intermediate version, the version was presented before faculty members of other departments of Samar State University. Suggestions such as adding the feature that is able to check the attendance of students were given.

After all recommendations were added to the system, the researcher thus released the final version of the study.

Instrumentation

The researcher used programming software, electronic components, and Wi-Fi technology to develop the system. To understand how the system works, major components of the system were discussed in this section.

System Components

Server/ System Unit

Figure 8 shows a server system unit, this is the repository or storage of the data of the system. The system database will be stored in this server. And high-end server was used to ensure a fast transaction processing between the system and the database.

Figure 8. **Server**

Wi-Fi Router

Figure 9 shows a Wi-Fi Router. This will connect the student's mobile phones to the system. The system is available through local host and accessible when connected to the network. Consequently, the students need to connect to the WiFi network to be able to access the system.

Figure 9. **Wi-Fi Router**

Android Phone

Figure 10 shows a mobile phone. The students used this device to access the system. This is also where the students can take exams and quizzes given by the teacher. Each of the students have user accounts in the system and password that they will use to log in to the system. The mobile phone has to have a Wi-Fi connectivity capability.

Figure 10. **Android Phone**

QR (Quick Response) Code.

Figure 11 shows a sample of a QR Code. This technology is used in checking the attendance of the students. Each student was be given a QR Code that is also saved the database of the system. The student has to present his QR Code to the camera of the laptop of the teacher to be identified by the system. Once the code is scanned, a match will trigger an attendance to mean that the student is present.

Figure 11. **Quick Response Code**

Validation of the Instrument

The researcher validated the materials used in the development of the system by conducting tests. Due to the unavailability of a high-end server, the researcher temporarily used a laptop as the server with MySQL as its database through localhost. For the Wi-Fi, it was tested as how many persons can connect to the network at once and whether large number of users will affect the functionality of the system. The result of the test conducted by letting 40 students connect to the Wi-Fi network showed that it did not affect the functionality of the system. Each of the students can access the system with acceptable speed and accuracy.

Moreover, about the mobile phones, it was found out after the test conducted that mobile phones must have a screen wide enough for students to comfortably use the system, an emphasis however was given that mobile phones that can connect to the network can only be used. For students who do not have this kind of phones, laboratory computers may be used in lieu thereof. For the QR Code, it was tested as to the ability of saving the equivalent value of the code to the database. The said process was done in order to compare the one that will be presented by the student upon checking of the attendance.

It was found out that this technology can be integrated to the system and the value of the QR Code can be saved and retrieved from the database accurately and quickly.

Sampling Procedure

An evaluation of the product has been conducted with three groups of respondents, namely, students, faculty members, and technical personnel. The system was explained to each group of respondents and the latter were given opportunity to use the system. After the demonstration of the system, the researcher distributed questionnaire to the respondents for the assessment of the system as well as the recommendations and suggestions.

Data Gathering Technique and Statistical Tool

The study is focused on evaluating the system based on its workability and acceptability. Before the testing, the researcher already identified the group of respondents who will use the system for product evaluation. The sampling technique that was used is convenience sampling and the statistical tools used are grand mean, and standard deviation.

Respondents

Respondents	*Number of Respondents*
Students	35
Faculty	15
IT Experts	10

Weighted Mean

The grand mean of a set of multiple subsamples is the mean of all observations. This is calculated by first, finding the sample means of each group, and taking the mean of the results from the first step.

CHAPTER IV

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

This chapter provides a thorough discussion of the results, analyses, and interpretation as the outcome of the evaluation conducted on the functional requirements of the system.

The current e-learning platforms used by Samar State University Faculty

There are three different e-learning platforms currently used by SSU – faculty. This result is based on the responses of 30 faculty-respondents. Further, interview results also indicate that only 12 out of 15 faculty respondents made used of the e-learning platform. Table 2 indicates the different types of e-learning platform and the number of faculty users. Note, that in particular, the main objective of interview process being conducted is only to determine the current e-learning platform used by the faculty.

Table 2

Current E-learning platforms used by faculty

E-learning platform type	No. of users
Schoology	2
Moodle	2
Google Classroom	8
Total	**12**

From the 12 currently utilized e-learning platforms, 2 uses schoology, 2 uses Moodle and 8 uses the google classroom. Moreover, it is clear that only few faculty used an e-learning platform despite of its popularity and advantages. Perhaps the reason for

this is the fact that the said e-learning platform are not designed or are not customized to the local curriculum process of the university.

Schoology is a social networking service and virtual learning environment for K-12 school and higher education institutions that allows users to create, manage, and share content. Learning Management System (LMS) or Course Management System (CMS) is a cloud-based platform that provides tools needed to manage an online classroom (Conte, 2011).

Moodle is a free and open-source LMS written in PHP and distributed under the GNU General Public License. It is being developed on a pedagogical principles. In most cases, it is being used for blended learning, distance education, flipped classroom and other e-learning projects in schools, universities, workplace and other sectors (Costello, 2013).

Designed and Developed WiFi Based Classroom Management System

A. Accessibility and Security

Accessibility and Security are considered important parameters to be considered in the design and development of a System. On this case, the developed system incorporates (1) a provision of accessibility via local area network; and (2) a customized user-security access and control of instructional materials for both the faculty and students.

In particular, system accessibility and security operation processes requires the user to enter his/her authorized account. Figure 12 depicts the log-in page of the system where students and faculty as well as the system administrator needs to provide and enter their authorized log-in information. In other words there are 3 accounts categories which defines a different system accessibility provision as follows: (1) Administrator Account; (2) Teacher Account and (3) Student Account. Note that for each type of account there is a corresponding restriction and privileges. The said restriction and privileges form part of the security mechanism of the system.

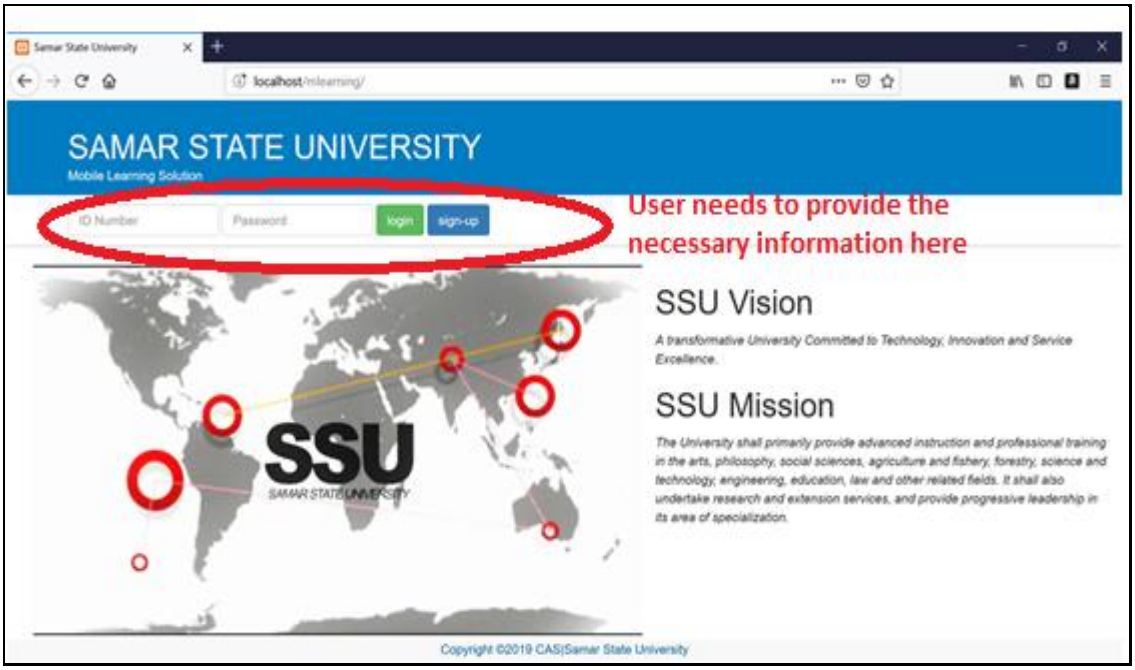

Figure 12. **Depicts the Log-In page of the System**

B. Accessibility of the Instructional Materials

Accessibility and Control of Instructional Materials varies in accordance to the type of user accounts. For and on the case for teachers, processes and functionalities d

includes but not limited to: (1) modifying, uploading and deleting instructional materials, (2) access to students attendance records and other records; (3) printing of reports; etc. While system functions and processes associated to students accounts includes but not limited to: (1) viewing their individual performance rating; (2) downloading of instructional materials; (3) signing for attendance via QR codes among others.

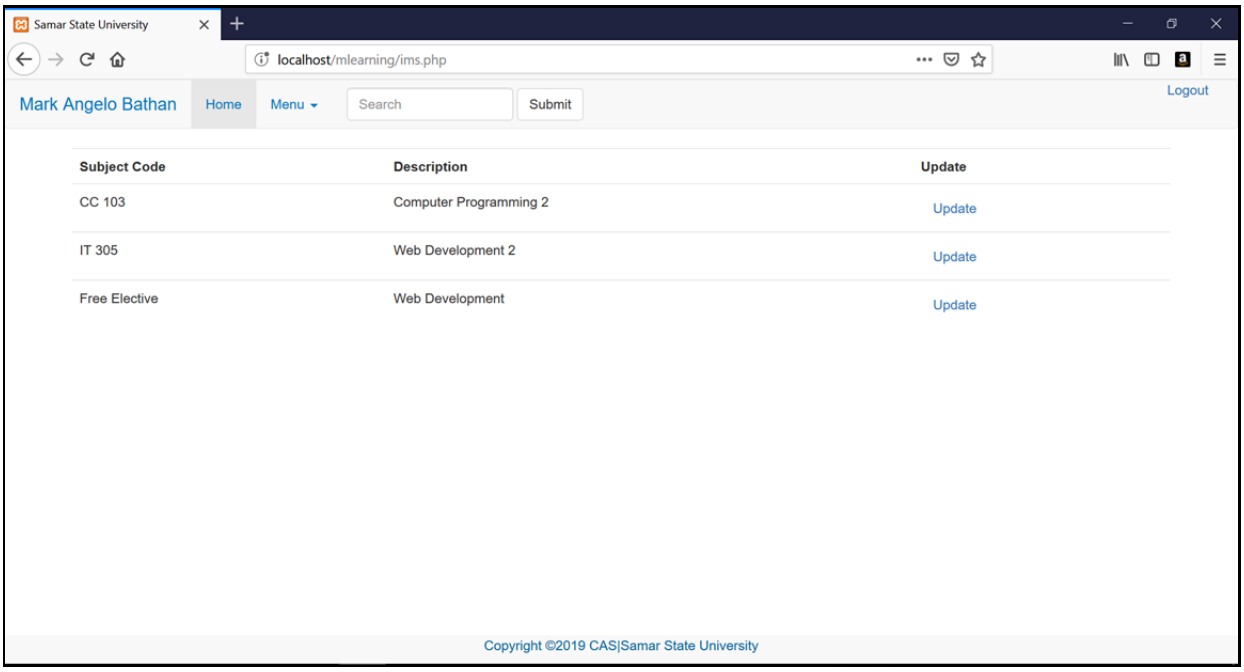

Figure 13. **Accessibility of the Instructional Materials**

Figure 13 is the system design provision for control, management and access of instructional materials. In connection to this, teachers and administrator account has a full control for this particular system functions. Student account can only utilized this feature by viewing and downloading all uploaded IMs by the teachers.

C. Student Evaluation & Monitoring

Another key design parameters that has been considered in the development of the system is the student evaluation and Monitoring. Student evaluation and monitoring is a system functionalities and processes that refers to the auto-calculation of student performance and attendance monitoring.

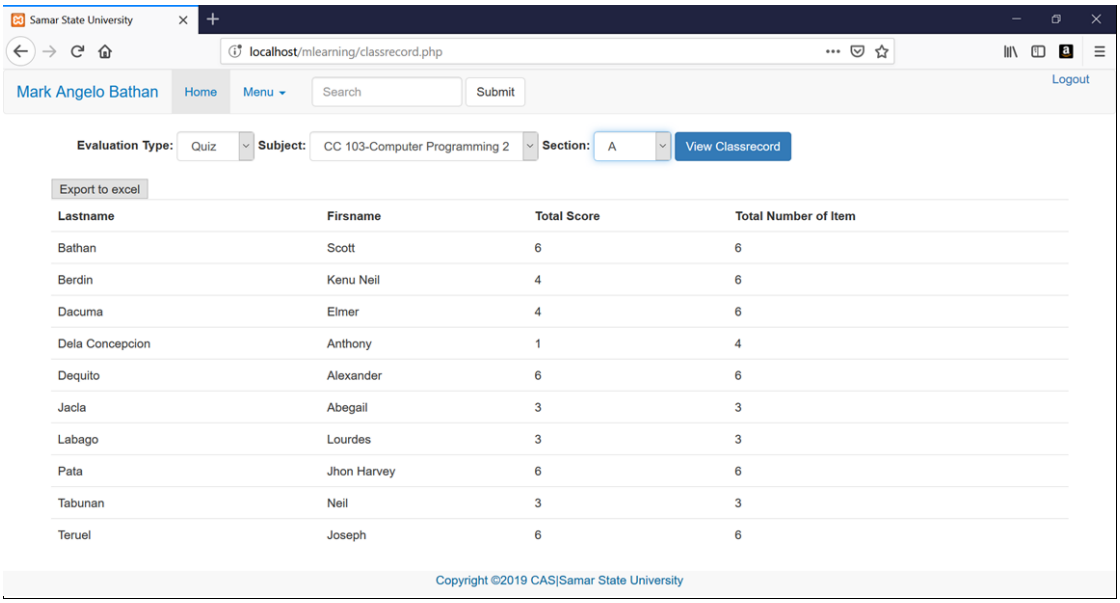

Figure 14. **Student Evaluation & Monitoring**

The auto-calculation of student performance is shown and describe in figure 14. As indicated in the figure, the individual scores of students in a particular class activity are automatically generated. Other information are also included on this system functions such Subject description, subject Code, etc. Note, that this feature are fully accessible and can be controlled by both the administrator account and teacher account. Student account has a limited control on this features, i.e. students can only access and view their individual ratings.

On the other hand, attendance registration can be done via QR code. In other words, students only need to scan their QR code for them to be registered as present on a particular class. Figure 15) shows the QR codes attendance registration of the system – the sample QR codes and sample attendance records.

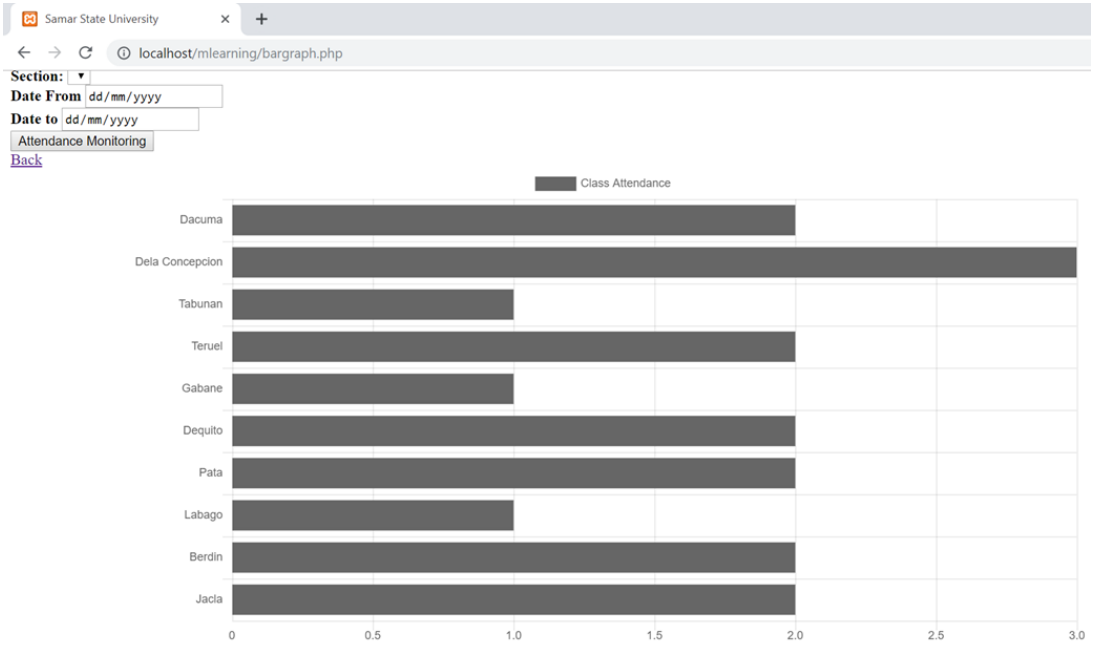

Figure 15. **Attendance Monitoring: Scan QR Code**

Assessment of System Functionality and Acceptability

System Functionality and Acceptability has been assessed both by the experts and end-users as describe in chapter 3. Hence two sets of evaluation questionnaires have been used. However, end-users are further categorized into two – (1) the faculty members and (2) the students. There were a total of 35 students and 15 faculty members who were selected as respondents in the beta testing conducted.

Ten (10) technical experts were selected as respondents. They were to provide technical suggestions or recommendations on the technologies used in the system.

The beta testing was conducted for 2 weeks, from April 22 – May 6, 2019. A five-point hedonic scale as was used in the evaluation of the end-user responses as follows: (a) 5 – Highly Acceptable (HA); (b) 4 – Acceptable (A); (c) 3 – Moderately Acceptable

(MA); (d) 2 – Slightly Acceptable (SL) and (c) 1 – Not Acceptable (NA). While a percentile-based evaluation was used in measuring the responses of the technical experts.

A. System Functionality and Acceptability as Evaluated by End-users

System workability and acceptability have been measured based on the following criteria – (1) Interface, (2) input design, and (4) output design. This has been evaluated by total of 50 end-user respondents. Out of 50 end-user respondents 35 were students while 15 were faculty members. Table 3, indicates the respondents' distribution.

Table 3

Distribution of End-Users as Respondents

End – User	TOTAL
Students	35
Faculty	15
TOTAL	**50**

Based on the student assessment, system interface has been evaluated to be "Highly Acceptable" with a computed mean of 4.57 as indicated in table 4. From among the Interface design criteria, the provision on five interface design criterions received a rating of "highly acceptable" while the other five criterions have been rated as "acceptable". Further, form among the interface design criterion, the provision on "environment navigating system" received the highest with a computed mean of 4.81 which is highly acceptable.

Table 4

Student Evaluation on System Interface Design

System Interface Design Criteria	SCALE					Weighted Mean	Interpretation
	5	4	3	2	1		
1. Interface provides user with an appropriate environment for navigating the system.	27	7	1	0	0	4.74	Highly Acceptable
2. The organization of the system is clear, logical and effective.	27	6	2	0	0	4.71	Highly Acceptable
3. The system is attractive and interesting; it motivates users to continue using the system.	21	12	2	0	0	4.54	Highly Acceptable
4. Users can navigate through the system independently without difficulty.	17	17	1	0	0	4.46	Acceptable
5. The system introduces a user to an easy to follow and consistent navigation system.	23	9	3	0	0	4.57	Highly Acceptable
6. The language in the program is clear to the intended audience.	21	11	3	0	0	4.51	Highly Acceptable
7. Graphics, audio, video, and/or animations add to the functionality of the system.	22	10	2	1	0	4.40	Acceptable
8. Help options are comprehensive and readily available.	24	9	1	1	0	4.60	Highly Acceptable
9. Text is clear and printed in type suitable for target audience.	18	13	3	1	0	4.37	Acceptable
10. Spelling, punctuation and grammar are correct.	27	7	1	0	0	4.74	Highly Acceptable
Average Mean						**4.57**	**Highly Acceptable**

4.51 – 5.00 Highly Acceptable
3.51 – 4.50 Acceptable
2.51 – 3.50 Moderately Acceptable
1.51 – 2.50 Slightly Acceptable
1.00 – 1.50 Not Acceptable

Table 5

Student Evaluation on System Input Design

System Interface Design Criteria	SCALE					Weighted Mean	Interpretation
	5	4	3	2	1		
1. Interface provides user with an appropriate environment for navigating the system.	32	3	0	0	0	4.91	Highly Acceptable
2. The organization of the system is clear, logical and effective.	21	11	3	0	0	4.51	Highly Acceptable
3. The system is attractive and interesting; it motivates users to continue using the system.	20	13	2	0	0	4.51	Highly Acceptable
4. Users can navigate through the system independently without difficulty.	18	16	1	0	0	4.49	Acceptable
5. The system introduces a user to an easy to follow and consistent navigation system.	24	9	1	1	0	4.60	Highly Acceptable
6. The language in the program is clear to the intended audience.	21	7	7	0	0	4.40	Acceptable
7. Graphics, audio, video, and/or animations add to the functionality of the system.	17	14	4	0	0	4.37	Acceptable
8. Help options are comprehensive and readily available.	16	16	3	0	0	4.37	Acceptable
9. Text is clear and printed in type suitable for target audience.	25	7	3	0	0	4.63	Highly Acceptable
. Spelling, punctuation and grammar are correct.	24	6	5	0	0	4.54	Highly Acceptable
Average Mean						**4.52**	**Highly Acceptable**

4.51 – 5.00 Highly Acceptable
3.51 – 4.50 Acceptable
2.51 – 3.50 Moderately Acceptable
1.51 – 2.50 Slightly Acceptable
1.00 – 1.50 Not Acceptable

Table 5 shows the system functionality and acceptability based on System Input Design criteria as evaluated by the student. As reflected on the table, the general computed mean for System Input Design is 4.52 with a descriptive rating of “highly acceptable”. Out of 10 input design criterions, 3 received a descriptive rating of “highly acceptable”, while the rest has a descriptive rating of “acceptable”.

Table 6

Student Evaluation on System Output

System Output Design Criteria	SCALE					Weighted Mean	Interpretation
	5	4	3	2	1		
1. The system keeps the display simple and consistent.	30	4	1	0	0	4.83	Highly Acceptable
2. The content is free from spelling and grammatical errors.	23	9	3	0	0	4.57	Highly Acceptable
3. The information is clear, concise and informative to the intended audience.	22	12	1	0	0	4.60	Highly Acceptable
4. The content is as extensive and original as possible.	24	8	3	0	0	4.60	Acceptable
5. The content is presented through the appropriate use of text, graphics and animation.	19	12	4	0	0	4.43	Acceptable
6. The content is displayed in digestive quantity.	22	8	4	1	0	4.46	Acceptable
7. Useful information like author, date created and updated and other factual data are clearly listed and available.	21	10	4	0	0	4.49	Acceptable
8. Use of valuable animation, graphics and sounds benefit the users.	15	12	7	1	0	4.17	Acceptable
9. The system can generate reports or printouts	17	10	7	1	0	4.23	Acceptable
10. Printouts are dated clearly and well organized.	15	13	5	2	0	4.17	Acceptable
Average Mean						**4.45**	**Acceptable**

4.51 – 5.00 Highly Acceptable
3.51 – 4.50 Acceptable
2.51 – 3.50 Moderately Acceptable
1.51 – 2.50 Slightly Acceptable
1.00 – 1.50 Not Acceptable

Table 6 shows the results of the Output Design assessment of the system which has an overall descriptive rating of "Acceptable". In other words, the reports generated and output graphical user interface is in conformity with that of the output expectation of the students.

In summary, students' evaluation indicates that the system has an over-all functionality and acceptability rating of "highly acceptable" as being defined by the general average mean of 4.51 as shown in table 7. In fact, two (2) of the systems functionality and acceptability indicators received a descriptive rating of "highly acceptable" and one (1) received "acceptable" with an average mean ranges from 4.40 – 4.50.

Table 7

General Student Evaluation Result on System Workability and Acceptability

System Workability and Acceptability Indicators	Weighted Mean	Descriptive Rating
Interface	4.57	Acceptable
Input	4.52	Acceptable
Output Design	4.45	Acceptable
General Weighted Mean	**4.51**	**Highly Acceptable**

4.51 – 5.00 Highly Acceptable
3.51 – 4.50 Acceptable
2.51 – 3.50 Moderately Acceptable
1.51 – 2.50 Slightly Acceptable
1.00 – 1.50 Not Acceptable

On the other hand, the system has been evaluated also by the faculty who are going to used it. It has been noted that the total number of faculty-respondents as end users is 15 coming from the different Colleges of the University. Further, the system is being evaluated with the same workability and acceptability criteria with that of student workability and acceptability criteria. However, both the faculty and students have different system user interface design, functions and processes.

Table 8

Faculty Evaluation Result on System Interface Design

System Interface Design Criteria	SCALE					Weighted Mean	Interpretation
	5	4	3	2	1		
1. Interface provides user with an appropriate environment for navigating the system.	11	4	0	0	0	4.73	Highly Acceptable
2. The organization of the system is clear, logical and effective.	10	4	1	0	0	4.60	Highly Acceptable
3. The system is attractive and interesting; it motivates users to continue using the system.	8	7	0	0	0	4.53	Highly Acceptable
4. Users can navigate through the system independently without difficulty.	5	10	0	0	0	4.33	Acceptable
5. The system introduces a user to an easy to follow and consistent navigation system.	10	5	0	0	0	4.67	Highly Acceptable
6. The language in the program is clear to the intended audience.	8	6	1	0	0	4.47	Acceptable
7. Graphics, audio, video, and/or animations add to the functionality of the system.	9	4	2	0	0	4.47	Acceptable
8. Help options are comprehensive and readily available.	5	9	1	0	0	4.20	Acceptable
9. Text is clear and printed in type suitable for target audience.	8	5	1	1	0	4.33	Acceptable
10. Spelling, punctuation and grammar are correct.	8	4	3	0	0	4.33	Acceptable
Average Mean						**4.47**	**Acceptable**

4.51 – 5.00 Highly Acceptable
3.51 – 4.50 Acceptable
2.51 – 3.50 Moderately Acceptable
1.51 – 2.50 Slightly Acceptable
1.00 – 1.50 Not Acceptable

Table 8 shows the evaluation result on System Interface as evaluated by faculty. It can be gleaned from the table that the computed average mean for System interface design is 4.47 with a descriptive rating of "acceptable". This result indicates that the system interface design adheres to the interface design requirements as suggested by the faculty.

Table 9

Faculty Evaluation Result on System Input Design

System Input Design Criteria	SCALE					Weighted Mean	Description
	5	4	3	2	1		
1. Input screens are designed for user convenience.	14	1	0	0	0	4.93	Highly Acceptable
2. There is an efficient input and data entry methods.	5	7	3	0	0	4.13	Acceptable
3. There is a logical sequence of data entry.	5	8	2	0	0	4.20	Acceptable
4. There are common expressions used to identify fields.	6	7	2	0	0	4.27	Acceptable
5. There are provisions for input verification and control.	9	3	1	2	0	4.27	Acceptable
6. There is clarity of error and feedback messages.	7	5	3	0	0	4.27	Acceptable
7. Simple labels are used to simplify data entry.	9	4	1	1	0	4.40	Acceptable
8. Emails and contact details are visible for making contact	3	10	2	0	0	4.07	Acceptable
9. Help options are comprehensive and readily available.	10	2	3	0	0	4.47	Acceptable
10. Language used in the text of the system is clear and concise.	8	6	1	0	0	4.47	Acceptable
Average Mean						**4.35**	**Acceptable**

4.51 – 5.00 Highly Acceptable
3.51 – 4.50 Acceptable
2.51 – 3.50 Moderately Acceptable
1.51 – 2.50 Slightly Acceptable
1.00 – 1.50 Not Acceptable

Table 9 shows that the majority of the faculty-respondents rated the input design criteria of the system as "Acceptable" with a computed mean of 4.35. Again, the result indicates that the actual input design of the system conforms to that of the faculty expectation.

Table 10

Faculty Evaluation Results on System Output Design

System Output Design Criteria	SCALE					Weighted Mean	Description
	5	4	3	2	1		
1. The system keeps the display simple and consistent.	11	4	0	0	0	4.73	Highly Acceptable
2. The content is free from spelling and grammatical errors.	7	7	1	0	0	4.40	Acceptable
3. The information is clear, concise and informative to the intended audience.	6	6	3	0	0	4.20	Acceptable
4. The content is as extensive and original as possible.	7	7	1	0	0	4.40	Acceptable
5. The content is presented through the appropriate use of text, graphics and animation.	6	6	2	1	0	4.13	Acceptable
6. The content is displayed in digestive quantity.	7	5	2	1	0	4.20	Acceptable
7. Useful information like author, date created and updated and other factual data are clearly listed and available.	8	3	4	0	0	4.27	Acceptable
8. Use of valuable animation, graphics and sounds benefit the users.	3	6	4	2	0	3.67	Acceptable
9. The system can generate reports or printouts	10	5	0	0	0	4.67	Highly Acceptable
10. Printouts are dated clearly and well organized.	10	3	2	0	0	4.53	Highly Acceptable
Average Mean						**4.32**	**Acceptable**

4.51 – 5.00 Highly Acceptable
3.51 – 4.50 Acceptable
2.51 – 3.50 Moderately Acceptable
1.51 – 2.50 Slightly Acceptable
1.00 – 1.50 Not Acceptable

Table 10, it shows the results of the Output Design evaluation. Results indicates that the computed mean is 4.32 with a descriptive rating of "acceptable".

In general, Table 11 shows the over-all system evaluation results based on the perception of Faculty-respondents. As indicated in the table, the general computed mean is 4.38 with a descriptive rating of "acceptable". Hence, it assumes that the developed

system conforms to the over-all standard based on the perception of the faculty-respondents as one of the end-user of the system.

Table 11

General Faculty Evaluation Result on System Workability and Acceptability

System Workability and Acceptability Indicators	Weighted Mean	DESCRIPTION
Interface	4.47	Acceptable
Input	4.35	Acceptable
Output Design	4.42	Acceptable
General Average Mean	**4.38**	**Acceptable**

4.51 – 5.00 Highly Acceptable
3.51 – 4.50 Acceptable
2.51 – 3.50 Moderately Acceptable
1.51 – 2.50 Slightly Acceptable
1.00 – 1.50 Not Acceptable

In summary, the designed and develop system has an over-all functionality and acceptability level of "acceptable" with a computed general average mean of 4.44. The results indicate that the system graphical user interfaces and the associated functionalities/processes as defined by the Interface, Input and Output Design indicators generally passed the standard requirements of the end-users – both the students and the faculty. Also, results indicates that the system has an acceptable processing performance level. The said results are indicated in table 12.

Table 12

Over-all End-Users Evaluation Results of the System

System Workability and Acceptability Indicators	Student Evaluation	Faculty Evaluation	Average Mean	Description
Interface	4.50	4.50	4.50	Acceptable
Input	4.45	4.42	4.44	Acceptable
Output Design	4.40	4.40	4.40	Acceptable
General Average Mean			**4.44**	Acceptable

B. System Functionality and Acceptability as Evaluated by Technical Experts

To further ensure the functionality and acceptability level of the system, this has been subjected for further assessment of technical experts. The concern of technical experts is on the technical details of the system design and in order to eliminate technical and end-user biases, the same functionality and acceptability criteria has been used. However, in technical evaluation a YES/NO checklist method instead of five-point hedonistic level was used. This is because technical experts do not concern on the extent of the system workability and acceptability level but rather looks only into the presence and absence of the technical requirements as defined on each indicator.

In particular, 100% of the technical experts believed that the technical details and/or components required on System Input Interface design has been available and made functional in the system itself. The results indicate that technical experts believe that all interface indicators are available and functional.

Table 13

Technical Experts Input Design Interface Evaluation

System Input design indicator	Frequency		Percent Indicator
	Yes	No	
1. Input screens are designed for user convenience.	10	0	100%
2. There is an efficient input and data entry methods.	10	0	100%
3. There is a logical sequence of data entry.	10	0	100%
4. There are common expressions used to identify fields.	10	0	100%
5. There are provisions for input verification and control.	10	0	100%
6. There is clarity of error and feedback messages.	10	0	100%
7. Simple labels are used to simplify data entry.			
8. Emails and contact details are visible for making contact	10	0	100%
9. Help options are comprehensive and readily available.	10	0	100%
10. Language used in the text of the system is clear and concise.	10	0	100%
Average	**10**	**0**	**100%**

Table 14, shows the technical experts' evaluation results on the output design of the system. From the table, it is indicated that 100% of the respondents agrees the availability of the functions and processes of the system output generation.

Table 14

Technical Experts Output Design Evaluation

System Input design indicator	Frequency		Percent Indicator
	Yes	No	
1. The system keeps the display simple and consistent.	10	0	100%
2. The content is free from spelling and grammatical errors	10	0	100%
3. The information is clear, concise and informative to the intended audience.	10	0	100%
4. The content is as extensive and original as possible.	10	0	100%
5. The content is presented through the appropriate use of text, graphics and animation.	10	0	100%
6. The content is displayed in digestive quantity.	10	0	100%
7. Useful information like author, date created and updated and other factual data are clearly listed and available.	10	0	100%
8. Use of valuable animation, graphics and sounds benefit the users.	10	0	100%
9. The system can generate reports or printouts	10	0	100%
10. Printouts are dated clearly and well organized.	10	0	100%
Average	**10**	**0**	**100%**

Further, table 15 indicates the Database design of the system. Note that considering the technical complexity in understanding the details of the database structures and design, this parameter has not been included as part of the Workability and Acceptability criteria on the part of the end-users. On this, the table indicates that 100% of the respondents indicates an affirmative response in all indicators stipulated in the table. This result imply that the database design is within the acceptable standards.

Table 15

Technical Experts Database Design Evaluation

System Input design indicator	Frequency		Percent Indicator
	Yes	No	
1. Each record contains a unique identifier as the primary key	10	0	100%
2. Fields represent distinct characteristics of the subject	10	0	100%
3. Records are easily stored and retrieved.	10	0	100%
4. There are provisions for database backup facility.	10	0	100%
5. There are provisions for database security.	10	0	100%
6. Database can accommodate the changing data needs within organization	10	0	100%
7. Database is ready and flexible for future plans like systems upgrade.	10	0	100%
8. Necessary technical documentation is included	10	0	100%
9. Database structure to suit different types of user needs	10	0	100%
10. Database structure avoids duplicate entry in the system.	10	0	100%
Average	**10**	**0**	**100%**

In general, it can be observed that experts have a positive response in the workability and acceptability of the system in terms of technical aspect. In in table 20, 100% of the respondents agrees the workability and acceptability of the developed system.

Table 16

Technical Experts Overall Evaluation on the Workability and Acceptability of the System

System Workability and Acceptability Indicators	Percent indicator
Interface	100%
Input	100%
Database Design	100%
Average	**100%**

In summary, the workability and acceptability of the designed and developed system is found to be generally acceptable by both the end-users and technical experts. The workability and acceptability encompass the functionality of the system, technical merits and the associated processes.

Processing Performance of the Developed System

System Design, its functionality and acceptability is deemed to be useless if its efficiency and effectiveness level is not good. Thus, the system has been further evaluated in terms of its processing performance particularly its (1) efficiency and (2) effectiveness level. Results of the evaluation are indicated in subsequent paragraphs.

A. Efficiency Level of the System

The efficiency level of the system has been evaluated using a rubrics that defines the efficiency. Note however that, efficiency level performance of the system has been evaluated only by the technical experts considering that efficiency parameters are technical in nature. Table 17 shows the evaluation results of the efficiency level of the system.

Table 17

Efficiency Level of the System

Efficiency Indicators/Parameters	Scale			Average	Description
	3	2	1		
1. The system operates at an acceptable speed.	30	0	0	3.0	Very efficient
2. There is accuracy of data processing.	30	0	0	3.0	Very efficient
3. System can handle predicted volumes of data in a timely and efficient manner.	30	0	0	3.0	Very efficient
4. The system uses internal search facility to let users find what they want quickly and efficiently.	30	0	0	3.0	Very efficient
5. The system is compatible and efficient to most operating systems available.	30	0	0	3.0	Very efficient
Average mean				**3.0**	**Very efficient**

2.6 – 3.0 Very efficient
1.6 -2.5 efficient
1.0 – 1.5 Not efficient

As indicated on table 17, the system is found to be very efficient based on the evaluation results having an efficiency level indicator of 3.0 which has a descriptive rating of 'very efficient'. In particular, the level of efficiency has been evaluated by observing the performance of the system while it is on its actual operations and used. Observation has been made by technical experts following the rubrics that defines the different efficiency parameters.

B. Effectiveness of the System

The effectiveness of the system has been evaluated in different system effectiveness indicators. The said effectiveness indicators are in accordance to the system general operations and functions. On this, it has been found out that the system is found to be 'very effective' as evaluated by technical experts and users. Table 18 shows the effectiveness evaluation results of the systems.

Table 18

Effectiveness Level of the System

Effectiveness Indicators/Parameters	Scale			Average	Description
	3	2	1		
1. The system is found to be effective in providing an automated e-learning services	30	0	0	3.0	Very effective
2. The system is found to be effective in terms of management, control and access of instructional materials	30	0	0	3.0	Very effective
3. The system is found to be effective in terms of auto-registration and monitoring of students attendance	30	0	0	3.0	Very effective
4. The system security and access features is found to be effective as it is being customized based on the type of user	30	0	0	3.0	Very effective
5. The system over-all graphic design, interface design and process is effective as it captures the needs of the users	30	0	0	3.0	Very effective
Average mean				**3.0**	**Very effective**

2.6 – 3.0 Very effective
1.6 -2.5 Effective
1.0 – 1.5 Not Effective

C. Security

Based on the respondents, the system has a high security level. The personal information provided by the user is only accessible by the user alone. Every user go through a login (providing username and password) process before using personal account. The credentials of the students like quizzes, exams and any other academic related activities is very confidential. Student can only access their own credentials and restricted to view others.

CHAPTER V

SUMMARY OF FINDINGS, CONSLUSIONS AND RECOMMENDATIONS

This chapter presents the significant findings, conclusions and recommendations of the study.

Summary of Findings

The following were the significant findings derived from the study.

1. The study develop a functional WiFi based classroom management system with a customized features and functionalities that are not present in the similar and existing system.
2. A Mobile Device: Wi-Fi Based Classroom Management System was developed. It gives access to both faculty members and students. The faculty member can give non-objective and objective type of quizzes and exams, upload instructional materials, check attendance through QR technology, and monitor students' performance.
3. Beta testing was conducted with 3 categories of respondents; Students, Faculty Members and Technical Experts. The system evaluation was conducted from April 22 to May 6, 2019 on the different departments of Samar State University-Main Campus.

Conclusions

Based on the above-mentioned findings, the following conclusions were considered:

1. The developed system contains features of classroom management such as giving quizzes, uploading instructional materials, checking attendance through QR technology, and monitoring students' performance which are not present on the existing system
2. The system met the objectives of the study. It was able to cater both functional and non-functional requirements needed by both students and faculty members. All features of the system were accomplished.
3. The data from the beta testing revealed that the system passed the evaluation on its, Interface, Input, Output Design, and Database. All technical experts agreed that the areas of evaluation mentioned in the questionnaire were present or incorporated in the system.
4. The data from the evaluation of the system's processing performance shows that the developed system is efficient, effective and secured.

Recommendations

Based on the results of the study, the following recommendations were considered significant to enhance the capability of the developed product.

1. Recommended for institutional implementation.
2. It was recommended that the system use high-end system materials such as a high-end Wi-Fi Router and a server where the system database will be installed.
3. A training program on how to use the system was recommended.

CHAPTER VI

PRODUCT TECHNICAL DESCRIPTION

I. Software Description

Table 19

Software Description

Software	Description
Sublime Text Editor	The application where the code has been written
XAMPP	The application that serves as the local web server and at same time database of the developed system
Web Browser	The application used for viewing the output of the developed system
Mobile Device: WiFi Based Classroom Management System	The developed system is designed to automate the manual or traditional way of teaching inside the classroom. The student's mobile devices like laptop, tablet, or mobile phone will be used as the tool for learning. The developed system is accessible using a web browser as long as the student is connected to the network that is provided. Using student's mobile device, accessing the instructional materials would be very easy and available for download. Monitoring student's performance will be a very task on the teacher's side. Since the evaluation is automated and attendance is checked via QR code.

II. Product Development

The researcher used the Fuzzy Front End (FFE) as the product development framework.

a. Identification of design criteria

b. Idea Analysis

c. Concept Genesis

d. Prototyping

e. Product Development

III. Cost and Benefit Analysis

Table 20

Cost and Benefit Analysis

ITEMS	AMOUNT
Server type Computer	65,000.00
Long range wifi router	5,500.00
Network cable	1,000.00
Total	**P 71,500.00**

IV. Operations Manual

Figure 16. **Mobile Learning Solution**

1. General purpose login page of the system. The administrator, teacher, and student will be using the same login page of the system
2. Sign-up. Registration for the student/s doesn't have an account yet.

Administrator

Figure 17. **Main page of the Administrator**

1. Menu. Show the different options that the administrator can do.
2. (a) Faculty. Page to add new faculty; (b) Subject. Page add new subject in the system; (c) School Year and Semester. Page to change school year and semester.
3. Search. Search a page needed.
4. Logout. Exit in the logged in account.

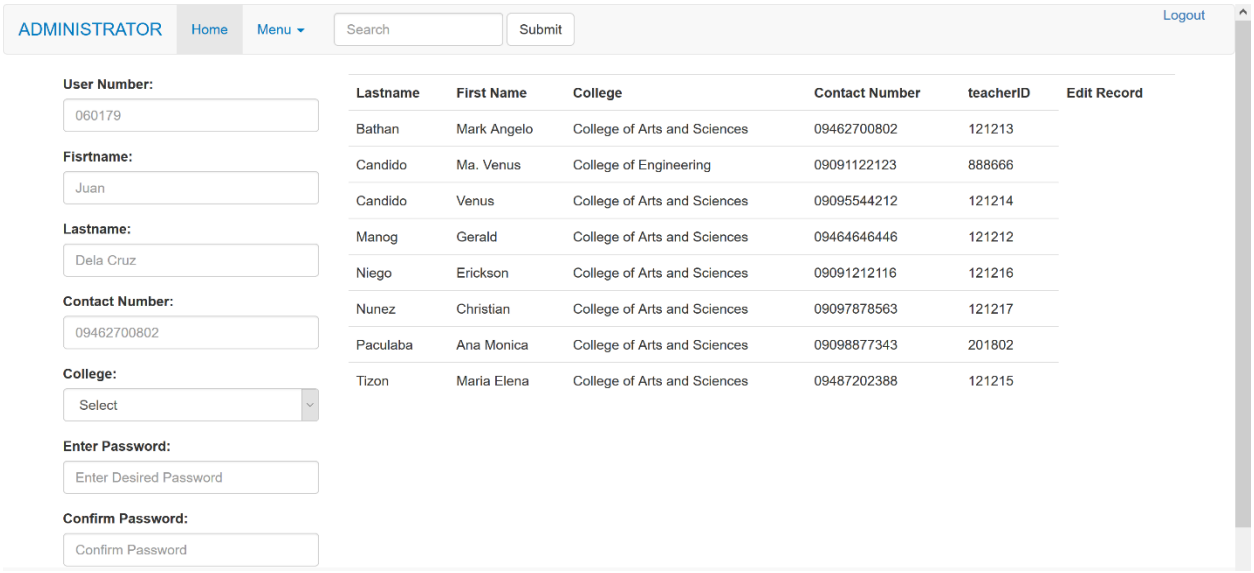

Figure 18. **Adding New Faculty**

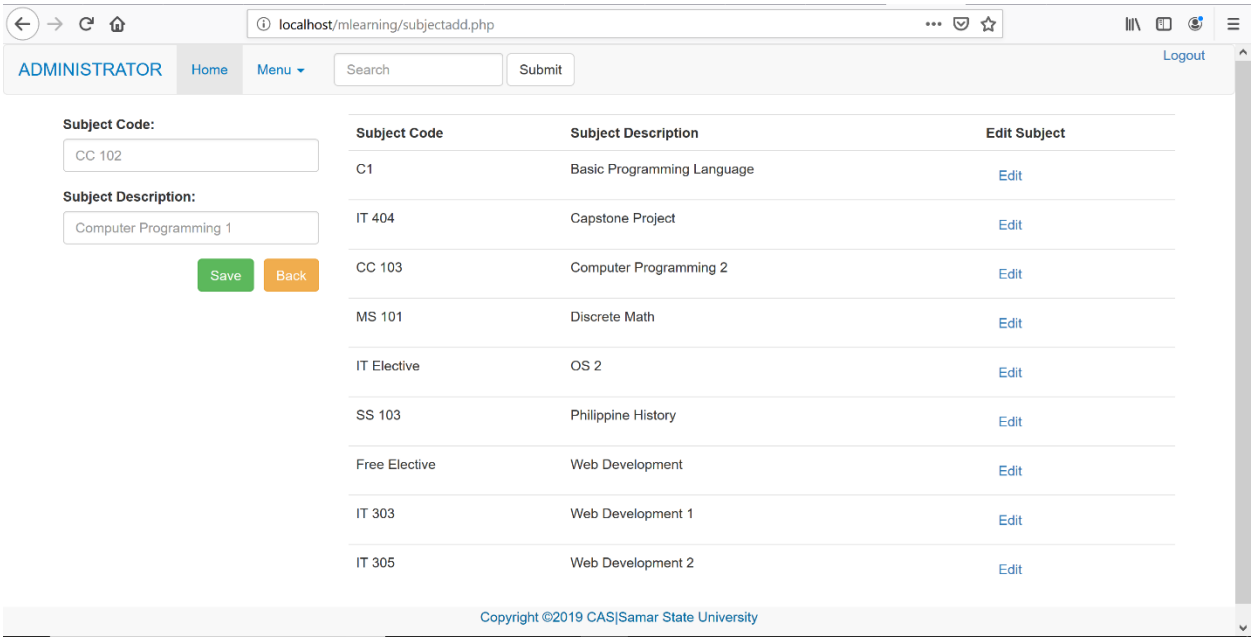

Figure 19. **Adding New Subject**

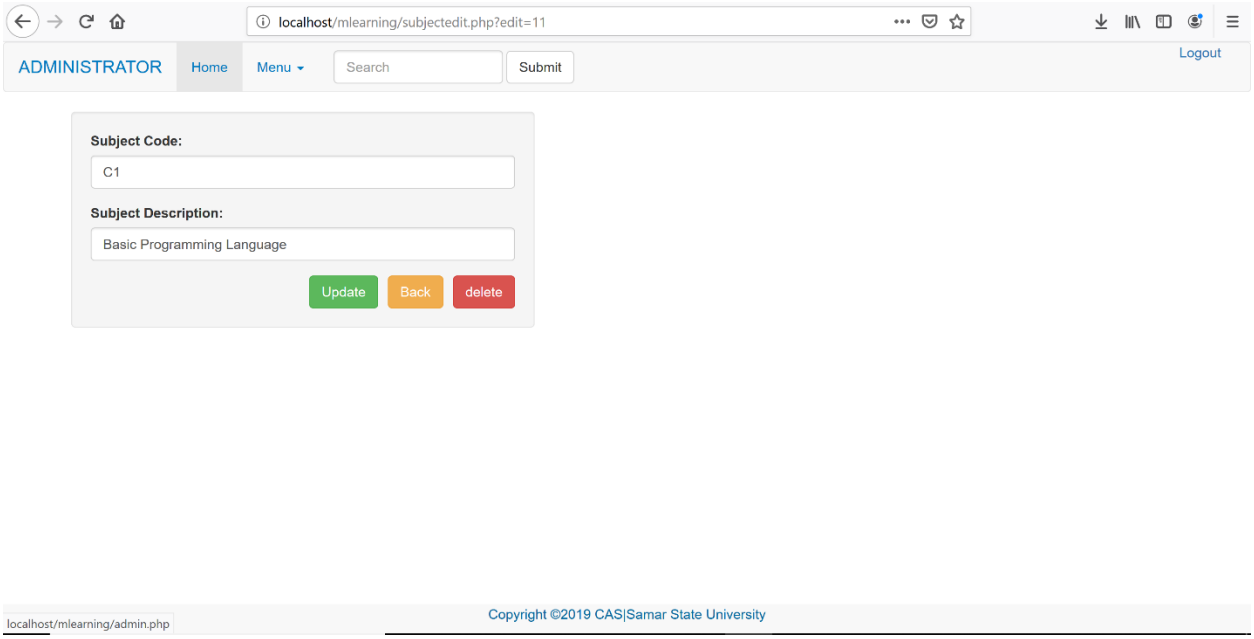

Figure 20. **Edit Subject's Information**

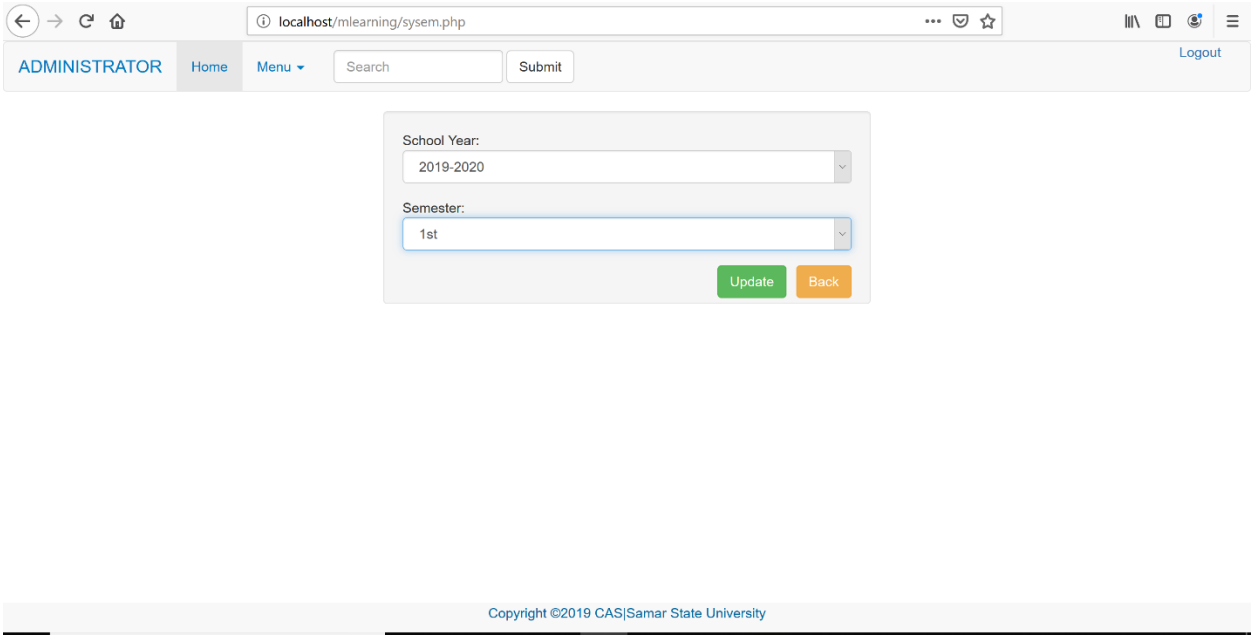

Figure 21. **Changing of School Year and Semester**

Teacher

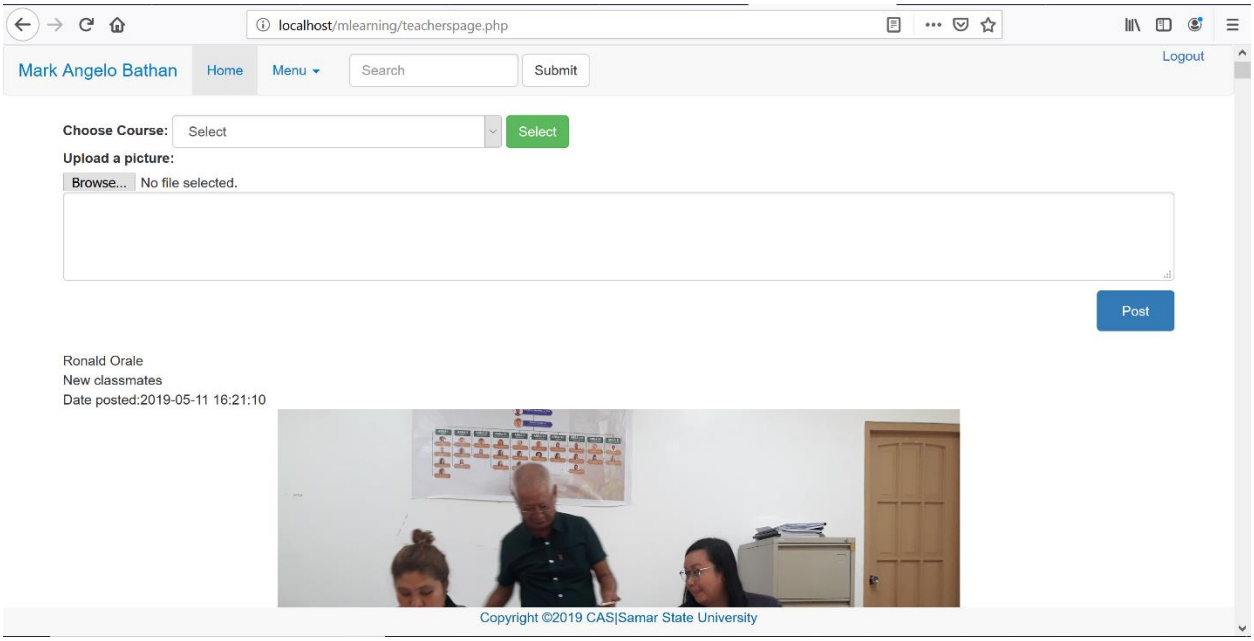

***Figure* 22. Teacher's main page**

Figure 22 is the teacher's main page. In this page teacher can view student's post and can also post something, like announcement or anything related to the subject. By clicking the Menu, the teacher will see the Subject Management, Instructional Material, Evaluation, Examination, Portfolio, Student List, Class Record, Attendance, and Settings.

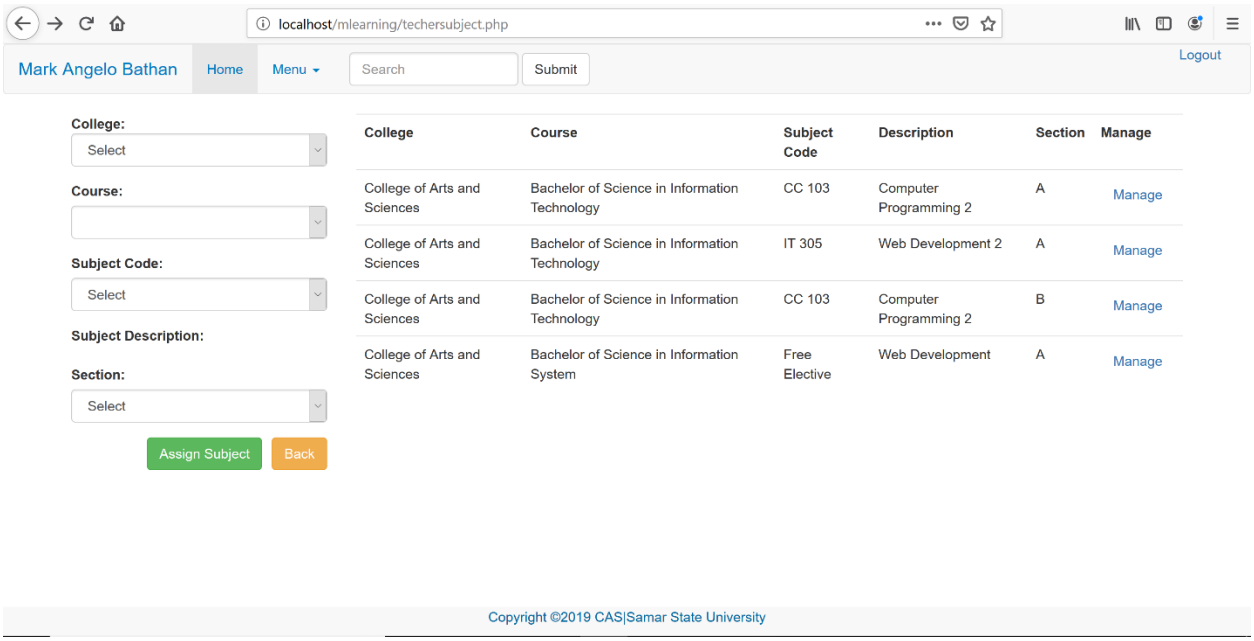

***Figure* 23. Subject Management**

Figure 23 is for Subject Management. This page is where the teacher get the subject assignment. Once the subject/s is already assigned, making some changes is still possible by just simply clicking the Manage link.

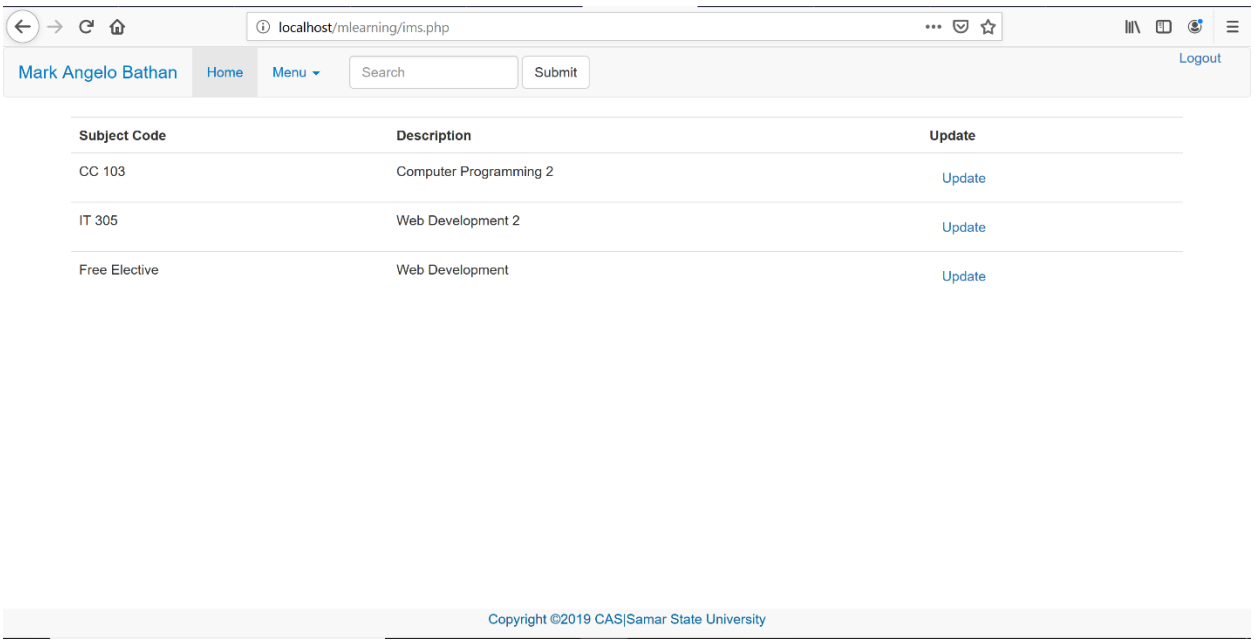

Figure 24. **Instructional Material**

By clicking Instructional Materials in the menu, the user will be directed to figure x. This page shows the subject/s that is being handled by the teacher. By clicking the Update link the user will be routed to figure x

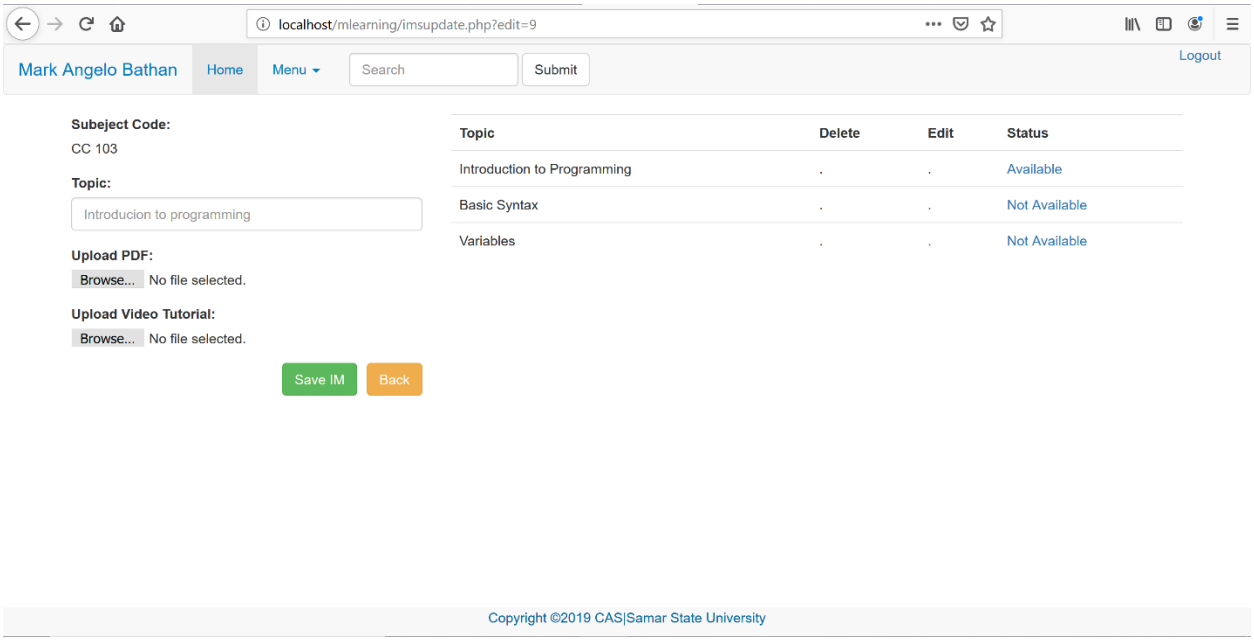

Figure 25. **Instructional Management**

Figure 25 is the page where the teacher upload the instructional materials in pdf format and video file. Making the instructional material available (accessible by the student) or not is in the hands of the teacher through this page. If the status is "Not Available" meaning the instructional material is not available on the student's side, click the link itself making the status "Available".

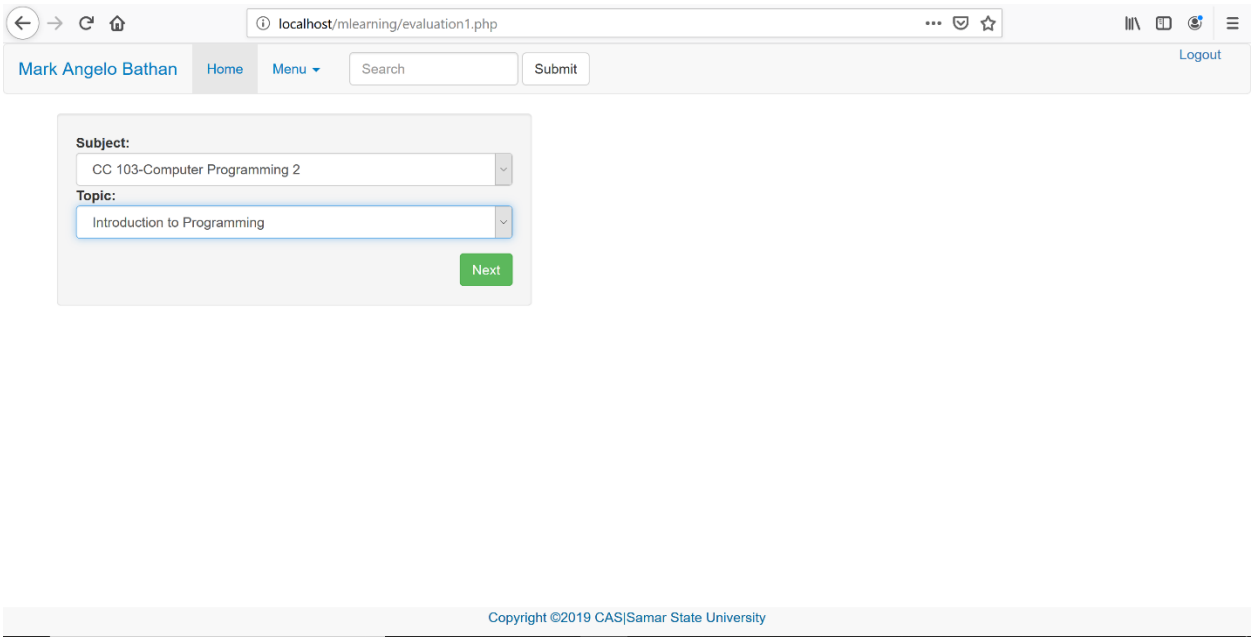

Figure 26. **Evaluation Page**

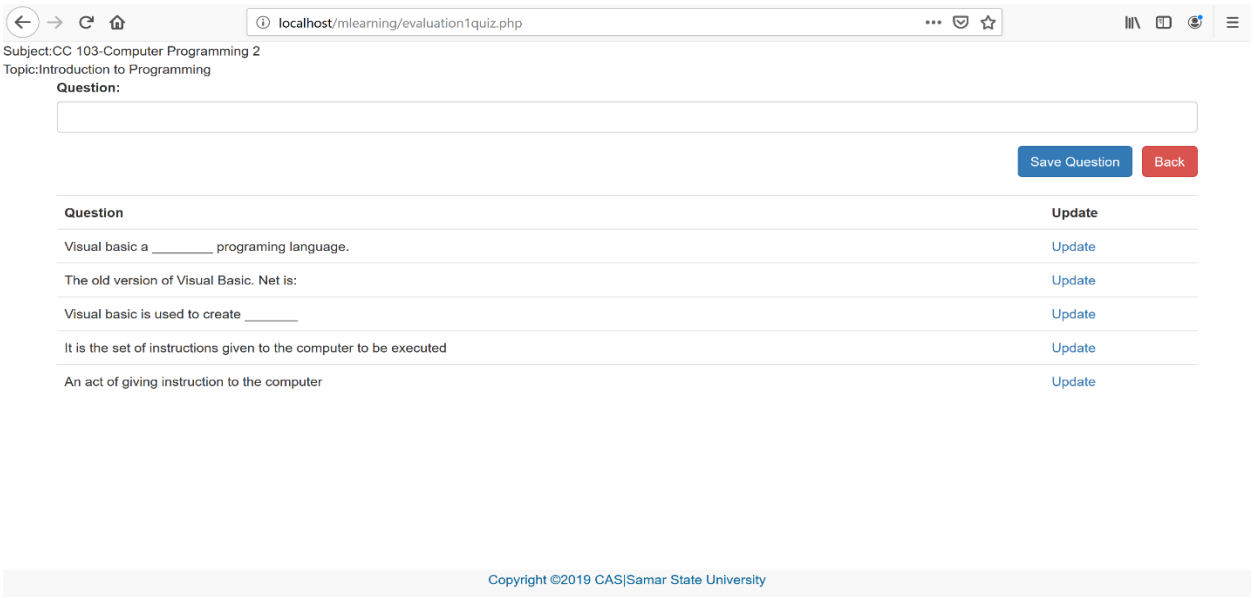

Figure 27. **Adding Question**

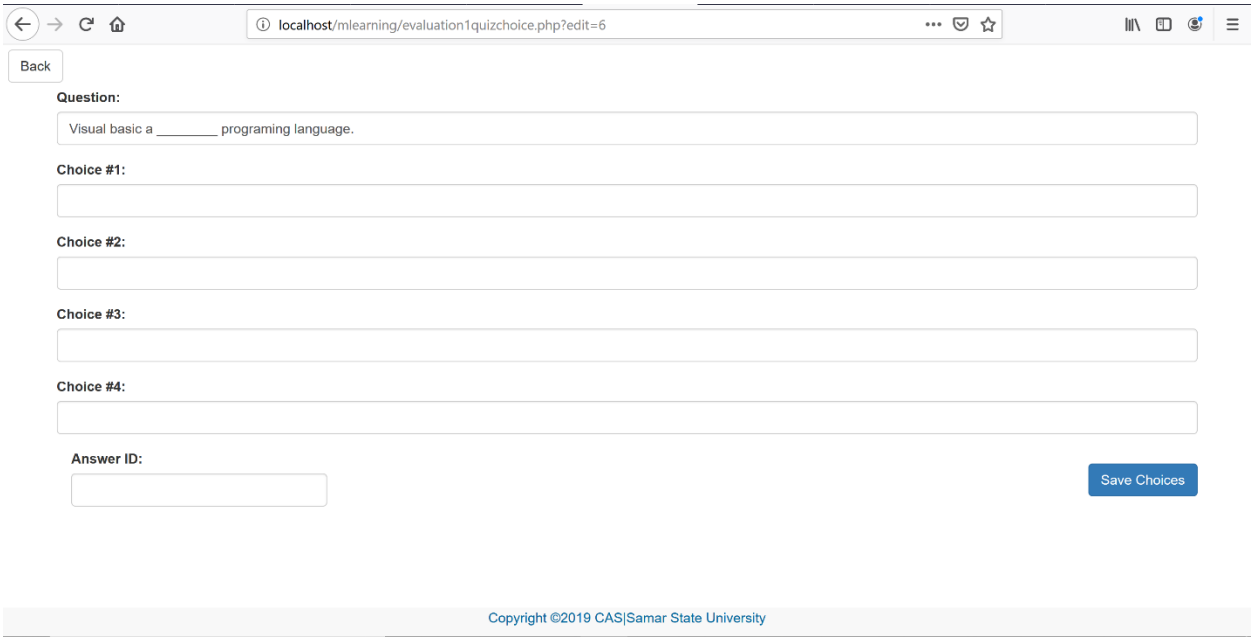

Figure 28. **Adding Choices**

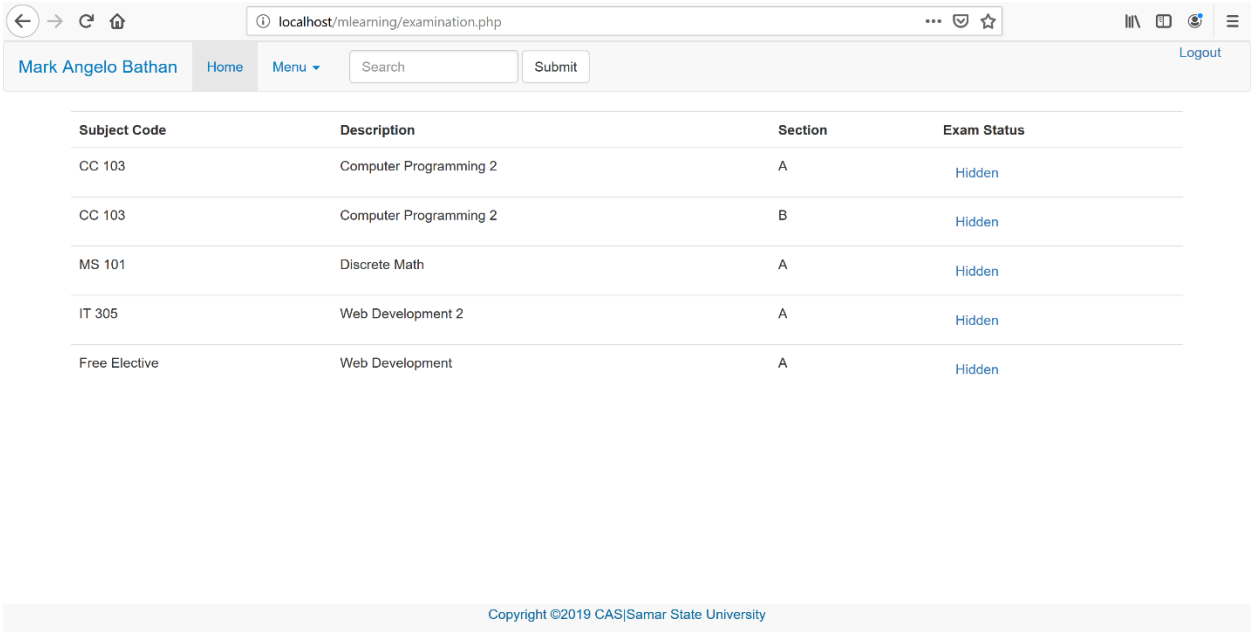

Figure 29. **Examination**

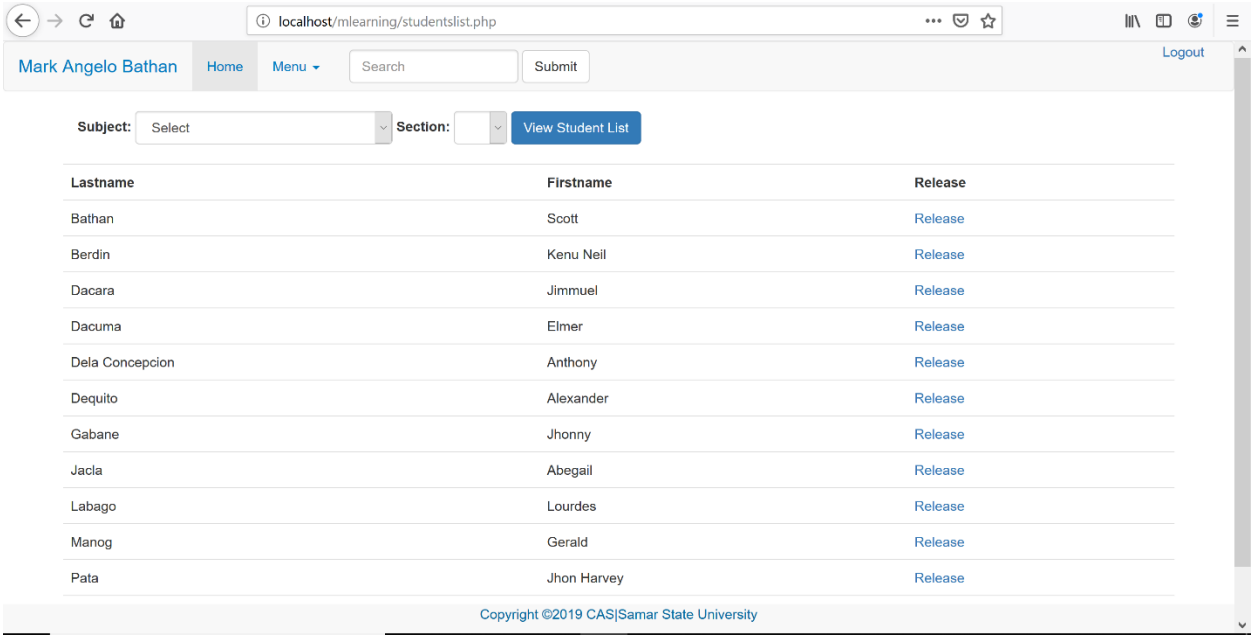

Figure 30. **Student list**

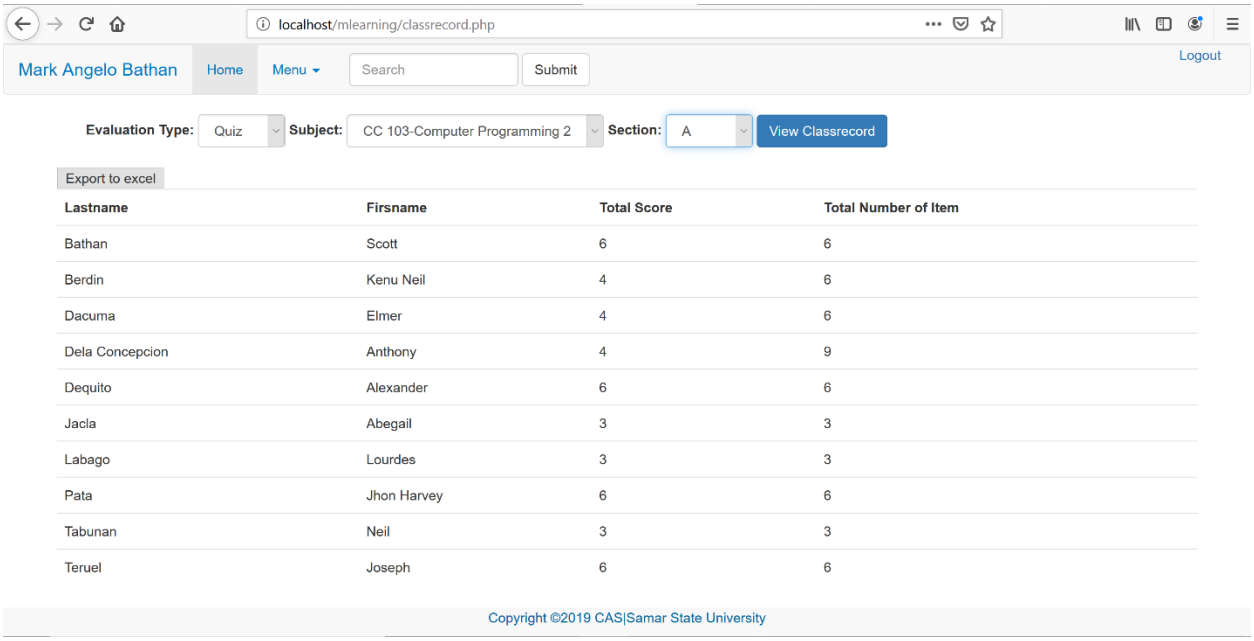

Figure 31. **Class Record**

Figure 32. **Attendance Monitoring**

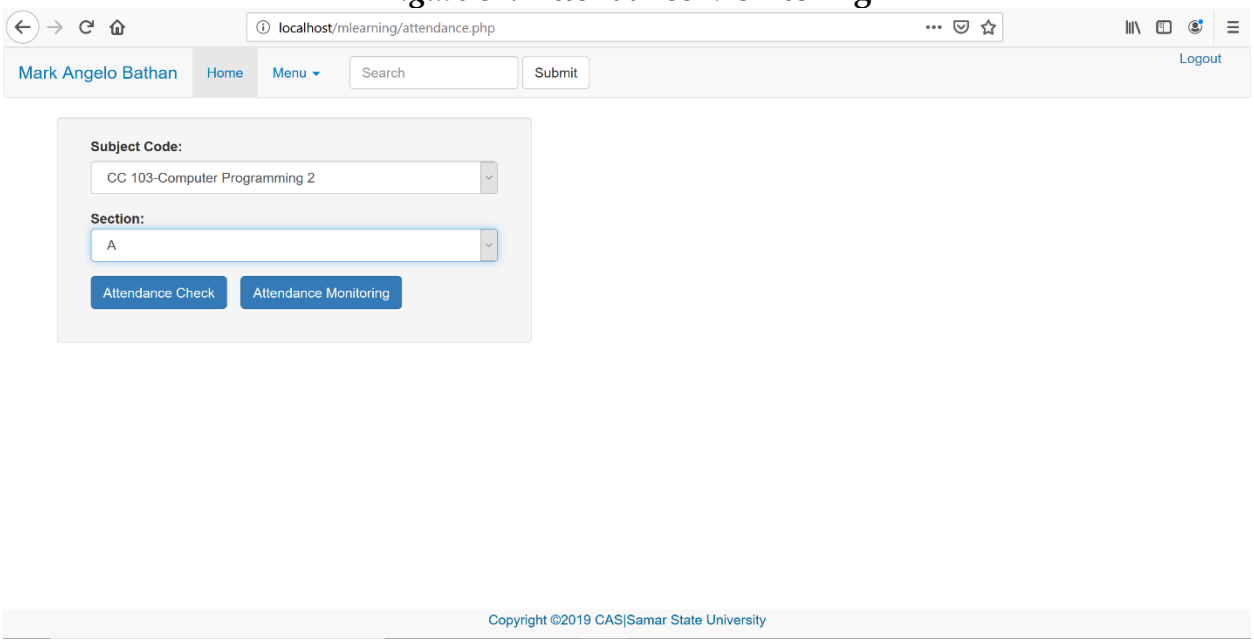

Figure 33. **Checking Attendance via QR code**

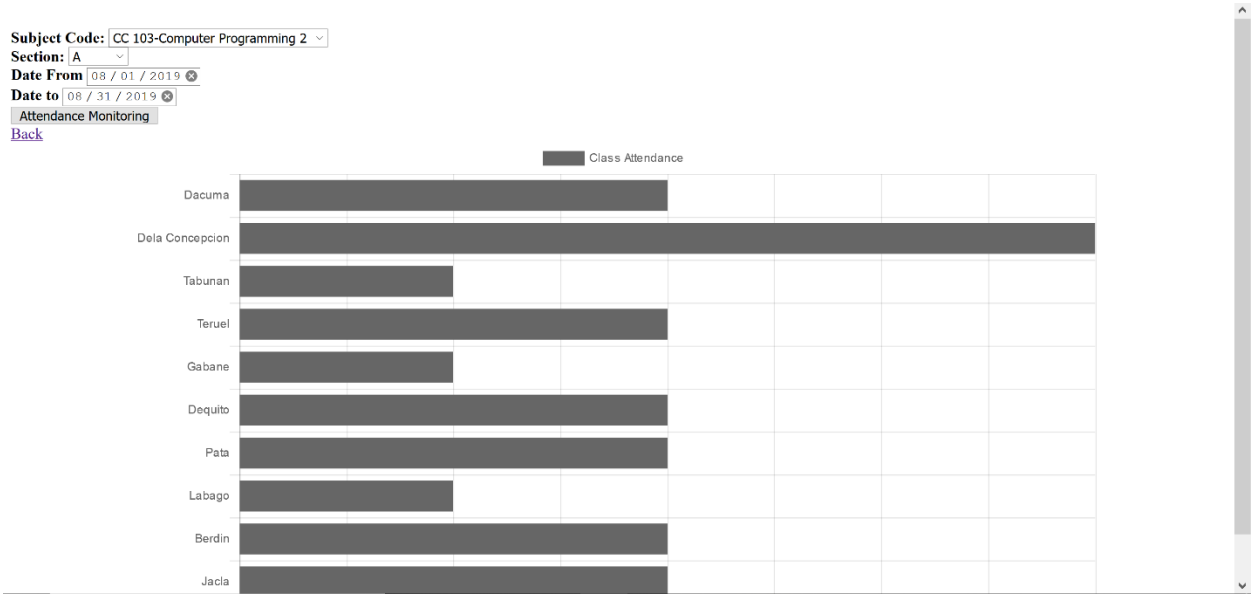

Figure 34. **Viewing student's attendance page**

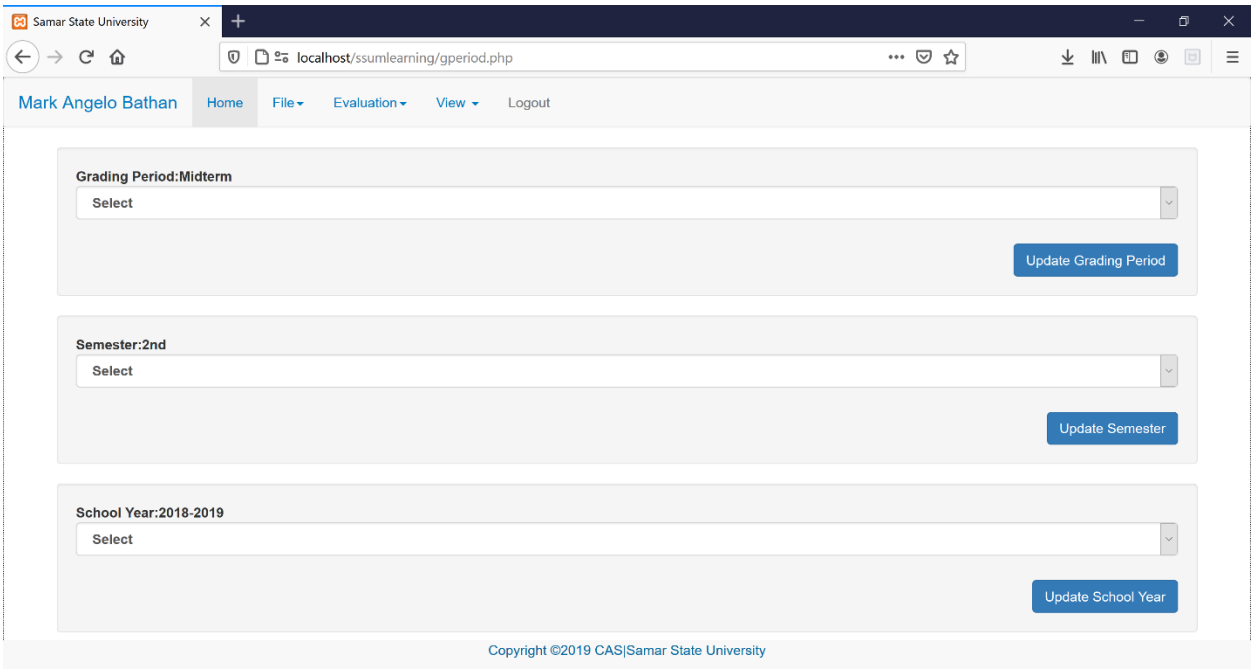

Figure 35. **Setup School year's semester and Grading Period**

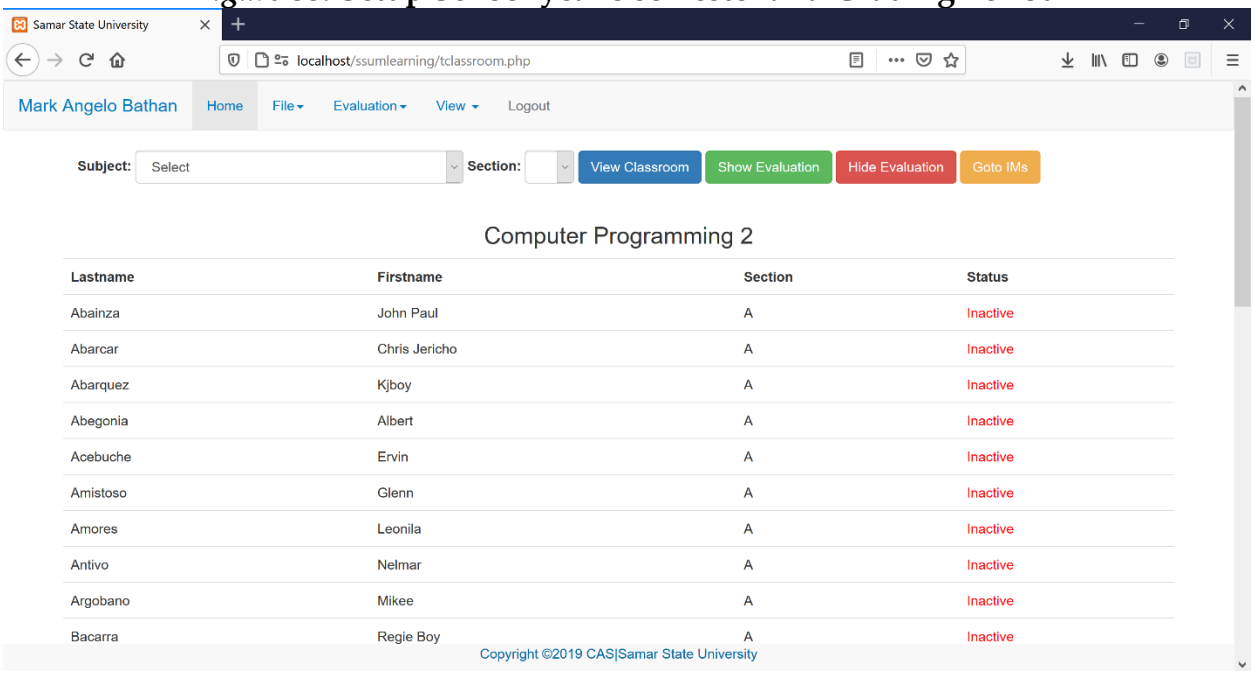

Figure 36. **Classroom**

Figure 36 is the Classroom page. This is the page where the teacher can monitor students who are inside the virtual classroom and can control the volume of instructional materials and evaluation that will appear on the student's side.

The process starts by selecting a subject and section handled:

1. Clicking View Classroom will display the students name in the page and the status indicator. If it is "Inactive" it means that the student is out of the virtual classroom. The status automatically changes its status to "Active" once the student start using the virtual classroom.
2. Clicking the Show Evaluation will display all the test/evaluation per topic that students must take after reading or watching the instructional materials provided by the teacher
3. Hide Evaluation works vice versa. It hides all the test/evaluation based on teacher's discretion for security purposes.
4. By clicking Goto IMs the teacher will be redirected to the instruction material page where the control of hiding and showing the IM's is located.

   Note: The indicator whether the evaluation is displayed or hidden is the course description. If the font color of the course is black it means that the evaluation is hidden, but if it green it is displayed.

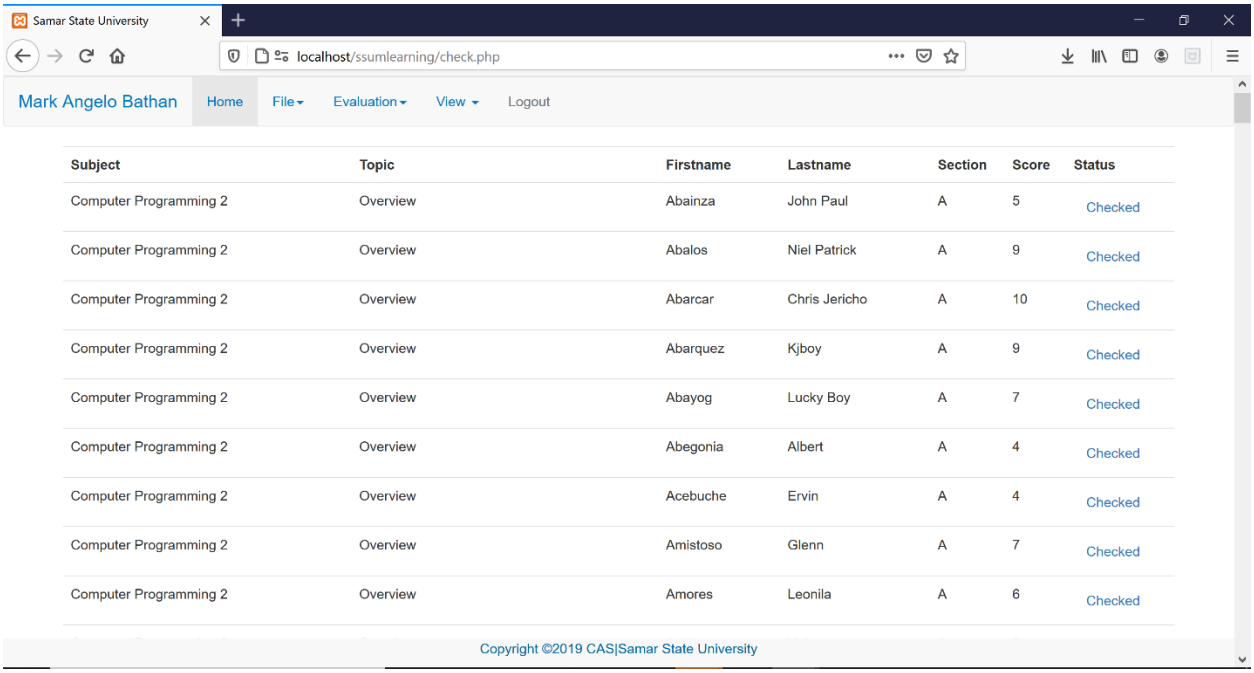

Figure 37. **Submitted Quizzes**

Figure 37 is the page that receives the non-objective type of quiz submitted by the students. If the status is “Checked” it means that the teacher already read and rated the answer of the student.

Students Interface

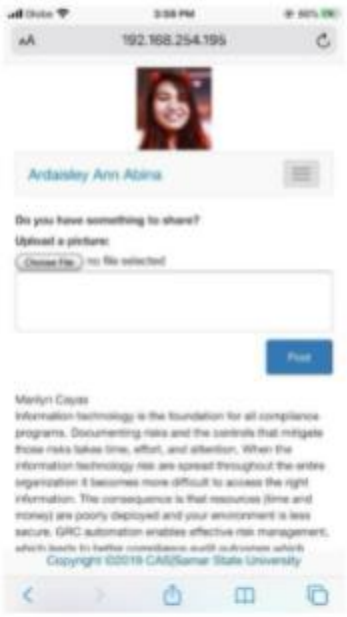

Figure 38. **Student's Home Page**

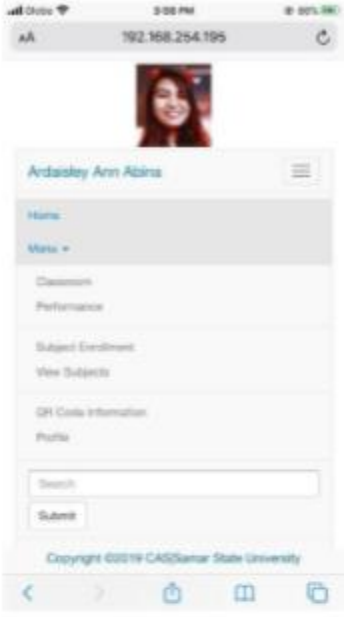

Figure 39. **Menus**

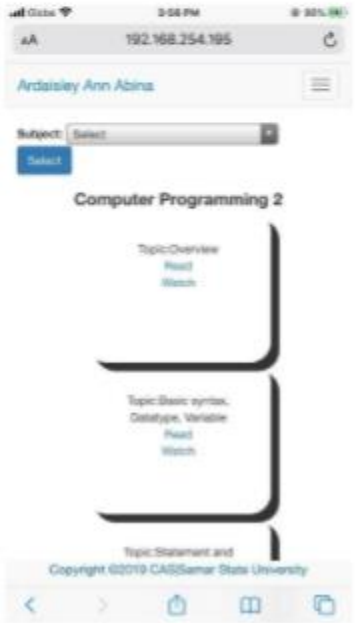

Figure 40. **Classroom and Evaluation Room**

Figure 41. **Performance Indicator**

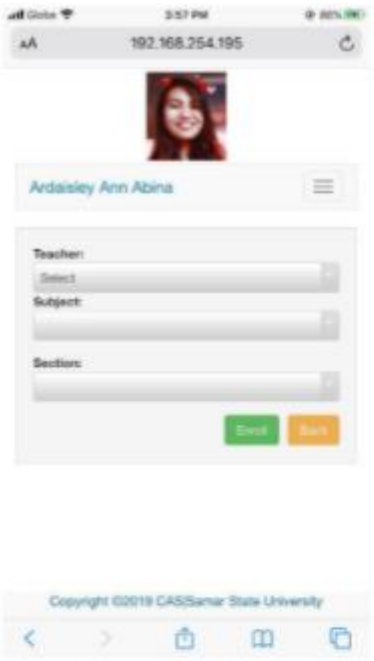

Figure 42. **Add Subject Page**

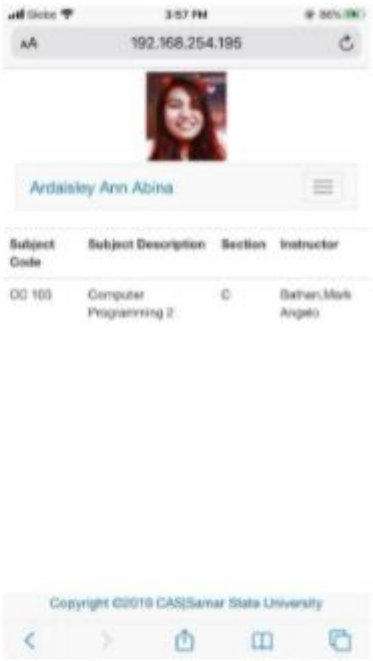

Figure 43. **Student's Subject/s**

Figure 44. **Studen's QR** Code

Figure 45. **Student's Profile**

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APPENDICES

APPENDIX A. LETTER OF APPROVAL

Republic of the Philippines
Samar State University
COLLEGE OF GRADUATE STUDIES
Catbalogan City

February 8, 2019

MARILYN D. CARDOSO, Ph., D.
University President
Samar State University

Madam:

As part of my professional development, I would like to request from your good office permission to continue my master's degree under MSIT (Master's in Science and Information Technology) program here in Samar State University. I am currently enrolled in Thesis Writing and preparing for pre-oral defense of my study entitled "**Mobile Device: Wi-Fi Based Classroom Management System**".

Thank you in advance for your consideration of this request.

Sincerely yours,

MARK ANGELO S. BATHAN
CAS faculty

Recommending Approval:

FLORABELLE B. PATOSA, Ph., D
Dean, College of Arts and Sciences

FELISA E. GOMBA, Ph., D.
Vice-President for Academic Affairs

Approved:

MARILYN D. CARDOSO, Ph., D.
University President

APPENDIX B. LETTER OF APPROVAL

Republic of the Philippines
Samar State University
COLLEGE OF GRADUATE STUDIES
Catbalogan City

Dear Respondents,

Greetings!

The undersigned is currently conducting a study "**WI-FI BASED CLASSROOM MANAGEMENT SYSTEM"** as a requirement to complete her degree leading to Master of Science in Information Technology.

In relation to this, the undersigned humbly ask your assistance in answering the questionnaire and hoping that you will take time answering the questions honestly. Rest assured that all the data gathered will be treated with utmost confidentiality and will be used for the purpose of this research endeavor.

Thank you very much for your patience, support and cooperation!

Very truly yous,

(SGD.) MARK ANGELO S. BATHAN
Researcher

APPENDIX C. QUESTIONNAIRES

Republic of the Philippines
Samar State University
Catbalogan City

COLLEGE OF GRADUATE STUDIES

A MOBILE DEVICE WIFI BASED CLASSROOM MANGEMENT SYSTEM

(*Questionnaire for End users: faculty, students and others*)

I. Determine the different e-learning platform used by faculty of Samar State University. Are you using e-learning platform? If yes, please specify below:

II. Please evaluate the functionality and acceptability of the system based on the parameters indicated below:

Direction: Please encircle the corresponding scale which best describes the level of workability and acceptability of the proposed Mobile device WiFi Based Classroom Management System.

SCALE	*DESCRIPTION*
5	**Highly Acceptable**, *if the condition is extensive and functioning excellently*
4	**Acceptable,** *if the condition is moderately extensive and functioning well*
3	**Moderately Acceptable**, *if the condition is lightly extensive and functioning fairly*
2	**Slightly Acceptable**, *if the condition is lightly extensive but not functioning fairly*
1	**Not Acceptable**, *if the condition is not extensive and functioning poorly*

	A. INTERFACE	**RATE**				
1	Interface provides user with an appropriate environment for navigating the system.	5	4	3	2	1
2	The organization of the system is clear, logical and effective.	5	4	3	2	1

3	The system is attractive and interesting; it motivates users to continue using the system.	5	4	3	2	1
4	Users can navigate through the system independently without difficulty.	5	4	3	2	1
5	The system introduces a user to an easy to follow and consistent navigation system.	5	4	3	2	1
6	The language in the program is clear to the intended audience.	5	4	3	2	1
7	Graphics, audio, video, and/or animations add to the functionality of the system.	5	4	3	2	1
8	Help options are comprehensive and readily available.	5	4	3	2	1
9	Text is clear and printed in type suitable for target audience.	5	4	3	2	1
10	Spelling, punctuation and grammar are correct.	5	4	3	2	1

B. INPUT		**RATE**				
1	Input screens are designed for user convenience.	5	4	3	2	1
2	There is an efficient input and data entry methods.	5	4	3	2	1
3	There is a logical sequence of data entry.	5	4	3	2	1
4	There are common expressions used to identify fields.	5	4	3	2	1
5	There are provisions for input verification and control.	5	4	3	2	1
6	There is clarity of error and feedback messages.	5	4	3	2	1
7	Simple labels are used to simplify data entry.	5	4	3	2	1
8	Emails and contact details are visible for making contact	5	4	3	2	1
9	Help options are comprehensive and readily available.	5	4	3	2	1
10	Language used in the text of the system is clear and concise.	5	4	3	2	1

C. OUTPUT DESIGN		**RATE**				
1	The system keeps the display simple and consistent.	5	4	3	2	1
2	The content is free from spelling and grammatical errors.	5	4	3	2	1

3	The information is clear, concise and informative to the intended audience.	5	4	3	2	1
4	The content is as extensive and original as possible.	5	4	3	2	1
5	The content is presented through the appropriate use of text, graphics and animation.	5	4	3	2	1
6	The content is displayed in digestive quantity.	5	4	3	2	1
7	Useful information like author, date created and updated and other factual data are clearly listed and available.	5	4	3	2	1
8	Use of valuable animation, graphics and sounds benefit the users.	5	4	3	2	1
9	The system can generate reports or printouts	5	4	3	2	1
10	Printouts are dated clearly and well organized.	5	4	3	2	1

III. Please evaluate the processing performance of the developed system based on the parameters indicated below:

SCALE	*DESCRIPTION*
3	**Very Efficient**
2	**Efficient**
1	**Not Efficient**

A. **EFFICIENCY**		**RATE**		
1	The System operates at an acceptable speed.	3	2	1
2	There is accuracy of data processing	3	2	1
3	System can handle predicted volumes of data in a timely and efficient manner.	3	2	1
4	The system uses internal search facility to let users find what they want quickly and efficiently	3	2	1
5	The system is compatible and efficient to most operating systems available	3	2	1

SCALE	*DESCRIPTION*
3	**Very Effective**
2	**Effective**
1	**Not Effective**

B. **EFFECTIVENESS**		**RATE**		
1	The system is found to be effective in providing an automated e-learning services.	3	2	1
2	The system is found to be effective in terms of management, control and access of instructional materials.	3	2	1
3	The system is found to be effective in terms of auto-registration and monitoring of students attendance	3	2	1
4	The system security and access features is found to be effective as it is being customized based on the type of user.	3	2	1
5	The system over-all graphic design, interface design and process is effective as it captures the needs of the users	3	2	1

C. Describe the security level of the automated system.

_____

_____

_____

COLLEGE OF GRADUATE SCHOOL

A MOBILE DEVICE WIFI BASED CLASSROOM MANAGEMENT SYSTEM

(Questionnaire for Technical Experts)

Evaluation of the computer experts on the technical components of the proposed Mobile Device WiFi Based Classroom Management System in terms of user-interface, input design, processing performance, database design and output design.

Direction: Please check from the options either **YES** or **NO** that best describes the technical components of the proposed Mobile Device WiFi Based Classroom Management System.

	INTERFACE	**YES**	**NO**
1	Interface provides user with an appropriate environment for navigating the system.		
2	The organization of the system is clear, logical and effective.		
3	The system is attractive and interesting; it motivates users to continue using the system.		
4	Users can navigate through the system independently without difficulty.		
5	The system introduces a user to an easy to follow and consistent navigation system.		
6	The language in the program is clear to the intended audience.		
7	Graphics, audio, video, and/or animations add to the functionality of the system.		
8	Help options are comprehensive and readily available.		
9	Text is clear and printed in type suitable for target audience.		
10	Spelling, punctuation and grammar are correct.		

	INPUT	**YES**	**NO**
1	Input screens are designed for user convenience.		
2	There is an efficient input and data entry methods.		

3	There is a logical sequence of data entry.		
4	There are common expressions used to identify fields.		
5	There are provisions for input verification and control.		
6	There is clarity of error and feedback messages.		
7	Simple labels are used to simplify data entry.		
8	Emails and contact details are visible for making contact		
9	Help options are comprehensive and readily available.		
10	Language used in the text of the system is clear and concise.		

OUTPUT DESIGN		**YES**	**NO**
1	The system keeps the display simple and consistent.		
2	The content is free from spelling and grammatical errors.		
3	The information is clear, concise and informative to the intended audience.		
4	The content is as extensive and original as possible.		
5	The content is presented through the appropriate use of text, graphics and animation.		
6	The content is displayed in digestive quantity.		
7	Useful information like author, date created and updated and other factual data are clearly listed and available.		
8	Use of valuable animation, graphics and sounds benefit the users.		
9	The system can generate reports or printouts		
10	Printouts are dated clearly and well organized.		

DATABASE		**YES**	**NO**
1	Each record contains a unique identifier as the primary key.		
2	Fields represent distinct characteristics of the subject.		
3	Records are easily stored and retrieved.		
4	There are provisions for database backup facility.		

5	There are provisions for database security.		
6	Database can accommodate the changing data needs within organization.		
7	Database is ready and flexible for future plans like systems upgrade.		
8	Necessary technical documentation is included.		
9	Database structure to suit different types of user needs.		
10	Database structure avoids duplicate entry in the system.		

CURRICULUM VITAE

CURRICULUM VITAE

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EDUCATIONAL BACKGROUND

Elementary	**:**	**Catbalogan I Central Elementary School** **Catbalogan City, Samar** **2002**
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