POLYTECHNIC UNIVERSITY OF THE PHILIPPINES

GMSN LMS: Implementing Learning Management System in Grace Montessori School of Novaliches for Enhanced Academic Communication and Learning

A System Proposal Presented to the
Faculty of the College of Computer and Information Sciences,
Polytechnic University of the Philippines, Sta. Mesa, Manila

In partial fulfillment for the course
INTE 40163 - Capstone Project 1

by

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Proponents

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CHAPTER 1 – INTRODUCTION

1.1. PROJECT CONTEXT

Project Definition

The primary goal of this research is to investigate and explore new information and capabilities of education and learning through the use of technology. Given the effects of the COVID-19 pandemic on everyone's lives, including significant impacts on the education sector, relying on the potential of technology and the internet is a systematic approach. Therefore, the objective of this research is to develop a web-based learning management system, specially designed for teachers, students, and administrator, to enhance the educational accessibility, and facilitate an interactive way of learning. This will promote systematic approach on the educational processes inside the institution. Through the creation of a user-friendly and interactive web-based learning management system, the proponents aspire to enhance the educational experience for teachers and students, creating a more collaborative, simplified, engaging, and effective way of learning. This investigation also aims to improve the currently existing learning management systems and integrate different systems that can enhance the learning and teaching methods of students and teachers.

Project Overview

The project aims to meet the demand for an interactive platform that enhances educational accessibility within students and teachers, interaction and promoting an efficient and effective way of imparting knowledge, given the current need for adjustments in the learning modes of various schools due to the pandemic. The system will be web-based and include the essential features of a learning management system, such as user registration by the administrator, course creation, course assignment,

requirements submission, and interactive quizzes, that will encourage an engaging and interactive learning environment for students.

Project Assumption

The purpose of the researchers in making this project is to provide a user-friendly and engaging online platform that ensures educational accessibility within teachers and students. By creating an interactive space for learning, the system aims to make the educational experience more enjoyable and effective for the institution. In response to the challenges posed by the pandemic, the web-based platform will enable schools to adapt and continue their educational activities in a distance.

The successful implementation of the GMSN LMS project assumes that the system will be utilized and used by the involved users; the administrator, instructors, and students. With this, the study will serve as a contribution to the investigation and research for continuous enhancement of learning capabilities, methods, and school management.

1.2. TECHNICAL BACKGROUND

1.2.1. Equipment/Hardware

Workstation	
Desktop Computers	Processor: Intel Core i5 RAM: 8GB Storage: 256GB SSD Operating System: Windows 10 Graphics: Dedicated GPU Connectivity: Wi-Fi
Personal Laptops	Processor: Intel Core i5/i7 RAM: 8GB/16GB Storage: 256/512GB SSD Operating System: Windows 10 Graphics: Dedicated GPU Connectivity: Wi-Fi

Table 1.0 Equipment/Hardware

1.2.2. Software

Software	
Category	**Specifications**
Operating System	Windows 10/11
Mode of communication	Zoom, Messenger, Facebook, Google Classroom, Google Meet, MS Teams
Cloud Storage	Google Drive
Productivity Tools	Microsoft Office, Canva

Table 2.0 Software

e. People/Manpower

Position	Responsibility
Administrator/Chairperson	In charge of internal organization and supervises decision-making and operations.
Instructor	Responsible for providing guidance, overseeing instructional activities, and imparting knowledge to students.
Department Head	Responsible for overseeing departmental affairs and making decisions and propose events for the department.
School Principal	Responsible for providing leadership and administration for the entire school, managing resources, staff, and academic standards to promote student success.

Table 3.0 Peopleware/Manpower

f. Network Infrastructure/Architecture

In terms of learning management systems, they are currently using the online platforms that are accessible in the web. With that, there are currently no network infrastructures or architectures in place. However, in terms of student admission, they have their own database that is stored in cloud.

1.2.5. Storage, Backup and Recovery Procedure

The school and the instructors leverage on the online platforms available in the internet such as Google Drive and One Drive to manage school resources like lesson plans and learning materials. These cloud-based storage are utilized for efficient and secure data sharing. In terms of student data, the institution has their own database and in case of data loss, they will recover it within their duplicate files.

1.2.6. Security Procedures

Physical security involves ensuring that only authorized persons (administrator and IT staff) can access the physical equipment of the institution. Security measures applied in terms of protecting student information lies within their IT staff as well.

1.2.7. Policies and Procedures

The following are the list of policies and procedures of the existing system for learning and class management:

1. Enrollment process for students sets within the admission within face-to-face and online admission.
2. Students' data are stored within secured database made by the technology specialist of the school institution.
3. Administrators manually assign the classes to active instructors.
4. Instructors submit lesson plans to be checked and assessed by the principal.

5. Instructors assign tasks either through face-to-face or online meetings. Learning materials are also shared through online platforms like Google Classroom and MS Teams.
6. Students submit their works depending on the guidelines imposed by their instructors.
7. Instructors grade their student's work based on their own rubric.

1.2.8. Data and Process

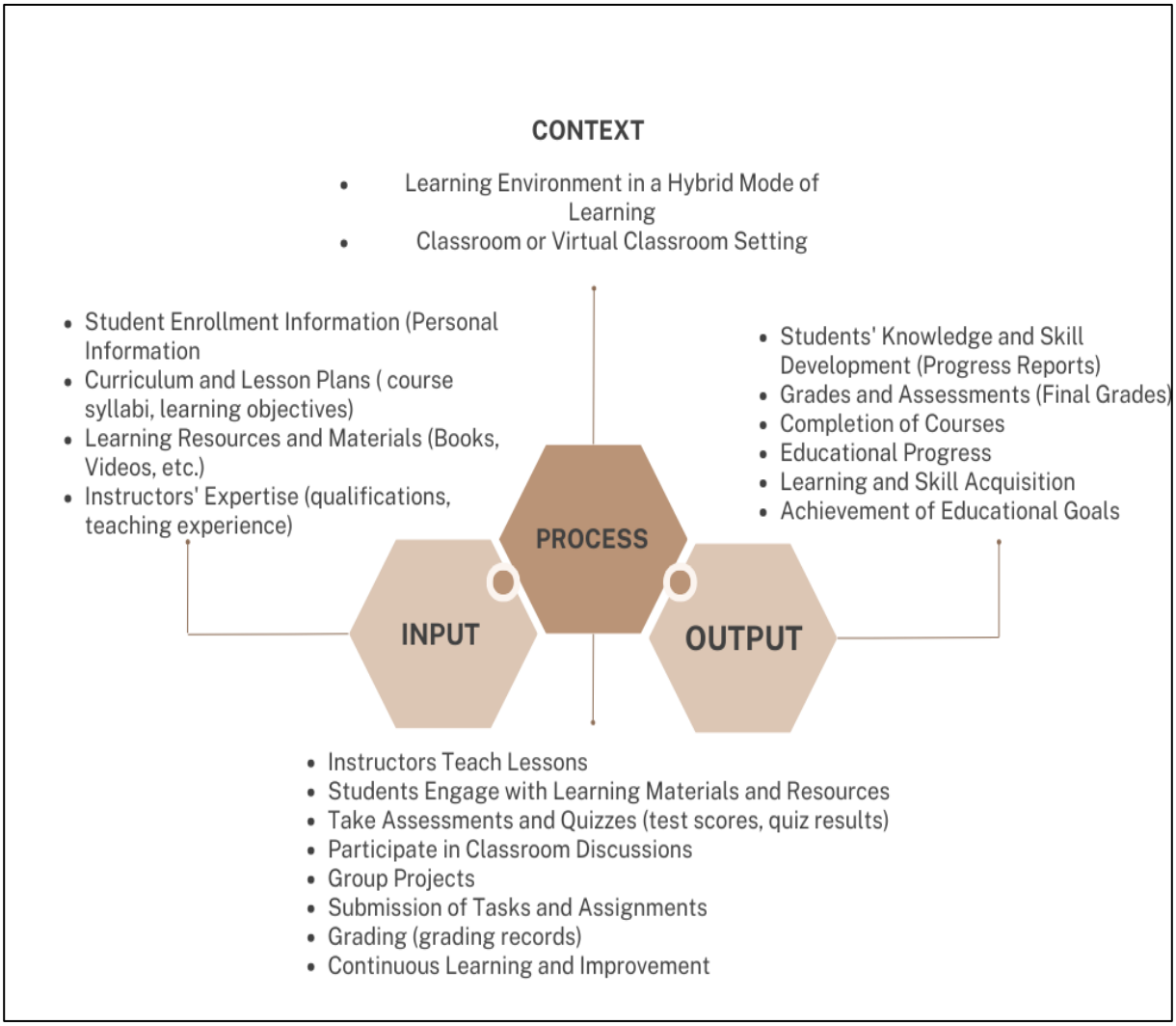

Figure 1.0

1.3. PROBLEM ANALYSIS

1.3.1. Fishbone Diagram

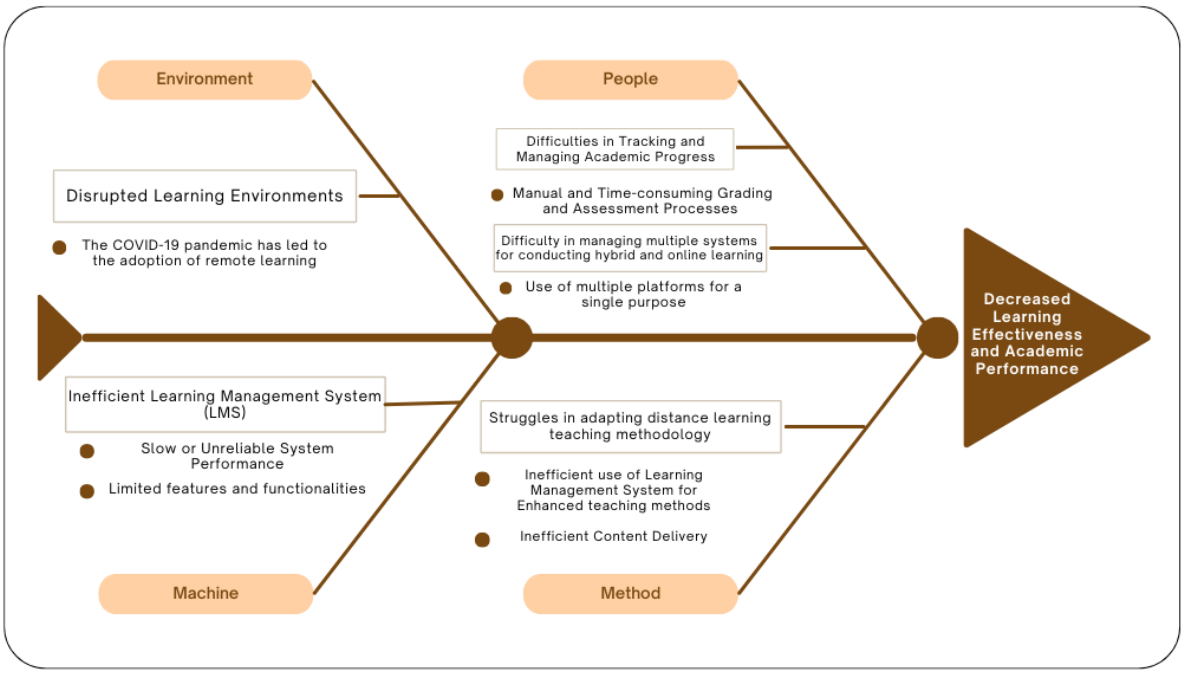

Figure 2.0 Fishbone Diagram

In modern education, challenges like disrupted learning environments, difficulties in tracking progress, inefficient LMS, and struggles in adapting distance learning teaching methodology results in decreased learning effectiveness and academic performance. Addressing these issues requires a comprehensive approach to bridge the gap with the currently existing problems in leveraging to digital learning, fostering active engagement for an enhanced educational experience.

1.3.2. Problem and Solution Statement

Problem Statement: The rise of hybrid learning due to the pandemic has added a new layer of complexity, where students and teachers must navigate both physical and virtual

classrooms. This shift has accumulated the need for simplification of academic processes, integration of necessary features, which are often lacking. With that, there is an urgent demand for an efficient and comprehensive Learning Management System (LMS) that can address these issues and enhance the educational experience in the context of hybrid learning environments.

Solution Statement: To address the challenges faced in modern education, the researchers propose the development of Learning Management System (LMS). The web-based LMS will act as a centralized platform that empowers both students and teachers by integrating advanced features and functionalities necessary for efficient and effective learning. Also, it will offer an interactive way of teaching and learning through online quizzes, and assignments while ensuring educational accessibility. To enhance student engagement and performance tracking, the system will automate grading for assessments and exams. Additionally, students will have the ability to view their grades, track progress, and receive feedback. The LMS will also enable instructors to leave comments and feedback on specific tasks, promoting a dynamic and interactive learning environment.

1.3.3. Problem – Requirements Matrix

Table 4.0 Problem – Requirements Matrix

PROBLEM	REQUIREMENTS
Difficulties in Tracking and Managing Academic Progress	The system should help the instructors to track and manage students' academic progress and performance through simplifying the access to students' performance records.

Limited features and functionalities of LMS	The system should offer access to a wide range of interactive learning features such as interactive quizzes and communication through peers and instructors.
Inefficient Learning Management Systems (LMS)	The system should ensure smooth and efficient functioning of the LMS. The information inside the system must be available when needed.
Struggles in adapting distance learning teaching methodology	Centralized system for conducting tasks and assessments as well as class and school schedules and efficient content delivery.
Difficulty in managing multiple systems for conducting hybrid and online learning	The system should provide integration of effective features for enhanced learning such as interactive quizzes, sharing learning materials and contents, and submission and grading of tasks.

1.4. PURPOSE AND DESCRIPTION

The purpose of the Learning Management System (LMS) is to create a modern and user-friendly platform that transforms how students and teachers experience education. The LMS seeks to overcome challenges in education by making educational accessibility easier, providing interactive teaching methods, and simplifying assessment and progress tracking. By bringing all educational tasks together in one place, the LMS aims to create an exciting and dynamic learning environment that helps students learn while making things easier for teachers. The management of students, instructors, and classes will be also be made easier for administrators, ensuring a systematic organization of the institution.

1.5. GENERAL OBJECTIVES

- Construct an intuitive and efficient online learning platform aimed at enhancing educational accessibility and communication, and facilitating interactive teaching through the adept utilization of technology.

1.6. SPECIFIC OBJECTIVES

- Eliminate manual processes and paper-based submission and assessment systems.
    - Implementing the use of learning management system will allow the paper-based workflows transferred to a digital and automated system. This will allow students and teachers to create, submit, and assess assignments, and conduct quizzes and exams that will reduce paperwork and teaching burden.
- Enhance collaboration and communication between students and teachers.
    - Effective communication and collaboration are crucial for a successful learning environment. By integrating messaging, chat, and feedback within the LMS, students and instructors can interact, ask questions, and share ideas, building a more engaged and connected learning institution.
- Integration of interactive content.
    - The LMS will support the integration of interactive elements, such as audio files and animations, in interactive quizzes. This will make the learning process more dynamic and appealing to students.
- Support blended/hybrid mode of learning.
    - The objective is to enable a blended learning approach, which combines traditional classroom-based learning with online components. The LMS will offer necessary features online discussions, submissions, and access to learning materials.
- Integration of different academic usage and platforms to simplify processes.
    - This includes integrating other needed academic features like all-in-one submission, access to courses, conducting interactive quizzes, assessments, and exams.

1.7. SCOPE AND LIMITATIONS

The project “ GMSN LMS: Implementing Learning Management System in Grace Montessori School of Novaliches for Enhanced Academic Communication and Learning” is set to be executed throughout the academic years 2023 to 2024, and focuses on students

from elementary (Grade 1) to senior high school students (Grade 12) of Grace Montessori School of Novaliches (GMSN) .The focus of this study is to develop a web-based learning management system that aims to enhance the educational experience by simplifying education accessibility and imparting knowledge between students and teachers, and enhance administrative processes within the institution. The system will aim to integrate necessary learning modules and features for more efficient and effective learning management system. Also, the system will be designed to provide an interactive platform for teaching and learning, enabling teachers to create engaging and interactive content and students to access and participate in these activities.

Additionally, the system's administrator will have the capability to create user accounts and assign courses to classes, that way, the educational management within students and instructors will be systematic and organized. However, it is important to note that the system's scope will be limited to the functionalities specified in the project proposal. Other administrative processes like payments, and other services not related with learning management will not be covered in this study. Any additional features or functionalities beyond the original scope will still be up for improvement and recommendations and will still be assessed by the researchers and developers.

CHAPTER 2 – REVIEW OF RELATED LITERATURE/SYSTEMS

This chapter presents and discusses the related literature and studies the researchers thoroughly investigated. Several studies of authors here and abroad were studied, evaluated, and asserted for the formation of a solid background for this study.

2.1. LITERARY WORKS

Online Learning and Learning Management Systems in Response to the Educational Effects of COVID-19

Spanning from 2019 to the present, the COVID-19 pandemic has had a severe impact on higher educational institutions in the Philippines. The crisis led to an abrupt shift to online learning as the primary mode of instruction and learning. In response, educators quickly adapted by recording and sharing lessons through various online platforms, including innovative approaches such as Google Classroom and WebQuest (Fox, 2007). However, the solution that can be offered today to the educators is through online learning. As one of the crucial components of higher education, educators must be able to facilitate students with lectures, delivery of materials, and even an assessment system. Online learning involves the use of technology, which is carried out by students in the process of transferring knowledge and working on student assignments. This online learning activity is very beneficial for students who interact online to improve their performance quality (Hassan et al., 2020).

According to Palis (2022), The worldwide COVID-19 pandemic is a prime illustration of how adaptable and advanced humanity is. In the midst of the nation’s COVID-19 pandemic, Drs. Dubey and Pandey started a study on online learning in higher education. Their research emphasizes the significant difficulties that the current situation—resulting from the widespread COVID-19 pandemic—presents for both

students and higher education institutions. However, it is still essential that we create strategic strategies, both as individuals and as institutions to resolve this situation. To prevail in the fight against the coronavirus, educational institutions must undergo a thorough change of their conceptualization and operational procedures to conform to the demands of digital learning.

In 2021, Alturki and Aldraiweesh carried out a study titled “Application of Learning Management System (LMS) during the COVID-19 Pandemic: A Sustainable Acceptance Model of the Expansion Technology Approach.” This investigation focused into the experiences of King Saud University students amidst the COVID-19 pandemic. The study uncovered that the LMS proved to be an engaging and valuable resource during this period. Students emphasized that a Learning Management System (LMS) offers a dedicated and efficient learning environment as it focuses on simplification and educational accessibility within distance education. Furthermore, it accomplishes all of this while conserving both time and money. Learners can swiftly access educational materials without being bound by time restrictions

In 2021, Sumadi, Suryani, and Musadad undertook a study with the objective of creating a versatile web-based Learning Management System (LMS) for Junior High Schools, addressing educational needs during the COVID-19 pandemic. This LMS allows teachers to deliver lessons online, including through virtual classrooms, promoting flexibility to access classes whenever they have internet connectivity. The study successfully produced an adaptable LMS, validated through assessments by experts in the field, media specialists, and potential user teachers. This LMS not only fits diverse educational requirements but also seamlessly integrates with other digital learning tools, enabling schools to comprehensively monitor student progress across all subjects.

User issues with Learning Management Systems

Pappas (2018) found seven problems with Learning Management Systems (LMS) that hurt affect user experience. These problems include a confusing user

interface, a lack of features, a summary that is hard to understand, the inability to track or retrace work progress, inconsistent navigation controls, the inability to switch between pages quickly, and bugs in the code. To make sure that an LMS helps students gain knowledge and perform well in school, it shouldn't have these basic problems.

Kiyenia (2023) pointed out that LMS systems often make the mistake of not being easy to use. Students expect LMS platforms to have good designs, but many of them look old. A private review of Absorb LMS said that it wasn't easy to use and wasn't friendly to people with dyslexia. Students' views are greatly affected by how easy it is to use. Koruu suggests that a design that is easy to use, simplifies the user's workload. Reduces frustration, increases happiness, and strengthens customer loyalty. People are more inclined to use a product if it aligns with their preferences and functions effectively.

Alturki, Ahmed, and Dr. Kinshuck did study at King Saud University in 2016 to find out how easy it is to access and use the Blackboard Learning Management System. The study found that the interactive features were not easy to use, so it was suggested that the university change the e-learning software to meet the needs of teachers and offer classes in both English and Arabic. This change would make the software easier to use and make it more accessible.

In 2023, Rahman conducted a study titled "Exploring the Experiences of EFL Students Regarding the Usage of Moodle and the Challenges in Its Implementation at Institut Parahikma Indonesia." The study showed that Moodle is more up-to-date than other Learning Management Systems (LMS). However, it also showed that not all of its functions were being used. Students were worried that not getting comments on their work submissions could affect their motivation in a negative way. This lack of feedback between teachers and students after they turned in their work was a big problem.

Despite its widespread adoption, there have been questions raised about the ongoing necessity of the LMS. Education futurists have advocated for LMS tools and platforms to become more adaptable to accommodate emerging instructional practices. Some proponents of change wish to disassemble the various components of a learning

experience to creatively combine open content and educational applications (Adams Becker et al., 2017; Anshari et al., 2016; García-Peñalvo & Forment, 2014). Certain thought leaders have expressed concerns that current learning management systems are too limited in their functionality (Brown, Dehoney, & Millichap, 2015) and have proposed the concept of a next-generation LMS, often referred to as a "next-generation digital learning environment" (NGDLE).

Integration of Interactive Quizzes in E-Learning

Yuliandari says that there are several perks to interactive quizzes in E-learning. First, they get kids involved in what they are learning. Second, they make kids more motivated. Third, these quizzes help students remember what they've learned, which leads to better grades in the end. Online quizzes that are fun can also help students feel less stressed. In 2020, a study was conducted to look at changes in how well students did in Science class and how engaged they thought they were. They used two different approaches to teaching: traditional lessons with paper quizzes and gamified lessons with gamified e-quizzes as formative exams. The results of the study show that both innovative gamified e-quiz applications and standard paper-based quizzes were good ways to test how well students were learning, especially when they were used as formative assessments after each topic was finished. The three groups of students were interested in the gamified way of teaching because it was something new and different from what they had done in other classes. This method also got students more interested by adding game-like aspects like points and badges. (Zainuddin, Shujahat, Haruna, & Chu, 2020).

A study conducted by Sanchez et.al (2020) entitled "The Impact of Gamified Quizzes on Student Learning in the Classroom" aims to examine how the application of gamified learning theory affects student learning results within an educational environment. The findings of the study provide evidence that the incorporation of gamification elements can result in short-term beneficial effects. The results also indicate that specific gamification strategies may possess short-term advantages and

could be particularly beneficial for persons with high levels of achievement. However, these findings also emphasize the necessity for additional research on the factors that precede and follow gamification implementation.

Student Management System

According to Sarhan, Atroshi, and Hamed (2016), numerous researchers have already tackled issues related to the development of student management systems. However, these systems still lack comprehensive and essential functions needed by students and educational institutions to fully harness the potential of information systems. The researchers also emphasized the importance of having integrated systems that cater various processes, enabling organizations to achieve their goals while ensuring ease of use. This ease of use promotes the transition from traditional paper-based data management approaches to computerized management systems.

According to Steenkamp and Basal (2010), schools are encountering problems due to the lack of integration in information systems, resulting in challenges such as inconsistent data, duplicate manual data entry, and the need for additional time to manage multiple user accounts and requests. In response, they proposed the development of an integrated student information system for a K-12 School System. The objective of their proposal was to create an information system that integrates various systems to meet the needs of users, including students, parents, teachers, and administrators. However, no further analysis, updates, or conclusive results have been reported regarding the deployment or outcomes of the mentioned study.

A study conducted by Ylaya V. (2020) examines the discontinuance of the student information system at Surigao State College of Technology, identifying several contributing factors such as system shortcomings, organizational initiative, environmental change, system investment, and institutional pressures. This study highlights the need for improvement in school transactions and services, aligning them with the decisions made by school administrators. Interviews conducted during the research study revealed additional

challenges, including complex user interface design, device incompatibility, and a lack of essential features. The study concludes that the full potential of the system has not been realized or maintained.

Learning Management System

As we live in a technology-based and digitally-driven era, some schools are also embracing this transformation, which has led to the adoption of Learning Management Systems (LMS). According to Kasim et al. (2016) A Learning Management System is an internet-based software platform created to manage learning materials, student engagement, assessment tools, and reports on learning progress and student activities. These services offer essential features, including restricted access control for authorized users, diverse learning content, and various communication tools. (Aldiab et al., 2018)

According to a study conducted by Nor Azura Adzharuddin and Lee Hwei Ling (2013), One of the issues faced by students is related to the use of the discussion board in the Learning Management System (LMS). Although some educators utilize the discussion board to encourage interaction between students and themselves, the lack of immediate feedback has discouraged users from fully utilizing this feature. Furthermore, while many interactive features are available in the LMS, its capacity for use may still be limited due to its demand on the commitments from both the instructor and students during a specific time frame. As a result, some students may find it challenging to actively participate in discussions and engage with the LMS's interactive components, impacting their overall learning experience.

An anonymous faculty member, as mentioned in the study by Dahlstrom et al. (2014), emphasized the need for better education regarding the Learning Management System (LMS) program. The faculty member stated that the LMS is a powerful tool, but unfortunately, many faculty members do not make full use of it. They believed that the university should take proactive steps to ensure that the LMS is widely adopted across all courses, enabling students to become familiar with the platform from day one. The faculty

member also stressed the importance of providing additional support for students, suggesting that LMS usage should be integrated into freshman orientation.

In addition to the adoption and support, the faculty member highlighted the need for improvements in the communication system within the LMS. They found the current forums and messaging systems to be cumbersome and inefficient. Calling for a more streamlined and effective communication platform, the faculty member believed that enhancing these features could significantly enhance the overall LMS experience for both students and instructors.

E-Learning

According to Valentina Arkorful and Nelly Abaidoo (2015), E-learning involves the use of digital resources for educational purposes, enabling teaching and learning through technological tools. It leverages technology to offer learners the convenience and flexibility to study at their own pace and from any location. E-learning encompasses multiple dimensions, including training, knowledge dissemination, and feedback provision, all geared towards enhancing the overall learning experience. The authors also emphasize the challenges associated with e-learning. These challenges include the constraints of distance and limited interaction, requiring learners to possess strong motivation and time management skills. Moreover, e-learning may be less effective than traditional methods in terms of providing clarifications and explanations. Learners might struggle to effectively communicate their knowledge, and controlling cheating in e-learning assessments can prove to be problematic. Additionally, concerns arise about the susceptibility to problems like piracy, plagiarism, and improper source utilization within e-learning environments.

Coman et al. (2020) highlighted the drawbacks of e-learning. The article points out that online learners may face challenges like distractions, loss of focus, and missing deadlines. The effectiveness of e-learning relies on the availability of technology, such as internet access and computers, which may be lacking for some students. Technical interruptions and system errors during courses can also pose difficulties.

In a study conducted by Almaiah et al. (2020), it was found that a crucial factor contributing to the widespread adoption and acceptance of e-learning systems among students is through conducting efficient, effective, and transparent e-learning activities within the e-learning system project. This ensures a secure and threat-free learning environment. These factors work collectively to create a favorable and empowering online learning experience, which holds growing significance in the era of digital education.

2.2. Synthesis of the Literary Works

Based on the related literary works, it can be concluded that Learning Management Systems (LMS) play a significant role in the effective imparting of knowledge in educational systems. Educational institutions can continue to harness the potential of LMS, as the impact of the covid-19 pandemic remains relevant to this day. Many schools still operate in hybrid or online modes of learning, underscoring the continued need for learning management systems. Maximizing the potential of LMS can help address challenges in maintaining education continuity and accessibility across various delivery modes. However, these systems have limitations, including the necessity for further enhancements to cater the diverse needs of its users.

Continuing research in this area can focus on developing more adaptable and user-friendly LMS to better accommodate evolving instructional practices and diverse learning environments. Additionally, exploring innovative ways to improve communication and interaction within LMS can enhance the overall educational experience. Further studies can also investigate the long-term impact of LMS on student learning outcomes and instructional practices beyond the immediate response to the pandemic.

Integration of different systems that can be useful and serve as improvement on features of learning management systems can also be explored as further research are conducted. This will also answer the lack of effectiveness and needed features of the existing LMS.

CHAPTER 3 – METHODOLOGY

3.1. REQUIREMENTS ANALYSIS

In this section, we outline the functional and non-functional requirements for the development of the GMSN LMS. The LMS aims to provide an efficient and user-friendly platform for students, teachers, and administrators to facilitate the management and delivery of educational content and activities. By gathering and analyzing the specific needs of all stakeholders, we can ensure that the LMS meets the highest standards of functionality, security, and usability.

3.1.1. Requirements

Functional Requirements

1. The system will allow the Administrator to create accounts for both Instructors and Students.
2. Students can access their enrolled courses and view course details, such as course description and instructor information.
3. Users (Instructors and Students) can access a Course Dashboard to view comprehensive course details, including course description and instructor information.
4. Students can submit assignments, and Instructors can assess and assign grades to the submitted work.
5. The system will feature quiz and exam functionality for formative and summative assessments. Instructors will have the ability to customize quiz themes according to their preferences.

6. The system will maintain a grade tracking feature to monitor and display student performance.

7. Users can access class members section to view the list of participants within a course.

8. Support for uploading and managing various content types (e.g., documents, files, links).

Non-Functional Requirements

2. **User Interface (UI) Design:** The LMS should feature an intuitive and user-friendly interface for easy navigation. Also, the LMS must be mobile-responsive, enabling users to access course content and features on various mobile devices.
3. **Performance and Scalability:** The LMS should be designed to handle an increasing number of users, courses, and data as the platform grows.
4. **Security:** Sensitive data must be encrypted both during transmission and at rest. The LMS will employ secure authentication mechanisms and role-based access control.

5. **Usability:** The platform must possess an intuitive and user-friendly interface, ensuring that users can easily navigate and access all system contents and functionalities without the need for extensive training

6. **Compliance:** The system shall adhere to ISO 25010 standards and pertinent regulations regarding with learning management, irrespective of the teaching methods employed.

3.1.2. Requirements – Features Matrix

Table 5. Functional Requirements

REQUIREMENTS	FEATURES
User Authentication and Authorization	- Users should be able to log in, and reset their passwords if needed. - User roles (e.g., students, instructors) will be defined with specific permissions upon registration by the administrator.
Course Management	- Administrator will be able to create, edit, assign, and delete courses. - Instructors should be able to add, edit, and remove course content, including lectures, assignments, quizzes, and exams.
Assignment and Assessment	- Instructors will be able to create assignments, quizzes, and exams. – Students will be able to submit assignments and take quizzes and exams. - The system will automatically grade assignments, quizzes, and exams.
Discussion and Communication	- Messaging and notification systems will be in place for communication within the platform.
Progress Tracking and Reporting	- Students and instructors should be able to track progress and view grades. - Instructors can monitor the progress of their teaching objectives for each task and the effectiveness of the learning materials they use.
Interactive Quizzes and Content	- The LMS will support the creation and delivery of interactive quizzes and gamification elements to enhance the learning experience. - Students will be able to engage and interact with gamified-rich content and quizzes.

Table 6. Non-Functional Requirements

REQUIREMENTS	FEATURES
User Interface (UI) Design	The LMS should feature an intuitive and user-friendly interface for easy navigation.
Performance and Scalability	The LMS should be designed to handle an increasing number of users, courses, and data as the platform grows.
Security	Sensitive data must be encrypted both during transmission and at rest. The LMS will employ secure authentication mechanisms and role-based access control.
Usability	The platform must possess an intuitive and user-friendly interface, ensuring that users can easily navigate and access all system contents and functionalities without the need for extensive training
Compliance	The system shall adhere to ISO 25010 standards and pertinent regulations regarding with learning management, irrespective of the teaching methods employed.

3.1.3. Use Case Diagram

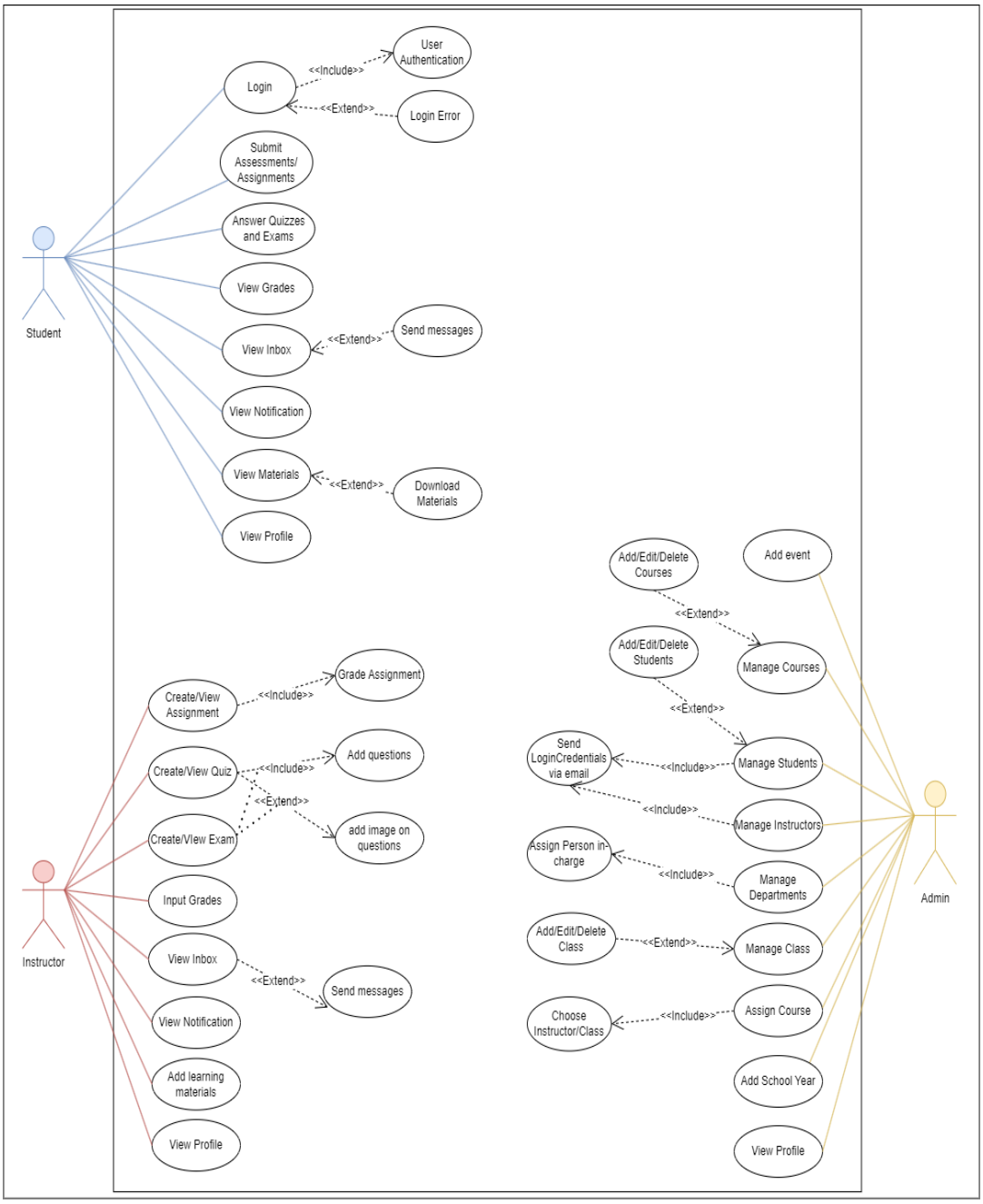

Figure 3.0 General Use Case Diagram

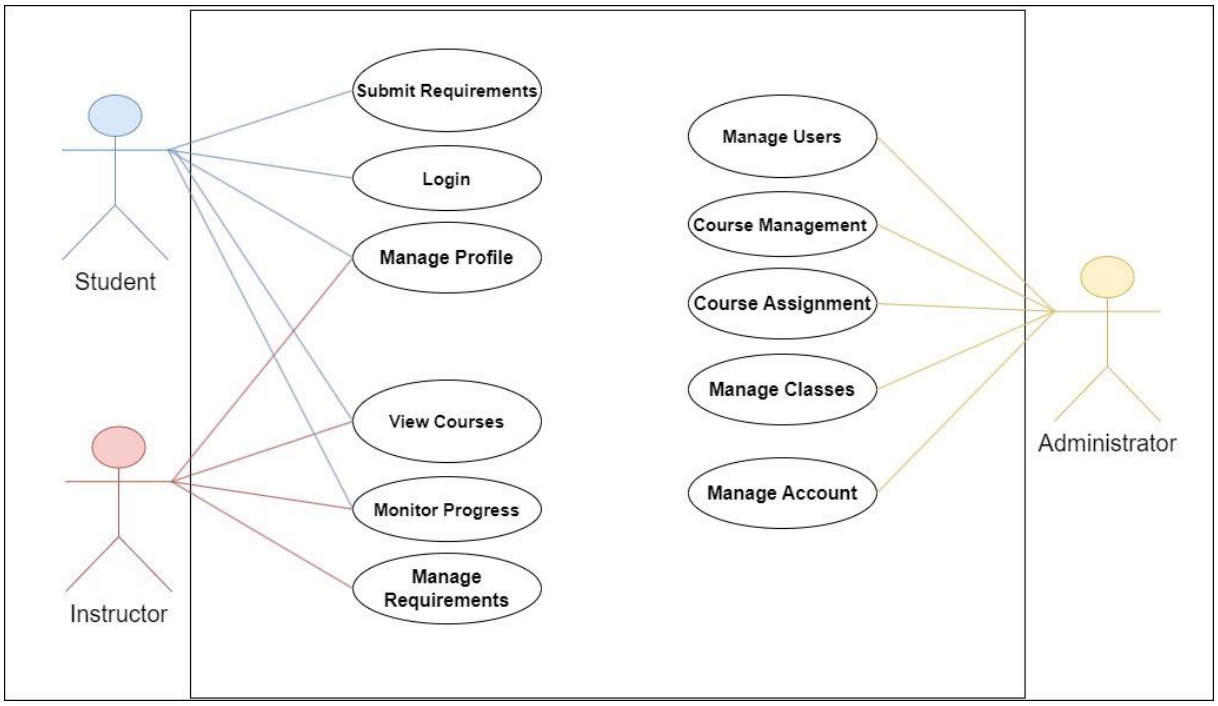

Figure 4.0 Use Case Diagram for Main Processes

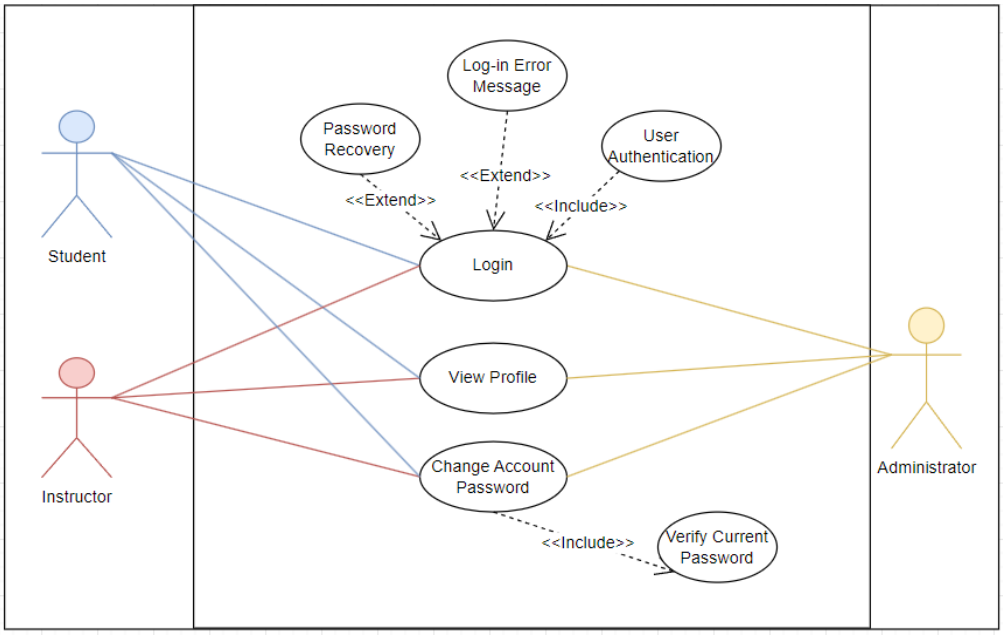

Figure 4B. Account Management

The use case diagram for the Learning Management System for GMSN explains the processes and inputs that the users – students, instructors, and admin, while using the system. The functionalities assigned within the system is also connected with the interactions and processes that the users will do while using the platform.

3.1.4. Use Case Report

Table 7.0 Use Case Report of Login

USE CASE ID:	UC01	
USE CASE NAME:	Login	
SCENARIO:	A user enters their credentials to access the system.	
TRIGGERING EVENT:	The user clicks on the 'Login' button.	
BRIEF DESCRIPTION:	The user initiates the 'Login' use case by entering their username and password into the system's login interface. If the provided credentials are correct, the system allows access to the user and displays the main interface of the Learning Management System. In case of invalid credentials, an error message will be shown, and the login process will not push through.	
ACTORS:	Students, Instructors, Admin	
INCLUDE USE CASE:	User Authentication	
EXTEND USE CASE:	Login Error, Password Recovery	
PRE-CONDITIONS:	1. The user must have a valid existing account in the system's database.	
POST-CONDITIONS:	Account will be logged-in and will be redirected to the homepage	
FLOW OF EVENTS:	ACTOR	SYSTEM

	1. The user accesses the login menu 2. The user is required to input his/her email address/username and password. 3. The user will then be logged in and will be able to access the website.	1.1 The system will display the login form 2.1 The system will verify the information entered. 3.1 the system will redirect the user's to the home page.
ALTERNATIVE FLOW:	1. To begin the 'Login' use case, the user accesses the login interface. 2. The user provides their login credentials. 3. The system validates the entered credentials by comparing them with the stored user database. 4. If the provided credentials are incorrect: a.) An error message is displayed, indicating the failed login attempt. B.) The user is not granted access to the system and remains on the login interface. c.) The user can click the "Forgot Password" button to recover their password.	
EXCEPTION CONDITIONS:	1. Invalid credentials 2. Network or System Errors	

Table 8.0 Use Case Report of Manage Students

USE CASE ID:	UC02
USE CASE NAME:	Manage Students
SCENARIO:	The administrator enrolls, edits, or deletes a student account in the system.
TRIGGERING EVENT:	The administrator identifies the need for changes in the student lists, which may include enrolling new students, editing existing student information, or deleting student accounts.
BRIEF DESCRIPTION:	This use case describes how the administrator manages student accounts in the Learning Management System (LMS) in response to identified changes in the student lists.

ACTORS:	Administrator	
INCLUDE USE CASE:	Add/Edit/Delete Students	
EXTEND USE CASE:	Send Login Credentials via email, Search Students	
PRE-CONDITIONS:	Admin must have a valid account and access to the system.	
POST-CONDITIONS:	The student accounts have been successfully managed based on the administrator's actions. The student list reflects any changes made by the administrator.	
FLOW OF EVENTS:	ACTOR	SYSTEM
	The administrator selects the "Manage Student Accounts" option within the LMS. The system presents the administrator with a list of existing student accounts. The administrator can perform the following actions: a.) Add Student: The system prompts the administrator to enter the necessary student information, such as name, email, username, and password. b.) Edit Student Information: The administrator selects an existing student from the list. The system displays the student's current information. The administrator makes the necessary changes to the student's details, such as updating information or correcting errors. c.) Delete Student Account: The administrator selects an existing student from the list. The system displays a confirmation prompt. The administrator confirms the deletion request.	1a. The system verifies the information and creates the student account together with generated hashed password. 2a. When the student is successfully added, the system will automatically send an email to the specific student containing their login credentials. 3b. The system saves the updated information. 4c. The system removes the student account from the list and deletes associated data.
ALTERNATIVE FLOW:	If the administrator decides not to proceed with any changes, they can cancel the process at any step.	
EXCEPTION CONDITIONS:	1. System errors 2. Technical difficulties	

Table 9.0 Use Case Report of Manage Department

USE CASE ID:	UC03	
USE CASE NAME:	Manage Department	
SCENARIO:	The administrator identifies the need to create, modify, or delete a department within the LMS.	
TRIGGERING EVENT:	The administrator must access the homepage and click the "Manage Department" on the sidebar.	
BRIEF DESCRIPTION:	This use case outlines the process by which an administrator manages departments within the LMS. It includes creating new departments, editing existing department details, and deleting departments as needed.	
ACTORS:	Administrator	
INCLUDE USE CASE:	Assign Person in-charge	
EXTEND USE CASE:	Search Department	
PRE-CONDITIONS:	Admin must have a valid account and access to the system.	
POST-CONDITIONS:	The department has been successfully managed based on the administrator's actions. Any changes made to department details are reflected in the LMS.	
FLOW OF EVENTS:	ACTOR	SYSTEM
	a.) The administrator selects the "Manage Department" option within the LMS. b.) The administrator selects the "Create New Department" option. The administrator submits the new department details. c.) The administrator selects an existing department from the list and can make necessary changes to the department details, such as changing the name, and/or changing the department head. d.) The administrator selects an existing department from the list.	1a. The system presents the administrator with a list of existing departments. 2b. The system verifies the information and creates the department, adding it to the department list. 3c. The system displays the current department information and saves the updated department information. 4d. The system displays a confirmation prompt. The system removes the

	The administrator confirms the deletion request.	department from the list and performs any necessary data cleanup.
ALTERNATIVE FLOW:	If the administrator decides not to proceed with any changes, they can cancel the process at any step.	
EXCEPTION CONDITIONS:	1. System errors 2. Technical difficulties	

Table 10. Use Case Report of Manage Instructor

USE CASE ID:	UC04	
USE CASE NAME:	Add Instructor	
SCENARIO:	The administrator identifies the need for changes in the instructor list. This may involve adding new instructors, editing existing instructor information, or removing instructor accounts.	
TRIGGERING EVENT:	The administrator must access the homepage and click the Manage Instructors on the sidebar.	
BRIEF DESCRIPTION:	This use case describes how the administrator manages instructor accounts in the Learning Management System (LMS) in response to identified changes in the instructor list.	
ACTORS:	Administrator	
INCLUDE USE CASE:	Add/Edit/Delete Instructors	
EXTEND USE CASE:	Send Welcome Email and Login Credentials, Search Instructor	
PRE-CONDITIONS:	Admin must have a valid account and access to the system.	
POST-CONDITIONS:	The instructor accounts have been successfully managed based on the administrator's actions. The instructor list reflects any changes made by the administrator.	
FLOW OF EVENTS:	ACTOR	SYSTEM
	a.) The administrator selects the "Manage Instructor Accounts" option within the LMS.	1a. The system presents the administrator with a list of existing instructor accounts.

	b.) The administrator selects the "Add New Instructor" option. The administrator submits the new instructor's details. c.) The administrator selects an existing instructor from the list. The administrator makes the necessary changes to the instructor's details, such as updating information or incorrect inputs. d.) The administrator selects an existing instructor from the list. The administrator confirms the removal request.	2b. The system verifies the information and creates the instructor account, adding it to the instructor list. The system will automatically send an email to the specific instructor containing their login credentials. 3c. The system saves the updated information. 4d. The system removes the instructor account from the list and performs any necessary data cleanup.
ALTERNATIVE FLOW:	If the administrator decides not to proceed with any changes, they can cancel the process at any step.	
EXCEPTION CONDITIONS:	1. System errors 2. Technical difficulties	

Table 11. Use Case Report of Manage Class

USE CASE ID:	UC05
USE CASE NAME:	Manage Class
SCENARIO:	This use case report outlines the process of adding/modifying/deleting a class to the system platform.
TRIGGERING EVENT:	The administrator identifies the need to create, modify, or remove a class within the LMS.
BRIEF DESCRIPTION:	This use case outlines the process by which an administrator manages classes within the LMS. It includes creating new classes, editing existing class details, and deleting classes as needed.
ACTORS:	Administrator
INCLUDE USE CASE:	Add/Edit/Delete Class
EXTEND USE CASE:	Search Class

PRE-CONDITIONS:	Admin must have a valid account and access to the system.	
POST-CONDITIONS:	The class has been successfully managed based on the administrator's actions. Any changes made to class details are reflected in the LMS.	
FLOW OF EVENTS:	ACTOR	SYSTEM
	a.) The administrator selects the "Manage Class" option within the sidebar. b.) The administrator selects the "Create New Class" option and submits the new class details. c.) The administrator selects an existing class from the list. The administrator can make necessary changes to the class details, such as class name and section. d.) The administrator selects an existing class from the list and confirms the deletion request.	1a. The system presents the user with a list of existing classes or courses. 2b. The system verifies the information and creates the class, adding it to the class list. 3c. The system displays the current class information and saves the updated class information. 4d. The system displays a confirmation prompt and removes the class from the list and performs any necessary data cleanup.
ALTERNATIVE FLOW:	The system will identify missing class information. Displays an error message about submitting the form.	
EXCEPTION CONDITIONS:	1. System errors 2. Technical difficulties	

Table 12. Use Case Report of Manage Course

USE CASE ID:	UC06
USE CASE NAME:	Manage Course
SCENARIO:	The scenario involves the administration or faculty members of an educational institution managing courses within the Learning Management System (LMS).

TRIGGERING EVENT:	The administrator identifies the need to create, edit, or delete a course within the LMS. This can occur when new courses are introduced, existing courses need updates, or courses need to be retired.	
BRIEF DESCRIPTION:	This use case outlines the process by which administrators manage courses within the LMS. It includes creating new courses, editing existing course details, and potentially deleting courses as needed.	
ACTORS:	Administrator	
INCLUDE USE CASE:	Add/Edit/Delete Course	
EXTEND USE CASE:	Search Course	
PRE-CONDITIONS:	Admin must have a valid account and access to the system	
POST-CONDITIONS:	The course has been successfully managed based on the admin's actions. Any changes made to course details are reflected in the LMS.	
FLOW OF EVENTS:	ACTOR	SYSTEM
	a.) The user administrator selects the "Manage Course" option within the LMS. b.) The administrator selects the "Create New Course" option and submits the new course details. c.) The administrator selects an existing course from the list and make necessary changes to the course details, such as updating the title, description, or course code. d.) The administrator selects an existing course from the list and confirms the deletion request.	1a. The system presents the user with a list of existing courses. 2b. The system prompts the user to enter essential course information, including the course name, description and verifies the information and creates the course, adding it to the course list. 3c. The system displays the current course information and make necessary changes to the course details. 4d. The system displays a confirmation prompt and removes the course from the list and performs any necessary data cleanup.
ALTERNATIVE FLOW:	If the entered information and forms are incomplete, the course will not be created.	
EXCEPTION CONDITIONS:	1. System errors	

	2. Technical difficulties

Table 13. Use Case Report of Assign Course

USE CASE ID:	UC07	
USE CASE NAME:	Assign Course	
SCENARIO:	The scenario involves administrator assigning a course to an instructor within the LMS. This is a common process when setting up courses for a new academic term or semester.	
TRIGGERING EVENT:	A new course needs to be assigned to an instructor, or when there is a change in instructor assignments for an existing course.	
BRIEF DESCRIPTION:	This use case outlines the process by which an administrator assigns a course to an instructor within the LMS. It involves selecting the course and the instructor, and confirming the assignment.	
ACTORS:	Administrator	
INCLUDE USE CASE:	Assign Course, Edit/Delete Assigned Course	
EXTEND USE CASE:	N/A	
PRE-CONDITIONS:	Administrator must have a valid account and access to the system. Instructors, classes, and courses must be existing before the administrator can assign a class.	
POST-CONDITIONS:	The course will be available for both instructor and students to access. The course assignment is reflected in the LMS.	
FLOW OF EVENTS:	ACTOR	SYSTEM
	a.) The administrator selects the “Assign Course” option within the LMS. b.) The administrator selects the course and class to be assigned from the list of available instructors.	1a. The system will populate the available courses, instructors, and classes to be assigned with each other. 2b. The system will assign the course and class to the instructor based on the details the admin

	c.) The administrator selects the course and class to be updated from any changes and input errors. d.) The administrator selects the course and class to be deleted from its assignment and confirms deletion request.	has provided. It will also be reflected on all user interfaces. 3c. The system populates the assignment details and process the changes made. 4c. The system displays a confirmation prompt and removes the course assignment from the list and performs any necessary data cleanup.
ALTERNATIVE FLOW:	If any of the components – instructor, class, or course – is missing, the assignment of a course cannot be completed. All three components are necessary for the course assignment process to proceed. If the administrator decides not to proceed with the assignment, they can cancel the process at any step.	
EXCEPTION CONDITIONS:	1. System errors 2. Technical difficulties	

Table 14.0 Use Case Report of School Year

USE CASE ID:	UC08
USE CASE NAME:	Add School Year
SCENARIO:	The scenario involves administrators or academic authorities setting up and managing school years within an educational institution's administrative system. This typically includes defining the start and end dates for each academic year.
TRIGGERING EVENT:	The need to create, modify, or manage school years. This can occur at the beginning of a new academic year or when adjustments are needed in the academic calendar.
BRIEF DESCRIPTION:	This use case outlines the process by which administrators or academic authorities create, edit, and manage school years. It includes defining the start and end dates for each academic year
ACTORS:	Administrator
INCLUDE USE CASE:	N/A

EXTEND USE CASE:	N/A	
PRE-CONDITIONS:	Administrators must have a valid account and access to the system. Administrator is logged into the system.	
POST-CONDITIONS:	The school year has been successfully created or modified.	
FLOW OF EVENTS:	ACTOR	SYSTEM
	a.) The administrator selects the "Manage School Year" option within the admin system. b.) The user selects the "Create New School Year" option. The user submits the new school year details. c.) The administrator selects an existing school year from the list, and can make necessary changes to the school year details, such as modifying the start and end dates. d.) The administrator selects an existing school year from the list and confirms the deletion request.	1a. The system presents the user with a list of existing school years. 2b. The system prompts the user to enter essential school year information, such as the year name, start date, and end date then verifies the information and creates the school year, adding it to the list of school years. 3c. The system displays the current school year information and saves the updated school year information. 4d. The system displays a confirmation prompt and removes the school year from the list and performs any necessary data cleanup.
ALTERNATIVE FLOW:	If there are technical issues during the addition process, administrators may contact technical support for assistance. If the admin decides not to proceed with any changes, they can cancel the process at any step.	
EXCEPTION CONDITIONS:	1. System errors 2. Technical difficulties	

Table 15.0 Use Case Report of Content Management

USE CASE ID:	UC09	
USE CASE NAME:	Content Management	
SCENARIO:	The contents on the landing page will be updated.	
TRIGGERING EVENT:	The administrator must access the “Contents” page and click the “Edit Content” button.	
BRIEF DESCRIPTION:	This use case report outlines the process of updating school information on the website’s landing page.	
ACTORS:	Administrator	
INCLUDE USE CASE:	Click the update button when the necessary information was updated.	
EXTEND USE CASE:	N/A	
PRE-CONDITIONS:	Administrators must have a valid account and access to the system. Administrator is logged into the system.	
POST-CONDITIONS:	Administrators will have the ability to track, update, and change the contents listed on the website contents page.	
FLOW OF EVENTS:	ACTOR	SYSTEM
	1. Administrator navigates to the content management section. 2. Administrator selects the option to edit certain content. 3. Administrator confirms the changes of the content.	1. The system will process the updates and reflects it on the interface of all the users.
ALTERNATIVE FLOW:	If there are technical issues during the update process, administrators may contact technical support for assistance.	
EXCEPTION CONDITIONS:	1. System errors 2. Technical difficulties	

Table 16.0 Use Case Report of Manage Assignment

USE CASE ID:	UC10	
USE CASE NAME:	Manage Assignment	
SCENARIO:	The scenario involves instructors managing assignments within a course in the LMS. This includes creating, editing, and deleting assignments.	
TRIGGERING EVENT:	Instructor identifies the need to create, modify, or manage assignments for a course.	
BRIEF DESCRIPTION:	This use case outlines the process by which instructors manage assignments within a course in the LMS. It includes creating new assignments, editing assignment details, and potentially deleting assignments as needed.	
ACTORS:	Instructor	
INCLUDE USE CASE:	Create/Edit/Delete Assignment, Grade Assignment	
EXTEND USE CASE:	Add material	
PRE-CONDITIONS:	1. The instructor is logged into the LMS. 2. The instructor is assigned as the instructor for the course. 3. The course exists and is accessible within the LMS.	
POST-CONDITIONS:	The assignments have been successfully managed based on the instructor's actions. Any changes made to assignment details are reflected in the course materials and the LMS.	
FLOW OF EVENTS:	ACTOR	SYSTEM
	a.) The instructor selects the "Manage Assignments" option within the course in the LMS. b.) The instructor selects the "Create New Assignment" option and submits the new assignment details. c.) The instructor selects an existing assignment from the list and make necessary changes to the assignment	1a. The system presents the instructor with a list of existing assignments for the course. 2b. The system prompts the instructor to enter essential assignment information, including the assignment name, description, due date, and score and then creates the assignment, adding it to the assignment list for the course.

	details, such as modifying the description, changing the due date, or adjusting score. d.) The instructor selects an existing assignment from the list and confirms the deletion request.	3c. The system displays the current assignment information and saves the updated assignment information. 4d. The system displays a confirmation prompt and removes the assignment from the list and performs any necessary data cleanup.
ALTERNATIVE FLOW:	If the required fields such as directions and descriptions are incomplete, the assignment will not be created. If the instructor decides not to proceed with any changes, they can cancel the process at any step	
EXCEPTION CONDITIONS:	1. System errors 2. Technical difficulties	

Table 17.0 Use Case Report of Submit Assignment

USE CASE ID:	UC11
USE CASE NAME:	Submit Assignment
SCENARIO:	The scenario involves students submitting assignments for a course within LMS.
TRIGGERING EVENT:	When a student needs to submit an assignment as part of their coursework.
BRIEF DESCRIPTION:	This scenario involves the submission of assignments and assessments of the student on the specific task/assignment assigned by the instructor of the course.
ACTORS:	Students
INCLUDE USE CASE:	Submit assignment material
EXTEND USE CASE:	Add comments
PRE-CONDITIONS:	The student must be inside the specific course, accessing the specific assignment.
POST-CONDITIONS:	The assignment will be submitted and will reflect on the interface. The assignment will also be submitted to the instructor. The

	submission is tagged as “late” or “on time” based on the submission time.	
FLOW OF EVENTS:	ACTOR	SYSTEM
	a.) The student selects the course they are enrolled in. b.) The student selects the assignment they want to submit and uploads the assignment file from their computer or device. c.) The student confirms the assignment submission.	1a. The system presents the student with a list of assignments for the course. 2b. The system provides an option for the student to upload their assignment file. 3c. The system records the submission time and checks it against the due date. If the submission is before the due date, it is tagged as “on time.” If the submission is after the due date, it is tagged as “late.” 4c. The system provides a confirmation message to the student, indicating whether the submission is “on time” or “late.”
ALTERNATIVE FLOW:	The assignment will be submitted regardless if it is submitted on time or not.	
EXCEPTION CONDITIONS:	1. System errors 2. Technical difficulties	

Table 18.0 Use Case Report of Manage Quiz and Exam

USE CASE ID:	UC12
USE CASE NAME:	Create Quiz/Exam
SCENARIO:	The scenario involves instructors managing quizzes and exams for their courses within the Learning Management System (LMS). This includes actions like editing, deleting, and viewing details of quizzes and exams.
TRIGGERING EVENT:	The triggering event is when an instructor identifies the need to manage quizzes and exams for a course. This can occur when they want to make changes to existing assessments or review details.
BRIEF DESCRIPTION:	This use case outlines the process by which instructors manage quizzes and exams within a course in the LMS. It includes actions

	such as editing quiz/exam details, deleting quizzes/exams, and viewing assessment details.	
ACTORS:	Instructor	
INCLUDE USE CASE:	Add/Edit/Delete Quizzes/Exams	
EXTEND USE CASE:	Filter Quizzes/Exams	
PRE-CONDITIONS:	The instructor is logged into the LMS and assigned as the instructor for the course. The course exists and is accessible within the LMS.	
POST-CONDITIONS:	The quizzes or exams have been successfully managed by the instructor based on their actions.	
FLOW OF EVENTS:	ACTOR	SYSTEM
	a.) The instructor selects the course they are assigned to. b.) The instructor selects the "Create New Quiz" or "Create New Exam" option and configures the quiz/exam settings. c.) The instructor selects a quiz or exam from the list and saves the updated quiz/exam details. d.) The instructor selects a quiz or exam from the list and confirms the deletion request.	1a. The system presents the instructor with a list of quizzes and exams. 2b. The system prompts the instructor to enter essential quiz/exam details, including the name, description, duration, question format, and grading criteria. 3c. The system allows the instructor to edit quiz/exam details, such as the name, description, duration, question format, and grading criteria. 4d. The system displays a confirmation prompt and removes the quiz/exam from the course and performs any necessary data cleanup.
ALTERNATIVE FLOW:	If the required fields such as directions and questions are incomplete, the quiz and exam will not be created. If the instructor decides not to proceed with any changes, deletions, or creations, they can cancel the process at any step.	
EXCEPTION CONDITIONS:	1. System errors 2. Technical difficulties	

Table 19.0 Use Case Report of Take Quiz/Exam

USE CASE ID:	UC13	
USE CASE NAME:	Take Exam/Quiz	
SCENARIO:	The scenario involves students taking quizzes and exams for their courses within the Learning Management System (LMS).	
TRIGGERING EVENT:	The triggering event is when a student needs to take a quiz or exam as part of their coursework.	
BRIEF DESCRIPTION:	This use case describes the process by which students take quizzes and exams within the LMS.	
ACTORS:	Students	
INCLUDE USE CASE:	View Quiz/Exam Instructions	
EXTEND USE CASE:	N/A	
PRE-CONDITIONS:	1. The student is logged into the LMS. 2. The student is enrolled in a course that includes quizzes or exams. 3. A quiz or exam is available for the course, and the assessment window is open.	
POST-CONDITIONS:	The student has successfully completed the quiz or exam. The student's responses and results are recorded in the LMS.	
FLOW OF EVENTS:	ACTOR	SYSTEM
	a.) The student selects the course they are enrolled in. b.) The student selects the quiz or exam they want to take. c.) The student reads the instructions and answers the questions within the allotted time. The student submits their responses when they have completed the assessment. d.) The student can view their quiz/exam results and scores.	1a. The system presents the student with a list of assessments (quizzes/exams) available for the course. 2b. The system displays the quiz or exam questions and instructions. 3c. The system records the student's answers and checks them against the answers provided by the instructors 4d. The system displays the score of the student.

ALTERNATIVE FLOW:	The quiz/exam will be graded regardless of whether it is submitted on time or not. The quiz/exam will be automatically submitted and graded when the tab is closed or when the allotted time runs out.
EXCEPTION CONDITIONS:	1. System errors 2. Technical difficulties

Table 20.0 Use Case Report of Add Announcement

USE CASE ID:	UC14	
USE CASE NAME:	Add Announcement	
SCENARIO:	The instructor wants to add an important announcement to the class.	
TRIGGERING EVENT:	The instructor must click the add announcement button on the announcements page.	
BRIEF DESCRIPTION:	This scenario involves adding an announcement that will be posted on a class.	
ACTORS:	Instructor	
INCLUDE USE CASE:	Choose class to which where the announcement will be posted or be inside the specific class.	
EXTEND USE CASE:	Add attachments	
PRE-CONDITIONS:	The instructor must be logged into his/her account.	
POST-CONDITIONS:	The announcements can be viewed and edited anytime.	
FLOW OF EVENTS:	ACTOR	SYSTEM
	1. The instructor must access his/her account. 2. The instructor will click the add announcement button and provide the details about the announcement. They	1. The system will process the storing of the announcement into the database and display it to the corresponding classes.

	have the option to upload files or image. 3. The instructor will need to click the “post” button to post the announcement.	2. The system will update the data in the database in case the instructor chose to edit the announcement content.
ALTERNATIVE FLOW:	The announcement can be posted from inside the course, but it will only reflect on the corresponding course.	
EXCEPTION CONDITIONS:	1. System errors 2. Technical difficulties	

Table 21.0 Use Case Report of Message

USE CASE ID:	UC15	
USE CASE NAME:	Message	
SCENARIO:	The instructors/students want to send a message to their peers/students/instructors or to both students and instructors.	
TRIGGERING EVENT:	The instructor and student must click the create message button.	
BRIEF DESCRIPTION:	This scenario involves communication between peers and instructors through the messaging feature of the system.	
ACTORS:	Instructor, Student	
INCLUDE USE CASE:	Choose the recipient of the message	
EXTEND USE CASE:	N/A	
PRE-CONDITIONS:	The instructor/student must be logged into his/her account. The message recipient must have an account as well.	
POST-CONDITIONS:	The messages can be deleted anytime.	
FLOW OF EVENTS:	ACTOR	SYSTEM

	1. The instructor must access his/her account. 2. The instructor will click the create message button on the navbar and provide the details about the recipient and message body. 3. The instructor will need to click the “send” button to send the message.	1. The system will process the storing of the message information. 2. The system will display the messages on the corresponding senders and recipients.
ALTERNATIVE FLOW:	If the message is empty, the message cannot be sent.	
EXCEPTION CONDITIONS:	1. System errors 2. Technical difficulties	

3.2. DESIGN SPECIFICATIONS

3.2.1. Activity Diagram

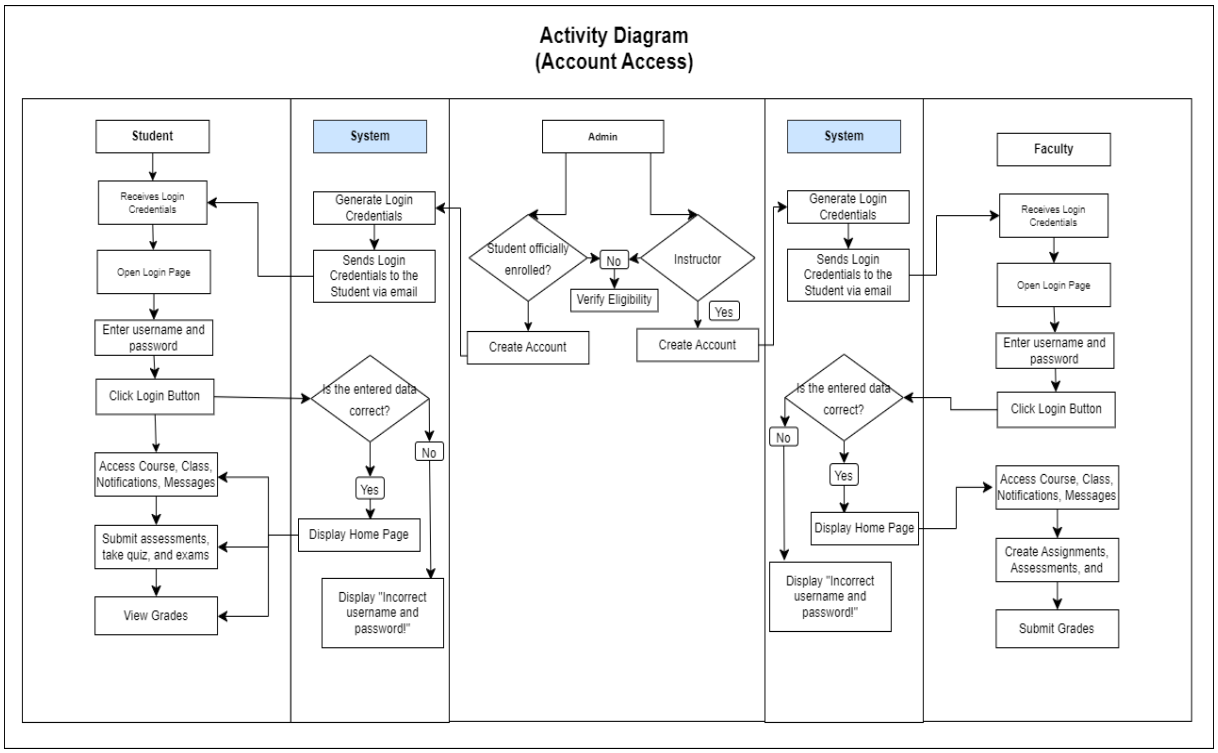

Figure 5. Activity Diagram of LMS

3.2.2. GUI Design

Admin Interface

The **Figure 6.1** shows the system's school-wide statistics, including total of students, instructors, classes, subjects, departments, and administrative users.

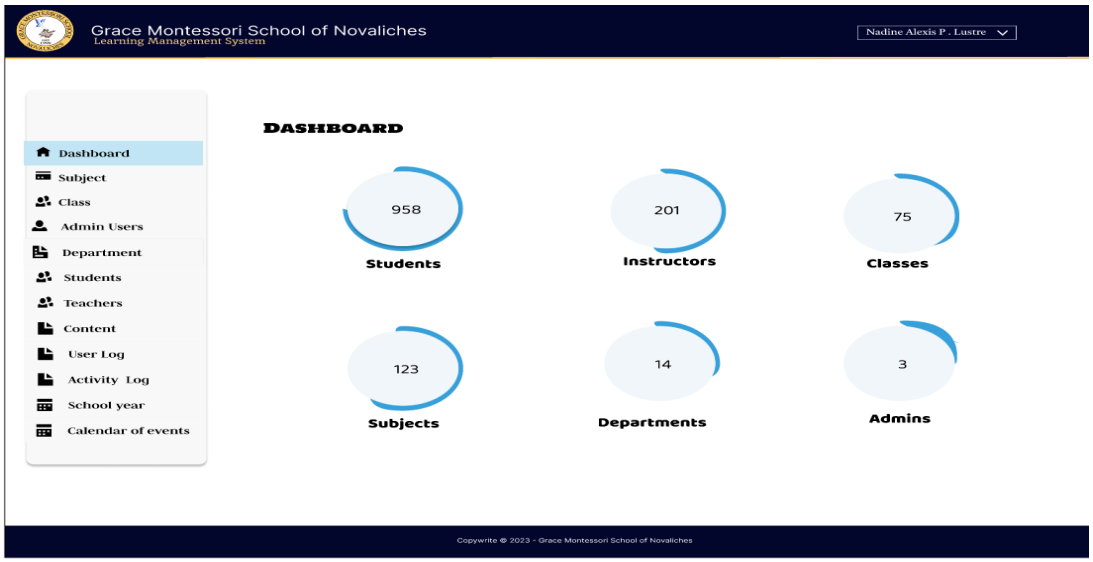

Figure 6.1 Admin Dashboard

Figure 6.1 shows the ***Subject List*** section, administrators can create subjects with course codes, as well as edit or delete existing subjects.

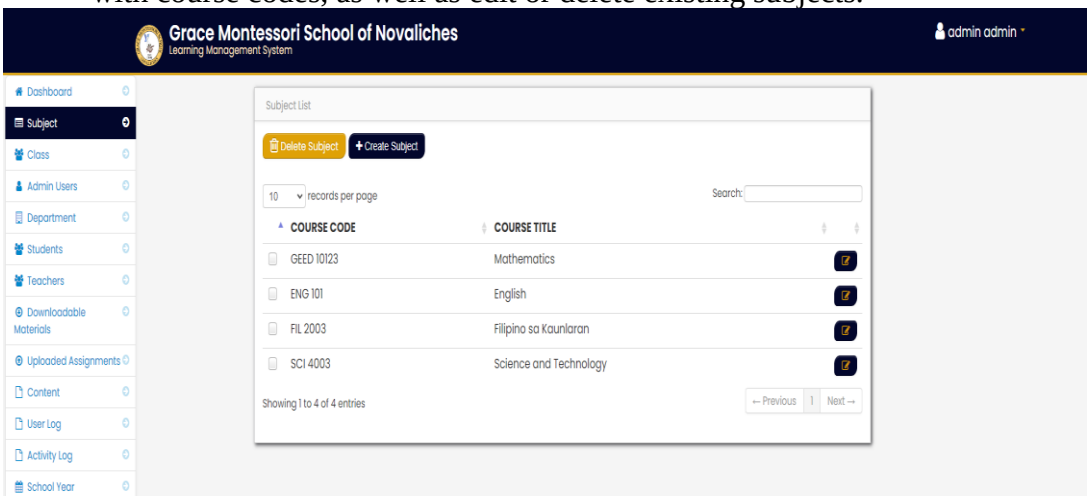

Figure 6.1 Admin | Subject List

Figure 6.3 shows the ***Class Lists*** section, system administrators have the ability to add class sections, perform edits, and delete them as needed

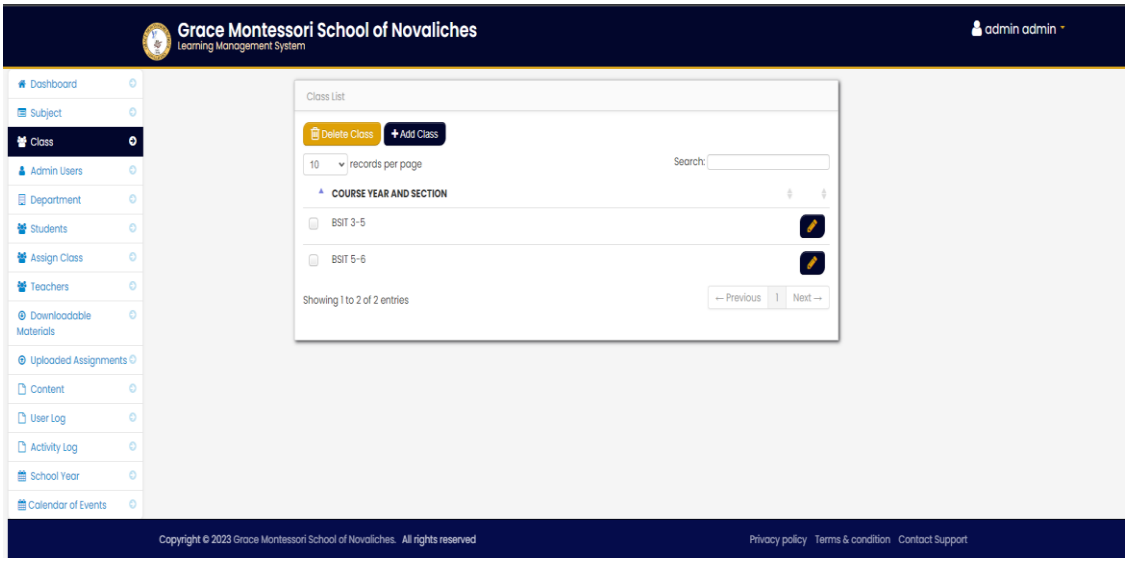

Figure 6.3 Admin | Class List

In **Figure 6.4**, administrators can add students to classes with their LRN (Learner Reference Number). They are able to edit and delete student records.

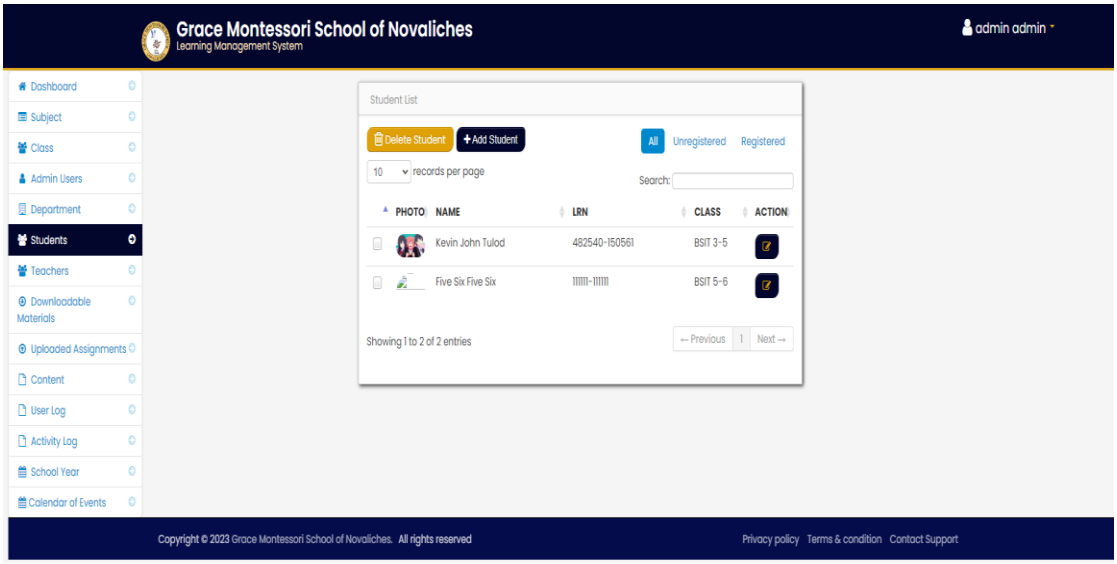

Figure 6.4 Admin | Student List

Figure 6.5 shows the ***Content section*** *and* is also dedicated for crafting the school's mission and vision statements, as well as providing information in the 'About Us' section.

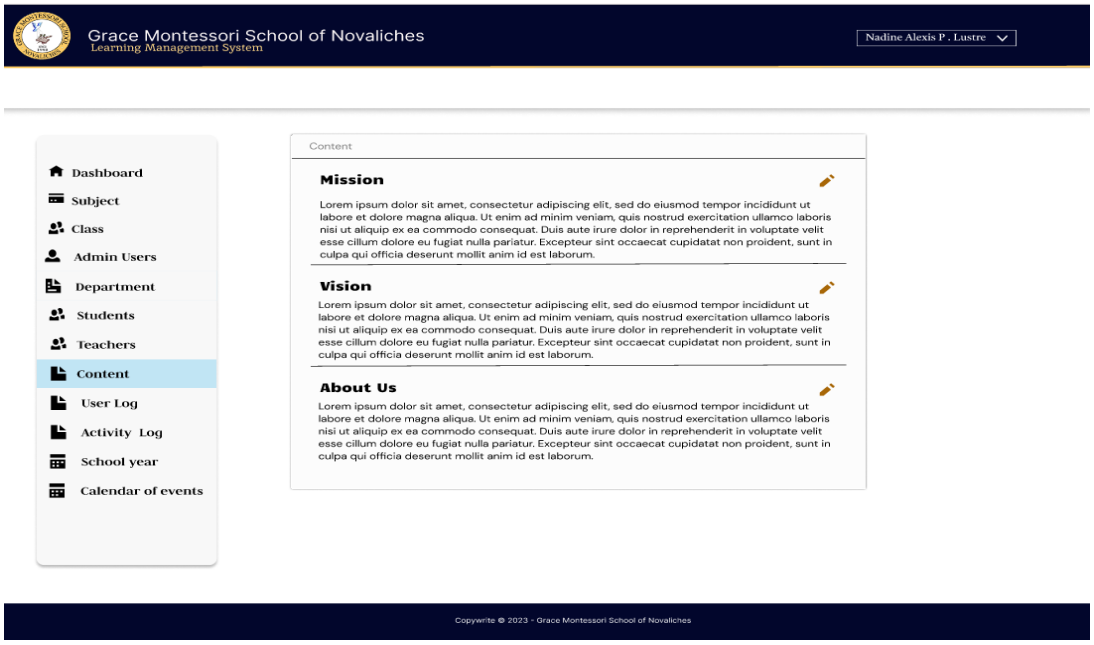

Figure 6.5 Admin | Content Management

Figure 6.6 shows the ***User Log*** section, displays recent logs containing details of the admin user, login and logout dates, along with timestamp information.

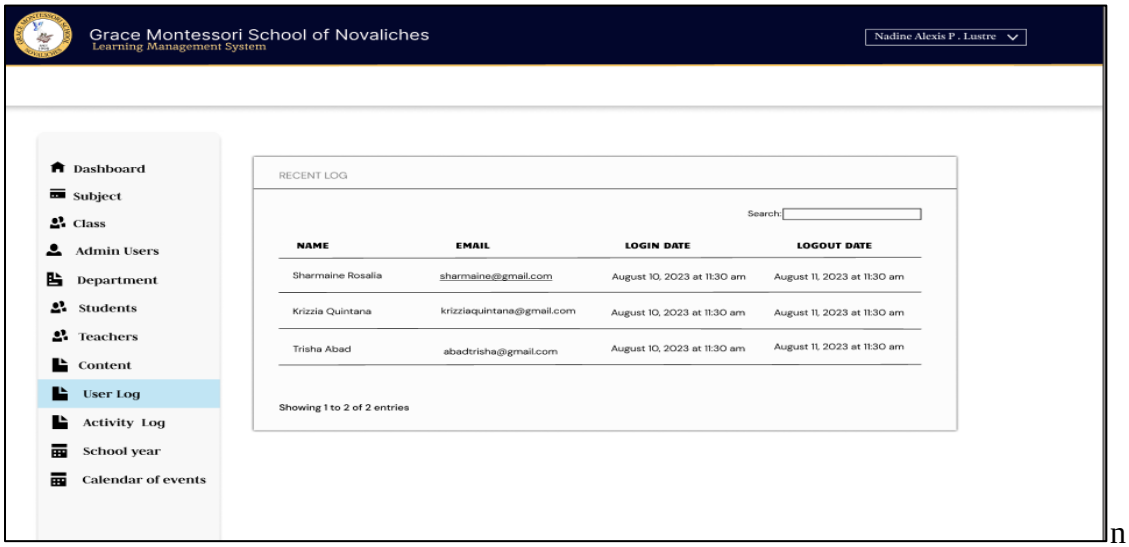

Figure 6.6 Admin | User Logs

Figure 6.7 shows the user who has logged in and their most recent activities.

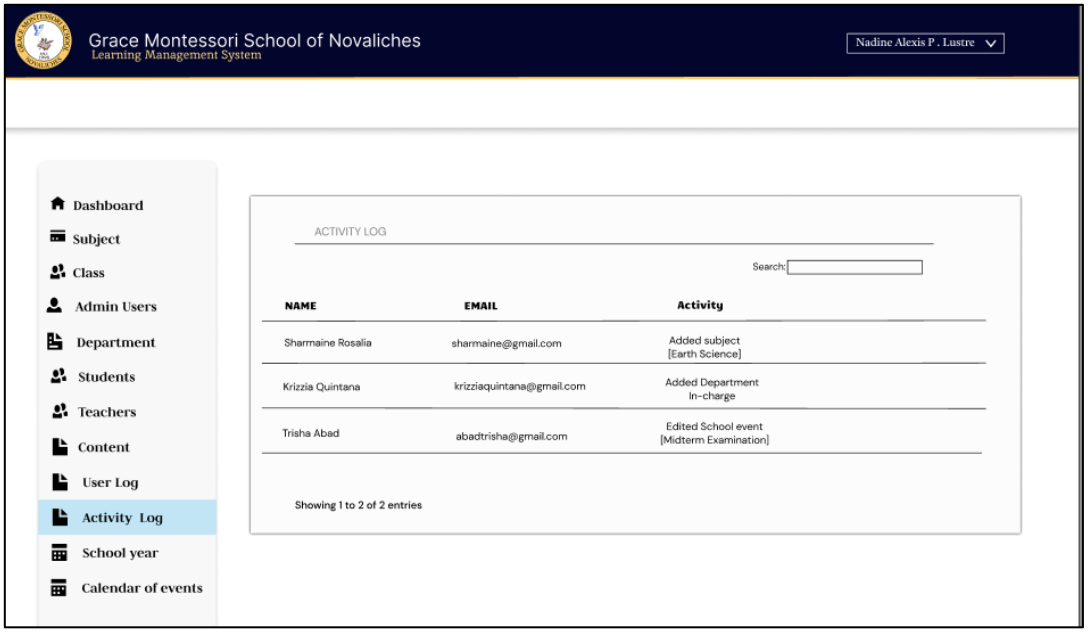

Figure 6.7 Admin | Activity Log

Figure 6.8 shows the ***Calendar of Events*** section, administrators can update the school calendar with new and upcoming events within the institution.

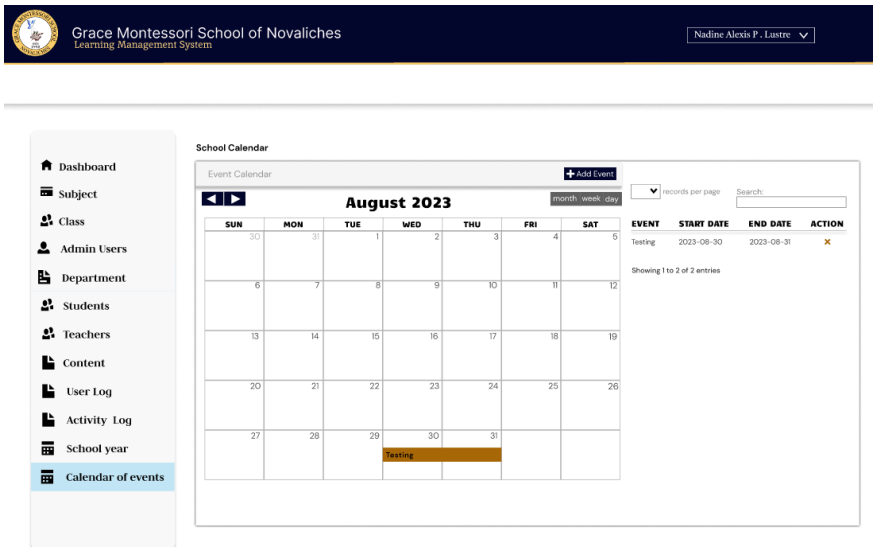

Figure 6.8 Admin | Calendar of events

Instructor Interface

Figure 6.9 shows the ***Classes*** section, instructors can view and access to the class sections they are responsible for, along with the corresponding course subjects.

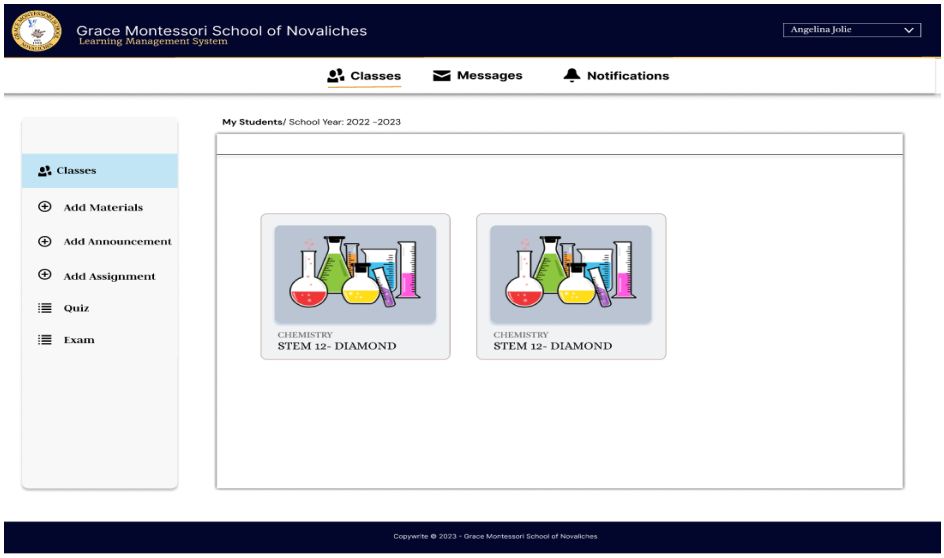

Figure 6.9 Instructor | Classes

Figure 7.0 shows the ***Subject Overview:*** Instructors can display their insights into the curriculum, course details, subject-related information as well as the grading system in a course subject.

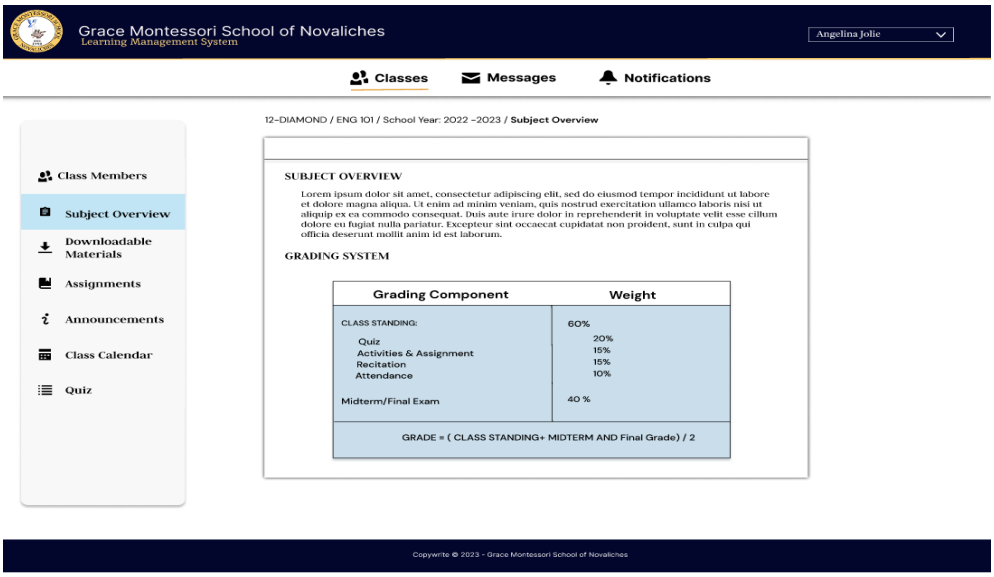

Figure 7.0 Instructor | Subject Overview

Figure 7.1 shows the ***Materials*** section. With this, the Instructors will be able to upload and manage educational resources on each class section.

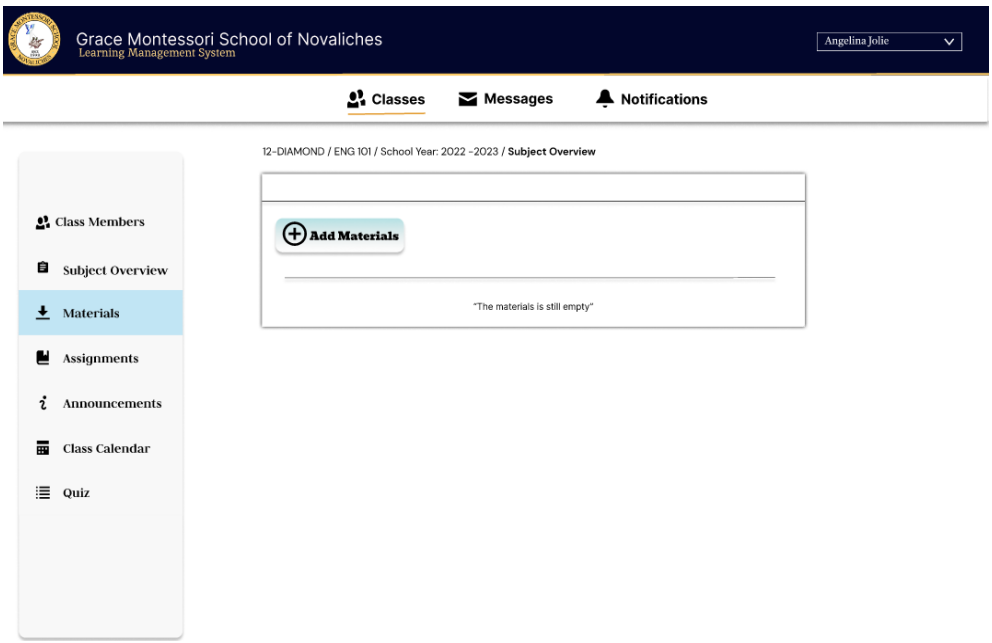

Figure 7.1 Instructor | Subject Overview

Figure 7.2 shows the ***Quiz*** section, wherein instructors can generate quizzes and allocate them to their respective classes and align its learning objective.

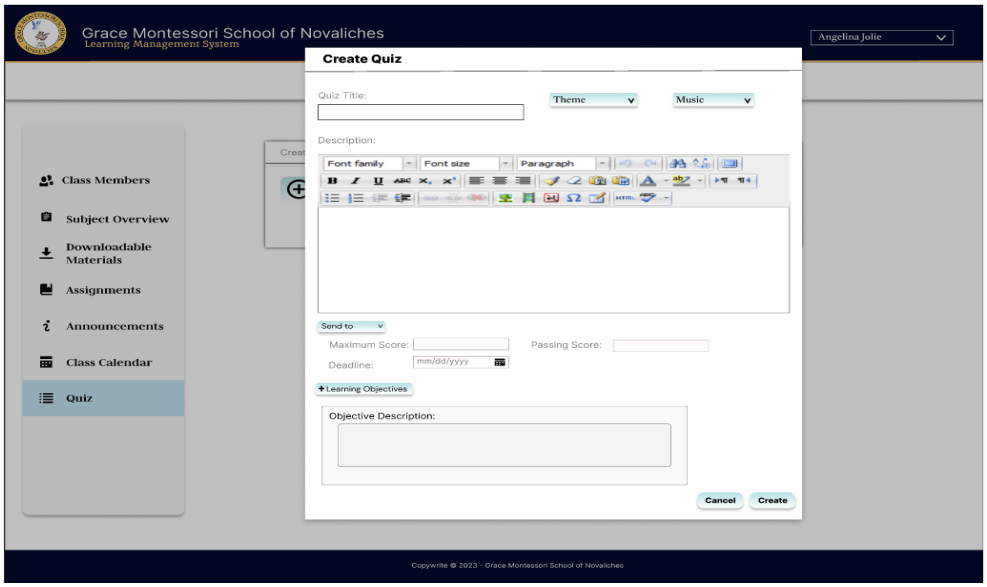

Figure 7.2 Instructor | Quiz

Figure 7.3 shows the ***Class Members*** section, wherein instructors may be able to oversee their students within their class, including the option to add, modify, or remove them.

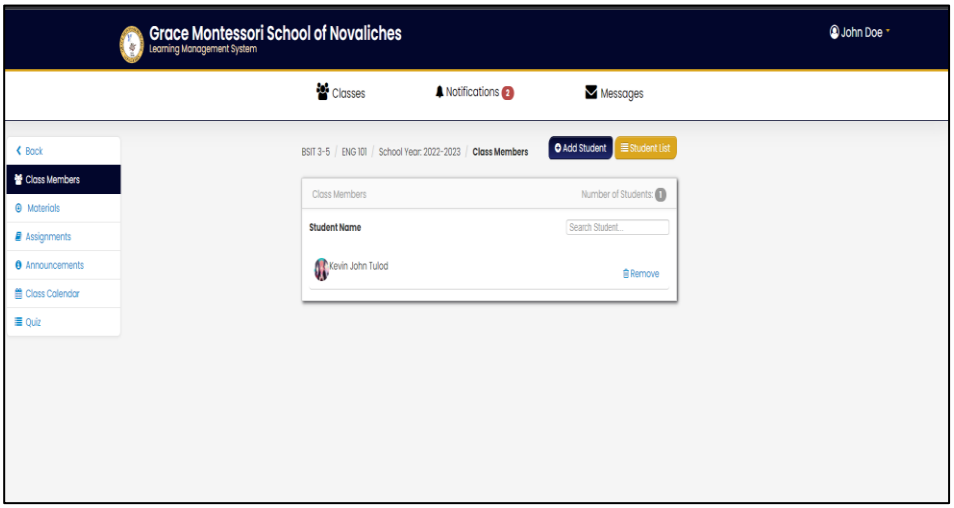

Figure 7.3 Instructor | Class Members

Figure 7.4 shows the ***Assignment*** section, wherein instructors can assign tasks for their subjects. Once students have submitted their assignments, instructors can grade their work and assess if the learning objectives are met.

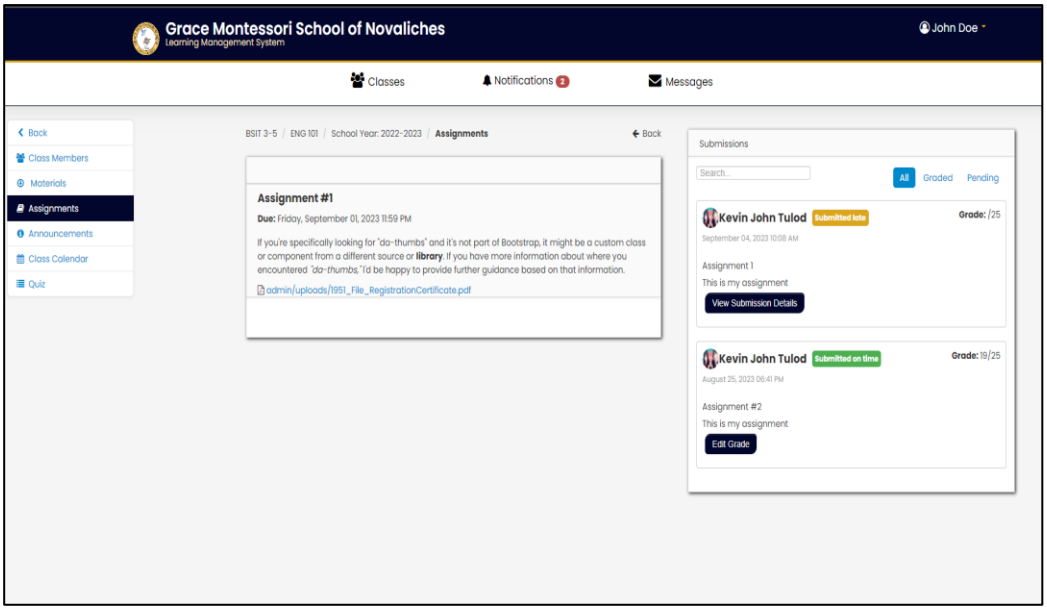

Figure 7.4 Instructor | Assignments

Figure 7.5 shows the ***Announcements*** page wherein instructors can able to publish class-specific announcements.

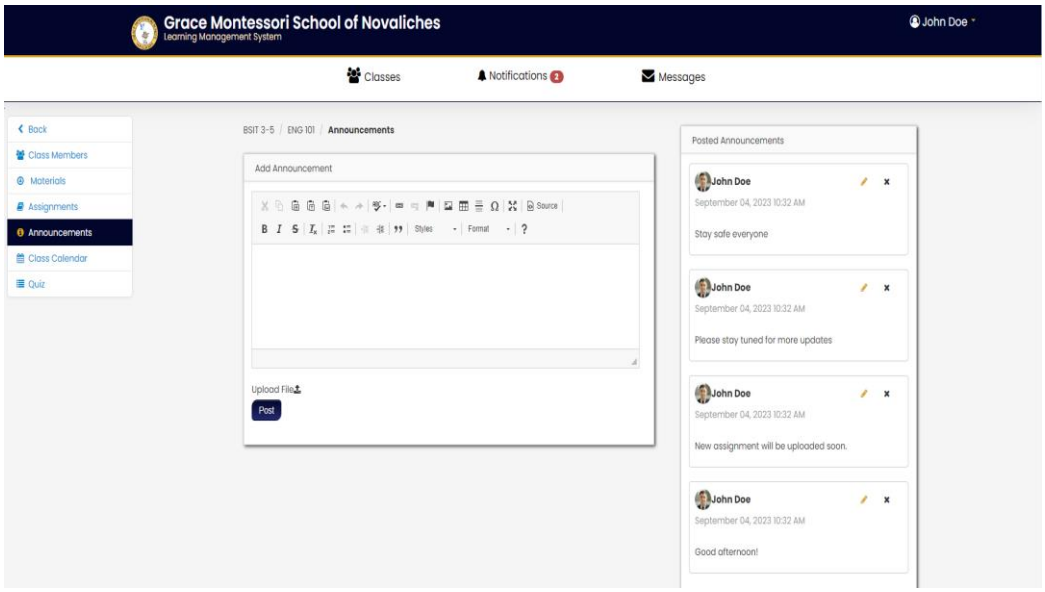

Figure 7.5 Instructor | Announcements

Figure 7.6 shows the ***class calendar*** section, wherein instructors have the ability to input upcoming events or activities into the class schedule.

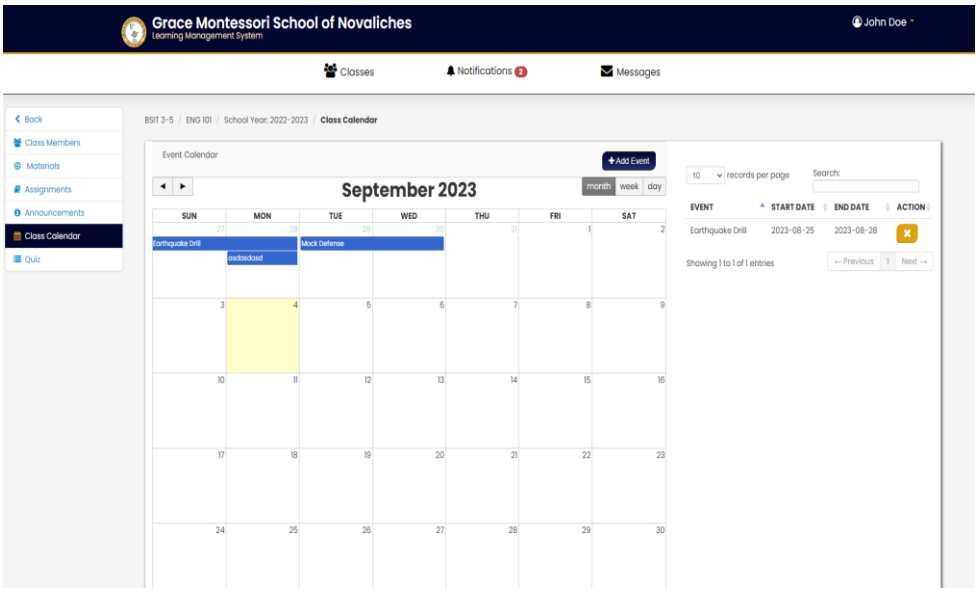

Figure 7.6 Instructor | Class Calendar

Student Interface

Figure 7.7 shows the ***Homepage***, wherein students can access school-wide announcements, view their upcoming tasks, and check the school calendar.

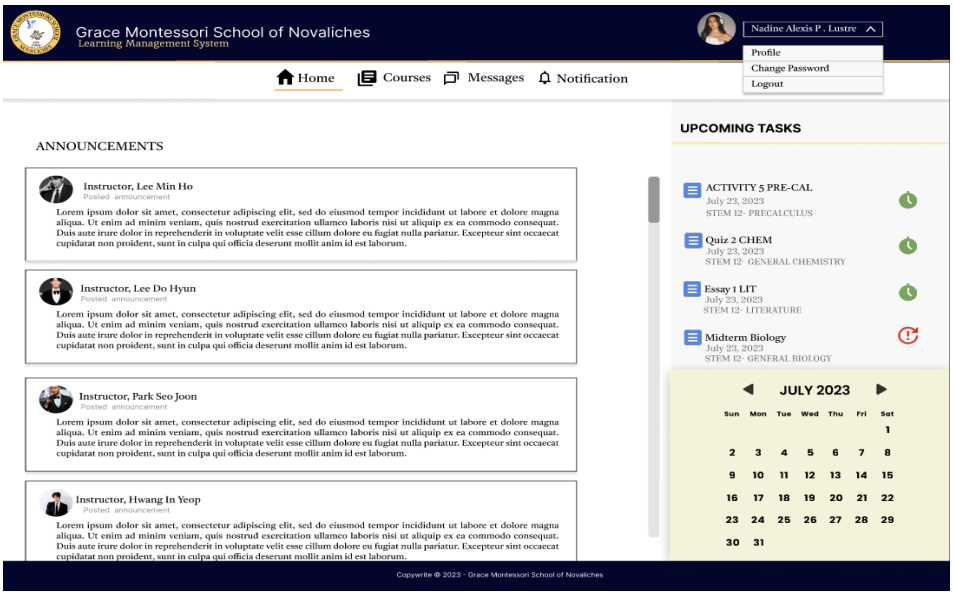

Figure 7.7 Student | Homepage

Figure 7.8 shows the ***Course dashboard*** presents the course subjects in which they are enrolled.

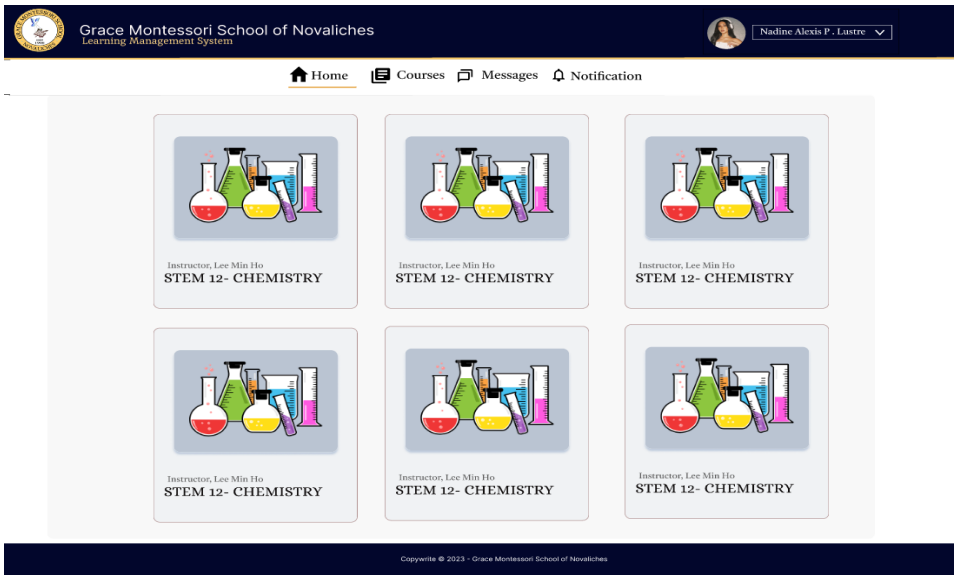

Figure 7.8 Student | Course Dashboard

Figure 7.9 shows the ***Home page***, wherein students can access an overview of the subjects they are enrolled in, along with the grading system input by their instructors.

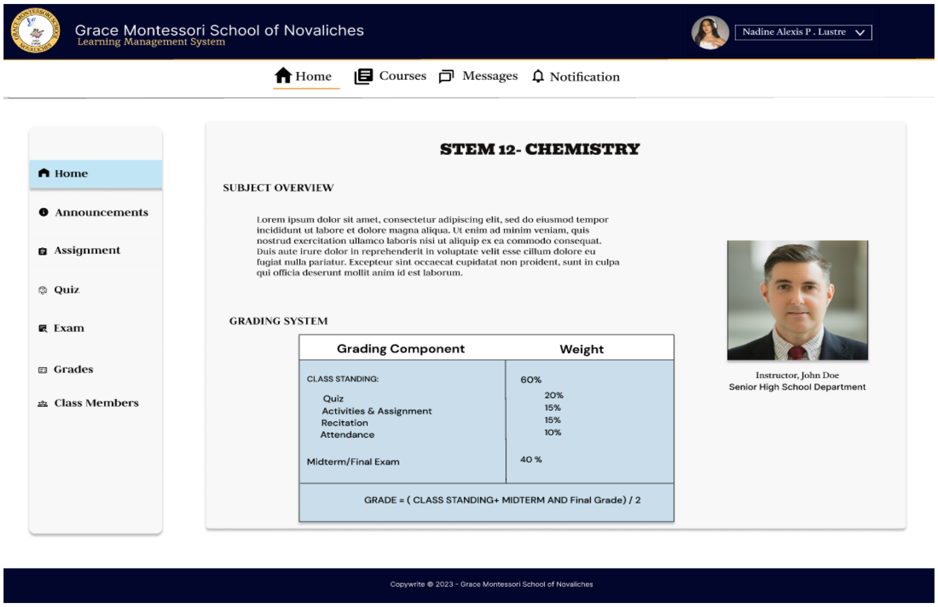

Figure 7.9 Student | Course Homepage

Figure 8.0 shows the ***Announcement page*** wherein it displays the announcements issued by their respective instructors.

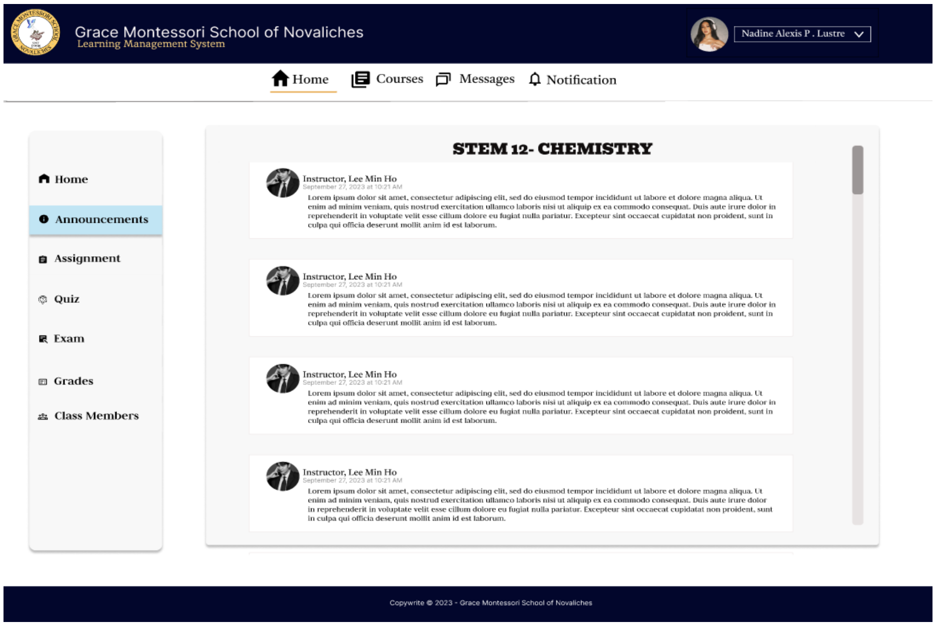

Figure 8.0 Student | Announcements

Figure 8.1 shows the ***Assignment*** section, wherein students can view, access and review their assignments, both past and current.

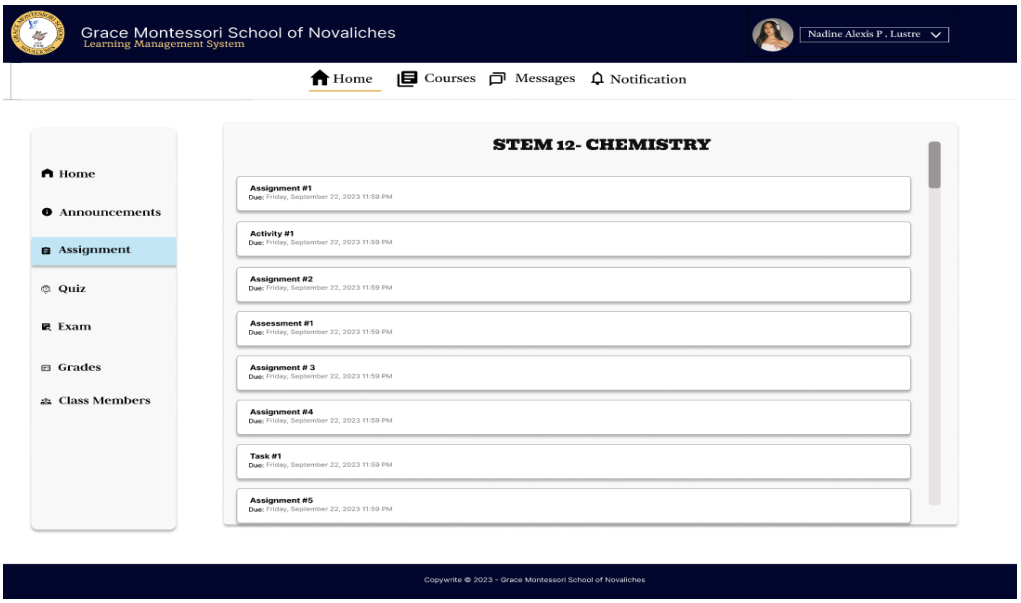

Figure 8.1 Student | Assignments

Figure 8.2 shows the part where students can submit their assignments or tasks, and they also have the option to resubmit if necessary.

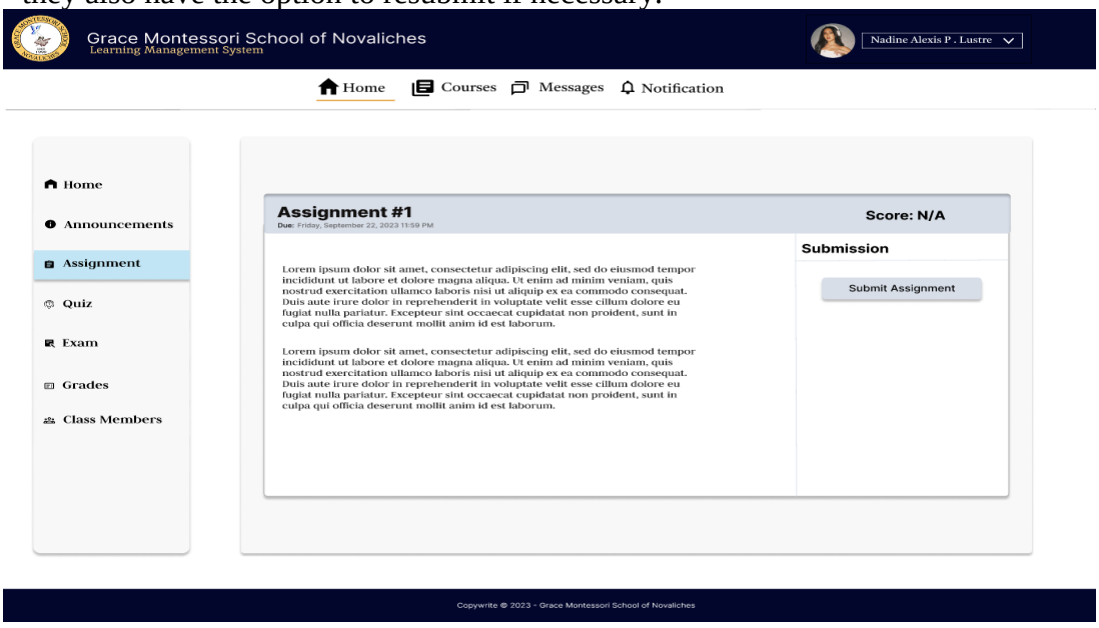

Figure 8.2 Student | Assignment Submission

Figure 8.3 shows the ***Interactive Quiz*** section, wherein students can readily access and engage with quizzes assigned by their instructors for an interactive learning experience.

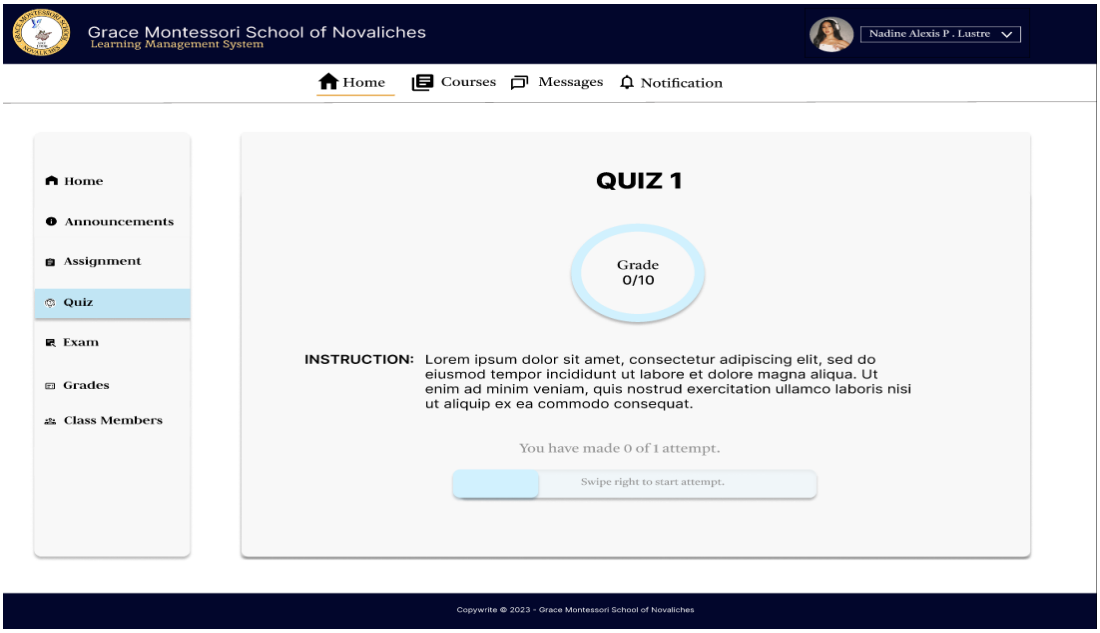

Figure 8.3 Student | Interactive quiz

Figure 8.4 shows the ***Class Member*** section, whereinstudents can view the members of the class.

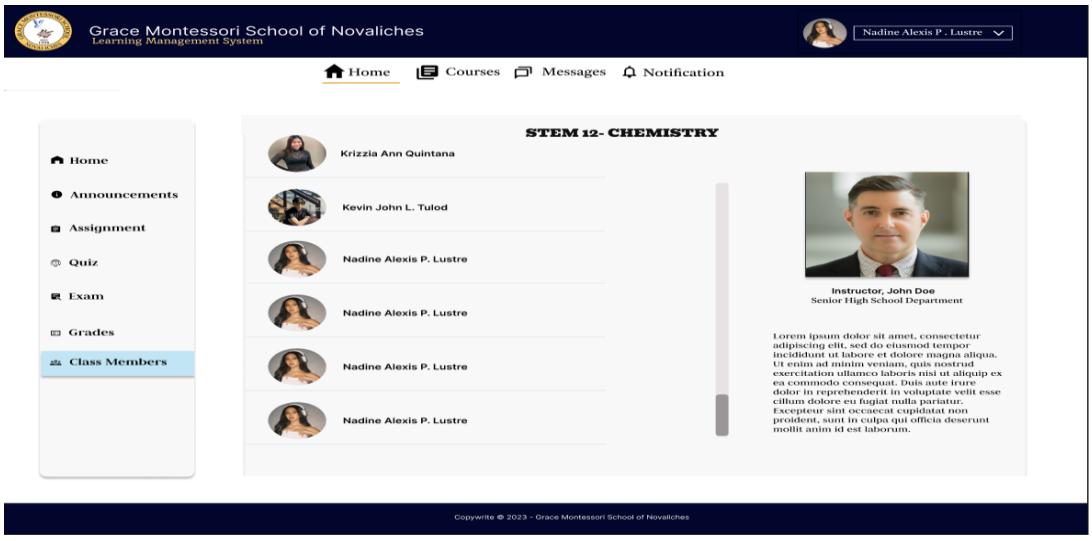

Figure 8.4 Student | Class Members

Figure 8.4 shows the ***Profile*** section, wherein student users have the ability to both view their personal information and make edits to their profiles.

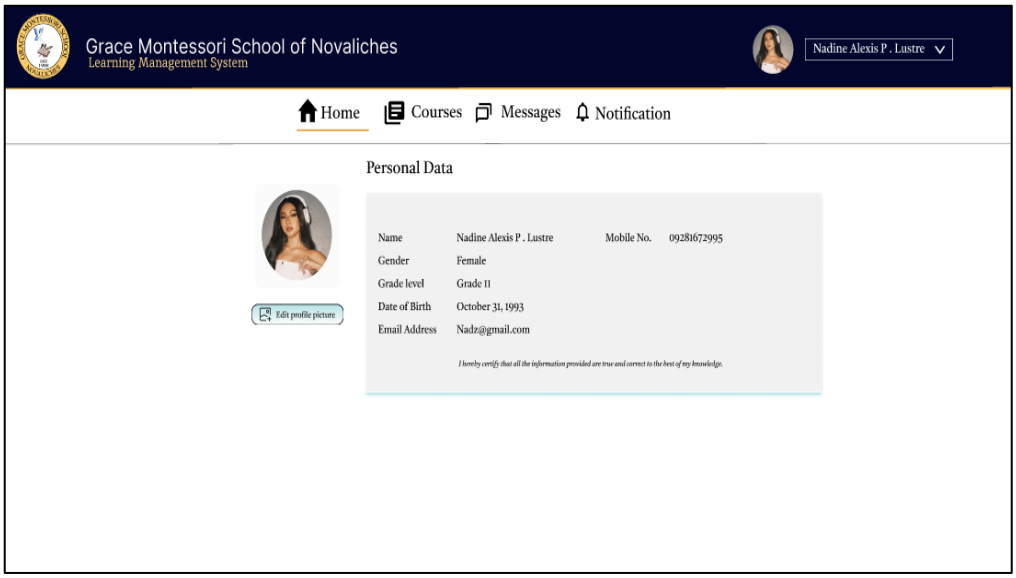

Figure 8.4 Student | Profile

3.2.3. Database Schema

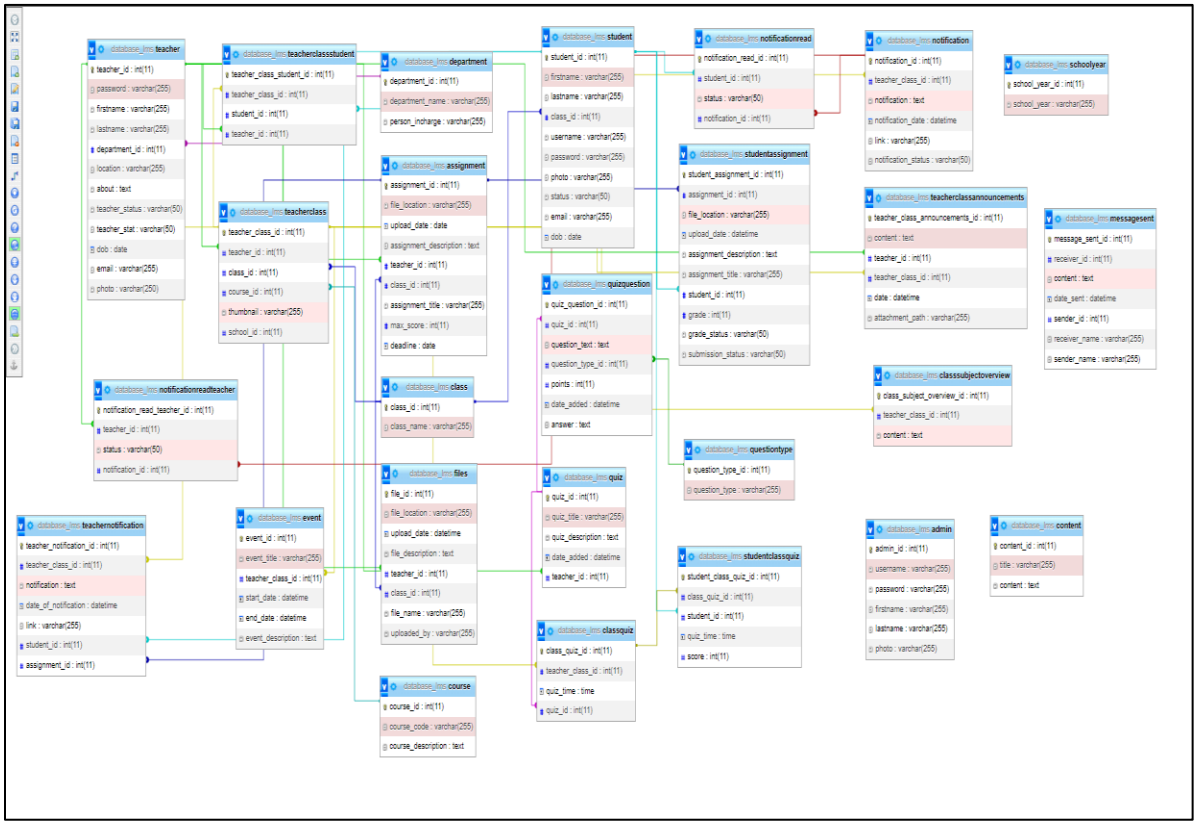

Figure 9. Entity Relationship Diagram

3.2.4. Data Dictionary

Table 22. Database Table of Admin

Table Name: admin **Table Description:** Contains information about the admin					
Key	**Field Name**	**Data Type**	**Default Value**	**Description**	**Sample Data**
PK	admin_id	int(11)		Primary key of admin table	1
	username	varchar(30)	NULL	Admin username for login	admin@gmail.com
	password	varchar(100)	NULL	Admin password for login	Admin_123

	firstname	varchar(30)	NULL	First name of admin	John
	lastname	varchar(30)	NULL	Last name of admin	Doe
	photo	varchar(100)	NULL	Profile picture of admin	adminprofile.png

Table 23. Database Table of Assignment

Table Name: assignment **Table Description:** Contains information about assignment					
	Field Name	**Data Type**	**Default Value**	**Description**	**Sample Data**
PK	assignment_id	int(11)		Primary key of assignment table	1
	file_location	varchar(100)	NULL	Contains uploaded files by the instructor for the assignment	assignment1.pdf
	upload_date	datetime	NULL	Stores the date and time when the instructor uploaded the assignment.	2023-08-31 23:59:00
	assignment_description	text	NULL	Contains the details about the assignment	This is your assignment.
FK	instructor_id	int (11)	NULL	Foreign key from instructor table. Stores the id of the instructor who uploaded the assignment	1
FK	class_id	int (11)	NULL	Foreign key that directs to	1

				the specific class	
	assignment_title	varchar (100)	NULL		Assignment #1
	max_score	int (3)	NULL		30
	deadline	datetime	NULL		2023-010-31 23:59:00

Table 24. Database Table of Class

Table Name: class
Table Description: Contains the details of a class

Key	Field Name	Data Type	Default Value	Description	Sample Data
PK	class_id	int(11)		Primary key for class table	1
	class_name	varchar(100)	NULL	Contains the name of the specific class	BSIT 3-5
FK	department_id	int(11)		Foreign key that connects to the department table	1

Table 25. Database Table of class_quiz

Table Name: class_quiz
Table Description: Contains the details of quiz to be created by instructor

Key	Field Name	Data Type	Default Value	Description	Sample Data
PK	class_quiz_id	int(11)		Primary key of class_quiz table	1
FK	teacher_class_id	int(11)	NULL	Foreign key that connects to teacher_class table	1
FK	quiz_id	int(11)	NULL	Foreign key that connects to quiz table	1
	quiz_timelimit	time	NULL	Assigns time limit for the quiz in minutes	30
	quiz_upload_date	datetime	NULL	Stores the upload date of quiz	2023-010-31 23:59:00

Table 26. Database Table of class_subject

Table Name: class_subject **Table Description:** Contains descrition about specific class					
Key	**Field Name**	**Data Type**	**Default Value**	**Description**	**Sample Data**
PK	class_subject_overview_id	int(11)		Primary key	1
FK	teacher_class_id	int(11)		Foreign key that connects to teacher_class table	1
	content	text	NULL	Contains the details and description of class as per the instructor	Welcome! Let's have fun in our class!

Table 27. Database Table of Content

Table Name: content **Table Description:** Contains the details about the landing page of the website					
Key	**Field Name**	**Data Type**	**Default Value**	**Description**	**Sample Data**
PK	content_id	int(11)		Primary key of content table	1
	title	varchar(100)	NULL	Name of the content	Mission
	content	text	NULL	Contains details about the content	This is our school

Table 28. Database Table of Course

Table Name: course **Table Description:** Contains details about the courses					
Key	**Field Name**	**Data Type**	**Default Value**	**Description**	**Sample Data**
PK	course_id	int(11)		Primary key of course table	1
	course_code	varchar (20)	NULL	Contains the code of the course	EN12Lit-Ia-21
	course_title	varchar(100)	NULL	Contains the name of the course	21st Century Literature

	course_description	text	NULL	Contains the description of the course	Explore the literary landscape of the 21st century in this course, delving into contemporary narratives, themes, and voices that shape our modern world. Analyze evolving literary forms and engage with diverse perspectives to gain a deeper understanding of literatures.

Table 29. Database Table of Department

Table Name: department **Table Description:** Contains information about the departments inside the school					
Key	**Field Name**	**Data Type**	**Default Value**	**Description**	**Sample Data**
PK	department_id	int(11)		Primary key of department table	1
	department_name	varchar (100)	NULL	Contains the name information of the department	Senior Highschool Department
	person_incharge	varchar (100)	NULL	Contains the information about the person in charge of a specific department	John Doe

Table 30. Database Table of Event

Table Name: event **Table Description:** Contains the information about the events inside the school					
Key	**Field Name**	**Data Type**	**Default Value**	**Description**	**Sample Data**
PK	event_id	int(11)		Primary key of event table	1

	event_title	varchar(100)	NULL	Contains the name of the event	Exam Week
FK	teacher_class_id	int(11)	NULL	Foreign key that connects to teacher_class table	1
	start_date	datetime	NULL	Contains the start date and time of the event	2023-010-31 23:59:00
	end_date	datetime	NULL	Contains the end date of the event. Cannot be earlier than the start date.	2023-011-31 23:59:00
	event_description	text	NULL	Contains description about the event	Exam week for SHS and HS department

Table 31. Database Table of Materials

Table Name: materials
Table Description: Contains information about the materials uploaded by the instructor on class.

Key	Field Name	Data Type	Default Value	Description	Sample Data
PK	material_id	int(11)		Primary key for files table	1
FK	teacher_id	int(11)	NULL	Foreign key that connects to teacher table	1
FK	class_id	int(11)	NULL	Foreign key that connects to class table	1
	file_description	text	NULL	Contains information about the materials uploaded	This is your learning material for today.
	File_location	varchar(100)	NULL	Contains the files uploaded	material1.pdf, material2.pdf
	upload_date	datetime	NULL	Stores date and time when the materials were uploaded	2023-010-31 23:59:00

	file_name	varchar(100)	NULL	Contains the name/title of the materials uploaded	Learning Materials

Table 32. Database Table of messages

Table Name: messages **Table Description:** Contains information about the messages sent by students and instructors					
Key	**Field Name**	**Data Type**	**Default Value**	**Description**	**Sample Data**
PK	message_id	int(11)		Primary key for messages table	1
	receiver_id	int(11)	NULL	Stores the key for the receiver of the messages	1
	content	text	NULL	Contains the message to be sent	Hello, how are you?
	Date_sent	datetime	NULL	Stores date and time when did the message was sent	2023-012-31 23:59:00
	sender_id	int(11)	NULL	Stores the key for the sender of the message	1
	receiver_name	varchar(100)	NULL	Contains the name of the receiver of the message	John Doe
	sender_name	varchar(100)	NULL	Contains the name of the sender of the message	Jane Doe

Table 33. Database Table of Notification

Table Name: notification **Table Description:** Contains information about the notifications inside the LMS					
Key	**Field Name**	**Data Type**	**Default Value**	**Description**	**Sample Data**
PK	notification_id	int(11)		Primary key for notification table	1
FK	instructor_class_id	int(11)	NULL	Foreign key that connects to the	1

				teacher_class table	
	notification	text	NULL	Stores the content of the notification	A new assignment has been uploaded on BSIT 3-5
	notification_date	datetime	NULL	Stores the date and time when did the user receive the notification	
	link	varchar(100)	NULL	This provides an anchored link to the destination of the notification	announcements.php
	status	varchar(20)	NULL	Identifies that the notification is already read	1

Table 34. Database Table of question_type

Table Name: question_type
Table Description: Contains information about the question types available for quiz

Key	Field Name	Data Type	Default Value	Description	Sample Data
PK	question_type_id	int(11)		Primary key for question_type	1
	question_type	varchar(20)	NULL	Specifies the type or category of the quiz question.	True or False

Table 35. Database Table of quiz

Table Name: quiz **Table Description:** Contains information about the quiz to be uploaded by the instructor					
Key	**Field Name**	**Data Type**	**Default Value**	**Description**	**Sample Data**
PK	quiz_id	int(11)		Primary key for quiz	1
FK	teacher_id	int(11)	NULL	Foreign key that connects the teacher table	1
	quiz_title	varchar(100)	NULL	Contains the title of the quiz	Quiz #1
	quiz_description	varchar(200)	NULL	Contains the directions and other details about the quiz	This is your quiz. Goodluck! You only have 1 attempt.
	Date_added	datetime	NULL	Stores the date and time of the upload of the specific quiz.	2023-012-31 23:59:00

Table 36. Database Table of quiz_question

Table Name: quiz_question **Table Description:** Contains information about the questions inside a quiz					
Key	**Field Name**	**Data Type**	**Default Value**	**Description**	**Sample Data**
PK	quiz_question_id	int(11)		Primary key for quiz_question table	1
FK	quiz_id	int(11)	NULL	Foreign key that connects to the quiz table	1
FK	question_type_id	varchar(20)	NULL	Contains the choices for question type for a specific question	1
	question_text	text	NULL	Captures the actual question text associated with	True or False: Is 1 + 1 = 2?

				each quiz question entry.	
	points	int(3)	NULL	Stores the assigned point value for each quiz question.	1
	date_added	datetime	NULL	Indicates the date of addition for the record entry	2023-012-31 23:59:00
	answer	text	NULL	Holds the provided answer to the quiz question	True
	attachment_path	varchar(100)	NULL	Stores the file path for any associated attachments	attachment1.png

Table 37. Database Table School Year

Table Name: school_year
Table Description: Represents the academic year during which educational activities take place

Key	Field Name	Data Type	Default Value	Description	Sample Data
PK	school_year_id	int(11)		Primary key that identifies each academic year record.	1
	school_year	varchar(50)	NULL	Indicates the specific academic year under consideration.	S.Y. 2022-2023

Table 38. Database Table of student

Table Name: student
Table Description: Contains information about the students who will use the LMS

Key	Field Name	Data Type	Default Value	Description	Sample Data
PK	student_id	int(11)		Primary key that identifies each student in the system.	1
FK	class_id	int(11)	NULL	Foreign key that associates the student	1

				with their respective class	
	firstname	varchar(100)	NULL	Records the first name of the student.	John
	lastname	varchar(100)	NULL	Records the last name of the student	Doe
	student_number	varchar(20)	NULL	Provides the student's unique identification number	000000-000000
	password	varchar(50)	NULL	Hashed password for access to the student's account	$2y$10$GdsV.tXp5np0tsZ.lWu0VevUwgSrGwXuq/PbncCzS7n7n.aezwr6S
	photo	varchar(100)	NULL	Stores an image of the student	image.png
	status	varchar(50)	NULL	Reflects the current status of the student	registered
	email	varchar(100)	NULL	Stores the student's email address	johndoe@gmail.com
	dob	date	NULL	Records the student's date of birth	2001-10-10

Table 39. Database Table of student_class_quiz

Table Name: **Table Description:**					
Key	**Field Name**	**Data Type**	**Default Value**	**Description**	**Sample Data**
PK	student_class_quiz_id	int(11)		Identifies each student-class-quiz association	1
FK	class_quiz_id	int(11)	NULL	Links the quiz with the specific class and instructor	1

FK	student_id	int(11)	NULL	Foreign key from student attempting the quiz	1
	quiz_time	time	NULL	Implies how many minutes allotted for the quiz	30
	score	int(3)	NULL	Stores the score achieved by the student in the quiz	10/10

Table 40. Database Table of instructor

Table Name: instructor
Table Description: Contains information about instructors who will use the system

Key	Field Name	Data Type	Default Value	Description	Sample Data
PK	instructor_id	int(11)		Primary key for instructor table. Uniquely identifies each instructor within the system.	1
FK	department_id	int(11)	NULL	Foreign Key that associates the instructor with their respective department	1
	firstname	varchar(50)	NULL	Records the first name of the instructor	John
	lastname	varchar(50)	NULL	Records the last name of the instructor	Doe
	email	varchar(100)	NULL	Stores the email address of the instructor	johndoe@gmail.com
	password	varchar(50)	NULL	Hashed password for access to the instructor's account	$2y$10$GdsV.tXp5np0tsZ.lW
	photo	varchar(100)	NULL	Stores an image of the instructor	instructorphoto.png

	teacher_status	varchar(50)	NULL	Reflects the current status of the instructor	active
	dob	date	NULL	Records the instructor's date of birth	1998-10-10

Table 41. Database Table of instructor_class

Table Name: instructor_class
Table Description: Contains information about the classes assigned to instructor

Key	Field Name	Data Type	Default Value	Description	Sample Data
PK	instructor_class_id	int(11)		Primary key uniquely identifying each instructor-class association	1
FK	instructor_id	int(11)	NULL	Foreign key referencing the instructor linked to the class	1
FK	class_id	int(11)	NULL	Foreign key pointing to the class associated with the instructor	1
FK	course_id	int(11)	NULL	Foreign key indicating the course linked to the instructor-class	1
FK	shool_year_id	int(11)	NULL	Foreign key referencing the school year of the instructor-class	1
	thumbail	varchar(100)	NULL	Stores an optional thumbnail image	thumbnail.png

Table 42. Database Table of instructor_class_announcements

Table Name: instructor_class_announcements **Table Description:**					
Key	**Field Name**	**Data Type**	**Default Value**	**Description**	**Sample Data**
PK	instructor_class_announcements_id	int(11)		Primary key uniquely identifying each instructor - class announcement entry.	1
FK	instructor_id	int(11)	NULL	Foreign key referencing the instructor making the announcement	1
FK	instructor_class_id	int(11)	NULL	Foreign key indicating the instructor-class associated with the announcement	1
	post_date	datetime	NULL	Indicates the date when the announcement was posted	2023-012-31 23:59:00
	attachment_path	varchar(100)	NULL	Stores the file attachments	image.png

Table 43. Database Table of instructor_notification

Table Name: instructor_notification **Table Description:** Contains information about the notifications on instructor's side					
Key	**Field Name**	**Data Type**	**Default Value**	**Description**	**Sample Data**
PK	instructor_notification_id	int(11)		Primary key uniquely identifying each instructor notification entry	1
FK	instructor_class_id	int(11)	NULL	Foreign key referencing the instructor-class associated with the notification	1
FK	student_id	int(11)	NULL	Foreign key referencing the notification from student's activity	1
FK	assignment_id	int(11)	NULL	Foreign key referencing the assignment related to the notification	1
	notification	text	NULL	Contains the notification message content	John Doe submitted an assignment from BSIT 3-5
	notification_date	datetime	NULL	Indicates the date of	2023-012-31 23:59:00

				the notification	
	link	varchar(100)	NULL	Stores a link associated with the notification	assignments.php

Table 44. Database Table of instructor_tokens

Table Name: instructor_ tokens
Table Description: Contains information about the authentication of instructors when they forgot password

Key	Field Name	Data Type	Default Value	Description	Sample Data
PK	instructor_ token_id	int(11)		Primary key uniquely identifying the token for instructor	1
FK	instructor_id	int(11)	NULL	Foreign key referencing the instructor's id	1
	token	varchar(200)	NULL	Identifier of the limited password change	123
	expiration_date	datetime	NULL	Expiration date of token	2023-012-31 23:59:00

Table 45. Database Table of student_tokens

Table Name: instructor_ tokens
Table Description: Contains information about the authentication of students when they forgot password

Key	Field Name	Data Type	Default Value	Description	Sample Data
PK	student_ token_id	int(11)		Primary key uniquely identifying the token for student	1
FK	student_id	int(11)	NULL	Foreign key referencing the student's id	1

	token	varchar(200)	NULL	Identifier of the limited password change	123
	expiration_date	datetime	NULL	Expiration date of token	2023-012-31 23:59:00

3.3. DEVELOPMENT METHODOLOGY

3.3.1. Process Model

The Agile Development Model used for the Grace Montessori School of Novaliches LMS is all about making sure it fits the users well and can change when needed. Instructors, students, and administrators will be involved in the development process of the system. This way, the LMS keeps getting better to match the needs and requirements of the school in terms of learning. Through this methodology, the institution not only delivers regular updates but also actively gathers invaluable feedback, ensuring a responsive and dynamic LMS that consistently enhances the learning experience for all users.

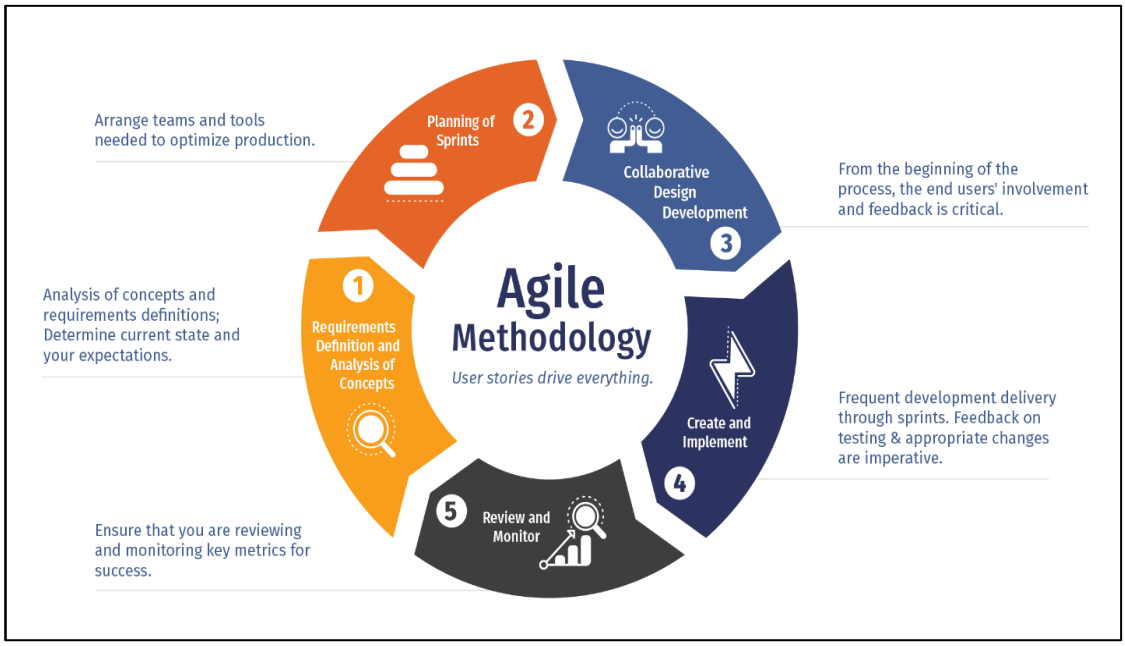

Figure 10. Agile Methodology

3.3.2. Development Models

Programming Language: PHP, JavaScript

Frontend Development: HTML, CSS, JavaScript, Bootstrap

Database: MySQL, phpMyAdmin

Integrated Development Environment: Visual Studio 2022

Framework: Laravel, Bootstrap

Prototyping Tool: Figma

3.4. TEST METHODOLOGY/PROCEDURES

3.4.1. Unit Testing

Unit Testing – This test is employed to verify the functionality and dependability of individual components within the code.

- Blackbox Testing – The tester focuses on determining whether the unit meets the requirements stated in the program specifications.

3.4.2. System Testing

System Testing – thorough assessment of the complete system to confirm the seamless interaction and cohesive operation of all its components.

3.4.3. End-to-end Testing

End-to-end Testing – Comprehensive examination of the system's workflows from initiation to completion, validating the accurate execution of all processes and interactions.

3.4.4. Performance Testing

Performance Testing – involves evaluating the speed, responsiveness, and overall efficiency of a software system to ensure it meets performance requirements.

3.4.5. Security Testing

Security Testing – focuses on assessing a software system's defenses against vulnerabilities and potential threats to ensure it maintains the desired level of security. This also focuses on the integrity, confidentiality, and availability of information.

3.4.6. Compatibility Testing

By thoroughly testing for compatibility, developers can release the LMS with confidence, knowing that it will function dependably and effectively across a variety of environments and devices, giving all users a seamless learning experience. As part of the LMS compatibility testing, the following features are evaluated:

Network Compatibility: The LMS is tested to make sure it works properly in a variety of network scenarios, including those with various bandwidths and connection speeds. With the help of this step, users can access the LMS without any problems, irrespective of their network configuration.

Compatibility testing with various web browsers, including Google Chrome, and Microsoft Edge, checks how the LMS functions. This aims to ensure flawless LMS functionality across all popular browsers.

3.4.7. Testing Procedure

The testing procedure of the GMSN LMS covers the functionality, necessary requirements, and features that need to be tested by the users.:

Table 46. End to End Testing Procedure

Test Case No.	Test Title	Test Description	Expected Results	Status (Pass/Fail)
TC001	User Registration Process	Check the flow of information from start to finish	Administrator should be able to register users successfully.	
TC002	Change Password	Test password change and reset function including hashing.	User's password should be changed/reset successfully.	

TC003	Announcement/Event posting	Test posting announcements and events to instructors and students.	Announcements and events should reflect to the chosen recipients without inconsistencies.	
TC004	Task Management	Test creating and submitting tasks within the system.	Tasks must reflect on the correct recipients and creators.	

Table 47. Performance Testing Procedure

Test Case No.	Test Title	Test Description	Expected Results	Status (Pass/Fail)
TC005	User Login	Test to verify successful login and also assess unauthorized access attempts.	Users should be able to log in with valid login credentials.	
TC006	Department, Class, Student, Instructor, Course Management process	Test adding, deleting, and updating information from the system from start to finish.	Necessary changes must reflect without inconsistencies and defects.	
TC007	User Roles & Permissions	Tests for different user roles (administrators, instructors, students) and evaluate their respective permissions and access levels.	Users should be granted access in accordance with their respective roles.	

Table 48. Security Testing Procedure

Test Case No.	Test Title	Test Description	Expected Results	Status (Pass/Fail)
TC008	Data Encryption	Try unauthorized access to user data and evaluate the effectiveness of encryption	User data must maintain its security and	

		mechanisms through testing.	remain encrypted.	
TC009	SQL Injection Test	Execute an SQL injection test with the intention of identifying potential security vulnerabilities within the system.	System should be able to deflect SQL injection attempts.	

Table 49. System Testing Procedure

Test Case No.	Test Title	Test Description	Expected Results	Status (Pass/Fail)
TC010	Capacity Testing	Test the system's performance by simulating many users at once to see when it becomes slow or starts to crash.	System can accommodate multiple users at once.	

3.5. SYSTEM REQUIREMENTS

3.5.1. Hardware Requirements

Users must have at least a desktop computer or laptop with the following specifications to be able to visit the website and use its features.

Table 50. Hardware Requirements

COMPONENT	MINIMUM	RECOMMENDED
Processor	Intel Celeron M	Intel Core i3 or Ryzen 3 equivalent
Installed Memory (RAM)	**4 GB**	**8 GB**
Hard Disk Drive/Solid State Drive	**128 GB**	**256 GB or more**
Internet Connection	**20 mbps**	**25 mbps or more**

3.5.2. Software Requirements

Operating System: The system is best suited for Windows 8 64-bit or higher.

Browser: For optimal performance and interface, it is advisable to use Google Chrome or Microsoft Edge. While Mozilla Firefox is also supported, the user interface may not be fully maximized.

Table 51. Software Requirements

COMPONENT	MINIMUM	RECOMMENDED
Operating System	**Microsoft Windows 8**	**Microsoft Windows 10 or higher**

3.6. QUALITY PLAN

The following table shows the description of the scale for evaluating the quality characteristics of the GMSN LMS. It encompasses eight main quality characteristics according to the International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) 25010. The characteristics that will be used to measure the quality are the following:

- Functional Suitability – this characteristic assesses the extent to which the software's functions meet specified needs and requirements. It includes aspects like completeness, correctness, and appropriateness of functions.
- Performance Efficiency – this evaluates how well the software performs in terms of speed, responsiveness, and resource utilization. It focuses on the factors like speed, and resource consumption.
- Compatibility – assesses the system's ability to operate effectively in different environments, including various browsers and hardware components.
- Usability – evaluates the software's user-friendliness and how easy it is for users to interact with and navigate the system.

- Reliability – focuses on the software's ability to perform consistently and accurately over time.
- Security – evaluates the system's ability to protect data and functions from unauthorized access, breaches, and other security threats.
- Portability – evaluates the software's ability to be adapted for use in different environments and on various platforms.

GMSN LMS Survey					
Demographics					
Name (Optional):			**Age**:		
User Type: (Administrator, Instructor, Student)			**Gender**		
Direction: Please put a check on the criteria of your choice. **5 – Strongly Agree, 4 – Agree, 3 – Neutral, 2 – Disagree, 1 – Strongly Disagree**					
Functional Suitability	**5**	**4**	**3**	**2**	**1**
GMSN LMS effectively fulfills its intended functions and requirements.					
GMSN LMS includes all the necessary features and capabilities needed for effective learning					
GMSN LMS aligns with the functional goals and objectives set for educational courses.					
Performance Efficiency	**5**	**4**	**3**	**2**	**1**
GMSN LMS operates with satisfactory speed and responsiveness.					
GMSN LMS can handle and process multiple users and processes.					
Users experience quick response times when interacting with the GMSN Learning Management System.					

Compatibility	**5**	**4**	**3**	**2**	**1**
The system is compatible with a wide range of web browsers, ensuring a consistent user experience.					
Usability	**5**	**4**	**3**	**2**	**1**
Users find the interface intuitive and user-friendly, with easy navigation and clear instructions.					
GMSN LMS offers a personalized learning experience, allowing users to set preferences and track progress easily.					
GMSN LMS is error-free and available to use anytime.					
Reliability	**5**	**4**	**3**	**2**	**1**
GMSN LMS provides the needs of its users under normal operations.					
GMSN LMS is operational and accessible at a time needed for use.					
GMSN LMS can operate with no frequent errors.					
GMSN LMS has minimal downtime, with a high level of availability, ensuring uninterrupted learning.					
Security	**5**	**4**	**3**	**2**	**1**
GMSN LMS can ensure that user data is securely stored and protected against unauthorized access or breaches.					
GMSN LMS enforces strong authentication and authorization mechanisms to safeguard user accounts.					
GMSN LMS account verification is working properly.					

Portability	**5**	**4**	**3**	**2**	**1**
The system can be accessed and used across different devices with consistent performance and usability.					
Users can seamlessly switch between different platforms (e.g., desktop, tablet, mobile) without issues.					
Comments and Suggestions:					
_____ Signature				_____ Date	

Table 52. Evaluation Survey Form

3.7. STATISTICAL TREATMENT OF DATA

Scale	Range	Verbal Interpretation
5	1.0-1.80	Strongly Agree
4	1.81-2.60	Agree
3	2.61-3.40	Neutral
2	3.41-4.20	Disagree
1	4.20-5.00	Strongly Disagree

Table 53. Likert Scale

To compute the mean value: $\bar{x} = \Sigma xN$

WHERE:

$\bar{x}$ = mean

Σ = sum of

X = data points

N = total number of respondents

3.8. EVALUATION PLAN

The purpose of creating an evaluation plan for the GMSN LMS is to assess and measure the effectiveness, performance, and overall success of the LMS implementation in adherence with the ISO 25010 standards. The following are the evaluation methods:

Evaluation methods:

e. User Acceptance Testing (UAT): UAT sessions will be conducted with representatives from different user groups (administrators, instructors, and students) to evaluate the system's functionality and usability based on predefined test scenarios.

b. User Feedback Surveys: Surveys will be administered to gather feedback from system users regarding their experience, problems while using the system, and suggestions for improvement.

c. Performance Metrics: Key performance indicators such as the functional completeness, resource utilization, capacity, accessibility, and availability will be measured to assess efficiency improvements within the system.

d. Security Evaluation: An assessment of the system will be carried out to examine how it has implemented access controls, encryption, and other security measures aimed at safeguarding sensitive information.

e. User interview and surveys: User interviews and surveys will be conducted by the proponents based on the quality plan in adherence to ISO/IEC 25010 standards after

users have tested the functionalities and features of the system. The proponents will ensure that users' data and feedback are treated with privacy and sensitivity.

In summary, the evaluation plan presents a thorough method for gauging the influence and efficiency of the GMSN Learning Management System once the project is finished and implemented. The integration of interviews, usability testing, and surveys aligned with ISO/IEC 25010 standards guarantees a comprehensive evaluation process that focuses into not only the achievement of objectives and results but also user experiences. Through active engagement of stakeholders and key participants, the plan intends to offer valuable insights that can be utilized for enhancements aimed at better serving the institution.

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APPENDIX I

Capstone Project Revision Matrices

Republic of the Philippines
POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
Office of the Vice President for Academic Affairs
College of Computer and Information Sciences

CAPSTONE PROJECT REVISION MATRIX

INFORMATION

Title	GMSN LMS: Implementing Learning Management System in Grace Montessori School of Novaliches for Ehnahnced Academic Communication and Learning		
Program	Bachelor of Science in Information Technology	Year and Section	3-5
Researcher Names and Email Addresses:	1. Abad, Trisha A. (trishaabad59@gmail.com) 2.Quintana, Krizzia Ann C (quintanakrizziaann@gmail.com) 3.Rosalia, Sharmaine V. (rosalia.sharmaine@gmail.com) 4.Tulod, Kevin John L. (kevinjohntulod017@gmail.com)		

REVISION INFORMATION

Presentation Date	Month	September	Day	05	Year:	2023	Time:	Room:	S-508
Presentation Type	☒ Proposal	☐ Tool	☐ Final	☐ Redefense					

ACTION

Comments/Suggestions by the Panelists	Action Taken by the Proponents/Researchers	Page No.	Suggested by: Panelist's Name	Panelist Signature
Put the panelist's comment here as stated in the Comments and Suggestions Sheet	Kindly discuss what did your group do. If the comment is about the manuscript, kindly indicate the page number.			
The listed technical background is not about the client.	Changed the technical background based on the components used by the client	2-5	~~Prof.~~ John Dustin Santos	Revise ~~Data~~ figure 1.0 but ok 9/12/23
Change use case diagram on "Manage Account" action for students and instructors into "Manage Profile" and don't conntect the action to the Admin Actor.	The Manage Account actions for students and instructors are changed to "Manage Profile" and is separated from the Admin	24	~~Prof.~~ John Dustin Santos	ok 9/12/23
Add Learning Objectives to be aligned for every tasks and uploaded materials	Learning Objectives added for every task creation and material upload	21	~~Prof.~~ John Dustin Santos	ok 9/12/23
Add short description about each website interface	ADDED SHORT DESCRIPTION ABOUT THE FUNCTIONS AND PROCESSES FOR EVERY INTERFACE	46-57	~~PROF~~ JOHN DUSTIN SANTOS	fix the figure desc. but ok 9/12/23

Figure 11. Capstone 1 Proposal Defense Revision Matrix