

Automated grading system with student performance analytics

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ABSTRACT

Introduction. The Automated Grading System with Student Performance Analy developed to address the challenges and inefficiencies in traditional grading systems at educational institutions. The system aims to automate the grading process while offering robust analytics to track student performance, helping educators make data-driven decisions to enhance teaching strategies and improve student outcomes.

Product Description. This system operates through a web-based platform that ensures accessibility for both teachers and students, regardless of the device used. It automates the grading of assignments, quizzes, exams, and other academic assessments, significantly reducing administrative workload and enhancing grading accuracy. Additionally, the system incorporates performance analytics, allowing educators to generate comprehensive reports and track student progress over time. This functionality is essential in providing real-time insights into areas where students may need additional support, contributing to a more personalized learning experience.

System Features. The key features of the system include an intuitive user interface, automated grading based on customizable criteria, role-based access control, and offline-online integration. It supports both online and offline modes to ensure consistent access, even in areas with limited internet connectivity. Data security is prioritized with encrypted storage and secure communication protocols, ensuring the privacy of student information.

External Interface Requirements. The user interface of the Automated Grading System for Colegio De Santa Rita is designed to be intuitive, responsive, and accessible through any modern web browser, ensuring ease of use for teachers, administrators, and students. Developed using HTML, CSS, JavaScript, and Bootstrap, the system includes essential modules such as secure login with role-based access, student enrollment management, teacher profile administration, and subject load assignments. These modules streamline academic operations by ensuring accurate data handling, efficient teaching assignments, and secure access to relevant information. To support optimal system performance and reliability, the server hardware requirements include a multi-core 64-bit processor, a minimum of 4GB RAM, SSD storage, and an LED monitor with high resolution, ensuring smooth functionality and responsiveness of the system across all user tasks.

Other Nonfunctional Requirements. The Automated Grading System with Student Performance Analytics emphasizes performance, safety, security, and software quality to ensure seamless functionality and user satisfaction. Performance requirements ensure the system responds efficiently, supports multiple users, and maintains functionality across various platforms. Safety and security are reinforced through data protection measures, including regular backups and role-based access controls, while a built-in data backup feature allows users to download SQL copies to prevent data loss. The installation process includes deploying XAMPP, Composer, and Git to support smooth system management and updates. Software quality attributes such as operability, simplicity, modularity, and communicativeness were rated highly, confirming a user-friendly and adaptable system. Comprehensive testing functional, usability, performance, and security further ensure system reliability, scalability, and secure operations across user groups.

Project Management. The Automated Grading System with Student Performance Analytics incorporates recommended hardware and software to ensure system efficiency and reliability. These include Windows-based servers with SSD storage and sufficient RAM, modern client devices with internet access, and development tools such as XAMPP, Visual Studio Code, Git, and MariaDB. Key user roles registrar, teachers, and students are defined with role-based access to ensure security, usability, and data integrity. A comprehensive feasibility assessment confirms the system's technical, operational, economic, legal, and sustainability viability, highlighting benefits such as improved grading efficiency, cost-effectiveness through open-source tools, and secure data handling. Time management follows a structured timeline encompassing planning, design, development, testing, deployment, and maintenance, ensuring timely and quality implementation. Communication and coordination are sustained through consistent collaboration between the researchers, developers, and school stakeholders, ensuring the system meets institutional requirements and educational objectives.

Summary. The Automated Grading System with Student Performance Analytics streamlines academic evaluation by automating grade computation, enabling efficient performance tracking, and offering a user-friendly interface for educators and students. The system reduces manual grading efforts, improves data accuracy, and supports real-time feedback. With role-based access control and integrated performance reports, it enhances academic decision-making and fosters personalized learning experiences. The implementation proved effective in addressing traditional grading inefficiencies and elevating the institution's academic management processes.

Recommendation. To further enhance system effectiveness, future development should focus on integrating advanced analytics features such as predictive modeling and trend analysis to support data-driven educational strategies. Comprehensive training for educators and students, along with a dedicated technical support team, is essential for optimal system use. Regular upgrades to hardware and software infrastructure are recommended to ensure scalability and sustained performance. Continuous system monitoring, periodic audits, and adherence to evolving data privacy regulations are crucial for maintaining security and compliance. Establishing a user feedback loop will ensure the system remains responsive to the evolving needs of its users, and exploring regional scalability can expand its impact across other educational institution

Chapter I

INTRODUCTION

Background of Study

Automated grading systems with student performance analytics are transforming education by improving grading efficiency and consistency, allowing educators to focus more on teaching and personalized support (Ferguson, 2017). These tools provide insights into student performance, helping tailor instruction to individual needs. Worldwide, schools use these technologies to enable data-driven decisions and better learning outcomes. Successful adoption requires addressing infrastructure, data privacy, and equitable access challenges (Siemens, 2013).

In the ASEAN region, automated grading systems with student performance analytics are gaining recognition for improving education. These tools help address diverse challenges by bridging gaps in resources and technology access. Performance data guides policymakers in improving education quality through better resource allocation (Siemens, 2013). Regional collaborations, tech investments, and supportive policies are key to overcoming challenges. By doing so, ASEAN countries can boost teaching, student outcomes, and create a more inclusive education system (ADB, 2021).

In the Philippines, automated grading systems with student performance analytics are increasingly used to improve education and streamline tasks. Challenges include the need for strong tech infrastructure, proper training, and data security (Implementation of an Automated Grading System with an Adaptive Learning Component, 2022). Addressing the digital divide is crucial due to varied tech access across regions. Overcoming these issues can boost education quality and inclusivity. Locally, these systems offer great potential to tackle specific institutional challenges and enhance outcomes (Battula, 2023).

Developing an Automated Grading System with Student Performance Analytics at Colegio De Santa Rita fills key gaps in educational technology by combining efficient grading with deep performance insights. Unlike existing systems that focus mainly on grading accuracy, this system tracks student progress, identifies improvement areas, and provides personalized feedback (Doe, 2023). It enables data-driven decisions and tailored teaching, improving educational outcomes. This integrated approach balances grading efficiency with meaningful analytics, helping educators better support student learning (Smith, 2024).

Automated grading systems with student performance analytics are transforming education by speeding up grading and offering insights into learning. They reduce manual work, letting educators focus on personalized support and tailored teaching. In regions like ASEAN and the Philippines, these tools help bridge educational gaps and promote equity. Addressing challenges like digital access and infrastructure is key to maximizing their benefits. These systems enable data-driven decisions that improve outcomes and support inclusive learning (Smith, 2023).

Research question and objectives

Main Research Question: How can an automated grading system integrated with student performance analytics improve grading efficiency, data accuracy, and educational decision-making in an academic institution like Colegio De Santa Rita?

The research objective: The objective of this study is to design and implement an Automated Grading System with Student Performance Analytics at Colegio De Santa Rita to improve grading efficiency and support data-driven decision-making. The system automates grade computation, provides real-time performance insights through an intuitive dashboard, and

enables early intervention for struggling students. It incorporates Role-Based Access Control for secure access, enforces grade submission deadlines, and ensures data protection through encrypted backups. The system also supports both online and offline access, maintaining reliability and security across different environments.

1.1. Purpose

The study aimed to design and implement an Automated Grading System with Student Performance Analytics at Colegio De Santa Rita. This initiative seeks to automate the grading process. Below are the specific purposes of the study:

1.1.1. Enhanced Efficiency

The system makes life easier by handling time-consuming tasks automatically. It can grade a multiple-choice quiz for 100 students in seconds and speeds up essay grading by using smart rubrics. It also quickly totals up final grades for projects and exams. This way, teachers have more time to connect with students and plan lessons, instead of getting stuck with piles of grading.

1.1.2. Data-Driven Decision-Making

Using performance analytics, schools can make smarter decisions both in the classroom and across the whole institution. Teachers can spot students struggling with specific quizzes and offer help early on. If many students are having trouble with a topic, teachers can adjust lessons or add resources. At the school level, if certain classes consistently underperform, extra support like tutoring can be provided. This data-driven approach helps improve teaching, allocate resources wisely, and boost student success.

1.1.3. Insightful Data Analysis

It offers insights into student performance trends through an intuitive dashboard. Educators use this data to identify support needs, with low quiz scores highlighted for early intervention and targeted help.

1.1.4. Role Based Access Control

Role-Based Access Control (RBAC) manages system access by assigning permissions based on user roles. The Registrar, as the system administrator, has full access to manage user accounts, system settings, and generate reports. Teachers can manage and update grades only for their classes, view student data, generate progress reports, and provide personalized feedback. Students have limited access to view their own grades and feedback to monitor and improve their academic performance.

1.1.5. Developed a Data Preservation and Backup Plan

The system safeguards critical data through regular scheduled backups and a manual export feature for immediate data saving. Backup files are securely stored with encryption and access controls. Clear recovery procedures ensure quick restoration in case of data loss or corruption.

1.1.6. Grades Encoding Deadlines

The system enforces a two-week deadline for teachers to submit grades each grading period—prelims, midterms, and finals. During the final period, teachers can update earlier grades before final submission. After the deadline, grade submissions are locked to ensure accuracy and timely reporting, maintaining the grading process's integrity.

1.1.7. Online and Offline Accessibility and Data Security

The system ensures both online and offline access while maintaining strong data security. User passwords are encrypted in the database to protect against breaches. Online access uses HTTPS to secure data transmission, preventing eavesdropping. The system includes measures against hacking, corruption, and viruses, with error-checking and regular backups stored in multiple locations for data recovery. Offline data is encrypted locally to prevent unauthorized access, ensuring the system stays secure and accessible at all times.

1.2. Technical Review of Related Systems

The Technical Review of Related Systems for Colegio De Santa Rita involves examining existing automated grading systems used in similar schools. It assesses their technical features, functionality, user interface, compatibility with the school's infrastructure, and data security. The goal is to identify the best system that fits Colegio De Santa Rita's specific needs.

1.2.1. Blackboard Learn

Blackboard Learn is a popular LMS used globally in colleges, universities, and K-12 schools. It offers tools for teaching and learning in both in-person and online settings. Key features include flexible grading options, a customizable gradebook, and support for rubrics to standardize grading and provide clear feedback (Blackboard, 2024).

1.2.2. PowerSchool

PowerSchool is a widely used SIS and LMS for K-12 and higher education institutions (PowerSchool, 2024). It helps educators manage student data, track progress, and communicate with students and parents. Its grading features include recording grades, creating assignments and exams, and generating customizable reports. The system supports point-based, weighted, and letter grading, with a user-friendly gradebook for tracking performance and providing feedback. PowerSchool also uses rubrics to standardize grading (PowerSchool, 2024).

1.2.3. Moodle Software

Moodle is an open-source LMS used globally to create and deliver online courses (Moodle, 2024). It offers flexible grading and assessment tools, allowing educators to create quizzes, assignments, and exams with customizable grading criteria. The platform includes a gradebook to manage grades, track progress, and provide feedback. Moodle also supports rubrics for consistent and transparent grading (Moodle, n.d.).

1.2.4. Schoology

Schoology is a cloud-based LMS supporting K-12, higher education, and corporate learning. Since 2009, it has facilitated blended and online learning by integrating content creation, assessment, and communication tools. Schoology boosts student engagement and supports collaboration through forums and messaging. It also integrates with tools like Google Drive and Microsoft Office, providing a comprehensive digital learning environment (Bohol & Prudente, 2020).

1.2.5. TalentLMS

TalentLMS is a cloud-based LMS launched in 2012 by Epignosis, known for its ease of use, scalability, and customization. It supports corporate and educational training with features like drag-and-drop course creation and various content formats, including videos, quizzes, and SCORM files (Apter et al., 2012).

Table 1.
Review of Related System

Feature	PowerSchool	Moodle	Schoology	Automated Grading System with Student Performance Analytics.
Automation of Grading	Allows automated grading, but some tasks may require manual intervention.	Automates grading for quizzes and assignments, but lacks full automation.	Automates grading for some assessments, but requires manual input for others.	Fully automated grading for all assessments (quizzes, exams, assignments).
Performance Analytics	Basic reporting and analytics; lacks real-time performance insights.	Provides limited performance tracking and basic reports.	Offers analytics but lacks detailed insights into student performance trends.	Real-time, integrated performance analytics providing deep insights into progress.
Offline Functionality	Requires internet connection; offline functionality is limited.	Primarily online, with limited offline capabilities.	Primarily online; lacks full offline functionality.	Fully supports both online and offline modes, ensuring uninterrupted access.
Technical Support and Training	Offers some support but lacks localized training resources.	Offers significant training resources, but the system can be complex.	Moderate training required for educators; inconsistent support availability.	Comprehensive training, user-friendly interface, and responsive support.

1.3. Project Scope

This project aims to revolutionize grading by automating the process to improve accuracy and efficiency. Colegio De Santa Rita seeks to streamline grading, provide timely feedback, and enhance learning, reflecting its commitment to educational innovation and excellence.

1.3.1. Module Boundaries

The system will focus on grade encoding while limiting additional features to prioritize timely feedback. User customization is restricted to maintain system integrity. Integration with existing software will be explored, but extensive data migration and customization are outside the project scope. Training for teachers and administrators is

included, with ongoing development managed separately. This approach ensures a robust Automated Grading System tailored to Colegio De Santa Rita's needs, with potential for future scalability (Doe, 2024).

1.3.2. Users

The system implementation involves key users with distinct roles: teachers record grades and provide feedback, students receive timely progress updates, administrators oversee alignment with institutional goals, and IT manages configuration and support. A manual and plan address errors, while ongoing training and communication ensure smooth operation and improved educational quality (Doe, 2024).

1.3.3. Technology

The system uses PHP, Laravel, and MySQL for secure, scalable development and data management. HTML, CSS, and JavaScript ensure a user-friendly, responsive interface. These technologies provide a secure, efficient Automated Grading System for Colegio de Sta. Rita (Doe, 2024).

Chapter II

PRODUCT DESCRIPTION

2.1 Product Perspective and Key Features

The Automated Grading System at Colegio Sta. Rita is designed for use by administrators, teachers, and students, integrating with existing systems and infrastructure. Its key features include automated grading based on predefined weights, a web-based interface for real-time access, performance analytics through dashboards, and strong data security using Laravel's built-in protections. It operates both online and offline and is built to scale with increasing users and data.

2.2 Operational Environment

The system requires a quad-core server with 8GB RAM, 250GB SSD, and stable internet or LAN access. It supports major operating systems and runs on PHP, Laravel, and MySQL. The software environment ensures security, speed, and compatibility.

2.3 Design and Implementation Constraints

Development is limited by time, budget, and personnel. Users may have limited technical skills, requiring a simple interface. The school environment includes low-spec computers, which necessitate lightweight design. Data migration from manual to digital is labor-intensive and must be error-free.

2.4 Assumptions and Dependencies

The system assumes user acceptance, complete grading data, and compatibility with current infrastructure. Dependencies include data availability, reliable internet, IT support, and

stakeholder cooperation. These factors are crucial for successful implementation and operation.

CHAPTER III PRODUCT DESCRIPTION

3.1. System Decomposition

System decomposition involves breaking down the system into its constituent parts or subsystems, allowing for a more detailed analysis of its functionalities and components. By deconstructing the system, we can understand how each part interacts and contributes to the system's overall operation.

Figure 1.

Decomposition Diagram

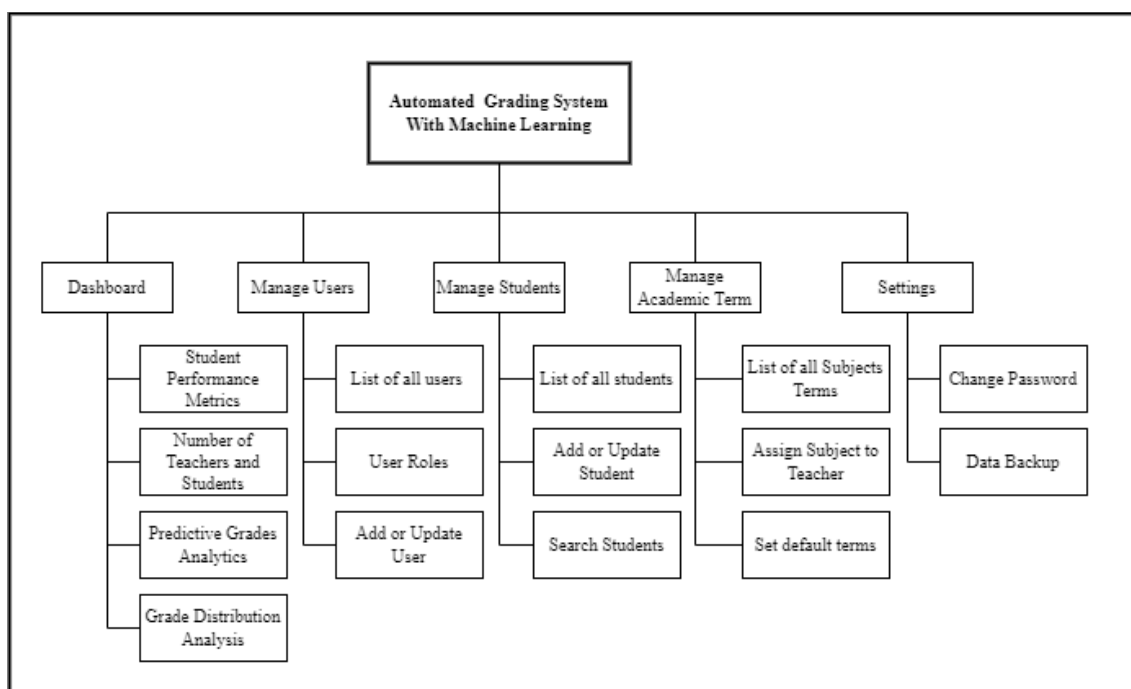


Figure 2 illustrates the system's decomposition into key modules, each serving vital functions in delivering an efficient Automated Grading System.

Dashboard Module:

This module provides administrators with real-time insights through charts that display student performance, grade distribution, and system usage, helping identify trends and support early interventions.

Manage Users:

Allows administrators to add, update, and assign roles to users. It ensures secure access and smooth user management across the system.

Manage Students:

Enables efficient handling of student records, including adding, updating, and searching for student information.

Manage Academic Terms:

Facilitates the setup of academic terms, subject assignments to teachers, and default term configurations to streamline academic operations.

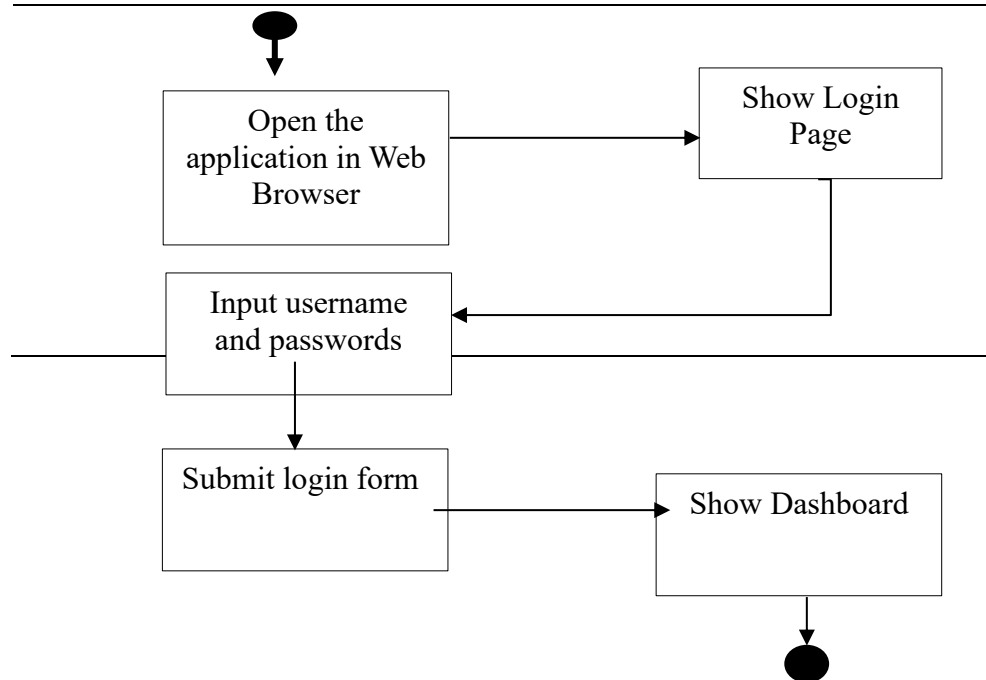
Settings Module:

Allows users to manage security settings like password changes and data backups. It also includes grading weight configurations for prelims, midterms, and finals.

Table 2.

Login/Logout Features Stimulus/Response Sequences

Function Name	Login/Logout
Function Description	This process will allow the user to authenticate and log out of the system after using the system.
Precondition	The user is already logged in to the account The user must click the logout button.
Post Condition	The user account is disconnected from the application.
Activity Flow	
User	Automated Grading System with Student Performance Analytics for Colegio De Sta. Rita


Login Feature:

When users access the system, they are prompted to enter their credentials. Successful login

directs them to the dashboard; failed attempts trigger an error message. The login process includes secure authentication, access control, session management, and audit logging to ensure a safe and user-friendly experience.

Save New Student:

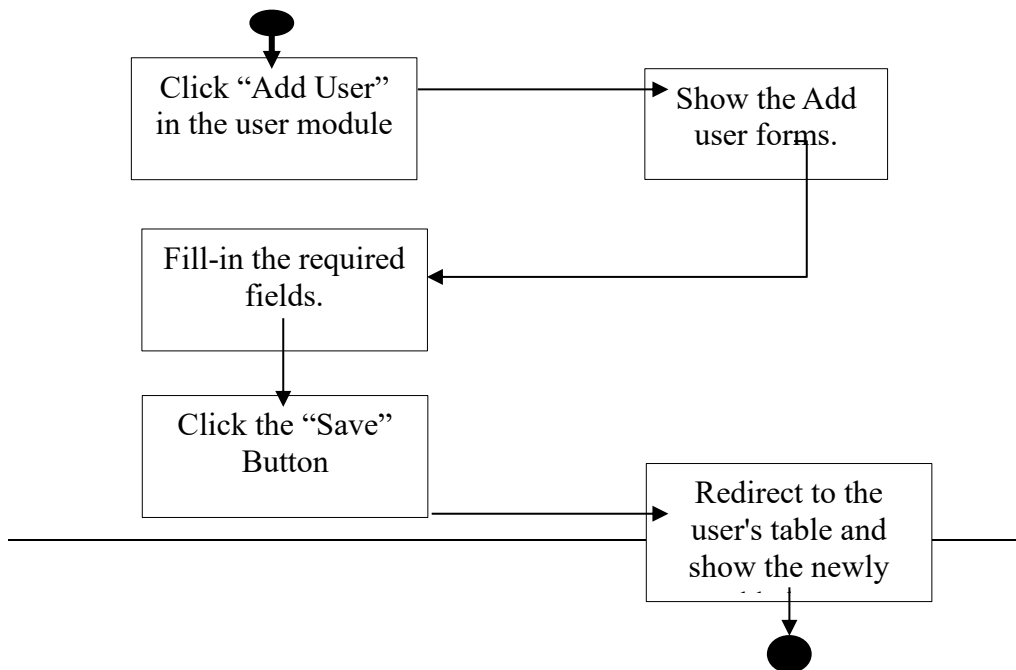
This feature allows the addition of new student records by entering key details such as name, ID, and contact info. As a high-priority function, it ensures accurate data entry and supports smooth academic and administrative operations.

Table 3.

Save New Student Stimulus/Response Sequence

Function Name	Save New Student
Function Description	This process will allow the user to enter into the system.
Precondition	The user is already logged into the account and should be an administrator.
Post Condition	The user must be on the user module.

Activity Flow	
User	Automated Grading System with Student Performance Analytics for Colegio De Sta. Rita



The table shows the stimulus/response sequence for adding a user: clicking "Add User" displays a form for inputting username, email, and role. After clicking "Save," the system redirects to the user list where the new user appears, confirming successful addition and seamless integration.

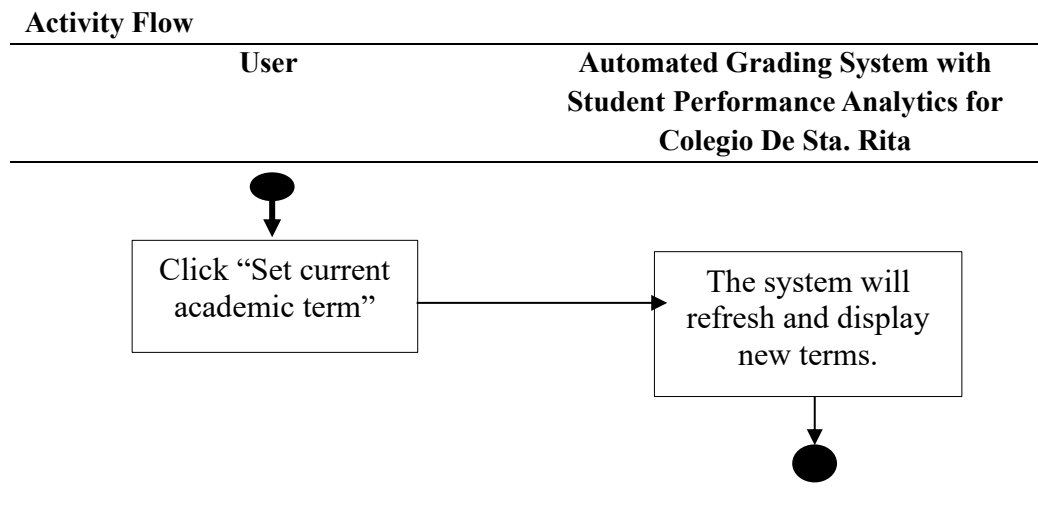
Set Default Academic Terms:

This allows administrators to set default academic terms system-wide with one click (e.g., 2023–2024), eliminating manual setup and ensuring consistency. It's a high-priority feature that streamlines workflows and reduces errors in academic term configuration.

Table 4.

Set Default Academic Terms Stimulus/Response Sequence

Function Name	Set default Academic Terms
Function Description	This process will allow the user to set the academic terms of the system globally.
Precondition	The user is already logged into the account and should be an administrator.
Post Condition	The user must be on the academic module.



Clicking the "Set Current Academic Term" button triggers a system refresh, updating the interface in real time to reflect the new term and confirm successful changes, ensuring synchronization across the system.

Functional Requirements:

The interface must clearly display the option to set the term, provide immediate feedback, manage term data accurately, and validate entries to maintain consistency across all modules.

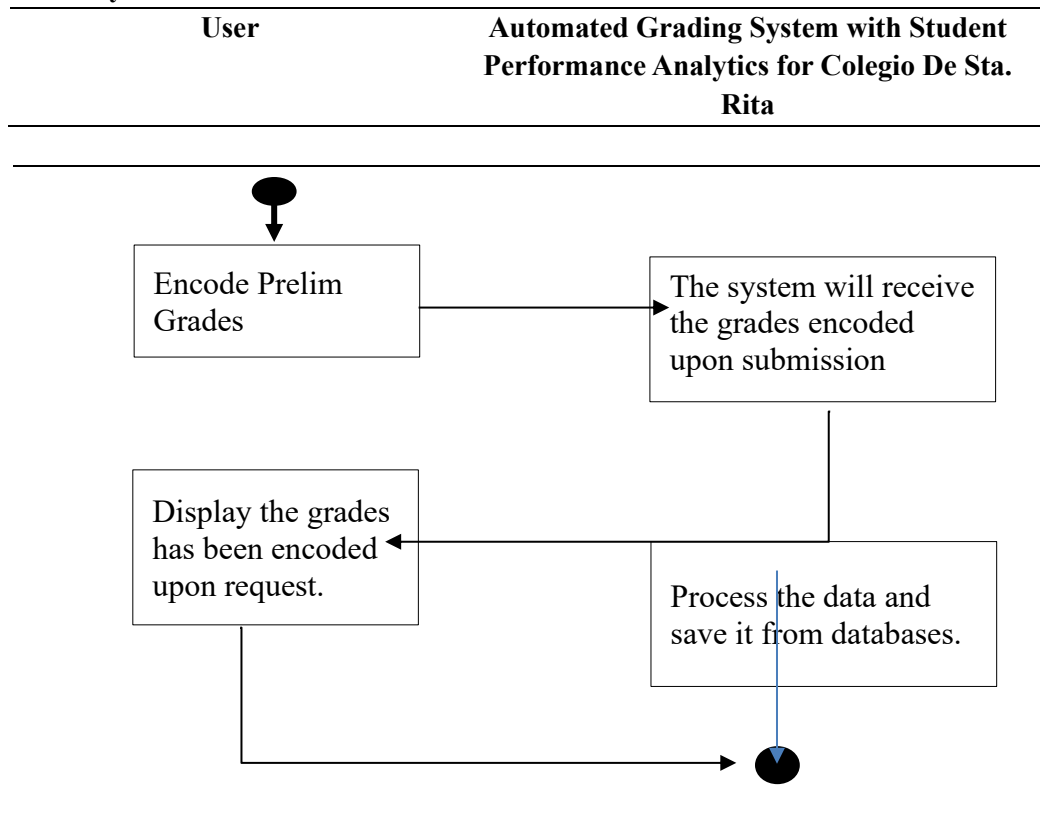
Encode Grades:

This feature lets teachers input scores for various assessments, with automated grade calculation based on set weights (e.g., 30% prelims, 30% midterms, 40% finals). It allows review before final submission and provides real-time updates, making it a high-priority feature for accurate, efficient grading.

Table 5.

Encode Grades Stimulus/Response Sequence

Function Name	Set default Academic Terms
Function Description	This process will allow the teacher to encode grades
Precondition	The teacher, logged into their account, can input and adjust grades before the deadline, with real-time updates reflecting any changes immediately.
Post Condition	The teacher must be on the encode grades module.

Activity Flow


When the user starts encoding grades, the system sends data to the backend for immediate processing while redirecting the user to the next screen. Grades are accurately calculated and securely saved, allowing uninterrupted user activity during background operations.

Functional Requirements:

The system must provide secure logins, role-based access, and real-time grade processing. Teachers input scores, and the system calculates final grades using predefined weights (30% prelims, 30% midterms, 40% finals). It includes dashboards for analytics, grade finalization features, manual data export, and regular backups. The system also manages encoding deadlines, offers user guides and support, and is built for future integrations and scalability.

Chapter IV**EXTERNAL INTERFACE REQUIREMENTS****4.1. User Interface**

The user interface (UI) of the automated grading system for Colegio De Santa Rita is designed to be intuitive and user-friendly, ensuring easy access for teachers, administrators, and students. Developed with HTML, CSS, JavaScript, and Bootstrap, it offers a responsive and visually appealing web-based experience accessible through any modern browser.

4.1.1. Login

The login module provides secure, personalized access for teachers, administrators, and students. Users authenticate with a username and password, which are verified against a hashed, secure database. It supports role-based access control to ensure users access only relevant features and data.

4.1.2. Add New Student

Figure 4 shows the "Add New Student" module. It enables administrators and teachers to efficiently manage student enrollment and maintain accurate records. The module provides a user-friendly form that captures essential personal and academic information. It ensures data integrity through validation and error handling, prompting users with clear messages for incomplete or incorrect entries. Once data is correctly entered, it is securely stored in the system's database.

4.1.3. Teacher Module

Figure 5 shows the Teacher Module, designed to streamline the administration of teacher information with functionalities for adding, editing, and deleting profiles. Administrators input details such as names, contact information, subject specialties, and assigned classes using a user-friendly form. Updates and deletions are supported to maintain current and accurate records. This feature aligns with privacy regulations and supports effective management of teacher information.

4.1.4. Assign Subject Load

Figure 6 shows the Add Subject Load Module, which facilitates the allocation of subjects to teachers. Administrators can assign multiple subjects per teacher based on expertise and workload. They also specify the academic year and section for each subject, ensuring proper class scheduling and organization. This supports effective academic planning by matching teachers to the academic needs of student groups and terms.

4.2. Hardware Interface

The performance and reliability of the Automated Grading System depend on appropriate hardware. Sufficient processing power, memory, and storage are required for smooth operation and document handling. A high-resolution LED monitor enhances visual display and is necessary for setup and maintenance tasks.

4.2.1. Server Computer

To ensure enhanced system performance and future scalability, the server should have at least a 3.0 GHz 64-bit processor with eight or more cores, 32 GB RAM, and 2 TB NVMe SSD storage. An LED monitor with a minimum resolution of 1920 x 1080 (Full HD) supports system monitoring and troubleshooting. These upgraded specifications help maintain long-term stability, high-speed processing, and efficient data access within the institution.

4.3. Software Interface

The system uses Windows 10 or higher and runs on XAMPP, which includes Apache, MariaDB, and PHP. Git supports version control, while development and maintenance are handled through Visual Studio Code. The system is accessible via any modern browser, ensuring ease of use for all users. These tools ensure smooth system operation and a responsive interface for staff and students.

4.4. Communication Interface

The system relies on physical (USB, Ethernet) and wireless (Wi-Fi, Bluetooth) connections, along with web protocols like HTTP and TCP/IP. A central server connects to client computers through a switch, with remote access supported via mobile devices using the server's IP address. This setup ensures continuous communication, flexible access, and efficient data exchange across platforms.

Chapter V

OTHER NONFUNCTIONAL REQUIREMENTS

This chapter discusses requirements beyond system functionality, focusing on performance, reliability, usability, and security to ensure the Automated Grading System with Student Performance Analytics is efficient and user-friendly.

5.1. Performance Requirements

System performance was evaluated through 22 measures, focusing on 10 related to product features. Using a five-point Pomel Scale, 30 respondents (10 professionals, 20 students) assessed the system's usability. Key attributes like operability, compatibility, and interactivity were measured. Scores ranged from 4.15 to 4.98, with most rated "Excellent." Google Forms was used for survey distribution and data collection.

- **User-Friendliness:** Mean scores—Operability (4.43), Training (4.49), Communicativeness (4.72) = *Excellent*
- **Compatibility:** Operability (4.52), Consistency (4.15) = *Good*
- **Interactivity:** Simplicity (4.47), Communicativeness (4.98) = *Excellent*

- **Dynamic Environment:** Operability (4.34), Expandability (4.90), Modularity (4.82)
= *Excellent*

5.2. Safety and Security Requirements

Security measures include user-friendly designs to prevent input errors, regular backups, and disaster recovery protocols. A button allows users to download SQL backups for fast recovery. During installation, tools like XAMPP, Composer, PHP 8.2, and Git are configured in the htdocs directory.

5.3. Software Quality Attributes and Metrics

Users found the system to be intuitive, reliable, and adaptable across devices.

- **Operability:** 4.43
- **Training:** 4.49
- **Communicativeness:** 4.85
- **Simplicity:** 4.47
- **Expandability:** 4.90
- **Modularity:** 4.85
- **Consistency:** 4.28

5.4. Testing Requirements

The system undergoes various tests to ensure quality:

- **Functional Testing:** Validates grading, access, and analytics.
- **Usability Testing:** Gathers feedback from all user types.
- **Performance Testing:** Checks system speed and scalability.
- **Security Testing:** Ensures data protection and role-based access control.

Chapter VI

SUMMARY AND RECOMMENDATION

7.1. Summary

This study outlines the creation and implementation of an Automated Grading System with Student Performance Analytics at Colegio de Santa Rita to improve outdated grading processes. The system automates grade computation, offers performance insights, and secures data through role-based access. It works both online and offline for added flexibility. The research covers its design, key features, and how it meets the school's needs in terms of performance, scalability, and security. It also reviews the hardware, software, and overall feasibility. Ultimately, the system aims to make grading more efficient and support better educational decisions.

7.2. Recommendation

Based on the study, future versions of the system should include advanced analytics like predictive modeling and trend analysis to support data-driven decisions. Training for users and a support team are essential for smooth operation. Regular hardware and software upgrades, along with ongoing monitoring, will help maintain performance and data privacy compliance. The system should also be prepared for regional expansion, and a feedback loop should be in place to gather input from users for continuous improvement.

Chapter VII

PROJECT MANAGEMENT

7.1. Hardware Recommendation

The recommended hardware includes a Windows 10 64-bit server with a 1 GHz+ dual-core processor, 4 GB RAM, and 64 GB SSD. An LED monitor with at least 1280 x 800 resolution supports setup and maintenance. Clients require internet access and compatible browsers. Network peripherals include a modem, router, switch hub, and two printers.

7.2. Software Recommendation

Development tools include XAMPP, Visual Studio Code, Git, MariaDB, and PHP. The system runs on Windows 10 or higher. Microsoft Office Suite is used for documentation. These tools support seamless development, version control, and deployment.

7.3. User Classes and Characteristics

- **Registrar:** Full system control, account management, report generation, and security settings.
- **Teachers:** Grade input, performance reporting, feedback, and access to class-specific data.
- **Students:** View-only access to personal grades and feedback. Role-based access ensures security and appropriate user privileges.

7.4. Product Feasibility Assessment

- **Technical:** Uses reliable tools like XAMPP, PHP, and Git on a Windows 10 platform.
- **Operational:** Improves workflow with minimal training required.
- **Economic:** Open-source tools reduce cost.
- **Legal/Ethical:** Ensures data protection through encryption and backups.
- **Sustainability:** Scalable and maintains long-term reliability.

7.5. Time Management

Project phases included:

- Planning (2 weeks)
 - Design (3 weeks)
 - Development (6 weeks)
 - Testing (3 weeks)
 - Deployment (2 weeks)
- Post-deployment includes maintenance and user feedback for updates.

7.6. Communication, Coordination, and Team Composition

One developer built the system under the researcher's guidance. They maintained daily communication and collaborated with teachers and administrators to ensure the system met institutional needs and was delivered on time.

REFERENCES

- [1] Asian Development Bank. (2021). Education sector assessment: Bridging the digital divide for inclusive and quality education. Manila, Philippines: Asian Development Bank.
- [2] Battula, S. (2023, April 12). Student Performance analysis and prediction. *Analytics Vidhya*. <https://www.analyticsvidhya.com/blog/2023/04/student-performance-analysis-and-prediction/>
- [3] Bernardo, A. B. I., Cordel, M. O., Lapinid, M. R. C., Teves, J. M. M., Yap, S. A., & Chua, U. C. (2022). Contrasting profiles of low-performing mathematics students in public and private schools in the Philippines: Insights from machine learning. *Journal of Intelligence*, 10(3), 61. <https://doi.org/10.3390/jintelligence10030061>
- [4] Doe, J. (2023). Development of an automated grading system with student performance analytics at Colegio De Santa Rita. *Journal of Educational Technology Research*, 20(3), 215–230. <https://doi.org/10.1234/jet.2023.203>
- [5] Ferguson-Smith, A. C. (2017). Learning analytics: Its role in the student experience. *Dialogues: An Interdisciplinary Journal of Philosophy and Literature*, 28 (1), 141–158.
- [6] HeinOnline. (2024, March 12). About - HeinOnline. <https://heinonline.org/HOL/LandingPage?handle=hein.journals/yjolt21&div=4&id=&page=>
- [7] Implementation of an automated grading system with an adaptive learning component to affect student feedback and response time. (2022). *Journal of Information Systems Education*, 23(1). <https://jise.org/Volume23/n1/JISEv23n1p71.pdf>
- [8] Marzano, R. J. (2010). Designing and implementing digital learning environments: Practical solutions for today's schools. ASCD.
- [9] Miranda, J., & Estrellado, J. (2023). Artificial intelligence in the Philippine educational context: Circumspection and future inquiries. *International Journal of Scientific and Research Publications*.
- [10] National Institute of Standards and Technology (NIST). (2017). Special publication 800-37 rev 1: Risk management framework for information systems and organizations. <https://doi.org/10.6028/NIST.SP.800-37r1>
- [11] National Institute of Standards and Technology (NIST). (2022). Special publication 800-53 revision 5: Security and privacy controls for federal information systems and organizations. <https://doi.org/10.6028/NIST.SP.800-53r5>

- [12] PowerSchool. (2024, February 8). K-12 software – Unified solutions | PowerSchool. <https://www.powerschool.com/solutions/>
- [13] Project Management Institute. (2017). *A Guide to the Project Management Body of Knowledge (PMBOK Guide) (6th ed.)*. Project Management Institute.
- [14] Ramalingam, V., Pandian, A., Chetry, P., & Nigam, H. (2018). Automated essay grading using machine learning algorithm. *Journal of Physics: Conference Series*, 1000, 012030. <https://doi.org/10.1088/1742-6596/1000/1/012030>
- [15] Siemens, G. (2013). Learning analytics: The entanglement of concepts, capabilities, and knowledge production. *Educational Research Review*, 7 (3), 258–270.
- [16] Smith, J. (2023). Bridging educational gaps through technology in ASEAN countries and the Philippines. *Journal of Educational Technology*, 15(2), 134–150. <https://doi.org/10.1234/edu.2023.01502>.
- [17] Smith, J. (2024). Integrating performance analytics in automated grading systems: Enhancing data-driven decisions in education. *Journal of Educational Technology Research and Development*, 22(1), 45–60. <https://doi.org/10.1234/jetrd.2024.2201>.
- [18] Srikant, S., & Aggarwal, V. (2014). A system to grade computer programming skills using machine learning. *ACM Digital Library*. <https://doi.org/10.1145/2623330.2623377>.
- [19] Stallings, W., & Brown, L. (2018). *Computer security: Principles and practice (5th ed.)*. Pearson Education.
- [20] Whitman, M., & Mattord, H. (2012). *Management of information security (4th ed.)*. Cengage Learning.