

Rationale of the Study

A successful grading system means producing grades that accurately reflect a student's academic performance and learning progress. At LJDS University, however, the grading system has become an important issue affecting students, teachers, and administrators due to the current system still using manual procedure that require a lot of effort and time, leading to delays in grade submission, lack of real-time updates for students, risk of human error, security concerns, and difficulties in generating reports. As the student population increases, the transition from a manual grading system to a modernized grading system needs to be pushed through, and a main necessity to produce more reliable and accurate grades.

There are several researches and articles that indicate that some schools right now, which have a huge number of students, are not yet using the modernized grading system. According to Christelle Joy Barreno et al. [2019] in their research paper entitled, "Computerized Grading System For Metropolitan Academy of Manila", stated that the school currently employs a manual grading method, which is somewhat laborious for teachers and prone to a lot of mistakes. With that said problem, the researchers propose developing a computerized system that would automate grade recording and computations. Modules for recording student information, entering grades, automatically calculating overall grades, and safely storing data would be the highlight of the system proposed by the authors. Through client interaction, the methodology will employ fourth generation methodologies to convert requirements into an operational prototype. However, they put emphasis on some certain restrictions that the system might be facing when it would be available to the public such as the inability to print grades or retrieve passwords. But behind those restrictions, the researchers are optimistic that their proposed system will benefit the teachers from the system's time savings and accuracy improvements.

As the population of LJDS University continuously grows, different kinds of problems with the institution appear out of nowhere and the school does not know where to begin. The delay in the real time update of the students grades is one of the results of manual grading. The current system is facing difficulty in maintaining its work as recurring issues regarding grade submissions have been reported. Transparency of the system was also questioned by the teachers as they were having difficulty on how they would assess the situation if parents raise questions about the grades of their child. Aside from the current system to be time consuming, grade confidentiality and security are also additional concerns and because of those reasons, the administration infer that the system is not sustainable in the long run. In line with those gaps stated, this research paper seeks to bridge the gap by formulating a strong and secured system that can accommodate a heavy load of commands made by the administration without jeopardizing the integrity of their work and at the same time provides secured storage of the information stored on the system.

The implementation of this system will benefit the teachers and the school administrations as their burden would be reduced and they would have more time to attend to other activities since they could record and calculate their student's marks more quickly. In implementing the new system, students can monitor their grades and make improvements of their school performance if needed. School administrators can now verify the accuracy of each student's grades without having to recalculate them. Class records and grading sheets can also be reported and sent in on time. A transparency of the grades will also be addressed as parents can also view the grades inputted by the system. This provides a positive relationship between the teachers and parents by avoiding such conflicts like favoritism leading to manipulation of data. Moreover, this system can also serve as a stepping stone for other schools that still haven't transitioned to a more modern and systematic system of grading. The researchers are hoping that as the system paves the way into the world of education, other schools can take inspiration from it and build a system that would exceed the performance of our made up system.

Related Systems and

Objectives of the Systems

The manual grading system faces many issues, especially as university populations increase. Manual grading system often face challenge like errors in calculating grades, delays in grade, inconsistency in grading and unsecured grading system. As a result, many universities are transitioning from manual processes to automated grading systems. This review will discuss different research papers, The Automated Grading System (AGS) for Colegio de Santa Rita de San Carlos, Inc. focuses on automation of grading for efficiency and accuracy in grading with the enhancing of usability and user friendliness of the system. An Online Grading System for Mindanao State University Maigo School of Arts and Trades discusses that their Online Grading System discusses the grading methods, including scalability, real time feedback, decreasing the potential of human error. E-class record systems in web-based platform in the research, E-Class Record for Basic Education Department, University of Bohol Tagbilaran City that designed for managing and tracking student academic records and performance. And, Quezon City University BSIT Students, Online Grading System keeps the records of students grades, and their progress and puts it online for both students and faculty to access.

Javer C. Borngo [2019] in his research Online Grading System Mindanao State University Maigo School of arts and trades have the related solution to our research on the need for accurate

grades, eliminating human error, save more time for faculties and to give real time update grades to students. The Mindanao State University (MSU) Online Grading System designed automation to make the grading process faster, which allows teachers enter grades quickly and efficiently. Implementing Automation not only saves the teachers time but also enables the students to track their grades instantly. The strength of their system includes scalability, students real time update of grades, enables the faculties to change the grades after submission, and the archive and export grading data for future use. Their system also have weakness they recognize that small details can affect usability, and compatibility with mobile devices is a necessary but still unaddressed.

Elison E. Bayot et al. [2023] in their research A Capstone Project on the Development of an Automated Grading System in the Basic Education Department of Colegio De Santa Rita San Carlos, INC. also align closely with our research, as they similarly aim security measures in instance, each account that has been registered in the system has its own password. The same with our system, this also aims to minimize the delays in submitting grades to the registrar's office and reduce the workload of the teachers, It will be designed to accommodate the system of each and every record of the students in the school, similar with our research printing of student information and grades is also one of the feature of the system. This research is focus on functions like adding, editing, and deleting records, as well as maintaining and managing student information securely. This emphasizes the system's strengths in security, data management, usability, and process efficiency. While the system have lot of strengths, the system have drawbacks that could hinder its full functionality, these challenges include limiting its application to similar educational environments without additional customization because it is for CSR-SCC's needs and should follow DepEd's Grading policies so this limits other functions. And, the system is designed as a desktop based application, meaning it can only be accessed from specific

computers in Colegio De Santa Rita San Carlos which hinders the viewing of grades outside the school premises.

Abigail S. Agapito et al. [2022] in their research Online Grading System with Attendance Monitoring for Quezon City, Compared to other system like Mindanao State University Maigo School of arts that focuses in automation, the research Online Grading System with Attendance Monitoring for Quezon City use Natural Language Processing as their approach, NPL-based grading also offer automation but with enhanced text comprehension capabilities, which could potentially add value by analyzing student responses with more sophistication than numeric grades alone. Fractal grading system feature that makes the system unique this method include students poor performance and rewards. The method is different from traditional grading system by adjusting the weight of a single high or low score based on overall consistency, that aims to provide fair assessment of a student's performance. There are also challenges in this system for user interface, in instance many users, especially students, struggle with these systems because of difficulties in understanding the UI/UX, which hinders for effectiveness of the system.

Alfredo A. Guhirit [2023] in his research E-Class Record for Basic Education Department, University of Bohol, Tagbilaran City, use analytics to tracking student performance and focus ISO 9126 standards for aiming for quality, usability and funtionality that makes it user-friendly but it requires internet and teacher training. Whilst, Borngo's MSU system priorities more on real-time grade updates and automation for grading, even though it lack mobile compatibility. Bayot's system at Colegio De Santa Rita focuses more on data management and security with password-protected accounts but only limited on desktop use, it restrict access outside of the institution. Bayot's CSR system focuses on protecting security and easy record tracking but it only limit to

school computers. Borngo's MSU system provides faster grade updates and reserve teachers time with feature of automation but it lacks on mobile access. The University of Bohol system uses visual analytics which makes it unique; assist the teachers to track the progress of the

student and follows strict standards though it requires more on the internet side and teacher training. The downside of the University of Bohol system requires on the internet and teacher training, Bayot's CSR system is limited to school computers, and Borngo's MSU system lacks mobile access.

Matrix

System	Features	Technology	User Interface	Security	Limitations
Modernized Grading System (LJDS University)	<ul style="list-style-type: none"> - Auto save - Can browse History 	CSS, REACT(Web Based) Python & MySQL	User-friendly UI with interactive design	Secure login with password protection with email authentication	<ul style="list-style-type: none"> - Internet Reliant - Technical Issues
Online Grading System (by Mindanao State University - Maigo)	<ul style="list-style-type: none"> - Automated calculations - Real-time data access - Remote entry 	PHP, MySQL, web-based interface (HTML, CSS, JavaScript)	User-friendly, accessible online with responsive design	User management module, password-protected access	<ul style="list-style-type: none"> - Requires consistent internet - Server maintenance

School of Arts and Trades)					
Automated Grading System (in the Basic Education Department of Colegio De Santa Rita San Carlos)	<ul style="list-style-type: none"> - Grade computation - Student record tracking - Report generation - Teacher load management - Account creation for instructors - Student registration 	Microsoft Visual Studio (VB.NET), SQL Server	User-friendly and intuitive	Secure login with password protection for different user types	<ul style="list-style-type: none"> - Desktop-only - Limited portability
E-Class Record for Basic Education (Department , University	<ul style="list-style-type: none"> - Formative assessment recording - Password protection 	ASP.NET, Web-based interface (HTML, CSS, JS), SQL Server	User-friendly, responsive, modern interface, includes a user guide for	Role-based access	<ul style="list-style-type: none"> - Limited customization - Outdated UI design

of Bohol, Tagbilaran City)	- Automatic data saving		password reset		
Natural Language Processing (Quezon City University)	- Multi-Level User Access - Real-Time Data Update - Online Submission	PHP, CSS, MySQL, XAMPP	Simple, functional UI with straightforwar d navigation	Login authentication , data backup, disaster recovery	- Programming language and syntax barriers

Objectives of the System:

Objective 1: Real Time Update of Grades

Problem: Students do not have updates on their own grades or academic Performance whole semester, grades are only visible in final grades which leads students unaware of their on going performance and surprised when they received it in finals.

Objective: To design a feature that, after teachers records the exams, quiz, activities etc. it will be visible for the students can track their grades throughout semester.

Objective 2: Automating Grade Calculations

Problem: The teacher will calculate the grades by herself, which can be problematic because of errors in calculation.

Objective: Designing a feature that will do the calculations automatically for grades, so the teacher would only need to put data.

Objective 3: System Transparency

Problem: The current manual grading is not transparent and can lead to restricted oversight, likely abuse of authority, and lesser user trust.

Objective: The central system should allow visibility and audit mechanisms so that transparency is enhanced and enable users to track action, view logs, and verify data changes, hence encouraging accountability and trust.

Objective 4: Compiling grades from different departments

Problem: Administrator manually compile grades from all different departments which causes them to have more work and delay of generating reports

Objective: The system will implement a centralized grading system that creates automated feature that gather grades from different departments

Objective 5: Securing Grade Data

Problem: Grades are stored in hard copy records or unsecured spreadsheets and as a result there is a risk involved. of unauthorized access, data loss, or manipulation.

Objective: Implement a secured and centralized grade management system to ensure data security, integrity, and accessibility.

3. Scope and Limitations

Scope of the System

The scope of the proposed system includes the following key functionalities:

1. **Grade Recording and Computation:** Automates the recording and computation of grades for various assessments (quizzes, exams, assignments, etc.), ensuring accuracy and reducing human error.
2. **Real-Time Updates:** Students will have access to view their grades as they are entered, eliminating delays and allowing for timely feedback and improvement.
3. **User Management:** Role-based access for students, teachers, and administrators to ensure data security and appropriate access to different system functions.
4. **Centralized Reporting:** Generates detailed reports for administrative purposes, such as class average calculations, individual performance tracking, and grade summary reports.
5. **Data Security:** The system will employ encryption and secure login mechanisms to ensure the protection of sensitive student information.

Limitations of the System

The following limitations apply to the proposed system:

1. **Internet Dependency:** The system requires an internet connection for real-time updates, making it inaccessible offline.

2. **Mobile Access:** Initially, the system will be optimized for desktop use and may not be fully responsive on mobile devices.
 3. **Advanced Analytics:** While basic reporting functionalities will be included, the system will not support advanced predictive analytics or AI-based grading at this stage.
 4. **Customization:** The system is initially designed for LJDS University, and while it is scalable, additional customization may be needed for other institutions to use it effectively.
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Methods and Techniques

Type of Research

This study employs an **Applied Technological Research** approach, aimed at addressing the operational inefficiencies of the manual grading system through the design and implementation of a functional, automated grading system.

Research Methods

The methods used to gather data for the study include:

1. **Interviews:** Interviews with teachers, students, and administrators to understand the challenges and needs regarding the current grading system.
2. **Document Analysis:** Reviewing current grading workflows, policies, and reports to identify gaps and inefficiencies.
3. **Surveys:** Distributing questionnaires to students and staff to gather quantitative data about their expectations for the new system.
4. **Observation:** Observing manual grading practices to pinpoint specific areas for automation and improvement.

Research Techniques

The system development utilizes the following techniques:

1. **Agile Development:** Agile methodology will be employed, ensuring iterative development with regular feedback loops to refine and improve the system continuously.
 2. **Prototyping:** A prototype will be created for early feedback from users, which will allow the development team to adjust and improve system features.
 3. **User-Centered Design (UCD):** The system will be designed with a focus on usability, ensuring that it meets the needs of end-users (students, teachers, and administrators).
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Models

The development of the system is supported by various models and diagrams, which provide a visual representation of its functionality, structure, and data flow.

Use Case Diagram

A **Use Case Diagram** will be used to identify the primary functions of the system and the interactions between users (students, teachers, and administrators) and the system. This diagram will help clarify the roles of each user type and the specific tasks they can perform, such as:

1. **Students:** Access their grades, track academic progress, and receive real-time updates.
2. **Teachers:** Input grades, generate reports, and manage student data.
3. **Administrators:** Oversee the system, compile grade reports, and ensure data security and integrity.

Why the Use Case Diagram is a Good Fit for This Study

The **Use Case Diagram** is an excellent fit for this study because it:

- **Clarifies System Interactions:** It shows how users interact with the system, which is essential for understanding the features and functions that need to be developed.
- **Ensures Comprehensive Coverage:** It helps ensure that all necessary functionalities—such as grade recording, monitoring, and report generation—are included in the system.
- **Facilitates User Understanding:** Since the system will be used by multiple user types, the diagram helps communicate the system's operations clearly to non-technical stakeholders (such as faculty and administrators).

Additional diagrams like **Entity-Relationship Diagrams (ERD)** and **Class Diagrams** will be used to define the database structure and system architecture, ensuring that all data entities (such as students, grades, and subjects) are properly related and organized.

Tools

To develop and document the system efficiently, various tools were employed during the project:

Documentation Tools

- **Microsoft Word** and **Google Docs:** Used for writing research papers, system manuals, and reports. These tools allowed for easy collaboration among the research team.

Programming Languages

- **ReactJS:** Used for frontend development to create a dynamic and responsive user interface.
- **Python:** Employed for backend development, handling the logic for grade computation and system processes.

- **HTML5 and CSS3:** Used for structuring and styling the user interface.

Database Management

- **MySQL:** A relational database management system chosen for its reliability and performance in handling large datasets and transactional operations such as grade recording.

User Interface Design Tools

- **Figma:** Used to design wireframes and prototypes for the user interface, ensuring a user-friendly experience.

Integrated Development Environment (IDE)

- **Visual Studio Code:** The primary IDE used for coding and debugging the system, chosen for its versatility and extensive support for web development.

Version Control

- **GitHub:** Used for version control, allowing the team to track changes, collaborate effectively, and maintain an up-to-date codebase.

Testing Tools

- **Selenium:** Used for automated UI testing to ensure the interface functions as expected.
- **Postman:** Used to test API endpoints and verify that all components interact correctly.

Development Process

The system development followed the **Agile SDLC** methodology, which allows for iterative development, continuous feedback, and flexibility. Below is an overview of the phases involved in the development process:

Planning Phase

- The project's objectives, scope, and feasibility were defined, and a project plan was created to allocate resources and timeframes.

Requirements Gathering and Analysis

- Key requirements were gathered through interviews and surveys. These were prioritized based on their impact on system functionality.

System Design

- The system architecture was developed using **Use Case Diagrams** and **Entity-Relationship Diagrams (ERD)**. These models helped define the database structure and user interactions.

Coding/Development Phase

- The system was developed using **Python**, **ReactJS**, and **MySQL**. Version control was managed through **GitHub**, and development was divided into sprints to focus on specific modules.

Testing Phase

- The system underwent **unit testing**, **integration testing**, and **user acceptance testing (UAT)** to ensure functionality and security.

Deployment Phase

- The system was deployed on a server, and training sessions were conducted for end-users to ensure they were familiar with the new features.

Maintenance Phase

- Ongoing maintenance and updates were planned to address user feedback, bugs, and system performance improvements.
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Software Requirements

Functional Requirements

1. **User Authentication:** Secure login and access management for students, teachers, and administrators.
2. **Grade Recording and Calculation:** Automates the recording and calculation of grades for various assessments.
3. **Real-Time Updates:** Students can track their grades as they are entered, ensuring timely feedback.
4. **Report Generation:** Administrators can generate reports for grade summaries and performance tracking.
5. **Role-Based Access:** Different user roles (student, teacher, administrator) with varying access levels.

Non-Functional Requirements

1. **Performance:** The system should respond to user requests within 2 seconds.
2. **Scalability:** The system must support up to 1,000 concurrent users.

3. **Security:** Data must be encrypted, and login credentials must be securely stored.
4. **Availability:** The system should maintain 99.5% uptime.
5. **Maintainability:** The system should be easy to maintain, with clear documentation and modular design.

Usability Requirements

1. **Intuitive Design:** The system should have a user-friendly interface, making it easy to navigate and use.
2. **Training Resources:** A user manual and tutorials should be provided for new users.
3. **Error Handling:** Clear and informative error messages should be displayed when users encounter issues.
4. **Task Success Rate:** Users should be able to complete key tasks within 10 minutes of using the system for the first time.