**ENHANCED STUDENT PERFORMANCE TRACKING AND GRADING SYSTEM FOR ANTONIO C. ESGUERRA MEMORIAL NATIONAL HIGH SCHOOL**

**A Capstone Project Presented to the Faculty**

**of the Institute of Computer Studies**

**Rizal Technological University**

**In Partial Fulfillment of the Requirements for the Degree of**

**Bachelor of Science in Information Technology**

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**DEDICATION**

**ACKNOWLEDGMENTS**

**ABSTRACT**

This study presents the development of the Enhanced Student Performance Tracking and Grading System for Antonio C. Esguerra Memorial National High School. The project aims to address the inefficiencies of the current manual grading process and improve the timely identification of at-risk students. The system automates performance tracking, grading, and report card input, ensuring secure and accurate real-time data synchronization for student records.

By streamlining these processes, the system enables better decision-making for teachers and administrators, leading to timely interventions and an overall enhanced educational experience for students and leaving less potential for human error. The system aims to improve the current manual spreadsheet and paper-based system of the faculty to a more streamlined and solution. The system standardizes the grading process and provides valuable insights into student performance, allowing for improved monitoring and support.

The system is built using a combination of PHP, MySQL, Tailwind CSS, and JavaScript, running on the XAMPP platform for local development. Composer and npm are utilized for dependency management and integrating modern tools into the development process. AJAX is implemented to enable seamless real-time communication between the client and server, ensuring that student records are updated without page reloads. Additionally, the Gmail API is integrated to facilitate secure communication with parents regarding student performance and updates.

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# CHAPTER I

## **INTRODUCTION**

Modern academic institutions face significant challenges in delivering quality education, assessing student performance, and developing effective strategies for evaluating progress and planning future initiatives. (Albreiki et al., 2021) Traditional methods of grading and performance monitoring often remain fragmented and labor-intensive, resulting in delays in decision-making and an increased risk of human error. Instructors frequently encounter difficulties in efficiently tracking students' academic progress throughout the academic year, despite the critical importance of this task.

Another significant challenge posed by delayed performance tracking is the failure to provide timely support for students from both parents and teachers. When performance data is not captured and communicated promptly, educators may miss critical opportunities to intervene and assist students who are struggling. This delay not only hampers the ability of teachers to offer necessary guidance but also limits parental involvement. Enhancing and continuously fostering relationships and collaboration between parents and teachers is crucial for the personal and academic development of students. Teachers engage with students more than any other staff members within the school, and both local and international evidence indicates that strong school-parent partnerships are associated with reduced rates of grade retention and school dropouts, lower student absenteeism, and a decrease in disruptive behavior. (Myende & Nhlumayo, 2020) Without early identification and support, at-risk students may continue to fall behind, exacerbating their academic challenges and undermining their chances for success.

Although educational institutions today collect vast amounts of student data from various sources, they continue to seek innovative ways to leverage this information to enhance their instruction and improve the overall quality of education (Khan et al., 2021). This is where the datafication of education becomes essential. It enables the development of automated methods to discern patterns within extensive sets of educational data, aiding in the prediction of student behaviors and information (Bañeres et al., 2020). By harnessing datafication, schools can make informed, data-driven decisions that enhance their ability to monitor student performance and tailor interventions more effectively.

However, the analysis of student data represents only the initial step toward fostering positive academic outcomes. Parental support is a crucial component of a child's education and stands as one of the most influential factors contributing to academic success (Shahzad et al., 2020). Academic performance is not solely determined by the educational processes within schools; it also heavily relies on the encouragement and support received from parental and teacher figures.

The centralization of learning analytics and parent-teacher collaboration within an educational information system can lead to positive student performance. By leveraging analytics to identify at-risk students and by facilitating open communication between educators and parents, schools can create a supportive environment that promotes academic success and overall student well-being.

**PROJECT BACKGROUND**

Antonio C. Esguerra Memorial National High School faces challenges in managing student performance and data efficiently. Currently, teachers rely on manual processes to track grades and evaluate student progress, which often leads to delays, inaccuracies, and administrative burdens. One of the key issues is the reliance on separate systems for grading and reporting, where teachers must manually transfer grades from spreadsheets into separate DepEd report card templates. This not only increases the risk of human errors but also consumes valuable time that could be better spent on educational tasks.

These issues are closely tied to the school’s AKAP ("Anak, Kamusta ang Pag-aaral") Program, which is specifically designed to identify and support students at risk of academic failure. Under this program, ‘AKAP’ students are flagged based on consistent low scores, failure to complete assignments, and overall poor academic performance. Currently, faculty members typically identify at-risk students only after the first quarter, making it difficult to implement timely interventions. The reliance on manual recording of learning outcomes often leads to delays in recognizing students who may need support, hindering educators' ability to provide proactive assistance. Once these students are identified, the program facilitates interventions by allowing instructors to contact their parents for discussions. This collaborative approach enables parents and teachers to work together to develop strategies aimed at improving the student’s academic performance. However, the existing limitations in early identification underscore the need for a more efficient system.

To address these challenges, the Enhanced Student Performance Tracking and Grading System aims to automate the grading process while ensuring secure access to student data. One of the primary solutions is the centralization of data, which integrates grading information for all students into a unified platform. This standardization streamlines grading processes, reducing administrative burdens and minimizing the risk of errors. Additionally, the system promotes early parent interventions, allowing teachers to contact parents as soon as potential academic issues are flagged. This timely communication fosters collaboration and ensures that at-risk students receive the support they need. Furthermore, the system is equipped with analytics capabilities, enabling the generation of automatic reports that help educators track overall student progress.

**OBJECTIVES OF THE STUDY**

To develop an Enhanced Student Performance Tracking and Grading System for Antonio C. Esguerra Memorial National High School that streamlines the processes of performance evaluation, grading, and reporting, thereby improving overall student outcomes and administrative efficiency.

**To automate the recording and grading process** by creating a centralized database that integrates student performance data, ensuring real-time updates and reducing manual errors within the first year of implementation.The system will allow exporting the report cards in needed formats (PDF, Excel) that can be easily shared. Ensuring transparency and providing a consistent, standardized method of communicating academic performance.

**To implement a performance tracking algorithm** for identifying at-risk students early in the academic year, aiming to flag any student that has consecutive failing scores (less than 50%) in their school activities, therefore requiring additional support before the end of the first grading period.

**To improve communication between faculty and parents** by incorporating a direct e-mail parent button. This will facilitate better collaboration between the school and parents, enabling them to take timely action in supporting their child’s academic improvement.

**To create a tailored and intuitive user Experience (UX)** by specifically designing the for teachers and administrators. This system will offer an intuitive interface that simplifies navigation and enhances productivity. By centralizing all student grading and performance data in a single UI, the system eliminates the need for complex spreadsheet and file management, allowing users to quickly access, update, and analyze information with minimal effort.

**To provide comprehensive reports and visual data insights** through charts and graphs that allow teachers and administrators to easily analyze student performance trends. These reports will aid in decision-making processes, identifying areas for improvement, and ensuring that data-driven strategies are used to enhance student learning outcomes.

**SIGNIFICANCE OF THE STUDY**

By automating the grading process and providing a centralized platform for performance tracking, the system addresses the pressing challenges currently faced by the school, such as the manual handling of grades and the inefficient identification of at-risk students. The success of this study will be of great relevance to:

**For teachers**, the system automates the grading process, allowing them to focus more on instruction rather than administrative tasks. With real-time data synchronization, educators can access up-to-date information on student performance, which aids in tailoring their teaching strategies to meet the diverse needs of their students. The user-friendly interface and comprehensive reporting features will empower teachers to make informed decisions, improving their overall effectiveness in the classroom.

**For students**, the system fosters a more supportive learning environment by enabling timely interventions based on performance data. By identifying students who may need additional assistance earlier in the academic year, the school can provide targeted support through the AKAP ("Anak, Kamusta and Pag-aaral") Program, thereby enhancing students' chances for academic success.

**For Administrators**, the system provides a centralized platform that simplifies the management of academic records and grading workflows. With secure access to student performance data across all classes and sections, administrators can more easily monitor overall academic progress, identify patterns, and make data-driven decisions. The system reduces administrative workload by automating the generation of reports, improving data accuracy, and enhancing the efficiency of school operations.

Lastly, **the parents** will benefit from improved communication and involvement in their children's education. The system's features will allow for timely updates on student progress, enabling parents to engage proactively in their child's learning journey. This enhanced collaboration between school and home is crucial for fostering a holistic educational experience.

This study not only addresses the existing challenges within Antonio C. Esguerra Memorial National High School but also contributes to the broader goals of educational reform and the pursuit of academic excellence. Through this solution, the study aims to create a sustainable impact that ultimately enhances the quality of education provided to students.

**SCOPE AND LIMITATIONS**

This research focuses exclusively on the implementation of the system at Antonio C. Esguerra Memorial National High School, specifically targeting junior high school students. The key features will include an automated grading system, user access for teachers and administrators, and tools for performance analytics that inform instructional strategies. The program will be utilized solely by teachers and administrative staff, limiting participation from other stakeholders, such as students and parents, in the input and management of data.

The technical scope of the project encompasses the use of modern web technologies, including a MySQL relational database for secure data storage and retrieval, which allows for real-time updates and access. The system will utilize programming languages such as PHP for server-side scripting and JavaScript for client-side interactivity, ensuring a responsive user interface. Additionally, frameworks like Tailwind CSS are employed to enhance the user experience across various devices. This architecture supports scalability and allows for future enhancements, such as incorporating mobile access or integrating additional features based on user feedback.

However, the project faces several limitations. It is designed to allow the input of teacher information, student information, scores, grades and teacher remarks only, excluding other factors such as student behavior which are also critical for a comprehensive understanding of a student’s academic journey. Additionally, since the system is web-based, it requires reliable internet access; any device without internet connectivity will be unable to use the platform, potentially hindering access for users in areas with unstable connections.

Moreover, user training will be essential, as varying levels of technological proficiency among staff may lead to challenges in system adoption. The system's focus on junior high school students may mean that the unique needs of other educational levels, such as senior high school, remain unaddressed as those educational levels have vastly different and complex curriculums.

**DEFINITION OF TERMS**

To enhance comprehension of this study, various terms and keywords are defined in this section.

**AKAP (Anak, Kamusta ang Pag-aaral) Program.** A school initiative designed to identify and support students at risk of academic failure through targeted interventions. In the context of this study, the AKAP Program emphasizes collaboration between teachers and parents to facilitate early identification and support for struggling students. (Schools Division Office of Rizal, 2021)

**At-Risk Students.** Students who are identified by the system’s algorithms as needing additional support based on low or failing grades. The system flags these students for early intervention. (Rudd et al., 2021)

**Data Synchronization.** The process of automatically updating and harmonizing data across multiple users and systems. (Vidhyalakshmi & Priya, 2020) Within this project, real-time data synchronization ensures that teachers and administrators have immediate access to the latest student information, enhancing decision-making and intervention strategies.

**User Experience (UX).** The overall satisfaction and efficiency of users when interacting with a system. (Krol & Zander, 2021) This study focuses on optimizing UX for teachers and administrators to improve engagement with the Enhanced Student Performance Tracking and Grading System, thereby supporting better educational outcomes.

**Role-Based Access Control (RBAC).** A security model that restricts system access based on user roles. (Liu et al., 2021) In this project, RBAC ensures that only authorized personnel, such as teachers and administrators, can access sensitive student data, thus enhancing data security.

**Predictive Model.** An algorithm that forecasts outcomes based on historical data. (Vidhyalakshmi & Priya, 2020) In this study, predictive models are employed to flag at-risk students and suggest personalized interventions to improve their academic performance.

**CRUD Operations (Create, Read, Update, Delete).** Fundamental operations that enable users to interact with data in a database.  (Sulemani, n.d.) This project incorporates CRUD functionalities to facilitate the effective management of student records, grades, and performance metrics.

**Data Mining.** The practice of analyzing large datasets to uncover patterns and trends. (Dogan & Birant, 2020) This system utilizes data mining techniques to identify at-risk students based on their academic performance, enabling timely interventions.

**Learning Analytics.** The measurement, collection, analysis, and reporting of data about learners and their contexts. In this study, learning analytics is employed to assess student performance trends and improve educational outcomes through data-driven insights. (Silva et al., 2023)

**Early Warning System (EWS).** A systematic approach to identifying risk of failure by monitoring important indicators. (Shrivastava et al., 2021) This project integrates an EWS to facilitate timely interventions for at-risk students.

**Intervention Monitoring.** The ongoing assessment of the effectiveness of intervention strategies implemented for at-risk students. (Harris, 2023) This project includes features for intervention monitoring to evaluate student progress and adjust support strategies as needed.

**Performance Metrics.** (Manavalan, 2020) Quantifiable measures used to assess student performance and progress. In this study, performance metrics are utilized to evaluate academic outcomes and inform data-driven decision-making in the Enhanced Student Performance Tracking and Grading System.

# CHAPTER II

## **REVIEW OF RELATED LITERATURE AND SYSTEMS**

### This chapter provides an in-depth review of existing literature and systems relevant to the development of the Enhanced Student Performance Tracking and Grading System. The purpose of this review is to examine key studies, methodologies, and technologies used in educational information systems, particularly in relation to the objectives of the study.

**The Role of Automated Grading and Standardization in Improving Educational Outcomes**

According to Maicus (2021) in their paper titled **Automated Grading for Advanced Topic Courses,** automated grading systems have been employed to assist instructors in managing the growing number of students in computer science courses, especially in advanced topics that are traditionally difficult to grade. The research introduces six performance axes for evaluating the success of an auto grading system: repeatability, scalability, security, extensibility, instructor ease of use, and educational value. Additionally, Maicus emphasizes the importance of system modularity for easier integration of new features and suggests peer grading as a complementary method for handling assignments that cannot be automatically graded.

This study connects to our project because both systems aim to enhance the grading process through automation. Although Maicus focuses on advanced topics in computer science, the core objectives align with our own: reducing the manual workload for teachers, increasing grading accuracy, and providing real-time feedback to students. Like Maicus' system, our project seeks to streamline educational processes and improve decision-making. By referencing this study, we can demonstrate the value of automation in grading and performance tracking in different educational contexts, showing its relevance and applicability to our own educational environment.

According to Mayberry (2023) in their paper titled **Making the grade: Do teacher-created grading systems result in disparate outcomes for high school students?** The absence of formalized grading policies within schools and districts often leads to differential grading practices among teachers, which can result in disparate outcomes for students. The study examines the effects of teacher-created grading systems by analyzing data from four core high school subjects. Regression analysis revealed that the teacher factor significantly influenced student grades, even after controlling for demographics and standardized test scores. These findings raise concerns about the fairness of grades, as students’ academic outcomes can be affected by the grading practices of their assigned teacher.

This study is relevant to our project as it highlights the inconsistencies that arise when grading is left to the discretion of individual teachers. By implementing an automated grading system, our project aims to standardize grading practices, ensuring fairness and reducing the disparities that Mayberry identifies. This supports our system's goal of promoting consistency in student assessments, leading to more equitable academic outcomes across different classrooms.

According to the review of literature on standards-based grading at the secondary level, the shift toward standards-based grading presents significant challenges for educators, particularly in secondary schools. The research identifies key elements that are necessary for the successful implementation of such grading systems and explores both the benefits and drawbacks of reforming traditional grading practices. While the process of transitioning to a standards-based system can be daunting, especially for teachers, the study shows that these systems offer improvements in learning outcomes and communication between all stakeholders, including students, teachers, and parents (Standards-based grading at the secondary level, n.d.).

This study is relevant to our project as it highlights the challenges teachers encounter when adapting to new grading methods, which informs our efforts to create a structured and consistent grading system. The benefits identified, such as enhanced communication and improved grading practices, align with our goal of improving the feedback loop between teachers, students, and parents through automated communication tools like the Gmail API. By understanding the complexities of implementing a new grading system, we can make our project more user-friendly for teachers while ensuring that it supports reliable and effective grading for the school.

According to White (2021) in their paper titled **Standards-based grading at the secondary level,** it has become a prominent topic in secondary education, with both secondary and post-secondary institutions engaging in grading reform. The transition to a standards-based system poses significant challenges for teachers, as they must adjust their grading practices and adopt a new mindset. While research highlights the benefits of implementing such a system—particularly in improving learning outcomes—reforming an entire district’s grading process is a considerable task. The review identifies key elements, benefits, and drawbacks of standards-based grading and explores its implementation at different educational levels.

This study is relevant to our project as it addresses the difficulties teachers face when adopting new grading methods, offering insights into creating a more structured and consistent grading process. The study also emphasizes the benefits of improved communication between students, teachers, and parents, which aligns with our project’s goal of enhancing communication through the Gmail API. By understanding these challenges, we can design a system that is easier for teachers to use, ultimately supporting our aim of building a more reliable and effective grading system for the school.

According to Dalangin et al. (2021) in their paper titled **Online Grading System with Examination for Philippine Institute of Quezon City,** the implementation of an online grading system with examination for the Philippine Institute of Quezon City addresses the need for timely information sharing between schools, students, and parents. The system allows students to take exams and automatically evaluates their performance, reducing manual effort by computerizing the entire grading process. It offers several advantages over manual grading, including scalability, real-time feedback, reduced human error, and administrative oversight of grades. The study concludes that the system met its objectives and was well-accepted by users, recommending its adoption to improve grade awareness and management.

This study benefits our project by illustrating how automating the grading process can reduce manual work, minimize errors, and provide real-time feedback—core goals of our system. The successful implementation of their system reinforces the potential for a similar solution to be well-received in our context, supporting our aim of enhancing efficiency, communication, and grade management between teachers, students, and parents.

**Implementing Predictive Algorithms and Automated Systems for Student Performance Tracking**

According to Karalar et al. (2021), in their paper titled **"Predicting Students at Risk of Academic Failure Using Ensemble Model During Pandemic in a Distance Learning System"**, identifying students at risk of academic failure is crucial for improving student outcomes, especially in higher education. The study highlights the growing importance of predictive systems in distance learning environments, particularly during the pandemic, where early detection and intervention can ensure students receive necessary support. These predictions focus on classification and regression models, with classification (pass/fail) being more prevalent than the prediction of final grades or scores (Khan & Ghosh, 2021).

Chukwuemeka et al. (2023), in their paper titled **"An Enhanced Student Engagement and Academic Performance Predictive System"**, emphasize predictive analytics as a tool to understand student commitment and scholarly performance. Their model aims to identify students at risk of poor performance or engagement early, allowing interventions that can improve learning outcomes in higher education. It also serves as an early warning system for educators to take strategic actions to enhance student success.

Albreiki et al. (2021), in their paper titled **"Customized Rule-Based Model to Identify At-Risk Students and Propose Rational Remedial Actions"**, discuss the advantages of early detection of at-risk students, including increased retention rates and improved institutional effectiveness. Despite advancements, many universities still face challenges such as high dropout rates and academic underachievement (Namoun & Alshanqiti, 2021). Automated systems that analyze student performance can help institutions deliver better education and address future academic needs.

Mappalotteng et al. (2024), in their paper titled **"Web-Based Student Academic Grade Processing Information System"**, address the inefficiencies of manual grade processing systems, such as time consumption and storage issues. Their study advocates for automated systems to streamline grade management. Similarly, other studies support integrating information and communication technology in education to enhance school management and data accessibility (Fathahillah, 2022; Antonyan & Arakelyan, 2023). Systems that automate student data management have been shown to save time and space (Azeka et al., 2022), as demonstrated by successful implementations in various schools, such as Kiddy ABC Islamic School (Ermawati & Wahyuningsih, 2021) and Nature Islam Elementary School (Badrul & Sari, 2021).

**Parental Involvement and Academic Performance of Learners**

According to Salac and Florida (2022) in their paper titled **"Epstein Model of Parental Involvement and Academic Performance of Learners"**, children perform better in school when parents are actively involved in their academic lives. Parental involvement significantly influences learners' academic performance. It is recommended that both teachers and parents enhance motivation and positive reinforcement in learning activities to boost academic outcomes. Schools should continue promoting a strong presence of parents through school programs that foster engagement in their children’s education.

Miguel et al. (2021), in their study titled **"Teachers’ Initiatives and Perceived Parental Involvement Practices Among Filipino Junior High School Students"**, discuss the benefits of collaboration and open communication between parents and teachers. They argue that open communication between teachers and parents can be adapted to fit different family settings. Additionally, parents' material and emotional support should help students manage time, learning space, and resources at home, which are essential skills for real-world scenarios. Teachers are encouraged to involve parents in learning management systems to allow monitoring and collaboration, especially in home-based learning environments. Adjustments made by teachers to strengthen parental involvement should focus on helpful, timely communication, as suggested by Koch (2020).

Ruaya (2023), in their journal article titled **"Enhancing Parental Engagement via the Grade Viewer Application: A Study in Taganaan National High School"**, highlights the long-recognized importance of parental involvement in determining students' academic performance and well-being. When parents are actively involved in their children's education, students tend to exhibit better attendance, higher motivation, improved behavior, and enhanced academic performance. Traditional methods of parental engagement, such as parent-teacher meetings and physical progress reports, have limitations in terms of timeliness and accessibility. The **Grade Viewer Application**, a digital platform, offers a more efficient solution by providing real-time updates on students' grades, assignments, and attendance. Studies have shown that increased parental engagement, facilitated through digital platforms, correlates with higher academic performance and improved student behavior. The application allows parents to promptly address concerns and celebrate achievements by providing instant updates on their child’s academic progress.

Tus (2021), in their publication titled **"Amidst the Online Learning in the Philippines: The Parental Involvement and Its Relationship to the Student's Academic Performance"**, reveals a significant relationship between parental involvement and students' academic outcomes. The study highlights that parents, as primary caregivers, shape children's exposure to the world, including their academic journey. The study shows that negative parental behavior, such as physical punishment or yelling, adversely impacts students' academic performance. In contrast, students with active parental involvement are more likely to be motivated and achieve academic success. The study emphasizes the importance of engaging parents in school activities and suggests that active parental involvement positively correlates with students’ academic performance. Parents should take the lead in supporting their children's educational goals and successes.

**User Experience Design in Educational Information Systems**

According to Putra and Setiawan (2020) in their paper titled **“The Importance of User Experience Analysis in the Design of an Education Information System Application,”** advancements in technology and its applications are expected to significantly benefit the field of education. The landscape of education is evolving; it is no longer solely reliant on face-to-face interactions between instructors and students but is increasingly integrating information systems for teaching and learning activities. However, users often encounter challenges in understanding the system's functionalities during the design process. To mitigate these difficulties, conducting an evaluation of the system’s requirements is essential for enhancing user comprehension of its objectives. An effective information system is one that users can easily navigate and understand. Thus, creating a system without any requirement analysis and evaluation can result in a design that is not user centered. The insights gathered during this analysis phase are vital for informing the system’s design.

User Interface/User Experience (UI/UX) design plays a crucial role in this context. Ilham et al. (2021), in their paper **“Analysis and Design of User Interface/User Experience with the Design Thinking Method in the Academic Information System of Jenderal Soedirman University,”** emphasize that UI/UX is key to ensuring products meet user needs effectively, leading to a comfortable and enjoyable experience. For example, if an Academic Information System (SIA) is not user-friendly, it can negatively impact users and the system itself, resulting in input errors, missing information, and navigation difficulties (Ilham et al., 2021).

In their research titled **“Online Grading System with Examination for Philippine Institute of Quezon City,”** Dalangin et al. (2021) underscores the importance of thorough requirements analysis and evaluation before moving to the system design phase. This proactive approach allowed them to tailor the user experience specifically to the needs of teachers and administrators, resulting in a streamlined and efficient grading process. By prioritizing user requirements, the developed system significantly enhanced the grading experience compared to the traditional method of using separate Excel files, facilitating a more organized and accessible means of managing student assessments.

The emphasis on analysis as a precursor to the design phase highlights its critical role in the overall development process. In the paper **“Designing and Implementing e-School Systems: An Information Systems Approach to School Management of a Community College in Northern Mindanao, Philippines,”** Grepon et al. (2021) systematically examined gathered reports to develop a functional design that encompasses various components of their system, including Network Infrastructure, System Architecture, Database Model, User Roles, and User Interface (UI). Each of these elements necessitates a thorough understanding of user needs and system requirements, which can only be achieved through careful analysis. This underscores the importance of user experience research and design in academic information systems.

Connecting these insights to our project, the emphasis on user-centered design principles becomes pivotal. Our system aims to track student performance and enhance grading processes, which requires seamless user experience for both teachers and administrators. By integrating comprehensive UI/UX design methods, informed by a detailed analysis of user needs, we can ensure that the system is intuitive and efficient.

**Integrating Data-Driven Analytics and Visual Tools**

Namoun and Alshanqiti (2021), conducted a systematic review of student performance prediction using data mining and learning analytics techniques. They noted that the use of learning logs and machine learning can reveal important patterns, enabling more effective identification of students who may struggle academically. Their study emphasized the importance of integrating analytics with education to foster a proactive learning environment.

Similarly, a study by Albreiki et al. (2021) also delved into the significance of early predictions using data mining techniques, particularly in educational environments. The authors examined how these techniques, applied across various educational systems, can accurately forecast student performance. The study emphasized that the type of educational system plays a role in how early accurate predictions can be made, reinforcing the importance of integrating data-driven tools, such as reports and visual feedback systems, in student performance tracking.

On the other hand,Mehdi and Nachouki (2023) expanded on this field by developing a model for predicting students' GPA at graduation. Their study used key predictors like high school GPA and introductory IT course grades, finding that high school GPA was the most significant factor in predicting graduation performance. This further supports the significance of data-driven prediction tools in improving student outcomes, aligning with the other studies that emphasize the role of analytics in education.

Doneva et al. (2020) introduced a learning analytics software tool designed to support decision-making in higher education institutions. The tool allows program managers and university administrators to monitor student learning processes and make timely, data-driven decisions aimed at improving institutional outcomes. Their research, conducted at the University of Plovdiv, demonstrated how such tools can be leveraged to enhance the quality assurance and management processes of academic programs, adding further evidence of the critical role of learning analytics in improving educational outcomes.

In the context of our system, integrating data-driven analytics and visual feedback tools is crucial to achieving real-time, actionable insights into student progress. Drawing from these studies, our system's use of data mining and analytics will allow teachers to identify at-risk students early on and intervene accordingly. By implementing visual tools like performance dashboards and detailed reports, the system will provide a user-friendly interface that empowers educators to make informed decisions, enhancing the school's capacity to address academic challenges proactively.

**Synthesis**

The reviewed literature converges on several key themes that underscore the importance of integrating technology, data-driven analytics, and user experience design in modern educational systems. Across multiple studies, the role of analytics in tracking and improving student performance is highlighted as a crucial innovation. Namoun and Alshanqiti (2021) and Albreiki et al. (2021) emphasize the value of learning analytics in identifying at-risk students early, allowing educators to intervene before academic failure occurs. These studies highlight that integrating predictive models can provide critical insights into students' learning behaviors, thereby fostering a proactive educational environment. Similarly, Mehdi and Nachouki (2023) point out that using predictive tools to assess key indicators like high school GPA or performance in introductory courses can provide reliable predictions of future outcomes, such as graduation GPA. Doneva et al. (2020) further add that data analytics tools not only improve student performance but also support institutional decision-making and quality assurance processes, proving their broader impact on academic administration.

In addition to technology, user experience design (UX) is presented as a pivotal component in the effectiveness of educational information systems. Putra and Setiawan (2020) argue that proper UX is necessary to ensure that systems are user-friendly and meet the functional needs of educators and students. Ilham et al. (2021) reinforce this by demonstrating that poor UI/UX design can lead to operational inefficiencies and user dissatisfaction. These findings are echoed in Dalangin et al.'s (2021) study, which illustrates how user-centered system design tailored to the specific needs of teachers and administrators led to a more streamlined and efficient grading process. These studies highlight the importance of not only developing data-driven solutions but also ensuring that these systems are designed with usability and user engagement in mind, enabling smoother navigation and reducing the potential for user error.

Another angle explored in the literature is the significant role of parental involvement in the academic performance of learners, particularly once at-risk students have been identified. Studies by Salac and Florida (2022) and Miguel et al. (2021) stress that when parents are actively involved in their children's education—through open communication with teachers, access to real-time performance updates, and active participation in learning activities—students are more likely to perform better academically. Tools like grade-viewer applications, as discussed by Ruaya (2023), enable parents to monitor their children's progress more effectively, providing timely feedback and reinforcing their role in the learning process. This aligns with findings from Tus (2021), who highlighted that parental engagement correlates positively with students' academic outcomes, especially when parents offer emotional and practical support at home.

The connection between parental involvement and data-driven analytics becomes especially important after identifying at-risk students. Once students are flagged as struggling academically, the involvement of parents becomes a crucial factor in the success of intervention strategies. By leveraging predictive tools to identify these students, schools can facilitate more informed discussions with parents, empowering them to take a more active role in their child’s academic recovery. The insights provided by performance tracking systems, combined with enhanced parental engagement, create a more supportive environment for students to succeed. This multi-stakeholder approach emphasizes the need for both technological solutions and human-centered interventions in supporting at-risk learners.

A notable gap in the literature, however, is the lack of focus on the specific challenges faced by secondary-level educational institutions in integrating such advanced systems. Most studies predominantly target higher education, with limited exploration of the unique contexts of public high schools. Additionally, while technology and predictive models are consistently highlighted as critical, there is still limited research on how these systems can be scaled or adapted for diverse educational settings, particularly those with limited resources or technological infrastructure.

Ultimately, the synthesis underscores a clear pattern of growing reliance on technology to improve educational outcomes through both users experience design and data analytics. However, there is a need for further research to address the challenges of implementing these systems in resource-constrained environments, as well as exploring more inclusive strategies that cater to both secondary and higher education institutions.

# CHAPTER III

## **DESIGN AND METHODOLOGY**

**TECHNICAL BACKGROUND**

This chapter discusses the technical details of the *Enhanced Student Performance Tracking and Grading System* for Antonio C. Esguerra Memorial National High School, covering how the system functions, the technologies used in its development and deployment, and how it benefits the school's grading and performance monitoring processes.

The current system at Antonio C. Esguerra Memorial National High School relies heavily on manual processes. Teachers use Microsoft Excel for recording and computing student grades. These grades are then manually transferred to class cards and submitted to the registrar’s office for safekeeping and distribution. This process is inefficient and prone to human errors, often resulting in delays and inaccuracies in reporting student performance.

The *Enhanced Student Performance Tracking and Grading System* aims to automate these manual processes by centralizing grade collection, computation, and reporting. It will allow teachers to input grades directly into the system, which will automatically compute final grades and provide real-time access to student performance data. This system will integrate the current grading practices into a single platform while reducing the time and effort required for grade recording and reporting.

The system will primarily be built using **PHP** (Hypertext Preprocessor) for server-side programming, ensuring robust and efficient back-end functionalities. In addition to core PHP, the system will leverage various PHP libraries like **Composer** to manage dependencies and integrate third-party functionalities. **Composer** will be instrumental in implementing key features such as the Excel export functionality for grade reports and **Gmail API** integration for secure and automated email notifications to parents and students. Furthermore, PHP libraries will also be used for PDF export functionality, allowing users to generate printable versions of reports and student performance data in a streamlined manner.

On the front end, the interface will be designed with **HTML**, **Tailwind CSS**, and **JavaScript**, ensuring both responsiveness and ease of use. Tailwind CSS, a utility-first framework, will enable faster design implementation and a clean user interface. A JavaScript UI library will be used alongside Tailwind CSS, allowing for quicker and more efficient development of the system.

The system’s database will be managed using **MySQL**, accessed and administered via **phpMyAdmin**, which will securely store critical data such as student records, grades, and performance reports. To ensure data integrity and security, the system will employ various protective measures. One key approach will be the use of prepared statements in SQL queries, which safeguards against SQL injection attacks, a common vulnerability in web applications. All sensitive information, such as user credentials, will be encrypted before storage, ensuring that even in the event of unauthorized access, the data remains protected. In addition, secure password hashing algorithms will be implemented for password storage, and user authentication will be further strengthened by strict password policies. The system will also feature role-based access control (RBAC), ensuring that only authorized users, such as teachers and administrators, can access or modify sensitive student data.

The system requirements for the Enhanced Student Performance Tracking and Grading System will be relatively flexible, as it is a web-based application. Users, such as teachers and administrators, will only need a device with stable internet access and a modern web browser (such as Google Chrome, Mozilla Firefox, or Microsoft Edge). The system will be able to run on any platform, including Windows, macOS, and Linux, provided **that the device meets basic internet browsing capabilities.**

The Enhanced Student Performance Tracking and Grading System will serve three key stakeholder groups: teachers, administrators, and students. Teachers will be able to record grades efficiently, track student progress, and provide feedback through a centralized platform. Administrators will have access to detailed reports and analytics, enabling them to monitor overall school performance and intervene when necessary. Students, as well as their parents, will be able to receive educational interventions earlier due to real-time performance tracking.

The development of the Enhanced Student Performance Tracking and Grading System will follow the Agile Software Development Life Cycle (SDLC), which was chosen for its flexibility and iterative approach. Agile will allow for incremental development and continuous user feedback, ensuring that the system meets the specific needs of teachers, administrators, and students.

During the **analysis** phase, the project team will gather input from key stakeholders, including faculty and administration, to identify **requirements** in the existing grading and performance monitoring system. This collaborative effort will ensure the system's goals are aligned with user needs.

In the **design** and **development** phase, the team will work in small sprints to create and refine system features. Early iterations will focus on basic functionalities, such as inputting grades and generating reports, while later phases will introduce more complex features like performance analytics and early identification of at-risk students.

The **testing** phase will involve regular feedback sessions with teachers and staff to fine-tune the system. This iterative process will allow the team to address bugs and make improvements based on real-world usage.

Finally, the system will be **deployed**, followed by **maintenance** and regular updates based on ongoing user feedback, ensuring the system remains relevant to the school's needs.

**FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENTS**

During our discussions with the faculty and administrative organization inside the school, we identified several issues related to student performance tracking, grading, and overall school management. The following functional and non-functional requirements are based on the feedback we received, and overall requirement analysis that was done, addressing the school's specific needs and challenges.

The system should provide several functional requirements including **user** **authentication** and **authorization**, allowing students, teachers, and administrators to log in using unique credentials. Users will be assigned specific roles, such as teacher, or admin, which will determine their access to various features of the system.

The system must also **manage** **student** **data** efficiently. Administrators should have the ability to add, edit, and delete student and teacher information as needed. Teachers, on the other hand, will need to **input and update students' grades and performance data** throughout the academic year. The system should facilitate section and class management, where administrators can create, modify, and delete sections. Teachers must be able to assign students to appropriate sections and manage section-specific details.

One of the key features of the system is its ability to handle **grading** **and** **report** **card** **generation**. Teachers will input grades for students across various subjects, and the system will automatically calculate their overall average based on those inputs. It should be capable of generating downloadable and printable report cards in multiple formats, such as Excel and PDF.

Moreover, to assist teachers in monitoring student progress, the system must allow for **performance tracking** over time and include a feature to identify at-risk students or students involved in special programs like the AKAP ("Anak, Kamusta ang Pag-aaral") Program.

Lastly, the system should inform teachers and administrators when students are **flagged as** **at-risk based on predefined criteria**. This will ensure that timely interventions can be made when necessary. Support for the AKAP Program must also be integrated, allowing for easy management and contacting of students’ parents through email who are part of this initiative.

The Enhanced Student Performance Tracking and Grading System must adhere to several non-functional requirements, with a primary focus on security and usability, while also ensuring maintainability and scalability to accommodate future needs. **Security** is crucial to the functionality of the system, given the sensitivity of the data being handled, such as student grades and personal information. The system is developed using PHP and SQL, with stringent security measures implemented to protect against common vulnerabilities. Specifically, the system employs prepared statements to guard against SQL injection attacks, along with rigorous input validation to prevent unauthorized or malicious data entry. Additionally, user passwords are stored using secure hashing technologies, and robust password policies are enforced to ensure strong account security.

**Usability** is also a critical consideration in the system's design, particularly to accommodate the needs of a diverse group of users, including older generations of teachers who are more familiar with spreadsheet-based workflows. The system features a minimalistic and predictable user interface that mirrors the layout and functionality of traditional spreadsheet software. This familiar structure ensures that users, regardless of their technological proficiency, can navigate the system with ease. The design emphasizes clarity, with intuitive workflows and consistent labeling, allowing teachers to adopt the system with ease.

In addition to security and usability, the system has been developed with **maintainability** and scalability in mind. The architecture is modular, allowing individual components—such as the grading module or student management system—to be updated or enhanced independently without impacting the overall functionality of the system. This modular design ensures that future maintenance and enhancements can be performed efficiently, reducing the complexity of ongoing system management.

**Scalability** is another crucial factor. As the student population grows, the system must be able to handle increasing volumes of data and additional users without compromising performance. It incorporates a feature for archiving student records rather than deleting them, ensuring that historical data is preserved for future reference while maintaining optimal performance in the active database. Archived records are accessible when necessary but are excluded from day-to-day operations, thereby ensuring that the system remains efficient as it scales.

**DESIGN OF SOFTWARE, SYSTEM AND PROCESSES**

This section outlines the architectural design and structural components of the Enhanced Student Performance Tracking and Grading System. It delves into the key software design principles, system architecture, and the processes that underpin the functionality and user experience of the application.

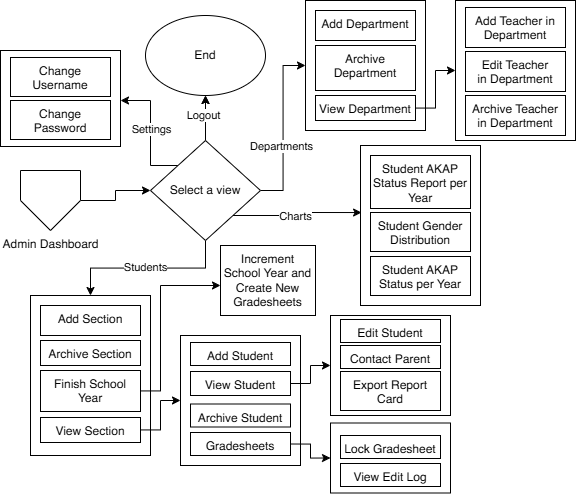
The user authentication flowchart illustrates the step-by-step process for accessing the system, starting with user login credentials and ending with successful authentication or failure prompts. It highlights the verification of user roles (admin or teacher), secure database checks, and the appropriate system response based on the input provided.

**A diagram of a computer program

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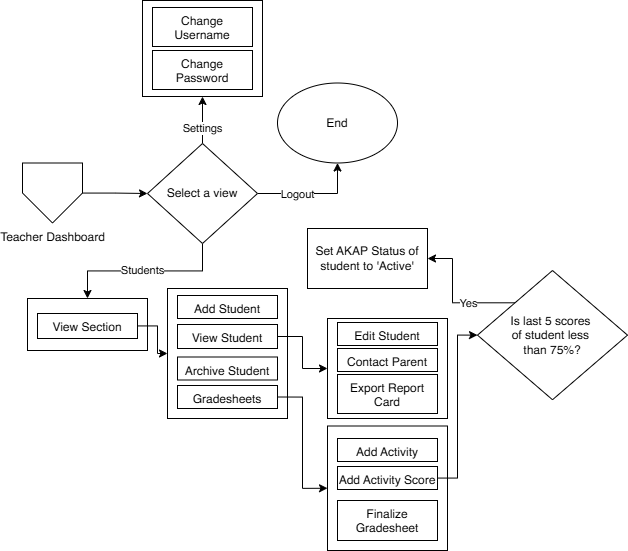
**Figure 1.** Login and Registration Flowchart

The admin dashboard flowchart presents an overview of the system's key functionalities available to administrators, including information management, grade and report card generation, and the analytic analytics tools.

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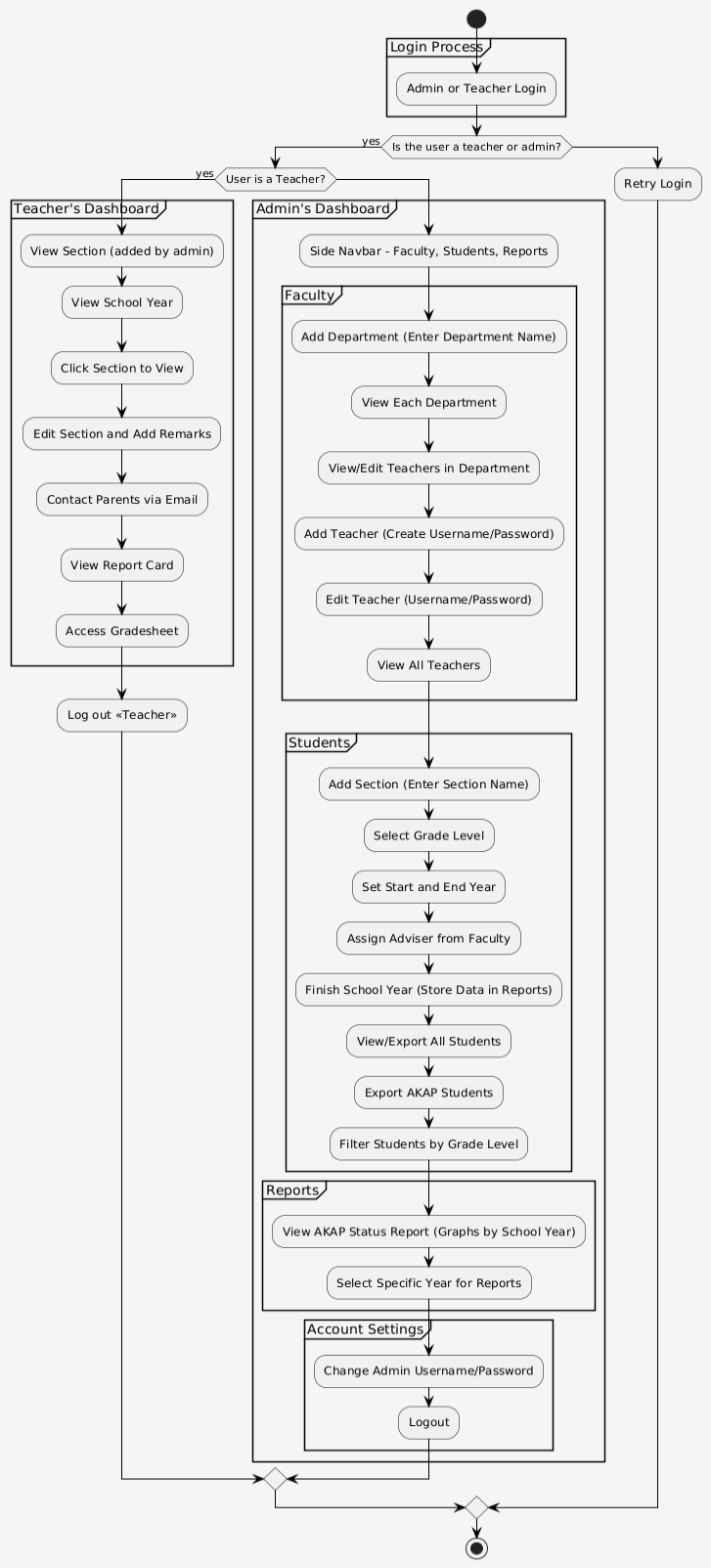
**Figure 2.** Admin Dashboard Flowchart

The teacher dashboard figure provides an overview of the tools available to teachers for managing student data, including inputting grades and tracking student performance. It features an organized interface that allows teachers to easily generate report cards, identify at-risk students, and add remarks, all designed to streamline classroom management and enhance instructional decision-making.

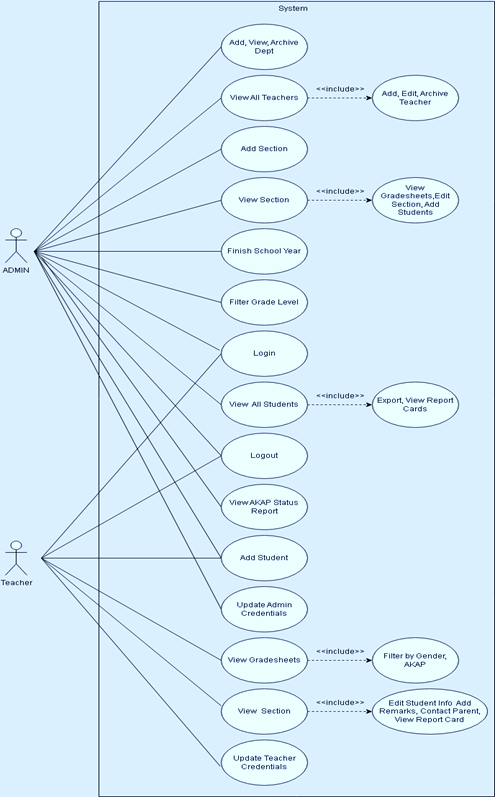
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**Figure 3.** Teacher Dashboard Flowchart

The structure of the system is designed to simplify managing student performance, so teachers and admins have the right tools for their jobs. Admins oversee the organization, forge performance reports and the teachers are focused on working with their assigned sections, grading and communicating with parents. **Activity diagram** shows the separate paths each user could take in the system and symptoms of workflow transitions between tasks.



**Figure 4.** Activity Diagram

This **use case diagram** shows the roles of Admin and Teacher in the system. The admin manages departments, teachers, sections, and students. They can view and edit grades, finish the school year, view reports, and update credentials. Teachers focus on viewing grade sheets, managing student info, and updating their own credentials. Both can log in and out of the system, and some tasks, like viewing sections and students, involve related actions like managing student data and reports.

**Figure 5.** Use Case Diagram

The main goal of the **context diagram** is to provide a broad overview of the system's interactions with its surroundings. It emphasizes the boundaries and data exchanges between the system and its external entities rather than going into great depth about the internal operations of the system.

A diagram of a business

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**Figure 6.** Context Diagram

A **data flow diagram (DFD)** is a visual aid for modeling how data moves through a system or procedure. It demonstrates the input, processing, storing, and output of data as it flows between various parts of a system.

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**Figure 7.** DFD Diagram Level 1

Educators and administrators are the primary users of various modules that manage student data, grades, tests, and reports. Instructors input grades and quiz and exam information, which are processed by modules like Managing Exam and Grade Details (4.0) and Managing Quiz and Details (1.0). This information is then compiled into comprehensive reports by the Generate AKAP Statuses and Reports (4.0) module. Administrators not only manage student and instructor accounts but also ensure accurate data processing across modules such as Managing Student Information (2.0 and 5.0). The system's information flow facilitates tracking and evaluating student performance throughout the academic year, contributing to the successful completion of school year tasks (7.0).

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**Figure 8.** DFD Diagram Level 2

The figure now clearly shows separate databases for managing different types of data: the Quiz and Exam Details Database (A3), Grades Details Database (A1), Student Information Database (A2), Teacher Accounts Database (A6), and Finish School Year Database (A7). The data flow is defined: teachers input exam and grade information into the relevant databases, while the Generating AKAP Statuses and Reports (4.0) module compiles data from multiple sources to produce detailed reports. Administrators can interact with the system through a faculty dashboard to retrieve reports, grades, and student information. Modules such as Managing Quiz and Exam Details (3.0) and Managing Student Information (2.0 and 5.0) ensure accurate and up-to-date student performance records by accessing the corresponding databases.

This **Entity-Relationship Diagram** represents how data is structured, highlighting the connections between entities. The diagram also includes primary keys, foreign keys, and attributes, providing a clear blueprint for database implementation.

**A screenshot of a computer

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***Figure 9.*** *Entity-Relationship Diagram*

**DEVELOPMENT PROCESS**

The development process for the Student Performance Tracking and Grading System was executed in alignment with the Agile Software Development Life Cycle (SDLC). This approach emphasized iterative development, continuous feedback, and collaboration with the client, enabling the team to adapt quickly to changing requirements and enhance the overall quality of the system.

**A diagram of software development

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***Figure 10.*** *Agile SDLC Diagram*

During the **analysis phase**, the project team gathered input from key stakeholders, including teachers and administrators, to identify challenges within the existing grading and performance monitoring system. This collaboration laid the foundation for the system's goals, ensuring that the development aligned with user needs. The team created used these requirements to help in outline the system architecture, features, and user interface, which guided the subsequent phases of development.

The **design** and **development** phase were iterative and was done by feature. The team employed a modular approach, breaking down the system into manageable components based on the several features needed. Once the basic design was approved by the client, the team implemented essential CRUD (Create, Read, Update, Delete) operations, which formed the backbone of the system.

As the initial iterations focused on these foundational features, more complex functionalities were integrated in later iterations. This included advanced features such as performance analytics, tracking of student progress, and automated notifications through the Gmail API. The iterative approach allowed the team to refine and enhance the system progressively, incorporating stakeholder feedback at each step and ensuring that the more complex features built upon the solid groundwork established earlier.

**Implementation** occurred concurrently with the development of individual features. As features were completed, they were integrated into the main application repository. The team used Git, a version control system, to manage code changes and facilitate collaboration among developers.

The **testing** phase involved rigorous feedback sessions per feature with the client to identify areas for improvement. This iterative process allowed developers and the client to address issues based on real-world usage and ensure that the system met the quality standards expected by users.

Once the system reaches a stable state, the **deployment** phase will commence. The team will ensure that all components are thoroughly tested before transitioning the application to the production environment. This phase will include final user acceptance testing, allowing stakeholders to validate the system's performance and usability.

Following deployment, the system will enter the **maintenance** phase, where regular updates and enhancements will be implemented based on ongoing user feedback. Addressing any emerging issues, and incorporating new features as required, ensuring the system remains relevant and effective in meeting the school's needs.

**ETHICAL CONSIDERATIONS**

Antonio C. Esguerra Memorial National High School uses the "Enhanced Student Performance Tracking and Grading System" based on a strict ethic strict adherence. This chapter reports the ethical standards by which the project was conducted, covering legal, social, professional, and academic guidelines. The project aims to be very transparent about participant involvement, personal data protection, and intellectual property rights.

Based on transparency and voluntary participation. The project will be briefed to students, teachers and school administrators on the project’s purpose, scope and potential impact. The methods of collecting data, and how it will be put to use, will be clearly explained to participants.

In accordance with the Data Privacy Act of 2012 of the Philippines (Republic Act No. 10173) the project takes extreme measures to ensure the privacy and confidentiality of all the collected data. This sensitive information such as students’ grades and other grades will be being safeguarded.

Further, will ensure that legal regulations are followed when data is retained and deleted. After the project is complete, data will be deleted securely and only kept when necessary to aid in valid educational use and only after an explicit school administration consent.

To uphold academic integrity and respect for intellectual property, the project will strictly adhere to ethical research and development practices. All sources of information, whether they be academic references, software, or other intellectual property, will be appropriately acknowledged to prevent any form of plagiarism.

One of the objectives of the project is to assure that the system’s tracking and grading mechanisms are fair and equitable. For the system development, the measure of ensuring each at-risk student is treated fairly based on their background will be designed. Finally, the system will be rigorously tested in order to make sure that no such biases exist that would unfairly affect student performance evaluation. The system will be regularly audited by us to prove that all of it is fair and to monitor the system, and even the teachers themselves will assist in making sure that the grading is being taken into account with academic standards. (Schreyer Institute, 2023; University of Virginia, 2023).

But for the ethical use of the system, those using it will be given such thorough training by teachers and school staff. In this training we will learn about different system’s functionalities, ethical usage of the data as well as maintain the fairness in student evaluation. (Olsen, B., & Wyss, M. C.) According to the Center for Teaching, Vanderbilt University, the success and the integrity of the grading process requires that educators are well prepared to use the system.

# CHAPTER IV

## **RESULTS AND DISCUSSIONS**

# CHAPTER V

## **SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS**

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## **APPENDIX A**

Gantt Chart

## **APPENDIX B**

Survey Questionnaire