Global Scientific JOURNALS
GSJ: Volume 13, Issue 12, December 2025, Online: ISSN 2320-9186
www.globalscientificjournal.com

STUDENTS RADIO FREQUENCY IDENTIFICATION TRACKING PLATFORM FOR CEGUERA TECHNOLOGICAL COLLEGES

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Abstract

This study, entitled *"Design and Development of a Student Radio Frequency Identification (RFID) Tracking Platform for Ceguera Technological Colleges*," focused on automating the attendance recording and monitoring process to improve efficiency, accuracy, and data management. The platform was developed using RFID-enabled identification cards to capture student entry and exit transactions, supported by a secure and well-structured database that enables real-time monitoring, storage, and retrieval of attendance records and student information. An intuitive administrative interface was incorporated to facilitate student data management, attendance monitoring, and report generation. The system's performance and software quality were evaluated using the ISO/IEC 25010 quality model, specifically assessing functionality, usability, reliability, security, and performance efficiency. The development process followed a structured software development methodology to ensure the creation of a reliable, scalable, and user-friendly prototype.

The findings indicated that the RFID-based tracking platform effectively automated attendance recording and monitoring, delivering accurate and real-time data while significantly enhancing administrative efficiency and strengthening the secure handling of student records. The functional prototype successfully captured student entry and exit transactions and maintained a reliable database for efficient monitoring and data retrieval. Moreover, the administrative interface proved effective in managing student information and generating comprehensive reports, resulting in a high overall software quality rating of 4.7, which corresponds to "Far Exceeds Expectations."

In conclusion, the study demonstrated that the RFID-based student tracking platform is highly effective, accurate, secure, and user-friendly, successfully meeting its intended objectives of automating attendance management and improving institutional administrative processes. The system's compliance with the ISO/IEC 25010 quality standards confirmed its technical robustness, reliability, and operational efficiency.

Based on the results, it is recommended that the platform be implemented across all departments of Ceguera Technological Colleges. Regular

maintenance and updates of the RFID database should be conducted to ensure data accuracy and system reliability. Training programs for administrative personnel are also recommended to maximize system utilization. Furthermore, future enhancements may include the integration of automated notifications for absences or late entries and the exploration of scalability options to expand the platform's functionality for broader school management and decision-support applications.

Keywords: Attendance Tracking, Database Management, RFID, Real-Time Alerts, Student Monitoring, Students

Introduction

Educational institutions are increasingly turning to automated attendance monitoring systems to ensure efficiency, accuracy, and student safety. Radio Frequency Identification (RFID) and Quick Response (QR) code technologies have been widely integrated into school systems to reduce manual recording errors and provide real-time monitoring. For instance, Sharma and Patel (2023) reported that RFID-based attendance systems in Indian universities significantly reduced classroom disruptions caused by manual roll calls. Similarly, Lee, Ahmad, and Hassan (2023) introduced an IoT-based attendance system in Malaysia that combined RFID with SMS alerts, enabling parents to receive instant notifications regarding their children's attendance. In Nigeria, Okeke and Chukwu (2023) demonstrated that automated attendance systems improved accountability by minimizing cases of student truancy and enhancing communication between schools and guardians. In the United States, Johnson and Wang (2023) emphasized the effectiveness of integrating RFID with mobile notifications to foster transparency and safety in K–12 institutions. Smith and Brown (2023) also noted a growing global trend in adopting mobile-enhanced attendance systems as part of school modernization efforts. These international studies underscore that RFID and SMS-integrated systems are vital tools in strengthening communication, transparency, and security in schools worldwide.

In the Philippines, the integration of Information and Communication Technology (ICT) in education is strongly encouraged by both the Commission on Higher Education (CHED) and the Department of Education (DepEd). CHED Memorandum Order No. 9, Series of 2013, mandates higher education institutions to strengthen student services through technology-aided solutions, which include attendance monitoring. Likewise, DepEd Order No. 74, s. 2010, emphasizes the importance of maintaining accurate student attendance records for discipline and developmental purposes. Local research supports this government thrust. Dela Cruz (2021) highlighted the growing demand for RFID-based systems to promote parental involvement and enhance student safety. Hernandez and Flores (2023) found that schools adopting SMS-linked attendance tracking reported improved communication with parents and a reduction in absenteeism. Santos, Ramirez, and Uy (2023) further demonstrated that GSM-enabled RFID systems significantly improved both transparency and monitoring efficiency in higher education institutions. Collectively, these studies affirm a national trend toward adopting smart attendance systems that ensure accountability, safety, and active parent-school collaboration.

Within Camarines Sur, several institutions are already deploying automated identification and attendance-related solutions. At Rinconada National Technical Vocational School, an RFID-integrated ID system has been developed to streamline access control and monitoring (RNTVS, n.d.). Baao Community College documented a QR-based attendance platform with SMS alerts to notify guardians in near real time (Baao Community College, n.d.). Camarines Sur Polytechnic Colleges proposed an RFID-based gate pass system to automate gate operations and enhance security (CSPC, 2025). DepEd Milaor National High School's eSIMS includes a barcode-ID attendance module for campus entry/exit (DepEd Milaor NHS, 2018). In addition, Naga College Foundation's software agreement reflects ongoing adoption of SMS-enabled school systems in the province (Naga College Foundation, 2025). These initiatives show clear local feasibility and acceptance of RFID and SMS technologies, directly motivating an Students Radio Frequency Identification Tracking Platform for Ceguera Technological Colleges.

At Ceguera Technological Colleges, the existing manual attendance system presents several challenges such as inaccurate records, delayed updates, and the absence of real-time communication with guardians. With increasing enrollment and heightened concerns about student safety, many parents have expressed the need for a system that provides instant updates on their children's arrival and departure from school. To address these issues, this capstone project, titled "Students Radio Frequency Identification Tracking Platform for Ceguera Technological Colleges," aims to design and implement an automated attendance and gate monitoring system. The system will utilize a Raspberry Pi microcontroller, RFID scanner, and GSM technology for SMS services. Students will scan their ID cards when entering or leaving the premises, and the system will automatically record attendance and notify guardians via SMS. This project seeks to enhance security, strengthen parental engagement, and improve efficiency and accuracy in attendance monitoring at the institution.

Specific Objectives

Specifically, the study aimed to:

1. Design a student Radio Frequency Identification (RFID) tracking platform for Ceguera Technological Colleges to
    1.1. automate attendance recording
    1.2. and monitoring processes.
2. Develop a functional prototype using RFID-enabled ID cards capable of capturing:
    2.1. Student entry transactions
    2.2. Student exit transactions.
3. To enable real-time monitoring and retrieval, create a secure and organized database capable of storing**:**
    3.1. Attendance logs

3.2. Student information
4. Implement an administrative interface that allows school personnel to:
4.1. Manage student data
4.2. Monitor attendance
4.3. Generate comprehensive reports
5. Evaluate the system's performance and software quality according to the ISO/IEC 25010 standard, focusing on:
5.1. Functionality
5.2. Usability
5.3. Reliability
5.4. Security
5.5. Efficiency

Scope and Delimitations

This study focused on the design and development of a Students Radio Frequency Identification (RFID) Tracking Platform for Ceguera Technological Colleges. The platform was designed for use at the school's gate entry and exit points to improve the efficiency and accuracy of student attendance monitoring. Senior High School students used RFID-enabled identification cards to record their entry and exit, which were automatically logged in the system. The platform was equipped with an SMS notification feature that sent instant alerts to the student's registered parent or guardian upon scanning, enhancing school–home communication. The system utilized a Raspberry Pi microcontroller as the main processing unit, an RFID scanner for identification capture, a GSM module for SMS transmission, and a local database for storing student and attendance data. An administrative interface was developed for authorized personnel to manage student records, monitor real-time attendance, and generate reports. The system was evaluated based on selected ISO 25010 software quality characteristics including functionality, usability, reliability, security, and efficiency. A total of twenty (20) evaluators were selected - ten (10) IT experts, three (3) school personnel, and seven (7) student users -upon the recommendation of the adviser and the panel to ensure an appropriate and representative evaluation group. Their feedback was considered essential in assessing the system's overall performance.

The study was limited to monitoring the attendance of students only and did not cover faculty, staff, or visitors. It was restricted to RFID-based identification, excluding other attendance-tracking technologies such as biometrics and QR codes. The SMS notification feature was confined solely to gate entry and exit transactions and did not include classroom or subject-level attendance. Additionally, SMS delivery depended on the GSM module and mobile network availability, making it susceptible to delays or failures in areas with weak signal coverage. The system was deployed and tested only as a prototype within a controlled environment at Ceguera Technological Colleges, involving a limited number of students, parents or guardians, and school administrators. These delimitations defined the scope of the project and ensured that the study remained feasible within the available timeframe, resources, and technical constraints.

Gap Bridged of the Study

The reviewed literature and systems showed several significant similarities with the present research, particularly those utilizing RFID technology for school attendance monitoring and SMS notifications, such as the systems developed at Lipa City Colleges and Medina College Ipil Inc. These studies demonstrated the feasibility of real-time recording of student gate transactions, automated alerts to parents, and improved accuracy in attendance logging. Similarly, works from Bestlink College and Notre Dame of Midsayap College expressed the benefits of replacing manual attendance with automated RFID-enabled platforms, highlighting enhanced efficiency and reduced human error. The present study aligned with these findings by adopting an RFID-based approach and incorporating SMS notifications, reinforcing the value and practicality of automated attendance solutions in Philippine educational institutions.

What distinguished the present study from previous works was its emphasis on an enhanced administrative interface and a more structured and organized attendance database that supported real-time monitoring, historical retrieval, and automated report generation tailored for Ceguera Technological Colleges. While earlier systems primarily focused on recording attendance and sending SMS alerts, this project filled a notable gap by integrating a unified platform that strengthened institutional oversight, improved data accessibility, and expanded functionality beyond simple logging. Additionally, the use of the ISO/IEC 25010 quality framework for evaluating system performance ensured that the developed prototype met recognized software criteria in functionality, usability, reliability, security, and efficiency - an evaluation approach not consistently applied in earlier local studies. Through these unique contributions, the current study bridged the gap by offering a more comprehensive, data-driven, and quality-assessed RFID attendance management system designed for real-world deployment in the Philippine school environment.

Conceptual Framework

This study followed the Input–Process–Output (IPO) model with feedback, illustrating the systematic development of the Student Radio Frequency Identification (RFID) Tracking Platform for Ceguera Technological Colleges. The input included the design and planning of an RFID-based student tracking platform intended to automate attendance recording and monitoring processes. It also involved the development of a functional prototype using RFID-enabled identification cards capable of capturing student entry and exit transactions, along with the establishment of a secure and organized database that stored student records and attendance logs for real-time monitoring and retrieval. Additionally, the input incorporated the creation of an administrative interface that enabled personnel to manage student data, monitor attendance, and generate reports, as well as the evaluation of the system based on ISO/IEC 25010 software quality metrics—

functionality, usability, reliability, security, and efficiency.

The process phase adopted the Rapid Application Development (RAD) Model, which consisted of the following stages: (1) Requirements Planning, where system needs and objectives were identified in collaboration with stakeholders; (2) User Design, where user interface requirements, system flow, and interactions were prototyped and refined; (3) Construction, where the system components were built, integrated, and tested; and (4) Cut-Over, which involved deployment, training, final testing, and implementation of the working system within the institution. The RAD model enabled fast development cycles and iterative improvements based on continuous stakeholder involvement.

The output of this process was a fully functional Student Radio Frequency Identification Tracking Platform for Ceguera Technological Colleges, capable of accurately recording attendance, providing real-time monitoring, generating automated reports, and offering a secure digital platform for administrative use.

Finally, feedback was incorporated to maintain system relevance and functionality. Broken lines were used from the feedback to the process stage because feedback did not always occur in a strictly linear manner; rather, it represented an iterative and flexible loop where end-users and administrators provided suggestions at any development stage. This reflected the nature of the RAD model, where system improvements and refinements could arise at any point to enhance performance, usability, and security.

Requirements Planning

The first stage of the Rapid Application Development (RAD) methodology is Requirements Planning. This phase involved identifying the specific needs of the institution and the intended users to establish a clear foundation for system development. The researchers conducted consultations and discussions with school administrators, faculty, and selected students to gather information on the existing attendance monitoring practices and the challenges encountered in their implementation.

Based on these consultations, the requirements were classified into functional and non-functional categories. The functional requirements included: (1) the ability to automatically record student attendance using RFID-enabled identification cards, (2) the storage and retrieval of attendance data in a centralized database, (3) the generation of attendance reports for administrative use, and (4) the capability to notify concerned parties regarding student attendance status. On the other hand, the non-functional requirements focused on system reliability, data security, user-friendliness, and scalability to ensure that the platform would remain efficient and adaptable to future needs.

The outcome of the Requirements Planning stage served as the blueprint for the succeeding phases of development. By clearly defining the objectives and scope of

the system, the researchers ensured that the platform addressed the institution's operational needs while also meeting user expectations.

User Design

The second stage of the Rapid Application Development (RAD) methodology is User Design. This phase focused on transforming the identified requirements into visual representations and interactive prototypes that reflected the intended features of the system. Active collaboration with the end-users, school administrators and faculty members were emphasized to ensure that the design aligned with actual needs and expectations.

During this stage, the researchers developed wireframes and mock-ups of the platform, including the login interface, attendance monitoring dashboard, transaction logs, and reporting modules. These design elements allowed users to visualize the system's layout and flow before full-scale development. Feedback from the participants was continuously gathered and incorporated, which ensured that the platform was intuitive, user-friendly, and functionally relevant.

Key considerations during the User Design phase included the simplicity of navigation, the clarity of displayed information, and the integration of essential features such as automatic attendance recording, SMS notification, and database management. The iterative process of designing and refining the interface enabled the researchers to produce a system blueprint that balanced functionality with ease of use. The outcome of this phase was a validated set of user interface designs and workflow diagrams that served as the foundation for the Construction phase. By actively engaging users in the design process, the researchers were able to minimize potential usability issues and ensure that the platform effectively addressed the institution's operational requirements.

Construction

The Construction Phase was the development stage of the project, and it began after the initial designs had been validated. During this phase, the different components of the Students Radio Frequency Identification Tracking Platform were built and tested. The main modules developed included the RFID integration for capturing student entry and exit transactions, the backend database for securely storing attendance logs and student information, the administrative web interface for monitoring and reporting, and the SMS notification module powered by the SIM800L GSM device.

Alongside the software modules, the kiosk enclosure was also constructed to house the Raspberry Pi, RFID reader, display monitor, and power components in a secure and accessible manner. This ensured that the system was both functional and practical for deployment in the school environment.

As each module was developed, it underwent immediate testing to assess functionality, usability, reliability, security, and efficiency. Errors and performance issues were identified through repeated trial and error, and solutions were applied promptly to ensure system stability. This iterative development approach ensured that the final prototype was not only technically robust but also aligned with stakeholder requirements.

Cutover

In this final phase, the Students Radio Frequency Identification Tracking Platform underwent comprehensive evaluation and rigorous testing to ensure its reliability, functionality, and readiness for deployment. This process was essential in identifying any errors, inconsistencies, and usability issues that could affect system performance during actual operation. Based on the evaluation outcomes, both hardware and software components were refined to enhance efficiency, accuracy, and overall user experience. The testing phase verified that the system's features including RFID-based attendance logging, automated SMS notifications, and real-time dashboard monitoring performed seamlessly under different operating conditions.

Moreover, the feedback gathered during this stage played a vital role in improving the system's design and functionality, ensuring that it meets the practical needs and expectations of its intended users. Both the hardware setup (Raspberry Pi kiosk, RFID reader, GSM module, and power system) and the software modules (database, web interface, and notification system) were carefully evaluated and optimized to achieve stable performance and consistent communication flow between components.

The Students Radio Frequency Identification Tracking Platform was evaluated by three groups of respondents: ten (10) IT experts who assessed the system's technical performance and security; three (3) administrative staff members representing the principal, and senior high school faculty, who evaluated the system's operational efficiency; and seven (7) students who provided feedback on usability and interface design. The numerical rating scale used was as follows: (1) Does not meet expectations, (2) Partially meets expectations, (3) Meets expectations, (4) Exceeds expectations, and (5) Far exceeds expectations.

The evaluation results and corresponding feedback contributed significantly to final system improvements, ensuring that the Students Radio Frequency Identification Tracking Platform is fully functional, user-friendly, and ready for real-world deployment in the institutional environment.

Findings

During the development and after testing and evaluation of the developed system the following findings have been established:

1. The RFID-based student tracking platform for Ceguera Technological Colleges effectively automated attendance recording and monitoring,

providing accurate, real-time data, enhancing administrative efficiency, and ensuring secure and user-friendly management of student attendance.

2. Developed a functional prototype using RFID-enabled ID cards to capture student entry and exit transactions, supported by a secure and organized database that stored attendance logs and student information for real-time monitoring and retrieval.
3. Implemented an administrative interface for managing student data, monitoring attendance, and generating reports, while evaluating the system's performance and software quality based on the ISO/IEC 25010 standard, achieving a rating of 4.7, which means "Far exceeds expectations" in terms of functionality, usability, reliability, security, and efficiency.

Conclusions

Based on the findings of this study the following conclusions were formulated:

1. The RFID-based student tracking platform successfully streamlined attendance processes, ensuring accuracy, efficiency, and secure management of student records.
2. The functional prototype effectively captured student entry and exit transactions and maintained a reliable database for real-time monitoring and retrieval of attendance information.
3. The administrative interface proved highly effective in managing student data and generating reports, achieving a software quality rating of 4.7, or "Far exceeds expectations," across all evaluated criteria.

Recommendations

Based on the conclusions drawn from this study, the following recommendations were formulated:

1. May implement the RFID-based student tracking platform across all departments of Ceguera Technological Colleges to fully streamline attendance processes and enhance overall administrative efficiency.
2. Maintain and regularly update the RFID-enabled database system to ensure continued accuracy, reliability, and real-time accessibility of student attendance records.
3. Provide training for administrative staff on using the interface effectively and to periodically evaluate the system's performance to sustain its high software quality standards.
4. May integrate additional features such as automated notifications for absences or late entries to further improve communication between the school, students, and parents.
5. May explore scalability options for the system, allowing future expansion to include other school management functions such as class scheduling,

grade tracking, or library management.

References

1. Agile Lone Star. Rapid Application Development: A Quick Guide. Retrieved August 5, 2025 from https://www.agilelonestar.com/knowledge-base/rapid-application-development
2. Agile Lone Star. Rapid Application Development: A Quick Guide. Retrieved August 5, 2025 from https://www.agilelonestar.com/knowledge-base/rapid-application-development
3. Al-Fedaghi, S., & Atiyah, S. (2018). Tracking systems as thinging machine: A case study of a service company. arXiv. https://arxiv.org/abs/1811.11940
4. Ali, N. S., Alhilali, A. H., Rjeib, H. D., Alsharqi, H., & Al-Sadawi, B. (2022). Automated attendance management systems: systematic literature review. International Journal of Technology Enhanced Learning, 14(1), 37–65. https://doi.org/10.1504/IJTEL.2022.120559
5. Aljohani, N. R., & Alzahrani, A. I. (2019). RFID-based attendance system for students. International Journal of Computer Applications, 182(43), 8–11. https://doi.org/10.5120/ijca2019918419
6. Aljohani, N. R., & Alzahrani, A. I. (2019). RFID-based attendance system for students. International Journal of Computer Applications, 182(43), 8–11. https://doi.org/10.5120/ijca2019918419
7. Alpasan, B. G. B. (2021). *Public High School Web-Based Attendance Monitoring System with SMS Notification*. *International Journal of Social Science and Human Research*, 4(12).
8. Alpasan, B. G. B. (2021). *Public High School Web-Based Attendance Monitoring System with SMS Notification*. *International Journal of Social Science and Human Research*, 4(12).
9. Alpasan, J. (2021). Web-based attendance monitoring with SMS notification at Estancia National High School. Philippine Journal of ICT in Education, 5(2), 88–95.
10. Alpasan, J. (2021). Web-based attendance monitoring with SMS notification at Estancia National High School. Philippine Journal of ICT in Education, 5(2), 88–95.
11. Baao Community College. (n.d.). Chapter 1: QR-based Attendance Monitoring System with SMS Notification [Capstone document]. Retrieved August 14, 2025, from https://www.scribd.com/document/770682982/Chapter-1-QR-Based-Attendance-Monitoring-System-With-SMS-Notification
12. Baao Community College. (n.d.). Chapter 1: QR-based Attendance Monitoring System with SMS Notification [Capstone document]. Retrieved August 14, 2025, from https://www.scribd.com/document/770682982/Chapter-1-QR-Based-Attendance-Monitoring-System-With-SMS-Notification
13. Bakhri, F.S., Ekhsan, H.M., & Hamid, J.N. (2020). Students' attendance monitoring system with SMS notification. Journal of Computing Research and Innovation, 5(1), 19-24.
14. Bakhri, F.S., Ekhsan, H.M., & Hamid, J.N. (2020). Students' attendance monitoring system with SMS notification. Journal of Computing Research and Innovation, 5(1), 19-24.
15. Bhat, S., R, N., & S, P. (2023). Enhancing Room Security and Automating Class Attendance Using ID Cards. ArXiv. https://arxiv.org/abs/2307.03926
16. Bondoc, B. C. (2023). *Web-based smart attendance monitoring system using QR code and GSM module for SMS notification*. *World Journal of Advanced Research and Reviews*, 20(03)
17. Bondoc, B. C. (2023). Web-based smart attendance monitoring system using QR code and GSM module for SMS notification. World Journal of Advanced Research and Reviews, 20(03)
18. Camarines Sur Polytechnic Colleges. (2025). RFID-Based Gate Pass Monitoring for CSPC [Project proposal]. Retrieved August 14, 2025, from https://www.scribd.com/document/435456278/RFID-Based-Gate-Pass-Monitoring-for-CSPC-May-Kasama-Nang-Recomendations
19. Camarines Sur Polytechnic Colleges. (2025). RFID-Based Gate Pass Monitoring for CSPC [Project proposal]. Retrieved August 14, 2025, from https://www.scribd.com/document/435456278/RFID-Based-Gate-Pass-Monitoring-for-CSPC-May-Kasama-Nang-Recomendations
20. Cambridge Dictionary. (n.d.). Student. In Cambridge Dictionary. Retrieved July 29, 2025, from https://dictionary.cambridge.org/us/dictionary/english/student
21. Cambridge Dictionary. (n.d.). Student. In Cambridge Dictionary. Retrieved July 29, 2025, from https://dictionary.cambridge.org/us/dictionary/english/student

22. CHED. (2013). *CHED Memorandum Order No. 9, s. 2013: Enhanced Policies and Guidelines on Student Affairs and Services.* Commission on Higher Education.
23. CHED. (2013). CHED Memorandum Order No. 9, s. 2013: Enhanced Policies and Guidelines on Student Affairs and Services. Commission on Higher Education.
24. Chugh, R., & Sharma, B. (2021). Digital attendance tracking systems: Enhancing accuracy and efficiency in educational institutions. International Journal of Information and Education Technology, 11(4), 166–172. https://doi.org/10.18178/ijiet.2021.11.4.1504
25. Commission on Higher Education. (2013). CHED Memorandum Order No. 9, Series of 2013: Policies and standards for ICT in education. Quezon City, Philippines.
26. Commission on Higher Education. (2013). CHED Memorandum Order No. 9, Series of 2013: Policies and standards for ICT in education. Quezon City, Philippines.
27. Connolly, T., & Begg, C. (2019). Database systems: A practical approach to design, implementation, and management (7th ed.). Pearson.
28. Cruzata, L. (n.d.). History of Ceguera Technological Colleges. CTC-Lenard Cruzata-Handbook. Retrieved July 29, 2025 from https://student-handbook-lenardcruzata.weeblysite.com/s/stories/history-of-ceguera-technological-colleges
29. Cruzata, L. (n.d.). History of Ceguera Technological Colleges. CTC-Lenard Cruzata-Handbook. Retrieved July 29, 2025 from https://student-handbook-lenardcruzata.weeblysite.com/s/stories/history-of-ceguera-technological-colleges
30. Dela Cruz, J. (2021). The role of ICT in enhancing school safety and parental communication. *Philippine Journal of Educational Technology*, 16(2), 45–52.
31. Dela Cruz, J. (2021). The role of ICT in enhancing school safety and parental communication. Philippine Journal of Educational Technology, 16(2), 45–52.
32. Dela Cruz, R. (2021). The role of RFID attendance systems in promoting parental engagement. Philippine Educational Technology Review, 7(1), 44–56.
33. Dela Cruz, R. (2021). The role of RFID attendance systems in promoting parental engagement. Philippine Educational Technology Review, 7(1), 44–56.
34. Department of Education. (2010). DepEd Order No. 74, s. 2010: Institutionalizing attendance policies in basic education. Pasig City, Philippines.
35. Department of Education. (2010). DepEd Order No. 74, s. 2010: Institutionalizing attendance policies in basic education. Pasig City, Philippines.
36. DepEd Milaor National High School. (2018). eSIMS features: Student Attendance Management System. Retrieved August 14, 2025, from https://elmer3nidad5.wixsite.com/milaornhs/esims-features
37. DepEd Milaor National High School. (2018). eSIMS features: Student Attendance Management System. Retrieved August 14, 2025, from https://elmer3nidad5.wixsite.com/milaornhs/esims-features
38. DepEd. (2010). *DepEd Order No. 74, s. 2010: Guidelines on Student Attendance Monitoring.* Department of Education.
39. DepEd. (2010). DepEd Order No. 74, s. 2010: Guidelines on Student Attendance Monitoring. Department of Education.
40. Elsayed, R., et al. (2025). *IoT security solutions for students' laboratory with RFID-based attendance authentication*. *International Journal in Information Technology in Governance, Education and Business.*
41. Eltayeb, K. M. (2023). *Database Security and Auditing: A Practical Guide*. Apress.
42. Garcia, P., & Lim, S. (2023). SMS-integrated attendance tracking for urban schools in Quezon City. Philippine ICT Journal, 9(3), 62–75.
43. Garcia, P., & Lim, S. (2023). SMS-integrated attendance tracking for urban schools in Quezon City. Philippine ICT Journal, 9(3), 62–75.
44. GSMA. (2024, June 11). SMS Evolution (Version 3.0) (NG.111). https://www.gsma.com/newsroom/wp-content/uploads/NG.111-v3.0.pdf
45. GSMA. (2024, June 11). SMS Evolution (Version 3.0) (NG.111). https://www.gsma.com/newsroom/wp-content/uploads/NG.111-v3.0.pdf
46. Guevarra, B. S., & Corpuz, F. T. (2023). *Development of a Class Attendance Monitoring System Using Barcode with SMS Notification*. *Journal of Survey in Fisheries Sciences*, 10(1S).
47. Guevarra, B. S., & Corpuz, F. T. (2023). *Development of a Class Attendance Monitoring System Using Barcode with SMS Notification*. *Journal of Survey in Fisheries Sciences*, 10(1S).
48. Hernandez, M., & Flores, K. (2023). ICT-driven attendance monitoring in Philippine colleges. Journal of Philippine Computing and Education, 8(2), 30–42.

49. Hernandez, M., & Flores, K. (2023). ICT-driven attendance monitoring in Philippine colleges. Journal of Philippine Computing and Education, 8(2), 30–42.
50. Homeland Security (2024). Radio Frequency Identification (RFID): What is it?. About DHS | Homeland Security
51. INTRAC. (2017). Monitoring: The systematic and continuous collection and analysis of information about the progress of a piece of work over time. https://www.intrac.org/app/uploads/2017/01/Monitoring.pdf
52. Ishaq, K., & Bibi, S. (2023). *IoT based smart attendance system using RFID: A systematic literature review*. arXiv. https://doi.org/10.48550/arXiv.2308.02591
53. Ishaq, K., & Bibi, S. (2023). IoT Based Smart Attendance System Using RFID: A Systematic Literature Review. arXiv. https://doi.org/10.48550/arXiv.2308.02591
54. ISO/IEC 25010:2023. *Systems and software engineering Quality Requirements and Evaluation.*
55. ISO/IEC 25010:2023. Systems and software engineering Quality Requirements and Evaluation.
56. Johnson, M., & Wang, Y. (2023). RFID-based attendance and communication systems in U.S. schools. International Journal of Educational Technology, 12(2), 45–56.
57. Johnson, M., & Wang, Y. (2023). RFID-based attendance and communication systems in U.S. schools. International Journal of Educational Technology, 12(2), 45–56.
58. Laudon, K. C., & Laudon, J. P. (2022). Management information systems: Managing the digital firm (17th ed.). Pearson.
59. Lee, K., Ahmad, N., & Hassan, S. (2023). IoT-based smart attendance with SMS notification for Malaysian schools. Journal of Smart Education Systems, 9(1), 21–35.
60. Lee, K., Ahmad, N., & Hassan, S. (2023). IoT-based smart attendance with SMS notification for Malaysian schools. Journal of Smart Education Systems, 9(1), 21–35.
61. Lomapawog, H., & Pomrerada, J. (2021), Web Programming using PHP & MySQL
62. Mendoza, R., & Cruz, A. (2023). RFID attendance monitoring system for technical institutions in Cavite. Philippine Journal of Computing Research, 10(2), 12–25.
63. Mendoza, R., & Cruz, A. (2023). RFID attendance monitoring system for technical institutions in Cavite. Philippine Journal of Computing Research, 10(2), 12–25.
64. Merriam-Webster. (n.d.). Attendance. In Merriam-Webster.com dictionary. Retrieved July 30, 2025, from https://www.merriam-webster.com/dictionary/attendance
65. Merriam-Webster. (n.d.). Attendance. In Merriam-Webster.com dictionary. Retrieved July 30, 2025, from https://www.merriam-webster.com/dictionary/attendance
66. Mustafa, Ahmed & Jawad, Lahieb. (2022). Electronic Student Attendance Management System.
67. Mustafa, Ahmed & Jawad, Lahieb. (2022). Electronic Student Attendance Management System.
68. Naga College Foundation, Inc. (2025, May 1). School Software Service Agreement (SSSA) with Livro Systems Inc. Retrieved August 14, 2025, from https://www.scribd.com/document/897550162/Moa-Sms-Naga-College-Foundation-Inc-Docx
69. Naga College Foundation, Inc. (2025, May 1). School Software Service Agreement (SSSA) with Livro Systems Inc. Retrieved August 14, 2025, from https://www.scribd.com/document/897550162/Moa-Sms-Naga-College-Foundation-Inc-Docx
70. National Privacy Commission. (n.d.). Data Privacy Act. National Privacy Commission. Retrieved August 12, 2025, from https://privacy.gov.ph/data-privacy-act/
71. National Privacy Commission. (n.d.). Data Privacy Act. National Privacy Commission. Retrieved August 12, 2025, from https://privacy.gov.ph/data-privacy-act/
72. Nueva, C. H., Tapic, F. M. J., Pineda, I. T., Melendrez, J. K. T., Jimena, P. C., & Alquiza, R. J. (2024). *RFID-Based Student Attendance Monitoring System with SMS Notification Using Arduino for Bestlink College of the Philippines*. *Ascendens Asia Singapore – Bestlink College of the Philippines Journal of Multidisciplinary Research*, 3(1A).
73. Nueva, C. H., Tapic, F. M. J., Pineda, I. T., Melendrez, J. K. T., Jimena, P. C., & Alquiza, R. J. (2024). *RFID-Based Student Attendance Monitoring System with SMS Notification Using Arduino for Bestlink College of the Philippines*. *Ascendens Asia Singapore – Bestlink College of the Philippines Journal of Multidisciplinary Research*, 3(1A).
74. Okeke, C., & Chukwu, P. (2023). Enhancing accountability with RFID-based attendance in Nigerian secondary schools. African Journal of ICT in Education, 15(3), 77–90.
75. Okeke, C., & Chukwu, P. (2023). Enhancing accountability with RFID-based attendance in Nigerian secondary schools. African Journal of ICT in Education, 15(3), 77–90.

76. Raspberry Pi 500+ (Oct. 2025) https://magazine.raspberrypi.com/articles/raspberry-pi-500-in-raspberry-pi-official-magazine-issue-158
77. Raspberry Pi Head-to-Head (Nov. 2025) https://magazine.raspberrypi.com/articles/raspberry-pi-vs-raspberry-pi-zero-2-vs-raspberry-pi-pico-in-raspberry-pi-official-magazine-159
78. Rinconada National Technical Vocational School. (n.d.). Web-based Student ID Generator System with RFID Technology [Research summary]. Retrieved August 14, 2025, from https://www.researchgate.net/publication/381461794_WEB-BASED_STUDENT_IDENTIFICATION_CARD_ID_GENERATOR_SYSTEM_WITH_RFID_TECHNOLOGY_INTEGRATED_IN_THE_COMPUTER_LABORATORY_AND_LIBRARY_FOR_RINCONADA_NATIONAL_TECHNICAL_VOCATIONAL_SCHOOL_RNTVS_FOR_ACCESS_MON
79. Rinconada National Technical Vocational School. (n.d.). Web-based Student ID Generator System with RFID Technology [Research summary]. Retrieved August 14, 2025, from https://www.researchgate.net/publication/381461794_WEB-BASED_STUDENT_IDENTIFICATION_CARD_ID_GENERATOR_SYSTEM_WITH_RFID_TECHNOLOGY_INTEGRATED_IN_THE_COMPUTER_LABORATORY_AND_LIBRARY_FOR_RINCONADA_NATIONAL_TECHNICAL_VOCATIONAL_SCHOOL_RNTVS_FOR_ACCESS_MON
80. Rivera, J., & Lagarteja, E. (2021). QR code attendance with SMS notification in Callang National High School. Philippine Journal of Computing Studies, 6(1), 55–68.
81. Rivera, J., & Lagarteja, E. (2021). QR code attendance with SMS notification in Callang National High School. Philippine Journal of Computing Studies, 6(1), 55–68.
82. Rivera, R. B., & Lagarteja, J. G. (2021). *Study on the Impact and Effectiveness of QR Code and SMS-based Attendance Monitoring System Among the Students of Callang National High School*. *International Journal of Scientific & Technology Research*, 9(03).
83. Rivera, R. B., & Lagarteja, J. G. (2021). *Study on the impact and effectiveness of QR code and SMS-based attendance monitoring system among the students of Callang National High School.*
84. Rivera, R. B., & Lagarteja, J. G. (2021). *Study on the Impact and Effectiveness of QR Code and SMS-based Attendance Monitoring System Among the Students of Callang National High School*. *International Journal of Scientific & Technology Research*, 9(03).
85. Rivera, R. B., & Lagarteja, J. G. (2021). Study on the impact and effectiveness of QR code and SMS-based attendance monitoring system among the students of Callang National High School.
86. Sanglay, Caayao & Sarmiento (2025) Smart Attendance System using Barcode with SMS Notification of Ceguera Technological Colleges
87. Santos, L., Ramirez, J., & Uy, R. (2023). GSM-enabled RFID systems for student monitoring in higher education. Philippine Journal of ICT and Innovation, 11(1), 101–114.
88. Santos, L., Ramirez, J., & Uy, R. (2023). GSM-enabled RFID systems for student monitoring in higher education. Philippine Journal of ICT and Innovation, 11(1), 101–114.
89. Sean MCManus & Mike Cook, (2023), Raspberry Pi for dummier, 4th Edition
90. Sharma, R., & Patel, D. (2023). RFID integration in classroom management systems: A case study in India. Asian Journal of Computing and Education, 11(4), 101–115.
91. Sharma, R., & Patel, D. (2023). RFID integration in classroom management systems: A case study in India. Asian Journal of Computing and Education, 11(4), 101–115.
92. Smith, A., & Brown, L. (2023). Mobile-enhanced attendance systems: Global perspectives and trends. Computers & Education Review, 65(1), 1–12.
93. Smith, A., & Brown, L. (2023). Mobile-enhanced attendance systems: Global perspectives and trends. Computers & Education Review, 65(1), 1–12.
94. Sommerville, I. (2016). Software engineering (10th ed.). Pearson.
95. Zhou, W., & Piramuthu, S. (2020). RFID and sensor network automation in the supply chain: Research and applications. Springer.
96. Zhou, W., & Piramuthu, S. (2020). RFID and sensor network automation in the supply chain: Research and applications. Springer.

ACKNOWLEDGEMENT

The researcher extends heartfelt gratitude to the following individuals, whose unwavering support and guidance were integral to the successful completion of this study.

To *Ceguera Technological Colleges Inc*., for choosing the researcher as one of its scholars. This opportunity meant a great deal and provided invaluable support that greatly contributed to the successful completion of this academic endeavor. The researcher is sincerely grateful for the trust and assistance extended throughout the study.

The researcher also extends sincere appreciation to *Mr. Julio Victor Marlo D. Ceguera,* School President of Ceguera Technological Colleges, for his unwavering support of the researcher's academic pursuits and for generously granting a scholarship that significantly contributed to the successful completion of this study.

The researcher likewise extends heartfelt gratitude to *Dr. Lovella Follosco Ceguera***,** Vice President for Academic Affairs, for her constant encouragement and invaluable support throughout the researcher's academic journey. Her confidence in the researcher's potential served as a source of motivation to persevere and continually strive for excellence. The researcher is deeply grateful for her sustained encouragement and positive influence.

Most of all, the researcher expresses profound gratitude to *Aemilianum College Inc*., for providing not only a strong sense of belonging within the Aemilian community but also the invaluable opportunity to pursue the prestigious Master in Information Technology (MIT) degree, which significantly contributed to the researcher's academic advancement and personal growth.

The researcher also extends sincere appreciation to *Rev. Fr. Rey Genaro M. Malabanan, CRS*, the esteemed School Director, whose visionary leadership and steadfast commitment to the advancement of graduate education have continually served as a source of inspiration within the institution and beyond.

A sincere expression of gratitude is extended to the research adviser, *Marco L. Espinosa, MIT*, for generously sharing her invaluable knowledge and expertise, which significantly enriched the conduct and quality of this study.

The researcher also expresses deep appreciation to *Dr. Josefina R. Sarmiento***,** Professor and Dean of the College of Engineering, Computer Studies, Technology, and Liberal Arts (CECTLA), for her untiring encouragement, expert guidance, and invaluable assistance in providing clear directions and step-by-step guidance throughout the conduct of the project study.

Heartfelt thanks are likewise conveyed to the esteemed panel of examiners, namely *Mr. Milan E. Bausa*, *Dr. Sherry Mae R. Llander, Dr. Lydia D. Doctor, Dr. Josefina R. Sarmiento,* and Rev. *Fr. Mandee N. Batac, CRS*. Their insightful comments, constructive criticisms, and professional expertise were instrumental in refining the project and significantly enhancing its overall quality.

Special appreciation is extended to the researcher's family - particularly to his wife, *Mrs. Darlyn V. Argarin*, and to his children, *Rodalyn May V. Casili, John Austin V. Argarin, John Roger V. Argarin*, and *Angel May V. Argarin*. Their endless love, constant encouragement, and unwavering support served as a strong foundation throughout this academic journey.

Above all, the researcher offers sincere gratitude to the ***Almighty God***, the ultimate source of wisdom, strength, and guidance, for the countless blessings and divine assistance bestowed throughout the completion of this study.

A heartfelt thank you is extended to all those who, whether mentioned or not, contributed in

any way to the successful completion of this study. God bless us all!

R.C.A.