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STUDENT MANAGEMENT INFORMATION SYSTEM: RFID-BASED STUDENT ATTENDANCE TRACKING AT SD JUARA WIRAUTAMA

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ABSTRACT

This study examines the implementation of a Radio Frequency Identification (RFID)-based Education Management Information System (SIMDIK) for recording student attendance at Juara Wirautama Patrol Elementary School in Indramayu. Using a qualitative descriptive approach, data were collected through observation, interviews, and documentation involving teachers and students. Data analysis includes reduction, presentation, and drawing of conclusions, while validity is ensured through triangulation of sources and techniques. The findings indicate that the RFID system improves the efficiency and accuracy of attendance recording, minimizes the potential for data manipulation, and accelerates administrative processes. This system also enables real-time monitoring of student participation in school activities integrated into the school management system. Teachers and students view this system as practical and effective in improving discipline. However, some challenges remain, including network disruptions, device limitations, and human error (e.g., forgotten cards). Additionally, parents do not yet have direct access to monitor student attendance. Overall, the RFID-based SIMDIK system demonstrates strong potential to support transparent, accountable, and efficient digital transformation in the field of education. To maximize its effectiveness, it is recommended to improve technological infrastructure, device maintenance, human resource training, and access features for parents.

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INTRODUCTION

Education is the cornerstone of sustainable national development. In the era of globalization, education aims not only to produce a generation that is intellectually capable but also one that can adapt to advancements in

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information and communication technology (ICT). Information technology has transformed the way education is managed, not only in terms of learning but also in the administration and management of educational institutions (Simaremare, 2009). One crucial aspect of administration is the student attendance recording system, which is still largely conducted manually in schools across Indonesia (Firmansyah, 2025).

The utilization of this technology is realized through the implementation of educational management information systems. This system is a combination of human resources and information technology tools used in the process of managing data—from collection, storage, and processing to the presentation of information—which is subsequently used as the basis for decision-making in the field of education (Miftah, 2021). One of the key components in school management is student attendance tracking. Until now, the attendance process has generally still been carried out manually using attendance books. This method tends to be time-consuming, prone to recording errors, and inefficient in monitoring student attendance (Arfan, 2024). Consistent and accurate attendance records not only reflect students' discipline levels but also serve as a foundation for academic assessment and administrative management in the field of education (Aab Abdul Basit, 2025)

To improve the efficiency and accuracy of educational data management, a technology-based system capable of supporting integrated governance is required, namely the Educational Management Information System (SIMDIK). SIMDIK is a system designed to manage various types of educational data—including data on students, teachers, curriculum, facilities and infrastructure, finances, and student attendance records—in a systematic and measurable manner. The presence of SIMDIK assists educational institutions in presenting real-time data to support rapid, accurate, and data-driven decision-making processes (Azrafiandi, 2023).

The implementation of SIMDIK has become increasingly relevant with the advent of Radio Frequency Identification (RFID) technology, which enables automatic student attendance tracking. This technology works by detecting the electronic ID cards (ID Cards) that students carry when they are held near an RFID reader, thereby eliminating the need for manual attendance recording (Fatah, 2023). This innovation aligns with efforts toward digitalization in educational administration and supports transparency and accountability in attendance data.

The RFID-based attendance system makes it easy for students to check in and out simply by tapping their RFID card on a reader installed at the school entrance. Student attendance is automatically recorded in the system, making the information accessible to both school officials and parents. Through this system, attendance monitoring becomes more practical and enables schools to take immediate action if any issues related to student attendance arise. (Yoyon Efendi, 2021)

Manual attendance tracking systems are considered to have a number of drawbacks, such as the potential for data manipulation, delays in reporting, and low efficiency among administrative staff. Furthermore, manual recording tends to be inaccurate and difficult to monitor in real-time, even though attendance data is a crucial indicator for assessing student discipline and engagement. With an RFID system, attendance data is immediately recorded and stored digitally, and can be accessed by teachers, homeroom teachers, and school administrators (Sianturi & Sitio, 2025).

Previous studies have shown that RFID systems have a positive impact on improving the accuracy and efficiency of attendance recording. (Fatah, 2023) demonstrated that the RFID system at SMK LPT Ciamis simplified daily data compilation and reduced data entry errors. Meanwhile, (Sianturi & Sitio, 2025) concluded that cloud-based RFID attendance tracking systems enable cross-location data management without compromising security. Additionally, (Firmansyah, 2025) demonstrated that Arduino Nano-based RFID devices can be optimally implemented in school environments.

However, the implementation of RFID technology in schools is not without challenges, such as limited devices, a lack of technical training for teachers, and operational issues like students forgetting to bring their cards. Furthermore, systems managing students' personal data must prioritize information security to prevent data breaches (Masinambow, 2025).

SD Juara Wirautama Patrol Indramayu is one of the elementary schools that has implemented an RFID-based attendance system since 2024. This implementation is part of the development of the School Information

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Management System (SIMDIK) at the school, with the aim of replacing the manual attendance recording method previously used. The RFID system is used to record daily attendance in class, attendance at school-organized activities, and to award student participation points. The recorded data can be accessed in real-time by teachers and school administrators.

To date, there has been limited academic research that thoroughly examines the implementation of RFID systems within the SIMDIK framework at the secondary education level. This study aims to examine the implementation of an RFID-based educational management information system for student attendance tracking at SD Juara Wirautama Patrol Indramayu. The results of this study are expected to contribute to the development of efficient and effective educational management information systems and serve as a reference for the application of digital technology in educational management.

METHOD

This study employs a qualitative method with a descriptive approach to examine the implementation of an RFID-based educational management information system (SIMDIK) for student attendance recording at SD Juara Wirautama Patrol, Indramayu. This methodological choice is grounded in the need to understand the phenomenon within its natural institutional context, where the researcher functions as the primary instrument of data collection and interpretation (Sugiyono, 2020). A descriptive approach was deemed appropriate given the study's aim to document and analyze operational realities, user experiences, and system constraints as they occur in practice.

The research subjects comprised six purposively selected participants — two classroom teachers, one student affairs coordinator, and three students from different grade levels — all of whom were directly and actively engaged in the daily operation of the RFID attendance system. Purposive sampling was applied on the grounds that informant selection in qualitative inquiry should prioritize depth of knowledge over representational breadth, focusing on those most proximate to the phenomenon under investigation (Abdussamad, 2021). Prior to data collection, informed consent was obtained from all adult participants, while parental consent was secured for student participants in accordance with ethical research standards for studies involving minors.

Data were collected over four weeks through three complementary techniques. First, structured observation sessions were conducted across multiple class entry and exit periods to document students' card-scanning behavior, device responsiveness, and teachers' real-time follow-up procedures, with field notes recorded systematically at each session. Second, semi-structured interviews — each lasting approximately 30–45 minutes — were conducted individually with each participant using a pre-established interview protocol covering three thematic domains: perceived system benefits, operational challenges, and recommendations for improvement. Third, documentation of physical RFID components — including student ID cards, card readers, and system interface screenshots — was collected to provide corroborating material evidence for the field findings.

Data analysis proceeded through three sequential stages as outlined by (Sugiyono, 2020): data reduction, in which raw data from all three sources were systematically coded and filtered for relevance to the research focus; data presentation, in which distilled findings were organized into coherent narratives to surface recurring patterns and themes; and conclusion drawing, in which interpretations were derived through iterative cross-referencing of all data sources. To establish trustworthiness, source triangulation was employed by cross-comparing accounts from teacher and student informants, while methodological triangulation was achieved by converging evidence from observation, interview, and documentation data (Abdussamad, 2021). Member checking was additionally conducted by returning preliminary findings to key informants for verification, thereby strengthening the credibility of the interpretive conclusions.

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RESULT AND DISSCUSION

RESULT

Data collected through observation, interviews, and documentation at SD Juara Wirautama Patrol, Indramayu, yielded three primary findings regarding the implementation of the RFID-based attendance system within the school's SIMDIK framework.

System Operation and Scope. Based on interviews with Ms. Imelda Setiyani, S.Pd., the student affairs coordinator, the RFID-based attendance system has been operational since 2020 as part of the school's broader digital transformation agenda. Each student is issued an RFID card, which is scanned on reader devices installed in every classroom. Attendance data are transmitted automatically to the school management system in real-time. Beyond daily attendance, the system records student participation in institutional activities — including internal competitions, Student Council events, and national holiday observances — generating cumulative activity points integrated into the student management database. At the time of the study, system access remained restricted to school personnel; no parent-facing interface had been activated.

User Perceptions. The student affairs coordinator reported that the system hasresulted in faster attendance processing and a measurable reduction in fraudulent recording practices. From the student informants' perspective, the majority perceived the system as operationally convenient, citing accelerated check-in procedures as a factor that reinforced punctuality and attendance motivation.

Operational Constraints. Recurring technical and behavioral challenges were documented across observation sessions. These included intermittent network disruptions that interrupted data synchronization with the school server, suboptimal performance of card reader devices during peak usage, and instances of students arriving without their RFID cards. In each case, the school reverted to manual recording as a contingency measure. The absence of a parent access portal was additionally identified as a systemic gap in the current implementation.



Figure 1: Student RFID Card (Source: Administrator Of Juara Wirautama School)

DISCUSSION

The finding that the RFID system improved attendance processing speed and reduced data manipulation is consistent with, and further contextualizes, the conclusions of Susanto et al. (2019), who established that RFID-based attendance mechanisms yield significant gains in recording accuracy and administrative efficiency. However, where Susanto et al. examined the system in isolation as an administrative tool, the present study extends that analysis by demonstrating that RFID implementation within an integrated SIMDIK framework amplifies these benefits — enabling not only attendance recording but also real-time holistic student profiling through activity-point accumulation. This integration represents a functionally distinct advancement over standalone RFID deployments documented in prior literature.

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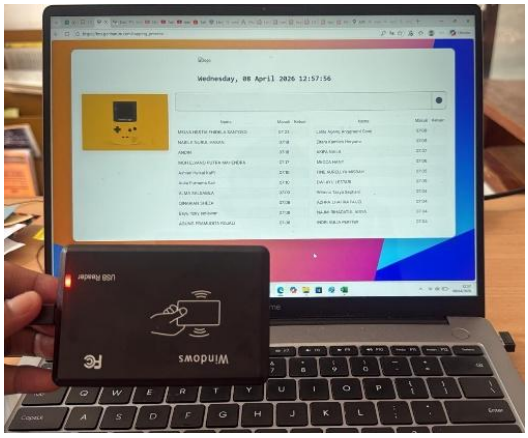

Figure 2. RFID Card Reader Source: Administrator Of Juara Wirautama School)

The use of activity-point data as a non-academic performance indicator corresponds to the participatory evaluation framework proposed by Dewanto et al. (2017). Critically, however, the present findings reveal that this data-driven profiling mechanism is only partially realized: while the technical infrastructure for comprehensive student monitoring exists, its analytical utility is constrained by the absence of a parent-accessible interface, which limits the system's capacity to function as a genuinely transparent accountability instrument.

The operational constraints identified — network instability, device inconsistency, and human error — corroborate Parlika's (2020) argument that RFID implementation viability is contingent on three interdependent conditions: robust network infrastructure, hardware reliability, and adequate technical capacity among system operators. The present study adds empirical specificity to this claim by documenting that all three conditions remain incompletely met at the study site, and that the school's reliance on manual recording as a fallback mechanism, while pragmatically sound, effectively reintroduces the inefficiencies the digital system was designed to eliminate.

The absence of parental system access constitutes the most consequential structural limitation identified in this study. Zahid and Prapanca (2023) demonstrated that integrating attendance systems with parent-facing portals significantly strengthens stakeholder engagement and external oversight. The present findings extend this argument by establishing that without such integration, the potential of the RFID-SIMDIK system to function as a collaborative educational governance instrument — one that bridges institutional monitoring and family supervision remains structurally unrealized.

CONCLUSION

This study empirically demonstrates that the implementation of a Radio Frequency Identification (RFID)-based attendance system within the SIMDIK framework at SD Juara Wirautama Patrol Indramayu significantly enhances administrative efficiency and data accuracy while reducing manipulation risks and strengthening student discipline. Academically, these findings reinforce the viability of RFID-integrated management information systems as instruments of holistic student profiling — capturing not only daily attendance but also quantifying student participation in non-academic activities through a real-time, integrated point system.

Despite these contributions, three structural barriers threaten the system's sustainability: (1) network instability causing data synchronization failures; (2) limited device capacity affecting consistent reader performance; and (3) low operational compliance due to human error, particularly students failing to carry their RFID cards. Critically, the absence of a parent-facing access module undermines the system's potential for meaningful

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stakeholder engagement — weakening the collaborative oversight between school and families that is essential for a transparent and accountable attendance ecosystem.

Based on these findings, this study recommends three prioritized interventions: first, strengthening network infrastructure and establishing a scheduled device maintenance protocol to ensure system reliability; second, delivering structured technical training for teachers and administrative staff as primary system operators; and third, developing a parent access module through an automated notification portal to create a more inclusive attendance monitoring ecosystem. Simultaneous implementation of these recommendations is expected to enhance the long-term viability of the RFID-SIMDIK system as an adaptive educational management solution in the digital era.

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