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Optimizing Early Childhood Education Student Development Data Governance Through the Implementation of the EduPrima Information System with Learning Analytics

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ABSTRACT

Early childhood education has a strategic role in the foundation of child development, but SS Schools in Bogor still face administrative obstacles due to inefficient manual recording systems, prone to data loss, and hindering holistic monitoring of child development. Key problems include unstructured data management and the absence of analytical tools to support teachers' instructional decisions. This program implements a web-based EduPrima application that provides integrated data management and Learning Analytics features through the stages of socialization, system development, technical training, and intensive mentoring. As a result, administrative digitization improves operational efficiency and provides objective supporting data, so that institutional governance becomes more accountable and transparent without replacing the primary pedagogical role of teachers.

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INTRODUCTION

Digital transformation in the global education ecosystem has become an imperative that is fundamentally reshaping the relationship between educational institutions and families (Sosa-Alonso et al., 2025). At the national level, Law Number 20 of 2003 concerning the National Education System Article 1 paragraph 14 defines early childhood education as an effort to foster education through educational stimulation from birth to the age of six years to support the physical and mental growth of children (Law of the Republic of Indonesia, 2003). Digital school management systems are hypothesized to enhance the efficiency of data management and support evidence-based decision-making through data-driven classroom construction (Shi, 2025). Its effectiveness depends on the ability to reduce administrative burdens without eliminating pedagogical value, so digitizing PAUD administration is a strategic step to create modern, transparent, and accountable governance.

Sekolah Suci Sutjipto (SS) in Katulampa, Bogor, is a voluntary institution that accommodates 17 students and employs four educators amid limited facilities. All administrative records and student growth and development are still manual on paper, making them inefficient and prone to input errors, loss of physical data, and long processing duration (Zakiyah & Prasetyo, 2025). The burden of

manual administration also distracts teachers from direct interaction with students and hinders the adoption of learning innovations (Luo et al., 2021). Digital transformation therefore represents a critical pathway toward improving the productivity and quality of educational services at this institution.

Various previous service initiatives have introduced various digitization instruments for PAUD administration, such as the SimPAUD application (Setiawan et al., 2022), Android-based e-portfolios (Nurhayati & Fadhilah, 2023), Google Form (Utami & Kurniasih, 2024), and the SIPPA application which has been proven effective in improving the accuracy of student development data (Afrianingsih et al., 2026). However, the long-term effectiveness of all these platforms depends on self-regulated learning of teachers, and without intensive mentoring, technology only becomes an additional tool that does not have a substantive impact on the quality of education (Aditya & Andrisyah, 2023).

An international literature review confirms that Learning Analytics (LA) provides a new dimension in holistic and longitudinal monitoring of child development through data visualization that supports evidence-based instructional decision-making (Liang et al., 2023; Al-Zahrani & Alasmari, 2023). The learning management system's data-driven engagement score is an objective indicator of academic performance (Kittur et al., 2021). However, teachers' digital literacy is a key moderation variable; without adequate literacy, teachers are at risk of experiencing technology fatigue that reduces teaching performance (Dong et al., 2026; Huang, 2023), so that training must be structured in a modular manner based on real needs analysis in the field (KMOE, 2025).

The originality of this activity lies in the development of the EduPrima application, a web-based information system specifically designed to bridge the needs of administrative and pedagogical analysis in SS Schools. EduPrima integrates digital progress logging, centralized data storage, and Learning Analytics with an interactive dashboard that provides reflective feedback for teachers (Yilmaz, 2020). The system is designed to support individualized developmental profiles for all students (Gadzhimusieva et al., 2026) and is built on an open-source framework for material management flexibility (Pinilla et al., 2021), positioning EduPrima as a digital transformation instrument that maps child development data.

The main goal of this service is to overcome manual data management in SS Schools through digitalization that increases operational efficiency (Zakiyah & Prasetyo, 2025), improves educators' digital literacy (Aditya & Andrisyah, 2023), provides learning Analytics features based on historical data (Liang et al., 2023), and ensures long-term data sustainability (Al-Zahrani & Alasmari, 2023). Success is measured through user satisfaction, data accuracy, and consistency of use, with the aim of establishing a replicable early childhood education digitization model for adoption by comparable institutions in other regions (Shi, 2025).

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IMPLEMENTATION METHOD

1. Stages of Socialization and Identification of Web Needs

The program began with socialization to harmonize perceptions between the proposing team and stakeholders at the SS School. The meeting with principals and teachers introduced the architecture of the web-based system and the benefits of the Learning Analytics feature for children's development. The team drafted the User Requirement Specification (URS) covering child development assessment parameters, input frequency, and access rights settings, using a co-design approach to mitigate resistance to change. Indicators of success are URS documents approved by partners and the presence of stakeholders at least 80%.

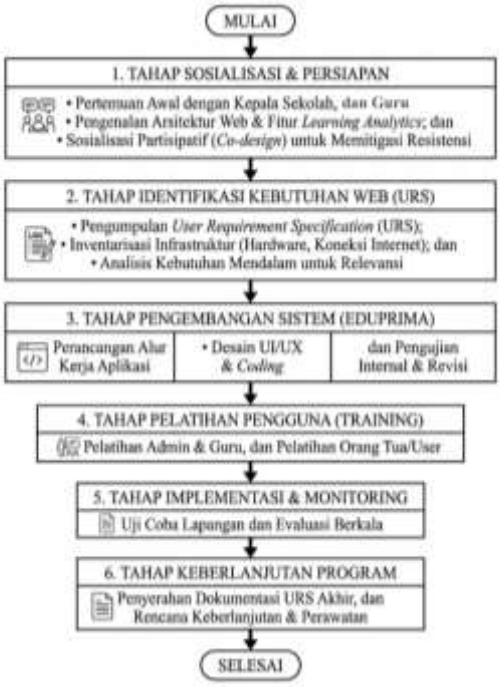

Figure 1. Flow chart of the PKM implementation methodology

2. Specifications of Web-Based Information Systems Technology

The EduPrima system is built using the Laravel 11 (backend), React (frontend), and MySQL database frameworks for large-capacity structured data management. The server uses a VPS with 4 GB of RAM, 100 GB of storage, and a 2-core CPU to ensure access stability. Data security is guaranteed through SSL/TLS encryption, Role-based Access Control, and weekly automatic backups, ensuring that only the authorities can access the child's developmental data to maintain family privacy.

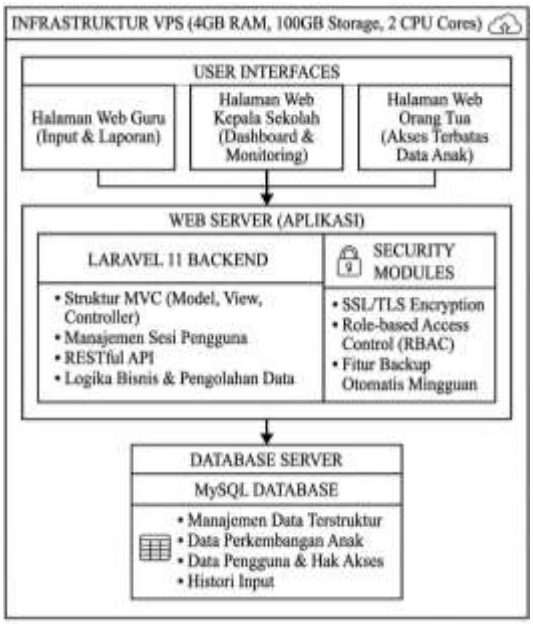

Figure 2. EduPrima web system architecture diagram

3. Integration of Learning Analytics Module on the Dashboard

The Learning Analytics (LA) module is integrated to convert raw data of student development into actionable information by teachers. A simple statistical algorithm detects growth trends in cognitive, motor, language, and social-emotional categories visualized on an interactive dashboard in real-time. The system provides automated learning recommendations based on historical data to support more objective and evidence-based instructional decision-making.

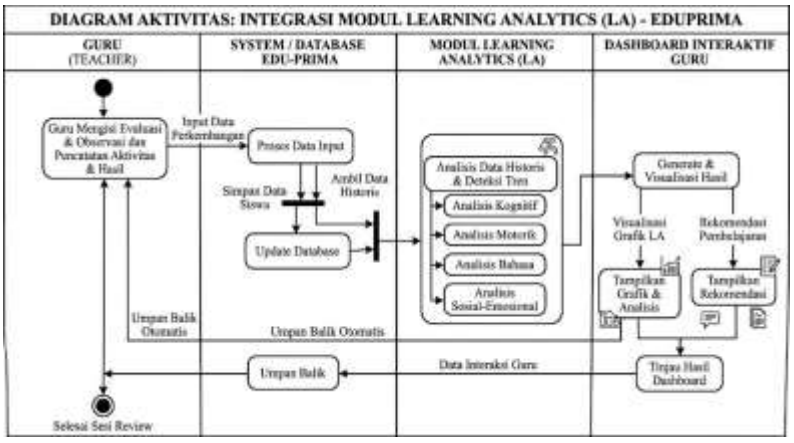

Figure 3. Learning Analytics module integration activity chart

4. Technical and Website Operational Training for Teachers

The training was carried out face-to-face in two sessions: developmental data input techniques and dashboard chart interpretation. The material is provided in a modular format in the form of printed guides and short video tutorials to avoid excessive cognitive load and prevent technology fatigue for participants (Huang, 2023). The real-case simulation method with real assessment instruments is applied, with a target of at least 80% of participants being able to carry out daily operations independently.

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5. Intensive Assistance and Evaluation of Web Implementation

Intensive one-month post-training mentoring includes onsite support and remote technical assistance. The team monitors system usage metrics and conducts periodic evaluations through weekly reports to identify bottlenecks. User Acceptance Testing (UAT) is implemented to ensure all features work as needed, with the success metrics of use at least once per week and user satisfaction achieving a score of at least 75%.

Figure 4. Documentation Photos of Training Activities and Website Trials

6. Sustainability Strategy and Self-Management

To ensure sustainability, the team prepares comprehensive SOPs and user manuals, along with the formation of an internal team of data management from educators. A train-the-trainer mechanism is implemented so that key teachers can train their peers in the future, supported by regular maintenance plans and access to long-term technical support from the university. The program ends with the formal handover of digital assets to partners.

Table 1. Web-Based PkM Implementation Plan Matrix

Yes	Stages of Activity	Technical Procedure Description	Achievement Indicators
1	Socialization & Identification	Coordination meeting and preparation of system requirements document (URS).	URS documents are partner-approved.
2	Web System Development	Laravel coding and MySQL database configuration.	The website is active and stable.
3	Analytics Integration	Development of LA modules and development visualization dashboards.	The dashboard displays real graphs.
4	Operational Workshop	Training on the use of data input and evaluation features on the website.	Teachers pass the competency test.
5	Mentoring & UAT	Troubleshooting and monitoring of website usage logs.	Satisfaction Users ≥75%.
6	SOP submission	Preparation of manuals and training of internal admin teams.	The internal team is actively reporting.

RESULTS AND DISCUSSION

1. Digitization of Administration and Data Governance Transformation

The main achievement of the service is the successful transition of the SS School administration from the manual method to an integrated digital platform through the EduPrima application. The Daily Activity feature allows teachers to document instructional activities in data-driven classrooms, while the digital Attendance Recap minimizes the risk of attendance data loss. This digitalization reduces daily administrative time from two hours to thirty minutes, gives teachers more space to focus on stimulating children's education (Zakiyah & Prasetyo, 2025), and proves that administrative digitalization is a restructuring of institutional governance towards a more modern and accountable direction.

Figure 5a shows a daily activity interface that integrates the details of student activities with automatic growth and development assessment parameters into the report module through a simple design to minimize technology fatigue, while Figure 5b presents an automatic attendance recapitulation feature that ensures data accuracy and facilitates administrative reporting to the education office without the need for manual calculations.

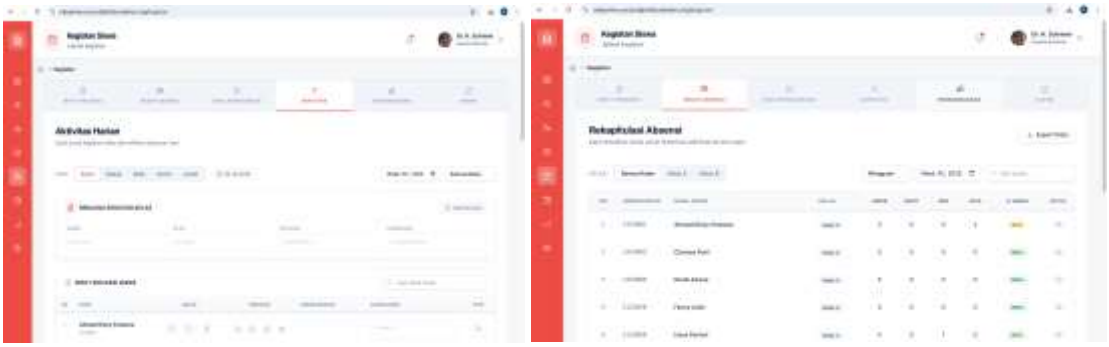

Figure 5. (a) Input of the Student's Daily Activities. (b) Digital Presence Recapitulation

2. Implementation of Learning Analytics for Holistic Progress Monitoring

A key feature of this system integration is the Learning Analytics module that converts daily assessment data into a holistic and longitudinal visualization of child development graphs in cognitive, motor, and social-emotional dimensions (Liang et al., 2023). Interactive dashboards provide objective reflective feedback for teachers (Yilmaz, 2020), translated into Learning Recommendations features in the form of specific pedagogical intervention suggestions for each child, so that instructional decision-making is based on real data, not subjective assumptions (Al-Zahrani & Alasmari, 2023).

Figure 6a presents a graph of automatic student development trends by EduPrima that compares actual achievement with PAUD standards to identify stimulation needs and facilitate visual communication with parents, while Figure 6b displays the details of indicators along with historical data-based automatic recommendation narratives as an instrument for teachers' reflection in optimizing the design of daily activities and the efficient preparation of narrative reports.

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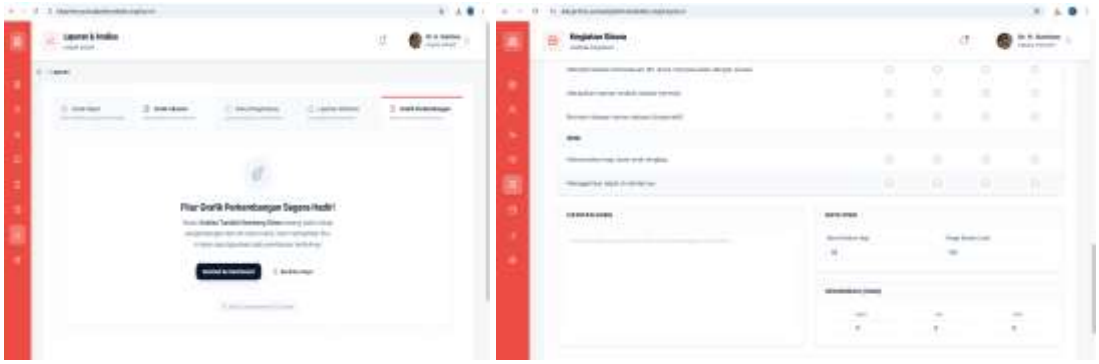

Figure 6. (a) Visualization of Child Development Graph (b) Development Details and Recommendations

3. Synchronization of Reports and Strengthening School-Family Connections

The Report Card and Liaison Book module in EduPrima function as a bridge of information between educators and parents. Digital report cards produce end-of-semester progress reports in professional and standard formats, eliminating the burden of copying teacher manual data. The Digital Liaison Book facilitates real-time daily communication that encourages parents to be actively involved in child stimulation at home, building an inclusive education ecosystem that increases parents' trust in the professionalism of the institution.

Figure 7a presents a digital report card that summarizes student development achievements per semester with numerical values and automatic descriptive narratives according to national PAUD standards for administrative validity and long-term archiving, while Figure 7b shows a digital liaison book that facilitates daily communication between teachers and parents to ensure that interaction history is stored as a complete part of the child's development profile while reducing dependence on physical media that is susceptible to damage.

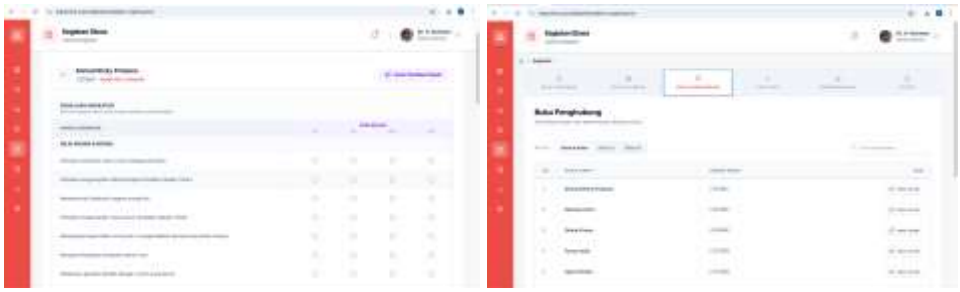

Figure 7. (a) Digital Student Development Report Card. (b) Liaison Book and Activity Report

4. User Acceptance Testing (UAT) Evaluation

The UAT evaluation was carried out after an intensive mentoring session to validate EduPrima's operational readiness from the perspective of the end user. Three respondents—one principal and two teachers—filled out a 17-item questionnaire on a Likert scale of 1–5 that covered six dimensions: ease of use, interface performance, data accuracy, Learning Analytics features, administrative output, and data security. Table 2 summarizes the average score of each dimension.

Table 2. Recapitulation of EduPrima User Acceptance Testing (UAT) Results

Yes	Assessment Dimensions	Average	Criteria
1	Ease of Use	4,58	Excellent
2	System Performance & Interface	4,67	Excellent
3	Data Accuracy & Synchronization	4,50	Excellent
4	Learning Analytics Features	4,42	Excellent
5	Administrative Output & Efficiency	4,67	Excellent
6	Data Security	4,83	Excellent
	Overall Average	**4,59**	**Excellent**

The EduPrima system obtained an average UAT score of 4.59 from a scale of 5.00 (91.8%), was in the Very Good category (range 4.20–5.00) according to the Likert scale conversion, and exceeded the minimum satisfaction threshold of 75% set in the program success indicators. The Data Security Dimension recorded the highest score (4.83), indicating strong respondent confidence in the implemented role-based encryption and access control mechanisms. The Interface Performance and Administrative Output dimensions each achieved 4.67; Respondents reported satisfaction with the dashboard's visual clarity and professional presentation, as well as with the digital report card format's alignment with national PAUD administrative standards. The Learning Analytics Feature Dimension obtained the lowest score (4.42) although it remained in the excellent category; One respondent gave a neutral score on the relevance of learning recommendations, indicating the need to improve personalization algorithms as the volume of historical data increases. All respondents assigned the maximum score (5.00) to the administrative efficiency dimension, confirming a reduction in working time from two hours to thirty minutes per day. The principal reported that the simplified interface design effectively minimized cognitive fatigue, while two teachers identified the filling of daily developments as an area that could potentially be simplified through the batch input feature in the next version.

5. Significance of Service Results and Contributions

The results of this service have wide significance from practical and academic aspects. For SS Schools, the system eliminates administrative barriers that reduce teacher productivity with predictive analysis capabilities through Learning Analytics that are impossible to do manually. From the perspective of the university, this activity contributes to the achievement of IKU related to the work of lecturers used by the community. Scientifically, this service proves that Data-Driven Decision Making theory is relevant for non-formal education, while offering a low-cost, high-impact replication model for other similar PAUD Units in the Bogor area.

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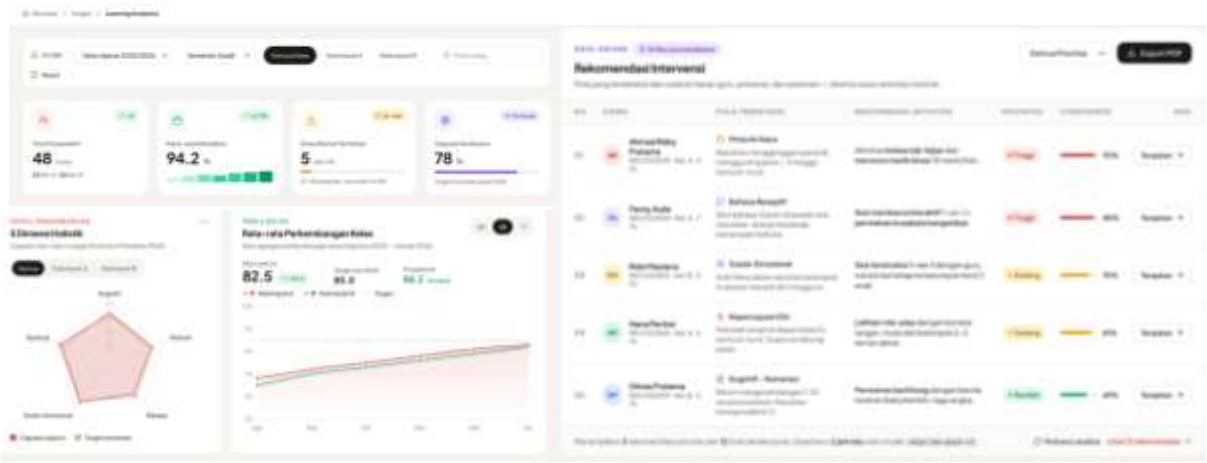

Figure 8. Learning Analytics page

6. Research Implications and Limitations

The main implication of the program is the need to continuously improve teachers' digital literacy so that analytical features can be optimally utilized; Without intensive training, the system is at risk of serving only as an archiving tool. The technical limitations found are the dependence on a stable internet connection and the teacher's discipline in entering data consistently. The current system is still limited to descriptive statistical analysis and has not yet incorporated advanced AI capabilities, making post-program mentoring and iterative feature development essential to the system's long-term relevance for the institution.

CONCLUSION

This service activity concluded that the implementation of EduPrima brought fundamental changes in data management in SS Schools, increasing administrative time efficiency by up to 75% and strengthening the accuracy of monitoring children's growth and development through objective data visualization. The scientific contribution lies in proving that data-driven decision-making theory is relevant for non-formal education with limited infrastructure. The program outcomes suggest that digital transformation can be realized through a participatory approach that aligns partner needs with user-friendly technology solutions.

Based on the implementation results, several strategic suggestions were proposed: improving educators' digital literacy should be at the top of the agenda; more sophisticated exploration of artificial intelligence (AI) needed for automated personalized learning recommendations; longitudinal studies needed to measure the impact of Learning Analytics on the quality of long-term learning outcomes; and synergy with the local education office is highly recommended so that this system can be adopted as an operational standard for other similar PAUD units in the Bogor area and its surroundings.

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