

## THE ROLE OF THE PRINCIPLE IN THE INTEGRATION OF TECHNOLOGY AND HUMAN RESOURCES FOR OPTIMISING LEARNING AT SD MATARAM BARU

**Bambang Yuswanto**

Universitas Muhammadiyah Metro, Metro, Indonesia  
[bambangyw02@gmail.com](mailto:bambangyw02@gmail.com)

**Muhammad Ihsan Dacholfany**

Universitas Muhammadiyah Metro, Metro, Indonesia  
[muhammadihsandacholfany@gmail.com](mailto:muhammadihsandacholfany@gmail.com)

**Sutrisni Andayani**

Universitas Muhammadiyah Metro, Metro, Indonesia  
[trisnimath.andy@gmail.com](mailto:trisnimath.andy@gmail.com)

### Abstract

The development of information and communication technology demands the integration of technology in learning in elementary schools. This study aims to analyze the role of school principals in integrating educational technology and human resource management (HR) for learning optimization in elementary schools in Mataram Baru District, Lampung. This study uses a qualitative approach with a case study method in six elementary schools. Data collection techniques include interviews, observations, and documentation studies, analyzed using Miles and Huberman's interactive analysis model. The results of the study show that school principals play the role of strategic planners, drivers of digital learning innovation, managers of technological resources, facilitators of teacher training, and evaluators of technology use. The main challenges faced include limited infrastructure, low teacher competence, and resistance to change, which are addressed through collaborative approaches and the development of learning communities. This research enriches the concept of technology-based innovative leadership and offers an adaptive HR development model to support digital transformation in elementary schools.

**Keywords:** principal, educational technology, human resources, learning optimization, elementary school.

### INTRODUCTION

The development of information and communication technology (ICT) in the 21st century has transformed various aspects of life, including the world of education. The integration of technology in learning is considered important to improve the effectiveness of the teaching and learning process and prepare students to face the challenges of the digital era (Dacholfany et al., 2024; Husna et al., 2023). In primary schools, the use of technology can encourage student engagement, enrich learning experiences, and improve academic outcomes (Paling et al., 2024).

Several studies have confirmed the importance of technology in education. A study by Rahim et al. (2023) showed that online and blended learning are more effective than traditional methods. In addition, a meta-analysis by Sadikin et al. (2023) found that

technology integration enriches teaching materials and increases student motivation to learn. In the context of school leadership, Primansyah et al. (2025) revealed that the success of technology implementation is highly dependent on the managerial capacity of school principals, including in providing infrastructure and teacher training, and examining PAI teachers' adaptation strategies in facing technological changes (Hikma Apriyani, et al., 2025) and digitalisation.

However, gaps still exist in the implementation of educational technology, especially in rural primary schools. Research by Putra & Pratama (2023) shows that infrastructure limitations, low digital competence of teachers, and lack of managerial support are the main obstacles. Studies by Babullah et al. (2024) and Prastiwi & Widodo (2023) also emphasise the need for effective human resource management to encourage optimal technology adoption.

Previous studies have generally focused on infrastructure or teacher competencies separately. This study offers novelty by simultaneously examining the role of school principals in integrating educational technology and managing human resources to optimise learning at the primary school level, particularly at SD Mataram Baru Lampung.

The problem addressed in this study is the low optimisation of technology use in learning at SD Mataram Baru, caused by limited teacher competencies, lack of technology training, and weak managerial roles of school principals. Based on an initial survey, these constraints are not only related to facilities but also to the low level of internal school policy support for educational technology integration.

To overcome these problems, the proposed solution is to strengthen the role of the principal as an educational technology innovation manager through strategic management of human resources and the formulation of sustainable technology integration policies. This study aims to analyse in depth the role of school principals in integrating educational technology and managing human resources to optimise learning at SD Mataram Baru Lampung. The results of this study are expected to contribute to the development of innovative leadership in primary schools and serve as a reference in the formulation of technology-based education policies.

## **RESEARCH METHOD**

This study uses a qualitative approach with a case study method. The qualitative approach was chosen to understand the complex phenomena related to the role of the principal in integrating educational technology and human resource management to optimise learning at Mataram Baru Elementary School, Lampung. Case studies were chosen because they allow for in-depth exploration of the dynamics occurring in the specific context of the elementary school (Ali Ibrahim et al., 2024; Sugiyono, 2020).

The research subjects consisted of principals, teachers, and administrative staff from six elementary schools in Mataram Baru District. The object of the research was the role of the principal in integrating educational technology and human resource

management. The subjects were selected purposively based on their active involvement in the implementation of educational technology.

Data collection techniques included in-depth interviews, observation, and documentation study. Interviews were conducted semi-structured to explore the experiences and views of principals and teachers regarding technology integration. Observation was conducted to see the practice of using technology in learning directly. Documentation was analysed to obtain supporting data such as school policies and teacher training programmes.

Data analysis was conducted using the Miles and Huberman interactive analysis model, which includes data reduction, data presentation, and conclusion drawing and verification. Data validity was ensured through source and technique triangulation, by comparing the results of interviews, observations, and documentation (Haddar et al., 2023).

The research was conducted at six elementary schools in Mataram Baru Subdistrict: SDN Tulung Pasik, SDN Kebon Damar, SDN Way Areng, SDN Mandala Sari, SD Muhammadiyah Mataram Baru, and SDN 2 Mataram Baru. The research period ran from January to March 2025.

## RESULTS AND DISCUSSION

### The Role of School Principals in the Integration of Educational Technology

School principals play a strategic and multifaceted role in promoting the integration of educational technology in primary schools. Based on the results of a study conducted in six primary schools in Mataram Baru District, it was identified that school principals not only act as policy makers but also as drivers of change in technology-based learning innovation. These roles include strategic planning, driving digital learning innovation, managing technological resources, facilitating digital competency training, and supervising and evaluating the implementation of technology in the school environment. Each of these functions is carried out synergistically to create a learning ecosystem that is responsive to the challenges of the 21st century.

Table 1. The Role of the Principal as Manager in the Integration of Educational Technology

No	The Role of the Principal	Implementation in the Field
1	Strategic Planner	Developing RKS/RKAS based on technology and digitalisation.
2	Drivers of Digital Learning Innovation	Teacher mentoring, innovation incentives, learning communities.
3	Technology Resource Manager	Device rotation, local technician cooperation, routine maintenance.
4	Teacher Training and	Modular training, blended learning, digital

	Development Facilitator	community.
5	Implementation Supervisor and Evaluator	Digital satisfaction survey, monitoring of technology use.

The role of the principal as a strategic planner is reflected in the preparation of the School Work Plan (RKS) and the School Activity and Budget Plan (RKAS), which explicitly include programmes for the procurement of information and communication technology (ICT) equipment and teacher training programmes, as found in SDN Tulung Pasik and SDN Kebon Damar. This demonstrates the principal's ability to translate the vision of technology integration into operational school plans, in line with Mintzberg's theory on the importance of adaptive planning in educational organisations to deal with external environmental changes (Sari et al., 2024).

As drivers of innovation, school principals took the initiative to form digital learning communities, provide incentives to innovative teachers, and facilitate project-based training at SDN Way Areng and SD Muhammadiyah Mataram Baru. These initiatives reinforce Fullan's (2019) finding that the success of innovation in education requires strong support from managerial leadership and the development of a collaborative culture that encourages experimentation and shared learning among teachers.

In terms of technology resource management, the principal demonstrated high creativity and adaptability. For example, by creating a rotation schedule for the use of ICT devices so that they can be optimally utilized by all classes, and by collaborating with local technicians for device maintenance, as was done at Kebon Damar Elementary School. This approach is in line with Barney's Resource-Based View, which emphasises that effective management of internal school resources can be a source of sustainable competitive advantage, even in the context of limited facilities in semi-rural areas (Ferreira & Ferreira, 2025).

In addition, the principal also plays an active role as a facilitator of teacher digital competency development. The training programme adopted uses a modular and blended learning approach, allowing teachers to learn flexibly and more applicable to the needs of their respective classes, as seen at SDN Mandala Sari. These findings support Sutoyo's (2024) research, which states that improving teachers' digital competencies is a determining factor in the successful adoption of technology in learning.

In the monitoring and evaluation function, the principal developed a digital-based monitoring system to observe the progress of technology use by teachers and students, and routinely conducted satisfaction surveys involving teachers and students, as was done at SDN 2 Mataram Baru. This continuous evaluation strategy is consistent with Rogers' theory of innovation diffusion, which emphasises the importance of feedback in accelerating the adoption of new technologies (Mailin et al., 2022). Additionally, this study reinforces the findings of Mawaddah et al. (2024), which identified that active

involvement of school principals in technology integration positively impacts the effectiveness of learning.

Interestingly, this study also adds new findings that a community-based digital innovation management approach, as well as inter-teacher mentoring practices, have proven to be effective strategies for overcoming capacity limitations at the primary school level, particularly in semi-rural areas such as Mataram Baru. These initiatives not only strengthen a sense of shared ownership of innovation but also accelerate the growth of technological skills among teachers.

The theoretical implications of these findings enrich the study of innovative leadership in technology-based education at the primary school level, especially in geographically and resource-constrained contexts. Practically, this model of a participatory, adaptive, and collaborative principal role can serve as a reference in designing school leadership development programmes to support more equitable digital transformation across all levels of primary education in Indonesia.

### Human Resource Management for Learning Optimisation

Effective human resource management is key to optimising technology-based learning at the primary school level. School principals play a central role in ensuring that human resources, particularly teaching staff, have the necessary competencies, motivation and support to deliver learning innovations that are relevant to the demands of the times. Research findings from six primary schools in Mataram Baru Subdistrict indicate that the principal's role in HRM extends beyond administrative aspects such as recruitment and training. It also encompasses fostering a collaborative work environment, strengthening an innovation-driven culture, and implementing structured and adaptive performance evaluation processes.

Table 2. Main Aspects of Human Resource Management in the Field

No	Human Resource Management Aspects	Implementation in the Field
1	Planning and Recruitment of Educators	Transparent recruitment, SWOT analysis of teachers, collaboration with external parties.
2	Teacher Competency Development and Training	Modular training, blended learning, teacher mentoring.
3	Creation of a Collaborative Work Environment	Regular discussion forums, learning communities, innovation sharing sessions.
4	Innovative Leadership	Innovation pilot projects, experimental support, awards for innovative teachers.
5	Performance Evaluation and Human Resource Development	Participatory evaluation, feedback loop, annual development planning.

In terms of planning and recruiting teaching staff, the principal strives to ensure that the selection process is conducted objectively and based on the actual needs of the school. At SDN Way Areng and SD Muhammadiyah Mataram Baru, teacher selection is carried out through educational needs analysis and SWOT analysis, so that the teachers recruited are truly in line with the competencies required by the school. This approach is in line with the principles of Human Capital Management according to Becker and Huselid, which state that human resource management in modern organisations must be based on strategic needs analysis and oriented towards developing competitive advantages through the quality of human resources (Serenko, 2024).

Teacher competency development is another aspect that receives serious attention. At SDN Kebon Damar and SDN Tulung Pasik, the school principals implemented modular training, project-based training, and blended learning approaches to accelerate technology adoption in the classroom. This approach enriches the findings of Jawaz & Hanif (2024), which show that continuous and directly applicable teacher training has a positive impact on the effectiveness of technology integration in learning. School principals not only provide technical training but also encourage teachers to develop digital-based lesson plans, integrate online learning platforms, and use educational applications creatively.

In creating a collaborative work environment, school principals build internal learning communities and innovation forums among teachers, as implemented at SDN Mandala Sari and SDN 2 Mataram Baru. These learning communities not only serve as a platform for knowledge sharing but also as a medium for mutual support, overcoming challenges in technology implementation, and designing student-centred learning innovations. This approach reinforces Wenger's theory about the importance of *Communities of Practice* as a strategy for continuous professional development in education (Lestari et al., 2024).

The innovative leadership of school principals is also reflected in providing space for innovation experiments, technology-based learning pilot projects, and a reward system for creative teachers, as seen at SDN Way Areng and SD Muhammadiyah Mataram Baru. Innovation in education requires a safe environment for experimentation and appreciation for change initiatives, so that teachers are encouraged to try new approaches without fear of failure (Babullah et al., 2024), especially in the face of changing times, if knowledge is still limited (Nining Surya Ningsih, 2020).

Teacher performance evaluations are conducted systematically and continuously using a combination of classroom observation methods, student surveys, and peer feedback, as practised at SDN Tulung Pasik and SDN Kebon Damar. This data-driven evaluation system aligns with the Marzano model, which emphasises the importance of evidence-based assessment to improve teaching performance and support decision-making based on actual school needs (Suryani, 2023) and should develop more interactive and student-centred methods (Hikma Apriyani, 2025), so that there is clarity

about what needs to be achieved and what needs to be done (Nining Surya Ningsih, 2020),

This study is consistent with the findings of Ratnawati & Lestari (2025), which indicate that human resource management based on collaboration, innovation, and systematic evaluation has a significant impact on improving technology-based learning quality. However, this study also adds significant new findings, namely that the formation of internal learning communities (as implemented at SDN 2 Mataram Baru) has proven to be a factor in accelerating teachers' mastery of digital competencies, especially in the context of primary schools in semi-rural areas with limited infrastructure and access to external resources.

The theoretical implications of these findings enrich the conceptual framework for human resource management in the context of technology-based educational transformation at the primary level. Practically, strategies such as collaborative management, teacher mentoring, providing innovation spaces, and data-driven evaluation systems can be adopted as effective teacher development models to accelerate digital transformation in primary schools, especially in areas with complex resource challenges.

### **Identify Challenges and Solutions in Technology Integration and Human Resource Management**

The process of integrating educational technology and human resource management (HRM) at the primary school level is a dynamic journey that is not without real challenges in the field. These complexities include technical constraints, HR competencies, and managerial issues, all of which are interrelated and impact the pace of digital transformation in primary education. Based on research conducted at six primary schools in Mataram Baru Subdistrict, it is evident that these challenges are not only structural in nature but also closely related to the readiness of human resources and organisational culture within each school.

Table 3. Challenges and Solutions in the Integration of Educational Technology

<b>No</b>	<b>School</b>	<b>Key Challenges</b>	<b>Solutions Implemented</b>
1	SDN Tulung Pasik	Limitations of the device	Device rotation; assistance proposal
2	SDN Kebon Damar	Poor internet quality, low device maintenance	Cooperation with local technicians; network strengthening
3	SDN Way Areng	Teachers are not skilled in maintaining/using the equipment	Basic technical training; team of technology teachers
4	SDN Mandala Sari	Limited budget	Collaboration with committees

			and donors
5	SD Muhammadiyah Mataram Baru	Lack of documentation on device usage	Digital inventory administration system
6	SDN 2 Mataram Baru	Incompatibility between devices	User guide; troubleshooting team

The main challenges in technology integration lie in infrastructure and user competence. Many schools, such as SDN Tulung Pasik, SDN Kebon Damar, and SDN Way Areng, face limitations in the number of ICT devices, unstable internet connections, and a lack of technical personnel for equipment maintenance. This has resulted in the suboptimal use of technology in learning. However, the creativity of school principals and teachers in responding to these limitations is commendable. They have initiated adaptive solutions such as a device rotation system between classes, the formation of an internal technology team composed of teachers, and collaboration with local technicians for regular repairs and maintenance of equipment. This response demonstrates that resource limitations are not an insurmountable barrier but rather a catalyst for innovation rooted in local wisdom.

Table 3. Challenges and Solutions in Human Resource Management

No	School	Key Challenges	Solutions Implemented
1	SDN Tulung Pasik	Variations in teacher abilities	Project-based modular training
2	SDN Kebon Damar	Limited time available to teachers	Blended learning method
3	SDN Way Areng	The teacher generation gap	Training from external resource persons
4	SDN Mandala Sari	Low teacher motivation	Mentoring system; teacher progress awards
5	SD Muhammadiyah Mataram Baru	The rapid pace of technological change	Continuous training programme
6	SDN 2 Mataram Baru	Lack of internal trainers	Digital learning community

From the perspective of human resource management, the challenges that arise are no less complex. Variations in digital skills among teachers, a generation gap between senior and young teachers, and limited time for training are significant obstacles in the digital transformation process. Some schools, such as SDN Tulung Pasik and SDN 2 Mataram Baru, have responded to this by adopting a modular training approach, blended learning, and the formation of internal digital learning communities. This strategy not only improves teachers' competencies gradually but also builds



solidarity among educators to share knowledge and experiences in adopting technology. This step highlights the importance of a differentiated training strategy based on actual needs and individual capabilities.

These findings are consistent with the research by Choirunisa & Nauval (2025), which highlights that infrastructure limitations and teacher competencies are the main barriers to the adoption of information and communication technology (ICT) in the education sector. Additionally, this study reinforces the findings of Putri et al. (2024), which emphasises that innovative school leadership, particularly in addressing internal barriers, is a key factor in the successful adoption of educational technology at the primary school level. School leaders who can adapt and innovate have a greater chance of transforming limitations into growth opportunities for their schools. Therefore, competencies must be enhanced to advance educational quality (Nining Surya Ningsih, 2020)

However, this study also enriches the literature by revealing a new dimension, namely that in the context of semi-rural primary schools, local collaboration-based strategies have proven to be highly effective. Collaboration with local technicians, the formation of teacher learning communities, and the development of internal mentoring programmes have emerged as practical solutions to address digitalisation challenges without relying entirely on external assistance. This collaborative model demonstrates that with adaptive and creative resource management, schools in areas with limited infrastructure can still move towards digital transformation gradually but surely.

Theoretically, the results of this study reinforce the importance of an adaptive management approach in developing educational technology in primary schools. Organisational adaptability, flexibility in resource use, and the ability to build local collaborative networks are key success factors that need to be considered in modern educational leadership theory. Meanwhile, in practical terms, primary schools in areas with limited infrastructure can adopt flexible strategies such as device rotation systems, collaboration with local communities, strengthening internal learning communities, and diversifying teacher training methods. With these steps, digital transformation in semi-rural primary schools is not only a long-term vision but can also be realised gradually with tangible results.

## **CONCLUSION AND RECOMMENDATIONS**

This study shows that school principals play a crucial role in integrating educational technology and managing human resources (HR) to optimise learning in primary schools. School principals act as strategic planners, drivers of digital learning innovation, managers of technological resources, facilitators of teacher competency training, as well as supervisors and evaluators of technology implementation. The integration of educational technology faces significant challenges, such as infrastructure limitations, low digital competency among teachers, resistance to change, and budget constraints. Through local collaborative approaches, teacher learning community

development, modular training, and strengthening data-based monitoring, schools are able to overcome these obstacles. This study enriches the concept of innovative leadership and broadens the understanding of the importance of needs-based adaptive management in accelerating digital transformation in primary school environments, especially in semi-rural areas.

Based on the research findings, several recommendations are provided as follows. School principals need to strengthen collaborative and adaptive innovative leadership and build strategic partnerships to address infrastructure limitations. Teachers are advised to actively participate in digital training and form independent learning communities. Local governments need to increase budgetary support, technology provision, and school-based training. Further research is recommended to expand the study to secondary education or different regions to develop technology-based innovative leadership models.

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