ISSN : 2962-9195 E-ISSN : 2963-8992

Journal of Educational Management Research
Vol. 05 No. 05 (2026) : 6818-6834
Available online at https://serambi.org/index.php/jemr

Optimizing Computer Laboratory Management to Support Technology-Based Learning in Pesantren Education

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DOI: https://doi.org/10.61987/jemr.v5i5.3324

Keywords:
Computer Laboratory Management, CIPP Evaluation, Technology-Based Learning, Digital Literacy, Educational Management

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ABSTRACT

This study is motivated by the increasing importance of computer laboratories in supporting technology-based learning and developing students' digital competencies, particularly in educational institutions with specific infrastructure and internet-access policies. This study aims to evaluate computer laboratory management by examining institutional needs, resource readiness, operational implementation, and management outcomes. A qualitative evaluative case study was employed using the Context, Input, Process, and Product (CIPP) evaluation model. Data were collected through in-depth interviews, non-participant observation, and document analysis involving school administrators, laboratory personnel, teachers, and students. The data were analyzed using the interactive model of data condensation, data display, and conclusion drawing and verification. The findings indicate that laboratory management is supported by annual planning, selective internet access, scheduled utilization, backup computers, and routine technical maintenance. However, several challenges remain, including limited infrastructure, overlapping staff responsibilities, unintegrated inventory records, and the absence of written standard operating procedures. These findings imply that effective laboratory management requires stronger administrative coordination, clearer task distribution, standardized maintenance procedures, and an integrated digital inventory system to ensure sustainable laboratory operations and improve the quality of technology-based learning.

Article History:
Received: August 2026; Revised: September 2026; Accepted: October 2026

Please cite this article in APA style as:
Hidayat, F., Sholikhun, M., Rosowulan, T. (2026). Optimizing Computer Laboratory Management to Support Technology-Based Learning in Pesantren Education. *Journal of Educational Management Research, 5*(5), 6818-6834.

INTRODUCTION

Globalization and digital disruption have transformed the knowledge, communication, and occupational skills required for meaningful participation in contemporary society today (Abdillah et al., 2026; Dahlia et al., 2025). Institutions are consequently expected to prepare learners not only with disciplinary knowledge but also with digital literacy, adaptability, and the ability to solve

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problems through technology. These competencies matter beyond schools because access to digital systems increasingly shapes opportunities for further education, employment, public services, and social participation across communities. Technology-based education can strengthen learning outcomes and student engagement when digital resources are meaningfully integrated into instruction (Malik, 2023; Ahmad, 2024; Dahlia, 2026). Therefore, the quality of educational technology provision has become a broader social concern. Schools must consistently ensure that technology is available, functional, and pedagogically useful, rather than treating digital transformation as the simple acquisition of computers or software.

This responsibility is especially significant for Islamic educational institutions, including pesantren, which must preserve religious and character formation while responding to changing social and technological demands. Integrating information and communication technology (ICT) can expand learning opportunities and help santri develop competencies relevant to contemporary academic and professional environments today. Research has discussed technology integration in Islamic education and interactive digital learning media, emphasizing alignment with educational purposes (Abdullah et al., 2024; Rofi'i & Rohmat, 2026). Computer laboratories are strategic learning facilities: they enable students to practice digital skills, explore information, and complete technology-supported tasks. Their contribution, however, depends on reliable equipment, connectivity, technical assistance, and effective institutional management. Strengthening laboratory management is thus essential to ensuring that pesantren education can connect its educational traditions with the demands of digital society.

Many educational institutions face a persistent gap between technology-oriented learning demands and the capacity of their facilities. Computer laboratories must often accommodate regular lessons, extracurricular activities, and computer-based examinations despite limited budgets, insufficient devices, unstable networks, and inadequate technical support. These challenges are particularly complex in pesantren, where internet access may also be regulated to maintain discipline. At SMP Syubbanul Wathon Bandongan, preliminary observations identified unstable bandwidth during simultaneous student use and restrictions that complicated lessons using platforms such as Canva and Kahoot. The number of functioning computers was sometimes insufficient, while delayed maintenance contributed to system freezes, malware infections, and hardware failures. Inventory relied on manual records, and formal operating procedures were lacking. These conditions threaten learning continuity and assessment readiness (Hapsari et al., 2025; Pakaya et al., 2025).

Previous studies have examined technology-based education through

learning outcomes, student engagement, digital competencies, and instructional innovation. Malik (2023) and Ahmad (2024) examined the effects of technology-based learning on student engagement and learning outcomes, while Adli et al. (2024) reviewed artificial intelligence in science education. Research has also considered technology-based collaborative learning and competency development, as well as the use of digital modules in computer network practicums to support twenty-first-century skills (Asad et al., 2026; Mursyida et al., 2024). These studies show that technology contributes to learning when supported by suitable pedagogy. However, their primary attention is directed toward learning processes, student competencies, or particular instructional technologies. Less attention is given to the organizational conditions that determine whether computer laboratories can reliably support diverse educational activities in resource-constrained educational institutions generally.

Other studies have addressed laboratory administration and program evaluation directly. Pakaya et al. (2025) examined computer laboratory management in relation to digital literacy, whereas Siregar et al. (2023) designed a decision-support system for selecting laboratory assistants. Hapsari et al. (2025) explored strategies for strengthening literacy and numeracy in computer-based assessment, and Nabila and Nadlir (2025) applied the Context, Input, Process, and Product (CIPP) model to evaluate curriculum implementation. These contributions provide useful insights into facility management, assessment readiness, and comprehensive educational evaluation. Nevertheless, the available studies rarely explain how institutional regulations, resource limitations, network restrictions, and operational practices interact in pesantren-based computer laboratories. This gap is important because management recommendations developed for other educational settings may not adequately reflect the distinctive governance and instructional conditions of pesantren institutions in Indonesia.

This study addresses this important research gap by examining computer laboratory management as an integrated institutional system through the CIPP evaluation framework. Its novelty lies in connecting pesantren-specific policies and educational needs with resource readiness, operational implementation, and the contribution of laboratory services to learning and assessment preparation. Rather than treating equipment availability or digital learning outcomes as isolated indicators, the study considers how institutional context shapes resource allocation, how available inputs support daily processes, and how these processes influence service effectiveness. This approach is intended to produce useful, context-sensitive understanding of laboratory management amid infrastructure constraints and regulated internet access. The study also aims to provide practical and applicable evidence for improving planning, maintenance,

accountability, and the sustainable use of computer laboratories in Islamic schools and pesantren settings.

Accordingly, this study aims to evaluate computer laboratory management at SMP Syubbanul Wathon Bandongan using the CIPP model. It is guided by four research questions: how do institutional needs and pesantren policies shape laboratory management; how adequate are the human resources, budget, hardware, and software supporting laboratory operations; how are instructional services, maintenance, and daily operational procedures implemented; and to what extent do laboratory services support learning activities and readiness for ANBK and TKA? The study argues that laboratory effectiveness is determined not merely by the availability of computers, but by the alignment of institutional policy, resource provision, operational practices, and educational objectives. Evaluating these dimensions together should identify key weaknesses and establish improvement priorities. The findings may inform more responsive, accountable, and sustainable management of educational technology facilities effectively.

RESEARCH METHODS

This study employed a qualitative case study design to examine computer laboratory management at SMP Syubbanul Wathon Bandongan in its natural institutional setting. A qualitative approach was selected because the research sought to understand managerial practices, institutional policies, resource utilization, and operational challenges through the experiences of relevant participants rather than statistical measurement. The case study design enabled an in-depth investigation of a specific educational institution and its distinctive organizational context. Evaluation was guided by Stufflebeam's Context, Input, Process, and Product (CIPP) model to systematically examine institutional needs, resource adequacy, implementation practices, and management outcomes (Nabila & Nadlir, 2025; Pakaya et al., 2025). This design was considered appropriate because laboratory management involves interconnected technical, administrative, and pedagogical dimensions that require contextual interpretation and comprehensive examination within actual educational practices.

The research was conducted at SMP Syubbanul Wathon Bandongan, located in Magelang Regency, Indonesia. The institution was purposively selected because its pesantren-based educational environment presents distinctive challenges in managing computer laboratory facilities while balancing intensive instructional utilization and internal internet access regulations. These characteristics provided a relevant setting for examining the relationship between institutional policies, infrastructure capacity, and technology-supported

learning activities. Research participants were selected purposively based on their responsibilities, involvement, and knowledge of laboratory management. They consisted of the principal, Muhamad Nur Achlis, M.Ag., Gr.; the computer laboratory coordinator, Hanif, S.Pd.; the laboratory technician, Hadak, S. Kom.; the ICT teacher, Zaka, S. Kom.; and representative students. Supporting documents included the School Activity and Budget Plan (RKAS), detailed budget plans (RAB), equipment inventories, and laboratory utilization schedules to strengthen contextual understanding.

Data were collected through three complementary techniques: in-depth interviews, non-participant observation, and documentary analysis. In-depth interviews were conducted with the principal, laboratory coordinator, technician, ICT teacher, and selected students to obtain information about institutional policies, resource allocation, laboratory operations, maintenance practices, and learning experiences. Non-participant observations focused on laboratory conditions, equipment utilization, network accessibility, instructional activities, and technical responses to operational disruptions without directly intervening in ongoing activities. Documentary analysis involved examining institutional administrative records, including RKAS documents, RAB, equipment inventories, maintenance records, and laboratory usage schedules. Combining these techniques enabled methodological triangulation by comparing information obtained from different sources and research procedures. This approach was important for examining laboratory management comprehensively, particularly because effective technology-supported education depends on adequate infrastructure and coordinated institutional practices (Abdillah et al., 2026; Hussein et al., 2024).

Data analysis followed the interactive qualitative model developed by Miles, Huberman, and Saldaña, comprising data collection, data condensation, data display, and conclusion drawing and verification. First, collected information from interviews, observations, and documents was organized and reviewed to identify relevant evidence concerning computer laboratory management. Second, data condensation involved selecting, simplifying, and categorizing information according to the four CIPP dimensions: context, input, process, and product. Third, data display was conducted by organizing findings into descriptive narratives and thematic matrices to identify relationships, recurring patterns, and differences across information sources. Finally, conclusions were formulated and continuously verified by comparing interview statements, observational evidence, and documentary records. This analytical procedure enabled systematic interpretation of institutional conditions, resource readiness, operational implementation, and management outcomes while

maintaining consistency between empirical evidence and the research objectives.

RESULTS AND DISCUSSION

Results

Evaluation of Computer Laboratory Management Based on the CIPP Model

The evaluation of computer laboratory management at SMP Syubbanul Wathon Bandongan was conducted using four dimensions of the CIPP model: Context, Input, Process, and Product. Findings from interviews, observations, and institutional documents revealed how the school organized its laboratory facilities to support ICT instruction, extracurricular activities, and national computer-based assessments. The findings also identified operational arrangements, resource allocation mechanisms, staff responsibilities, instructional practices, and equipment maintenance procedures. Although the laboratory supported various educational activities, its management involved several operational constraints, particularly staff workload distribution, infrastructure maintenance, inventory administration, and the absence of formalized operating procedures. The following sections present the empirical findings according to each evaluation dimension.

Context Evaluation: Educational Needs and Institutional Digital Policies

The context evaluation examined the institutional background, educational requirements, and internal policies governing technology utilization. The school faced the challenge of accommodating digital learning requirements while maintaining pesantren regulations concerning students' internet access. The computer laboratory was primarily designated for ICT instruction and practical digital skills development, including office applications and graphic design. It also functioned as an examination facility for ANBK, UCO TKA, and TKA.

The school addressed internet restrictions through selective connectivity arrangements. Internet access was activated according to instructional requirements and under teacher supervision. This arrangement allowed students to use web-based learning applications while maintaining institutional control over internet utilization.

The Principal, Mr. Muhamad Nur Achlis, M.Ag., Gr., explained the institution's planning and facility utilization arrangements: “Facility planning and development are conducted at the end of each academic year prior to the start of the new academic cycle, involving all SMP Syubbanul Wathon Bandongan stakeholders. Currently, the lab is primarily dedicated to ICT instruction due to device limitations, though it also functions as the examination center for ANBK, UCO TKA, and TKA.”

The Head of the Computer Laboratory, Mr. Hanif Al Amin, S.Pd., further

explained the implementation of internet access regulations: "Instructional delivery proceeds smoothly because internet access is enabled selectively based on lesson requirements. For units covering Canva design or Kahoot quizzes, active connections are provided under strict supervision to prevent unauthorized browsing."

These findings indicate that institutional planning was conducted annually through stakeholder coordination, while laboratory utilization was prioritized for ICT learning and examination activities. Internet access arrangements were implemented as an operational mechanism for balancing instructional requirements and institutional discipline.

Input Evaluation: Resource Forecasting, Budgeting, and Personnel Allocation

The input evaluation focused on infrastructure readiness, financial planning, equipment availability, and human resource allocation. Annual coordination meetings were conducted to assess computer functionality, electrical capacity, air-conditioning performance, and network infrastructure. The school incorporated laboratory requirements into its School Activity and Budget Plan (RKAS), with detailed expenditure proposals documented through Budget Plans (RAB).

One documented allocation was prepared in August 2026 to support the laboratory's audio and multimedia equipment. The following table presents the detailed procurement requirements and expenditure allocation.

Table 1. Budget Plan (RAB) for Computer and Multimedia Laboratory Support Equipment (August 2026)

No	Item / Description	Brand / Specification	Qty	Unit	Vendor / Channel	Total Price + Shipping (IDR)
1	Multi-Channel Wireless Mic	Sennheiser	1	PCS	Online Marketplace	1,069,300
2	Power Amplifier	First Class	1	PCS	Online Marketplace	2,475,900
3	Mono Akai Jack	Krezt TJ 135	4	PCS	Online Marketplace	181,800
4	Male XLR Jack	Krezt TX 068	4	PCS	Online Marketplace	161,700
5	Transparent Audio Speaker Cable	One Fiber	2	PCS	Online Marketplace	216,200
6	Audio & Microphone Cable	Mogami	4	PCS	Online Marketplace	126,000
7	Equipment Installation Service	-	4	Person	Local Technician	600,000

TOTAL EXPENDITURE	**4,830,900**

Source: Internal RAB Documentation, Computer Laboratory SMP Syubbanul Wathon Bandongan (2026).

Table 1 presents the allocation of IDR 4,830,900 for seven procurement and installation requirements. The power amplifier represented the largest expenditure, amounting to IDR 2,475,900, followed by the wireless microphone at IDR 1,069,300. The remaining allocation covered audio connectors, cables, and installation services. The procurement records also documented the division of administrative responsibilities. The Head of the Laboratory, Hanif Al Amin, S.Pd., formulated the technical requirements, which were approved by the Principal, Muhamad Nur Achlis, M.Ag., Gr., and School Treasurer, Meira Lestariningrum, S.E. Final authorization was provided by the Institution Director, KH. R. Maimun Muslih. Purchases were conducted through online marketplaces, while installation services were obtained from local technicians.

Equipment planning was based on previous performance evaluations and current technical requirements. The Head of the Laboratory explained: "We evaluate previous performance and draft requirements based on needed hardware upgrades. After technical discussions with the laboratory technician, proposals are submitted to the principal for funding approval through the facilities department. Equipment allocation decisions are based on student-to-computer ratios per class, targeting a 1:1 ratio, while addressing reported performance issues such as system slowdowns during application usage."

The Laboratory Technician, Mr. Hadak, S. Kom., described the technical considerations involved in equipment planning: "Planning begins by evaluating computer availability and operational status. While the laboratory head focuses on budget constraints to keep proposals economical, technical staff must account for spare part availability to manage unexpected hardware failures. Given fluctuating component prices, maintaining inventory flexibility is critical."

He also identified four primary operational funding requirements: "Laboratory funding is provided through the school's RKAS. Allocations cover four primary areas: (1) direct spare part purchases for internal repairs; (2) monthly internet service provider (Indihome) subscription fees; (3) scheduled maintenance contracts for air conditioning units; and (4) auxiliary technical hardware, including school security CCTV maintenance."

The distribution of personnel responsibilities was also examined to identify the relationship between formal positions and actual operational workloads. Table 2 summarizes the responsibilities performed by laboratory

personnel.

Table 2. Staff Roles and Workload Responsibilities

Position	Formal Role Description	Actual Operational Reality
Head of Laboratory	Managerial oversight, budget planning, and facility supervision	Manages administrative duties alongside active teaching loads in Islamic Studies & ICT
Lab Technician	Daily hardware maintenance, inventory management, & system repairs	Serves as ICT instructor while managing electrical infrastructure & school CCTV networks
ICT Teacher	Curriculum delivery & classroom management	Teaches ICT and Arabic language courses; focuses primarily on instruction without technical maintenance duties

Table 2 shows that the Head of the Laboratory and Laboratory Technician performed responsibilities extending beyond their formal positions. The laboratory head combined managerial and administrative activities with teaching responsibilities, while the technician simultaneously handled instructional duties and technical infrastructure. In contrast, the ICT teacher's responsibilities were primarily concentrated on curriculum delivery. These findings demonstrate that laboratory operations depended on personnel managing multiple institutional responsibilities.

Process Evaluation: Instructional Execution and Adaptive Strategies

The process evaluation examined laboratory scheduling, instructional implementation, equipment utilization, and responses to technical problems. ICT instruction was allocated approximately 80 minutes per weekly session. The laboratory had 38 fully functional computers, serving regular classes with approximately 32–36 students. Additional operational capacity was maintained to accommodate equipment failures during lessons.

The Head of the Laboratory, Mr. Hanif, S.Pd., confirmed the computer allocation arrangements: "Classes average 32 to 36 students, supported by 38 operational computers that maintain a one-to-one ratio. If a unit experiences a technical issue, students immediately move to an available backup workstation."

Laboratory utilization was organized through coordination with the academic curriculum team. The scheduling arrangement accommodated male

students during morning sessions and female students during afternoon sessions. Table 3 presents the weekly laboratory utilization schedule.

Table 3. Weekly Computer Laboratory Class Schedule at SMP Syubbanul Wathon Bandongan

Group / Time	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday
Male Students	**Kenzo 1**	**Jenius 1**	**Labaika 1**	**Jenius 2**	**Jenius 4**	**Labaika 3**
(Morning Sessions)	(09.00-10.35)	(07.00-08.20)	(07.00-08.20)	(07.00-08.20)	(07.00-08.20)	(07.00-08.20)
		Jenius 5	**Kenzo 3**	**Kenzo 5**	**Kenzo 2**	**Labaika 2**
		(08.20-09.40)	(08.20-09.40)	(09.55-11.15)	(08.20-09.40)	(08.20-09.40)
		Jenius 3	**Kenzo 4**		**Labaika 5**	**Labaika 4**
		(09.55-11.15)	(09.55-11.15)		(09.55-11.15)	(09.55-11.15)
Female Students	**Labaika 7**	**Labaika 9**	**Labaika 10**	**Kenzo 7**	**Jenius 8**	**Jenius 7**
(Afternoon Sessions)	(13.35-14.55)	(12.15-13.35)	(12.15-13.35)	(12.15-13.35)	(13.35-14.55)	(12.15-13.35)
		Labaika 6	**Kenzo 8**	**Kenzo 6**	**Jenius 6**	**Jenius 10**
		(13.35-14.55)	(13.35-14.55)	(13.35-14.55)	(14.55-16.15)	(13.35-14.55)
		Kenzo 9	**Labaika 8**	**Jenius 9**		**Kenzo 10**
		(14.55-16.15)	(14.55-16.15)	(14.55-16.15)		(14.55-16.15)

Table 3 illustrates how laboratory utilization was distributed across six instructional days, with separate schedules for male and female student groups. Morning sessions accommodated male students, while afternoon sessions were allocated to female students. The schedule also shows that several student groups used the laboratory sequentially throughout the day, requiring coordination of room availability and instructional periods. This arrangement enabled the school to organize laboratory activities according to its institutional scheduling requirements.

Instructional activities focused on office productivity applications, digital design using Canva, and interactive formative assessments through Kahoot. The ICT Teacher, Mr. Zaka, S. Kom., explained: "Instruction combines theoretical foundations with practical laboratory work. We utilize PC hardware and internet resources to teach office productivity applications and digital learning media. To

prevent distraction or misuse, internet connectivity is activated selectively during specific lesson modules under direct supervision."

Beyond regular ICT instruction, the laboratory was also utilized for ANBK and TKA examinations. When examination requirements exceeded the available laboratory seating capacity, administrators implemented a portable laboratory arrangement by deploying auxiliary laptops into regular classrooms.

Students also described their experiences with laboratory-based instruction: "Hands-on computer lab sessions help us understand technology concepts faster. Interactive quizzes on Kahoot keep lessons engaging, and if a system runs slowly, technical staff quickly redirect us to a functional backup PC."

These findings indicate that instructional implementation combined scheduled computer access, supervised internet utilization, practical learning activities, and alternative equipment arrangements to accommodate different educational requirements.

Product Evaluation: Educational Outcomes and Facility Sustainability

The product evaluation examined the operational outcomes of laboratory management, particularly maintenance sustainability, equipment functionality, and support for technology-based learning. Maintenance activities were conducted internally through routine cleaning, CPU temperature monitoring, antivirus updates, and system re-imaging. These activities were performed to maintain computer functionality and minimize interruptions during instructional activities.

When computer components failed, the technician employed component cannibalization by transferring functional parts from damaged units to computers requiring repairs. Mr. Hadak, S. Kom., described this practice: "When hardware fails, we perform immediate internal repairs by salvaging working components or requesting replacement parts. Moving functional RAM or power supplies from non-operational units allows us to restore faulty PCs on the same day."

This approach helped reduce replacement expenditure and restore computer functionality. Minor component repairs, including mouse and keyboard replacements, generally cost approximately IDR 150,000 per unit.

Nevertheless, the evaluation identified two administrative limitations. First, inventory tracking remained unintegrated because equipment records and maintenance histories were maintained through basic spreadsheets and physical labels without real-time logging. Physical maintenance logbooks were not currently maintained. Second, formal written SOPs governing routine maintenance, software licensing checks, and system management had not been

established. Consequently, several operational procedures depended on individual staff experience and informal working practices.

Despite these administrative limitations, student feedback indicated positive experiences with laboratory-based learning: "Using the computer lab makes learning technology practical and clear. End-of-class interactive games like Kahoot make complex topics easier to understand."

Overall, the findings demonstrate that the laboratory supported ICT instruction and examination activities through internal maintenance, backup equipment, and adaptive operational arrangements. However, inventory administration and the formalization of maintenance procedures remained areas requiring further improvement.

Discussion

The findings demonstrate that computer laboratory management in pesantren is shaped by the need to reconcile digital learning requirements with institutional regulation. Selective internet access enabled students to use Canva and Kahoot while preserving supervised connectivity, indicating that restrictions did not necessarily prevent technology integration but influenced how it was organized. This adaptive arrangement is consistent with research emphasizing that technology-enabled education requires alignment between institutional conditions, learning objectives, and implementation strategies (Nurezki & Sauri, 2026; Balalle, 2024). It also complements evidence that technology-supported learning environments depend on purposeful design rather than technology availability alone (Kusumajati et al., 2023; Chen et al., 2023). Theoretically, this finding extends contextual evaluation by showing how institutional culture and access policies function as active determinants of technology adoption in religious educational settings in practice.

The input findings reveal that resource readiness involves more than the number of functioning computers. The school documented procurement through the RKAS and RAB, allocated funding for multimedia equipment, and coordinated technical approval across institutional roles. However, staff members carried overlapping managerial, teaching, and technical responsibilities, suggesting that human-resource capacity may constrain the benefits of financial and physical resources. This pattern supports the view that technology-enabled education requires coordinated quality assurance and evaluation of both tangible and organizational inputs (Dhouchak & Kumar, 2026; Rothwell et al., 2024). Research on technology integration also emphasizes the importance of appropriate infrastructure and support systems for effective learning implementation (Li & Wang, 2023; İbili et al., 2024). Practically, workload distribution and technical staffing should therefore be considered alongside equipment procurement and budget transparency locally.

The process findings indicate that laboratory access was organized through a weekly schedule, a reported 1:1 computer allocation, and backup workstations for technical disruptions. Supervised internet activation and the use of portable laptops for examinations illustrate adaptive responses to operational constraints. These practices align with studies showing that technology-based learning can support engagement when activities are organized around learners' needs and supported by delivery arrangements (Bi et al., 2024; Balalle, 2024). They also resonate with research on blended and technology-supported learning, where instructional design and implementation quality influence the learning experience (Kusumajati et al., 2023; Chen et al., 2023). Thus, scheduling, contingency equipment, and clear connectivity procedures should be treated as components of reliable laboratory delivery consistently. Digital instruction includes AI-supported translation applications (Yuxiu, 2024; Bi et al., 2024).

The product findings present a mixed picture of operational effectiveness. Internal repairs, component reuse, routine cleaning, antivirus updates, and system re-imaging helped sustain equipment availability despite financial constraints. Nevertheless, spreadsheet-based inventory, the absence of physical maintenance logbooks, and missing written SOPs limited the consistency and traceability of maintenance activities. These findings suggest that short-term technical responsiveness does not automatically ensure long-term system reliability. Evaluation of technology-supported programs should therefore consider both immediate service continuity and the quality of management systems that sustain it (Samal, 2024; Dhouchak & Kumar, 2026). Evidence from immersive and technology-based education likewise underscores that educational value depends on dependable implementation conditions, not simply the presence of advanced tools (Park et al., 2024; Kim, 2024). Written procedures and integrated asset records are practical priorities across academic years.

The study contributes to educational management theory by applying the CIPP framework to a pesantren computer laboratory where digital learning requirements intersect with institutional internet regulations and constrained resources. The findings show that context, input, process, and product are interdependent: policy shapes access, staffing and budgets shape operational capacity, daily practices determine service continuity, and administrative systems influence sustainability. This integrated interpretation extends the use of CIPP beyond broad curriculum or program evaluation toward the management of a specific educational facility in pesantren contexts. It also complements research on technology integration by emphasizing institutional governance and operational capacity as conditions for effective digital learning (Nurezki & Sauri, 2026; Li & Wang, 2023). The contribution is a context-sensitive account of how laboratory management can be evaluated as an educational service system.

Practically, the findings point to several priorities: formalizing SOPs for

maintenance and software oversight, integrating inventory and repair records, reviewing staff workload distribution, and maintaining contingency plans for network or equipment failures. Budget planning should continue to connect technical assessments with transparent procurement priorities and the actual needs of instruction and examinations. The study also suggests that pesantren can maintain controlled internet access without eliminating digital learning, provided access is purposefully scheduled and supervised. These recommendations are consistent with broader work on technology-enabled learning quality and the evaluation of educational investments (Park et al., 2024; Kim, 2024). Because this study concerns one institution, future research could compare pesantren and examine student competencies, service reliability, and resource efficiency over time, including how institutional policies shape equitable access and long-term educational benefits.

CONCLUSION

This study concludes that effective computer laboratory management in pesantren-based education depends not only on infrastructure availability but also on the integration of institutional policies, resource allocation, operational practices, and continuous maintenance. The most important finding is that adaptive strategies, including selective internet access, annual planning, backup equipment, and internal hardware repairs, enable the laboratory to sustain technology-based learning despite resource and regulatory constraints. The scholarly contribution of this study lies in applying the CIPP evaluation model to explain the interrelationships between institutional context, resource readiness, operational implementation, and management outcomes within an Islamic boarding school environment. The practical implications highlight the importance of distributing technical responsibilities appropriately, establishing written Standard Operating Procedures (SOPs), and implementing an integrated digital inventory system to improve accountability and operational sustainability. Nevertheless, this study is limited to a single institution and relies primarily on qualitative evidence. Future research should examine multiple pesantren, compare traditional and modern institutional settings, and employ quantitative measures to investigate the long-term implications of laboratory management for students' digital literacy and learning outcomes.

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