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EDUCATION

INFLUENCE OF PRINCIPALS' SUPERVISION OF THE TEACHERS ON THEIR INTEGRATION OF ICT IN SECONDARY SCHOOLS IN NAIROBI CITY COUNTY, KENYA

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ABSTRACT

Purpose of the study: The study examined the influence of principals' frequency of supervision on the integration of ICT by teachers in secondary schools in Nairobi City County.

Methodology: The research employed a descriptive survey design. The target population comprised 142 principals, 17 county education officers, and 2,955 teachers. Stratified proportionate sampling was used to select 296 teachers, while all principals and county education officers were included in the study. Data were collected using questionnaires, interview guides, and an observation checklist. A pilot study was conducted to confirm the validity and reliability of the research instruments, with factor analysis and Cronbach's alpha coefficients above 0.7, indicating acceptable consistency.

Findings: The study found a significant positive correlation between principals' supervision levels and teachers' ICT integration ($r=0.716$, $\beta=0.850$, $p=0.000$), with the regression model explaining 51.3% of the variance in ICT integration.

Conclusion: The study concluded that principals' active supervision plays a crucial role in promoting ICT adoption by creating a supportive environment through regular monitoring, feedback, and guidance.

Recommendations: The study recommends that principals establish a strong supervision framework to monitor lesson planning, instruction, and assessment methods, conduct periodic evaluations, and encourage peer observations and mentorship programs to enhance ICT integration among teachers.

Keywords: *Principals' supervision, teachers, integration of ICT secondary schools, Nairobi city county*

BACKGROUND OF THE STUDY

The integration of Information and Communication Technology (ICT) in education has been globally recognized as a transformative approach to improving learning outcomes. Principals' supervision of teachers is crucial in ensuring the effective adoption of ICT, encompassing oversight in lesson planning, syllabus tracking, and teacher preparedness (Martin, Budhrani & Wang, 2019; Liu, 2021; Olabiyi, 2024). Effective supervision fosters the adoption of technology by identifying areas where teachers require training and support, enhancing their ability to integrate ICT into classroom instruction (Trayek, Fahme Abu, Ahmad, Mohamad Zaid & Nordin, Mohd Sahandri, 2018). However, excessive supervision can have counterproductive effects, as noted by Kibuku, Rachel Njeri, Ochieng, Daniel Orwa, and Wausi, Agnes Nduku (2020), particularly in higher education contexts in Kenya, necessitating a balanced approach.

The implementation of ICT in education varies across countries, with both opportunities and challenges. In Malaysia, Hu, Ling, AlSaqqaf, Abdulnaser Ahmed Mohammed & Swanto, Suyansah (2020) emphasized the need for technology-enhanced learning to prepare students for the digital economy. In contrast, Nawaz, Muhammad Khawar (2021) highlighted barriers in Pakistan, such as inadequate infrastructure, high costs, and weak policy frameworks, which have contributed to a digital divide in schools. Similarly, in Africa, ICT adoption in secondary education has been slow due to government funding constraints, insufficient teacher training, and infrastructural deficiencies (Chimezie, Nwosu Bartholomew & Prince, Ogbuagwu Nicholas, 2016). Research in Nigeria, Ghana, and Cameroon has shown that inadequate government support and unreliable electricity hinder ICT implementation in schools, underscoring the need for targeted policy interventions (Abdul, Ming, Rahaman & Amadu, 2018; Arrey-Ndip, Nkongho, Molu, Germain Blaise, Nyenty, Abie & Akamba, Moses, 2020).

Kenya faces similar challenges in ICT adoption, with less than ten percent of public secondary schools offering computer studies as a subject (Kibuku, Rachel Njeri, Ochieng, Daniel Orwa

& Wausi, Agnes Nduku, 2020). Despite ICT advancements in other sectors, its integration in education remains limited due to teachers' underutilization of available tools, poor infrastructure, and slow policy implementation (Nyang'ari, Ezekiel Muturi, 2017; Tarus, John K., Gichoya, David & Muumbo, Alex, 2015). This weak adoption highlights the urgent need for strategic interventions, including comprehensive teacher training and increased investment in ICT infrastructure, to bridge the digital divide and enhance student learning experiences (Liu, 2021; Olabiyi, 2024; OECD, 2000; Mwangi, Simon Njuguna, Gichuki, Catherine & Mwai, Nicholas, 2023; Njue, Nancy Karambu, Langat, Alex & Oduor, Samuel, 2022). A significant knowledge gap exists regarding the influence of principals' supervision on ICT integration in Kenyan secondary schools, particularly in Nairobi City County. While theoretical insights on school leadership and ICT adoption are available, there is limited empirical evidence linking principals' supervision to effective ICT integration. Addressing this gap will provide valuable insights for policymakers, educators, and school leaders to develop strategies that enhance ICT adoption through improved leadership and teacher support. This study aimed to bridge the gap between theory and practice by offering evidence-based recommendations to strengthen ICT implementation in Kenyan schools.

STATEMENT OF THE PROBLEM

Kenya ranked second in ICT readiness among Sub-Saharan African countries in 2021, following South Africa. Despite this high ranking, ICT integration in schools remains a challenge. The Ministry of Education projected that only 10.8% of secondary schools would be integrated with ICT (Ministry of Education, 2021), far below the 25% target set for 2015 (Ministry of Education, 2015). The Session Paper of 2019 emphasized the need for a robust ICT infrastructure to support the Digital Literacy Programme, with the Kenya Institute of Curriculum Development tasked with developing digital content. Additionally, efforts such as ensuring electricity access and capacity-building for administrators, education managers, and teachers have been highlighted as crucial steps in facilitating ICT adoption. Paul, Iravo, and Yusef (2020) noted that the Digital Literacy Programme, launched in 2016, aimed to equip students with digital devices and train teachers to deliver digital learning content effectively.

Despite government initiatives, the slow adoption of ICT in schools remains a pressing concern, with many teachers continuing to rely on traditional teaching methods. The limited ICT integration in secondary schools is particularly troubling, given the role of technology in modern education. A critical knowledge gap exists regarding the effect of principals' supervision on teachers' ICT integration in Nairobi City County. The primary issue is that

principals in secondary schools often lack a structured approach to supervising teachers on ICT integration. Some principals do not conduct any supervision related to technology use, while others lack the capacity and knowledge of what aspects of ICT to supervise and how to undertake this supervision effectively. This gap in supervision frequency and quality contributes significantly to the inconsistent adoption of technology in teaching and learning practices.

Nairobi City County was chosen for the study as it has the highest ICT infrastructure and connectivity among Kenyan counties, making it an ideal environment to examine supervision practices without the confounding variable of severe resource limitations. If ICT integration challenges exist in this relatively well-resourced county, findings would be valuable for understanding barriers in less-equipped regions. Additionally, the diverse range of schools in the county provides a representative sample for understanding the relationship between principals' supervision and teachers' technology adoption in urban educational settings. This study was necessary to address the identified gap and offer practical recommendations to strengthen ICT implementation through effective supervision by school principals.

RESEARCH OBJECTIVE

To examine the influence of principals' frequency of supervision on teachers' integration of ICT in Secondary Schools in Nairobi City County.

RESEARCH HYPOTHESIS

H_0: There is no significant influence of principals' frequency of supervision on teachers' integration of ICT in Secondary Schools in Nairobi City County.

LITERATURE REVIEW

The literature review was done in sections.

Empirical Review

Principals' supervision plays a crucial role in the effective integration of ICT in teaching and learning by ensuring that teachers consistently incorporate technology into their instructional practices. Effective supervision involves monitoring the frequency of ICT use in classrooms and assessing teachers' technological competency levels before implementing digital learning initiatives (Fadhila & Istiyono, 2019; Qazaq, 2017). Studies indicate that structured supervision strategies help identify areas where teachers require additional training, ensuring that ICT adoption aligns with instructional goals (Martin et al., 2019). However, excessive supervision

may create resistance among educators, highlighting the need for a balanced approach that fosters teacher autonomy while promoting technology adoption (Kibuku, Ochieng & Wausi, 2020).

Supervision in the digital era requires principals to incorporate technology into their oversight roles, moving beyond traditional evaluation methods. ICT-based supervision enables real-time monitoring, collaboration, and data-driven decision-making to enhance teaching quality (Avidov-Ungar & Eshet-Alkalai, 2018). Tools such as digital lesson observation systems and online teacher management software provide transparency in supervision while allowing principals to assess instructional delivery remotely (Mwakapenda & Lubben, 2020).

Learning management systems further facilitate the evaluation of student progress and teaching effectiveness, shifting from high-stakes assessments to continuous formative evaluations that support teachers' professional development (Ololube, 2016). While ICT-enabled supervision enhances efficiency, its successful implementation requires structured planning, adequate training, and institutional support. Principals must integrate digital tools into their leadership practices while ensuring teachers receive ongoing mentorship and guidance (Tondeur, van Braak, Siddiq & Scherer, 2017). Online professional learning communities and virtual lesson observations provide platforms for continuous teacher development and peer collaboration. However, the effectiveness of ICT-based supervision depends on school leaders' ability to navigate digital tools and foster a culture of innovation among educators.

Several challenges hinder the full implementation of ICT-based supervision, including inadequate technological infrastructure and disparities in digital resource access. Schools with limited internet connectivity struggle to implement digital lesson tracking, virtual feedback, and online teacher evaluations, leading to inconsistencies in supervision outcomes (Mtebe & Raisamo, 2014). Additionally, many principals and teachers lack sufficient training in digital supervision tools, reducing their ability to provide meaningful feedback and effectively incorporate technology into the evaluation process (Pelgrum & Law, 2019). These challenges highlight the need for targeted capacity-building programs to equip school leaders with the necessary ICT skills for effective supervision.

The role of principals in ICT-based supervision extends beyond evaluation to fostering a culture of digital literacy and continuous learning. Studies show that school leaders who model ICT use and encourage collaborative digital learning communities significantly enhance teacher engagement and technology adoption (Voogt, Knezek, Cox, Knezek & Brummelhuis,

2018; Al-Qahtani & Higgins, 2019). Research further suggests that integrating ICT into supervision requires data-driven approaches to personalize teacher development programs and align professional learning opportunities with instructional needs (Anderson & Dexter, 2020). Addressing existing gaps in ICT integration will require policy interventions, investment in digital infrastructure, and training programs to support school leaders in implementing technology-driven supervision effectively.

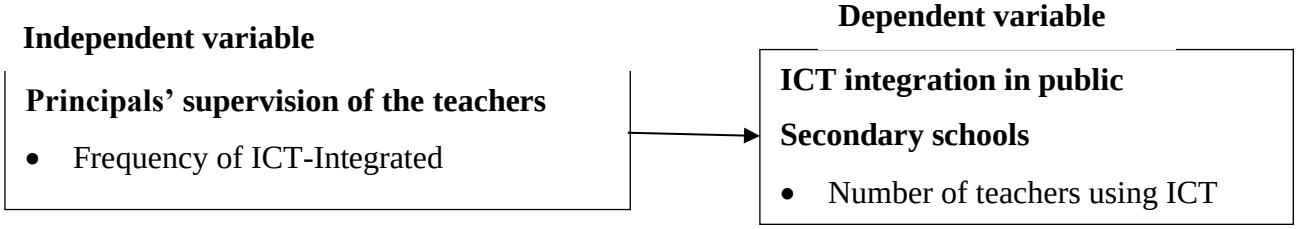
Theoretical Framework

The study was anchored on Transformational Leadership Theory, which provides a structured lens for understanding the integration of ICT in education. Introduced by James MacGregor Burns (1978), the theory distinguishes between transformational leaders—who inspire and motivate followers toward growth—and transactional leaders, who focus on task-based exchanges. Bernard Bass (1985) later expanded the theory, outlining four core dimensions: Idealized Influence (leaders as role models), Inspirational Motivation (articulating a clear vision), Intellectual Stimulation (promoting innovation), and Individualized Consideration (providing tailored support). This theory was relevant to the study as it highlights how principals, through visionary leadership and targeted support, can drive ICT adoption in schools. It recognizes that successful integration depends not only on access to digital tools but also on how teachers are empowered to use them. Through supervision, continuous professional development, and structured feedback, transformational leaders influence teacher confidence and commitment to ICT. By addressing barriers such as resistance and skill gaps, and by fostering a supportive culture, principals play a critical role in embedding technology into teaching. Thus, the theory offers a clear framework for examining how school leadership impacts ICT integration, aligning directly with the study's objectives.

Conceptual Framework

Figure 1 illustrates the conceptual framework.

Figure 1: Conceptual Framework



RESEARCH METHODOLOGY

The study adopted a positivist research philosophy and a descriptive survey design to systematically examine ICT integration and leadership influence. The target population comprised 142 principals, 17 County Directors of Education, and 2,955 teachers from formal and informal secondary schools in Nairobi City County. A stratified random sampling technique ensured representativeness, with a 10% sampling rate yielding 296 teachers. Data collection involved structured questionnaires for teachers, interviews with principals and education officers, and an observation checklist to assess ICT infrastructure. Pretesting in 14 schools confirmed construct validity through factor analysis, with all items exceeding the 0.4 factor loading threshold, while Cronbach's alpha values above 0.7 ensured reliability. Simple linear regression analysis was conducted to examine the influence of principals' supervision on teachers' ICT integration. The Analysis of Variance (ANOVA) was used to test the statistical significance of the regression model. This approach allowed the study to determine both the strength of the relationship between the variables and whether the observed relationship was statistically significant. Ethical approvals were obtained from NACOSTI and relevant institutions, with informed consent, confidentiality, and voluntary participation upheld. Research assistants facilitated data collection to enhance efficiency and maintain methodological rigor. Analysis combined qualitative and quantitative approaches, with thematic analysis applied to qualitative data and SPSS used for descriptive and inferential statistical analysis.

DATA ANALYSIS, PRESENTATION AND INTERPRETATIONS

The chapter covers data analysis, presentation, and interpretation. It includes general and demographic information, descriptive statistics, correlations and regression analysis. Each section is discussed in detail.

General and Demographic Information

The study achieved a 92.1% response rate, with 281 teachers (94.9%), 126 principals (88.7%) and 12 county education officers (70.6%) successfully completing their research instruments, surpassing the 70% threshold recommended for social science studies (Kothari, 2004; Israel, 2013). The high participation rate among teachers and principals ensured data reliability, while the lower response from county education officers was likely due to administrative workload but did not compromise representativeness. The demographic analysis revealed a moderate gender imbalance, with 58.7% male and 41.3% female respondents. Most participants (81.5%)

were aged 36-55 years, indicating an experienced workforce, while 80.4% held graduate degrees and 14.9% had postgraduate qualifications, confirming high academic credentials. Additionally, 44.8% had 11-15 years of teaching experience, and 27.0% had 7-10 years, reflecting significant professional expertise. These findings confirm that respondents possessed the necessary knowledge to provide reliable insights on ICT integration, strengthening the validity of the study's conclusions and recommendations for improving technology adoption in secondary education.

Principals' Supervision of Teachers and Integration of ICT

The study examined the influence of principals' supervision on teachers' ICT integration in secondary schools in Nairobi City County, focusing on monitoring lesson delivery, providing feedback, facilitating professional development, and ensuring ICT resource availability. Teachers' responses were measured using a five-point Likert scale, with descriptive statistics such as percentages, means, and standard deviations used to analyse agreement levels on ICT integration practices. The descriptive statistics on principals' supervision of teachers are presented in Table 1.

Table 1: Principals' Supervision of Teachers and Integration of ICT

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Std. Deviation
There is the supervision of ICT integration of teachers once a week	26.70%	50.90%	5.30%	7.50%	9.60%	2.22	1.20
There is the supervision of ICT integration of teachers once in two weeks	42.70%	36.30%	6.80%	12.10%	2.10%	1.95	1.08
There is the supervision of ICT integration of teachers monthly	25.30%	49.10%	8.20%	9.60%	7.80%	2.26	1.17
There is the supervision of ICT integration of teachers once a term	27.00%	55.20%	6.80%	10.00%	1.10%	2.03	0.91
The use of ICT in learner and staff security management is supervised.	32.00%	42.00%	2.50%	19.20%	4.30%	2.22	1.21
Teachers are supervised in uploading content on YouTube	28.10%	50.50%	5.00%	8.20%	8.20%	2.18	1.17
Teachers are supervised on the use of ICT in processing of marks	49.10%	37.40%	3.20%	6.40%	3.90%	1.79	1.04
Teachers are supervised when creating lesson plans (the issue is doing it using ICT)	35.20%	40.90%	3.60%	16.40%	3.90%	2.13	1.18
The school principal /school management monitors syllabus coverage of ICT	29.90%	38.40%	9.30%	12.80%	9.60%	2.34	1.29
The school administration examines teacher work records concerning ICT integration.	26.70%	52.30%	5.30%	11.40%	4.30%	2.14	1.07
Average						**2.13**	**1.13**

The study found that 77.6% of respondents disagreed that there is weekly supervision of ICT integration, while only 17.1% agreed and 5.3% remained neutral. The mean score was 2.22 with a standard deviation of 1.20. For bi-weekly supervision, 79.0% disagreed, with 14.2% agreeing and 6.8% neutral, yielding a mean of 1.95 with a standard deviation of 1.08. Monthly supervision showed similar patterns with 74.4% disagreeing, and termly supervision had 82.2% disagreement. Regarding specific supervision areas, 74.0% disagreed about the supervision of ICT in security management, while 23.5% agreed and 2.5% remained neutral. The mean score was 2.22 with a standard deviation of 1.21. Content uploading supervision showed 78.6% disagreement, and mark processing supervision had the lowest mean at 1.79 with a standard deviation of 1.04, with 86.5% disagreeing. Lesson plan supervision revealed 76.1% disagreement with only 20.3% agreement. The supervision of ICT syllabus coverage and integration into teacher work showed similarly low levels of implementation.

For syllabus coverage monitoring, 68.3% disagreed, while 22.4% agreed, and 9.3% remained neutral. The mean score was 2.34 with a standard deviation of 1.29. Work record examination showed 79.0% disagreement with only 15.7% agreement and 5.3% neutral. The mean score was 2.14 with a standard deviation of 1.07. The overall composite mean of 2.13 with a standard deviation of 1.13 indicates consistently inadequate supervision of ICT integration across all aspects. This suggests that principals are not effectively monitoring and supporting teachers' use of technology in various educational activities. The data reveals a significant gap in supervision practices, which could be hindering the successful implementation of ICT integration initiatives in schools. Regular and systematic supervision is crucial for ensuring that teachers are effectively implementing ICT in their teaching practices and for identifying areas where additional support or training may be needed.

The study conducted interviews with principals and county directors of education to understand how supervision influences ICT integration in secondary schools. Principal, Formal school in Embakasi East emphasized: "*Effective supervision allows principals to track teachers' progress in ICT integration, identifying strengths and areas that require additional support or professional development*." This highlights how monitoring plays a crucial role in understanding teachers' technological development needs and ensuring appropriate support is provided. The emphasis on identifying areas for improvement suggests a developmental rather than purely evaluative approach to supervision. Moreover, the Sub-County Officer in Kamukunji noted: "*Regular supervision creates a structured accountability system that encourages teachers to consistently implement and improve their ICT integration strategies in*

classroom settings." This underscores the importance of systematic oversight in maintaining momentum in technology adoption and ensuring sustained implementation efforts.

Furthermore, the Principal of Informal school in Starehe observed: "*Direct supervision provides opportunities for principals to offer constructive feedback, helping teachers refine their technological teaching approaches and address potential implementation challenges*." This emphasizes how supportive supervision can help teachers overcome obstacles and improve their technological pedagogical practices. In addition, the Sub-County Officer in Westlands stated: "*Strategic monitoring transforms ICT from a peripheral educational tool to a core pedagogical strategy*." This highlights how effective supervision can help embed technology use into regular teaching practices rather than treating it as an optional add-on.

Moreover, a principal from a formal school in Makadara explained: "*Supervisory approaches that emphasize constructive feedback create psychological safety for teachers experimenting with technological pedagogical approaches*." This reveals how supportive supervision can create an environment where teachers feel comfortable taking risks and innovating with technology. Additionally, the Sub-County Officer in Mathare emphasized: "*Comprehensive supervision helps track teachers' technological skill progression, enabling customized capacity-building strategies*." This suggests that effective monitoring allows for more targeted and personalized professional development interventions. Similarly, the Principal, Informal school in Kibra noted: "*Regular technological performance assessments help develop data-driven educational strategies*." This highlights how supervision can inform evidence-based decision-making about technology integration approaches.

In addition, the Principal, Formal school in Embakasi West noted: "*Identifies strengths and areas requiring technological skill development, helping teachers understand broader technological impact*." This suggests that effective supervision provides both specific feedback and broader context for technology integration. In the same vein, the Principal of the Informal school in Kasarani reported: "*Creates accountability for ICT integration efforts while building confidence in ICT implementation*." This emphasizes how supervision can balance accountability with support to promote effective technology use. A Sub-County Officer in Embakasi Central revealed: "*Ensures systematic digital learning and monitors technology adoption rates while providing technological leadership development*." This insight emphasizes how supervision supports both individual teacher growth and broader institutional technological transformation.

Furthermore, the Sub-County Officer in Langata stated: "*Supportive monitoring creates opportunities for peer learning and technological knowledge sharing among teachers*." This emphasizes how supervision can facilitate collaborative learning and the spread of best practices in technology integration. Moreover, the Principal of Formal school in Dagoretti South observed: "*Regular technological performance evaluations motivate teachers to continuously improve their digital pedagogical skills*." This suggests that systematic monitoring can drive ongoing professional growth and improvement in technology use. Building upon this insight, Principal, Informal school in Roysambu added: "*Principals' active involvement in teachers' technological journey signals institutional prioritization of digital education*." This highlights how supervision demonstrates leadership commitment to technology integration.

Besides, Sub-County Officer in Ruaraka emphasized: "*Supportive supervision promotes technological experimentation and reduces resistance to technological change by providing personalized guidance and support*." This observation connects supervision to innovation and change management in technology adoption. The interviewees emphasized that effective supervision was crucial for tracking teachers' progress and ensuring accountability in ICT implementation. They highlighted that when principals actively monitored ICT integration, they could better identify strengths and areas requiring additional support or professional development. Respondents particularly noted that regular supervision created a structured system that encouraged teachers to consistently implement and improve their technological teaching approaches.

The combined findings highlight the direct relationship between principals' supervision and successful ICT integration. Interviewees stressed that effective supervision requires a balanced approach that combines accountability with support and encouragement. They emphasized that when principals prioritized ICT supervision, it led to better policy implementation, more consistent resource utilization, and improved teaching practices. Many respondents suggested that successful ICT integration requires ongoing monitoring and feedback, not just occasional checks, highlighting the need for principals to develop comprehensive supervision strategies that support sustainable technology integration in teaching and learning. The study also conducted Pearson correlation analysis and results are presented in Table 2

Table 2: Pearson correlation analysis for principals' supervision of teachers and integration of ICT

		Integration of ICT	Principals' supervision of teachers
Integration of ICT	Pearson Correlation Sig. (2-tailed)	1.000	
Principals' supervision of teachers	Pearson Correlation	.716**	1.000
	Sig. (2-tailed)	0.000	

The study established a strong, positive, and statistically significant relationship between principals' supervision and ICT integration in secondary schools ($r = 0.716$, $p = 0.000$), indicating that schools where principals actively oversee and support ICT adoption are more likely to experience effective technology integration in lesson planning, instruction, and assessment. Effective supervision helps identify challenges requiring targeted interventions such as training, mentorship, and resource provision, while also promoting accountability and adherence to ICT policies, thereby fostering a culture of continuous technological advancement. However, excessive supervision may lead to resistance among teachers, highlighting the need for a balanced approach that emphasizes support and professional development over pressure (Kibuku, Ochieng & Wausi, 2020). These findings align with previous studies by Qazaq (2017) and Martin et al. (2019), which demonstrate that principals' supervision, including competency assessments and instructional design evaluations, enhances teachers' preparedness for digital learning. Doculan (2016) further underscores the value of monitoring and evaluation in tracking progress within digital environments. Ultimately, active but supportive supervision remains essential for embedding ICT into instructional practices and ensuring its effective use in secondary education

Teachers' Integration of ICT in Curriculum and Instruction Activities

Table 3 presents teachers' responses regarding their integration of ICT across various curriculum and instruction activities in secondary schools. The data reveals the percentage distribution of agreement levels, alongside means and standard deviations, providing insight into the extent of technology adoption in key instructional practices.

Table 3: Teachers' Integration of ICT in Curriculum and Instruction Activities

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Std. Deviation
Activities that show ICT integration by teachers							
Preparation of soft copies of schemes of work	35.90%	42.00%	4.60%	8.90%	8.50%	2.12	1.23
Presentation of lessons using PowerPoint	34.90%	46.30%	4.30%	8.90%	5.70%	2.04	1.12
Enabling learners to search for online content on their subjects	42.30%	45.60%	4.30%	5.30%	2.50%	1.80	0.93
Administering online examinations for relevant subjects	38.10%	48.40%	1.80%	7.80%	3.90%	1.91	1.03
Using ICT in processing of examination results	33.50%	52.30%	1.10%	5.00%	8.20%	2.02	1.13
Using ICT software to report students' results to parents and stakeholders to avoid delay	38.10%	29.20%	3.20%	20.60%	8.90%	2.33	1.39
Average						**2.04**	**1.14**

The findings presented in Table 3 reveal a concerning pattern of limited ICT integration in curriculum implementation across secondary schools in Nairobi City County. Analysis of teachers' ICT integration activities shows consistently low mean scores across all dimensions measured, with an overall average of 2.04 on a five-point scale. The preparation of soft copies of schemes of work, a fundamental aspect of digital planning, received a mean score of only 2.12, with 77.9% of respondents indicating disagreement with this practice being common. Similarly, the utilization of PowerPoint for lesson presentation scored 2.04, with 81.2% of teachers reporting limited adoption. Most concerning is the enabling of learners to search for online content, which recorded the lowest mean score (1.80), indicating that the student-centered application of ICT remains particularly underdeveloped despite its potential to foster independent learning skills crucial for 21st-century education. The administration of online examinations and use of ICT in examination processing showed similarly low adoption levels, with mean scores of 1.91 and 2.02 respectively. These findings indicate that even administrative applications of technology, which often precede pedagogical integration, remain underutilized. The relatively higher score for using ICT software to report students' results (2.33) suggests that external accountability functions may be driving limited technology adoption rather than pedagogical transformation. The consistency of high disagreement percentages across all measured activities (ranging from 67.3% to 87.9%) highlights a systemic rather than isolated challenge in ICT integration. The standard deviations ranging from 0.93 to

1.39 indicate some variation in responses, but not enough to suggest significant pockets of successful integration that could serve as internal models for improvement.

These findings have significant implications for educational stakeholders in Nairobi City County. First, they suggest that investments in ICT infrastructure may not be translating into corresponding changes in teaching and learning practices, indicating a potential misalignment between resource allocation and professional development strategies. Second, the consistently low integration across both instructional and administrative domains implies a need for comprehensive rather than targeted interventions to address the multifaceted barriers to technology adoption. Third, the particularly low scores in student-centered applications of ICT suggest that current capacity-building approaches may be failing to adequately prepare teachers to implement modern, learner-centered pedagogies that leverage digital tools effectively. For principals and education officials, these findings underscore the urgency of reimagining capacity-building programs to focus not just on technical skills but on transforming teaching philosophies and practices to embrace the potential of technology in enhancing learning experiences and outcomes.

Regression Analysis

The purpose of regression analysis is to model and analyse relationships between independent and dependent variables. The regression analysis identifies the strength and nature of the relationships between variables. In this study, the regression analysis includes model fitness, analysis of variance and regression coefficients. The results of the study's coefficients of regression are shown in Table 4.

Table 4: Regression Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.716a	0.513	0.511	0.367511

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.674	1	39.674	293.741	.000b
	Residual	37.683	279	0.135		
	Total	77.357	280			

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.228	0.069		3.312	0.001
	Principals' supervision of teachers	0.850	0.050	0.716	17.139	0.000

a Dependent Variable: Teachers' Integration of ICT in Curriculum and Instruction Activities

The model summary shows that the R square was 0.513, indicating that principals' supervision explains 51.3% of the variation in teachers' ICT integration in secondary schools. This implies that over half of the differences in ICT adoption among teachers can be attributed to the frequency and quality of principals' supervision, while the remaining 48.7% is influenced by other factors not captured in this model. The ANOVA results yielded a p-value of 0.000, which is less than the threshold significance level of 0.05, hence the model is statistically significant. This confirms that principals' supervision of teachers is a valid and reliable predictor of ICT integration in secondary schools in Nairobi City County, providing strong statistical evidence to reject the null hypothesis and accept that there is indeed a significant relationship between supervision frequency and technology adoption in teaching practices.

The coefficients table reveals that principals' supervision of teachers has a positive and significant influence on ICT integration (β=0.850, t=17.139, p=0.000). This indicates that for every unit increase in principals' supervision, there is a 0.850 unit increase in ICT integration, demonstrating the substantial impact of supervision on technology adoption. The high t-value

(17.139) further validates the statistical significance of this relationship. Based on these findings, the study decisively rejects the null hypothesis and concludes that principals' frequency of supervision significantly influences teachers' ICT integration in secondary schools. These results align with previous research by Fadhila and Istiyono (2019) and Powell and Barbour (2018), confirming that consistent monitoring and guidance by principals are essential elements for successful technology implementation in educational settings.

CONCLUSION

The study concludes that principals' supervision of teachers plays an essential role in shaping the success of ICT integration. Regular monitoring, feedback, and guidance from school leadership create a supportive environment that encourages teachers to embrace digital tools in their teaching methodologies. Schools with structured supervision frameworks experience higher levels of ICT utilization, as teachers receive the necessary support and motivation to adopt technology in their instructional practices. The presence of an active supervision system ensures that teachers are consistently encouraged to explore innovative ways of using ICT, making digital integration a fundamental part of their teaching routine. Without adequate supervision, some teachers may be reluctant to incorporate technology due to a lack of confidence or resistance to change. Principals who are actively involved in monitoring teachers' ICT use can identify challenges, provide necessary interventions, and promote accountability, ultimately fostering a culture of digital learning in schools.

RECOMMENDATIONS

The study recommends that principals should establish a robust supervision framework to monitor and guide teachers' ICT integration efforts. They should actively supervise teachers' lesson planning, classroom instruction, and assessment methods to ensure that ICT is effectively incorporated into these teaching activities. Principals should conduct periodic evaluations to assess how teachers are using digital tools in lesson delivery and provide constructive feedback to enhance their ICT integration skills. Additionally, they should implement structured monitoring mechanisms to track syllabus coverage, the use of digital learning materials, and the extent of ICT adoption in daily teaching routines. Principals should also encourage peer observations and mentorship programs where experienced ICT users support their colleagues in adopting digital strategies. By providing regular supervision and structured feedback, school leaders can identify gaps in ICT implementation and provide targeted interventions to improve teachers' adoption of technology.

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