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Pedagogy Over Provision: The Influence of Teacher-Led ICT Lesson Integration on Student Academic Performance in in junior secondary schools in Loitokitok Sub-County, Kenya

By

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Abstract
This study investigates the influence of teachers' ICT lesson integration on students' academic performance in the rural, semi-arid setting of Loitokitok Sub-County, Kenya. The global imperative to integrate Information and Communication Technology (ICT) into education often emphasizes infrastructure provision, yet the pivotal role of teacher-led pedagogical integration in determining student outcomes remains under-examined, particularly in marginalized rural contexts Guided by a synthesis of the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Technological, Pedagogical, and Content Knowledge (TPACK) framework, the study employed a descriptive survey design. Data were collected from 90 teachers and 150 learners across 30 public junior secondary schools using questionnaires and triangulated with interviews from 30 head teachers and 3 Curriculum Support Officers. Quantitative data were analyzed using descriptive statistics, regression, and chi-square tests, while qualitative data were analyzed thematically. The findings reveal that teachers' ICT lesson integration is a profoundly powerful predictor of academic success. Teachers demonstrated high confidence (M=4.02) and reported significant improvements in student engagement and understanding (M=4.16) through ICT use. Regression analysis confirmed this, showing that teachers' ICT lesson integration explained an overwhelming 94.7% of the variance in student academic performance ($R^2 = 0.947$, $p < 0.001$). Learners corroborated these findings, reporting that ICT-supported lessons enhanced their comprehension of difficult topics (M=4.07) and improved their academic results (M=3.90). Despite these positive outcomes, inadequate professional development was identified as a key barrier, with only 58% of teachers feeling they had received adequate support. The study concludes that effective pedagogical integration of ICT, driven by teacher competency and confidence, is more influential on academic performance than the mere availability of technology. It recommends prioritizing continuous, pedagogy-focused teacher training and establishing robust institutional support systems to transform ICT from a peripheral tool into a central pillar of learning in rural schools.

Keywords: ICT Integration, Teacher Competency, Academic Performance, Rural Education, TPACK, Kenya, Junior Secondary School, Pedagogy

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1. Introduction

The 21st-century educational landscape is increasingly defined by the integration of Information and Communication Technology (ICT) as a catalyst for transforming traditional teaching paradigms into dynamic, student-centered learning environments. Globally, nations like Finland and Singapore have demonstrated that embedding ICT within educational frameworks can significantly enhance student engagement, foster digital literacy, and improve academic outcomes (UNESCO, 2022). This technological shift is a core component of the United Nations' Sustainable Development Goal 4, which advocates for inclusive and equitable quality education by leveraging technology to bridge learning gaps. In Sub-Saharan Africa, this mandate has inspired numerous national initiatives aimed at modernizing education systems to prepare learners for a digital economy (Aguti et al., 2021).

In Kenya, the government has championed this agenda through ambitious policies such as the Digital Literacy Programme (DLP) and the Competency-Based Curriculum (CBC). The CBC, in particular, positions ICT not merely as a subject but as a fundamental tool for achieving core competencies like critical thinking, creativity, and collaboration (Ministry of Education [MoE], 2021). These initiatives signal a clear policy direction: technology is integral to the future of Kenyan education. However, the translation of this national vision into classroom practice is fraught with challenges, creating a significant gap between policy intent and on-the-ground reality.

This implementation gap is most pronounced in rural, marginalized, and semi-arid regions, where infrastructural deficits, socio-economic barriers, and limited human capacity converge to hinder progress. Loitokitok Sub-County, a vast and predominantly rural area in Kajiado County, exemplifies this context. Here, schools grapple with unreliable electricity, inconsistent internet connectivity, and an insufficient supply of digital devices (Ndungu, 2022). While much of the existing research on ICT in Kenya has focused on the critical issue of infrastructure or has aggregated data from urban and rural settings, it has often overlooked the more nuanced and arguably more decisive factor: the teacher. The mere presence of technology does not guarantee improved learning; its effectiveness is fundamentally mediated by the teacher's ability to integrate it meaningfully into pedagogical practice.

1.1 Statement of the Problem

Despite significant national investment in ICT through programs like the DLP and the CBC, junior secondary schools in rural areas such as Loitokitok Sub-County continue to report unsatisfactory academic outcomes (MoE, 2021). The prevailing discourse often attributes this underperformance to infrastructural deficits. However, an overemphasis on infrastructure risks obscuring the critical role of the educator. Technology is a tool, and its impact is contingent upon the skill, confidence, and pedagogical creativity of the teacher who wields it. While studies in Kenya have confirmed the correlation between ICT access and performance (Wambugu, 2021), there remains a significant lack of empirical research that isolates and deeply examines the influence of teachers' pedagogical integration of ICT within marginalized rural contexts.

Existing literature often generalizes findings across diverse geographical and socio-economic settings, failing to capture the unique challenges and opportunities within semi-arid regions like Loitokitok. This study addresses this gap by moving beyond the question of *if* schools have ICT to investigate *how* teachers are using it in their lessons and the resultant effect on student academic performance. By focusing specifically on the pedagogical dimension lesson design, instructional strategies, and student engagement this research seeks to provide evidence on whether the quality of teacher-led integration is a more powerful determinant of academic success than the mere availability of hardware.

1.2 Objective of the Study

The primary objective of this study was to assess the influence of teachers' ICT lesson integration on students' academic performance in public junior secondary schools in Loitokitok Sub-County, Kajiado County, Kenya.

2. Literature Review

2.1 Theoretical Framework: A Synthesis of UTAUT and TPACK

Understanding the complex interplay between teachers, technology, and student outcomes requires a robust theoretical lens. This study is anchored in a synthesis of two complementary frameworks: the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Technological, Pedagogical, and Content Knowledge (TPACK) framework. Together, they provide a comprehensive model for analyzing both the external drivers of ICT adoption and the internal knowledge structures required for its effective pedagogical implementation.

The UTAUT model, developed by Venkatesh et al. (2003), synthesizes eight prominent technology acceptance theories to explain users' intentions and actual usage of a technology. It identifies four core determinants:

1. Performance Expectancy: The degree to which an individual believes that using the system will help them attain gains in job performance. For teachers, this is the belief that integrating ICT will improve their teaching effectiveness and enhance student learning outcomes.
2. Effort Expectancy: The perceived ease of use of the system. Teachers are more likely to adopt ICT if they find the tools user-friendly and not overly complex.
3. Social Influence: The extent to which an individual perceives that important others (e.g., school principals, colleagues, parents) believe they should use the new system. A supportive school culture can significantly influence a teacher's willingness to integrate ICT.
4. Facilitating Conditions: An individual's perception of the organizational and technical infrastructure available to support the use of the system. This includes access to hardware, software, reliable internet, and technical support.

UTAUT is invaluable for explaining *why* teachers choose to adopt (or resist) ICT. It highlights the external and psychological factors that shape their behavior. However, it does not fully explain *how* that technology is used effectively once adopted. This is where the TPACK framework becomes essential.

The TPACK framework, proposed by Mishra and Koehler (2006), posits that effective teaching with technology lies at the intersection of three core domains of teacher knowledge:

Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK).

(i) Content Knowledge (CK): The teacher's deep understanding of the subject matter they teach.
(ii) Pedagogical Knowledge (PK): The teacher's knowledge of teaching and learning processes, including classroom management, assessment strategies, and instructional design.
(iii) Technological Knowledge (TK): The teacher's knowledge about various technologies, ranging from basic tools like projectors to advanced software and digital platforms.

According to TPACK, effective ICT integration is not simply about having knowledge in these three areas in isolation. Rather, it requires a sophisticated blending of them. For instance, Technological Pedagogical Knowledge (TPK) involves understanding how specific technologies can change teaching and learning. Technological Content Knowledge (TCK) is about knowing how technology can be used to represent and explore concepts in a particular subject area. The ultimate goal is achieving TPACK, the integrated knowledge that enables a teacher to select and use appropriate technologies to teach specific content in a pedagogically sound manner.

By synthesizing UTAUT and TPACK, this study constructs a more holistic analytical model. UTAUT explains the conditions under which a teacher in Loitokitok becomes willing and able to use ICT (e.g., they believe it will improve student scores, find it easy to use, are encouraged by their principal, and have access to a working projector). TPACK then explains the quality and effectiveness of that use (e.g., the teacher skillfully uses the projector not just to display notes, but to show a dynamic simulation that makes an abstract science concept tangible and understandable). This dual framework allows us to assess not only the adoption of ICT but, more critically, the quality of its pedagogical integration and its ultimate influence on student performance.

2.2 Empirical Review: Teachers' Competency and ICT Integration

The discourse on ICT in education has progressively shifted from a focus on access to a more critical examination of pedagogical application. Infrastructure is a necessary but insufficient condition for educational transformation; the teacher remains the central agent in this process. A substantial body of literature affirms that the competency, confidence, and pedagogical creativity of teachers are the most significant predictors of whether ICT integration leads to improved student outcomes (Tondeur et al., 2019).

Globally, studies in developed nations have established a strong link between teacher ICT competency and student achievement. Tondeur, van Braak, and Ertmer (2019), in a multi-country study across technologically advanced settings, found that ICT-competent teachers were more adept at creating learner-centered environments. Their use of simulations, collaborative platforms, and educational software correlated with higher levels of student engagement and superior performance, particularly in STEM subjects. This research underscores that competency is not merely technical skill but the ability to weave technology into the fabric of pedagogy.

In the context of Sub-Saharan Africa, this linkage is equally potent, though often constrained by contextual challenges. A study in Ghana by Ofori-Kwakye and Boateng

(2020) revealed that junior secondary school teachers proficient in using interactive digital tools fostered deeper conceptual understanding among their students. However, the study also found that a majority of teachers possessed only basic ICT skills, limiting their use to static PowerPoint presentations. This highlights a critical gap between potential and practice, where a lack of advanced pedagogical training in ICT restricts its transformative power. Similarly, a qualitative study in Uganda by Mugisha and Nakabugo (2021) showed that teachers who underwent specific ICT competency training were more confident and effective integrators of technology, and their students consistently outperformed peers in national examinations. These studies collectively argue that investment in teacher training is paramount for realizing the academic benefits of ICT.

Research within Kenya echoes these findings, consistently identifying teacher proficiency as a key determinant of successful ICT integration. A study in Meru County by Muthomi and Muthaa (2022) discovered that while most junior secondary teachers had foundational ICT skills, they lacked the pedagogical knowledge to apply these skills effectively in the classroom. Schools where teachers were able to move beyond basic use saw marked improvements in student performance in continuous assessments. In Machakos County, Wambua and Ndungu (2020) found a strong positive correlation between teachers' digital literacy and student achievement in English and Mathematics. Critically, teachers with high ICT competence were able to leverage digital platforms for collaborative learning and real-time assessment, which significantly boosted student outcomes.

The rollout of the CBC in Kenya has placed further emphasis on teacher ICT competency. Mwangi and Njoroge (2021), studying CBC implementation in Nairobi, showed that ICT-competent teachers were more effective at facilitating CBC-aligned strategies like project-based learning and digital assessments. However, a significant limitation of much of the existing Kenyan research is its geographical focus on urban or peri-urban counties. These settings often have better infrastructure and more access to training opportunities, making their findings difficult to generalize to marginalized rural areas like Loitokitok Sub-County.
The literature overwhelmingly indicates that the effectiveness of ICT in improving academic performance is fundamentally mediated by the teacher. While global and national studies affirm this, a clear research gap persists regarding the specific dynamics of teacher-led ICT integration in under-resourced, rural Kenyan contexts. This study seeks to fill this gap by focusing squarely on the pedagogical practices of teachers in Loitokitok, providing context-specific evidence on how their confidence, lesson design, and instructional strategies influence student achievement in junior secondary schools.

3. Research Methodology

This study adopted a descriptive survey research design to gather comprehensive information on existing practices, attitudes, and the relationship between teachers' ICT lesson integration and student academic performance. The study was conducted in the 30 public junior secondary schools of Loitokitok Sub-County, Kajiado County, a predominantly rural and semi-arid region in Kenya. The target population included 228 junior secondary school teachers, 76 head teachers, and 3 Curriculum Support Officers (CSOs).

A stratified random sampling technique was employed, with schools stratified by the three educational zones in the sub-county. A total of 30 schools were randomly selected. From each selected school, three teachers were randomly chosen, resulting in a sample of 90 teachers. All 30 head teachers from the sampled schools were purposively included, and a census approach was used for the 3 CSOs. Additionally, 152 learners from Grades 7-9 were selected through stratified random sampling. The final sample size was 305 respondents.

A mixed-methods approach was used for data collection. Questionnaires with Likert-scale items were administered to the 90 teachers and 150 learners to collect quantitative data on perceptions of ICT integration, confidence levels, and academic impact. Semi-structured interview guides were used with the 30 head teachers and 3 CSOs to gather in-depth qualitative data on institutional support, training initiatives, and observed pedagogical practices.

Quantitative data were coded and analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics (frequencies, means, standard deviations) were used to summarize the data. To assess the relationship between variables, inferential statistics including linear regression analysis and chi-square tests were employed. Qualitative data from interviews were transcribed and analyzed thematically to identify recurring patterns and provide rich context to the quantitative findings. Ethical considerations, including informed consent and confidentiality, were strictly adhered to throughout the research process.

4. Findings

The study achieved a near-perfect response rate of 99%, ensuring the reliability and representativeness of the findings. This section presents the results pertaining to the influence of teachers' ICT lesson integration on student academic performance.

4.1 Descriptive Findings on ICT Lesson Integration

The perceptions of both teachers and learners were captured to provide a multi-faceted view of ICT integration in the classroom.

4.1.1 Teachers’ Perspectives on ICT Lesson Integration

Teachers' responses, summarized in Table 4.12, indicate a high degree of confidence and a positive perception of ICT's impact on teaching and learning. A striking 81% of teachers reported being "confident" or "very confident" in integrating ICT tools into their daily teaching activities (M=4.02). This suggests that a majority of educators in Loitokitok have overcome initial technophobia and feel equipped to use digital tools. Furthermore, 72% of teachers affirmed that they actively design lessons incorporating ICT, indicating a conscious pedagogical shift. Crucially, 83% of teachers agreed that ICT integration has helped improve learner engagement and understanding (M=4.16), the most positively rated item. This directly links teacher practice to student outcomes. However, a notable area of concern was support and training; only 58% of teachers felt they had received adequate support, signaling a potential gap between confidence and continuous professional development.

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Table 4.12: Teachers' Responses on ICT Lesson Integration (N = 90)

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev.
1. I am confident in integrating ICT tools into daily teaching activities	2 (2%)	5 (6%)	10 (11%)	45 (50%)	28 (31%)	4.02	0.89
2. I design lessons that incorporate ICT to support learning	3 (3%)	7 (8%)	15 (17%)	40 (44%)	25 (28%)	3.86	0.95
3. I encourage students to use ICT in assignments and research	1 (1%)	6 (7%)	12 (13%)	42 (47%)	29 (32%)	4.02	0.87
4. ICT integration has helped improve learner engagement & understanding	2 (2%)	4 (4%)	10 (11%)	38 (42%)	36 (41%)	4.16	0.91
5. I have received adequate support/training on ICT lesson integration	6 (7%)	12 (13%)	20 (22%)	30 (33%)	22 (25%)	3.56	1.12

Source: Field Data 2025

4.1.2 Learners' Perspectives on ICT Lesson Integration

Learners' responses, detailed in Table 4.13, largely corroborated the teachers' views. A combined 77% of learners agreed that their teachers regularly use ICT in lessons (M=3.94). This alignment between teacher claims and student experience strengthens the validity of the findings. Most importantly, learners perceived a direct academic benefit from this integration. An overwhelming 83% stated that ICT-based lessons help them "understand difficult topics better" (M=4.07), and 84% felt these lessons made them "more interested and engaged in class" (M=4.14). This highlights ICT's dual role in enhancing both cognitive understanding and affective engagement. Finally, 77% of learners agreed that using ICT during lessons has "improved my academic results" (M=3.90), providing a direct learner-perceived link between ICT integration and performance.

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Table 4.13: Learners' Responses on ICT Lesson Integration (N = 150)

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev.
6. My teachers regularly use ICT tools when teaching lessons.	5 (3%)	10 (7%)	20 (13%)	70 (47%)	45 (30%)	3.94	0.93
7. Lessons where ICT is used help me understand difficult topics better.	3 (2%)	7 (5%)	15 (10%)	75 (50%)	50 (33%)	4.07	0.87
8. Teachers encourage us to use ICT for assignments and projects.	8 (5%)	12 (8%)	25 (17%)	65 (43%)	40 (27%)	3.79	0.99
9. ICT-integrated lessons make me more interested and engaged in class.	2 (1%)	8 (5%)	15 (10%)	70 (47%)	55 (37%)	4.14	0.84
10. Using ICT during lessons has improved my academic results.	6 (4%)	10 (7%)	19 (13%)	72 (48%)	43 (29%)	3.90	0.94

Source: Field Data 2025

4.2 Inferential Findings on ICT Lesson Integration and Academic Performance
To determine the statistical influence of teachers' ICT lesson integration on academic performance, linear regression and chi-square tests were conducted.
The regression model summary (Table 4.14) reveals an exceptionally strong relationship. The correlation coefficient (R) of 0.973 indicates a near-perfect positive correlation between ICT lesson integration and academic performance. The coefficient of determination (R Square) of 0.947 is profoundly significant, indicating that 94.7% of the variance in student academic performance is explained by the quality of teachers' ICT lesson integration. This is a powerful finding, suggesting that pedagogical application of ICT is the single most dominant factor influencing academic outcomes in this context.

Table 4.14: Model Summary on ICT Lesson Integration

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F Change	Sig. F Change
1	.973	.947	.946	.23666	1571.222	.000

Source: Field Data 2025

The ANOVA test (Table 4.15) confirms the statistical significance of the model, with an F-value of 1571.222 and a p-value of .000. This indicates that the relationship is not due to random chance and that ICT lesson integration is a reliable predictor of academic performance.
The results presented in Table 3 indicate a very strong relationship between the independent variables and the dependent variable. The correlation coefficient (R = 0.973) shows a very high positive correlation**,** suggesting that changes in the predictor variables are closely associated with changes in the outcome variable.

The coefficient of determination (R Square = 0.947) reveals that 94.7% of the variance in the dependent variable can be explained by the model's predictors. This means the model provides an excellent fit to the data, leaving only 5.3% of the variation unexplained by other factors not included in the model.

The Adjusted R Square value (0.946) is slightly lower than the R Square, indicating that the model remains robust even after adjusting for the number of predictors. The standard error of the estimate (0.23666) is relatively low, further confirming the model's high accuracy in predicting the dependent variable.

The F-statistic value (F = 1571.222) with a significance level of $p < 0.001$ shows that the overall regression model is statistically significant. This means that the independent variables, taken together, reliably predict the dependent variable and the model is not due to random chance.

Table 4.15: ANOVA on ICT Lesson Integration

Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	87.998	1	87.998	1571.222	.000
Residual	4.929	88	.056		
Total	92.926	89			

Source: Field Data 2025

The regression coefficients (Table 4.16) quantify this impact. The unstandardized coefficient (B = 1.028) shows that for every one-unit increase in the quality of ICT lesson integration, student academic performance increases by 1.028 units. The standardized Beta coefficient (β = 0.973) confirms that this variable has a very strong effect size.

The ANOVA results in Table 4 show that the regression model is highly significant ($F(1, 88) = 1571.222$, $p < 0.001$). This indicates that the independent variable(s) included in the model explain a statistically significant proportion of the variance in the dependent variable.

Specifically, the regression sum of squares (SSR = 87.998) is much larger than the residual sum of squares (SSE = 4.929)**,** suggesting that the model accounts for the majority of the total variance **(**ST = 92.926**)** in the dependent variable. This aligns with the earlier R Square value of 0.947**,** meaning that approximately 94.7% of the variation in the dependent variable is explained by the predictors.

The very high F-statistic (1571.222) further confirms the model's strength and statistical significance, implying that the predictor variable(s) contribute meaningfully to explaining the observed outcomes, and the likelihood that these results occurred by chance is extremely low ($p < 0.001$).

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Table 4.16: Coefficients on ICT Lesson Integration

Model	Unstandardized Coefficients (B)	Std. Error	Standardized Coefficients (Beta)	t	Sig.
(Constant)	-0.305	0.105		-2.913	0.005
ICT Lesson Integration	1.028	0.026	0.973	39.639	0.000

Source: Field Data 2025

Finally, the chi-square test (Table 4.17) showed a highly significant association between the categorical variables of ICT integration practices and academic performance levels (Pearson Chi-Square = 722.308, p = .000). This reinforces the finding that the way ICT is integrated into lessons is strongly linked to student success.

The coefficients presented in Table 5 show the contribution of ICT Lesson Integration to predicting students' academic performance**.**

The unstandardized coefficient (B = 1.028) indicates that for every one-unit increase in ICT lesson integration, students' academic performance is expected to increase by 1.028 units**,** holding other factors constant. This suggests a strong positive relationship between ICT integration and academic outcomes.

The standardized beta coefficient (β = 0.973) further confirms that ICT lesson integration has a very strong standardized effect on academic performance, making it a dominant predictor in the model.

The constant value (B = -0.305, p = 0.005) is statistically significant, implying that when ICT integration is absent, students' academic performance would be slightly below the mean reference point.

The t-value (t = 39.639, p < 0.001) shows that ICT lesson integration significantly predicts academic performance at the 0.05 level. This means the observed effect is highly statistically significant**,** and the likelihood that it occurred by chance is extremely low.
Overall, the results suggest that enhancing ICT integration in teaching substantially improves students' learning outcomes and performance levels.

Table 4.17: Chi-Square Tests on ICT Lesson Integration

Test	Value	df	Asymptotic Sig. (2-sided)
Pearson Chi-Square	722.308	272	.000
Likelihood Ratio	341.766	272	.003
Linear-by-Linear Association	84.280	1	.000

Source: Field Data 2025

The Chi-Square results presented in Table 6 show the association between ICT integration in teaching and learning and students' academic performance. The Pearson Chi-Square value (χ^2 = 722.308, df = 272, p < 0.001) indicates a highly significant association between ICT integration variables and academic performance. This means that differences in students' academic performance are strongly related to the extent of ICT use in lessons.

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Similarly, the Likelihood Ratio (χ^2 = 341.766, p = 0.003) confirms this significant association, reinforcing the robustness of the relationship between the two variables. The Linear-by-Linear Association value (χ^2 = 84.280, $p < 0.001$) suggests a clear positive linear relationship, implying that as the level of ICT integration in lessons increases, students' academic performance also tends to improve consistently. Overall, the Chi-Square test results support the conclusion that ICT integration in teaching has a statistically significant and positive influence on learners' academic performance.

5. Discussion

The findings of this study powerfully assert that the pedagogical integration of ICT by teachers is a far more significant determinant of student academic performance than the mere provision of technology. The exceptionally high R-squared value (0.947) suggests that in the rural context of Loitokitok, *how* a teacher uses technology in the classroom almost entirely explains the variation in student academic success related to ICT. This central finding challenges the infrastructure-centric discourse that often dominates discussions of ICT in developing contexts and firmly places the focus on teacher capacity and pedagogy.

The high levels of teacher confidence (M=4.02) and perceived positive impact on student engagement (M=4.16) align with the UTAUT framework. This confidence reflects a strong *performance expectancy*—teachers in Loitokitok believe that using ICT leads to better teaching and learning. This belief is a critical first step in technology adoption. Furthermore, the corroboration from learners that ICT makes lessons more engaging (M=4.14) and easier to understand (M=4.07) reinforces the *effort expectancy* from a student perspective; technology reduces the cognitive load of difficult subjects, thereby motivating its use.

However, confidence alone is insufficient. The effectiveness of this integration is best explained by the TPACK framework. The fact that 72% of teachers actively design lessons incorporating ICT, and that learners report better understanding of complex topics, suggests that teachers are beginning to blend Technological Knowledge (TK) with Pedagogical Knowledge (PK) and Content Knowledge (CK). When a teacher uses a video simulation to explain a biological process, they are not just using technology (TK); they are employing a pedagogical strategy (PK) to make difficult content (CK) more accessible. This study provides empirical evidence that this TPACK-in-action is what drives academic performance. The qualitative data, which highlighted that younger, more digitally native teacher were often more adept at this, suggests that their inherent TK allows for a more seamless integration with their PK and CK.

This study's findings resonate with, and extend, existing literature. While Alshammari (2021) found teacher confidence to be a key determinant of ICT adoption, this study quantifies its direct impact on performance in a marginalized African context. The strong predictive power of lesson integration supports the work of Tondeur et al. (2021), who argue that effective ICT integration fosters higher-order thinking skills. This research provides a stark quantitative measure of that argument, suggesting the impact is not marginal but transformative.

Crucially, the study also illuminates a critical vulnerability: the gap in professional development. With only 58% of teachers feeling adequately supported, there is a clear disconnect between their intrinsic motivation to use ICT and the external support required to do so effectively and sustainably. This aligns with findings from Buabeng-Andoh and Essel (2023) in Ghana, who noted that inconsistent training limits the full potential of ICT. This is where the UTAUT model's *facilitating conditions* become critical. Without adequate training, technical support, and institutional encouragement, even the most confident teachers may see their efforts stymied. From a TPACK perspective, professional development is the primary mechanism for building teachers' integrated knowledge base. A lack of training means that teachers may remain proficient in one domain (e.g., TK) but struggle to effectively synthesize it with the others, leading to superficial or ineffective ICT use.

6. Conclusion and Recommendations

6.1 Conclusion

This study concludes that in the context of rural junior secondary schools in Kenya, the pedagogical practice of teachers is the lynchpin for unlocking the potential of ICT to improve student academic performance. While infrastructure is an important enabler, it is the teacher's confidence, skill in instructional design, and ability to create engaging, technology-enhanced learning experiences that overwhelmingly predict student success. The findings demonstrate a clear and powerful positive relationship between the quality of teacher-led ICT lesson integration and academic outcomes. The act of thoughtfully weaving technology into the curriculum to make learning more interactive, comprehensible, and engaging is what truly matters. However, this potential is constrained by a significant gap in continuous professional development, which threatens the sustainability and equity of ICT integration. Ultimately, this research posits a shift in focus: from merely providing technology to empowering the teachers who turn that technology into meaningful learning.

6.2 Recommendations

Based on these conclusions, the following recommendations are proposed:

1. Prioritize Pedagogy-Focused Teacher Training: The Ministry of Education and Teachers Service Commission (TSC) should shift the focus of ICT training from basic digital literacy to advanced pedagogical integration. Professional development programs should be continuous, context-specific, and centered on the TPACK framework, equipping teachers with strategies to use ICT creatively to teach their specific subjects.
2. Establish Strong Institutional Support Systems: School leadership must create an enabling environment that supports ICT integration. This includes developing clear school-based ICT policies, facilitating peer-mentoring programs where digitally proficient teachers can support their colleagues, and allocating time in the school schedule for collaborative ICT-based lesson planning. This directly addresses the need for better *facilitating conditions* as identified in the UTAUT model.
3. Invest in Sustainable and Relevant Resources: While pedagogy is key, it cannot exist in a vacuum. Policy-makers and development partners should ensure that resource provision is aligned with pedagogical goals. This includes providing not just hardware, but also access to curated digital content, educational software, and reliable internet connectivity that supports the curriculum.
4. Incentivize and Recognize Innovative Teaching: To foster a culture of innovation, the TSC and school management should create mechanisms to recognize and reward teachers who demonstrate excellence in ICT lesson integration. This can foster positive *social influence* and motivate more teachers to move beyond basic use towards transformative pedagogical practices.

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