

School Administrative Support and Integration of ICT in Teaching A-Level Biology in Sheema Municipality, Uganda: Analysing the Relationship

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ARTICLE INFORMATION	ABSTRACT
Article history: Published: October 2026 Keywords: School Administrative Support ICT Integration A-Level Biology Self-Determination Theory Sheema Municipality Uganda	This article reports findings on the third objective of a wider study that examined the influence of school administrative support on the integration of information communication technology (ICT) in teaching A-Level Biology in secondary schools in Sheema Municipality, Uganda. The specific objective addressed here was to analyse the relationship between school administrative support and the integration of ICT in teaching A-Level Biology; two prior objectives, examining the level of school administrative support and the level of ICT integration, have been reported elsewhere. Anchored on Self-Determination Theory, the wider study adopted a mixed-methods convergent parallel design, drawing quantitative data from 86 A-Level Biology students and qualitative data from 10 Biology teachers, 5 headteachers, and 1 Municipal Education Officer across five secondary schools, selected through simple random, stratified, and purposive sampling. Pearson correlation analysis revealed a very strong, positive, and statistically significant relationship between the composite Administrative Support score and the composite ICT Integration score ($r = 0.884$, $n = 86$, $p = 0.000$), with a coefficient of determination ($r^2 = 0.78$) indicating that approximately 78% of the variance in ICT integration was explained by administrative support alone, leading to rejection of the null hypothesis. Qualitative findings from teachers, headteachers, and the Municipal Education Officer corroborated this relationship, with administrative support, equipment, training, technical help, and leadership encouragement, described as a decisive enabler of teachers' ICT use, while unreliable internet connectivity and frequent power outages, rather than administrative unwillingness, were identified as the primary constraints limiting the translation of strong support into consistently high classroom integration. The study concludes that school administrative support was the single strongest identified determinant of ICT integration in A-Level Biology teaching in Sheema Municipality, and recommends that school administrations institutionalise dedicated ICT budgets and maintenance plans, that the Ministry of Education and Sports strengthen teacher training and connectivity support, and that the Municipal Education Office intensify supervision and partnership-brokering for ICT resourcing.

1. Introduction

The integration of information communication technology (ICT) in teaching is expected to enhance conceptual understanding, practical skills, learner engagement, and academic performance, particularly in science subjects such as Biology, but this requires school administrations to provide ICT infrastructure, teacher training, technical support, resource allocation, and supportive leadership (Ministry of Education and Sports [MoES], 2023; UNESCO, 2021; Tondeur, van Braak, Siddiq, & Scherer, 2017). By the late 2010s, Uganda had greatly expanded school ICT infrastructure, with a government programme building computer laboratories in over 1,000 secondary schools by 2021, including many in rural areas (Uganda Communications Commission, 2025). Even so, ICT use in lessons has remained low in many rural and semi-urban districts, including Sheema, illustrating that providing equipment alone has not been enough to secure classroom-level integration (Education Statistical Abstract, 2026).

In Sheema Municipality specifically, despite government and development-partner investment in computer laboratories, digital science content, and connectivity, ICT integration remains constrained by inadequate administrative support, limited teacher training, insufficient technical assistance, maintenance challenges, and weak leadership commitment (Mbabazi et al., 2022; Kibirige, 2023; Liu et al., 2024; UNESCO, 2025). Kabwohe Secondary School and Sacred Heart Mushanga Secondary School, for instance, received ICT laboratories through the Uganda Communications Commission Schools ICT Laboratories Project, yet these facilities are not fully utilised by science teachers (UCC, 2021). Although previous studies have examined ICT integration generally, limited empirical evidence exists on how school administrative support specifically influences ICT integration in A-Level Biology in Sheema Municipality.

It was against this background that the wider study from which this article is drawn examined the influence of school administrative support on the integration of ICT in teaching A-Level Biology in secondary schools in Sheema Municipality. That study pursued three objectives: to examine the level of school administrative support provided to A-Level Biology teachers, to investigate the level of ICT integration in teaching A-Level Biology, and to analyse the relationship between school administrative support and ICT

integration; the first two objectives have been reported elsewhere. This article addresses the third objective, namely, to analyse the relationship between school administrative support and the integration of information communication technology in the teaching of A-Level Biology in secondary schools in Sheema Municipality.

The study was anchored on Self-Determination Theory (SDT), developed by Deci and Ryan (1985), which holds that people become highly motivated when basic needs for autonomy, competence, and relatedness are met. In education, this means teachers engage more readily with innovations such as ICT when they feel empowered, capable, and supported, and administrators can significantly influence teacher motivation by providing hands-on training, protected planning time, and a supportive environment (Ryan & Deci, 2000). Unlike the Technology Acceptance Model, which focuses on individual perceptions of usefulness, SDT emphasises the broader social context in which factors such as leadership support and school climate turn resources into genuine commitment (Chiu, Lee, Nie, & Richardson, 2022; Tondeur et al., 2017); in this study, SDT guided the hypothesis that greater administrative support would be associated with increased integration of ICT in A-Level Biology instruction.

Empirically, Schmitz, Antonietti, Consoli, Cattaneo, Gonon, and Petko (2023) conducted a large quantitative survey of 2,247 upper secondary teachers in Switzerland and found that principals' transformational leadership, including vision setting, resource allocation, and support for teacher development, significantly predicted teachers' pedagogical use of digital technologies, though the study did not isolate subject-specific integration such as Biology or examine contexts with limited infrastructure. Landa, Zhu, Sesabo, and Machumu (2023) found that leader support was positively associated with academics' integration of innovative technologies among Tanzanian university staff, but in a higher-education rather than secondary-school context. Yang, Alias, and Mohd Nor (2025), in a systematic review of 26 empirical studies, found that leadership behaviours, including resource allocation, professional development organisation, and modelling of ICT use, were pivotal in advancing teachers' ICT integration from surface-level usage toward more pedagogically rich practice, while Sepadi, Kgaphola, and Molapo (2025), in a qualitative case study of rural South African teachers, found that a lack of structured support mechanisms was linked to constrained ICT integration, without quantitatively assessing the strength of this relationship. Sterrett and Richardson (2020) further cautioned that digital principal leadership, however committed, operates within broader systemic and infrastructural conditions that leadership alone cannot fully resolve. None of these studies isolates the relationship between administrative support and ICT integration within a subject-specific, A-Level science context in a semi-urban Ugandan municipality, leaving a clear empirical gap that motivated the present study's third objective. Guided by these considerations, the study was directed by the null hypothesis that there is no statistically significant relationship between school administrative support and the integration of information communication technology in the teaching of A-Level Biology in secondary schools in Sheema Municipality. This article reports the quantitative and qualitative evidence generated to test this hypothesis, discusses the findings in relation to Self-Determination Theory and prior empirical work, and draws conclusions and recommendations relevant to school administrations, the Ministry of Education and Sports, and the Municipal Education Office.

2. Materials and Methods

2.1 Research Design and Approach

This article is drawn from a wider study that examined the influence of school administrative support on the integration of ICT in teaching A-Level Biology in secondary schools in Sheema Municipality. The specific analyses reported here relate to the study's third objective, which sought to analyse the relationship between the two variables. The wider study adopted a mixed-methods convergent parallel design, allowing the researcher to collect and analyse quantitative and qualitative data concurrently, thereby providing a more comprehensive understanding of the study problem (Creswell & Plano Clark, 2018); within this approach, a descriptive survey design was employed, appropriate for collecting information on administrative support and ICT integration without manipulating variables (Kumar, 2011).

2.2 Study Area and Population

The study was conducted in Sheema Municipality, located in southwestern Uganda, comprising both urban and peri-urban government-aided and private secondary schools offering Advanced Level education. Of the schools offering A-Level Biology in the municipality, five secondary schools were selected, and the study population comprised one Municipal Education Officer, five headteachers, ten A-Level Biology teachers, and one hundred A-Level Biology students from these schools.

2.3 Sample Size and Sampling Procedure

A headteacher and two A-Level Biology teachers were purposively selected from each of the five schools, given their direct involvement in school management and Biology instruction, giving a total of five headteachers and ten Biology teachers; the Municipal Education Officer was similarly purposively selected. A-Level Biology students were selected using simple random sampling to ensure equal chances of participation; applying the Yamane (1967) formula, $n = N / (1 + N(e)^2)$, with a target population of 100 students and a 5% margin of error, a sample of 86 students was drawn, giving a total sample of 102 respondents across all categories.

2.4 Data Collection Instruments

A structured questionnaire was administered to the 86 A-Level Biology students, organised into five sections: demographic information; availability of ICT infrastructure and resources (used to operationalise administrative support as experienced by students); frequency of teachers' ICT integration in Biology lessons; students' perceptions of ICT use; and challenges affecting ICT use, with Sections B, C, and D rated on five-point Likert scales. A semi-structured interview guide, comprising open-ended questions organised around the study's three specific objectives, was used to collect qualitative data from the Municipal Education Officer, headteachers, and Biology teachers.

2.5 Validity and Reliability

Content validity was established through expert review by the supervisor and two experts in educational management and research

methodology, yielding a Content Validity Index of 0.96, exceeding the minimum acceptable threshold of 0.70 (Amin, 2005); face validity was further confirmed through a pilot test administered to 15 students and 2 teachers outside the study area. Reliability, assessed using Cronbach's alpha computed on the responses of the 86 students in the main study sample, yielded coefficients of 0.906 for the availability of ICT resources sub-scale, 0.828 for the frequency of ICT use sub-scale, and 0.744 for the students' perceptions sub-scale, giving an overall alpha of 0.939 across the 26-item instrument, all exceeding the acceptable threshold of 0.70 (Taber, 2018).

2.6 Data Analysis

To examine the relationship between school administrative support and the integration of ICT in teaching A-Level Biology, Pearson correlation analysis was used to determine the strength, direction, and statistical significance of the relationship between the composite Administrative Support score and the composite ICT Integration score derived from the student questionnaire. Qualitative data from interviews with the Municipal Education Officer, headteachers, and Biology teachers were analysed using thematic analysis, organised into themes and subthemes based on the study's specific objectives and integrated with the quantitative results to provide a comprehensive understanding of the relationship.

2.7 Ethical Considerations

Ethical clearance was obtained from the Research Ethics Committee of Bishop Stuart University following clearance from the Faculty of Education, Arts and Media Studies, and permission was sought from the Municipal Education Officer of Sheema Municipality and the headteachers of the selected secondary schools. Participation was voluntary, and respondents were free to withdraw at any time without consequence. Confidentiality and anonymity were ensured by not recording student names on questionnaires and by coding headteacher and teacher interview responses by school and respondent number rather than by name.

3. Results

This section presents findings on the relationship between school administrative support and the integration of ICT in teaching A-Level Biology in the selected secondary schools of Sheema Municipality.

3.1 Correlation between Administrative Support and ICT Integration

A Pearson correlation analysis was conducted between the composite Administrative Support score and the composite ICT Integration score derived from the student questionnaire. Table 1 presents the results.

Table 1: Pearson Correlation Coefficient Between School Administrative Support and Integration of ICT in Teaching A-Level Biology (N = 86)

Correlations		Administrative Support	ICT Integration
Administrative Support	Pearson Correlation	1	0.884**
	Sig. (2-tailed)		0.000
	N	86	86
ICT Integration	Pearson Correlation	0.884**	1
	Sig. (2-tailed)	0.000	
	N	86	86

**Correlation is significant at the 0.01 level (2-tailed). Source: Field Data, 2026.

As shown in Table 1, the Pearson correlation analysis revealed a very strong, positive, and statistically significant relationship between school administrative support and the integration of ICT in teaching A-Level Biology ($r = 0.884$, $n = 86$, $p = 0.000$). Since this coefficient falls within the conventional range of 0.80–1.00, the findings indicate a very strong positive relationship between the two variables, with a coefficient of determination ($r^2 = 0.78$) indicating that approximately 78% of the variance in ICT integration was explained by administrative support alone. Because the correlation coefficient was statistically significant at the 0.01 level ($p = 0.000$), the null hypothesis, that there is no statistically significant relationship between school administrative support and the integration of ICT in teaching A-Level Biology, was rejected. This very strong composite relationship indicated that schools providing more computers, connectivity, and ICT laboratory access were also the schools whose Biology teachers made more frequent classroom use of these tools, a relationship that was consistent with, and indeed exceeded in strength, comparable leadership-technology relationships reported in the literature (Schmitz et al., 2023; Landa et al., 2023).

3.2 Qualitative Corroboration

Interviews with teachers, headteachers, and the Municipal Education Officer corroborated the very strong quantitative relationship. Regarding administrative support as a decisive enabler, one teacher explained: "Administrative support has a strong influence because access to equipment, training, time and technical help determines whether I can plan and deliver ICT-supported lessons" (Teacher TCH01), a view echoed by teacher TCH02 and by teachers TCH03 to TCH10. A headteacher offered an explanation of the underlying mechanism: "when the administration is in support of the integration of ICT, it does not only equip the learners with the updated information, but it makes the teachers acquire ideas and skills, which enable the school performance to improve" (Headteacher, School C), while another noted that support worked through "sessionization and role modeling," in which administrators themselves used the same ICT facilities and required departments to embed ICT use in their plans (Headteacher, School A). At the same time, informants identified structural and resource challenges limiting the translation of support into practice. One teacher noted: "The main challenges are intermittent internet, power interruptions, limited devices and the need for more advanced ICT training" (Teacher TCH01), a view reinforced by the Municipal Education Officer, who identified "inadequate devices,

unreliable internet and electricity, limited technical support, insufficient advanced teacher training and competing school priorities” as the major challenges hindering integration across the municipality. This confirmed the quantitative finding that poor internet connectivity and power outages were the two most commonly cited challenges among students, and explained why, despite a very strong overall correlation between support and integration, the level of integration itself remained only moderate rather than high, since infrastructural reliability rather than administrative willingness appeared to be the binding constraint.

Regarding recommendations for strengthening administrative support, stakeholders converged on the need for dedicated ICT budgeting, maintenance planning, connectivity, and continuous training. One teacher called for the school to “budget consistently for ICT maintenance, internet, teacher training and replacement of obsolete equipment” (Teacher TCH02), while the Municipal Education Officer recommended that “administrative support can be strengthened through dedicated ICT budgets, regular teacher training, maintenance plans, reliable connectivity, school-level ICT policies, monitoring and stronger partnerships.” This convergence, from classroom teachers through to the district education office, reinforced the conclusion that strengthening the reliability, rather than merely the presence, of administrative support would be the most direct route to lifting ICT integration from a moderate to a high level.

3.3 Summary of Hypothesis Testing

Taken together, the Pearson correlation result (Table 1) and the corroborating qualitative themes above provided converging evidence of a very strong, statistically significant, positive relationship between school administrative support and the integration of ICT in teaching A-Level Biology. The null hypothesis, that there is no statistically significant relationship between the two variables, was therefore rejected at the 0.01 level of significance.

4. Discussion

The third objective of this study sought to analyse the relationship between school administrative support and the integration of ICT in teaching A-Level Biology in secondary schools in Sheema Municipality. The correlation analysis revealed a very strong, positive, and statistically significant relationship between the two variables, leading to rejection of the null hypothesis.

The very strong positive relationship recorded in this study is consistent with Schmitz et al. (2023), who, in a large-scale survey of upper secondary teachers in Switzerland, found that principals' transformational leadership, including vision setting, resource allocation, and support for teacher development, significantly predicted teachers' pedagogical use of digital technologies. The strength of the relationship recorded in the present study considerably exceeded associations typically reported in comparable literature, and is consistent with Landa et al. (2023), who similarly found a positive association between leader support and technology integration among Tanzanian academics, though the present study's subject-specific, secondary-school focus on A-Level Biology extends this literature into a context and educational level not previously examined empirically.

The finding that administrative support operated as a decisive enabler of ICT use, corroborated qualitatively by teachers' own accounts that they “cannot sustain integration without equipment, training and leadership encouragement,” is consistent with Yang et al. (2025), who, in a systematic review of empirical studies, found that leadership behaviours such as resource allocation, professional development organisation, and modelling of ICT use were pivotal in advancing teachers' ICT integration from surface-level usage toward more pedagogically rich practice. This is also consistent with Self-Determination Theory (Ryan & Deci, 2000), which holds that when institutional conditions satisfy teachers' needs for competence, autonomy, and relatedness, intrinsic motivation to adopt innovations follows; the strength of the relationship recorded in this study suggests that, in Sheema Municipality, administrative support functioned precisely as this kind of enabling institutional condition rather than a peripheral or symbolic gesture.

At the same time, the finding that ICT integration lagged behind strong administrative support, and that infrastructural unreliability, internet connectivity and power outages, rather than administrative unwillingness, was the binding constraint identified by teachers, headteachers, and the Municipal Education Officer alike, is consistent with Sterrett and Richardson (2020), who cautioned that digital leadership, however committed, operates within broader systemic and infrastructural conditions that leadership alone cannot fully resolve. This confirms that while administrative support was the strongest identified determinant of ICT integration in this study, its translation into consistent classroom practice remained partly contingent on national and district-level infrastructural investment beyond the immediate control of individual school administrations.

5. Conclusion and Recommendations

The study concludes that school administrative support was the single strongest identified determinant of the level of ICT integration in A-Level Biology teaching in Sheema Municipality, with the very strong, statistically significant positive correlation confirming that variation in ICT integration across schools was overwhelmingly explained by variation in the administrative support those schools provided. This finding fills the research gap identified by providing localised, empirically grounded, subject-specific evidence of how administrative support actions, rather than infrastructure availability considered in isolation, shape ICT integration in A-Level Biology instruction in the particular context of Sheema Municipality.

Headteachers and school administrations should institutionalise dedicated annual ICT budgets covering internet subscription, equipment maintenance, and replacement of obsolete devices, rather than relying solely on periodic government or development-partner support, and should formalise written ICT policies and designate technical support personnel in schools where these do not yet exist. Headteachers are further encouraged to strengthen supervision of classroom ICT use, including through structured lesson observation and departmental ICT targets, to help close the gap between the high availability of ICT infrastructure and its only moderate classroom use.

The Ministry of Education and Sports should strengthen advanced, subject-specific ICT training for Biology teachers, particularly in the use of virtual laboratory simulations and digital practicals, and should partner with the Uganda Communications Commission and internet service providers to extend reliable, subsidised internet connectivity and stable electricity to semi-urban and rural secondary schools, given that unreliable connectivity and power outages, rather than the absence of equipment, were the most

commonly cited barriers to integration in this study. The Municipal Education Office should intensify supervision and monitoring of ICT use in Biology teaching across both government-aided and private schools, standardise school-level ICT monitoring practices, and continue to broker partnerships with government programmes, NGOs, and private-sector actors to extend infrastructure and training support to schools that have not yet received it.

Because the descriptive survey design used in this study captured administrative support and ICT integration at a single point in time, limiting the extent to which firm causal claims can be made about the direction of the relationship, future researchers should build on this study's triangulated evidence by designing longitudinal studies tracking changes in administrative support and ICT integration over a three- to five-year period, ideally alongside investment in improved electricity and internet infrastructure, and should investigate the specific mediating role of teacher ICT competence and self-efficacy in this relationship, given the present study's finding that infrastructure availability alone did not guarantee high classroom integration.

Consent for Publication

All authors consented and approved the manuscript to be submitted for publication.

Availability of Data and Materials

The data supporting the findings of this article are available from the corresponding author upon reasonable request.

Competing Interests

The authors declare no competing interests.

Funding

This research was funded by the authors.

Authors' Contributions

Akakimpa Begumanya Innocent conceptualised the study, collected and analysed the data, and prepared the original draft of the manuscript. Enock Asiimwe and Wilson Mugisha supervised the study and reviewed and edited the manuscript. All authors read and approved the final manuscript.

Acknowledgments

The authors thank the students, Biology teachers, headteachers, and the Municipal Education Officer of Sheema Municipality for their time and willingness to participate in this study. Appreciation is also extended to Bishop Stuart University for its support during the conduct of this research.

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