Editon Consortium Journal of Curriculum and Educational Studies [ISSN: 2663-9319]

Issue no: 01 | **Vol no:** 07 | **April** 2026: 18-32

Influence of Teachers' Education Level on the Use of Digital Devices in Teaching Agriculture in Public Secondary Schools in Nakuru County, Kenya

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Article History
Received: **2026.02.19**
Accepted: **2026.03.14**
Published: **2026.04.17**

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Cite this article in APA
Mwangi, M. N., Maina, S., & Mwangi, S. W. (2026). Influence of teachers' education level on the use of digital devices in agriculture teaching in public secondary schools, Nakuru County, Kenya. *Editon consortium journal of curriculum and educational studies*, *7*(1), 18-32. https://doi.org/10.51317/ecjces.v7i1.679

Abstract
The purpose of this article is to determine the influence of teachers' educational levels on the use of digital devices in Nakuru County, Kenya. The article aims to address the critical knowledge gap in the use of digital devices in teaching Agriculture, while accounting for instructors' educational levels. Despite the policy focus, the implementation and awareness of digital tools among Agriculture teachers remain notably subdued in many institutions, according to previous studies. The study was conducted among a population of 698 Agriculture teachers in Nakuru County, from which a sample of 168 was selected using a multi-stage sampling design. Reliability was confirmed via pilot testing involving 35 teachers in Nyandarua County, giving a Cronbach's alpha coefficient of 0.963. Using a cross-sectional survey design, the research analysed data from 140 completed questionnaires through SPSS Version 29. The Kruskal-Wallis H test revealed that educational qualification was a significant predictor of digital device use ($H(3) = 8.862$, $p = 0.031$). Post-hoc analysis using the Mann-Whitney U test confirmed that teachers with a Master's degree reported significantly higher digital device usage than those with an Undergraduate degree ($p = 0.003$), while differences in digital device usage across all other educational qualifications were non-significant. The study concludes that academic qualifications significantly influence the adoption of digital devices. The recommendation underscores the need to enhance digital infrastructure and strategically reinforce in-service training focused on pedagogical applications.

Key words: Agriculture, public secondary schools, teachers' level of education, teaching, use of digital devices.

INTRODUCTION

The rapid development of Information and Communication Technologies (ICT) has greatly enhanced education worldwide and transformed how learners and teachers interact with knowledge and skills (World Bank, 2016; UNESCO, 2023a). Despite ICTs' potential to transform teaching and learning, their transformative impact has been more gradual and uneven in Sub-Saharan Africa, including Kenya, due to persistent infrastructure and capacity constraints (Nsyengula et al., 2025). Specifically, ICT has revolutionised teaching in the school setting, promoting learner-centred pedagogies and increasing interest in subjects such as STEM and applied sciences, including Agriculture.

Governments and institutions around the world have placed increasing emphasis on the implementation of digital technologies in learning systems as a means of improving quality, access, and equity (OECD, 2023; UNESCO, 2023b). The implementation of digital learning environments can be successful on four pillars: hardware, software, digital content, and teacher competencies. The most common digital tools used in instruction delivery in secondary schools are laptops, projectors, interactive whiteboards, online learning systems, digital content repositories, and evaluation tools. They assist educators in creating interactive lessons, enabling the visualisation of complex ideas and enhancing engagement among learners (Ngoungouo, 2017).

Teachers in digitally enabled classrooms act as experts in subject matter as well as facilitators of the technology-enhanced learning. They are involved in preparing digital instructional content, handling student information, conducting assessments via digital platforms, and communicating with learners via web portals and learning management systems (Kiarie & Ondigi, 2025; Kenya Education Management Institute, 2021). Digital devices also help learners acquire the latest information, simulations, and animations that can make abstract or practical subjects more familiar. For example, digital simulations of crop development, weather projections, or videos of contemporary farming methods can be used to enhance Agricultural lessons and address the gap between theory and practice. Nonetheless, handwritten notes, printed books, and conventional lecture methods remain an indispensable part of teaching in most African states, such as Kenya and Tanzania (Pima, 2019). This means that the use of digital resources is limited, which also restricts learner-centred pedagogy and limits the opportunity to be interactive and self-directed.

Teachers' features are central to ICT adoption. Higher academic qualifications may lead to greater exposure to ICT integration, more advanced pedagogical training, and better digital literacy skills (Kisirkoi, 2015). On the other hand, a teacher with a diploma might not have the opportunity to take new ICT modules, which limits their use of digital resources.

This study is guided by the Technological Pedagogical Content Knowledge (TPACK) framework. The model emphasises the intersection of technological knowledge, pedagogical knowledge, and content knowledge for effective ICT integration (Shafie et al., 2019). In this case, the Agriculture subject is the critical area of focus for the secondary schools. The Technology Acceptance Model (TAM) further complements the framework by explaining teachers' behavioural intention to adopt digital devices based on perceived usefulness and ease of use (Schorr, 2023).

The government has been prioritising the use of digital devices in schools in Kenya, primarily through the initiation of the National ICT Strategy of Education and Training in 2006 and the Digital Literacy Programme (DLP) in 2016, which sought to provide schools with ICT infrastructure (Kenya Institute of Curriculum Development, 2023). Nevertheless, despite these efforts, additional issues related to implementation, such as poor infrastructure, the lack of technical support, teacher capacity building and unreliable access to electricity or internet in rural schools continue to be experienced (Odhiambo, 2019). The particular limitation is faced by public secondary institutions, which have a number of schools that do not have enough digital devices, and those that do, share the same facilities, such as a computer laboratory. This is particularly true of the teaching of Agriculture, which is among the most skill-oriented and practical subjects to be taught in the Kenyan curriculum. ICT can significantly be applied in agriculture education translation in the form of animation and simulations to illustrate how farming works, multimedia to explain how experiments involving soil and crops can be conducted, and access to updated agricultural data (Kiarie & Ondigi, 2025).

Integrating digital devices into the teaching and learning of Agriculture can enhance interactivity, promote practical engagement, and align instruction with current

agricultural practices. Although Kenya invests in installing and improving ICT infrastructure and training of teachers in ICT integration, the frequency of usage of digital devices by Agriculture teachers in secondary schools remains low, with some using conventional methods predominantly. Meanwhile, agricultural performance at the Kenya Certificate of Secondary Education (KCSE) has remained low, and the mean scores have been found to be below 50 per cent from 2018 to 2022. Research indicates that performance improves when digital devices are integrated into teaching and learning. Research indicates that there is limited use of digital tools by teachers in the actual teaching and learning of various subjects. In Kenya, specifically in Nakuru County, there is inadequate research-based evidence to explain how teachers' educational levels influence the use of digital resources in the teaching and learning of Agriculture. This study, therefore, targets examining the influence of teachers' education level on the use of digital devices in public secondary learning institutions of Nakuru County with the intention of developing an informed intervention to boost digital proficiency level and the quality of instruction delivery in Agriculture.

LITERATURE REVIEW

Regional and Local Trends in the ICT Adoption in Secondary Education

Systematic reviews have shown empirical evidence in Sub-Saharan Africa that, although global ICT integration in secondary education has promoted learner-centred pedagogies and increased engagement in Science, Technology, Engineering, and Mathematics (STEM) subjects, the adoption rates in the region are not uniform as a result of infrastructural and human capacity factors (Nsyengula et al., 2025). Technology-enhanced learning meta-analyses suggest that digital technologies, including simulations and multimedia materials, can be very helpful in providing conceptual knowledge in practical courses in case they are properly introduced by skilled instructors (Tondeur et al., 2015). The research conducted based on the Technological Pedagogical Content Knowledge (TPACK) model in East Africa indicates that effective ICT integration presupposes that teachers should have integrated knowledge of technology, pedagogy, and subject content, but most teachers work with fragmented TPACK competencies (Woldegiorgis, 2025). The supplementary information based on the Technology Acceptance Model (TAM) is that the intention to use digital devices by teachers is strongly predicted by perceived usefulness and ease of use, and more frequently by the level of qualification (greater levels of qualification are often associated with stronger positive perceptions) (Scherer et al., 2019; Schorr, 2023).

ICT in Agriculture Education: Improving Practical Learning

The study of agriculture in secondary schools demonstrates the breakthrough that could be achieved by digital devices in closing theory-practice gaps with the help of animations, virtual simulations of crop cycles, soil analysis tools, and real-time integration of weather data (Lukuyani et al., 2025). In Sub-Saharan Africa, the implementation of ICT-based agriculture education has been associated with positive changes in student performance in practical examinations, and experimental studies have shown up to 23 percentage points higher results in technology-intensive groups than in traditional lecture-based groups. Specific studies on Kenya indicate that multimedia tools and online repositories can be used to visualise intricate agricultural operations, but penetration into rural and peri-urban areas where traditional approaches are more common is low (De & Kaugi, 2023; Omariba et al., 2016)

Teacher Characteristics Affecting the ICT Adoption

There is a considerable amount of literature that finds teacher traits, such as age, gender, teaching experience, ICT skills, and attitudes, to be pivotal factors in digital device use in the classroom at the secondary level (Bariu, 2022; Mingaine, 2013). Systematic reviews in Kenya and other neighbouring nations indicate that positive attitudes of teachers towards ICT are a strong predictor of implementation, with odds ratios showing almost a doubling in adoption rates among supportive teachers (Bariu, 2022). There has been quite a bit of focus on gender and age, with some studies reporting a reduction in the gap in basic ICT access, yet still a difference in higher-level pedagogical utilisation. Professional development opportunities and teaching experience also turn out to be consistent predictors because teachers with specific training in the middle of their careers show greater integration rates (Njuguna, 2025).

Teachers' Qualifications and Technology Integration

Although the qualifications of teachers have been discussed in general terms in terms of overall pedagogical competence, there are limited studies that separate the effect of the level of education (e.g., Diploma, Undergraduate, Postgraduate, or Master's level) on digital device adoption in subject-specific cases like

Agriculture (Joshi & Khatiwada, 2025). Available data indicate that an increased level of academic achievement is positively associated with increased exposure to ICT modules in pre-service and in-service training, leading to improved digital literacy and confidence in technology-enhanced pedagogy (Opicho et al., 2025; Carballo, 2025). The integration of TPACK in practical subjects in postgraduate-trained teachers in Kenyan secondary schools is reportedly higher; nevertheless, the integration is usually across disciplines, but not specifically in Agriculture. Comparative research in East Africa also shows that teachers with diploma-level education are more challenged in receiving high-level ICT professional development that will help them effectively utilise digital education resources (Mingaine, 2013).

ICT Problems and Prospects in Kenyan Secondary Schools

In Kenya, policies such as the National ICT Strategy for Education and Training (2006) and the Digital Literacy Programme (2016) have emphasised infrastructure development; however, implementation gaps persist in public secondary schools, particularly in rural counties (Mingaine, 2013). Issues like poor equipment, poor power supply, and lack of technical assistance still limit the capability of Agriculture teachers to implement simulations and multimedia successfully (Kiarie & Ondigi, 2025). There are opportunities in terms of specific capacity-building, with recent interventions showing that, when professionally developed well, ICT integration rates can be boosted greatly by matching them to the needs of a subject.

Agricultural Performance in Kenya

The agriculture performance at KCSE has not been good, and the national mean scores have been below 50 per cent between 2018 and 2022 (Kenya National Examination Council, 2023). As an illustration, the total Agriculture mean score was 98.06/200 (49.03%) in 2022; the same has been seen in the past years. These performance tendencies are associated by scholars with the traditional teacher-centred approach to instruction and insufficient application of ICT and digital resources (De & Kaugi, 2023). This explains the need to increase the use of digital resources in facilitating the learning of Agriculture in schools to improve delivery and learning.

In Nakuru County, where the subject of Agriculture is taught in most rural and peri-urban schools, the ICT adoption inequality is apparent. Other schools that have improved facilities incorporate the use of digital tools in classes with conventional methods, whereas others are still utilising the old method of teaching. This variation brings important questions concerning the motivation and inhibiting factors of ICT use by Agriculture teachers. It is necessary to know the importance of teachers' level of educational qualifications in integrating ICT. These findings will be relevant to policymakers, Education curriculum specialists, and teacher educators to design specific interventions that can enable digital capacity development, reduce disparities, and enhance more effective Agriculture education in Kenya.

METHODOLOGY

The study adopted a cross-sectional research design. The target population consisted of 698 Agriculture teachers in public secondary schools in Nakuru County. A sample size of 168 was established using the Nassiuma (2000) formula. A multi-stage sampling technique was employed, involving purposive sampling of the county, stratified sampling of sub-counties, and simple random sampling of individual teachers. A total of 140 teachers returned complete questionnaires (83.3% response rate). The study collected data using the Agriculture Teachers' Questionnaire (ATQ). Content validity was established through expert evaluation by supervisors from the Department of Agricultural Education and Extension and the Faculty of Education and Community Studies at Egerton University. A pilot test was conducted on 35 Agriculture teachers in Nyandarua County, Kenya. Reliability was tested using Cronbach's Alpha, yielding a coefficient of 0.963, indicating excellent internal consistency and stability of the ATQ.

Approval of collecting data was obtained from the Egerton University Institutional Scientific and Ethics Review Committee (EUISERC) and the National Commission for Science, Technology and Innovations (NACOSTI). Descriptive statistics and inferential tests were performed. Hypothesis, examining teachers' level of education, was tested using the Kruskal-Wallis H test as it involved categorical data and a post hoc test using the Mann-Whitney U test with Bonferroni to determine accurately which pair of groups differed. The researcher assured participants of confidentiality, informing them that the data was only for research purposes and ensuring that no real names were disclosed. Participants were informed that they could withdraw from the questionnaire at any time without fear of penalty or victimisation.

RESULTS AND DISCUSSION

The study targeted 168 Agriculture teachers across four sub-counties in Nakuru County. About 140 teachers successfully submitted their questionnaires, yielding an overall response rate of about 83.33 per cent. This value was deemed satisfactory for data analysis and reporting. As articulated by Fincham (2008), a response rate above 70 per cent is generally statistically robust for survey-based research.

Demographic Information

The demographic information of respondents was assessed primarily to establish the essential context necessary for understanding how teacher characteristics influence the use of digital devices in teaching Agriculture. The following subsections present the results organised by gender, age, education level, teaching experience, and computer skills, using both tables and figures. Table 1presents the distribution of Agriculture teachers in Nakuru County by gender.

Table 1: **Gender of Respondents**

Gender	Frequency	Percent
Male	79	56.4
Female	61	43.6
Total	140	100.0

Source: From the Study (2025)

The results indicated a close gender balance of the agriculture teachers, which is in line with the trends in the country where gender gaps in the recruitment of teachers are becoming smaller.

These results indicate a close gender balance of Agriculture teachers in Nakuru County. Such a balance may be attributed to recent policies that facilitate gender equity in the recruitment of teachers. Table 2 indicates how the agriculture teachers in Nakuru County are distributed in terms of their age.

Table 2: Age Distribution

Age group	Frequency	Percent
20 to 30 years	23	16.4
31 to 40 years	67	47.9
41 to 50 years	47	33.6
Over 50 years	3	2.1
Total	140	100

Source: From the Study (2025)

Table 2 indicates the distribution of respondents by age bracket, demonstrating that the sample is concentrated in the middle career stages. Specifically, the 31-40 years age group constituted the largest proportion at 47.9 per cent (n = 67), closely followed by the 41-50 years bracket at 33.6 per cent (n = 47). Conversely, the youngest cohort (20-30 years) accounted for 16.4 per cent (n =23), while the oldest group (Over 50 years) represented the smallest percentage at 2.1 per cent (n = 3). This distribution signifies that the teacher population in this study area is predominantly characterised by a mid-career labour force. This observation aligns with Ochieng and Mutiso (2021), who reported a concentration of Agriculture educators in the 30-50 age range. Such results are consistent with findings from Sub-Saharan Africa, where teacher demographics are often dominated by mid-career professionals. The academic background of the surveyed teachers was

subsequently examined in order to assess the foundational professional preparedness of the educators for the integration of ICT. Table 3 then details the distribution of Agriculture teachers in Nakuru County according to their academic qualifications.

Table 3: Education Qualifications of the Agriculture Teachers

Qualification	Frequency	Percent
Postgraduate Degree	27	19.3
Undergraduate Degree	106	75.7
Diploma	4	2.9
Masters	3	2.1
Total	140	100

Source: From the Study (2025)

Table 3 summarises the educational attainment of the respondents. The data clearly shows that the majority of teachers hold an Undergraduate degree (75.7%), while 19.3% possess a Postgraduate degree. A smaller proportion reported holding a Diploma (2.9%) or a Master's degree (2.1%). These figures collectively indicate that Agriculture teachers in Nakuru County are highly qualified, with the majority exceeding the basic qualification requirements set by the Teachers Service Commission (TSC). This aligns with broader patterns observed across Kenyan secondary schools, where most Agriculture teachers hold at least an undergraduate degree in education or agricultural sciences (Waiganjo et al., 2022). Table 4 provides a statistical overview of the professional teaching experience (in years) of the surveyed Agriculture teachers in Nakuru County.

Table 4: Descriptive Statistics of Teaching Experience in Years

Statistic	Value
Valid Responses (N)	140
Mean	10.90
Standard Deviation	7.174
Minimum	2
Maximum	37

Source: From the Study (2025)

Following the analysis of continuous data, the average professional experience was found to be approximately 10.90 years, spanning a wide range from a minimum of 2 years to a maximum of 37 years of service (SD = 7.174). The distribution reveals that most educators have accrued less than fifteen years of service, suggesting a workforce that is well established yet still relatively young in professional terms. Comparable findings have been reported across other Kenyan Counties, reflecting the impact of recent recruitment initiatives that have introduced younger teachers alongside veteran staff (Waiganjo et al., 2022). Figure 1 visually presents the frequency distribution of teaching experience in years for the agriculture teachers

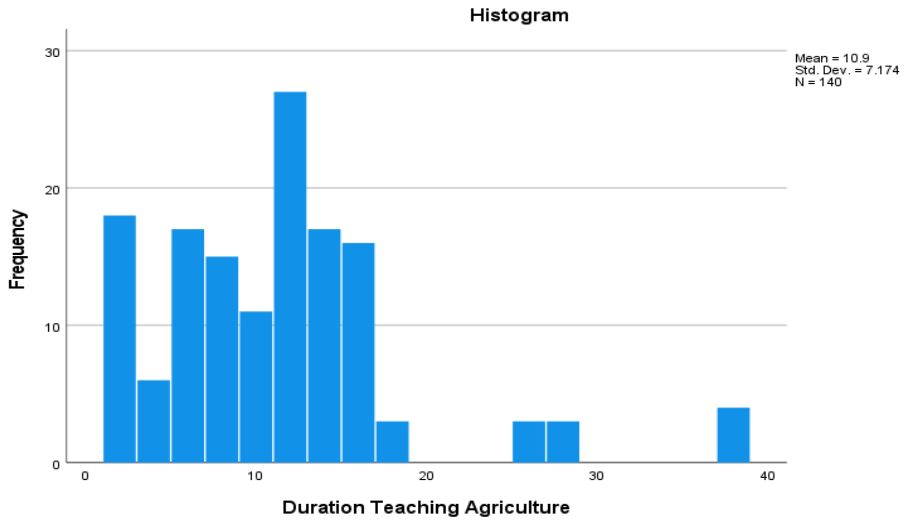

Figure 1: **Distribution of Duration of Teaching Agriculture**
Source: From the Study (2025)

The histogram (figure 1) and the descriptive statistics reveal a nuanced picture. While the agriculture teachers in Nakuru County are generally not newly recruited teachers, the wide variance observed clearly signals the recent injection of young teachers into the system. This finding aligns with Waiganjo et al. (2022) who reported that most agriculture teachers in Kenyan public secondary schools have fewer than 15 years of experience. The next section, Table 5, details the self-reported computer skills and proficiency levels of the sampled agriculture teachers in Nakuru County.

Table 5: Summary of Level of Computer Skills by Respondents

ICT Proficiency	Frequency	Percent
Medium (Intermediate)	114	81.4
High (Advanced)	26	18.6
Total	140	100

Source: From the Study (2025)

Table 5 shows the self-reported computer skills and proficiency levels of the surveyed Agriculture teachers in Nakuru County. The data depict that the overwhelming majority of respondents reported possessing intermediate skills (81.4%), while 18.6 per cent classified themselves as highly proficient (Advanced). No teacher reported being at a low (beginner) skill level. This distribution suggests that overall ICT competence among Agriculture teachers in Nakuru County is moderate to proficient. This finding corroborates research by Tondeur et al. (2015), whose study demonstrated that most educators in Kenyan schools possess basic or intermediate ICT literacy. Despite this general competence, the absence of widespread advanced skills may potentially constrain the deeper integration of complex digital devices into pedagogical practice.

While the preceding sections successfully outline the demographic and proficiency profiles of Agriculture teachers in Nakuru County, the primary focus shifts to investigating how these characteristics influence the actual utilisation of digital tools in the classroom. To facilitate inferential testing, a composite mean score for DDU was calculated from the Likert scale items. The resulting mean scores, which form the basis for subsequent inferential analysis, are summarised in Table 6.

Table 6: Summary of Mean Scores for Influence of Teacher Characteristics on the Use of Digital Devices

Teacher Characteristic	Mean Score(M)	Standard Deviation (SD)	S. E	Interpretation
Level of Education	4.17	0.78	0.066	High influence
Teaching Experience	3.70	0.91	0.077	High influence
Age	3.74	0.79	0.668	High influence
Gender	2.16	0.84	0.071	Low influence

Source: From the Study (2025)

Analysis of the mean scores summarised in Table 6 reveals that teacher characteristics related to academic and professional tenure are perceived to be the most influential factors. Level of education (M = 4.17, SD = 0.78), teaching experience (M = 3.70, SD = 0.91), and age (M = 3.74, SD = 0.79) were all rated highly by respondents. Conversely, the mean score for gender was significantly lower (M = 2.16, SD = 0.84), suggesting a relatively weaker perceived influence of gender on digital device usage. Collectively, these findings demonstrate that professional factors such as cumulative work experience, teachers' educational qualifications, and age-related attributes exert a stronger perceived influence on ICT adoption than gender. This observation is consistent with recent literature, which posits that while the gender gap in basic ICT access is narrowing, the adoption process is increasingly driven by critical external and professional factors. Elements such as quality of teacher training, evolving pedagogical practices, and frequency of exposure to new technology exert a more substantial impact on the successful integration of digital devices in the classroom.

Moreover, global evidence reinforces this connection, underscoring that higher levels of education exhibit a strong, multifaceted relationship with an educator's confidence in digital pedagogy (UNESCO, 2023c). This alignment underscores the need for targeted and specialised professional development initiatives designed to elevate teacher competence beyond basic digital literacy. Figure 2 is a graphical comparison of averages of scores on the impact of teacher features on using digital devices, which is added to the results in Table 6.

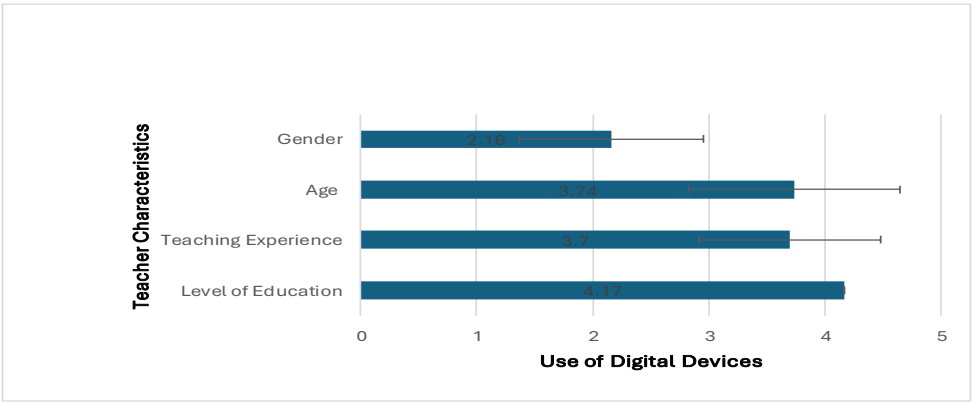

Figure 2: **Average Perceived Influence of Teacher Attributes on Digital Devices Utilisation**
Source: From the Study (2025)

The bar graph visually summarises the key findings from Table 6. The chart clearly shows that level of education registers the strongest perceived influence, while gender exhibits the lowest impact the visual reinforces the noticeable disparity between the powerful predictive factors (level of education, age, and teaching experience) and the relatively marginal influence of gender, this observed pattern suggests that the foundational approach to advancing meaningful ICT integration must prioritize sustained investment in teacher professional development

and career-long learning. However, recent Kenyan surveys support the notion that gender disparities in technology use are diminishing, as teachers from both genders are attaining similar levels of digital engagement (Tondeur et al., 2015). This affirms that professional capital, derived from academic qualifications and accumulated teaching experience, is the most compelling factor predicting the successful adoption of digital devices in secondary schools.

Collectively, these demographic attributes provide essential contextual insight into the role of individual teacher characteristics in influencing the adoption of digital devices in agricultural instruction. The gender distribution remains relatively balanced, as confirmed by the frequencies presented in Table 1. Similarly, the age distribution in Table 2 clearly indicates that the respondent pool is primarily composed of individuals aged between 31 and 50. Furthermore, the findings show that most Agriculture teachers possess an undergraduate degree, their average teaching experience is approximately 11 years, and the majority report having intermediate computer skills. Overall, this demographic profile provides the necessary context for the subsequent analysis of how teacher features statistically impact the use of digital equipment.

Influence of Teacher Educational Qualification on Digital Device Use

The analysis of the perceived influence of educational attainment on DDU in the teaching of Agriculture was conducted prior to the inferential testing. Table 7 presents the statistical descriptives of the composite DDU scores categorised by the highest level of academic qualification.

Table 7: Descriptive Statistics of Device Use Score Per Education Group

Education Qualification	Composite score for digital device use				
	N	Mean	S. D	Min	Max
PGDE	27	3.8296	0.20440	3.30	4.00
Undergraduate Degree	106	3.6689	0.52192	1.20	4.00
Diploma	4	3.4750	0.15000	3.40	3.70
Masters	3	3.7000	0	3.70	3.70

Source: Field Data (2025)

Descriptive analysis indicated that the mean composite DDU score across all educational groups exceeded 3.4, suggesting a high level of digital device use in Agriculture instruction. The descriptive findings further indicated that the mean scores for teachers holding a Postgraduate degree (M = 3.8296) and a Master's degree (M = 3.7000) were slightly higher than the mean scores for Undergraduate degree (M = 3.6689) and Diploma (M = 3.4750) holders. These numerical trends suggest a potential link between higher academic attainment and more extensive ICT integration. Such conclusions are consistent with the work of Buabeng-Andoh (2012), who previously established that advanced academic qualifications enhance an educator's willingness and capability to implement digital technologies.

Table 8 then introduces the self-reported availability of digital devices as a critical factor in the usage of digital devices in teaching of Agriculture to assess if observed usage patterns are constrained by resource limitations.

Table 8: Level of Availability of Digital Devices for Use by Teachers

Rate of Availability	Frequency	Percent
Low	33	23.6
Moderate	96	68.6
High	11	7.9
Total	140	100

Source: From the Study (2025)

Findings show that among teachers, 7.9 per cent said that they had high device availability, whereas most (68.6%) said they had moderate device availability, and only a minority (23.6%) said that they had low device availability. This implies that although teachers may be qualified and willing to adopt ICT, the inadequate digital devices may limit the utilisation of ICT in teaching. Latest research by Kiarie and Ondigi (2025) agree that the availability of infrastructure is still a key factor in realising the benefits of ICT integration. The preceding descriptive analysis revealed that the average DDU score across all educational groups was above 3.4, indicating a generally high perceived usage of digital devices in Agriculture instruction. This observation suggests a numerical trend where higher levels of academic attainment may correlate with more maximal ICT integration.

Following the descriptive analysis, statistical assumptions were examined prior to proceeding with the primary inferential test, and the data were formally examined. For this purpose, Table 9 depicts the findings of the Shapiro-Wilk test, which assessed the normality of the composite DDU score distribution across the educational groups.

Table 9: Shapiro-Wilk Test of Normality for Composite Digital Device Use

Education Level	Statistic	Df	Sig.
Diploma	-	3	-
Undergraduate	0.855	27	0.001
PGDE	0.761	106	0.000
Masters	-	4	-

Source: Field Data (2025)

The results from Table 9 demonstrate that the Shapiro-Wilk test was statistically significant for the Undergraduate ($p = 0.001$) and the Postgraduate ($p = 0.000$) degree holders. This outcome leads to the formal rejection of the null hypothesis of normality for these groups. Such a fundamental violation of the normality assumption renders the standard One-Way ANOVA not suitable for analysing this dataset (Field, 2018; Ghasemi & Zahediasl, 2012). Consequently, the researcher proceeded to evaluate the homogeneity of variances across the educational groups. The Levene's test was executed, with the resulting statistics presented in Table 10.

Table 10: Levene's Test of Homogeneity of Variances

Test Type	Levene Statistic	df1	df2	Sig.
Based on Mean	1.920	3	136	0.129
Based on Median	1.719	3	136	0.166
Based on Median and adjusted df	1.719	3	129.216	0.166
Based on Trimmed Mean	1.808	3	136	0.149

Source: Field Data (2025)

The analysis in Table 10 confirmed that the results of Levene's test were not statistically significant across any of the test types ($p > 0.05$), thereby validating the assumption of homogeneity of variance. Given this outcome, that the normality assumption was violated while the homogeneity of variance was satisfied, the Kruskal-Wallis H test, the appropriate non-parametric alternative to the One-Way ANOVA, was selected for hypothesis testing. Table 11 presents the mean ranks of the four groups based on their highest educational qualifications. It shows comparisons of mean ranks of the categories and not the means of the raw scores.

Table 11: Mean Ranks of the Educational Qualifications of Agriculture Teachers

Educational qualifications	Sample Size (n)	Mean Rank
Master's Degree	3	114.33
Postgraduate Degree	27	78.52
Undergraduate Degree	106	68.61
Diploma	4	74.38

The results presented in Table 11 showed the mean ranks of usage of digital devices in teaching of agriculture in public secondary schools by teachers with the following educational qualifications: master's degrees (114.33), postgraduate degrees (78.52), undergraduate degrees (68.61) and diplomas (74.38). Table 12 indicates the Kruskal-Wallis H test results.

Table 12: Kruskal-Wallis Test for Education Level and ICT Use

Statistic	Value	Df	P-Value
Kruskal-Wallis-H	8.862	3	0.031

Source: Field Data (2025)

The inferential results show a statistically significant overall difference in the adoption of ICT based on educational level, with the test yielding $H = 8.862$ at $df = 3$, resulting in a p-value of 0.031. This statistically significant finding confirms that the teacher's academic qualifications are an influential factor in determining the distribution of DDU scores. Since the overall result was significant, Mann–Whitney U tests with Bonferroni correction were used for post hoc pairwise comparisons to determine which groups differed. Bonferroni correction was used to retain the family-wise error rate of $\alpha = 0.05$. The results are summarised in Table 13. Bonferroni correction was calculated as follows:

With $k = 4$ groups, there are $\frac{4(4-1)}{2} = 6$ feasible comparisons. The adjusted level of significance is $\bar{\alpha} = \frac{0.05}{6} \approx 0.0083$.

Table 13: Mann-Whitney Post-Hoc Tests for Education Groups

Education levels Compared	Mean Rank Difference	p-value (Adjusted for Multiple Comparison)	Interpretation (p 0.0083
Masters vs. Undergraduate	45.72	0.003	Significant
Masters vs. Postgraduate	35.81	0.076	Not significant
Masters vs. Diploma	39.95	0.086	Not significant
Postgraduate vs. Undergraduate	9.91	0.404	Not significant
Postgraduate vs. Diploma	4.14	0.771	Not significant
Undergraduate vs. Diploma	5.77	0.697	Not significant

Source: Field Data (2025)

The post-hoc analysis has shown that only Master's and Undergraduate degree holders had a statistically significant difference for multiple comparisons ($p = 0.003$). Since 0.003 is less than the adjusted level of significance of 0.0083, this difference was statistically significant. These results affirm that the overall $p = 0.031$ obtained by Kruskal-Wallis is attributable to the difference between the Master's and Undergraduate groups. The higher mean rank of the Master's holders (114.33) in comparison with the undergraduate holders (68.61), as shown in Table 11, reveals that teachers with a Master's degree self-reported significantly higher use of digital tools. All other groups of educational qualifications did not differ significantly from the others, as can be observed from this analysis. Higher use of digital devices in teaching agriculture by teachers with higher levels of education, for example, a Master's degree, is supported by the theory of education, which associates complex integration of ICT with higher levels of education (Mishra & Koehler, 2006).

To conclude, the results show that the education level of teachers is an essential determinant of ICT integration in the teaching of Agriculture. Academic credentials were typically linked to higher ICT usage, but the postgraduate training did not necessarily result in increased use in the classroom. Such findings underscore the necessity to enhance ICT training at all levels of teacher education so that both the pre-service and the post-graduate training are offered sound instruction pedagogy of ICT to facilitate the delivery of instructions instead of merely concentrating on academic theory.

CONCLUSION AND RECOMMENDATIONS

Conclusion: This study set out to research the impact of the chosen teacher attributes, i.e. level of education, on the deployment of digital devices in teaching Agriculture in secondary schools in Nakuru County, Kenya. The study utilised both descriptive and inferential statistics to analyse data from 140 Agriculture teachers, with assumption checks performed prior to hypothesis testing. The undergraduate ($p = 0.001$) and postgraduate diploma ($p = 0.000$) groups had significant results in the Shapiro-Wilk test of normality, and this indicated that the assumption of normality was not met. Nevertheless, the test of homogeneity of variances of Levene was not significant ($p = 0.129$), and thus, the condition of equal variances was met. According to these findings, the Kruskal-Wallis test was deemed appropriate. There was a significant difference in ICT use across educational levels, as shown by χ^2 (3, N = 140) = 8.862, $p = 0.031$. The pairwise comparisons of Master's and Undergraduate degree holders using the Mann-Whitney U test revealed that the former reported a significantly higher rate of digital device use relative to undergraduates ($p = 0.003$). The other pairwise comparisons were not significant. These findings indicate that the level of academic qualifications tends to be positively correlated with more digital device utilisation with Postgraduate training, not always correlating with increased classroom implementation.

Recommendations: This study recommends that ICT incorporation into teacher training should be enhanced through the inclusion of practical digital literacy courses at all levels of teacher training, including post-graduate teacher training programmes. This will ensure adequate ICT preparedness in teaching. All teachers should be

supported with continuous professional development through refresher courses regularly and peer-learning opportunities for all groups to equally adopt ICT integration in the teaching of agriculture.

REFERENCES

Bariu, T. N., & Chun, X. (2022). Influence of teachers' attitude on ICT implementation in Kenyan universities. *Cogent Education, 9*(1), Article 2107294. https://doi.org/10.1080/2331186X.2022.2107294

Buabeng-Andoh, C. (2012). Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development Using Information and Communication Technology, 8*(1), 136–155. https://files.eric.ed.gov/fulltext/EJ1084227.pdf

Carballo, R. C. (2025). Influence of ICT value in teaching, social expectations on ICT, and behavioral control on teachers' ICT adoption. *European Journal of Applied Science, Engineering and Technology, 3*(4), 39–48. https://doi.org/10.59324/ejaset.2025.3(4).04

De', K. J., & Kaugi, E. (2023). Adoption of information and communication technology in teaching and learning in secondary schools in Nairobi County, Kenya. *African Journal of Education and Practice, 9*(2), 15–37. https://iprjb.org/journals/AJEP/article/view/1960/2101

Field, A. (2018). *Discovering statistics using IBM SPSS statistics* (5th ed.). Sage.

Fincham, J. E. (2008). Response rates and responsiveness for surveys, standards, and the journal. *American Journal of Pharmaceutical Education, 72*(2), Article 43. https://doi.org/10.5688/aj720243

Ghasemi, A., & Zahediasl, S. (2012). Normality tests for statistical analysis: A guide for non-statisticians. *International Journal of Endocrinology and Metabolism, 10*(2), 486–489. https://brieflands.com/articles/ijem-71904.pdf

Joshi, B. M., & Khatiwada, S. P. (2025). Teachers' characteristics, ICT use and educational outcomes. *Teacher Half-Yearly Journal, 17*(1), 63–81. https://doi.org/10.3126/thj.v17i1.77840

Kenya Education Management Institute. (2021). *ICT integration in education* (Training module). https://www.kemi.ac.ke/

Kenya Education Management Institute. (2021). *ICT integration in teaching and learning: Best practices for Kenyan schools* (Training module). https://www.kemi.ac.ke/

Kenya Institute of Curriculum Development. (2023). *Senior school curriculum designs: STEM pathway*. https://kicd.ac.ke/cbc-materials/curriculum-designs/

Kenya National Examinations Council. (2023). *Kenya certificate of secondary education report*. https://www.knec.ac.ke/downloads/

Kiarie, B. K., & Ondigi, S. R. (2025). Challenges and solutions during championship of information communication technology (ICT) integration for teaching and learning in secondary schools across Nairobi, Kiambu and Machakos counties, Kenya. *Journal of Popular Education in Africa, 9*(7), 5–31. https://kenyasocialscienceforum.wordpress.com/wp-content/uploads/2025/07/1pdf-kiarie-ondigi-challenges-and-solutions-during-championship-of-information-communication-technology.pdf

Kisirkoi, F. K. (2015). Integration of ICT in education in a secondary school in Kenya. *Literacy Information and Computer Education Journal, 6*(2), 1900–1906. https://infonomics-society.org/wp-content/uploads/licej/published-papers/volume-6-2015/Integration-of-ICT-in-Education.pdf

Kyule, M. (2022). *A literature review perspective of the challenges facing secondary school agriculture training in Kenya*. Proud Pen EBooks. https://doi.org/10.51432/978-1-8381524-5-1-8

Lukuyani, E. N., Masibo, E., & Echaune, M. (2025). Selected teacher factors and ICT integration in public secondary schools in Bungoma County, Kenya. *International Journal of Humanities, Social Sciences and Education, 12*(7), 23–28. https://doi.org/10.20431/2349-0381.1207003

Mingaine, L. (2013). Skill challenges in adoption and use of ICT in public secondary schools, Kenya. *International Journal of Humanities and Social Science, 3*(13), 61–72. https://ijhss.thebrpi.org/journals/Vol_3_No_13_July_2013/8.pdf

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Nassiuma, D. K. (2000). *Survey sampling: Theory and methods*. Nairobi University Press.

Njuguna, E. W., Kimotho, M., & Nduku, E. (2025). The extent to which teachers' ICT training influences ICT use in teaching among public secondary school teachers in Kipipiri Constituency, Nyandarua County, Kenya. *European Journal of Education Studies, 12*(3). https://doi.org/10.46827/ejes.v12i3.5896

Nsyengula, S., Emmanuely, H., Mhagama, W., Okello, J. W., & Yassin, A. (2025). Challenges and opportunities for technology and language learning in Sub-Saharan Africa. *Journal of Classroom Action Research, 4*(1), 7–14. https://doi.org/10.52622/jcar.v4i1.360

Ochieng, D. A., & Mutiso, P. K. (2021). Demographic characteristics of teachers and their influence on instructional delivery in Kenya. *International Journal of Pedagogy and Curriculum Development, 6*(1), 55–67.

Odhiambo, C. A. (2019). *School-based factors influencing integration of ICT in teaching and learning at public secondary schools in Kwanza Sub-county, Kenya* (Master's thesis, University of Nairobi). https://erepository.uonbi.ac.ke/handle/11295/109685

Omariba, A., Ondigi, S. R., & Ayot, H. O. (2016). Challenges facing teachers in integrating educational technology into Kiswahili teaching. *International Journal for Innovation Education and Research, 4*(12), 23–39. https://doi.org/10.31686/ijier.vol4.iss12.42

Opicho, E. N., Imonje, R., & Chepkonga, S. (2025). Teachers' digital literacy skills and implementation of competency-based curriculum in junior schools in Westlands Sub County, Kenya. *International Journal of Current Science Research and Review*. https://zenodo.org/records/15197712

Pima, J. M. (2019). Factors that motivate teachers to use ICT in teaching: A case of Kaliua District secondary schools in Tanzania. *International Journal of Education and Development Using Information and Communication Technology, 15*(1), 179–189. https://files.eric.ed.gov/fulltext/EJ1214272.pdf

Scherer, R., Siddiq, F., & Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modeling approach. *Computers & Education, 128*, 13–35. https://doi.org/10.1016/j.compedu.2018.09.009

Schorr, A. (2023). The technology acceptance model (TAM) and its importance for digitalization research. In *Sciendo eBooks* (pp. 55–65). https://doi.org/10.2478/9788366675896-005

Shafie, H., Abd Majid, F., & Ismail, I. S. (2019). Technological pedagogical content knowledge (TPACK) in teaching 21st century skills. *Asian Journal of University Education, 15*(3), Article 24. https://doi.org/10.24191/ajue.v15i3.7818

Tondeur, J., Krug, D., Bill, M., Smulders, M., & Zhu, C. (2015). Integrating ICT in Kenyan secondary schools: An exploratory case study of a professional development programme. *Technology, Pedagogy and Education, 24*(5), 565–584. https://doi.org/10.1080/1475939X.2015.1091786

UNESCO. (2023a). *Global education monitoring report 2023: Technology in education – A tool on whose terms?* https://unesdoc.unesco.org/ark:/48223/pf0000385723

UNESCO. (2023b). *ICT competency framework for teachers (ICT-CFT)*. https://unesdoc.unesco.org/ark:/48223/pf0000265721

UNESCO. (2023c). *Technology in education: A global overview of policies and practices*. https://www.unesco.org/gem-report/en/technology

Waiganjo, M. M., Wambugu, P. W., & Udoto, M. O. (2022). Implications of class size in teaching agriculture in secondary schools: Kenya's challenge in implementing competency-based curriculum. *Journal of African Studies in Educational Management and Leadership*. https://www.kaeam.or.ke/articles/V12/V12C2.pdf

Woldegiorgis, E. T. (2025). Challenges of integrating technology in East African higher education systems. *Technology, Pedagogy and Education*, 1–19. https://doi.org/10.1080/1475939X.2025.2520589

World Bank. (2016). *World development report 2016: Digital dividends*. https://doi.org/10.1596/978-1-4648-0671-1