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# Digital Data Literacy and Institutional Leadership: Mapping the Needs, Challenges, and Gender Disparities among Heads of Primary Schools in Western Kenya

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**Abstract**
This study examined the data needs, challenges, and capacity-building requirements of primary school Head of Institutions (HOIs) in Western Kenya. The increasing emphasis on evidence-based management in education has created a growing need for school administrators to possess strong data literacy skills for effective decision-making, accountability, and improvement of educational outcomes. The study adopted a descriptive design approach involving a survey of 109 primary school head teachers, of whom 97 responded positively, from Bungoma and Busia counties. Data were analysed using descriptive statistics and inferential techniques. The findings revealed that although HOIs demonstrated basic competence in interpreting and communicating school data, significant gaps existed in digital data management, data analysis, use of technological tools, and effective utilisation of data for strategic decision-making. Significant differences were observed in data collection challenges by gender and county, with female HOIs and those in Busia County experiencing greater barriers. The study further established a strong demand for data literacy training, with most administrators indicating the need for practical training in Excel, EMIS, data analysis, and evidence-based decision-making. The study concluded that strengthening school administrators' data literacy skills through targeted, inclusive, and practical training interventions was essential for promoting accountability and improving educational outcomes.

**Key words**: Data literacy, educational accountability, EMIS, school administrators, Western Kenya.

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## INTRODUCTION

In today's data-driven society, school administrators must possess strong digital data literacy skills. Digital data literacy skills are becoming an increasingly important strategic resource in education as schools are expected to use data to drive decision-making processes (Sleiman & El-Hindi, 2021). School leaders should have the capacity to collect, analyse, and interpret data to make informed decisions that can improve student outcomes. Data literacy is the ability to understand, interpret, and apply data effectively to make informed decisions. As educational systems continue to grapple with challenges such as improving student outcomes, reducing achievement gaps, and maximising resources, data literacy has emerged as an indispensable skill set for school leaders (Henderson & Corry, 2021; Zupanc et al., 2009).

In the context of school accountability, data-based decision-making has become increasingly important (Liu & Han, 2020). Data literacy skills enable school leaders to make evidence-based decisions, identify areas of improvement, and monitor progress towards better educational outcomes. Moreover, by analysing data, school leaders can identify inequities and disparities, promote fair and equal access to quality education, and track the effectiveness of interventions and policies (Tilahun &Abebe, 2020).

The increasing volume and availability of educational data require school leaders in Kenya to possess the skills needed to navigate through vast amounts of information (Otieno & Onderi, 2021). The need for enhancing data literacy skills among school leaders in Africa has been highlighted in various studies and reports. For example, a study by UNESCO (2019) found that while many African countries have established Education Management Information Systems (EMIS), the effective use of data for decision-making is still limited. The study also highlighted the need for capacity building in data analysis and interpretation among education stakeholders, including school leaders. In addition, the African Union's Data Policy Framework has placed emphasis on training capacities among state actors and non-state actors, including school leaders, in data literacy to enhance transparency and accountability in education systems.

The need for enhancing data literacy skills among school leaders in Africa arises from several factors. Firstly, the increasing volume and availability of educational data require leaders to possess the skills needed to navigate through vast amounts of information. Secondly, data literacy skills enable school leaders to make evidence-based decisions. Thirdly, data literacy skills are crucial for fostering accountability and transparency in educational systems (African Development Bank, 2017).

Furthermore, schools are expected to use data to drive decision-making processes, and school leaders need to be able to collect, analyse, and interpret data to make informed decisions that can improve student outcomes. In addition, school leaders need to be able to use data to identify areas for improvement and make informed decisions that can positively impact student achievement. In connection with this, global frameworks such as the Global Competency Framework for an Inclusive World and the Global Framework of Reference on Digital Literacy Skills emphasise the importance of data literacy skills for students and educators. This framework suggests that improving relationships between teachers and students is important for students' academic and social development. Thus, data literacy skills can help school leaders identify areas for improvement and develop strategies to improve relationships between teachers and students (UNESCO, 2018; OECD, 2018).

The overarching motivation for this project was that digital data literacy skills are becoming increasingly important strategic decision-making resources in education (Sleiman & El-Hindi, 2021). School leaders should therefore have the capacity to collect, analyse, and interpret data to make informed decisions that can improve student outcomes. In addition, head teachers are supposed to be computer literate to provide digital leadership, as government circulars and communications are now delivered to schools digitally to encourage paperless communication. This is because the government sends volumes of communication that school head teachers have to fill in and submit through the Education Management Information System (EMIS). This information includes financial data, school attendance, teacher performance appraisals, and school academic performance. Information from teachers has to be filled in digitally, and the head teacher is required to review and submit.

School administrators therefore need to be able to navigate through vast amounts of educational data and use data to inform policy and practice. It has been noted that school leaders, however, have received little or no training in the field of data management (UNICEF 2019;

Zupanc et al., 2009). Further, there is little theoretically sound evidence of studies done in Africa on data literacy by school leaders (Henderson & Corry, 2021).

In today's data-driven education systems, school leaders are expected to collect, analyse and use data to improve teaching, learning and accountability. Digital data literacy has therefore become an essential leadership competence. In Kenya, this expectation is exacerbated by the requirement that the HOIs submit financial, attendance, appraisal and performance data through the Education Management Information System (EMIS) and other digital platforms.

Yet the reality for primary school heads in Western Kenya, particularly in Bungoma and Busia counties, is markedly different. Most still rely on paper-based registers, have received little or no formal training in data management or analysis, operate with unreliable electricity and internet, and lack dedicated data support staff. As a result, data collection remains largely a compliance exercise rather than a tool for instructional improvement or strategic planning. These challenges are not evenly distributed: female head teachers and those working in Busia County report significantly greater difficulties in obtaining accurate, timely and consistent data. Despite the policy push toward digital data use, there is still limited empirical evidence on the precise needs, barriers and gender disparities that primary school heads in these two counties face.

This study therefore maps the digital data literacy needs, challenges, and gender disparities among Heads of Primary Schools in Bungoma and Busia counties. The findings are intended to inform the design of context-sensitive capacity-building programmes that can close the gap between policy expectations and actual practice

## LITERATURE REVIEW

Digital data literacy has recently emerged as a crucial competence in educational leadership due to the fact that successful management of schools requires not only obtaining administrative data but also analysing, interpreting, and transforming various kinds of data into decisions. As argued by Mandinach and Gummer (2016) in developing the concept of a data-literacy framework, educators need proper knowledge, skills, and disposition to use data properly. It is important that the authors distinguish digital data literacy from the narrower notion of assessment literacy because of the need to transform different types of data into decisions and actions. Similarly, according to Schildkamp (2019), the process of making decisions based on data should include five steps: goal definition, collecting evidence of different kinds, sense-making, improvement actions and evaluation. However, the above-mentioned studies present mostly theoretical approaches or practices but provide insufficient evidence about the data competencies and obstacles faced by school leaders in poor environments. In turn, it is important to note the difference between the tasks of school leaders and classroom teachers. According to the findings of a systematic review carried out by Lee et al. (2024), there were seven dimensions and 63 indicators of principals' data literacy. Importantly, principals need to have not only competencies related to analysing data but also data use cultures, school improvement and leadership practices. Consequently, the data mentioned above proves that data literacy is a multidimensional leadership competence, but provides insufficient empirical evidence about the manifestation of this competence among school heads in African countries and especially in Kenya.

Further, the empirical studies prove the influence of the organisational environment on the data literacy of school leaders. As reported by Schildkamp et al. (2019) in researching the topic of school data teams, effective data use was associated with leadership practices such as shared goal setting and norm setting, individual support, professional learning stimulation, creation of a positive climate for data use and network creation. In turn, these findings reveal the fact that having data-analytic skills is not sufficient when the school leaders lack organisational structures that would promote collaborative data use. In the framework of an intervention study, educators participating in data-use activities substantially increased their data literacy skills, including data analysis using Excel; however, the participants still had difficulties in identifying clear and measurable goals for data use. The abovementioned evidence demonstrates that professional development could promote data literacy, but its efficiency depends on the type of training and organisational context.

The evidence about the Kenyan case is starting to fill this contextual gap, but many gaps still exist. According to the findings of the peer-reviewed study by Omoso and Nakitare (2026) devoted to the topic of data-driven decision-making in Kenyan secondary schools, the facilitators of data use were such aspects as leadership, organisational factors, and user buy-in. At the same time, inefficient data systems, data illiteracy, lack of access to

information, and poor cooperation were the main barriers to data use. Although the above-mentioned evidence reveals the fact that data literacy is linked to other institutional and technological factors, it does not provide information about the prevalence and magnitude of the specific data-literacy needs of school heads since it focuses on secondary schools and qualitative accounts.

Recent empirical work from other low-resource African and Global South contexts further illuminates the constraints facing school leaders. In a qualitative case study conducted in a Gauteng school district in South Africa, Dasruth and Naicker (2026) examined how school leaders practise digital leadership amid resource constraints, technophobia and limited access to infrastructure. They found that leaders adopted adaptive, context-responsive strategies, such as balancing traditional and digital pedagogies, leveraging informal peer support, and prioritising foundational administrative data use, yet persistent barriers of unreliable connectivity, inadequate devices and uneven digital competencies continued to limit deeper data-driven decision-making and school transformation. Their resulting four-dimension digital leadership framework underscores that effective data use in under-resourced settings depends as much on organisational adaptation and leadership responsiveness as on technical skills alone.

Complementing these findings, an empirical case study of a resource-constrained Indonesian primary school (Wardani et al., 2026) showed that "smart school leadership" operates through staged, adaptive transitions rather than abrupt digital overhauls. School administrators strategically prioritised core administrative workflows, compliance databases and basic data-driven decision-making focused on early-grade literacy and numeracy. Informal distributed leadership (peer mentoring by digitally more competent junior staff) helped bridge literacy gaps, but hardware scarcity, unstable internet and non-systemic training placed a clear ceiling on progress toward fully integrated digital data use. Together, these studies reinforce that in low-resource primary education systems the gap between policy expectations of digital data literacy and actual practice remains wide, and that gender, infrastructure and organisational support interact to shape leaders' capacities, precisely the gaps this study maps in Bungoma and Busia counties.

Although emerging studies from low-resource African and Global South contexts have begun to document the technical and organisational barriers to school leaders' data literacy (Dasruth & Naicker, 2026; Omoso & Nakitare, 2026; Wardani et al., 2026), far less attention has been paid to the gendered dimensions of these challenges. In particular, limited empirical work examines how gendered divisions of labour within schools, unequal access to institutional resources (such as dedicated data clerks, reliable devices, and internet connectivity), and differential opportunities for formal capacity-building may systematically constrain female head teachers' digital data literacy relative to their male counterparts. Without explicit attention to these intersecting structural factors, existing research risks underestimating the additional burdens faced by women administrators and, consequently, the design of equitable training and support interventions. This study therefore addresses that gap by mapping gender disparities in data needs, collection challenges, and training preferences among primary school heads in Bungoma and Busia counties.

## METHODOLOGY

The study was conducted in Western Kenya, specifically in Bungoma and Busia counties. The study targeted the Heads of Primary Schools, who are the responsible officers for managing school operations, educational digital data collection, analysis, and utilisation for decision-making.

A total of 109 HOIs were sampled to participate in the study, but only 97 responded. The sample was selected using a multistage sampling procedure where schools were first stratified by county and sub-county to ensure geographical representation. Thereafter, respondents were selected through simple random sampling from each stratum, giving eligible HOIs an equal opportunity to participate. Furthermore, data were collected through surveys.

The surveys were administered to assess baseline data literacy levels. The questionnaire was developed by the researchers after reviewing literature on school leaders' data literacy and was adapted to the Kenyan primary-school context. Content validity was established through expert review, and the instrument was piloted with 15 HOIs outside the study sample; Cronbach's alpha coefficients exceeded 0.70 for all major scales. Questionnaires were administered face-to-face by trained research assistants during school visits, with respondents

completing them independently under supervision. Data were analysed using descriptive statistics and inferential analysis.

## FINDINGS AND DISCUSSION

### Demographic Characteristics of Respondents

Out of the 109 questionnaires distributed, 97 were successfully returned, giving a response rate of 88.99 per cent. An insight into the target group is critical for effective data literacy interventions.

**Table 1: Demographic Profile of Heads of Institutions (N=97)**

| Category | Sub-Category Statistic | Frequency | Percent (%) |
|---|---|---|---|
| County | Bungoma | 59 | 60.82 |
| | Busia | 38 | 39.18 |
| Gender | Male | 60 | 61.86 |
| | Female | 37 | 38.14 |
| Highest Academic Qualification | P1 Certificate | 10 | 10.31 |
| | Diploma | 33 | 34.02 |
| | Bachelor's Degree | 51 | 52.58 |
| | Master's Degree | 3 | 3.09 |
| | PhD | 0 | 0.00 |

*Note: Total valid responses N=97*

The results show a male-dominated sample of HOIs (61.86%) in Bungoma County (60.82%), with most having a degree (52.58%). The most important qualification of the HOIs is a bachelor's degree. The restriction on master's degree holders and PhD degree holders is as follows. In Western Kenya's primary Schools, leadership positions reflect the gendered patterns of leadership. Men increasingly dominate leadership roles at a higher level. Moreover, formal training is focused more on pedagogy than on data analytics.

**Table 2: Professional Profile of Heads of Institutions (N=97)**

| Variable | Mean | SD | Min–Max |
|---|---|---|---|
| Teaching Experience (years) | 22.41 | 6.04 | 10–35 |
| Years as Head of Institution | 8.16 | 3.70 | 1–16 |
| Years in Current School | 3.69 | 2.22 | 1–12 |

The study's results point to the fact that while HOIs will arrive with a wealth of practical experience from having been in the role already, plus proposed training, their onboarding challenges must be considered and build upon what they do well rather than on assumptions of coming in with a blank slate. Based on our current understanding, we will develop a data literacy training module.

### Data Needs of Heads of Institutions

Efficient school leadership in a data-based education system begins with understanding the type and frequency

of data required by the Heads of Institutions (HOIs) for daily operations and strategy-making. The data needs of the HOIs are presented in Table 2. These insights provide essential baselines that would help design data literacy intervention.

**Table 3: Frequency of Actionable Data Requirements**

| Data Type | Daily | Weekly | Monthly | Termly | Annually | |
|---|---|---|---|---|---|---|
| **Student Data** | | | | | | |
| Student enrollment trends | 40 (41.24%) | 21 (21.65%) | 13 (13.40%) | 17 (17.53%) | 6 (6.19%) | |
| Student attendance records | 65 (67.01%) | 21 (21.65%) | 10 (10.31%) | 1 (1.03%) | - | |
| Student academic performance | 5 (5.15%) | 7 (7.22%) | 60 (61.86%) | 25 (25.77%) | - | |
| Student safety and health | 57 (58.76%) | 20 (20.62%) | 13 (13.40%) | 6 (6.19%) | 1 (1.03%) | |
| Student discipline/case records | 53 (54.64%) | 26 (26.80%) | 11 (11.34%) | 5 (5.15%) | 2 (2.06%) | |
| **Human Resource Management** | | | | | | |
| Staff attendance and punctuality | 86 (88.66%) | 6 (6.19%) | 1 (1.03%) | 4 (4.12%) | - | |
| Staff performance appraisal | 8 (8.25%) | 16 (16.49%) | 15 (15.46%) | 58 (59.79%) | - | |
| Staff discipline/case records | 30 (30.93%) | 18 (18.56%) | 18 (18.56%) | 30 (30.93%) | 1 (1.03%) | |
| Staff professional development | 13 (13.40%) | 17 (17.53%) | 16 (16.49%) | 47 (48.45%) | 4 (4.12%) | |
| Budgeting and expenditures | 15 (15.46%) | 6 (6.19%) | 10 (10.31%) | 53 (54.64%) | 13 (13.40%) | |
| **Physical & Financial Resources** | | | | | | |
| Inventory of school resources | 12 (12.37%) | 7 (7.22%) | 20 (20.62%) | 40 (41.24%) | 18 (18.56%) | |
| Procurement of goods/services | 9 (9.28%) | 10 (10.31%) | 20 (20.62%) | 47 (48.45%) | 11 (11.34%) | |
| Teacher professional records | 28 (28.87%) | 39 (40.21%) | 5 (5.15%) | 24 (24.74%) | 1 (1.03%) | |
| Curriculum coverage | 6 (6.19%) | 40 (41.24%) | 28 (28.87%) | 18 (18.56%) | 5 (5.15%) | |
| Parental involvement | 15 (15.46%) | 7 (7.22%) | 21 (21.65%) | 54 (55.67%) | - | |
| Classroom Observation Records | 44 (45.36%) | 23 (23.71%) | 17 (17.53%) | 13 (13.40%) | - | |

Results indicate a strong focus on high-frequency operational data. Daily requirements are dominated by staff attendance (88.66% daily), student attendance (67.01% daily), safety and health (58.76% daily), and discipline records (54.64% daily). Evidently, an administrative culture that prioritises compliance has solidified. In opposition to this, strategic academic data such as student performance is collected "primarily" every month by the greatest proportion of institutions (61.86%), while performance appraisals and budgeting (increasingly) receive a high emphasis on termly cycles. The data presented indicate that HOIs are overloaded with routine monitoring practices but less frequently

engage with data that supports instructional improvement and strategic long-term planning.

The study suggests that current data practices are contributing to prioritisation of external accountability over internal capacity building, which undermines evidence-based decision-making. The training materialmust help in upskilling on converting the high-frequency operational data generated through usage into actionable insights for learner outcomes as envisaged by Objective 1 of the study. Also, the need for digital tools that automate everyday collection so that researchers can do the analysis is emphasised here.

**Data Collection Methods and Practices**

To enhance data literacy, the first step is evaluating how data is currently being collected. This has direct consequences for data quality, time-effectiveness, and usefulness to school administrators. The findings on primary data collection methods are presented in Table 4.

**Table 4: Primary Data Collection Methods**

| Category | Frequency (n) | Percent (%) | Cumulative (%) |
|---|---|---|---|
| Paper-based registers | 73 | 75.26 | 75.26 |
| Excel Spreadsheets | 15 | 15.46 | 90.72 |
| EMIS | 7 | 7.23 | 97.95 |
| Specialized School Management Software | 2 | 2.06 | 100.00 |

With 75.26% of the respondents using paper registers, the results indicate a largely manual system that is familiar but probably not very efficient for education management. Only 15.46 per crnt of respondents use Excel, and full EMIS adoption is below ten per cent; hence, digital methods are marginal. The manual processes these rely heavily on mean that the earlier high-frequency operational data needs we identified are

aligned, but that accuracy, speed, and scalability are constrained.

**Data Communication and Utilisation Needs**

Data only becomes valuable when Heads of Institutions (HOIs) can communicate, analyse, interpret, and use it effectively for decision-making, engagement with stakeholders, and school improvement. It is essential to assess the data utilisation skills reported by the practitioners themselves to identify the gaps and design a fitting, practical, need-based training in data literacy under this project. The findings on data communication and utilisation needs are presented in Table 5.

**Table 5: Data Communication and Utilisation Needs**

| Statement | Always | Often | Sometimes | Rarely |
|---|---|---|---|---|
| I easily collect complete and accurate school data | 33 (34.02%) | 29 (29.90%) | 16 (16.49%) | 19 (19.59%) |
| I easily verify data for errors before submission | 47 (48.45%) | 17 (17.53%) | 27 (27.84%) | 6 (6.19%) |
| I easily analyze learner performance data | 34 (35.05%) | 31 (31.96%) | 30 (30.93%) | 2 (2.06%) |
| I easily identify trends and gaps using school data | 31 (31.96%) | 33 (34.02%) | 11 (11.34%) | 22 (22.68%) |
| I easily interpret data to support evidence-based decisions | 55 (56.70%) | 27 (27.84%) | 10 (10.31%) | 5 (5.15%) |
| I easily present data clearly to teachers and school boards | 47 (48.45%) | 21 (21.65%) | 23 (23.71%) | 6 (6.19%) |
| I easily use data to monitor school improvement plans | 40 (41.24%) | 28 (28.87%) | 25 (25.77%) | 4 (4.12%) |
| I am confident in using digital tools (computers/tablets) for school administration | 23 (23.71%) | 25 (25.77%) | 24 (24.74%) | 24 (24.74%) |
| I easily and independently troubleshoot minor EMIS or ICT issues | 16 (16.49%) | 19 (19.59%) | 43 (44.33%) | 19 (19.59%) |
| My administrative duties leave little time for data analysis | 14 (14.43%) | 25 (25.77%) | 37 (38.14%) | 21 (21.65%) |

HOIs show strong confidence in data management and data-related tasks. The majority of the respondents, 56.70 per cent, reported always being able to interpret their data for evidence-based decision-making. Additionally, a significant proportion, 48.45 per cent, were able to easily verify their data for errors and present data to stakeholders clearly and effectively.

The gap between HOIs' competence in carrying out basic interpretative and communicative tasks and their competence in the digital-enabled efficient use of analysed data is evident. Although many people can analyse the data manually to derive meaning, the digital tools' low confidence and time unavailability limit deeper analysis and trend identification (only 31.96%) and real-time use.

**Technical and Infrastructure Barriers/Needs**

A reliable technical infrastructure and human support are essential for effective data management and data literacy of school leaders. The data on infrastructural and technical barriers in primary schools in Western Kenya is presented in Table 6.

**Table 6: Technical and Infrastructure Barriers/Needs**

| Indicator | Category | Frequency (n) | Percent (%) |
|---|---|---|---|
| Access to Electricity | Always | 55 | 56.70 |
| | Often | 19 | 19.59 |
| | Sometimes | 15 | 15.46 |
| | Never | 8 | 8.25 |
| Internet Connectivity | Reliable/Fast | 22 | 22.68 |
| | Unreliable/Slow | 40 | 41.24 |
| | No Internet | 35 | 36.08 |
| Adequacy of Digital Devices | Yes, fully equipped | 13 | 13.40 |
| | Partial/Limited | 37 | 38.14 |
| | No – use personal devices | 47 | 48.45 |
| Dedicated Data Clerk | Yes | 15 | 15.46 |
| | No | 82 | 84.54 |
| Dedicated Data Manager | Yes | 17 | 17.53 |
| | No | 80 | 82.47 |

The findings show that a majority of the respondents, 56.70 per cent, reported that their schools always have electricity. However, that foundation weakens considerably when we examine connectivity and devices, with just 22.68 per cent of schools enjoying a reliable internet connection and 13.40 per cent having fully equipped digital devices. Significantly, more than half of the penetration (48.45%) took place through the

personal devices of the HOIs. In addition, over 82 per cent of schools did not have a data clerk and a data manager. The lack of specialised support staff puts strain on overloaded administrators who could benefit from such staff for analysis and uses of digital data. The research highlights the importance of environmental constraints in understanding data needs and challenges. The gender and inclusion gaps are severely reinforced as poor infrastructure is likely to compound the disparities impeding female HOIs and schools in the poorly funded areas of Busia County.

**Challenges in Data Collection**

It is important to identify the challenges faced by HOIs in collecting authentic school data so that appropriate capacity building measures can be developed. The findings on the challenges in data collection are presented in Table 7.

**Table 7: Challenges in Data Collection (1 = No Challenge, 5 = Severe Challenge)**

| Challenge | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Accurate data from staff | 27 (27.84%) | 28 (28.87%) | 20 (20.62%) | 19 (19.59%) | 3 (3.09%) |
| Missing data or gaps in records | 18 (18.56%) | 32 (32.99%) | 20 (20.62%) | 11 (11.34%) | 16 (16.49%) |
| Data not timely (delayed) | 18 (18.56%) | 26 (26.80%) | 20 (20.62%) | 15 (15.46%) | 18 (18.56%) |
| Duplicate data entries | 27 (27.84%) | 22 (22.68%) | 19 (19.59%) | 8 (8.25%) | 21 (21.65%) |
| Inconsistencies in the data reported by staff | 23 (23.71%) | 30 (30.93%) | 32 (32.99%) | 11 (11.34%) | 1 (1.03%) |

It can be noted that there are moderate to high challenges throughout. A major contributing factor to these issues may be excessive dependence on manual paper-based systems and reliance on teaching staff for timely and accurate inputs.

To understand the differences in these challenges better, a bivariate analysis was done on an index of data collection challenges in total. The findings on gender and regional differences are presented in Tables 8 and 9, respectively.

**Table 8: Two-Sample t-test – Gender and Data Collection Challenges**

| Gender | Obs | Mean | Std. Dev. | t-value | p-value |
|---|---|---|---|---|---|
| Male | 60 | 2.525 | 0.843 | -2.11 | 0.038 |
| Female | 37 | 2.912 | 0.894 | | |

An independent-samples t-test suggested a statistically significant difference in data collection challenges between male and female HOIs, $t$ (72.94) = -2.11, $p$ = .038. Female HOIs reported significantly higher levels of challenges ($M$ = 2.91, $SD$ = 0.89) compared to male HOIs ($M$ = 2.53, $SD$ = 0.84).

**Table 9: Two-Sample t-test – County and Data Collection Challenges**

| County | Obs | Mean | Std. Dev. | t-value | p-value |
|---|---|---|---|---|---|
| Bungoma | 59 | 2.404 | 0.770 | -2.78 | 0.007 |
| Busia | 38 | 2.857 | 0.790 | | |

A comparable test utilising the county variable demonstrated a statistically significant difference between counties, t (73.52) = -2.78, p = .007. HOIs in

Busia County experienced more challenges (M = 2.86, SD = 0.79) than those in Bungoma County (M = 2.40, SD = 0.77). Data collection burden varies significantly by gender and geographical location. In Busia County, female administrators face challenges in accessing data that is accurate, timely, and consistent. The differences between them are fairly small and seem to be caused by structural differences (for example, sharing resources, workloads, or support) rather than personal characteristics.

A clear gap exists between gender and county, which requires gender-sensitive and contextual efforts to close that gap. Correspondingly, having a module on data validation, digital tools, and coordination between staff, as well as greater support for female HOIs and schools in Busia County, is necessary. Benchmark Structures to serve as evaluation indicators for impact.

**Data Training Needs**

It is important to understand what HOIs have been exposed to and what they perceive as their needs for training. The data were analysed by gender and county. The results are presented in Table 10.

**Table 10: Key Data Training Needs Indicators**

| Description | Yes (%) | No (%) |
|---|---|---|
| Received formal training in data management or analysis | 31.96 | 68.04 |
| Need training to use advanced data analysis software | 90.72 | 9.28 |
| Data literacy training should be mandatory for HOIs | 97.94 | 2.06 |

**Preferred Training Areas (Multiple Response)**

Using Excel for data analysis: 79.38 per cent
Data literacy skills: 76.29 per cent
Using EMIS/School Software: 69.07 per cent
Interpreting student assessment data: 60.82 per cent
Data-driven decision-making: 51.55 per cent

**Preferred Training Mode**

Face-to-face: 59.79 per cent
Online: 21.65 per cent
Blended: 18.56per cent

The findings show that most HOIs (68.04%) had not received training in data management or analysis.

Despite this, overwhelming demand exists, with 90.72 per cent requiring training in more advanced software, whilst 97.94 per cent support mandatory data literacy training. The needs are mainly in practical areas like Excel and general data literacy.

The data were further analysed by gender and presented in Table 11.

**Table 11: Chi-Square Test - Need for Advanced Data Analysis Training by Gender**

| Gender | Need Training (Yes) | Need Training (No) | Total | $\chi^2$ | df | p |
|---|---|---|---|---|---|---|
| Male | 52 (86.7%) | 8 (13.3%) | 60 | 4.85 | 1 | .028 |
| Female | 36 (97.3%) | 1 (2.7%) | 37 | | | |
| Total | 88 | 9 | 97 | | | |

The findings show that there was a statistically significant association between gender and need for advanced data analysis training, $\chi^2$ (1, N=97) = 4.85, p = .028. A significantly greater share of female HOIs declared a need for such training than males.

The data on training needs were further analysed by geographic location. The findings are presented in Table 12.

**Table 12: Chi-Square Test – Need for Advanced Data Analysis Training by County**

| County | Need Training (Yes) | Need Training (No) | Total | $\chi^2$ | df | p |
|---|---|---|---|---|---|---|
| Bungoma | 50 (84.7%) | 9 (15.3%) | 59 | 6.72 | 1 | .010 |
| Busia | 38 (100.0%) | 0 (0.0%) | 38 | | | |
| Total | 88 | 9 | 97 | | | |

The results show that there was a significant association with county, $\chi^2$ (1, N=97) = 6.72, p = .010, with all HOIs in Busia County expressing the need compared to 84.7 per cent in Bungoma.

These chi-square results show that training needs vary significantly. Women administrators and those in Busia County exhibit a significantly elevated level of needs. This is likely tied to their exposure to systemic barriers noted in previous sections. An example is the high level of difficulty encountered in data collection. The results indicate that gender and county context significantly affect perceived skill gaps.

**Discussion**

The findings from the present study are consistent with the literature in that they fill several gaps left in the reviewed literature. According to the study, the Heads of Institutions were quite good at interpreting and communicating data, yet poor in managing digital data, data analysis, using technological tools, and translating data into strategic decisions. This finding confirms the theory put forth by Mandinach & Gummer (2016) that data literacy consists of several elements, namely, knowledge, technical skills, and dispositions, and not merely the availability of data. Moreover, the findings of this study are consistent with the statement of Schildkamp (2019) that data literacy and data leadership are two key facilitators of successful data use, yet the way to overcome barriers associated with the two concepts is still unclear. What makes this study different from previous research in this field is the way it addresses the concept of data literacy. More precisely, through this study, in addition to identifying the concept, one can understand what data-literacy issues exist in institutions of learning and what specific competencies should be developed. In particular, it has been found that 75.26 per cent of the heads used paper registers, only 15.46 per cent of them used Excel, 68.04 per cent did not have any formal training in data management, and 90.72 per cent needed training in advanced data-analysis software. Also, the significant differences between gender and counties in terms of data collection prove the observation of Schildkamp (2019) that the use of data is affected by system, organisational, team and individual factors. Therefore, this study helps fill one more gap in the extant literature on the topic by explaining the data-literacy issue in primary schools of Western Kenya.

The findings of this study reveal a clear mismatch between policy expectations of digital data literacy and

the everyday realities of primary school heads in Bungoma and Busia counties. While HOIs reported relative confidence in basic interpretation and communication of data, the overwhelming reliance on paper-based registers (75 %), limited use of Excel or EMIS, and low formal training rates (68 %) had never received training) indicate that data practices remain largely administrative and compliance-oriented rather than instructional or strategic. These patterns align closely with Omoso and Nakitare's (2026) findings in Kenyan secondary schools, where inefficient data systems and data illiteracy emerged as major barriers, and with Dasruth and Naicker's (2026) observation in a South African district that resource constraints and technophobia force leaders into adaptive, incremental rather than transformative digital practices.

## CONCLUSION AND RECOMMENDATIONS

**Conclusion:** This study sought to map the needs, challenges, and gender disparities in data literacy skills among Heads of Primary Schools in Western Kenya. The study revealed that women HOIs and those based in Busia were more affected, as noted by gender and county differences. Women administrators and those in Busia County exhibit a significantly elevated level of needs. These findings provide a trajectory to improve the training programme's capacity in order to promote the use of data for school accountability and learning.

**Recommendations:** To address these gaps, the Ministry of Education and Teachers Service Commission should design targeted data literacy training for primary school heads, with a special emphasis on female administrators and Busia County schools. Additionally, researchers and monitoring bodies must systematically evaluate the impact of these programs on data-driven leadership. Finally, the national and county governments, alongside development partners, should collaborate to upgrade school infrastructure by improving internet connectivity, supplying computers, and providing dedicated data support staff.

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