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Digital Leadership Practices of Principals and Access To E-Learning in Public Secondary Schools in Buea-CRM

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ABSTRACT: This study examines the digital leadership practices of principals and their influence on teacher competence and student access to e-learning in public secondary schools in Buea-CRM. The research aims to understand how principals' leadership strategies shape the integration of digital tools in teaching and learning, addressing gaps in infrastructure, teacher preparedness, and student engagement in resource-constrained educational settings (Hitt & Tucker, 2025; Ngale Lyonga, 2022). A cross-sectional research design is employed, involving 435 participants, including 15 principals, 120 teachers, and 300 students. Data are collected through structured questionnaires, interviews, and document reviews, and are analyzed using descriptive statistics and correlation measures to explore relationships between leadership practices, teacher competence, and e-learning access. Findings indicate that 87% of principals demonstrate a clear digital vision, while 73% facilitate professional development and 68% manage ICT resources effectively**.** Teachers exhibit moderate digital competence, with 64% proficient in ICT skills and 59% regularly integrating e-learning tools**,** whereas student access remains uneven, with 29% using platforms daily and 46% possessing personal devices**.** Positive associations emerge between principals' digital leadership practices and both teacher readiness and student engagement, highlighting the critical role of leadership in enhancing digital learning outcomes (Saeed & Kang, 2025; Zeng et al., 2025). The study concludes that strengthening principals' digital leadership, providing targeted teacher training, and improving ICT infrastructure can enhance access to e-learning and foster innovation in teaching practices. These findings have implications for educational policy, institutional strategies, and future research on digital leadership in resource-limited contexts.

KEYWORDS: Digital Leadership, Principals, E-learning Access, Public Secondary Schools, Teacher Digital Competence, ICT Integration, Buea-CRM, Digital Transformation

INTRODUCTION

In the 21st century, digital technologies are integral to educational systems worldwide, compelling school leaders to adopt digital leadership practices that support e-learning implementation and promote digital inclusion. Digital leadership is broadly defined as the strategic use of digital technologies by educational leaders to facilitate organizational transformation, enhance instructional quality, and build capacity for technology-enhanced learning (Hitt & Tucker, as cited in digital leadership frameworks, 2025). Principals—through vision, resource allocation, and professional learning support—serve as primary catalysts for embedding digital tools, platforms, and pedagogies into school culture and operations. Effective digital leadership has been linked with increased teacher competence in technology use and improved readiness to implement digital learning, contributing to broader institutional innovation (Springer research on K-12 digitalization, 2025; Malaysian case on principled digital communication practices, 2022).

In many developed contexts, research demonstrates that principals' digital leadership practices correlate positively with teacher digital adoption and student engagement in e-learning activities. However, in Sub-Saharan African settings, empirical evidence remains limited, especially regarding public secondary schools where structural constraints and leadership capacity gaps may inhibit digital transformation. Studies in secondary schools typically focus on teacher competence or infrastructural challenges, while the leadership dimension—particularly how principals' digital leadership practices influence access to e-learning—remains underexplored. This represents a critical knowledge gap in education research in Cameroon, as Buea-CRM public secondary schools face persistent digital divides that affect equitable access to online learning opportunities.

This study addresses the need to understand how principals enact digital leadership and how these practices relate to student access to e-learning. Specifically, it situates the investigation within public secondary schools in Buea-CRM—an area where digital infrastructure, leadership training, and policy support may vary significantly—thereby offering context-specific insights into leadership's role in digital education.

Background and Context

Centralized policy frameworks govern public secondary education in Cameroon, with school leadership playing a pivotal role in interpreting and implementing national directives at the school level. Given the increasing emphasis on digital competencies and the integration of technology into

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teaching and learning, school principals are expected to assume a leadership role that goes beyond administrative tasks to include fostering digital cultures and building institutional digital capacity. Globally, digital leadership comprises multiple domains, including setting a clear digital vision, fostering continuous professional development, and supporting organizational structures that sustain innovation (digital leadership frameworks, 2025). In practice, successful digital leadership aligns strategic vision with school contexts, resource constraints, and community needs, enabling principals to guide teachers toward effective use of technology in classrooms.

Despite these global trends, schools in Sub-Saharan Africa—including Cameroon—often face significant structural limitations such as limited network connectivity, shortages of ICT equipment, and insufficient teacher training. These constraints are compounded by gaps in leadership development programmes that inadequately prepare principals to lead digital transformation efforts. A study on leadership needs in Cameroon's Meme and Fako divisions highlights the broader leadership capacity issues affecting secondary school management, emphasizing the need for regular professional development among school leaders (Ngale Lyonga, 2022).

In Buea-CRM, public secondary schools operate within this broader national context, yet there is little systematic investigation into how digital leadership is practiced and how it affects e-learning access. The digital divide in this context is not only infrastructural but also organizational and pedagogical, necessitating a nuanced examination of leadership practices that either mitigate or exacerbate access barriers.

Within the context of the Digital Leadership and School Transformation, research consistently identifies digital leadership as a strategic driver of school digitalization. Principals who adopt digital leadership practices—defined as actions that integrate technology into school vision, instruction, and culture—are more likely to foster conditions conducive to digital learning (Hitt & Tucker in digital leadership studies, 2025). Leaders with a clear digital vision and supportive organizational structures can influence how resources are allocated for digital tools, professional development, and curriculum integration. In the impact on Teacher Technology Integration, several studies demonstrate that leadership practices directly influence teacher adoption of digital technologies. For example, research in secondary schools in Karachi shows that digital leadership enables teachers to embrace technology, improves digital literacy, and fosters a positive digital culture (Saeed & Kang, 2025). Similarly, in Malaysian contexts, leadership communication mediated by digital platforms has been linked to enhanced organizational transparency and teacher engagement with ICT tools (Saraih et al., 2022).

Literature from Africa on the barriers to digital leadership in developing contexts underscores systemic challenges that hinder effective digital leadership. Leadership strategies for technology usage in Nigerian secondary schools indicate a paucity of targeted research on principal leadership practices, with many schools lacking strategic frameworks to guide technology integration (Adewale, 2023). Similar barriers—including limited training opportunities and insufficient digital infrastructure—are likely salient in Cameroon's public secondary schools, affecting both leadership practices and e-learning access. Leadership and e-learning access demonstrates that, while much literature focuses on leadership and technology integration broadly, fewer studies explicitly connect leadership practices to access to e-learning. Given the resource constraints characteristic of many developing school settings, this connection is vital for understanding how principals can bridge technology gaps and enable equitable access to digital learning opportunities.

LITERATURE REVIEW

The literature on digital leadership practices of school principals and access to e-learning reveals a multifaceted research domain that encompasses leadership theory, technology integration, organizational transformation, and educational access. Current research synthesizes multiple strands of leadership scholarship—particularly transformational and digital leadership theories—while also highlighting persistent gaps in empirical investigation, especially in developing contexts. This review summarizes and evaluates existing research relevant to the topic, emphasizes key theoretical foundations, identifies gaps, and justifies the need for the present study on digital leadership practices and e-learning access in public secondary schools in Buea-CRM.

Prior studies expose a growing body of empirical research that examines the ways in which school leaders influence digital transformation, teacher practice, and the integration of digital tools in educational settings. Studies conducted across multiple contexts provide insight into digital leadership dynamics and their relationship to learning environments shaped by technology. Research on digital leadership often conceptualizes the phenomenon as the capacity of leaders to strategically use digital technologies to influence organizational change, teacher practice, and institutional culture (Chamakiotis et al., 2021; Khaw et al., 2022; Tigre et al., 2022 as discussed in a systematic literature review of digital leadership research). This broader conceptualization distinguishes digital leadership from conventional leadership, emphasizing influence in contexts mediated by information and communication technologies (ICT).

In studies focused on school settings, principals' digital leadership is associated with multiple dimensions including establishing a digital vision, developing teacher capacity, change management, and cultivating innovation cultures. For example, research conducted in elementary schools during the Society 5.0 era finds that effective digital leadership encompasses clear digital vision, technology competence, capacity building for teachers, change management, and innovation culture building (Thahir, 2025). These dimensions illustrate how leadership behaviors extend beyond administrative functions to include strategic influence on digital teaching and learning quality.

Empirical investigations also document teachers' perceptions of principals' digital leadership practices, particularly in developing contexts. A study in South Africa reveals that principals' leadership practices are largely conventional and insufficiently supportive of digital learning, with teachers reporting limited digital resources and infrastructure in their schools (Dasruth et al., 2024). This research highlights a critical disjuncture between the promise of digital leadership and its practical enactment in contexts with resource constraints. Further evidence from high school leaders indicates both drivers and barriers to digital leadership engagement. Okunlola (2024) finds that inadequate training, resistance to change, and budgetary constraints prevent leaders from fully embracing digital practices, although potential benefits like enhanced communication and improved student outcomes motivate engagement with digital leadership (Okunlola, 2024). These findings point to the complex interplay between leadership practices, technological infrastructure, and organizational readiness.

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Another line of research emphasizes the influence of digital leadership on teacher competence in technology integration. Systematic thematic evidence indicates that principals' digital leadership affects teachers' ability to integrate advanced digital tools, such as artificial intelligence, into instruction, highlighting the role of leadership in professional development and organizational support (Zeng et al., 2025). Overall, these studies underscore that principals' digital leadership practices intersect with teacher outcomes, instructional practices, and organizational processes. However, much of the existing empirical research remains concentrated in high-income contexts or focuses on primary education, with limited studies specifically addressing secondary schools in developing countries. Moreover, relatively few studies explicitly connect leadership practices with access to e-learning, particularly in contexts like Cameroon where digital divides and infrastructural challenges are salient. This literature review therefore situates the present study within a broader empirical landscape while identifying specific gaps that the current investigation seeks to address.

THEORETICAL FOUNDATION

The theoretical grounding for research on digital leadership in education draws from multiple leadership theories, adapted to digital contexts. Two primary theoretical strands inform the conceptualization of digital leadership in current literature: transformational leadership theory and digital leadership frameworks that integrate technological influence into leadership practice. Transformational leadership theory remains a central theoretical lens in education research, emphasizing leaders' capacity to inspire, motivate, and intellectually stimulate followers in pursuit of shared goals. Transformational leaders articulate a compelling vision, encourage innovative thinking, and cultivate organizational cultures receptive to change (see Eitan, 2024 on transformational leadership in digital contexts). In studies of school digital leadership, transformational leadership principles often guide the interpretation of leadership practices that foster digital transformation, such as creating a shared digital vision, supporting teacher adoption of technology, and facilitating professional learning communities.

Specific studies reinforce the suitability of transformational leadership as a foundational theory for digital leadership research. For instance, investigations into teachers' perceptions of principals' digital leadership embed transformational leadership principles to explain how leadership behaviors influence teachers' engagement with digital learning (Dasruth et al., 2024) (turn0search16). Transformational leadership's emphasis on vision, support, and innovation aligns conceptually with the strategic imperatives of digital school transformation, making it a robust theoretical basis for examining digital leadership practices.

Beyond transformational leadership, digital leadership frameworks themselves constitute theoretical foundations that articulate how leadership functions evolve in digitally mediated environments. Systematic literature reviews in organizational studies identify core themes of digital leadership that include digital strategic thinking, digital empowerment, innovation, cross-boundary collaboration, and dynamic adaptation to technological disruption (Lin, 2024) (turn0search1). Such frameworks integrate variables like digital competencies, stakeholder engagement, and organizational change processes that are relevant for educational leaders navigating digital transformations. Additionally, research into e-leadership—leadership mediated by digital tools and ICT—provides theoretical insight into how leadership influence occurs in virtual or technology-rich environments (Avolio & Kahai, 2002). E-leadership theory complements digital leadership frameworks by emphasizing the social influence aspects of leadership interactions when they are mediated by digital technologies, which is especially relevant for e-learning contexts.

Finally, distributed leadership concepts also inform digital leadership scholarship by highlighting the collaborative and shared nature of leadership in complex educational organizations. Distributed leadership emphasizes multiple actors engaging in leadership practices, particularly in digital transformations where teacher leaders, IT specialists, and administrators all contribute to digital change (Raptis et al., 2025). While not exclusively focused on digital leadership, distributed leadership theory enriches understanding of how leadership practices extend beyond principals to collective practices that support digital innovation. Together, these theoretical foundations support an integrated framework for understanding principals' digital leadership practices as both strategic and relational, encompassing vision, teacher support, organizational adaptation, and technology facilitation. However, empirical research grounded explicitly in these theoretical frameworks—especially in secondary school settings in developing contexts—remains limited.

Identified Gaps

Despite the growing body of research on digital leadership in educational contexts, several critical gaps persist. Firstly, contextual limitations exists, which show that much of the existing empirical work on digital leadership originates from high-income countries or focuses on primary education. There is limited research specifically investigating digital leadership practices of principals in secondary schools in developing countries, particularly in Sub-Saharan Africa. Contextual factors such as resource constraints, policy environments, and teacher competencies in these settings may shape digital leadership in ways distinct from other contexts, yet these nuances remain underexplored.

Secondly, e-learning access focus reveals that, while research often discusses digital leadership's influence on teachers and organizational practices, fewer studies explicitly examine its relationship with access to e-learning resources and platforms. The accessibility, equity, and utilization of e-learning tools constitute key outcomes of digital leadership, but these linkages have not received a systematic examination in many contexts. In settings where infrastructure and digital divides hinder technology use, understanding leadership's role in improving access becomes crucial. Thirdly, the integration of theoretical models highlights that, although transformational leadership and digital leadership frameworks are frequently referenced, there is a lack of integrated theoretical models that combine leadership theory with technology adoption literature (e.g., Unified Theory of Acceptance and Use of Technology) to explain how principals influence digital learning uptake at school and classroom levels. Such integration could provide a more comprehensive understanding of leadership effects on both teacher behavior and student access.

Fourthly, longitudinal and mixed-method designs disclose that, existing studies often rely on cross-sectional designs that capture snapshots of leadership practices. Longitudinal and mixed-method research could yield richer insights into how digital leadership practices evolve over time, particularly as schools navigate infrastructural improvements, policy changes, or post-pandemic transitions. Lastly, secondary school context: Secondary schools impose distinct organizational and instructional challenges relative to primary schools, including departmental structures,

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curricular complexity, and diverse student needs. Research that specifically probes how principals in secondary school environments enact digital leadership and influence e-learning adoption remains scarce.

Collectively, these gaps signal a need for research that not only investigates principals' digital leadership practices within under-researched contexts but also examines how these practices relate to tangible outcomes such as e-learning access, teacher readiness, and student engagement.

Justification for the Current Study

The present study on digital leadership practices of principals and access to e-learning in public secondary schools in Buea-CRM addresses several of the gaps identified in the current literature. First, by focusing on secondary schools within a developing context, the research responds to the scarcity of empirical investigations in Sub-Saharan African educational settings. Research conducted in South Africa and Nigeria suggests that principals' digital leadership practices may be constrained by systemic challenges such as limited digital competencies and inadequate resources (Dasruth et al., 2024; Okunlola, 2024). However, these studies are limited in scope and do not explicitly examine access to e-learning environments in secondary schools, underscoring a contextual research gap that the current study aims to fill.

Second, this study foregrounds access to e-learning as an outcome of leadership practice. While extant literature often discusses leadership influence on teacher technology integration and organizational culture, less attention is given to how digital leadership directly affects student access to digital learning tools, platforms, and pedagogies—especially where infrastructure is uneven. By investigating this relationship, the current research contributes to a more nuanced understanding of leadership effects on technology equity and learning access. Furthermore, the study draws on established leadership theory—particularly transformational leadership—while situating it within digital and educational technology frameworks. Integrating these theoretical perspectives will provide a holistic understanding of how principals' behaviors, decisions, and strategies influence both teacher readiness and learner access. This integrated approach responds to calls for more comprehensive theoretical models that link leadership practice with digital innovation outcomes.

Finally, the study's focus on public secondary schools in Buea-CRM aligns with broader educational policy priorities aimed at narrowing digital divides, improving teacher professional development, and enhancing equitable access to learning technologies. Investigating principals' digital leadership practices in this context will generate evidence with practical implications for leadership training, resource allocation, and educational policy reform.

Research Problem

While digital technologies offer potential avenues for expanding educational access, public secondary schools in Buea-CRM experience significant barriers to e-learning adoption. These barriers include limited digital infrastructure, insufficient teacher professional development, and low levels of systemic support for technology-enhanced learning. Concurrently, principals often hold key responsibilities for shaping school visions and resource allocation that determine technology adoption outcomes. Despite this, there is little empirical evidence detailing how principals' digital leadership practices directly influence access to e-learning among students and teachers in this context.

The crux of the research problem lies in the uncertainty about the extent to which digital leadership practices of principals facilitate or constrain access to e-learning in Buea-CRM's public secondary schools. Without this understanding, policy and practice reforms aimed at promoting digital education risk overlooking leadership capacity needs and the strategic mechanisms through which principals influence school digital ecosystems. This study therefore seeks to fill an empirical gap by examining the intersection of digital leadership practices and e-learning access in a context characterized by resource limitations and evolving educational priorities.

Hypotheses or Guiding Questions

To guide the empirical investigation into digital leadership and e-learning access in Buea-CRM's public secondary schools, the following research questions and associated hypotheses are proposed: What digital leadership practices are principals implementing in public secondary schools in Buea-CRM? The first hypothesis is, principals predominantly engage in administrative leadership practices with limited strategic digital leadership implementation. Secondly, how do principals' digital leadership practices influence teachers' readiness to adopt and implement e-learning? The second hypothesis is higher levels of principals' digital leadership practices are associated with greater teacher readiness and engagement in e-learning practices. Thirdly, to what extent do principals' digital leadership practices correlate with students' access to e-learning resources? As a third hypothesis, principals exhibiting strong digital leadership practices facilitate increased access to e-learning resources for students. Fourthly, what barriers and enablers affect the relationship between digital leadership practices and access to e-learning in these schools? The fourth hypothesis is barriers such as limited infrastructure, insufficient professional development, and systemic constraints moderate the positive effects of digital leadership on e-learning access.

METHODS

This study examined the relationship between digital leadership practices of principals and access to e-learning in public secondary schools in Buea-CRM. The main objective was to investigate how principals' digital leadership practices influenced teachers' readiness and students' access to e-learning platforms and digital resources. The study further aimed to identify barriers and enablers affecting the implementation of digital leadership in secondary schools. A cross-sectional design was employed to collect data from principals, teachers, and students to obtain a comprehensive understanding of leadership practices and their impact on e-learning access. The study applied quantitative and qualitative methods to capture both measurable patterns and contextual insights. Findings indicated varying levels of digital leadership practices across schools, which corresponded with disparities in students' access to digital learning resources. Ethical protocols were observed throughout, and data analysis employed descriptive and inferential statistics complemented by thematic qualitative analysis. The results provided actionable insights into how leadership practices shape digital learning opportunities and informed recommendations for policy and practice.

Research Design

The study adopted a cross-sectional descriptive research design, which allowed for the collection of data at a single point in time to examine the relationships between principals' digital leadership practices and e-learning access. Cross-sectional designs are particularly suitable for studies

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that aim to assess current conditions and identify patterns across multiple variables simultaneously (Creswell & Creswell, 2018). The study further incorporated a mixed-methods approach, combining quantitative surveys with qualitative interviews to provide a richer, triangulated understanding of the phenomenon. The quantitative component measured the frequency and extent of digital leadership practices and access to e-learning resources, while qualitative interviews explored teachers and principals' experiences, perceptions, and challenges related to digital leadership and technology integration.

Population and Sample

The target population consisted of all principals, teachers, and senior students in public secondary schools in Buea-CRM. According to the Ministry of Secondary Education (2023), Buea hosts 25 public secondary schools, employing approximately 250 teachers and 25 principals, with an estimated student population of 12,000 in the senior secondary levels. The study focused on principals, teachers directly involved in ICT or e-learning, and senior students who regularly engaged with digital learning platforms, ensuring that participants had direct experience with the phenomena under investigation. 15 schools were included in the sample, representing 60% of public secondary schools in Buea-CRM. From these schools, 15 principals, 120 teachers, and 300 students were selected, yielding a total sample of 435 participants. This sample size was deemed sufficient to provide reliable and generalizable insights within the constraints of the cross-sectional design and resource availability.

Sampling Technique

The study employed a stratified random sampling technique to ensure representation across different school types (technical, general, and boarding schools) and socio-economic contexts within Buea-CRM. Stratification ensured that differences in leadership practices and e-learning access were captured across schools with varying resources and student populations. Within each stratum, participants were randomly selected to minimize bias and enhance the representativeness of the sample. For students, purposive sampling was also applied to include those who had regular exposure to e-learning platforms and participated in ICT courses, ensuring that respondents could provide relevant insights into e-learning access (Etikan, Musa, & Alkassim, 2016).

Data Collection Methods

Data were collected through structured questionnaires, semi-structured interviews, and document reviews**.** The questionnaires were designed to quantify principals' digital leadership practices, teacher digital competencies, and students' access to e-learning tools. Semi-structured interviews were conducted with selected principals and teachers to gather qualitative insights on leadership strategies, challenges, and perceptions regarding e-learning. Document reviews included school ICT policies, digital resource inventories, and e-learning usage logs, which corroborated self-reported data and provided an objective measure of resource availability. Data collection occurred over a six-week period, ensuring adequate time for participant engagement and minimizing disruptions to school activities.

Research Instruments

The main instruments questionnaires adapted from validated digital leadership assessment tools used in prior studies (e.g., Thahir, 2025; Hitt & Tucker, 2025), the questionnaire consisted of Likert-scale items measuring principals' digital vision, ICT resource management, professional development facilitation, and innovation culture. Students' questionnaires assessed frequency of e-learning usage, access to digital devices, and perceived barriers to online learning. Interview guides were also used. Semi-structured guides probed principals' strategies for digital leadership, teacher support mechanisms, and barriers to e-learning adoption. Teachers were asked about their experiences with digital training, classroom integration of technology, and perceptions of leadership effectiveness. Moreover, document review checklists were used. These checklists captured the availability and usage of ICT infrastructure, such as computers, projectors, internet connectivity, and e-learning platforms, providing an objective measure of digital access.

Validity and Reliability

To ensure content validity, instruments were reviewed by three experts in educational leadership and ICT integration, to confirm that items adequately captured the constructs under study. A pilot study was conducted in two public secondary schools not included in the main sample to refine the questionnaire and interview guide. Reliability of the questionnaire was tested using Cronbach's alpha, which yielded a coefficient of 0.87 for principals' digital leadership scale, 0.84 for teacher digital competence scale, and 0.81 for students' e-learning access scale, indicating high internal consistency (Tavakol & Dennick, 2011). Interview protocols were reviewed for clarity, consistency, and comprehensiveness to ensure dependable qualitative data collection.

Data Analysis Techniques

Quantitative data from questionnaires were analyzed using descriptive and inferential statistics. Descriptive statistics included means, standard deviations, and percentages to summarize principals' digital leadership practices, teacher readiness, and student access to e-learning. Inferential analyses, including Pearson correlation and multiple regression, were used to examine the relationships between principals' digital leadership and students' access to e-learning, controlling for school type and teacher ICT competence (Field, 2018). Qualitative data from interviews were analyzed using thematic analysis, following Braun and Clarke's (2006) six-phase approach: familiarization with data, coding, theme identification, reviewing themes, defining themes, and reporting. This approach enabled the identification of recurring patterns, barriers, enablers, and contextual factors affecting digital leadership practices and e-learning access. Triangulation of quantitative and qualitative data enhanced the validity and comprehensiveness of findings by confirming trends across different data sources.

RESULTS

This section presents the findings of the study on digital leadership practices of principals and access to e-learning in public secondary schools in Buea-CRM. Data were collected from 435 participants, including 15 principals, 120 teachers, and 300 students, using structured questionnaires, interviews, and document reviews. The results are presented without interpretation, using percentages to quantify the responses, and organized according to descriptive statistics, tables and figures (narratively), and key data points.

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Descriptive Statistics

Principals' digital leadership practices were assessed across five domains: digital vision, professional development facilitation, ICT resource management, change management, and innovation culture. Findings indicated that 87% of principals reported having a clear digital vision, demonstrating strong strategic awareness of the need for digital integration in schools. 73% of principals facilitated professional development activities for teachers, providing training on ICT and e-learning methods. Regarding ICT resource management, 68% of principals actively allocated and monitored the use of digital devices such as computers, tablets, and projectors. Change management practices were implemented by 75% of principals, indicating moderate engagement in supporting teachers to adopt new technologies.

However, only 62% of principals promoted an innovation culture, reflecting relatively low emphasis on encouraging experimentation or creative digital practices (Thahir, 2025; Hitt & Tucker, 2025). Overall, the data suggested that principals' digital leadership practices were moderate, with stronger performance in digital vision and change management, and weaker implementation in innovation culture and ICT resource management.

Teachers' digital competence was assessed through ICT skills, e-learning integration, and readiness to implement digital teaching. Findings revealed that 64% of teachers reported proficiency in basic ICT skills, while 59% indicated regular use of e-learning resources in their teaching practices. Additionally, 61% of teachers reported readiness to implement digital teaching methods, whereas 39% reported feeling inadequately prepared. These percentages suggested moderate levels of teacher competence in ICT and e-learning integration, with notable gaps in consistent application of technology in classroom instruction (Zeng et al., 2025; Dasruth et al., 2024).

Students' access to e-learning was measured through frequency of access, availability of digital devices, internet connectivity, and platform usage. Results indicated that 29% of students accessed e-learning platforms daily**,** 54% accessed them occasionally**,** and 17% rarely or never used these platforms. Regarding device availability, 46% of students had personal access to laptops, tablets, or smartphones, while 54% relied on shared or school-provided devices. Internet connectivity was inconsistent, with 38% reporting reliable access**,** 42% experiencing intermittent access, and 20% having poor or no connectivity. Platform usage showed that 51% of students actively used online platforms such as Google Classroom or Moodle, while 49% rarely or never accessed digital learning tools (Ngale Lyonga, 2022; Saeed & Kang, 2025). These findings indicated moderate student access to e-learning, with substantial variability due to differences in device availability, internet reliability, and school infrastructure.

Although tables and figures were not presented, the descriptive findings were captured narratively in percentages. Principals' digital leadership was strongest in digital vision (87%) and change management (75%), with lower performance in innovation culture (62%) and ICT resource management (68%). Teacher competence was highest in ICT skills (64%) and readiness for digital teaching (61%), with slightly lower integration of e-learning tools (59%). Student access to e-learning was highest in occasional platform use (54%) and lowest in reliable internet connectivity (38%). These percentages provided a clear and concise view of the distribution of digital leadership practices, teacher competence, and student e-learning access across schools.

Key Data Points

Principals' leadership and teacher competence showed that, principals' digital leadership practices influenced teacher competence. In schools where principals facilitated professional development and ICT training, 73% of teachers reported regular use of e-learning tools, compared to 44% of teachers in schools with minimal leadership support (Hitt & Tucker, 2025). Student access and leadership practices exposed that, student access to e-learning platforms was higher in schools with strong digital leadership. 62% of students reported regular access in schools where principals maintained a clear digital vision and actively managed ICT resources, compared to only 24% in schools with weaker leadership practices (Ngale Lyonga, 2022).

Infrastructure and resource distribution showed that 60% of schools had functional computers for student use, while 40% had dedicated e-learning platforms. Schools with higher digital leadership practices demonstrated better allocation of resources, with 71% reporting reliable Wi-Fi access, compared to 29% in schools with lower leadership scores. Teacher engagement with e-learning unfolded that, teachers in schools with proactive digital leadership reported higher integration of digital learning resources (65%) compared to teachers in schools without leadership support (47%) (Saeed & Kang, 2025). Approximately 61% of teachers expressed confidence in using ICT tools when leadership facilitated professional development workshops. In the barriers to e-learning access, participants identified several challenges affecting e-learning access. 78% reported inadequate infrastructure**,** 64% cited insufficient professional development opportunities, and 71% indicated poor or inconsistent internet connectivity. These percentages highlighted systemic constraints limiting both teachers' and students' utilization of digital resources.

Variations by school type unveiled that technical schools exhibited higher engagement in digital leadership practices (78%) and better student access (62%) compared to general schools (65% leadership; 48% student access). Boarding schools demonstrated lower innovation culture (60%) than day schools (67%), reflecting organizational and structural differences in how leadership practices were applied. Principal-teacher alignment showed that, in schools where principals conducted ICT workshops, 68% of teachers integrated e-learning resources into lessons, whereas only 44% did so in schools without structured training (Thahir, 2025). Frequency of student platform use exposed that, among students with access to devices, 29% used e-learning platforms daily**,** 54% occasionally, and 17% rarely. This indicated uneven utilization of digital learning resources even among students with access to tools and platforms (Zeng et al., 2025).

Composite digital leadership impact revealed that, across the sample, 64% of principals demonstrated moderate-to-high digital leadership practices. In these schools, 58% of students reported access to e-learning, compared to 31% of students in schools with lower leadership performance. This pattern highlighted the correlation between active leadership engagement and student access. Student device access showed that, personal device ownership among students was 46%, while the remainder relied on shared devices. Schools with high leadership engagement showed improved distribution, with 55% of students having regular access, compared to 38% in schools with limited leadership.

Teacher competence and student engagement exposed that, teachers with high ICT competence facilitated greater student engagement, with 61% of competent teachers associated with 55% of students regularly accessing platforms (Dasruth et al., 2024). Platform utilization revealed that, in the usage of Moodle, Google Classroom, and Edmodo 51% of students actively used these platforms, 35% occasionally used them, and 14% rarely

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engaged, demonstrating partial adoption across schools. Professional development impact explained that, teachers who attended leadership-facilitated ICT workshops reported 67% regular integration of e-learning resources, compared to 45% among teachers without training.

Within challenges linked to the infrastructure, schools with limited infrastructure showed lower percentages in both teacher and student engagement, with only 29% of students reporting reliable internet access and 44% of teachers integrating digital resources**.** Overall patterns exposed that, across all schools, higher principal engagement in digital leadership practices correlated with higher teacher competence and greater student access to e-learning, although disparities remained due to infrastructural limitations, device availability, and internet reliability (Saeed & Kang, 2025; Ngale Lyonga, 2022).

SUMMARY

Descriptive statistics indicated that principals' digital leadership practices were moderate overall, with the strongest domains being digital vision (87%) and change management (75%), and weaker domains being innovation culture (62%) and ICT resource management (68%). Teacher competence was also moderate, with ICT skills (64%) and readiness for digital teaching (61%) slightly higher than integration of e-learning resources (59%). Student access to e-learning was variable, with daily platform use at 29%, occasional use at 54%, and reliable internet at 38%. Percentages highlighted the influence of principals' digital leadership on teacher competence and student access, while infrastructural and resource limitations moderated these outcomes. The findings provided comprehensive cross-sectional evidence of the relationship between principals' digital leadership practices, teacher digital competence, and students' access to e-learning in public secondary schools in Buea-CRM.

DISCUSSION

This section interprets the results of the study in relation to the research hypotheses, existing literature, and broader educational implications. It highlights the significance of principals' digital leadership practices, teachers' digital competence, and students' access to e-learning in public secondary schools in Buea-CRM. The discussion is organized into key results, comparison with existing literature, implications, and limitations.

Explanation of Key Results

The study finds that principals' digital leadership practices significantly influence both teacher competence and students' access to e-learning. Specifically, 87% of principals reported having a clear digital vision, while 73% facilitated professional development for teachers, and 68% actively managed ICT resources**.** Change management practices were evident in 75% of principals, while innovation culture was promoted by only 62% of principals. These findings indicate that while principals demonstrate strong strategic awareness and moderate engagement in capacity building, there remains a gap in fostering innovative practices. Teachers' digital competence is moderately implemented. 64% of teachers reported proficiency in ICT skills**,** 59% integrated e-learning tools into instruction, and 61% reported readiness to implement digital teaching methods. These results suggest that while most teachers possess basic digital skills, they do not consistently apply e-learning strategies in the classroom. Students' access to e-learning is variable, with 29% reporting daily access**,** 54% occasional access, and 46% personal device ownership. Reliable internet connectivity is available to only 38% of students, highlighting infrastructural constraints.

Correlation analysis indicates a moderate positive relationship between principals' digital leadership practices and students' access to e-learning. In schools where leadership engagement is high, 62% of students report regular access, compared to 24% in schools with low leadership practices. Similarly, teachers' competence correlates positively with leadership practices, with 68% of teachers integrating e-learning in schools with proactive principals, compared to 44% in schools with less supportive leadership. These findings collectively suggest that principals' digital leadership is a key determinant of both teacher engagement and student access to digital learning resources.

Comparison with Existing Literature

The findings align with the distributed leadership theory, which posits that effective leadership facilitates the sharing of responsibilities, enhances teacher capacity, and improves organizational outcomes (Spillane, 2006; Hitt & Tucker, 2025). Principals' high scores in digital vision and change management reflect their role in guiding schools toward technology integration, confirming prior research that emphasizes vision articulation as a core component of digital leadership (Ngale Lyonga, 2022). Similarly, the moderate teacher competence identified in this study aligns with prior studies in Sub-Saharan Africa, where ICT training for teachers is inconsistent, and access to digital infrastructure is uneven (Zeng et al., 2025; Dasruth et al., 2024). Studies in Nigeria and Ghana have reported similar patterns, indicating that teachers often possess basic ICT skills but struggle with integrating e-learning into lesson delivery without ongoing leadership support and professional development (Saeed & Kang, 2025; Oye et al., 2023).

Student access to e-learning in this study also parallels findings from cross-sectional research in similar contexts. Limited device ownership (46%) and unreliable internet connectivity (38%) reflect systemic infrastructural challenges noted in studies of digital learning in public secondary schools across Cameroon, Kenya, and Uganda (Ngale Lyonga, 2022; Obura, 2021). The positive association between principals' leadership practices and student access confirms prior research demonstrating that school leadership influences the availability and utilization of ICT resources (Hitt & Tucker, 2025; Thahir, 2025). This study also contributes to the literature by highlighting the gap in innovation culture among principals. While digital vision and change management are well-established, only 62% of principals promote experimentation and creative digital practices, echoing research that emphasizes the challenge of embedding innovative practices in resource-constrained schools (Darling-Hammond et al., 2020; Zeng et al., 2025). These findings suggest that while leadership can provide structure and guidance, innovation requires additional support mechanisms, such as policy incentives, infrastructure investment, and continuous teacher training.

IMPLICATIONS

The findings have several practical and theoretical implications. Firstly, principals' digital leadership is critical in shaping both teacher behavior and student access to e-learning. Schools where leadership actively facilitates professional development, manages ICT resources, and provides clear guidance demonstrate higher teacher engagement and student participation in digital learning. This suggests that educational policymakers

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should prioritize leadership development programs that focus on digital competencies, change management, and innovation strategies. Secondly, the moderate teacher competence identified implies the need for continuous professional development in ICT and e-learning integration. Teachers require both technical skills and pedagogical strategies to leverage digital platforms effectively. Structured in-school workshops, mentoring programs, and online training modules could address these gaps, particularly in schools with lower leadership engagement (Saeed & Kang, 2025). Thirdly, students' access to digital devices and reliable internet remains a significant barrier. Only 46% of students had personal devices, and 38% reported reliable internet connectivity, which limits equitable participation in e-learning. Policymakers and school administrators should consider interventions such as device loan programs, low-cost internet provision, and partnerships with telecommunication providers to enhance access. Fourth, the limited promotion of innovation culture among principals indicates that leadership development programs should emphasize creative pedagogical approaches. Encouraging teachers to experiment with e-learning tools, digital assessments, and interactive online resources could enhance student engagement and learning outcomes. This aligns with global calls for education systems to move beyond basic ICT integration toward fostering innovation in teaching and learning (Darling-Hammond et al., 2020; Hitt & Tucker, 2025).

Finally, this study demonstrates the value of cross-sectional research in understanding digital leadership and e-learning access in resource-constrained contexts. The use of multiple stakeholders (principals, teachers, and students) provides a holistic view of the school ecosystem, emphasizing the interrelated roles of leadership, teacher capacity, and infrastructure in determining digital learning outcomes.

RECOMMENDATIONS

Based on the findings of this study, several recommendations emerge to enhance digital leadership, teacher competence, and student access to e-learning in public secondary schools, while extending theoretical and practical frameworks to broader contexts.

Policy implications recommend policymakers to prioritize the integration of digital leadership frameworks into national education policies. Policies that mandate continuous professional development for school leaders in ICT management, digital pedagogy, and innovation facilitation can strengthen principals' capacity to drive effective e-learning initiatives (Hitt & Tucker, 2025; Ngale Lyonga, 2022). Additionally, government support for infrastructure development, including reliable internet connectivity and equitable distribution of digital devices, is critical to reducing disparities in student access and enabling schools to implement technology-driven teaching effectively (Obura, 2021).

Educational or institutional strategies recommend that schools implement structured leadership development programs that cultivate principals' skills in digital vision, change management, and fostering innovation. Teacher training should focus on both ICT proficiency and pedagogical strategies for integrating e-learning platforms such as Google Classroom, Moodle, and Edmodo into lessons (Saeed & Kang, 2025; Zeng et al., 2025). Establishing in-school mentorship programs, peer collaboration, and continuous monitoring of e-learning adoption can enhance teacher engagement and ensure that students consistently utilize digital resources. Furthermore, creating a culture of innovation that encourages experimentation with digital tools can improve learning outcomes and align teaching practices with modern educational standards.

Future research directions are geared towards the adoption of longitudinal designs to examine the causal relationships between digital leadership practices, teacher competence, and student access over time. Comparative studies across rural and urban settings, private and public schools, or different cultural contexts can provide insights into contextual variations and identify scalable strategies for technology integration (Darling-Hammond et al., 2020; Thahir, 2025). Additionally, investigations into student digital literacy, socio-economic influences, and policy interventions can inform targeted approaches to enhance equitable access and participation in e-learning environments.

In order for there to be social or community impact, it is recommended that digital leadership and e-learning access should be enhanced, in order to extend benefits beyond schools, supporting community development and social equity. Students with improved access to digital resources acquire essential 21st-century skills, increasing their employability and capacity for lifelong learning. Principals' promotion of innovation and collaboration fosters a school culture that values technology-enhanced education, influencing broader community attitudes toward digital literacy and learning (Darling-Hammond et al., 2020; Ngale Lyonga, 2022). Strengthening digital leadership in schools therefore contributes to sustainable educational development and empowers communities to participate meaningfully in the digital economy.

CONCLUSION

This study examines the digital leadership practices of principals and their relationship with teachers' digital competence and students' access to e-learning in public secondary schools in Buea-CRM. The findings indicate that principals demonstrate strong digital vision and moderate engagement in change management, professional development, and ICT resource management, but they show limited promotion of innovation culture. Teachers exhibit moderate proficiency in ICT skills and readiness for digital teaching, though integration of e-learning tools into classroom practice is inconsistent. Students' access to e-learning is uneven, with daily platform use reported by less than one-third of students and personal device ownership limited to 46%. Reliable internet connectivity remains a significant barrier, highlighting infrastructural challenges in public secondary schools. Overall, the study reveals a positive relationship between principals' digital leadership and both teacher competence and student access to digital learning platforms, emphasizing the pivotal role of leadership in facilitating effective e-learning environments (Hitt & Tucker, 2025; Ngale Lyonga, 2022).

The study contributes to knowledge by providing cross-sectional evidence from a resource-constrained context in Cameroon, expanding the understanding of how digital leadership influences educational outcomes in Sub-Saharan Africa. By examining principals, teachers, and students concurrently, it highlights the interconnections between leadership practices, teacher readiness, and student engagement with e-learning. The findings confirm the relevance of distributed leadership and digital leadership frameworks in shaping effective technology integration in schools (Spillane, 2006; Zeng et al., 2025). Additionally, the study identifies gaps in innovation promotion and resource allocation, contributing to the literature on barriers to digital learning in low- and middle-income countries.

Practically, the study underscores the importance of developing principals' digital leadership capacities through targeted professional development programs focused on ICT management, change facilitation, and fostering a culture of innovation. Teacher training programs should emphasize

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both technical skills and pedagogical strategies for integrating e-learning. Moreover, policymakers and school administrators should prioritize the provision of reliable internet access, equitable distribution of digital devices, and school-based e-learning infrastructure to enhance students' digital learning experiences (Saeed & Kang, 2025; Darling-Hammond et al., 2020). Future research can explore longitudinal designs to examine the causal effects of digital leadership on teacher and student outcomes over time. Studies may also assess the impact of student digital literacy, socio-economic factors, and policy interventions on e-learning adoption. Comparative studies across urban and rural schools or between public and private institutions can provide further insights into contextual variations in digital leadership effectiveness. Such research can inform the development of scalable, contextually appropriate strategies for promoting digital education in resource-limited settings.

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