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EDUCATION

DIGITAL COMPETENCY DISPARITIES AND THE DIGITAL DIVIDE IN SECONDARY EDUCATION IN KENYA: A COMPARATIVE ANALYSIS OF STUDENTS AND TEACHERS

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ABSTRACT

The digital divide in secondary education extends beyond access to technology and increasingly reflects disparities in digital competencies among key stakeholders. This study sought to examine whether differences in digital competency levels between students and teachers influence the digital divide within a secondary school context. Grounded in the Knowledge-Based View, which conceptualizes digital skills as strategic organizational resources, the study adopted a quantitative case study design. Study data was collected through structured questionnaires administered to 78 students and 19 teachers. Descriptive statistics and Analysis of Variance (ANOVA) were used to compare competency levels between teachers and students at a 5% level of significance. The findings showed teachers reporting significantly higher digital competency levels than students, $F(1, 95) = 3.979$, $p = .049$. Both teachers and students showed confidence in the use of digital devices and also agreed that access to ICT infrastructure is a major drawback with the lowest mean of (Students: $M = 1.68$; Teachers: $M = 1.74$). Both groups also agreed in the perception that improving digital skills improves participation in digitally enabled learning (Students: $M = 4.35$; Teachers: $M = 4.68$) but teachers demonstrated a stronger self-reported competency. The findings seem to be consistent with other empirical studies that shows differences in digital skills cause inequalities in learning outcomes. Students showed moderate competencies but were found to have weaker confidence in academic applications suggesting that digital familiarity is not equal to productive use. The study's conclusion is that access to infrastructure is not enough but targeted skills development programmes ought to be introduced to build teachers digital literacy capacity which in turn translates to more students embracing and participating in technology enabled learning environments.

Keywords: *Digital Competency, Disparities, Digital Divide, Secondary Education, Comparative Analysis, Students and Teachers*

INTRODUCTION

One of the challenges facing the adoption of technology in education is the digital divide, a term first coined by the US department of Commerce in 1996 and referred to those who have access to digital devices access and those that did not have such access. With time, the term has evolved to refer not only to device access but to more complicated issues like availability of current and relevant software, internet accessibility, digital skills acquisition and ability to apply these skills in daily life. Further digital divide in modern day has also extended to demographics like gender, geographical locations and social status (Dolan, 2017). Although accessibility to computers, internet, electricity and smartphones looks generally within reach, and despite the world experiencing rapid advances in digital technology, teachers in secondary schools continue to struggle with digital literacy and students from low social economic zones, who would actually be the best beneficiaries, continue to struggle to access the same technology due to structural factors and poor government policies. To exacerbate the situation, it is sad to note that even when the internet and technology are accessible, users do not always have the pertinent knowledge to use them appropriately and effectively (Huffman, 2018).

The level of digital competency of the teachers in secondary schools in Kenya greatly affect how they deliver content by use of technology and consequently the level of usage of technology by the students for learning. Results from a study by Nyamboki et al (2025) in Homa Bay County, Kenya revealed a very strong correlation between access to ICT infrastructure and quality of teacher training with the study further noting key challenges as inconsistent teacher training programmes, limited ICT infrastructure and limited ongoing support. Locally, secondary schools that are in rural areas do not have the required facilities to enhance technology use in learning and teaching. For instance, most schools lack computer laboratories, electricity connection and reliable internet connection. Even where internet is available, the cost is too high to effectively support learning due to limited funding. In cases where schools have computer labs and internet connection, new challenges emerge of adequacy due to number of students using one computer, sharing of computers deny students and teachers the opportunity to learn and explore available options to expand knowledge due to limited computer time. Where teachers give students classwork to do at home, the challenge that faces students is that many homesteads do not have electricity connection, reliable and affordable internet connection and smart digital devices for use by students to complete their homework.

In Europe for instance, a study by Pearson (2023) found out that half of secondary school students did not have reliable Wi-Fi connection at home which is a factor that limited teachers from giving students class work to be done off school. This limited the application of digital skills and the expansion of digital literacy by students thus widening the digital divide. In United States, Kormos et al (2023) conducted a study to understand how teachers implemented technology using various modalities to enhance delivery and student engagement. The study found out that based on school setting and usage frequency, there existed significant variations in usage and frequency of how technology was utilised between rural, urban and suburban teachers. In addition, Hong et al. (2024) demonstrated that frequent and effective integration of ICT by teachers enhanced academic performance and digital readiness, particularly among students without access to computers at home.

In Kenya, the digital divide in secondary education remains pronounced, particularly between urban and rural schools. Despite national efforts to integrate ICT into education through policy frameworks such as Sessional Paper No. 1 of 2019 (Republic of Kenya, 2019), many schools continue to experience critical infrastructure deficits. National statistics indicate that less than 38% of schools have internet access (UNESCO, 2023), with rural secondary schools disproportionately affected (KNBS, 2025). Additionally, a significant proportion of schools lack reliable electricity, further constraining digital device usage. Although government initiatives have trained large numbers of teachers in ICT (Ministry of ICT, 2022), many educators report feeling inadequately prepared to integrate digital tools into classroom practice due to infrequent training and limited opportunities for hands-on application (Thuranira et al., 2024).

These infrastructural and training challenges translate into uneven digital competency levels among both teachers and students. Secondary schools in Kenya often report high student-to-computer ratios, particularly at the secondary level, limiting regular access to digital tools (Ministry of Education, 2021). Therefore, students' digital skills development is highly dependent on teachers' ability to creatively utilise limited resources, while teachers' own competency constraints further restrict digital engagement in classrooms. This mismatch in competency levels between teachers and students represents a critical dimension of the digital divide that remains underexplored in empirical research.

STUDY OBJECTIVE

The objective of this study was to assess whether differences in digital competency levels between students and teachers influence the digital divide in a secondary school context.

RESEARCH HYPOTHESIS

H_{01}: There is no statistically significant difference in digital competency levels between students and teachers, and therefore competency levels do not significantly influence the digital divide.

LITERATURE REVIEW

THEORETICAL REVIEW

This study is anchored on a combined theoretical framework drawing from the Knowledge-Based View (KBV) and Stakeholder Theory, which together provide a robust lens for examining digital competency disparities among students and teachers and their implications for the digital divide in secondary schools. The integration of these theories allows the study to conceptualize digital literacy competencies as strategic knowledge resources while recognizing the interdependent roles of key educational stakeholders in addressing digital inequities.

Knowledge-Based View Theory

The Knowledge-Based View is an extension of the Resource-Based View (RBV) and posits that knowledge constitutes the most strategically significant resource for organisational effectiveness and sustained advantage (Grant, 1996). Unlike physical or financial resources, knowledge is inherently complex, socially embedded, context-specific, and difficult to imitate, making it a critical driver of long-term performance. The theory further asserts that organisational success depends on the creation, integration, transfer, and application of knowledge through social and cognitive processes (Alavi & Leidner, 2001). In the context of education, KBV underscores the importance of digital competencies as core knowledge assets that shape teaching effectiveness and learning outcomes. Digital literacy skills possessed by teachers and students determine how effectively technology is utilised for instructional delivery, assessment, and knowledge construction. Schools that foster continuous knowledge creation through teacher training, collaborative learning environments, and curriculum-based

digital skill development are better positioned to minimize disparities in digital competence (Rasdiana et al., 2024).

The KBV theory suggests that disparities in digital knowledge acquisition and dissemination contribute to uneven learning experiences, thereby reinforcing the digital divide. Furthermore, KBV highlights the role of organisational routines and cultures that support knowledge sharing, aligning with the study's focus on teacher preparedness and curriculum integration as mechanisms for strengthening digital competencies (Nonaka & Takeuchi, 1995).

Stakeholder Theory

Stakeholder Theory advances the notion that organisations create value by recognizing and addressing the interests of all stakeholders affected by their operations, rather than prioritizing a single group (Harrison & Wicks, 2022). Stakeholders include individuals or groups that can affect or are affected by organisational actions, such as employees, customers, communities, and governments. In the educational context, key stakeholders encompass students, teachers, parents, school administrators, government agencies, local communities, technology providers, and non-governmental organisations. Originally articulated by Freeman (1984) and later expanded by scholars such as Donaldson and Mitchell, Stakeholder Theory emphasizes that organisational success depends on effective stakeholder engagement, collaboration, and alignment of interests (Valentinov & Roth, 2023). Bridging the digital divide in schools requires coordinated efforts among these stakeholders, each contributing resources, expertise, or policy support necessary for sustainable ICT integration.

In this study, Stakeholder Theory complements KBV by highlighting the relational dynamics that shape digital literacy development. Improving competency levels among teachers and students directly addresses their immediate learning needs while indirectly serving the interests of parents, administrators, and government bodies seeking equitable educational outcomes. The theory reinforces the idea that addressing digital competency gaps is not solely a technical or pedagogical issue but a collective responsibility involving multiple actors. It also supports the integration of ICT skills into the curriculum, as curriculum reform requires collaboration among educators, policymakers, industry experts, and the wider community.

EMPIRICAL REVIEW

The concept of the digital divide has evolved from a narrow focus on access to technology to a multidimensional understanding that encompasses skills, usage, and outcomes (van Dijk, 2005). Early conceptualizations defined the digital divide primarily in terms of unequal access to digital devices and internet connectivity, often referred to as the first-level digital divide (Norris, 2001). Subsequent scholarship expanded the concept to include disparities in digital skills, motivations, and patterns of use, commonly described as the second-level digital divide (van Dijk et al., 2014). This shift acknowledged that access alone does not guarantee meaningful engagement with technology. In educational settings, students may have exposure to digital tools but lack the competencies required to apply them effectively for learning. The concept further extends to the third-level digital divide, which concerns the extent to which individuals can translate digital engagement into tangible benefits such as improved academic performance or enhanced life opportunities (Srinuan & Bohlin, 2011).

Digital equity therefore implies that learners are not merely consumers of digital content but active participants capable of creating, evaluating, and applying digital knowledge (Digital Promise, 2024). This multidimensional understanding suggests that the digital divide is not a simple dichotomy of access versus non-access but a layered phenomenon shaped by competencies, institutional support, and contextual factors (Rogerson, 2020). Consequently, interventions focused solely on infrastructure provision may fail to achieve meaningful digital inclusion if underlying competency gaps remain unaddressed (Andrew et al., 2024).

Empirical evidence consistently demonstrates that digital competency levels among teachers and students play a central role in shaping digital inequalities. Studies across diverse contexts reveal that higher levels of ICT skills are positively associated with improved learning outcomes and greater digital participation. For instance, a meta-analysis conducted in Asia found that digital skill proficiency among secondary school students significantly correlates with academic achievement, with socioeconomic status acting as a moderating factor (Li et al., 2025). Similar findings have been reported in the United States, where disparities in digital skills – shaped by gender and socioeconomic factors were identified as key contributors to unequal online participation (van de Werfhorst, Kessenich & Geven, 2022). Research in Australia further indicates that students from disadvantaged backgrounds often lack critical digital competencies, thereby widening existing educational inequalities (Marsden et al., 2025). In Europe, recent empirical work shows that digital literacy significantly enhances students'

academic performance, underscoring the need to systematically integrate digital skills into school curricula (Zakir et al., 2025). Comparable patterns have been observed in African contexts, where digital literacy has been shown to positively influence academic achievement among secondary school students (Odeke, A. E. (2024).

Teacher competencies are equally critical in shaping students' digital learning experiences. Studies in Kenya indicate that many teachers struggle to utilise available digital devices due to inadequate technological and pedagogical skills (Chepchumba et al., 2023). Similar findings have been reported in Kakamega County, where teacher preparedness significantly influenced the effective integration of e-resources into instruction (Ouma, 2024). Globally, disparities in teacher technology use across urban and rural schools have been linked to differences in student engagement and learning outcomes (Kormos & Wisdom, 2023). Scholars further argue that teacher education programmes must integrate digital skills with pedagogical strategies to adequately prepare educators for technology-rich classrooms (Kaminskiene et al., 2022). Access to devices without corresponding skills is insufficient for reducing digital disparities (Warschauer, 2004). Policy-oriented research similarly calls for coordinated strategies that simultaneously address access, skills development, and institutional capacity to ensure equitable digital inclusion (Kovac et al., 2024).

METHODOLOGY

The study adopted a quantitative case study design to facilitate an in-depth examination of digital competency disparities within a single public secondary school, treating the institution as a bounded system to generate detailed empirical evidence on how differences in digital skills between students and teachers contribute to the digital divide. A cross-sectional survey design was employed, with data collected at one point in time using structured questionnaires (Creswell, 2014), enabling the measurement and comparison of digital competency levels through both descriptive and inferential statistical techniques. The target population comprised 400 students from Forms Two to Four and 25 teachers, ensuring representation of both users and implementers of digital technologies within the school context. Stratified sampling was applied, where students and teachers formed the primary strata, and students were further stratified by class level; a random sample of 30 students from each form was selected, yielding 90 student respondents, while all 25 teachers were included through a census approach to maximize instructional representation. Data were collected using structured questionnaires

administered via Google Forms, incorporating sections on demographic characteristics and items aligned with the study objectives, particularly digital competency levels. Data analysis involved descriptive statistics, including frequencies, percentages, means, and standard deviations, to summarise respondent characteristics and response patterns, followed by inferential analysis using Analysis of Variance (ANOVA) to test for statistically significant differences between students' and teachers' digital competency scores at a 5% level of significance ($p < 0.05$), with results interpreted in relation to the study objective on competency disparities and the digital divide.

FINDINGS AND DISCUSSION

Digital Competency Levels among Students and Teachers

Digital competency levels of students and teachers were assessed using seven Likert-scale items covering confidence in device use, online information retrieval, application of digital tools for schoolwork, perceptions of peers' and teachers' skills, and adequacy of ICT infrastructure. The means and standard deviations for the seven items are summarized in Table 1.

Table 1: Comparative Descriptive Statistics of Digital Competency Levels

Item	Students (n ≈ 73–76) M ± SD	Teachers (n = 19) M ± SD
Confidence in using digital devices	3.88 ± 0.97	4.47 ± 0.61
Ability to search/evaluate online materials	4.19 ± 1.02	4.32 ± 0.75
Use of digital tools for academic/lesson tasks	3.78 ± 1.30	4.16 ± 0.83
Improving digital skills enhances participation	4.35 ± 0.92	4.68 ± 0.48
Teachers have adequate digital skills	3.24 ± 1.15	3.32 ± 0.89
Students have adequate digital skills	2.03 ± 1.13	2.21 ± 1.03
Adequacy of ICT infrastructure	1.68 ± 1.02	1.74 ± 0.81

Table 1 shows that teachers consistently reported higher digital competency levels than students across the first four skill-based items. The largest differences were observed in confidence using digital devices (Students: M = 3.88; Teachers: M = 4.47) and in the perception that improving digital skills enhances participation (Students: M = 4.35; Teachers: M = 4.68). This indicates that while both groups exhibit positive attitudes toward digital skill development, teachers demonstrate stronger self-reported competency.

Both groups reported moderate agreement that teachers generally possess adequate digital skills (Students: M = 3.24; Teachers: M = 3.32). However, perceptions of students' overall

digital competency were considerably lower (Students: M = 2.03; Teachers: M = 2.21), suggesting recognition of student-level skill gaps. The lowest mean scores for both groups were recorded for adequacy of ICT infrastructure (Students: M = 1.68; Teachers: M = 1.74), indicating strong agreement that infrastructural constraints persist within the school. Notably, variability was higher among students on applied skill items (e.g., BQ3, SD = 1.30), suggesting uneven digital competency distribution within the student body. These descriptive findings align with the subsequent ANOVA results, which confirmed a statistically significant difference in overall competency levels between students and teachers.

Comparison of Digital Competency Levels between Students and Teachers

To assess whether differences in digital competency levels between students and teachers contribute to the digital divide at the school, an Analysis of Variance (ANOVA) was conducted. The results (Table 2) indicate that teachers had a higher mean digital competency score (M = 24.89, SD = 3.31) than students (M = 23.06, SD = 3.65).

Table 2: Comparison of Digital Competency Levels Between Students and Teachers

Category	**N**	**Mean**	**Std. Deviation**	**Std. Error**	
Students	78	23.06	3.65	0.413	
Teachers	19	24.89	3.31	0.76	
Total	97	23.42	3.64	0.369	
ANOVA statistics					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	51.2	1	51.201	3.979	0.049
Within Groups	1222.47	95	12.868		
Total	1273.67	96			

The ANOVA results revealed a statistically significant difference between the two groups, $F(1, 95) = 3.979$, $p = .049$. Consequently, the null hypothesis that students' and teachers' competency levels do not significantly influence the digital divide was rejected. Although the difference in mean scores was modest, the statistical significance suggests that even small disparities in digital skills between teachers and students may have meaningful implications for digital learning experiences. Higher teacher competency, when not matched by equivalent student skills and adequate infrastructure, may inadvertently widen the digital divide by limiting students' ability to fully engage with digitally mediated instruction.

CONCLUSION

This study concludes that differences in digital competency levels between students and teachers significantly contribute to the digital divide at a Kenyan secondary school. While teachers demonstrate relatively strong digital skills and positive attitudes toward technology use, students exhibit moderate and uneven competency levels. Furthermore, both groups identify inadequate ICT infrastructure as a major constraint. The findings suggest that the digital divide in this context is multidimensional, encompassing skill disparities (second-level divide) and infrastructural limitations (first-level divide). Even modest competency gaps, when statistically significant, may hinder equitable participation in digitally supported learning environments. From a theoretical standpoint, the study affirms the applicability of the Knowledge-Based View in conceptualizing digital literacy as a strategic organisational resource. It also reinforces Stakeholder Theory's proposition that digital inclusion requires collaborative and systemic approaches rather than isolated interventions.

RECOMMENDATIONS

Based on the findings, the study proposes the following recommendations:

Digital literacy programmes should be implemented to enhance students applied digital competencies, particularly in academic uses of technology. Structured training sessions, peer digital mentoring, and curriculum-embedded ICT tasks could reduce variability in student skill levels and promote more equitable digital participation.

The consistently low ratings regarding ICT infrastructure highlight an urgent need for improved access to functional digital devices, stable internet connectivity, and reliable power supply. Investment in infrastructure is essential to ensure that existing teacher competencies translate into meaningful instructional practice.

Although teachers reported relatively high competency levels, all indicated that further improvement would enhance their digital teaching effectiveness. Continuous professional development programmes should therefore focus on advanced pedagogical integration of ICT rather than basic digital skills alone.

Drawing from Stakeholder Theory, school leadership should foster collaborative models that involve teachers, students, parents, and policymakers in digital inclusion initiatives. Such collaboration may include digital clubs, ICT committees, and partnerships with technology providers to support sustainable implementation.

National ICT policies and digital learning initiatives should be adapted to reflect contextual realities at the school level. Policy support must extend beyond device provision to include maintenance systems, technical support, and structured skill-building programmes.

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