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Gender Disparities in ICT Beliefs and Usage Among Learners in Basic Public Schools in Urban Slums in Ghana

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Abstract

This study examines gender disparities in beliefs about and the usage of Information and Communications Technology (ICT) among students in basic public schools in urban slums in Ghana. A mixed-methods approach with a concurrent research design was employed, collecting data from 379 junior high school (JHS) students across 20 schools in 11 urban slums within two cities. Data collection tools included a self-administered structured questionnaire that utilized a five-point Likert-type scale and a lesson observation schedule. The data was analyzed using t-tests of independent samples and Pearson correlation in IBM SPSS version 26. The findings indicate that students have very high beliefs in ICT, evidenced by a mean score of 4.41, demonstrating their strong conviction in technology's potential to enhance education. However, disparities in ICT usage were apparent, with a mean score of 3.18 and a standard deviation of 1.33. The Pearson correlation analysis revealed a very weak but statistically significant positive relationship between students' beliefs in ICT and their ICT usage ($r = 0.127$, $p = 0.014$), suggesting that stronger beliefs in the educational value of technology may modestly increase usage frequency. Gender comparisons showed no significant differences in ICT

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beliefs between male (M = 30.87, SD = 3.59) and female learners (M = 30.78, SD = 3.88), t(370) = 0.20, p = 0.84. Similarly, no significant differences were found in ICT usage between males (M = 26.15, SD = 6.58) and females (M = 24.83, SD = 6.87), t(368) = 1.88, p = 0.06, although males reported slightly higher usage levels. This study underscores the potential of ICT to transform education in resource-constrained environments while highlighting the limited impact of gender on ICT beliefs and usage. The findings suggest that addressing barriers to ICT access and usage, rather than focusing solely on gender, may be crucial for achieving equitable technology integration in education.

Keywords

gender disparities, ICT beliefs, ICT usage, urban slum schools, ICT integration

Introduction

In today's world, Information and Communication Technology (ICT) plays a vital role in education, transforming how learners access information, communicate, and engage with educational content. Integrating ICT is essential for enhancing learning outcomes and preparing students for the digital age. However, significant disparities in ICT access and usage exist, particularly among learners in basic public schools in urban slums (Baako & Abroampa, 2024). This study explores gender disparities in ICT beliefs and usage among these learners in Ghana, offering insights into the factors contributing to these disparities and proposing strategies for addressing them (Mensah et al., 2023).

Information and Communication Technologies (ICTs) encompass a range of digital tools and systems—such as computers, mobile phones, internet services, and digital learning platforms—that enhance communication, information sharing, teaching, and learning processes (Unwin et al., 2017). In the field of education, ICTs are often advocated as transformative tools that can improve access to knowledge, enhance pedagogical practices, and promote inclusion and innovation among learners.

The global digital divide is a significant issue characterized by considerable differences in access to and use of Information and Communication Technology (ICT) across various regions and socioeconomic groups. According to the International Telecommunication Union (ITU), while ICT access has notably improved over the past decade, persistent disparities, particularly in developing countries, remain (ITU, 2024). Research indicates that gender disparities in ICT access and usage are widespread, with females often facing greater obstacles in accessing digital resourc-

es and possessing lower levels of ICT literacy compared to males (Gebhardt et al., 2019b; Woods, 2020). These disparities are influenced by various factors, including sociocultural norms, economic barriers, and educational opportunities.

In Africa, the digital divide is particularly stark, as many countries struggle to provide equitable access to ICT resources (Asongu & Odhiambo, 2019a). The African Union's Agenda 2063 highlights the importance of digital inclusion and the promotion of ICT in education as essential for achieving sustainable development. However, gender disparities in ICT access and usage continue to be a significant concern. In sub-Saharan Africa, these disparities are worsened by factors such as poverty, inadequate infrastructure, and sociocultural norms that often restrict females' access to education and technology (Asongu & Odhiambo, 2019b). Research underscores the need for targeted interventions to close the gender gap in ICT access and usage within the region.

In Ghana, the government has made efforts to integrate ICT into the education system through initiatives like the Ghana ICT for Accelerated Development (ICT-4AD) policy. However, significant disparities in ICT access and usage persist among learners, particularly in basic public schools in urban slums. These schools often lack the necessary infrastructure and resources to support effective ICT integration, while socioeconomic factors further exacerbate the digital divide (Asare et al., 2023; Gyamfi, 2017). Additionally, gender disparities in ICT beliefs and usage are evident, with male learners typically demonstrating higher levels of confidence and more frequent use of ICT compared to their female counterparts.

The issue of gender disparities in Information and Communication Technology (ICT) beliefs and usage among learners in basic public schools in urban slums in Ghana represents a significant concern. These disparities negatively impact the educational outcomes of female learners and perpetuate existing socioeconomic inequalities. Previous research has demonstrated that gender disparities in ICT access and usage can have long-term repercussions on learners' academic and career trajectories. It is, therefore, imperative to understand the factors contributing to these disparities and to identify strategies to mitigate them in order to promote equitable access to digital resources and enhance educational outcomes for all learners.

This study provides a comprehensive analysis of gender disparities in ICT beliefs and usage among learners in basic public schools in urban slums in Ghana. By adopting a positivist paradigm and employing a quantitative methodology, this study provides empirical evidence on the extent and nature of disparities in ICT

access and usage. The findings will enhance the existing body of knowledge on ICT in education and inform policies and practices aimed at promoting digital inclusion and gender equity. Moreover, the insights gained will be valuable for educators, policymakers, and stakeholders as they design and implement targeted interventions to address the gender gap in ICT access and usage. In this study, the following research questions are addressed:

1. What are learners' ICT beliefs and how are they using ICTs in basic public schools in urban slums Ghana?
2. What is the relationship between learners' ICT beliefs and their technology use in basic public schools in urban slums in Ghana?
3. Are there differences in ICT beliefs and ICT usage between male and female learners in basic public schools in urban slums in Ghana?

To understand gender disparities in ICT beliefs and usage, it is essential to consider the socioeconomic and cultural environments in which learners live and study. In Ghana, urban slum communities encounter challenges such as poverty, inadequate infrastructure, and gender norms that influence educational and technological experiences. To interpret the findings of this study, we must contextualize the realities of the sampled learners by examining their schools, home environments, and community dynamics. The following section provides an overview of the contexts in the urban slums of Kumasi and Tamale, where data collection took place.

Study Context

This study examined gender disparities in ICT beliefs and usage among junior high school (JHS) learners in 11 urban slum communities in Kumasi and Tamale, two major cities in Ghana. Urban slums in Ghana are often characterized by high poverty levels, inadequate infrastructure, and limited access to educational and technological resources (Jankowska et al., 2011). The sample included learners from 20 predominantly public JHSs, along with a few low-cost private schools, most of which lacked fully equipped ICT facilities and reliable internet access (Buabeng-Andoh, 2012).

The communities displayed significant ethnic and religious diversity. The slums in Kumasi were mainly inhabited by Akan-speaking groups, particularly the Asante—whose matrilineal traditions afford women relatively greater rights (Duncan, 2010). In contrast, the slums in Tamale were predominantly occupied by Dagomba and other Mole-Dagbani groups, where patrilineal inheritance systems and Islamic norms prevail (Ghana Statistical Service, 2021). These sociocultural contexts

significantly shaped gender norms, especially concerning access to education and technology.

Time use outside of school revealed distinct gendered patterns. Boys often engaged in petty trading or informal apprenticeships, while girls were burdened with extensive domestic responsibilities that limited their free time and mobility (Arku et al., 2012). These constraints contributed to disparities in ICT access and usage: boys had greater opportunities to access mobile devices and internet cafés, whereas girls, particularly in Muslim communities, faced cultural restrictions and safety concerns that hindered their digital engagement (Sey et al., 2015).

Additionally, high school dropout rates, particularly among girls, were a significant issue in these communities (Ananga, 2011). Factors such as early marriage, teenage pregnancy, and economic hardship meant that the girls who remained enrolled in junior high schools represented a particularly resilient subgroup. Understanding these complex socioeconomic, cultural, and infrastructural factors is essential for interpreting gender disparities in ICT beliefs and usage within the context of urban slums.

Review of Related Literature

The integration of Information and Communication Technology (ICT) in education is increasingly shaped by gendered beliefs and attitudes. Extensive studies on gender disparities in ICT access and usage among basic school learners have revealed significant differences that can impact educational outcomes and future opportunities. A review of recent literature highlights diverse perspectives on learners' beliefs about ICT and their actual use of technology for learning. Key themes include self-efficacy, stereotype threat, technological pedagogical knowledge, and the influence of institutional and cultural factors on ICT adoption. These studies underscore the necessity of addressing gender disparities to fully harness the benefits of ICT in educational settings. For example, Siddiq and Scherer (2019) conducted a meta-analysis examining gender differences in ICT literacy. Their findings indicate that enduring stereotypes influence girls' and boys' attitudes toward technology, with boys demonstrating greater confidence in using ICT despite having similar skill levels. This confidence gap negatively impacts the level of active engagement with ICT in learning environments. Research by Simeon and Waiganjo (2024) suggests that traditional gender norms significantly affect ICT engagement, often discouraging women from pursuing technology-related fields due to societal biases. This trend is reflected in

the lower representation of women in ICT careers and their more cautious approach to educational technologies.

Nikolopoulou et al. (2021) conducted a study investigating how teachers' beliefs influence the adoption of mobile internet in educational contexts. Their findings indicate that both teachers' gender and motivational factors, such as hedonic motivation, significantly impact their willingness to integrate Information and Communication Technology (ICT), thereby shaping students' learning experiences. Throndsen and Hatlevik (2016) examined the role of ICT self-efficacy in students' computer and information literacy, revealing that male students generally report higher levels of self-confidence. This disparity is linked to differences in ICT usage patterns at home and in school. Smit et al. (2024) further explore how self-efficacy beliefs affect students' interactions with ICT tools, noting that enjoyment in tasks leads to greater engagement, particularly in visual programming. They also emphasize the ongoing gender gap, attributing it in part to variations in confidence levels. Mailizar et al. (2020) documented barriers to e-learning during the COVID-19 pandemic, highlighting how gender and self-confidence influence both teachers' and students' adaptability to technology-enhanced learning environments. Gil-Flores et al. (2017) studied the impact of school infrastructure and teacher characteristics on ICT use in secondary education. They found that constructivist beliefs and gender significantly affect ICT integration, suggesting that addressing these factors could enhance ICT adoption. The study by Donneys et al. (2024) stresses the importance of incorporating gender-inclusive practices in STEM education in Colombia, arguing that aligning traditional knowledge with modern technologies can help bridge gender disparities in ICT usage.

While most studies acknowledge the existence of gender disparities in ICT adoption and usage, their focal points vary. For instance, Siddiq and Scherer (2019) emphasize the influence of stereotypes, whereas Nikolopoulou et al. (2021) investigate the role of teachers. Hatlevik et al. underscore self-efficacy as a crucial determinant, contrasting with Mailizar et al. (2020), who stress external barriers such as the pandemic. A comparative evaluation of these studies highlights the significance of cultural and individual-level factors in shaping ICT beliefs. While Simeon and Waiganjo (2024) focus on societal norms as barriers to women's participation in ICT, Smit et al. (2024) offer a psychological perspective, linking self-efficacy to disparities in engagement. Meanwhile, Donneys at al. (2024) propose a hybrid approach that leverages cultural inclusivity to address systemic inequalities.

Research indicates that male learners often report higher levels of self-efficacy in using Information and Communication Technology (ICT), attributing their confidence to early exposure and societal stereotypes about technology. Throndsen and Hatlevik (2016) emphasize that self-efficacy significantly influences ICT literacy, with male students typically outperforming their female counterparts in technical skills. This disparity is often linked to cultural norms that associate technology with masculinity. In contrast, females tend to value ICT tools for their practical applications in learning. Goswami and Dutta (2016) found that women are more likely to view ICT tools as beneficial when they perceive them to be user-friendly. Gendered stereotypes play a crucial role in shaping these perceptions. For instance, Qazi et al. (2022) discovered that cultural views of ICT as a male-dominated field contribute to women's limited engagement and confidence.

Common themes across these studies include the critical roles of self-efficacy and enjoyment in fostering positive attitudes toward ICT, the significant impact of gender norms, and the potential benefits of inclusive educational practices. This synthesis highlights the interplay between individual beliefs and broader sociocultural dynamics. To mitigate biases, gender-sensitive design and equitable access to technology are essential. Incorporating cultural elements into STEM curricula has shown promise in reducing disparities. Additionally, policies aimed at promoting ICT engagement among underrepresented groups could help address the structural barriers identified by Simeon and Waiganjo (2024).

A comparative evaluation of these studies highlights the significance of cultural and individual factors in shaping beliefs about ICT. While Simeon and Waiganjo (2024) focus on societal norms as obstacles to women's participation in ICT, Smit et al. (2024) provide a psychological perspective that connects self-efficacy to disparities in engagement. Meanwhile, Donneys et al. (2024) propose a hybrid approach in which cultural inclusivity could be used to address systemic inequalities.

It is also critical to note that unequal access to ICT resources exacerbates gender disparities. Tellhed et al. (2017) report that females often face systemic barriers, such as a lack of mentorship and encouragement, which limits their active use of ICT tools. Alam (2022) highlights that male learners are more inclined to participate in STEM-related ICT activities, while females tend to prefer applications related to the social sciences or humanities. Digital literacy assessments conducted by Rohatgi et al. (2021) reveal significant gender gaps: male learners demonstrate greater competence in complex ICT tasks, while females excel in collaborative ICT

use. Although males are more proficient in technical and autonomous ICT tasks, females show higher adaptability in using ICT for communication and collaborative learning (Ajai & Imoko, 2015). Research by Siddiq et al. (2016) suggests that targeted interventions, such as gender-sensitive training, can help bridge the gap in ICT use and beliefs.

Despite the valuable insights provided by these studies, limitations remain. Simeon and Waiganjo (2024) primarily focus on structural barriers while neglecting intrapersonal factors. In contrast, Smit et al. (2024) place too much emphasis on psychological elements, downplaying societal influences. Although the integrative approach proposed by Donneys et al. (2024) is commendable, it lacks empirical rigor in evaluating its implementation. Across the literature, gender consistently emerges as a moderating variable in Information and Communication Technology (ICT) adoption. Self-efficacy and stereotype threat are recurring themes, supported by infrastructural and pedagogical considerations. There is a consensus on the necessity for tailored interventions aimed at reducing gender disparities and promoting equitable ICT use in educational contexts. While studies robustly document gendered attitudes, they often lack longitudinal perspectives that would facilitate the analysis of changes over time. Furthermore, cultural contexts remain underexplored, limiting the generalizability of findings. Methodologically, some research relies heavily on self-reported data, potentially introducing biases.

The relationship between learners' beliefs about Information and Communication Technology (ICT) and their actual technology usage is complex, influenced by a mix of individual, cultural, and systemic factors. Addressing this complexity requires a comprehensive strategy that integrates initiatives to enhance self-efficacy, implement culturally inclusive pedagogies, and develop targeted policy interventions. Researchers have provided several recommendations; for example, ICT integration programs should focus on dismantling stereotypes through inclusive curricula and promoting role models in science, technology, engineering, and mathematics (STEM) fields. Additionally, the attitudes and self-efficacy of educators significantly influence learners' experiences. Therefore, professional development programs should emphasize gender-sensitive pedagogical strategies.

Research on ICTs, education, and gender disparities in the Global South highlights the importance of considering social, cultural, and structural contexts in technology adoption and use. In Ghana, scholars like Steeves and Kwami (2019) argue that gendered experiences with technology are influenced by broader social realities,

including poverty, cultural norms, and systemic inequalities. Their work shows that technological interventions often reinforce existing gender hierarchies unless the social context is addressed in development communication efforts.

Focusing on educational initiatives, Steeves and Kwami (2017) examined the One Laptop Per Child (OLPC) project in Ghana, concluding that merely distributing technology did little to bridge gender divides. Despite having access to devices, girls faced significant structural barriers such as limited technical support, sociocultural expectations regarding domestic labor, and marginalization in classroom interactions. Their findings illustrate that physical access to ICTs is insufficient without efforts to challenge and transform the gendered norms that limit digital engagement.

Kwami (2016) explored how Ghanaian women traders utilize mobile technologies to enhance their livelihoods across transnational spaces. Her research shows that women's ICT use is contextual and strategic, often driven by the need to balance economic survival with social expectations. While mobile technologies provide flexibility, structural limitations hinder women's full empowerment through digital tools.

Earlier contributions by Steeves and Kwami (2012) emphasize that ICT4D initiatives must transcend technological determinism to engage with gendered power dynamics. They argue that failing to address the social conditions of ICT use—including cultural values, gender relations, and resource inequalities—could lead technological interventions to perpetuate or exacerbate existing development divides.

Collectively, these studies offer a framework for examining gender disparities in ICT beliefs and usage among learners in urban slums. They emphasize that ICT access and usage are socially embedded phenomena influenced by gender norms, socioeconomic status, geographic location, and institutional support structures. Consequently, the present study frames ICT disparities not merely as issues of device availability but as reflections of broader intersectional inequalities that shape the digital experiences of young learners in marginalized urban environments.

In conclusion, gender disparities in ICT access and usage among primary school learners stem from a complex interplay of factors—including resource accessibility, usage patterns, attitudes, and sociocultural influences. Addressing these disparities requires a holistic approach that encompasses policy interventions, educational practices, and societal transformations to foster gender equity in the digital landscape.

Theoretical Framework

This study employs Feminist Intersectionality Theory to examine gender disparities in ICT beliefs and usage among learners in urban slums. Originally conceptualized by Kimberlé Crenshaw in 1989, intersectionality highlights how various identity dimensions—such as gender, race, class, and location—interact to shape individuals' experiences and barriers. Feminist scholars have expanded this concept to emphasize how power systems create overlapping forms of disadvantage or privilege (Collins, 2019).

Feminist Intersectionality Theory challenges the notion that gender can be examined in isolation from other social factors. It posits that social categories are interconnected and that their intersections create unique experiences that differ from those associated with any single identity axis. This framework is particularly effective for analyzing how learners' gendered experiences with ICT are influenced by socioeconomic status, living environment (such as urban slum conditions), education quality, and cultural norms.

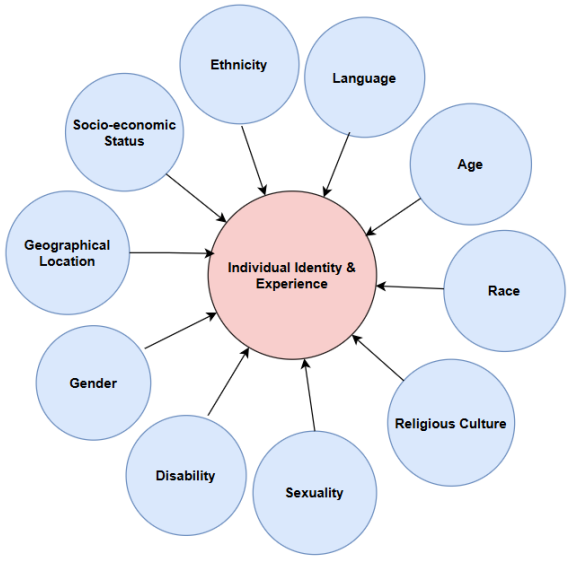

Figure 1: Conceptual framework of intersecting factors shaping individual identity and experience based on Feminist Intersectionality Theory (Cho et al., 2013)

As illustrated in Figure 1, individual identity and experience are shaped by the intersection of various social factors, including gender, race, socioeconomic status, geographic location, and cultural background. This study emphasizes the importance of examining these intersecting identities collectively when assessing disparities in ICT beliefs and usage among learners in urban slums.

Several studies have utilized intersectionality to explore inequalities in technology access and digital literacy. For instance, Oyedemi (2012) analyzed digital inequalities in South Africa, arguing that structural poverty and gender norms intersect to limit women's access to information technologies in low-income areas. These findings suggest that simplistic gender-based comparisons often obscure deeper disparities rooted in multiple, overlapping systems of oppression. In the realm of educational technology, Selwyn (2016) emphasizes that students' use of ICT is influenced by their socioeconomic backgrounds, school environments, and cultural expectations. Thus, intersectionality offers a nuanced understanding of how gender disparities in ICT beliefs and usage are shaped by broader contextual factors, including family income, community safety, and traditional gender roles prevalent in urban slum settings.

Applying Feminist Intersectionality Theory to this study acknowledges that girls in urban slums face unique barriers not only due to their gender, but also because they are girls living in poverty-stricken, under-resourced environments. These obstacles may include limited mobility, increased domestic responsibilities, cultural resistance to girls' engagement with ICT, and a lack of exposure to role models in STEM fields (Hilbert, 2011). This approach allows for the exploration of variations within gender groups; not all boys have the same access to or beliefs about ICT, just as not all girls face identical challenges or opportunities. Additionally, factors such as ethnicity, parental education, and disability status can further differentiate access to and attitudes toward ICT.

Feminist Intersectionality Theory is well-suited for this study because it offers a comprehensive, justice-oriented framework to explore the complex, layered, and context-specific nature of gender disparities in ICT beliefs and usage among learners in urban slums. This approach allows the research to move beyond simplistic gender comparisons and reveal how interconnected systems of oppression influence technological experiences and educational outcomes. As a result, the study enhances the understanding of digital equity in marginalized urban environments, making it more inclusive and contextually relevant.

Methodology

The study employed a quantitative methodology with a cross-sectional study design. This framework is appropriate as it facilitates the collection of numerical data from a substantial sample at a single point in time, allowing for the examination of relationships between various variables, such as gender, ICT beliefs, and ICT usage. The correlation design further enables the exploration of associations among these variables, which is essential for addressing the research objectives. A self-designed structured questionnaire was developed to collect data. This instrument was chosen to ensure the acquisition of standardized and comparable data from all respondents. Data was collected from 379 students randomly selected from 20 JHSs in Kumasi and Tamale, two Ghanaian cities with significant slum populations. Schools were randomly chosen from areas designated as slums, and within each school, classrooms and students were also randomly sampled.

Random sampling was used to minimize bias and enhance the representativeness of the sample, which is essential for generalizing findings to similar contexts. Additionally, ten randomly selected classroom lessons were observed to collect data on actual classroom events, allowing for triangulation with the quantitative data.

The data was analyzed using IBM SPSS v.26, leveraging its robust statistical capabilities. Descriptive statistics (frequencies, means, standard deviations, and rankings) summarized patterns in the data, providing insights into students' ICT beliefs and usage. Pearson's correlation coefficient examined the relationships between variables, while the independent t-test samples compared ICT beliefs and usage between male and female learners. These methods were chosen for their effectiveness in analyzing quantitative data and addressing the research questions.

The chosen methods and tools were considered suitable for achieving the objectives of the study. For instance, the structured questionnaire ensured data reliability and consistency, while the application of statistical methods allowed for an in-depth exploration of gender differences and correlations in ICT engagement. The focus on urban slum schools in Ghana provides context-specific insights that help address digital inequities in education.

The questionnaire for the study was organized into five sections (A to E), each targeting specific aspects of ICT interaction among students. Section A collected demographic data, including age, sex, grade level, internet access at home, and personal ICT devices. This information was essential for contextualizing the respondents' backgrounds. Section B assessed the availability and quality of ICT infrastructure

accessible to students, highlighting disparities in ICT access in urban slum areas. Section C focused on student technology use, capturing data on the frequency, purpose, and manner of their engagement with technology. Section D examined student ICT beliefs, including attitudes toward technology, perceived competence, and motivation to use ICT in an educational context. Section E investigated contextual factors influencing student ICT use, such as environmental, social, and economic influences. Each section was designed to comprehensively address different dimensions of the research topic. The statements, except for demographics, were measured on a five-point Likert scale to facilitate administration and enhance reliability. The questionnaire was designed to be completed within 20 minutes, and students were given two days to submit it through a designated teacher.

The questionnaire underwent expert reviews to ensure clarity of statements, relevance to research objectives, and appropriateness of language (Creswell & Creswell, 2018). It was subsequently pre-tested in a junior high school with characteristics similar to those of the selected research schools to assess the clarity of the questionnaire, comprehension, and the protocols for entering and exiting the research site. These questionnaires were then evaluated for internal consistency using the Cronbach's alpha coefficient (Bonett & Wright, 2015).

In this investigation, questionnaire reliability refers to the consistency of outcomes across multiple measurements. The Cronbach's alpha coefficient, a widely recognized index for assessing internal consistency reliability, was utilized. Vaske et al. (2017) suggest that the ideal Cronbach's alpha for a scale should be 0.70 or higher. As indicated in Table 1, most constructs exhibited Cronbach's alpha values exceeding 0.70 at a 95% confidence interval. While this threshold is often recommended for social science research, it is important to note that "there is no universal minimally acceptable reliability value" (Bonett & Wright, 2015, p. 2).

Table 1. Reliability Statistics for Learner Questionnaire

Construct	Cronbach's Alpha(α)	No. of Items
Learners' Access to ICT Resources	0.92	8
Learners' Technology Use	0.83	8
Learners' ICT Beliefs	0.85	7
Learners' Contextual Factors that Influence ICT Use	0.68	14
All Items on Questionnaire	0.897	37

The learners' questionnaire comprised 37 items designed to evaluate the integration of Information and Communication Technology (ICT) within basic public schools in urban slums in Ghana. Table 4.1 presents the Cronbach's Alpha coefficients for the four constructs, which range from 0.68 to 0.92—indicating a satisfactory level of internal consistency among the survey items. The overall Cronbach's Alpha coefficient of 0.897 suggests that the items effectively measure the underlying construct of ICT integration in education. This high value signifies a strong interrelationship among the items, consistently capturing the same concept, thereby enhancing the researchers' confidence in the reliability of the instrument.

Results and Findings

Analysis of Demographic Data

The demographic data of students in basic public schools in urban slums provides valuable insights into gender disparities in ICT beliefs and usage. The majority of students (92.6%) were aged between 12 and 17, with a small percentage (2.7%) under 12 and (4.8%) over 17. This concentration in the adolescent age group was significant, as it represented a period of heightened curiosity and adaptability toward technology. Adolescents are generally more inclined to experiment with and adopt ICT tools, making this demographic particularly relevant for examining patterns of ICT interaction in education.

The gender distribution was observed to be relatively balanced, with female students (51.6%) slightly outnumbering their male counterparts (47.9%). This balance sets the stage for analyzing gender-based differences in ICT beliefs and usage. Although the number of students identifying as *Other* (0.5%) is minimal, it highlights the importance of inclusivity in educational research. This equitable representation enhances the reliability of conclusions regarding gender disparities in ICT adoption and beliefs.

In terms of grade level, most respondents were in Basic 8 (58.5%), with fewer in Basic 7 (19.7%) and Basic 9 (21.8%). This distribution indicates that the study primarily captures students in the intermediate and final stages of basic education, where exposure to ICT may be heightened due to increased academic demands. Students in these grades are likely to rely on technology for both academic and extracurricular activities, providing meaningful data on how grade level influences ICT engagement.

This demographic data was crucial for the research focus, as it ensured a comprehensive understanding of ICT beliefs and usage among students of different ages, genders, and educational levels. By analyzing this data, the research could uncover patterns that illustrate how social and educational contexts shape ICT interactions. These findings could inform policies aimed at bridging gender gaps in ICT adoption and promoting equitable technological integration in urban slum schools.

Learners' ICT Beliefs on Its Use for Teaching and Learning

This section explored learners' ICT beliefs regarding the use of ICT for teaching and learning. The results of learners' responses are analyzed and presented in Table 2.

Table 2. Learners' ICT Beliefs

Statement	SD(%)	D(%)	N(%)	A(%)	SA(%)	Mean (Std.D)	Decision
I believe that technology enhances learning	6(1.6)	4(1.1)	21(5.6)	123(32.7)	222(59.0)	4.47(0.79)	Strongly Agree
I believe that technology is an effective learning tool	21(5.6)	28(7.4)	13(3.5)	127(33.8)	187(49.7)	4.15(1.15)	Agree
I believe that technology is essential for 21st-century learning	12(3.2)	15(4.0)	25(6.6)	139(37.0)	185(49.2)	4.25(0.97)	Strongly Agree
I believe that students should be taught how to use technology effectively	12(3.2)	9(2.4)	12(3.2)	114(30.3)	229(60.9)	4.43(0.92)	Strongly Agree
I believe that technology can be used to support learners	2(0.5)	3(0.8)	9(2.4)	123(32.7)	239(63.6)	4.58(0.64)	Strongly Agree
I believe that technology can be used to make learning interesting	3(0.8)	3(0.8)	5(1.3)	121(32.2)	244(64.9)	4.60(0.64)	Strongly Agree
I believe that technology can be used to personalize learning	3(0.8)	8(2.1)	38(10.1)	135(35.9)	192(51.1)	4.34(0.81)	Strongly Agree

Mean of means = 4.41 → Strongly Agree (SA); Mean of Standard Deviations = 0.85
Source: Field Data – Learner's Questionnaire (September 2023)
Key: *N* = 179; SD = Strongly Disagree (1.00 – 1.79); D = Disagree (1.80 – 2.59); N = Neutral (2.60 – 3.39); A = Agree (3.40 – 4.19); and SA = Strongly Agree (4.20 – 5.00)

The analysis presented in Table 2 indicates that a significant majority of learners (91.7%) believe that technology enhances their learning experience. With a mean score of 4.47 and a standard deviation of 0.79, there is a strong consensus among learners regarding this belief. A similar trend is observed for the statement "*I believe that technology is an effective learning tool*", where 83.5% either agree or strongly agree, resulting in a mean score of 2.

Additionally, 86.2% of learners either agree or strongly agree that technology is essential for 21st-century learning, marking this statement as having the highest level of agreement in this section. For the statement "*I believe that students should be taught how to use technology effectively*", a notable 90.9% strongly agree—underscoring a widespread belief in the importance of teaching technology skills. The mean score of 4.43, accompanied by a standard deviation of 0.92, indicates robust support for technology among learners. An overwhelming 96.3% believe that technology can support learners. When it comes to making learning interesting and personalized through technology, an impressive 97.1% either agreed or strongly agreed, reflecting a high level of consensus. Overall, the results demonstrate a positive attitude toward the role of technology in education among learners in basic public schools in urban slums.

The data, with a mean of 4.41, suggests that learners have a very favorable view of the value of ICT in their learning environment. This consensus can be interpreted as a strong endorsement for the integration of ICT in teaching and learning. The relatively low standard deviation of 0.85 indicates uniformity in responses, implying minimal variation in learners' beliefs about ICT; they collectively recognize its significance. These findings indicate that learners are prepared to embrace technology-enhanced learning, which can foster innovative teaching approaches and potentially improve learning outcomes. The strong agreement on the positive impact of ICT on education suggests that investments in technological infrastructure, training, and resources are likely to be well received and effectively utilized by learners.

The findings highlight the need for a supportive framework that encourages the integration of ICT in teaching and learning processes, ensuring that learners' positive beliefs translate into effective and meaningful use of technology in educational settings. This alignment between learners' beliefs and educational practices is crucial for the successful integration of ICT in schools, ultimately enhancing the learning experience and preparing students for a technology-driven world. The findings indicate that many learners recognize the potential of technology to enhance

learning, support students, and create a more engaging and personalized educational experience. However, some variations in the degree of agreement for certain statements suggest that, while there is overall support for the use of technology in education, differences in individual perspectives still exist.

Learners' ICT Use for Learning

The level of learners' ICT use for learning was further assessed beyond their ICT beliefs to understand whether these learners actually use technology for educational purposes. The results and analysis are presented in Table 3.

Table 3. Learners' ICT Use

Statement	SD(%)	D(%)	N(%)	A(%)	SA(%)	Mean (Std.D)	Rank
I always use technology in class	138(36.7)	159(42.3)	22(5.9)	42(11.2)	15(4.0)	2.03(1.11)	8th
I use technology to complete assignments	140(37.2)	130(34.6)	18(4.8)	49(13.0)	39(10.4)	2.25(1.35)	7th
I use technology to search for information online to enhance learning	64(17.0)	92(24.5)	13(3.5)	119(31.6)	88(23.4)	3.20(1.46)	6th
I feel that technology enhances my learning experience	42(11.2)	23(6.1)	23(6.1)	151(40.2)	137(36.4)	3.85(1.29)	1st
I can effectively use technology to support my learning	31(8.2)	59(15.7)	42(11.2)	102(27.1)	142(37.8)	3.70(1.33)	2nd
I use technology to provide a variety of learning opportunities	40(10.6)	85(22.6)	73(19.4)	96(25.5)	82(21.8)	3.25(1.31)	5th

I can effectively use technology to communicate with my parents/ guardians and teachers	68(18.1)	49(13.0)	20(5.3)	108(28.7)	131(34.8)	3.49(1.52)	4th
I use technology to make learning fun and interesting	33(8.8)	50(13.3)	31(8.2)	143(38.0)	119(31.6)	3.70(1.28)	3rd

Mean of means = 3.18 → Neutral (N); Mean of Standard Deviations = 1.33
Source: Field Data – Learner's Questionnaire (September 2023)
Key: *N* = 179; SD = Strongly Disagree (1.00 – 1.79); D = Disagree (1.80 – 2.59); N = Neutral (2.60 – 3.39); A = Agree (3.40 – 4.19); and SA = Strongly Agree (4.20 – 5.00)

The data presented in Table 3 highlights the use of Information and Communication Technology (ICT) for educational purposes among learners in basic public schools in urban slums. The statement "*I feel that technology enhances my learning experience*" received the highest level of agreement, with a mean score of 3.85 (SD=1.29), indicating that many learners perceive ICT as beneficial to their education. Similarly, the statement "*I can effectively use technology to support my learning*" also scored favorably, with a mean of 3.70 (SD=1.33)—suggesting that learners feel confident in utilizing ICT for educational purposes. Conversely, the statement "*I always use technology in class*" recorded the lowest mean score of 2.03 (SD=1.11), with most learners expressing disagreement or strong disagreement. This finding suggests that, despite acknowledging the benefits of ICT, its actual use in classroom settings remains limited. Another low-scoring statement, "*I use technology to complete assignments*", with a mean of 2.25 (SD=1.35), further reinforces this conclusion, indicating that learners infrequently use ICT for homework.

The high mean scores associated with statements regarding the perceived benefits of ICT—such as enhancing learning, supporting learning, and making learning enjoyable—indicate that learners have a positive attitude toward technology. However, the low scores related to the actual use of ICT in classrooms and for assignments highlight a significant gap between learners' favorable perceptions and their practical engagement with technology. Several factors may contribute to this discrepancy. One possible explanation is the limited availability and quality of ICT infrastructure in these urban slum schools (Baako & Abroampa, 2024), as previously mentioned

in this study. Additionally, a lack of teacher support or training in integrating ICT into the curriculum may hinder regular technology use.

These findings carry important implications for the integration of ICT in basic public schools in urban slums. There is a clear need to enhance the availability and quality of ICT infrastructure, which could involve providing additional devices, improving internet connectivity, and equipping classrooms with the necessary technology. To bridge the gap between learners' positive perceptions of ICT and its practical application, investment in teacher-training programs focused on integrating technology into the curriculum is essential. Teachers must acquire the skills and confidence necessary to effectively incorporate ICT into their teaching practices. The curriculum should also include more ICT-based activities and assignments, potentially by developing engaging digital content for both classroom and homework use. Educational policies must prioritize ICT integration in underprivileged schools, particularly in efforts to reduce gender disparities. Targeted interventions can encourage female learners to engage with ICT. Additionally, involving the community and raising awareness about the importance of ICT in education can further support the integration process. Parents and guardians should be encouraged to facilitate their children's use of technology for learning at home. While learners in basic public schools in urban slums in Ghana recognize the value of ICT in their education, significant efforts are required to ensure that this potential is fully realized through improved infrastructure, teacher support, and curriculum development.

The Relationship Between Learners' ICT Beliefs and Their Technology Use

Research objective two of the study examined the relationship between learners' ICT beliefs and their technology use. The Pearson's correlation coefficient was then computed to assess the linear association between learners' ICT beliefs and their ICT use. The results of the analysis are presented in Table 4.

As evident from the analysis in Table 4, the Pearson's correlation coefficient was found to be a very weak positive and statistically significant correlation with learners' ICT beliefs and their ICT use in basic public schools in urban slums ($r(372) = .127$, $p=.014$). The corresponding p-value implies that the correlation observed between the variables is not due to chance since it is significant ($p=.014$); thus, a relationship between the learners' ICT beliefs and their ICT use in basic public schools in urban slums exists. This finding suggests that a positive increase in the beliefs that learn-

ers have regarding the usefulness of technology to their learning could increase the frequency of their technology use for learning.

Table 4. Pearson's Correlation for Learners' ICT Beliefs and Their ICT Use

Variables		Learners' ICT Beliefs	Learners' ICT Use
Learners' ICT Beliefs	Pearson Correlation	1	.127*
	Sig.(2-tailed)		.014
	N	374	370
Learners' ICT Use	Pearson Correlation	.127	1
	Sig.(2-tailed)	.014	
	N	370	372

Correlation is significant at a 0.05 level (2-tailed).*

Pearson Correlation Interpretation: 0.800 – 1.00 (Positively Very Strong); 0.600 – 0.799 (Positively Strong); 0.400 – 0.599 (Positively Moderate); 0.200 – 0.399 (Positively Weak); 0.001 – 0.199 (Positively Very Weak); 0.000 (No correlation exists) (Wahyuni & Purwanto, 2020).

Differences in Learners' ICT Beliefs and Their ICT Use by Gender

An independent t-test sample was performed to evaluate whether there was a difference between learners' ICT beliefs among males and females. The results from the data indicated that there was no significant difference between the learners' ICT beliefs regarding males (M = 30.87, SD = 3.59) and females (M = 30.78, SD = 3.88), $t(370) = .20$, $p = .84$. These results suggest that gender really does not have an effect on learners' ICT beliefs.

An independent t-test sample was further performed to evaluate whether there was a difference between learners' ICT use among males and females. The results indicated that there was no significant difference between the learners' ICT use regarding males (M = 26.15, SD = 6.58) and females (M = 24.83, SD = 6.87), $t(368) = 1.88$, $p = .06$. These results suggest that gender does not significantly influence learners' ICT use. The difference was, however, greater among males than females.

The data from Table 5 suggested minimal differences between male and female learners regarding ICT beliefs and usage. This implies that both male and female learners hold similar attitudes toward ICT and utilize it to comparable extents. It suggests that both genders generally hold positive views on technology's role in learning. The results indicate that gender may not be a major barrier to fostering

positive attitudes toward ICT in the classroom. There could be differing interests in technology use between males and females, with males gravitating toward certain types of technology—leading to a higher reported use in those specific areas. Differences in access to technology outside of school or cultural expectations around technology use for girls could contribute to the slight variation.

Table 5. Difference Between Males and Females on Learners' ICT Beliefs and Use

	Gender	n	M	SD	df	*t*	*p*
Learners' ICT Beliefs	Male	178	30.84	3.59	370	.20	.84
	Female	192	30.78	3.88			
Learners' ICT Use	Male	178	26.15	6.58	368	1.88	.06
	Female	192	24.83	6.87			

p is significant at a 0.05 level at 95% C.I.

It is also important to consider other variables that may influence ICT integration in schools, such as socioeconomic status, teacher beliefs, and institutional support. Although the gender gap may not be significant in this context, these other factors could play a crucial role in the successful adoption and effective use of ICT in education.

Observation of Classroom Lessons for Technology Use

Classroom lessons were observed for ten (10) sampled teachers to gain a deeper understanding of ICT integration practices in the classrooms of basic public schools in urban slums. This section provides a summary of the data derived from these lesson observations. The observations assessed teachers' utilization of ICT integration indicators, which were rated on a scale ranging from Not Observed = 0 to Excellent = 4. The results from the observations are presented in Table 6.

Table 6. Data on ICT Integration Indicators in Lessons Observed

Integration Indicator	0 (Not Observed)	1 (Not Adequate)	2 (Adequate)	3 (Good)	4 (Excellent)
Teacher provides clear instructions on how to use ICT resources during the lesson	2	1	4	2	1

Teacher uses a variety of ICT resources to support student learning	3	2	1	3	1
Teacher uses ICT resources to differentiate instruction based on student needs	7	2	1	0	0
Teacher encourages student collaboration using ICT resources	3	3	2	1	1
Teacher encourages student communication using ICT resources	6	3	1	0	0
Teacher provides opportunities for student-led learning using ICT resources	3	3	1	1	2
Teacher effectively manages student behavior during ICT use	8	1	0	1	0
Teacher provides clear instructions on how to complete assignments using ICT resources	4	2	1	3	0
Teacher provides students with opportunities to practice during the lesson using ICT resources	8	1	1	0	0
Teacher provides feedback on student work that includes feedback on the use of ICT resources	7	1	1	1	0
Teacher encourages students to use ICT resources to enhance their work	5	1	1	1	2
Teacher provides opportunities for students to showcase their work using ICT resources	8	0	0	1	1

Students are actively engaged during the lesson with ICT resources	3	1	3	2	1
Students use ICT resources to collaborate and communicate with peers	7	1	1	1	0
Students use ICT resources to create and showcase their work during the lesson	8	0	0	1	1
Students can use ICT resources independently in the lesson	2	1	2	3	2
Mean (x)	**5.3**	**1.4**	**1.3**	**1.3**	**0.8**

The data from the lesson observations provides an overview of ICT integration in teaching practices in basic public schools in urban slums. The indicators reveal that while there is some usage of ICT, it is not uniformly applied across all teaching dimensions. For example, the highest frequency of *Not Observed* responses pertains to managing student behavior during ICT use, providing opportunities for practice, and offering feedback on ICT resource usage. This suggests challenges in these areas. In contrast, *Adequate* scores are more common for providing clear instructions on using ICT resources, indicating that when ICT is implemented, teachers can effectively guide students.

These findings highlight the need for targeted professional development for teachers, particularly in areas where ICT integration is insufficient. This could include training on classroom management during ICT use and strategies for providing constructive feedback on ICT-related assignments. Additionally, the data indicates a demand for a wider variety of ICT resources and more structured opportunities for students to practice using these resources during lessons.

The low scores in student-led learning, collaboration, and communication through ICT resources suggest underutilization of ICT's capabilities to create interactive, student-centered learning environments. Introducing more collaborative projects that leverage ICT may enhance student engagement and communication skills. The lesson observation data indicates partial integration of ICT in teaching, revealing significant opportunities for improvement.

On average, no ICT integration indicator was noted in five of the ten lessons observed. Improving ICT integration could lead to more dynamic teaching methods, increased student engagement, and a more enriching educational experience that equips students with essential 21st-century skills. Additionally, the lesson observation examined key technology teaching resources to determine whether they were utilized during the lessons.

The results of the lesson observations are shown in Table 7.

Table 7. ICT Resources Data in Lessons

Teaching Resource	Observed	Not Observed
Mobile Phone	2	8
Tablet	0	10
Computer (Desktop/Laptop)	3	7
Radio	0	10
Television	1	9
Projector	1	9
Lesson Plan	10	0
Textbook	10	0
Audio-Visual Aids (charts, pictures & videos)	7	3
Mean (x)	3.8	6.2

The data reveals a significant gap in the integration of ICT resources in basic public schools in urban slums. The low numbers of mobile phones, computers, and other digital devices indicate barriers to accessing and utilizing ICT in these schools. The complete absence of tablets and radios in all observed lessons, along with a lack of televisions and projectors in most cases, highlights a deficiency in infrastructure that supports digital learning. In contrast, the consistent use of lesson plans and textbooks suggests a reliance on traditional teaching methods and materials.

This scarcity of ICT resources may impede the development of digital literacy among students, which is increasingly essential in today's world. The lack of ICT integration could negatively impact the quality of education and the range of learning experiences available to students in basic public schools in urban slums. This digital divide risks perpetuating educational inequalities and limiting future opportunities for these students. The mean values of *Observed* (3.8, 38%) and *Not Observed* (6.2, 62%) ICT teaching resources reflect this trend and underscore the urgent need for action to bridge the digital gap in education within these communities.

Discussions and Policy Implications
Learners' ICT Beliefs and Their Technology Use

The analysis of the Pearson's correlation coefficient used to evaluate the linear association between learners' ICT beliefs and their ICT use found a weakly positive and statistically significant relationship. This suggests that enhancing learners' positive beliefs regarding the usefulness of technology for their learning could lead to an increase in the frequency of their technology use for educational purposes. This finding is consistent with other studies in the existing literature. For instance, Huang et al. (2021) found that learners' attitudes toward technology influence their ICT use in school. Tondeur (2020) also found a positive correlation between learners' perceived ICT efficacy and their increased technology use. This research finding further supports the importance of learners' ICT beliefs in achieving increased technology use.

The descriptive data (Table 2) suggests that learners hold a highly positive belief (4.41) in the value of ICT in their learning environment. This consensus can be interpreted as a strong endorsement of integrating ICT for teaching and learning. The low standard deviation (0.85) indicates minimal variation in learners' beliefs about ICT; they uniformly recognize its importance. These findings suggest a readiness among learners to embrace technology-enhanced learning, leading to more innovative teaching approaches and potentially improved learning outcomes. The results highlight the need for a supportive framework that promotes the integration of ICT in teaching and learning processes, ensuring that learners' positive beliefs translate into effective and meaningful use of technology in education. Aligning learners' beliefs with educational practices is crucial for successfully integrating ICT in schools, enhancing the learning experience, and preparing students for a technology-driven world.

Out of the eight items on the questionnaire regarding learners' technology use (Table 3), five were found to indicate high technology use among learners. The average score of 3.18 on the Likert-type scale suggests that students generally have a neutral view on using technology in education, though there is a slight lean toward a positive perception. This research finding may stem from various issues, such as students lacking sufficient experience with technology, inadequate training, or a limited understanding of technology's benefits in learning. The results indicate that while some students recognize the value of using technology for learning, others are hindered by challenges such as economic conditions, access to technology, or pedagogical practices that do not accommodate diverse learning styles with technology.

Learners' Gender on Their ICT Beliefs and ICT Use

The study further examined the influence of gender on learners' ICT beliefs and their ICT use. An independent sample of t-tests was, therefore, performed to evaluate whether there was a difference between learners' ICT beliefs and their ICT use among males and females. The findings from the means revealed a negligible difference between male and female learners regarding ICT beliefs. This implies that both genders hold nearly identical views about the value and utility of ICT in their learning processes. In this context, access to ICTs is severely restricted for both genders due to widespread poverty, under-resourced schools, and inadequate infrastructure (Ghana Statistical Service, 2021; Ministry of Education, 2018). Consequently, both girls and boys face similar challenges in their exposure to and use of digital technologies, which may reduce noticeable differences in attitudes and reported usage between the genders. The similarity in ICT beliefs across genders may reflect a universal cultural shift toward the acceptance and integration of technology in schools for learning.

In contrast, there was a slight difference in the actual use of ICT between genders, with males reporting a higher mean usage compared to females (see Table 5). This finding aligns with literature that has identified similar patterns of ICT use among male and female students (see Barrantes et al., 2019; Huyer & Hafkin, 2019). This contrasts with literature suggesting that although there may be differences in attitudes toward technology between genders, these do not necessarily translate into significant differences in actual usage patterns (Becker, 2022; Gebhardt et al., 2019a).

Several factors could account for these findings. For instance, the near parity in ICT beliefs between male and female students might stem from similar exposure to and experiences with technology in educational settings, where both genders have equal access to ICT resources. Additionally, societal perceptions that promote equal competency in technology use among genders could contribute to this result. The slight variance in ICT use may be influenced by extracurricular preferences or availability of time, which could differ between genders due to social and cultural factors, as supported by Kirkup (2018).

Observational findings indicated that textbooks and chalkboards were the primary teaching tools, with minimal use of digital devices like computers, tablets, or mobile phones during lessons. The limited integration of digital ICTs in classrooms stems from several interrelated factors. Many public schools in Ghana's informal settlements lack basic technological infrastructure, including electricity, reliable inter-

net connectivity, and adequately equipped ICT laboratories (Buabeng-Andoh, 2012). Budget constraints often direct investments in educational technologies toward better-resourced urban schools, leaving marginalized communities underserved. Furthermore, teachers' capacity and confidence in utilizing ICTs are limited, as many educators have received insufficient professional development in technology integration (Asongu & Odhiambo, 2019b).

These findings contribute to the ongoing discourse on gender differences in technology use and beliefs, suggesting that while disparities may exist in certain contexts, they may not always be pronounced or significant in some schools. This finding supports the belief that gender may not be a substantial barrier to ICT integration in learning environments, though it could influence usage due to the effects of gender roles that impact time.

Limitations of the Study

The study highlights that reliance on self-reported data raises concerns about potential response biases related to ICT access and usage. Learners may have inaccurately reported their engagement with ICTs due to social desirability or misunderstandings of the survey questions. Although classroom observations were included to triangulate the data, future research could benefit from ethnographic studies involving direct engagement with learners' home environments and daily practices. Such community-based approaches would offer deeper insights into the real-world contexts influencing learners' ICT experiences.

While classroom observations provided valuable contextual information, interviews with teachers could have further enriched the findings by capturing their perspectives on challenges and opportunities related to ICT integration. Teachers' insights would highlight institutional barriers, resource constraints, and pedagogical strategies that may not be evident from lesson observations alone.

Although random sampling was used to improve generalizability, the study was limited to learners enrolled in junior high schools. Given the high dropout rates in these communities, particularly among girls, the experiences of out-of-school youth with ICTs represent an important area for future exploration. By acknowledging these limitations and suggesting directions for future research, this study serves as a valuable initial step in understanding the intersection of gender, poverty, education, and technology access among young learners in Ghana's urban slums.

Conclusions, Contribution to Theory and Further Studies

This study offers insights into gender disparities in Information and Communication Technology (ICT) beliefs and usage among learners in basic public schools in urban slums. The findings indicate that learners generally hold strong beliefs in the potential of ICT to enhance education, as evidenced by a mean score of 4.41. This conviction underscores the importance of leveraging ICT to improve educational outcomes in resource-constrained environments. However, despite these beliefs, there are significant disparities in ICT usage, with a mean score of 3.18 and a standard deviation of 1.33, suggesting that many learners encounter barriers that hinder the effective utilization of technology for learning.

A key finding is the weak but statistically significant correlation between learners' ICT beliefs and their usage ($r = 0.127$, $p = 0.014$). This suggests that while positive beliefs about ICT can influence usage, other factors may affect the extent to which these beliefs are translated into practice. Additionally, gender differences in ICT beliefs and usage were minimal. Independent t-test samples revealed no significant differences in ICT beliefs between male and female learners ($t(370) = 0.20$, $p = 0.84$), with mean scores of 30.87 for males and 30.78 for females. Similarly, ICT usage exhibited no statistically significant gender disparity ($t(368) = 1.88$, $p = 0.06$), although males had slightly higher mean scores (26.15 compared to 24.83). These findings suggest that gender does not significantly influence ICT beliefs or usage among learners in the studied context.

The findings from this study offer a meaningful contribution to the theoretical discourse of Feminist Intersectionality by challenging conventional assumptions that gender is the primary axis of digital exclusion. Contrary to the dominant narrative often found in global literature, the study reveals that gender disparities in ICT beliefs and usage are statistically insignificant among learners in basic public schools in urban slums in Ghana. This decentering of gender as the sole determinant of ICT access is critical within intersectional analysis, as it repositions attention on other structural and contextual variables—such as poverty, school infrastructure, and systemic neglect—that equally, if not more significantly, shape learners' digital experiences.

The results highlight the pervasive role of structural marginalization, which affects learners across gender lines. While both boys and girls expressed strong confidence in the potential of ICT to enhance education, their actual engagement

with digital tools remained limited. This disconnect underscores the impact of environmental and institutional barriers—such as the lack of digital devices, insufficient access to electricity, limited internet connectivity, and under-resourced teaching staff—which act as intersecting forces that hinder ICT integration. These findings support the intersectional premise that access and opportunities are shaped not by a single identity marker alone, but by the complex interplay of multiple dimensions of disadvantage.

While international organizations such as UNESCO and ITU have consistently reported gender-based disparities in ICT access, particularly in low- and middle-income countries, the findings from this localized Ghanaian context present a counter-narrative. They reveal that in severely marginalized environments like urban slums, both boys and girls may encounter similar constraints, thus highlighting the need for localized, data-driven insights within intersectional research. In doing so, the study contributes to the expansion of Feminist Intersectionality theory by emphasizing the importance of context specificity and cautioning against overgeneralized global assumptions.

Although the study provides valuable insights, it raises questions for further investigation. A critical area for future research is understanding the socioeconomic, infrastructural, and pedagogical barriers that limit learners' ICT usage despite their strong beliefs. Longitudinal studies could also explore how learners' beliefs and usage patterns evolve over time, particularly in response to improvements in technological infrastructure and educational policies.

Intervention-based research is essential to assess the impact of targeted strategies, such as ICT skill-building workshops, on enhancing learners' engagement with ICT. Given that this study found minimal gender disparities, future research should examine these dynamics in different sociocultural and economic contexts to validate the findings and uncover any context-specific factors. Another important area for exploration is the role of educators and institutional support in shaping learners' ICT beliefs and usage. Investigating how teachers' ICT competencies and the availability of institutional resources influence learners could provide a more comprehensive understanding of the educational ecosystem. Addressing these gaps will aid in developing targeted strategies to ensure equitable and effective ICT integration in education, particularly in underserved urban slum communities. Such efforts are essential for maximizing the potential of ICT as a transformative tool for education and bridging digital divides in marginalized settings.

Research Ethics Statement

This empirical study is part of the thesis submitted for a PhD in ICT Education by the first author and had ethical clearance approval from the Institutional Review Board of the University. The IRB letter is referenced as *Ref. No.: HuSSREC/AP/133/VOL.2*.

Consent for publication

All the authors duly consent to the publication of this study.

Availability of data and materials

The raw data for the study is available upon reasonable request with satisfactory reasons.

Conflict of interest statement

Author one and corresponding author, Issah Baako, declares that he has no conflict of interest in this work.

Author two, Eric Opoku Osei, declares that he has no conflict of interest in this work.

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Authors' contributions

Author one, Issah Baako, is the main author of the study.

Author two, Eric Opoku Osei, is the co-supervisor of author one's PhD thesis.

Author three, Winston Kwame Abroampa, is the main supervisor of author one's PhD thesis.

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