FEATURE: GLOBAL PERSPECTIVES

Internet Policy and Connectivity Challenges for Students in a Ghanaian University

Jenna Kammer, Kodjo Atiso, and Edward Borteye

abstract: At the 2024 ALA conference, the authors presented their exploration of the internet access challenges faced by graduate students at a STEM university in Ghana. This research highlighted how unreliable, expensive, and intermittent internet affects academic life, particularly for students off-campus. Despite the university's solid on-campus connectivity and diverse digital resources, students struggle with internet access at home, which impacts online learning. The study, which surveyed students using a digital citizenship framework, revealed gaps in technical skills and political engagement. This paper tells the story of this research and policy changes in Ghana, including the needs identified by the researchers, such as improved infrastructure, more affordable internet, and enhanced digital literacy programs, to support academic success in regions with connectivity issues.

Introduction

At the 2024 American Library Association conference, the authors presented a poster for the Global Solutions sponsored by ALA's International Relations Round Table. The poster described prior research which examined the experiences graduate students had at a STEM university in sub-Saharan Africa when using technology to access information (see Figure 1). The topic generated many conversations with international academic librarians, particularly those in economically developing countries, who reported similar experiences: there are still academic centers in the world where access to the internet is sporadic, expensive, and unreliable for students and faculty, particularly when working off campus. Inequitable access to broadband impacts instructional models (whether a course can be taught online, hybrid, or face-to-face), student study habits (when and where students can study, particularly if they need to access digital instructional materials), the resources purchased by libraries (particu-
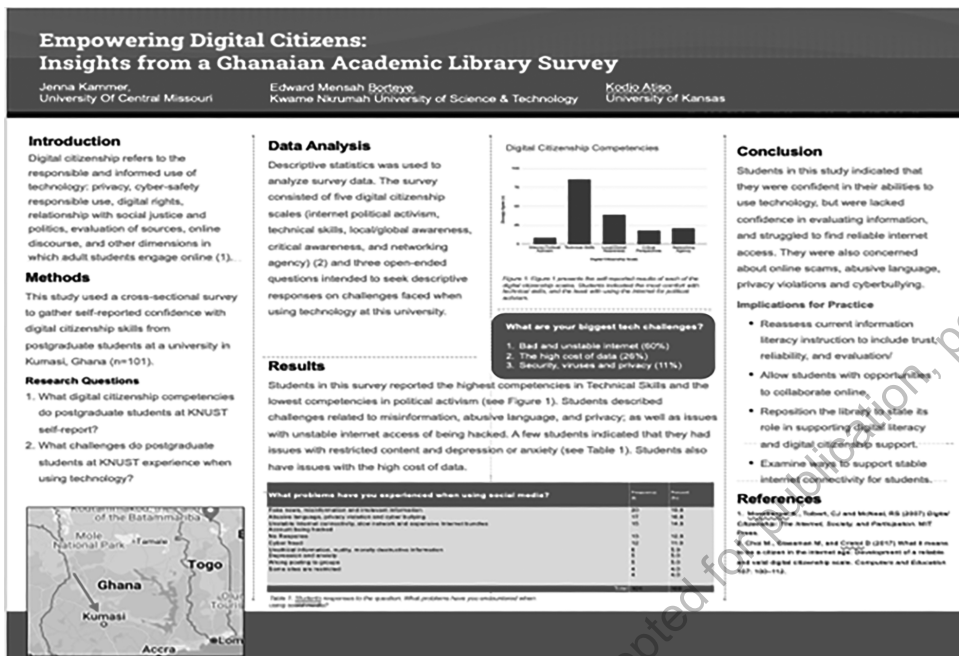
Figure 1. Poster presented at ALA's IRRT Global Solutions Session.

larly the choice of digital or print), and training related to using digital resources. For students who live off-campus in these areas of the world, access to the internet is even more restricted, with some students only having reliable (or affordable) internet access when they come to campus.

Much of the discussion related to global internet access is about internet penetration, which can be defined as whether countries have the digital infrastructure to allow internet reach; internet users, on the other hand, is defined as number of users and the time they spend using the internet, diversified by demographics. China leads by having the highest number of internet users, and Northern Europe has the highest internet penetration rate.[1] As of 2023, Africa had increased internet penetration with more fixed broadband subscriptions than in prior years, but it still has the lowest fixed broadband of any region in the world, likely due to higher prices.[2] However, the lived experience of connectivity has more nuance than just penetration and usage. Internet users may have access but suffer from reliability, speed, or security issues, all of which impact the teaching and learning experience.

To access the internet off campus, many people rely on cable and wireless mobile networks, including an extensive 4G network, and purchase data bundles with their local carrier. For students, this carries additional burdens as cost and efficiency become barriers to academic work.

This feature article examines internet policy and use in academic libraries in Ghana, and the problems faced by one subset of students at a STEM university. This includes discussion about the issues associated with being a student without a fixed-line broad-band infrastructure and low affordability for internet services. To access the internet off campus, many people rely on cable and wireless mobile networks, including an extensive 4G network, and purchase data bundles with their local carrier. For students, this carries additional burdens as cost and efficiency become barriers to academic work. This article discusses the implications these research findings have for students in this region, collaborations with those outside of the region, and considerations for academic libraries in regions with connectivity issues.

Internet Policy in Ghana

To understand more about the issues of connectivity in Ghana, it is important to examine current country policy and practices. Ghana's quest toward digitization can be traced back to the year 2000 when internet technology was first introduced in the West African sub-region. It was one of the first countries in the region to gain full internet connectiv-ity. Despite numerous challenges, Ghana has made attempts in different industries to catch up with the rest of the world, an effort that is paying off, as seen in various sectors like education, business, research, and manufacturing. Furtherance to this initiative, the government has initiated what they refer to as a "digital agenda," aimed at a gradual infiltration of information and communication technology (ICT) into all facets of the economy.[3] The digital agenda is meant to take Ghana to the next level of digital acces-sibility so that artifacts like student records are available online, online banking is easily accessible, and court records are available online.

The first step in this process was to establish a ministry to take care of this sector of the economy. As required by law, through a legislative instrument, the Civil Service Law, 1993 (PNDCL, 327) as amended, the Ministry of Communications and Digitalization was established.[4] Among the objectives of this ministry was to work toward a digital economy using ICT in Ghana. To achieve the aims of this ministry, several government agencies were tasked with working on various aspects of the ministry's agenda. (see https://moc.gov.gh/). They include the Postal and Courier Services Regulatory Commission (PCSRC), Ghana Meteorological Agency (GMet); Ghana-India Kofi Annan Centre of Excellence in ICT (AITI-KACE), National Information Technology Agency (NITA), Data Protection Commission (DPC), National Communications Authority (NCA), Accra Digital Center (ADC), National Cyber Security Centre (NCSC), Ghana Domain Name Registry (GDNR).

Ghana has gained measurable success from the initiative, despite some challenges. This is seen especially in e-government programs. The country ranks among the top five African nations in the World Bank's EBA ICT Index, indicating a strong, enabling digital environment.[5] Digitalization programs have been implemented in various sec-tors, including ports, health insurance, utility payments, and digital addressing systems, leading to increased efficiency and transparency.[6] Another success story is the school placement system, an online system that selects elementary school students into high schools, using candidates' indicators. The Digitization of operation for the regional examinations body, the West African Examinations Council (WAEC), made it possible for students and parents to easily access student records online.

The program has also secured economic gains for the country. According to the Ghana Investment Promotions Center (GIPC), the IT sector is valued at 1.5 billion Ghanaian cedis annually, and this trend is expected to grow at a steady rate.[7] The study projected annual growth in related industries as follows:

1. Digital infrastructure, including data centers, fiber optic cables, etc.: $400 million
2. Software (sales of software by companies like Oracle, IBM, and SAP): $200 million
3. Cloud infrastructure: $15 million
4. Cybersecurity: $30 million
5. Fintech, Health-tech and Ed-tech: $115 million
6. Training and services: $150 million

However, challenges persist, such as weak infrastructure, inadequate human capital, and insufficient stakeholder engagement.[8] Continued infrastructure development, digital education, and cybersecurity expertise are recommended to fully realize the benefits of digitalization. Other challenges include poor internet penetration and cybersecurity issues.[9]

Internet in Ghanaian Academic Libraries

Academic libraries in Ghana serve the teaching, learning and research needs of their students. These libraries can be found mainly in the colleges of education, technical schools, and the public and private universities in the country. All these libraries are able to function and serve their clients generally through the use of the internet. Internet usage in academic libraries in Ghana has grown steadily. Internet connectivity can be found in virtually all academic libraries in Ghana. Studies have found that while there is awareness of ICT benefits, usage is often unsophisticated.[10]

Academic libraries in Ghana use the internet for communication, online reference service, provision of access to electronic resources either through IP or off-campus access, automation, the creation of institutional repositories, and for providing access and security management through the installation of CCTV (closed-circuit television) cameras. Academic libraries in Ghana use the internet to communicate with their students and faculty. For example, they provide information on the library's website about available services and facilities. In other instances, direct messages about the library's services and facilities are sent to users via email and social media platforms such as WhatsApp and Facebook.[11]

The internet has also facilitated access to electronic resources in the academic libraries in Ghana. For example, Perpetua Dadzie and Thomas van der Walt found that the university libraries in Ghana had basic infrastructure to allow students and faculty to use the internet with moderately reliable results. These universities also had institutional repositories, online public access catalogs, library websites, digitally literate staff, and they were members of a resource sharing consortium.[12] Providing electronic resources in academic libraries in Ghana is an accreditation requirement that all libraries must meet. Therefore, through the Consortium of Academic and Research Libraries in Ghana (CARLIGH), all academic libraries in Ghana can subscribe to electronic resources from renowned publishers and database vendors to meet the information needs of their us-

ers.[13] The internet is what makes it possible for the users of these libraries to access these databases. These resources are accessed through IP or remote login. Users, therefore, can access electronic resources within the IP range of their various institutions, and those who are not within the IP range can access these resources remotely. These libraries primarily rely on EZProxy, RemoteXs, and myLOFT as remote login software to enable users outside their libraries to access their subscribed electronic resources.[14]

Most academic libraries in Ghana are automated and use computers for procedures like cataloging, circulation, collections and acquisitions. Alexandria and Koha are the software these libraries use to allow digital access to their collections. Automation has enabled these libraries to serve the needs of users. Some in-house functions, such as cataloging, classification, circulation, and user support services, such as reference and lending, are done using the internet. This software has enabled librarians to bring libraries closer to the doorsteps of library users through one of the most important modules within the software called the Online Public Access Catalog (OPAC), which is made accessible online through the internet, and is used by library users to search for catalogued library materials in real time from the comfort of their many locations.[15]

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Academic libraries in Ghana have successfully used the internet to set up institutional repositories in their respective libraries. These repositories, which are open access, project the intellectual output of their universities to the outside world. The common software used by all academic libraries in Ghana is DSpace, an open-source software. Institutional repositories, which house the completed research and academic projects of the faculty at a university, increase the visibility of the institution, and increase access to the research.[16] Osman Imoro and Nampombe Saurombe explained that repositories are popular in African universities, partly because of policies which encourage submission and generation of content.[17]

Digital citizenship itself is most often applied to youth who are learning about internet behavior and ethics in school settings. Digital citizenship is a term which arises from citizenship studies, and has been adopted in K-12 education as a way of teaching positive online behaviors.[18] Moonsun Choi, the scholar who was one of the developers of the framework used in this study, described the concept of digital citizenship as reminiscent of traditional concepts of citizenship, but also centering on rights and responsibilities for people within their nation-state and in a global society.[19] Specifically, Choi stated that active engagement is the key to being a digital citizen and includes use of the internet for social and political actions, as well as human rights, social justice and sustaining diverse communities.

Case Study - A University Library in Ghana

This section explains the specific case study and its implications. The study aimed to understand students' engagement with the internet, both on and off campus, at a

STEM university in Ghana. The study focused on their technical experiences and, more significantly, the implications for their digital participation. Researchers asked specifically how students might apply the elements of digital citizenship—including Internet Political Activism, Technical skills, Local/Global Awareness, Critical Perspective, and Networking Agency—to their abilities and asked how they use digital resources to seek information.[20] To understand this, a survey was distributed using WhatsApp, the communication tool deemed most effective for reaching students, to graduate students at a university in the Ashanti region of Ghana, yielding 101 responses. This approach aligns with existing research, which highlights WhatsApp's advantages as a popular and affordable communication tool among students in academic settings across Sub-Saharan Africa.[21]

The survey asked participants to describe their experiences using technology to access information. In this case, it was already established that while internet connectivity in some universities may experience poor connectivity, the situation at this university was different. In fact, this university subscribed to two internet service providers (namely Telecel and MTN), which provided the campus with a fiber optic connection, giving the campus a somewhat reliable internet connection. The university also subscribed to quite a few databases including ProQuest eBook Central, Taylor & Francis, and ScienceDirect. Other resources included Research4Life databases, including PubMed, EBSCOHost, Sage, and others. Generally, access to digital resources can be termed reliable on this campus. However, many students and faculty do not live on campus and need increased access to digital resources while working from home. Students living off campus must use their own internet and go through a remote access channel to use the library's online resources.

This public university's initial focus was science and technology, but it has expanded to include other disciplines that accommodate industry needs and population growth. This means that library resources are primarily within art, agriculture and natural resources, health, humanities and social sciences, engineering, and science, as students major in these areas. It is also important to note that universities in Ghana are constantly growing to meet new demands, which means programs may change from time to time. Instruction in this university is primarily face-to-face for traditional students and online, using mostly Zoom and sometimes Microsoft Teams and Google Meet for distance learning students. These technologies were particularly helpful during the COVID-19 pandemic, when most universities resorted to remote teaching and learning. The use of technology in teaching and learning is captured in the university's teaching and learning policy and e-learning policy, where a premium has been placed on the use of information and communication technologies to enhance access to information and facilitate contact with teachers and colleagues.[22] While the university provides broadband and wireless internet for staff and students, the speed is sometimes slow. The situation often leads students to rely on their own personal internet connections, which may be faster but come at a cost.

While this study focused on one university, the issues of internet connection may vary from one university to the other. The research team (one library science professor, one African Studies librarian, and one senior librarian from an academic library in Ghana) had worked on a similar topic at a different university in Ghana before and established that connectivity issues were indeed an issue for students and affected their

confidence as internet users.[23] That study examined how the students at the university felt about their abilities, ways of thinking and actions related to internet use. Using the same digital citizenship framework, students were asked to self-report their skills, as well as to openly write about their perceived barriers to accessing information.[24] The scale for self-assessing digital citizenship was developed specifically to understand more about how students engage in a digitized society. The findings indicated that students reported the highest competencies in technical

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skills (which can be attributed to the requirement of taking a computer literacy class in undergrad as described in the country context) and the lowest competencies in political activism (which can be attributed to the age of the population who was working, taking classes and raising families).

The findings from this case study underscored that restricted internet access will significantly impact information use by the students and faculty. One consequence of limited internet access is insecurity related to information-searching skills and knowledge of available electronic resources (the more time one spends on online learning experiences, the greater their self-efficacy).[25] In addition, university equipment (or the devices brought to campus by students) may be old, obsolete, or laden with viruses. Related to that, while security systems are developing at this university, digital safety remains a huge problem in the West African subregion because of scams—all are at risk of being hacked or scammed into giving money.

Apart from the security challenges, some students do not use the internet for academic purposes. These students usually use the internet for betting and watching non-academic videos from YouTube and TikTok. Using the university's bandwidth to stream online videos puts a strain on the allocated internet for academic use, thereby slowing it down. To address this, all students take a course in computer and communication skills in their first year as undergraduate students. The course is a degree requirement for all first-year undergraduate programs. Postgraduates (who are the participants in our study) are presumed to have acquired these skills already in their undergraduate years. The university's ICT policy, which recognizes the different ways of interactions and sharing of knowledge within the university as well as the outside world, is also helping to address these challenges.

Discussion

Researchers identified several critical findings from this experience. First, the quality of infrastructure affects students' confidence in digital citizenship. Second, students enhance their digital participation by finding their own resources. While it was insightful to understand how students assess their digital citizenship skills, the qualitative data on the challenges they face proved most valuable for designing effective library programs.

Quality of Infrastructure

The internet connectivity situation at this university is modest. Many survey respondents live off campus and do not fully benefit from the university's internet services. Consequently, their feedback reflects a broader perspective than just the on-campus internet situation. In addition to the university's cable and wireless networks, students and staff receive monthly internet bundles and airtime for calls. However, issues with slow internet speeds and lengthy downloads are more pronounced with their personal internet connections than with the university-provided services. Since the COVID-19 pandemic, the demand for digital resources and remote learning has increased, making reliable home internet access essential for completing academic tasks.

Students indicated that they need reliable internet, more cybersecurity and faster download speeds. This has affected students' information literacy; the librarians who conducted this study noted that information literacy is important for graduate students, as well as undergraduate students. While digital and information literacy is a targeted program for undergraduates, it is assumed that graduate students have these skills already. Additional opportunities like research classes related to using existing campus resources might be useful to mitigating graduate students' struggles.

Digital Participation in Imperfect Information Settings

Like many graduate students these days, the students in this study needed internet access when they were not on campus, as well as tools and resources which the university may not have. They found their own tools, such as WhatsApp for communication, or their own data packs (where they purchase data directly from the provider) for internet access. While this research originally sought to identify digital citizenship skills, the findings informed us that *digital participation* may be a better word to describe the online activity of graduate students (who are often adults over the age of 25 with families and jobs), as they participate in social media, academia, and staying abreast of global events.

Distributing this survey was helpful for the academic librarians at the university where this study was conducted. Findings (like students were worried about being scammed online, and that students were unsure what information is trustworthy) helped academic librarians to target their information literacy instruction. However, the findings did not surprise the authors of this paper. A previous study had already been conducted in 2021 comparing the experiences of undergraduate students in a regional university in the United States, with that of undergraduate students in a regional university in Ghana.[26] The findings from that cross-cultural study indicated that students from both countries were concerned about issues of access to the internet, as well as the ability to find correct information and being bullied online. Students in Ghana

The students in this study essentially stated that they participate in an imperfect information environment, in that their digital participation was significantly impacted by constraints related to data, security, trust, training and more.

were particularly concerned with accessing the internet, slow downloads, and the high cost of data. These findings were repeated in the survey at the STEM university as well.

The students in this study essentially stated that they participate in an imperfect information environment, in that their digital participation was significantly impacted by constraints related to data, security, trust, training and more. Information grounds—defined as the social setting in which a group of people experience information—inherently impacting how people use information, provides a useful framework to examine this case study.[27] This feature article describes the experiences examining the information grounds for a graduate student population at a public university in Ghana, how students responded to learning in these imperfect digital conditions, and how one university library is working to improve digital literacy and access within it.

Related Issues and Future Partnerships

The library consistently addresses students' concerns about the library in several ways. The library has redesigned the space to meet the students' learning styles. Since the internet is a big attraction for library users, more computers with internet connections have been provided on all floors in the main library. In the colleges and faculty libraries, additional computers have been procured for students' use. These computers are all connected to the internet. Through information literacy, the library orients students about the responsible use of the internet and how to search, access, and use ethically and legally the digital resources subscribed to by the library.

This work has indicated that there is potential for future partnerships within and outside of Ghana. There are opportunities for Ghanaian universities to increase and further develop their interlibrary loan structure so that it is easier to share resources among universities. There is a strong open access movement in Africa which has led to the development of *African Journals Online* and curation of open access journals to improve access to scholarly information. Also, there is a critical need for the Ghanaian government to increase broadband across the country. These efforts are underway with the implementation of the Digital Ghana Agenda.

Conclusion

In conclusion, internet access has implications for student success among graduate students in Ghana. Exploration of this issue highlights challenges faced by many remote regions in sub-Saharan Africa. Despite improvements in internet penetration, issues such as high costs, unreliable connections, and the limitations of mobile data continue to hinder the educational experiences of students, particularly in digital learning situations. We suggest that academic libraries continue work to enhance on-campus resources and foster partnerships with

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other institutions to address these disparities. Academic libraries must advocate for equitable access to digital resources and invest in innovative strategies that empower students to thrive in an increasingly connected world. By prioritizing these issues, the library community can contribute to narrowing the digital divide and fostering a more inclusive learning environment.

Jenna Kammer is an associate professor at the University of Central Missouri, email: jkammer@ucmo.edu, ORCID: 0000-0002-4739-767X.

Kodjo Atiso is the librarian for Africana and international studies at the University of Kansas, email: kodjoatiso@ku.edu, ORCID: 0000-0002-7634-6687.

Edward Borteye is a senior assistant librarian at Kwame Nkrumah University of Science and Technology, email: edborteye@yahoo.com, ORCID: 0000-0002-9925-9893.

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