Access and Equity: Computers for Schools Burundi

Jasmin Bey Cowin
Touro College

Although information and communication technology (ICT) has been used in various parts of the world to improve access to and the quality of education, educational systems in many African nations still face challenges around access to, equity in, and accessibility of ICT. Such issues are widespread in public education throughout Burundi. To resolve these issues, all stakeholders, including nongovernmental organizations, not-for-profit organizations, schools, communities, and employers in the education sector, must recognize and facilitate educational liberation leading to the social transformation of Burundi's educational system. It is especially important to include previously disadvantaged communities. This paper outlines and contextualizes the quest of Computers for Schools Burundi to improve access to and equity in ICT literacy skills for Burundian youth from kindergarten–Grade 12.

Keywords: information and communication technology (ICT), education, access, equity, computers for schools Burundi

ACCESS AND EQUITY: COMPUTERS FOR SCHOOLS BURUNDI

The United Nations Sustainable Development Goals shape policy priorities across the African continent. The future and development of Africa depends on how its leaders deliver quality education to their youth to train a skilled workforce able to resolve issues in services and infrastructure planning and construction.

> About two-thirds of the continent's population is under the age of 24 and is underemployed—including those with college and university degrees. Most workers are still trapped in very low-productivity activities in subsistence agriculture and the informal sector. To accommodate its high rate of population growth, Africa will have to generate between 12 million and 15 million jobs annually. (Monga, Shimeles, & Woldemichael, 2019, p. 7)

Delivering quality education to all school-age youth creates a solid foundation for developing future innovation, industrialization, science, and technology and allows the continent to participate and take its rightful place in the global community.

AN OVERVIEW OF KINDERGARTEN–GRADE 12 EDUCATION IN BURUNDI

The majority of Burundians live below the poverty line (72.9%) in rural areas (87%; World Bank, 2019a). The country's economy is largely reliant on its agricultural sector, which employs 80% of the labor force but contributes just 40% of the gross domestic product (GDP). As of 2014, when the latest data were available, the country ranked at the bottom of the Global Hunger Index. In 2017 the country was in the midst of a recession owing to the fragile political environment, low private consumption attributable to a decrease in food production caused by poor weather conditions, and forced migration of refugees and internally displaced persons (World Bank, 2019b). As of 2014, Burundi had three official languages: Kirundi, French, and English. Burundi's single indigenous language, Kirundi, is spoken by the entire population.

The educational system in Burundi is divided into pre-primary (ages 5–6), primary (ages 7–13), secondary (ages 13–18), and tertiary (ages 19–23) education. Education is compulsory for 6 years between ages 7 and 13. Primary education is free. About half of Burundi schools are semiprivate schools (*écoles conventionnées*) built and often managed by religious communities. Admission to secondary school is through a system of national examinations that determines which school a child can attend.

Extensive fighting during the Burundian Civil War (1993–2006) caused widespread damage to the state's educational system. Around 25% of all schools were destroyed, and many teachers were killed or internally displaced. More than 6,000 Burundian children still live in refugee camps outside Burundi.

According to *Report on the Quality of Education* (Varly & Mazunya, 2018, p. 8), the youth literacy rate (2008–2012) is 89.6% for males ages 15–24 and 88.1% for females the same age, one of the highest in sub-Saharan Africa (see Table 1).

TABLE 1
BURUNDI LITERACY RATE, 2017

Age group	Total	Males	Females
15–24 years	88.22%	91.03%	85.62%
15 years and older	68.38%	76.3%	61.22%
65 years and older	30.79%	46.5%	16.99%

Note. Adapted from UNESCO Institute of Statistics (2020).

> In 2014, the fact that the Kirundi language is used to test pupils in grade 2 partially explains why Burundi is performing so well. In 2014, at grade 6, 40% of the pupils reached the highest level in math (level 3, problem solving) versus 7.4% in reading (level 4, complex inference). (p. 8)

Public primary education is free; however, the costs of required uniforms and notebooks can be prohibitive for low-income students. In rural areas, the opportunity cost of not having children participate in agriculture can also prevent children from attending school. All of these factors contribute to low rates of completion of primary education.

The amount of public spending on education was as high as 5.4% of the GDP in 2013. However, this rather large share of the GDP is somewhat misleading, as most of it was and still is externally financed. According to the *Global Competitiveness Report* 2015–2016, Burundi ranks 139 out of 140 countries for "higher education and training."

Issues of access to and equity in information and communication technology (ICT) are widespread in public education throughout Burundi. To resolve these issues, all stakeholders, including the government, not-for-profit organizations, schools, communities, and employers in the education sector must facilitate expansion of the educational space for ICT investment. It is especially important to include previously disadvantaged communities in difficult-to-reach regions.

AN OVERVIEW OF HIGHER EDUCATION IN BURUNDI

According to Jackson (2000), Burundi has fewer university students per population than any other nation in Africa. Until 1999, the University of Burundi (Université du Burundi), a public university with 5,900 students in Bujumbura, was the main center of higher education. The creation of private universities such as Université Espoir d'Afrique, Université de Ngozi, Université Martin Luther King of Bujumbura, Université Paix et Reconciliation in Bujumbura, International Leadership University of Bujumbura, Université Ntare Rugamba of Bujumbura,

Bujumbura International University, and many others provides alternative opportunities for entry into higher education and regional, national, and international job markets.

Even before the conflicts, the ratio of students in the university from the two major communities did not reflect the real composition of the Burundian population. After the conflicts started in 1993, most of the Hutu ethnic group fled the university; although some returned, they formed an unequal minority population, with the university largely dominated by students from the Tutsi ethnic group. The situation has since improved, with the University of Burundi admitting students based entirely on their school performance. Students who attend a national university receive government-sponsored free tuition.

ICT FOR EDUCATION IN BURUNDI

Although facing significant financial limitations, stakeholders in the Burundi education sector are working to improve access to and equity in education by harnessing the power of ICT starting in primary school. The Ministry of Primary and Secondary Education has implemented the Transitional Education Plan 2018–2020. The plan seeks to address the 2014 Education Country Status Report and an analysis of risks and vulnerabilities conducted in 2017. The Global Partnership for Education is an important partner of the Transitional Education Plan with a focus on promoting fundamental access and equity, strengthening the resilience of the system, and improving countrywide governance of the school system. Training sessions on Early Grade Reading Assessment tools were delivered in the region in 2012. This robust assessment system might explain Burundi's favorable educational performance and basic literacy skills. However, continued political unrest and mass protests in Burundi's capital Bujumbura act as a destabilizing force and increase regional and international political isolation.

Most Burundi teachers have had 2 years of initial teacher training. Classroom pedagogical practices are similar to those in other African countries with one major exception: In the early grades, teaching and learning is facilitated by the fact that the medium of instruction, Kirundi, is the home language of teachers and pupils.

Burundi's drive to improve its educational infrastructure and performance fits into the larger framework of awakening and self-determination for the African continent:

> Firmly determined to take its future into its own hands, Africa is growing out of adopting agendas to, instead, setting the agenda. Agenda 2063 is one mechanism for doing so. So is the African Continental Free Trade Area, which will integrate a market of 1.2 billion people with a GDP of over $3.4 trillion, creating new opportunities for Africa and its business partners. In addition, many African countries are embarking on ambitious development plans that are driving the adoption of technologies and new sources of energy. Countries are also showing a greater appetite for information technology and knowledge. (Africa Growth Initiative, 2020, p. 13)

Through Ministry of Primary and Secondary Education directives, progress has been achieved in establishing a forward-looking policy environment to ensure effectiveness and competence in regard to the implementation of ICT in all public schools. For instance, Computers for Schools Burundi (CfSB) actively collaborates with various Burundian ministries on the development, implementation, and scaling

of ICT curricula to be used by kindergarten–Grade 12 schools nationwide. The government accepted the first version of the curriculum in 2014 and agreed to integrate it into several schools.

Supported by the government and appropriate institutional and regulatory structures, Burundi has seen a continuous scaling up of ICT integration into five provinces through CfSB. Yet, despite this significant progress, some education policies still need to be reviewed thoroughly and updated to ensure that the ICT polices are supported by complementary education policies. Issues such as unreliable Internet access, intermittent electricity, and basic necessities for functioning with the Internet of Things (Souter, Adam, Butcher, Sibthorpe, & Tusubira, 2012) continue to create challenges in remote areas of Burundi.

According to report *The State of the World's Children 2017: Children in a Digital World* (UNICEF, 2017, p. 1), "Connectivity can be a game changer for some of the world's most marginalized children, helping them fulfil their potential and break intergenerational cycles of poverty." Furthermore, UNICEF states that worldwide about 29% of youth, or 346 million individuals, are not online. African youth are the least connected. Around 60% are not online compared to just 4% in Europe. Implementing ICT in primary and secondary schools offers a pathway for empowerment by allowing youth to fully engage with the world at large. However, the pace of implementation is uneven and still evolving.

THE VISION AND MISSION OF CfSB

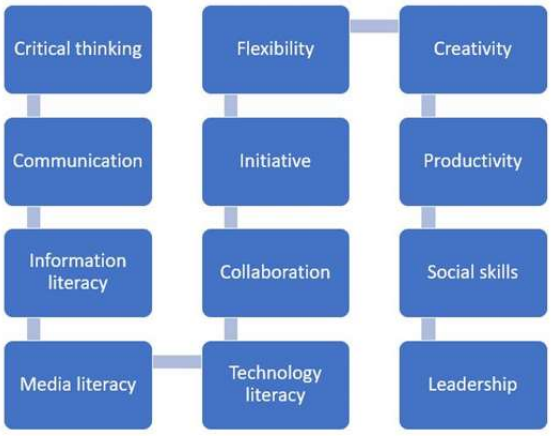
Emmanuel Ngendakuriyo, founder and executive director of CfSB believes that ICT integration into the Burundian education system and focused e-waste management are the keys to capitalize on Fourth Industrial Revolution opportunities. CfSB's principal goal is to modernize the Burundi education system through universal ICT education in primary and secondary schools, thereby creating access to and equity in digital skills for Burundian youth. The vision is to promote and integrate the use of ICT and 21st Century skills into primary and secondary schools as the main engine of sustainable development in Burundi. The mission focuses on delivering quality ICT education to all Burundian school-age youth, thereby creating a solid foundation for the development of future innovation, industrialization, science, technology integration; eventually resulting in poverty reduction and allowing Burundi's citizens to participate in and join as global citizens in a global economy.

CfSB participates in the government's Five Schools of Excellence project, which aims to prepare Burundi's youth to become leaders in scientific research, ICT innovation, and administration in both the private and public sectors. The Burundi government set up the Five Schools of Excellence project (2016-2017) to prepare Burundian youth to acquire the 21st Century skillsets necessary to assume future leadership positions in public and private administration, scientific research centers and be part of digital innovation initiatives. The schools are located throughout the country with student selection criteria based on Burundi's national test. Applicants complete a test of French and Mathematics which determines the highest-scoring Burundian students at the end of the school year.

The CfSB project goal is to equip each School of Excellence with ICT Labs, coupled with training teachers in ICT use and best pedagogy practices, to facilitate productive student education. Innovation, creativity, and digital entrepreneurship are crucial 21st Century skills for underserved Burundian youth to acquire. The CfSB project is intended to serve as an inspiration and best practices guide for the Education Ministry and Burundi's secondary schools. During school holidays, students and the community located around the equipped schools use the computer labs to benefit their community with continued ICT training.

The current CfSB curriculum focuses on 21st-century skills that modern students need to succeed in their careers, addressing the increasing power of technology and digitization (see Figure 1). A majority of African firms report very low to moderate levels of business preparedness among recent school graduates for five key Fourth Industrial Revolution technologies: "Failure to recognize and capitalize on [Fourth Industrial Revolution] opportunities, conversely, will impose considerable risks on African stakeholders: Without attempts to move beyond existing models of innovation, entrepreneurship, and digital growth on the continent, African businesses risk falling further behind" (Ndung'u & Signé, 2020, p. 62).

FIGURE 1
21ST-CENTURY SKILLS PROGRESSION



CfSB has partnered with Rotary Clubs, nationally and internationally. Rotary is made up of three parts: clubs, Rotary International, and The Rotary Foundation. Collectively, Rotary works to make lasting change in communities and around the world. CfSB, the Rotary Club Bujumbura-Doyen, and the Rotary Club Ottawa have partnered to apply for a grant through Rotary International with the Rotary Club of New York providing additional funding. The board of CfSB is composed of members of local, regional, and international companies, nongovernmental organizations, and governmental representatives.

STRATEGIES FOR EDUCATIONAL AND ECONOMIC COMPETITIVENESS

Implementing CfSB school projects is a significant step toward achieving the goal of modernizing the education sector in Burundi by including ICT and digital literacy skills in all provinces by 2025. Approximately 1,246 students and 203 teachers in five schools and five provinces are currently enrolled in CfSB programs (see Table 2).

TABLE 2
CFSB PARTICIPATING SCHOOLS

No.	School	Province	Teachers (*n*)	Students (*n*)
1	E.N. Ngagara	Bujumbura	41	183
2	Lycée Musenyi	Ngozi	39	285
3	Lycée Kiremba Sud	Bururi	43	245
4	Notre Dame De La Sagesse	Gitega	37	237
5	Lycée Rusengo	Ruyigi	43	296
Total			203	1,246

To refocus the CfSB mission and analyze its ongoing initiatives and execution trajectories, Jasmin Bey Cowin, EdD, Rotarian, joined the group in 2019 as a global impact and sustainability analyst and continual improvement for social responsibility coach. Using the Six Sigma problem solving and quality improvement framework and the SOFAIR method, she and her team comprehensively analyzed all institutional aspects of CfSB. The SOFAIR method consists of five phases of problem solving and process improvement. An important task was reframing general statements into concrete and succinct goals (see Table 3).

TABLE 3
CFSB REFOCUSED GOALS

Goals before SOFAIR analysis	Goals after SOFAIR analysis
Modernize the Burundi educational system; facilitate and enable access to the information to pupils, students and teachers.	Modernize the Burundi educational system by having computers and computer education in all 18 provinces by 2025.
Create exchanges between research centers.	Create a national network of 10 schools and teachers together with the five leading universities in Burundi by 2025.
Digital entrepreneurship and innovation education for students	Create three countrywide digital entrepreneurship and innovation awards for students, with the first award to be given at Computers for Schools Burundi's inaugural conference in 2022.

Further work at CfSB includes continuing with the guidance of ISO 26000 working on principles of social responsibility, such as accountability, transparency, ethical behavior, respect for stakeholder interests, respect for the rule of law, respect for international norms of behavior, and respect for universal human rights (International Organization for Standardization, 2018).

CfSB projects for access and equity include ICT teacher training, direct services to primary and secondary schools, and financial education initiatives in primary and secondary schools. The operating system for all schools is Windows 7, 8, or 10. Microsoft Office is used, with the license donated by Microsoft East Africa. The curriculum is divided into five major areas: data, representing information, algorithms, representing procedures, and interacting with computers (see Table 4).

TABLE 4
OUTLINE FOR COMPUTERS FOR SCHOOLS BURUNDI INFORMATION AND COMMUNICATION TECHNOLOGY CURRICULUM IN PRIMARY SCHOOLS

Content area: Computer operations and fundamentals	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
Working with mouse, keyboard, and monitor		•	•	•	•	•
Working with storage devices			•	•	•	•
Working with printer			•	•	•	•
Working with peripherals, such as a microphone, scanner, and webcam				•	•	•
File manipulation and content organization				•	•	•
Working with text	•	•	•	•	•	•
Editing: cut, copy, and paste	•	•	•	•	•	•
Bullets and numbering		•	•	•	•	•
Working with tables			•	•	•	•
Working with images				•	•	•

Developing physical and digital infrastructure is necessary as a large percentage of Burundi's disadvantaged children have intermittent or low-quality Internet access. This compounds their deprivation, effectively denying them the skills and knowledge that could help them fulfil their potential and break intergenerational cycles of disadvantage and poverty (UNICEF, 2017, p. 53). Access to advanced technology in Burundi is constrained by a lack of electricity and low teledensity, Internet density, and broadband penetration (International Telecommunications Union, 2018).

Global Kids Online stated in a synthesis of research that disadvantaged children predominantly access the Internet at home and through mobile devices. "Digital media environments increasingly mediate a host of activities and experiences important to children's cognitive, emotional and social well-being" (Livingstone, 2016, p. 5). Yet although Africa is the second largest and fastest growing mobile phone market in the world, cell phones are not a fully functional replacement for desktop computers in education, as the individual skillsets required to operate these devices are different. There is a marked difference between the use of mobile devices and CfSB's use of desktops in ICT teaching.

For example, cell phones are not conducive to exploring the full functionality and features of the Internet of Things, as they have smaller displays, portrait-style screens, slower processors, and less bandwidth. Touch-based input is less precise because of the small screen size. Finally, cell phones have tricky keyboards and limited multitasking and functionality in terms of, for example, bookmarking and opening links in new windows.

Although the Internet in Burundi is often unreliable, the platform CS Unplugged features offline activities to introduce students to computational thinking through concepts such as binary numbers, algorithms and data compression, separated from the distractions and technical details on computer use.

General aims of CfSB's ICT education are as follows:

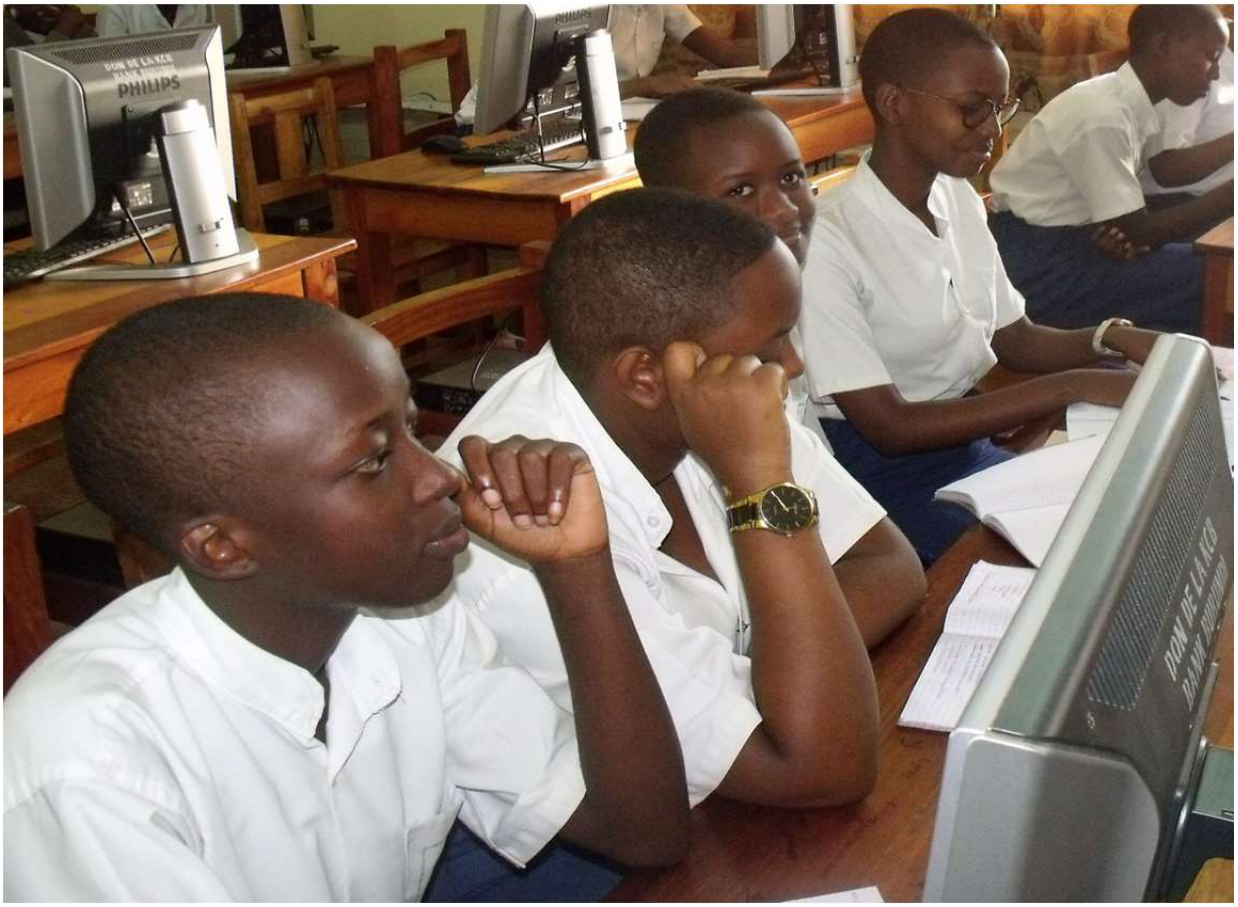
1. To help learners become competent, confident, responsible, and critical users of ICT by making efficient, effective, and creative use of basic software and hardware in their everyday classroom activities;
2. To assist learners in becoming responsible, critical, and reflective users of ICT by recognizing the capabilities and limitations of technology and its impact on society in general;
3. To encourage learners to develop the appropriate social skills essential for cooperative and collaborative learning by using ICT;
4. To empower ICT-disadvantaged learners by ensuring sufficient access for those learners who have few out-of-school opportunities to use technology;
5. To encourage learners to develop the appropriate personal skills essential for independent lifelong learning through ICT;
6. To help learners with special needs integrate themselves into school and society by increasing their independence and developing their knowledge, abilities, and interests; and
7. To enable learners to take control of their own learning.

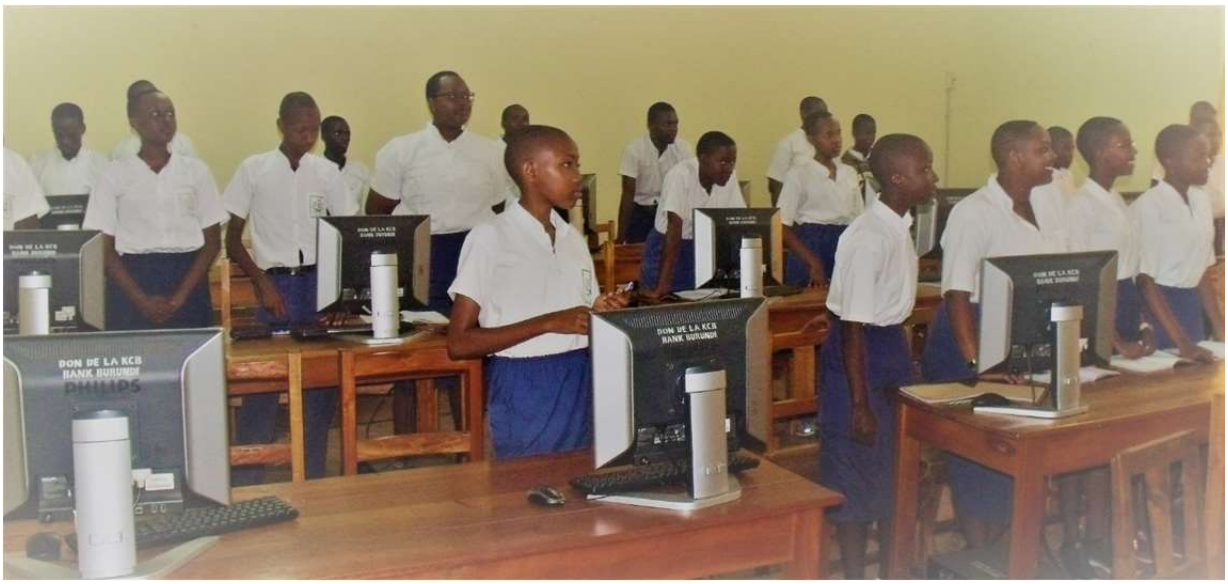
Figure 2

Ongoing teacher training is at the heart of CfSB initiatives. Service teacher training is conducted outside of the occasional training organized by the government for curriculum updates. Teachers in charge of the ICT curriculum in their respective schools are trained once per year to reinforce capacity. The training is done by the Ministry of Education and CfSB and includes the following:

- Revising initial training programs according to a new syllabus aligned with international standards,
- Delivering in-service training based on the newly developed materials,
- Supporting teachers' pedagogical supervision in computer labs with a push toward experimental learning,
- Equipping teachers' supervisors with classroom observation instruments,
- Piloting and monitoring the implementation of the revised ICT curriculum in the schools, and
- Organizing an evaluation of ICT learning outcomes in schools at the start of the project (baseline) and 3 years thereafter (see Figure 1).

FIGURE 2
COMPUTERS FOR SCHOOLS BURUNDI, LYCEE SCHEPPERS, NYAKABIGA, FEBRUARY 2020





As a not-for-profit organization, CfSB has a donation list aligned with monetary expenditures (see Table 5).

TABLE 5
CFSB EXPENDITURES

Amount	Expenditure
$10	Trains one teacher to become the primary ICT teacher for a school
$65	Buys one chair and one table for a computer for an ICT lab
$185	Buys one (desktop) computer to equip an ICT lab
$200	Pays the salary of a project coordinator for 1 month
$300	Buys one laptop for a teacher to use to teach in the ICT lab
$1000	Networks two ICT labs (includes buying the equipment) for one school
$2160	Covers 1 year of Internet access for a school

Note. ICT = information and communication technology.

CONCLUSION

Burundi's long-term plan aims to promote urbanization via facilitating rural–urban migration, freeing arable land, providing nonagricultural urban employment, and reducing the risks for social conflict and economic fragility. The main focal points are reconstructing national unity; controlling population growth and ensuring food security; resolving unemployment and increasing household revenues; promoting economic diversification and a competitive and sound economy; and creating infrastructure for production and increased literacy skills in all areas, especially ICT.

While Africa braces for the Fourth Industrial Revolution, Burundi's government has made significant improvements in education through reforming the curriculum; streamlining teacher accreditation; developing opportunities for continuing teacher education; and including ICT in schools, universities, and even communities. In the next 20 years, Burundi will continue to urbanize, putting large numbers of young job seekers into the labor market. Without a growing and productive private sector, Burundi's cities might rapidly become inundated with unemployed youth. Previous industrial revolutions consolidated technology and wealth in the hands of small, powerful groups. Thus, a renewed focus on access to and equity in ICT for all Burundian youth will require a two-pronged approach: investment in ICT and implementation of internationally aligned ICT curricula with targeted efforts to develop 21st-century skillsets. However, education laws should be reviewed to ensure that no legal conflicts arise from the use of ICT in education, specifically in regard to student confidentiality and privacy rights around data collection.

A renewed focus on access to and equity in ICT for all Burundian youth requires a two-pronged approach: investment in ICT and implementation of ICT curricula with targeted efforts to develop 21st-century skillsets. By furnishing schools with computers, offering effective training to teachers and other stakeholders on how to use ICT equipment and software, and providing direct computer education to students, CfSB provides access to and equity in ICT for Burundian youth.

REFERENCES

Africa Growth Initiative. (2020). *Foresight Africa: Top priorities for the continent 2020-2030.* Retrieved from https://www.brookings.edu/wp-content/uploads/2020/01/ForesightAfrica2020_20200110.pdf

Global Partnership for Education. (2020). *Burundi.* Retrieved from https://www.globalpartnership.org/where-we-work/burundi

HALI Access Network. (n.d.). *Education fact sheet—Burundi.* Retrieved from http://www.haliaccess.org/wp-content/uploads/2018/10/Burundi-Education-Fact-Sheet-2018.pdf

International Organization for Standardization. (2018). *Discovering ISO 26000.* Retrieved from https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100258.pdf

International Telecommunications Union. (2018). *Measuring the information society report 2018* (Vol. 1). Geneva, Switzerland: Author.

Jackson, T. (2000). *Equal access to education: A peace imperative for Burundi.* Retrieved from https://files.eric.ed.gov/fulltext/ED453338.pdf

Livingstone, S. (2016, November). *A framework for researching Global Kids Online: Understanding children's well-being and rights in the digital age.* Retrieved from http://globalkidsonline.net/wp-content/uploads/2016/05/Guide-1-Research-framework-Livingstone.pdf

Monga, C., Shimeles, A., & Woldemichael, A. (Eds.). (n.d.). *Creating decent jobs: Strategies, policies, and instruments.* Abidjan, Ivory Coast: African Development Bank.

Ndung'u, N., & Signé, L. (2020, February 6). *Capturing the Fourth Industrial Revolution: A regional and national agenda.* Retrieved from https://www.brookings.edu/wp-content/uploads/2020/01/ForesightAfrica2020_Chapter5_20200110.pdf

Souter, D., Adam, L., Butcher, N., Sibthorpe, C., & Tusubira, T. (2012). Education. In E. Yonazi, T. Kelly, N. Halewood, & C. Blackman (Eds.), *The transformational use of information and communication technologies in Africa* (pp. 70–84). Washington, DC: World Bank and African Development Bank.

UNESCO Institute of Statistics. (2020). *Burundi*. Retrieved from http://uis.unesco.org/country/BI

UNICEF. (2017). *The state of the world's children 2017: Children in a digital world*. Retrieved from https://www.unicef.org/publications/files/SOWC_2017_ENG_WEB.pdf

United Nations Development Programme in Burundi. (2011, June). *Complete Vision Burundi 2025*. Retrieved from https://www.bi.undp.org/content/dam/burundi/docs/publications/UNDP-bi-vision-burundi-2025_complete_EN.pdf

Varly, P., & Mazunya, M. (2018). *Report on the quality of education*. Retrieved from http://documents.worldbank.org/curated/en/249871498759548672/pdf/P161127-06-29-2017-1498759546356.pdf

World Bank. (2015, June 19). *Republic of Burundi: Strategies for urbanization and economic competitiveness in Burundi*. Retrieved from http://documents.worldbank.org/curated/en/467741468236044792/pdf/Burundi-ESW-Master-File-June-2015-CLEAN-W-WB-front-page-ALW-v2.pdf

World Bank. (2019a). *Rural population (% of total population)—Burundi.* Retrieved from https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?locations=BI

World Bank. (2019b). *The World Bank in Burundi.* Retrieved from https://www.worldbank.org/en/country/burundi/overview