

## ABSTRACT

Title of Document: THE EFFECT OF DIGITAL LIBRARIES IN  
RURAL MALAWIAN SECONDARY  
SCHOOLS: IMPLICATIONS FOR THE  
FUTURE OF AFRICA

*Qimmah Najeeullah*  
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Directed By: Professor Jing Lin  
Department of Counseling Education, Higher  
Education, and Special Education

This exploratory case study investigates the impact of offline digital libraries on teaching and learning in rural Malawian Community Day Secondary Schools (CDSSs). Grounded in Afro-futurism and self-efficacy theory, the research examines the implementation of an offline digital library as an educational resource in five CDSSs. The study addresses digital libraries' impact on attitudes toward teaching and learning, the effects of access to resources through offline digital libraries, and the factors that influence commitment to implementing digital resources. Through semi-structured interviews with students and teachers, the thematic analysis revealed two main themes: 1) an impact on the participant's attitudes toward teaching and learning (primarily mind/perspective shifts in school and community culture and behavior changes in participants in their ability to access to new tools and aptitudes, and 2) uncovers the many visions of personal and national life and motivations that influence commitment to a digital future for Malawi.

The study highlights the transformative potential of offline digital libraries in bridging the educational gap in resource-limited settings and underscores the importance of teacher training,

community engagement, and localized content to enhance the effectiveness of digital education tools. By leveraging existing technologies, rural Malawian schools can empower students and teachers to become future-oriented, self-reliant individuals capable of contributing to local and global development. This research contributes to the growing literature on digital education in sub-Saharan Africa and offers practical recommendations for policymakers and educators aiming to improve educational outcomes in underserved rural communities.

THE EFFECT OF DIGITAL LIBRARIES IN RURAL MALAWIAN SECONDARY  
SCHOOLS: IMPLICATIONS FOR THE FUTURE OF AFRICA

by

Qimmah Safa Najeeullah

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Advisory Committee:

Dr. Jing Lin (Chair)

Dr. Steven Klees

Dr. Taylor Woodman

Dr. Wayne Slater

Dr. Morris Thomas

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## Chapter 1: Introduction

### Earth Seed: Beginning Humanity's Multiplanetary Journey

*The destiny of Earthseed is to take root among the stars.*

- Octavia E. Butler, *Parable of the Sower* (1993)

Humanity needs to expand its reach into the universe, first and foremost, for the survival of our race, but also to become a multi-planetary species. As ecological and public health threats become ever more present in our consciousness and increase in severity, scientists and governments worldwide are exploring different scenarios for responding to these pending crises. So, in consideration of imminent calamities, I venture to ask: if we may need to leave our home planet and start anew on another, (1) how will the critical mass of the human population contribute to the survival of our species in this new world, (2) achieve the massive technical effort of creating physical infrastructure and creating management systems for natural and human resources on a new world or (3) at the very least, be able to endure on Earth that is no longer fit for human survival? Where does this process begin? Undeniably, education is central to exploring the nascent stages of our "deep future" of *long history* (Last, 2015). Transforming our approach to global education policy, including our willingness to ensure essential and solution-based STEM education (i.e., fixing a generator, wiring a solar panel, building a simple air or water filtration system, constructing a frost or greenhouse, and even bike repair) for *all* people is a key component of the discourse.

In the mid-21st century, a technological trench exists between the rich and poor, the global North and South, the West and its former colonies. The varied quality and access to education in one country versus another highlights a profound under-preparedness of the global

South and people with low incomes for the wave of technical consciousness and abilities required to address the challenges ahead. If we consider that 40% of the population on the planet earth is still only living on \$5 per day (World Economic Forum, 2023) and that the population is expected to decrease somewhat in Asia, Europe, and South America until the year 2100, but predicted to grow significantly in Africa from 1.4 billion inhabitants on the continent at the beginning of 2022 to reach 3.9 billion by the year 2100 (Statista Research Department, 2022) we can start to comprehend the task at hand. African adults have on average, five years of education, while the rest of the world has around eight (Institute for Security Studies, 2018). This paints a grim picture of the inevitable and rapidly approaching time when technical skills and know-how will mean the difference between life and death for one's family and for humanity's ability to bridge the trauma of adapting to new environmental realities. Specifically, those leading to severe life restrictions for most of humanity (i.e., regular extreme heat and cold weather, massive migration due to flooding, scarcity of clean/potable water, limited access to basic healthcare, and the halt of global food distribution/trade, etc.). As the developing world will feel the initial brunt of the impact, its contrasting proximity to natural and intuitive STEM knowledge and its familiarity with "simple living" provides an interesting rebuttal to the assumption that currently vulnerable communities will remain vulnerable once global ecological shocks undermine the stability of "rich" nations. With the proper foundational knowledge, self-efficacy, and preparation, the remaining world may be looking to current underdogs of the global South for the panacea to the new world order: an inversion of the social, economic, and natural resources of our current hemispheres based on a familiarity with nature's order and STEM know-how.

This outlook on geopolitics amid global climate change and pandemic vulnerability and its aftermath spans several areas of sociological, philosophical, environmental, economic, and

political intersections. It acknowledges the challenge of relevancy as the current social culture is more comfortable predicting the future of evolutionary possibilities for stars and planets on inconceivable scales of time but struggles to predict human possibility out even 100 years (Last, 2015). This challenge of relevancy becomes intensified if future human possibilities also challenge the permanence of patriarchy and white supremacist paradigms. Therefore, my investigation leans toward the intersection of social justice and philosophical contemplation on the anticipated development of "formerly" colonized African communities as they awaken from the haze of colonized education. Ultimately, seeking to concentrate on modern-indigenous identities free of the inherited social confinement of identity within the binary of oppressor/oppressed, minority/majority, rich/poor, and colonized/colonizer, I predict a new world with "a new people" central in its charge.

### **Climate Shocks, the Future of Whiteness, and Global Movements**

We are Earthseed.  
We are flesh—self-aware, questing, problem-solving flesh.  
We are that aspect of Earthlife best able to shape God knowingly.  
We are Earthlife maturing,  
Earthlife preparing to fall away from the parent world.  
We are Earthlife preparing to take root in new ground,  
Earthlife fulfilling its purpose, its promise, its Destiny.

—Octavia E. Butler, *Parable of the Sower* (1993)

The Western world is "browning"- moving toward resembling most of the world's population. In the U.S. alone, set to be "minority white" in 2045, non-European racial groups are recognized as the primary demographic engine of the nation's future growth, countering an aging, slow-growing, and soon-to-be declining Caucasian population (Frey, 2018). Africa has the youngest population in the world, with 70% of sub-Saharan Africa under 30 years old (Lam, Leibbrandt, & Allen, 2019). Such a high number of young people is an opportunity for the continent's growth

– but only if these new generations are fully empowered to realize their fullest potential.

*Whiteness*, defined by light skin, also denotes those who historically have benefitted from light-skin privilege; distinct by its hyper-visibility, which counterintuitively leads to invisibility (Lindner, 2018), plays a foundational role in racist epistemology of fear of a brown/black future by serving as the norm against which others come to be viewed as different (Dwyer & Jones, 2000; Kobayashi & Peake, 2000). As such, whiteness sets a narrative of structural positions, rhetorical tropes, and habits of perception (Baldwin, 2012; Dyer, 1997) that stand in for the regular (i.e., definitions of race, the color black as "tainted," African inferiority, etc.). As geographies of whiteness almost invariably served the world order that created the 21st century, they are 'past-oriented' (Baldwin, 2012). Whiteness, whether understood as a past or present phenomenon, tends to be explained, accounted for, and examined as an expression of social relations that took shape in the past (Baldwin, 2012; Satzewich, 2007). Much like James Baldwin's rhetorical strategy in his nonfiction *The Price of The Ticket (1985)*, when he was suddenly struck with the understanding there *was* no "whiteness," as it indicated a race, but purely an anxiety fantasy to which certain people had been trained to immediately leap to whenever certain other people encountered them, they coded as non-white; being something socially convinced, out of a kind of knee-jerk fear (Baldwin, 2021). What might be gained by examining constructions of postcolonial whiteness through futurity, a future condition or prospect? Since this question could take a variety of directions, one contemporary example is offered: the issue of climate change and migration. A rather poignant example found was in a Museum of London exhibit called *London Futures* (Marshall, 2010). In one of the photographs, Buckingham Palace is surrounded by a vast informal settlement similar to one found in parts of Mumbai or Nairobi. As a 'postcard' from the future, it provides a virtual rendering of a climate-

changed future bearing on one of the most iconic symbols of Britishness and whiteness. As such, the image tethers the politics of ecological shifts and environmental citizenship to those of race and whiteness through an appeal to the future (Baldwin, 2012). Unfortunately, the images in the exhibit only focus on the poor/global south flocking to the developed North (versus the possibility that climate events can lead to an alternate outcome, namely, climate migrants from the global North to the global South), reanimates the white/savior-black/migrant binary of colonialism. Perhaps the most significant opportunity of the images is to remind us that the Environmental Citizen is a future-oriented, independent thinker raised and rooted in alternate possibilities for human society and able to respond to the unpredictability of both environmental and social realities. A reflexive engagement with futurity might, therefore, build on Ahmed's (2004) insight by asking, how does the study of whiteness rely on some notion of a future based on white supremacy?

If we accept Richard Dyer's (1997) claim that the power of whiteness lies in its infinite variability, then undoubtedly, the future of whiteness contains the scope to disrupt its power. By thinking carefully and critically about how the future of whiteness is integral to ways in which the meaning of whiteness (as a concept that defines common/pseudo-permanent understanding of human social structures) can shift and change (Baldwin, 2012), this intellectual exercise creates space for the exploration of the future of blackness, the African and brown world alongside it.

The process of "learning to unlearn to re-learn," in addition to being an opening to other knowledge and thinkers beyond those from Europe and North America that have dominated the academy for the last 500 years, entails the complex process of "forgetting what we have been taught, to break free from the thinking programs imposed on us by education, culture, and social environment marked by the Western imperial reason" (Tlostanova & Mignolo,

2012). Indigenous African concepts like *Ubuntu*, a quality that includes the essential human virtues of compassion and humanity (Ewuoso & Hall, 2019), for example, can be interpreted as a decolonized way of "how we define well-being and how we live together on this planet" (Moyo, 2021), as opposed to the western concept of development that is ultimately linked to neoliberal capitalism, extractivism, and unequal globalization. The same applies to the term *Buen Vivir* (of the Spanish/African-diaspora) as a fundamentally different approach to a "good life" and the human-nature relationship (Gudynas & Acosta, 2011). The notion of *Ecosophy* (the articulation of social, subjective, ecology all together) is a newer terminology that adequately describes a philosophical approach combined with a way of life that can lead to concepts of reform and transformation but emphasizes the importance of "revealing, exposing, or shedding light on the stories-we-live by...to open them up to question and challenge ...based upon the kind of world the analyst wants to see" (Stibbe, 2015).

*Journey to Earthland* (Raskin, 2016), outlines the current choice of paths for humanity as we reach the end of this Planetary Phase, represented in part by the intense geopolitical struggle for control of diminishing natural resources. An emphasis on the two directions of the two kinds of Great Transition scenarios- Eco-communalism and New Paradigm –highlights a shift in consciousness and institutions of global governance, economies centered on the well-being of all, and environmental stewardship (Raskin, 2016). I sincerely appreciate this pairing - it is the foundation of the vision for humanity that a shift in global education priorities must embrace: the eco-economy and need to accept undeniable interdependency (i.e., global inflation due to war on Ukraine) and the ecologically-based and wellness-focused society of tomorrow; including cutting-edge programs training sustainability-minded professionals "equipped to manage

complex systems, and scientists, humanists, and artists keen to enrich Earthlandic culture." (Raskin, 2016).

Relatedly, Falk (2021) advocates for educational reform based on human development and internal aid to preserve the external grappling with the complexities and solidarity needed to release ourselves from present structures and to redefine the possible human experience, "a patriotism for humanity in which the whole becomes greater than the part, and the part is no longer the dominant organizing principle of life on the planet" (Falk, 2021). This ethos of human solidarity is the basis for my thesis. It validates the breaking down of many social and cultural systems that undermine and prevent the full contribution of most human beings to society.

### **Foundation of the Study: Malawi Digital Education Pilot Background & Role of the Researcher**

In early January 2021, I arrived in Lilongwe, Malawi, to serve as the Director of Programming and Training for the United States Peace Corps- an independent agency of the U.S. government that trains and deploys American volunteers to provide developing countries with skilled workers in fields such as education, health, entrepreneurship, women's empowerment, and community development to foster international peace and friendship. My 60-month contract began while the global COVID-19 pandemic roared across the world. I arrived in a typical landscape; the post had been empty since March 2020, when a mandatory global evacuation of all Peace Corps Volunteers (PCVs) took effect. This unprecedented break in the 30-year partnership with the Peace Corps (PC) and the Government of Malawi left local communities with a vacuum of resources to navigate the impact of the pandemic, as many other international NGOs and government aid programs followed suit, leaving the country. However, the global evacuation prompted PC Headquarters to create space for *Staff-Led Programming* - an unusual opportunity for current PC local staff at posts abroad to develop and conduct community

development projects, training, and workshops without volunteers. Inevitably, this window of opportunity was seized by the Programming Team of Peace Corp Malawi, and their efforts centered on the development of COVID-19 programming that would assist in the maintenance of partnerships with local communities while providing meaningful mitigation support along with meeting the objectives and goals of the PC mission globally.

The Education Program in Malawi aims to train teachers to help students attain communication skills in English necessary to access academic and/or professional opportunities. This program includes increasing the capacity of teachers to use general English teaching skills and gender-equitable classroom practices, ultimately improving community members' ability to support greater student access to learning. The program focused entirely on Community Day Secondary Schools (CDSS), which are often barely funded and even unapproved local schools that are under-resourced, understaffed, and located in communities with severe poverty. Teaching and learning resources are much needed in CDSSs in Malawi as most government or private secondary schools do not have science or computer labs or libraries, despite these being essential facilities for achieving quality secondary education for students.

In late April 2021, I assisted the education sector of PC-Malawi as it prepared for its first staff-led programming effort, which involved visits to suspended PCV sites after the end of the second significant wave of COVID-19. The goal of the visit was to gain insight into the impact of COVID and the global PC evacuation on Community Day Secondary Schools (CDSS) that previously hosted PCVs at Kadzakaloa CDSS, a rural school of approximately 300 students, located 90 minutes' drive northeast of Lilongwe, in the Ntchisi district of Malawi's Central Region. Due to the advocacy of a Peace Corp Volunteer approximately two years before our

arrival, the school received a generous donation of books and computers and built a brick-and-mortar library. These resources were all still in operation upon our arrival.

During the tour of the Kadzakaloa CDSS, which consisted of a collection of five one-level, dilapidated plaster and corrugated-metal-covered structures surrounded by trees and dirt plots, we sat in the relatively newly painted library admiring a bright mural of the Lake Malawi proudly stating, *reading can open your mind*. The librarian and full-time teacher who welcomed our team promptly handed us a round disk-like device, no more than eight inches in diameter, that he described as one of the resources provided by the grantors and that it gave access to "the internet library." The disk was marked with the logo of its creator, the organization *World Possible*, and its name – RACHEL, an acronym for Remote Area Community Hotspot for Education and Learning. Only vaguely understanding its function, specifically that it was a collection of internet-free digital libraries, we logged into the RACHEL from our smartphones, only using its hotspot signal to glimpse the content. We were astounded by its immense resources; hundreds of categorized libraries cover many topics, from primary to collegiate level subjects, from children's reading books to videos on how to fix a generator. Not only did the content include foundational resources that supported the basics of the Malawi national secondary curriculum, but it also included resources for the extended learning of teachers, administrators, and community members. Stunned by the discovery, we were further shocked to learn that the RACHEL had not been turned on in months. The librarian explained that teachers and students rarely accessed the equipment or its contents because the immense amount of information in RACHEL was a) not organized in a way to make it "easy" to connect its resources to the national curriculum and b) the teachers and students were not trained in how to research online, making it difficult and time-consuming to use regularly.

As we left Kadzaka, we saw an exciting COVID/Staff-led programming opportunity. The envisioned *RACHEL Pilot program* would allow teachers and students to access curricula-related materials of varying digital-based mediums. Furthermore, RACHEL could provide on-campus alternatives to essential tools and enhance the quality of education and classroom experience for students and teachers. The 100-meter radius coverage of the RACHEL hotspot signal allows teachers, students, and community members motivated by personal and academic development to access its contents. The mobile, offline, and independent management of the RACHEL allows for an easy bridge to educational development outside of school hours or when school is unable to be open due to various ongoing circumstances (i.e., the COVID-19 pandemic, environmental disruptions, lack of teacher supervision, lack of internet, etc.). We concluded that centering RACHEL in the future Peace Corps' Education/COVID-19 programming would be an opportunity to bridge a training gap for teachers and administrators and to provide alternative, expanded educational resources for students without the required use of continuous electricity and internet. RACHEL would be mobile enough to accommodate the realities of out-of-school youth and community members still interested in pursuing continuing education opportunities supported by independent self-study or community-led programs.

Therefore, in alignment with the Government of Malawi's strategic priority to increase access to education and improve the quality of instruction (MIE, 2018), the Education Sector of PC-Malawi developed a Digital Education Pilot project that seeks to expand access to digital educational resources for Community Day Secondary Schools (CDSSs). Further, in our following inquiries about the interest in digital programming and/or current efforts in *digital literacy*, defined as the ability to access, manage, understand, integrate, communicate, evaluate, and create information safely and appropriately through digital technologies for employment,

decent jobs, and entrepreneurship – including competences that are variously referred to as computer literacy, ICT literacy, information literacy and media literacy (Tvetipedia Glossary. (n.d.), Malawi's Ministry of Education informed us that current digital efforts led by the Office of Distance and e-Learning (ODEL) focused only on tertiary institutions and did not have the capacity to establish digital education tools in CDSSs. Therefore, they highly supported the Peace Corps' efforts to develop digital education in the schools where we currently work and offered to help us with curriculum resources for our digital education projects' expansion in FY23.

The pilot had no template in the Peace Corps. Not only was Staff-led programming a new concept, but no digital literacy/education efforts existed at PC at that time. The realities of navigating PC policies to preserve the institution's reputation as a non-donor agency posed numerous logistical, resource, and communication challenges as we developed the pilot concept at the post and worked to advocate for support from regional and headquarters leadership. The eventual foundation of the Digital Education Pilot proposed allowed for the sharing of best practices on applying existing digital tools in low-resourced rural communities among Peace Corps posts in the African region and encouraged the institution's support of the host country's interest in related programming.

### **Pilot Overview & Structure**

The pilot's center is the Remote Area Community Hotspot for Education and Learning (RACHEL). It is a battery-operated portable server pre-loaded with hundreds of continuously expanding digital libraries and copied educational websites. RACHEL has a large amount of content, consisting of collections of organized lessons, videos, research, and tutorials on subjects that span every sector of PC- Malawi programming, including secondary and tertiary, science,

health and environment, business/entrepreneurship and career development without the use of the internet. Via the capacity-building training of teachers, students, and community members on using its digital learning resources and through digital education and learning resources made available to participants on loan, the pilot has three aims. First, it increases community support of a) student and out-of-school youth' access to (and familiarity with) high-quality digital educational resources; b) improves student academic performance; and c) expands student professional/economic development opportunities. Second, it increases teacher motivation and performance. Third, it expands teacher access to low-cost professional development, continuing education, and/or local economic development opportunities.

### **Implementation**

Phase 1 of the RACHEL pilot started with five schools in different districts nationwide for school diversity, the staff-school ratio, and the manageability of monitoring and evaluation. The target was to reach and orient 51 teachers to using a digital library and provide 1,084 students access to learning resources in the digital library. The selected schools are Mkaika CDSS in Nkhotakota, Ntonda CDSS in Mngochi, Namasika CDSS in Machinga, Bembe CDSS in Rumphi and Meru CDSS in Chitipa. They were selected from a list of schools that had hosted a Peace Corps volunteer between 2017 and 2018 and based on the following criteria: 1) presence of existing space (building) to be used as a library, 2) committed and motivated Headteacher and staff who promote the culture of reading, 3) positive working relationship with the community, and 4) have successfully hosted an education Peace Corps volunteer in the past.

After selecting the five schools, two teams visited each school to verify that they met the criteria and to explain the details of the digital library project. The verification visits took place between September 20 and October 7, 2022. Following verification visits, each school was given

a baseline survey (see Baseline survey results summary – Appendix A). This data provided the Peace Corps with information that allowed the team to design a program and training to effectively prepare each school team to interact successfully with the RACHEL digital libraries. Under the guidance of PC Malawi's Monitoring and Evaluation Coordinator, the team compiled a Digital Education (RACHEL) Logical Project Framework.

Once selected, and after the school administration signed the Project Agreement (i.e., a contract developed for the expressed purpose of managing the expectations and responsibility of the equipment and accountability), the device Loan Agreement, and the MOU with Computers for Enhanced Education (CEE) (a non-governmental organization that works to support Malawian schools to provide quality ICT education with quality ICT equipment and equipment maintenance), the designated administrator/Counterpart received one RACHEL hotspot and four tablets and/or lap/desktops – one per grade level (i.e. each CDSS has grades 1 through 4) to house at a secure location in the school, typical for the school library which had pre-installed security bars and locks on windows and doors. Due to funding delays and the limited availability of CEE computers, the pilot initially started working with only three schools. Fortunately, starting with only three schools allowed for more effective and efficient monitoring and increased support for administrators and teachers. Headteachers, assisted by community leadership, would set weekly schedules for teachers' and students' use of the RACHEL in their classrooms and the simultaneous after-hours access to the digital library for up to 50 community members/out-of-school youth within 100 meters of the library. In one academic year (30 weeks), 50+ administrators and teachers at CDSSs would be trained in the use of the device and in skills to train others for a) student orientation, b) integration of resources into the national/enhanced classroom lessons, c) researching a range of professional and personal development projects, d)

monitoring and evaluation of the pilot and monitoring visits, e) supporting out-of-school youth and community members educational interests without the use of the internet (see RACHEL 60-week Intervention attachment). We envisioned reaching 500+ secondary students and equal or more community members in the first pilot year, and this was just the beginning.

PC Education and Training team conducted a RACHEL workshop at the school once the Project Agreement was signed. Workshop dates varied by school due to the availability of computer installation and the arrival of the RACHEL devices to post. However, all five workshops were hosted, and agreements were signed within four months of the Pilot launch in March of 2022. These workshops allowed the team to connect resources on RACHEL to the Ministry of Education, Science and Technology's secondary curricula, showing how to maximize the use of RACHEL in teaching and learning and how to assess student progress to demonstrate its effectiveness. At this workshop, the team discussed monitoring, described the support system for staff, and the assessment of the school's progress with and the final impact of the RACHEL program after one academic year. Lastly, the PC-Malawi Education Team visited each school once per term to monitor progress and observe classroom implementation. PC team visits also entail a survey (Appendix B) to understand how the program has impacted teaching and learning at the school.

Phase 2, projected for weeks 31- 60, upon the re-entry of PCVs, volunteers would be able to assist in developing and facilitating lesson plans, extra-curricular programming, and professional development activities for students, teachers, and community members. Additionally, PCVs would be a part of the ED Sector's Grant Writing Workshop, where teachers explore and discuss further options and resources for the school to continue their Digital education program with RACHEL, should the evaluations of use and impact meet the criteria for

continued support. In addition to the implementation of the hot spot, two virtual service volunteers would (1) serve as the initial support mechanism for PCVs and counterparts, (2) research, identify, and upload additional sources of content to correlate with CDSS national curricula-supported outcomes, and (3) mentor teacher to use new materials and tools over 5 -15 hours per week (by the Virtual Service Pilot Program requirements). However, presently, the pilot has not reached Phase 2 due to the delay in getting sufficient volunteers at the post.

### **Rural Malawian Political, Gender, Economic, and Climate Realities Poverty and Fragile Agri-dependency**

The 1999 World Human Development Report ranked Malawi 159th among 174 countries, one of the least developed countries. The report also indicates that about 60% of the population lives below the poverty line, which is reflected in low social indicators. For example, Malawi's infant and maternal mortality rates are among the highest in the region, at 128.3 per 1,000 and 620 per 100,000, respectively. Among other socioeconomic variables in Malawi that significantly constrain economic productivity is its education level, among the lowest in the region.

Malawi is a small, landlocked country in Southern Africa, bordered by Mozambique, Tanzania, and Zimbabwe. A focus is on Malawi for three reasons: (1) the country is home to a large rural population that directly depends on farming for food and income; (2) climate change and variability threaten rural livelihoods by causing a decline in agricultural productivity as well as increasing the frequency of extreme events; and, (3) given the absence of alternative rural livelihood options outside of agriculture, it is highly possible that climate associated changes may prompt rural dwellers to move to the country's rapidly expanding urban areas (Schensul et al., 2013) where workers earn over two-thirds of the median earning of their rural counterparts (NSO, 2014).

Seventy-one percent of Malawians earn less than the international poverty level of \$1.90 per day, and most of the labor force works in agriculture (The Economist, 2023). By 2040, there may be more than 100 days a year when the temperature rises above 30°C, a threshold at which maize (Malawi's staple crop) suffers. In 2015, drought and floods occurred; a year later, more drought occurred. As a result, 6.7 million people (in a country of 18.1 million) needed food aid (The Economist, 2023).

All of Malawi's socioeconomic sectors have been and will continue to be affected by ecological instability, which has implications for its population's livelihoods and social and economic development. Every year, Malawi loses an average of 1.7% of its GDP because of climate change-related disasters, mainly floods and drought (International Food Policy Research Institute [IFPRI], 2010). According to the Department of Disaster Management Affairs (DoDMA), between March 7 and 9, 2019, Malawi experienced devastating floods associated with Tropical Cyclone Idai. Almost 870,000 people from 15 of the country's 28 districts were affected, including 60 dead and 3 missing, 672 injured, and over 87,000 displaced. Most recently, the destruction of infrastructure, damage to crop fields, and erosion of main livelihood assets for households in several districts due to Cyclone Freddy in 2023 will likely have long-lasting impacts on food security in severely affected areas. The cyclone has also caused the displacement of over 659,000 people and the death of 679 people (Cyclone Freddy leads to Crisis (IPC Phase 3) outcomes in Southern Malawi, 2023).

In short, environmental shocks are making Malawi's pathway to prosperity more complicated, complex, and expensive. Factors that increase vulnerability to climate change impacts in Malawi are deep-rooted: poverty, rapid population growth that results in overexploitation of natural resources, and high dependence on subsistence rain-fed agriculture

(Government of Malawi, 2017). Further, widespread deforestation, often by desperate farmers who need to sell wood for extra income, has made it harder to manage water flows. Also, Lake Malawi feeds the hydro-power stations that provide more than 90% of the country's electricity. Yet in 2015, these stations lost two-thirds of their capacity because of droughts, leading to widespread blackouts (The Economist, 2019). These droughts hampered irrigation structures and affected businesses in the cities of Lilongwe and Blantyre, highlighting the fragility of Malawi's power sector.

Relatedly, Malawi's infrastructure challenges prevent greater technological engagement, awareness, and a robust public education sector. There were 8.27 million mobile connections in Malawi in January 2021, equivalent to only 42.7% of the total population (UNICEF, 2022). Data is expensive in Malawi- the cost of 100 Mega Bytes of data (equivalent to the minor U.S. Mobile plan) is 14.63% of monthly GDP per capita. These high costs prevent effective participation in the digital communication economy (particularly for people experiencing poverty) (Kainja, 2019). Based on the above assessment, Malawi is still in the readiness phase for mobile data affordability. To move to the emerging climate and 4IR readiness phase, mobile data costs must drop significantly.

The Government of Malawi has taken various actions to support adaptation planning. It has identified adaptation as a key priority at the national level for the country to increase the resilience of its vulnerable population and ecosystems. The government began its National Adaptation Plan (NAP) process in 2014 (Government of Malawi, 2017) and moving forward, the country must undertake the following activities in the NAP process: (1) Improving access to energy sources; (2) Increasing resilience of food production systems; (3) Improving weather and climate forecasting; (4) Improving agriculture to ensure farmers are moving from subsistence to

commercialization; (5) Promoting catchment management practices; (6) Integrated water resource management to encourage large scale commercial irrigation; (7) Population changes and human settlements; (8) Civic education and adult literacy; (9) Infrastructure development; (10) Inclusiveness of gender, disability and other socially excluded vulnerable groups in the implementation of climate change adaptation interventions; (11) Monitoring of climate: adequate database and easy access for all people; (12) Development of collaborative wildlife management; (13) Education, science, and green technology (DODMA, 2023).

### **Traditional Patterns and Gender Violence**

I want to highlight institutionalized barriers to the behavior changes required to meet the National Adaptation Plan components #8, #11, and #13, namely informal and formal obstacles to female educational achievement. In the Malawian context, they can be identified as (1) socio-cultural beliefs, (2) the educational structure (Kalipeni, 1997), and (3) gender violence (Bisika, Ntata, & Konyani, 2009). The socio-cultural context of Malawi is assorted in terms of ethnic composition, with two central kinship systems, matrilineal (in the Southern and Central Region) and patrilineal (in the Northern Region), which have affected the organization of small villages and the gender interactions between men and women for centuries. In both patrilineal and matrilineal societies, enormous emphasis is placed on women to produce children. There are initiation rituals through which related cultural norms, practices, and beliefs are learned from peers within the family and outside (Kalipeni, 1997).

In parallel, Malawi's educational system has two significant systems of education, namely, the formal and the informal. Informal education is still a part of rural society and is encouraged by the government because it instills respect for tradition and culture (Kalipeni, 1997). Girls are instructed about a woman's subservient role in society, advised to be respectful

and humble at all times, and girls are often encouraged to get married as soon as they reach menses, about age 12-14 (Helitzer-Allen, 1994). The general view in Malawian society is that it is better to educate boys than girls because girls leave school as soon as they start menstruating. Once they begin menstruating, girls are considered adults, while boys "take longer to mature" and thus can justifiably continue to stay in school longer than girls (Helitzer-Allen, 1994; Swainson, 2000). The other reason boys are preferred to girls regarding school is that girls will be looked after by their husbands when they get married, and keeping girls in school once they begin menstruating may result in unwanted pregnancies and therefore reduce their chances of having a good and stable marriage in the future (Kalipeni, 1997). Due to prominent culturally determined ways of defining women, right from the start, girls face an uphill battle in access to education, and their cultural roles result in gender restructuring more often in favor of men than women.

All odds are against girls regarding classroom interactions, the quality of instruction, and teacher expectations and roles. When girls go to school, they have to contend with a male-biased educational system. Many teachers knowingly or unknowingly discriminate against girls in the classroom. In the Malawian socio-cultural context, teachers firmly believe that girls are academically inferior to boys (Davidson & Kanyuka 1992). During class, many teachers encourage students to participate in answering questions, which puts girls in an awkward position since they have been taught in the traditional context to be quiet and submissive. Therefore, teachers may see girls' lack of participation as confirming the inferior status of girls and view them as "less serious and capable" (Davidson & Kanyuka 1992). Implementing any curriculum depends on many factors, especially the availability of well-qualified teachers who can translate gender-sensitive policies in the written curriculum into reality in the classroom.

This curriculum, then, makes it necessary for teachers to receive appropriate gender-sensitive training to carry out their work (Maluwa-Banda, 2004); otherwise, these practices will persist in excluding and limiting female students' access to critical educational resources, including digital tools and further relegate their contribution to national development to the backbone of the male labor force.

Dropout rates have generally been higher for girls than boys despite several attempts throughout the 1990s to increase girls' participation in education (Tsoka et al. 2002). While factors such as poverty, hunger, parental resistance, early marriage, overcrowded classrooms, and the distance to schools may result in children not attending school, we cannot overlook the gravity of the role played by violence and the threat of violence in preventing girls from accessing primary education (Bisika et al., 2009). Bisika's (2009) survey of 800 girls and young women in Malawi found the following acts girls and young women have cited as constituting *everyday* violence in Malawi: beatings, verbal abuse, punitive labor, food withholding, sexual assault and rape, forced marriage, social isolation and denial of access to education. This demonstrates that gender violence is a common experience in school for many adolescent girls.

Violence against women and girls is perpetuated by poor coordination among government agencies responsible for responding to these issues; there is little or no monitoring of cases handled by officials from these agencies. Police responses to reports of violence against women are negligent and dismissive. A lack of infrastructure, resources, and well-trained personnel in the justice system, along with widespread and deep-seated discriminatory attitudes toward women (Ministry of Gender, Children, Disability, and Social Welfare [MoGCDSW], 2018), lead to ongoing fear and violence against females of all ages across the country.

## **Overview of Education in Malawi Education Administration & Infrastructure Foundations**

Formal education in Malawi dates back to the pre-colonial era and the work of the early missionaries, namely the Free Church of Scotland, which founded the first primary school in 1875. The mission's policy was to use the school as an auxiliary to the church, with a great tendency toward emphasizing Christian religious bias in the mission's curriculum (Chimombo, 2010). In 1883, the British established the British Central Africa Protectorate, later renamed "Nyasaland" after the Yao (a native tribe) word for lake. As a protectorate, Nyasaland continued to be an independent state, with its external affairs controlled by the protector country, unlike a colony, which has no control over its internal affairs and is a part of the same nation as the colonial power (Horn, 2024). This Protectorate status explains the pitiful internal and external transport facilities well documented throughout Malawi's colonial history. Further, Malawi's Christian missions had been permitted to struggle alone in their respective fields, i.e., with no Department or Director of Education from the protector country to confer with the missions to encourage them and their work, nor to help them relate their influences on each other to meet Malawi's needs (Chimombo, 2010). Malawi's low quality of education was directly blamed on a lack of protective country oversight. Thus, in 1926, when the Government Department of Education was set up, the Protectorate administration played only a partial role in education, allowing each missionary group to design curricula for its schools and examine their students without refinement or oversight (Chimombo, 2010). This severe neglect was to persist through to independence and is responsible for many of Malawi's present problems and education.

At independence in 1964, the Government of Malawi inherited a largely dilapidated education system with low enrollment and completion rates at the primary level and very low participation rates at the secondary level. Since independence, few structural changes have been

made in Malawi. Post-independent era education provided an essential fee base to meet workforce needs with the motivation to develop a system that could support the aspirations of an independent state. The first (1973-1980) and second (1985-1990) Educational Plan was the initial attempt to design a modern education system for the country. Yet, the lack of a specific budget implementation prevented managers from planning. They also lacked a unified approach to education theory, practice, and development among the key players (Mwale and Chimombo, 1994). A shortage of teachers and learning materials and higher dropout and repetition rates greatly affected the effectiveness and efficiency of the system (Mwale & Chimombo, 1994), which continues to this day.

Since the introduction of free primary education in Malawi in 1991, enrollment and retention at the primary school level significantly improved while the demand for secondary education increased. The dropout rate at the secondary education level has been on the rise, and it was at 10.9% in 2018, with more girls dropping out than boys (13.4 % girls, 8.5% boys). Fees have been a significant reason for boys and girls dropping out of secondary school. Yet, many girls may not stay in school for more than a few years because of early marriage, so responsibilities and childcare take precedence over any hopes and dreams they may have (Bernbaum & Chatsika, 1998).

The structure of the formal education system in Malawi follows an 8-4-4 pattern. Children enroll in primary schools mainly at the age of six. Primary education is divided into three sections: the infant section, which comprises standards 1 and 2—the junior section, standards 3, 4, and 5. And the senior section standards 6, 7, and 8. In standard eight, the pupils sit for Primary School Leaving Certificate Examinations (PSLCE). These are national examinations, and those who pass are selected to attend public Secondary Schools. Primary schooling is of two

types: Government public and private (Kadzamira, 2003). Secondary education lasts four years and includes two cycles, each with a two-year duration. Forms one and two constitute junior secondary, while forms three and four constitute the senior secondary section. Public secondary schools are divided into three categories: (1) conventional secondary schools (mostly district secondary schools), (2) grant-aided secondary schools (national secondary schools), and (3) Community Day Secondary Schools (CDSSs). There are also Private Secondary Schools. The schools are categorized into boarding, day, co-educational, and single-sex schools. Pupils take public Junior Secondary Certificate Examinations (JSCE), and those who pass six subjects (including English) can proceed to the senior secondary section. The pupils sit for the Malawi School Certificate of Education examinations (MSCE) in the fourth form. Those whose total grade aggregate for any six subjects, including English, is less than 36 points and comprises distinctions or credits but not passes are eligible to write the University of Malawi entry examinations (Kadzamira, 2003).

Individual schools are encouraged to develop mission statements and school development plans, promote community participation by forming Parent Teachers Associations (PTAs), strengthen staff and pupil supervision, enhance communication, delegation, and participatory decision-making, and practice proper financial and records management practices.

Schools are encouraged to practice lesson planning and evaluation, team teaching, varied teaching methodologies, identify teachers' subject content needs, and then organize in-service training at the cluster level. They are also encouraged to develop training materials related to new subjects and topics.

Many schools in Malawi do not have the minimum resources for meaningful teaching and learning. Classes are often grossly overcrowded, and many occur without classrooms,

classroom furniture, clean water, and adequate sanitation (Chimombo, 2009). Naturally, the investment of additional resources to improve core operational infrastructure and the dignity of students and faculty is necessary. Other key measures of improving the quality of primary and secondary education include excellent financing of teaching and learning materials, greater community involvement in school management, strengthening the curriculum, restructuring the examination system, and improving teacher training (World Bank, 2010).

### **Resource and Teacher Shortages**

The secondary education system in Malawi suffers from a severe shortage of teachers. The year 2001 statistics show only 1367 qualified secondary school teachers. Therefore, the Ministry of Education deployed 1958 under-qualified (primary school) teachers. However, the system still required 8400 additional teachers (Mchazime, 2001). Mchazime (2001) attributes the teacher shortage to low output from the teacher training colleges due to limited bed space and the unpopularity of teacher education programs, rapid expansion of secondary education, and increasing attrition rate. Realizing the importance of teachers in the learning process, the Government of Malawi introduced a pre-service education program for primary school teachers, who teach at the secondary school level after the completion of the course. The government also tried to increase secondary school teachers by offering a University Certificate of Education course to non-educational graduates who joined the teaching profession and by upgrading primary school teachers to a Diploma level through a distance mode. In addition to these efforts, the government has introduced pre-service and in-service teacher education programs at the new University of Mzuzu. It has also revitalized in-service teacher education and training programs for teachers to widen and deepen their knowledge and skills in their profession (Mchazime, 2001).

Teacher Education challenges are additional barriers. According to UNICEF (2022), enrollment in primary Teacher Training Centers has increased from 3,749 in 2008 to 7,373 in 2018. Although there is an increase, there is a need to train more teachers to reduce the pupil-teacher ratio, which is currently at 70:1. There are still shortages of secondary school teachers, especially in STEM subjects. There are about 12,663 teachers in secondary schools, which is against the required number of 50,919 teachers by 2030 (UNICEF, 2022). Student enrolment in higher education institutions was at 30,972 in 2018, an increase from 8,168 students enrolled in 2008. Female enrollment in public universities increased from 33% in 2008 to 37.5% in 2018 because of the government's affirmative action, though female enrollment remains lower than that of male students (UNICEF, 2022).

Like many countries in the developing world, especially Southern Africa, there are many hurdles in Malawi's educational foundation system to break down the barriers to catching up with current technology, let alone contribute to developing new ones. That includes the lack of hard and soft innovation infrastructure, technological know-how, and physical assets. Advances in Information and Communication Technologies (ICT) are primarily attributed to investments in broadband installations, electricity access, and necessary skills development. Such investments are mainly concentrated in a few urban areas, exacerbating the digital divide among rural and urban areas.

### **Perspectives on the Malawian Curriculum**

An essential contextual element to understanding the nature of Malawi schools is the product of them. Makandawire et al. (2017) survey of second-year students studying Philosophy of Education at Lilongwe University of Agriculture & Natural Science, particularly those who apply for a change of program from teacher education to other programs between first and

second years of their study, shared some powerful insights into the nature of the curriculum and the role of teachers in secondary education:

The problem is that most of the time, we, the owners of education, do not participate in the development and review of the curriculum. This makes us learn some of the issues that may not help us... usually see the same people meeting to develop what we will know. Lack of participation makes our views not included in the curriculum, and that brings frustration when we realize that what we want to learn is not included in the curriculum (Makandawire et al., 2018, p. 5).

In a similar sentiment, one group discussion concluded,

There is a gap between youth and old people's thoughts. By sidelining us in curriculum change or development, the people who make curricula teach us what they learned long ago, and some of that stuff is irrelevant in our lives today. This is why some of us consider doing other courses after our first degrees to compensate for our missed ones.

Teachers are oppressed and not given much freedom (Makandawire et al., 2018, p. 5).

From the above sentiments, students argued that "choice" can only be done when people are asked to choose "know" options. The other perspective of students was that there should be entire participation of the society or country in curriculum development so that all own the future that is placed in education:

Society should select the Teacher education curriculum based on that society's needs. In this case, the curriculum should not be chosen by specialists but by the people themselves in the help of specialists who should act like secretaries.... The problem is that if that group that makes curricula goes wrong or makes a mistake, the future generation is spoiled. Maybe Malawi is not developing because education planners made the wrong

choices for us. We learn things that we already know in society while our friends in developed countries are learning significant sciences like how to make planes and other technologies. (Makandawire et al., 2018, p. 6)

However, according to students, the problem is that the youth are sidelined on the curriculum meant for them, making curriculum content and methodology missing the views of the beneficiaries of the curriculum. For students, the solution is to change the approach by making the students key stakeholders in curriculum developments and reviews (Leite C et al., 2015).

### **Secondary Education**

Traditionally, secondary education has been provided through boarding and day schools. Based on the primary school leaving examination results, students are assigned to different school types. These are "conventional" secondary schools, Community Day Secondary Schools (CDSS), Open Day Secondary Schools, and private schools. The better students attend conventional schools, and lower-scoring students attend community schools (government-approved and unapproved) (Ministry of Education, 2008). The students not selected for public facilities may participate in low-cost private schools with poor infrastructure and materials or "open" schools that operate in regular schools in the afternoons or evenings. Due to space limitations in public secondary schools, most children who pass national examinations at the end of the primary school cycle cannot continue (Country Status Report, 2008).

### **Community Day Secondary Schools**

Community Day Secondary Schools are generally rural and have poor-quality infrastructure. The community constructed some, while others used buildings constructed for distance education or primary education in the afternoons. Almost half remain unapproved (MOE, 2008). Secondary schools of any type are relatively few, about 769 in 2008, and many students depend on boarding facilities. In the year 2000, the Malawi Policy and Investment

Framework (PIF) put the formation of the Community Day Secondary School as one of the strategies for standardizing the operations of the various types of secondary schools (Grant-aided, Conventional, Approved Community Day, Non-approved Community Day and Private), aiming to enhance the country's educational quality (Jenkins & Tsoka, 2003). It was institutionalized to have a unified public education system and as a mechanism for maximizing the use of resources available in secondary schools and facilitating more effective school management, teaching, and learning (Jenkins & Tsoka, 2003) and aided in devolving some of the management functions to individual schools hence the commencement of decentralization.

The Malawi Ministry of Education's mission statement, between 2000 and 2015, focuses on the expansion of the secondary school system to accommodate the drastic increase in the number of primary school graduates. The mission statement formulation was also influenced by the realization that secondary school education provides the academic basis for gainful employment in the informal, private, and public sectors besides preparing students for tertiary education. The government prioritized establishing at least one secondary school in the 315 primary school educational zones by the end of 2002 (PIF, 2000, p. 24). Consequently, government donor agencies and local school communities started building new Community Day Secondary Schools (CDSSs) nationwide. Upon realizing that building new secondary schools in all the zones that did not have them would be very expensive and time-consuming, the Secondary School Education Project (SSTEP) (2000) indicated in 1998 that the government changed all the independent Distance Education Centers (DECs) that were offering secondary school education to Community Day Secondary Schools.

More than half of the secondary schools in Malawi are CDSSs, accounting for more than half of the pupils. Hango (2004) and Kadzamira (2003) stated in their study that the CDSSs are

characterized by the following problems: inadequate teaching and learning resources, in some cases, the school buildings are of substandard quality since most of them are built locally, and several of them do not have their buildings. As a result, they operate in primary schools. In such CDSSs, classes start after the lower primary school pupils have finished. These secondary schools are referred to as Non-approved Community Day Secondary Schools. However, the government still recognizes them as centers for secondary school education. In addition, Community Day Secondary Schools do not receive monthly government funding (Kadzamira, 2003). They depend on the local funds that they collect from the pupils. Most teachers and headteachers are under-qualified (mainly primary school teachers).

### **Research Objectives**

Malawi's Ministry of Education (MOE) noted in 2022 that it was seeking 394 billion MWK (approximately 233 million USD) to fully implement the digitization of education nationwide, defined as the conversion of analog information into digital, and pages into bytes (Gobble, 2018). The ministry's Director of Science, Technology, and Innovation stated, "We want to have expanded access to education... This will be useful even in the times of pandemics...but also in climatic tragedies..." (Singini, 2022). This optimism indicates that Malawi is also preparing for the future complexities of education worldwide. Digital education (or the use of digital technologies to support learning) is positioned as a virtual panacea for many barriers encountered by traditional and mortar-based educational structures due to environmental disasters and economic and biological threats. Hence the problem: the MOE expressed that it cannot establish digital education in Community Day Secondary Schools (CDSSs); as community-developed and community-managed schools, they are the most common, most rural, and most underfunded of all Malawi's schools (Malawi Institute of Education, 2018). Therefore, the MOE highly supports efforts to establish digital education in

schools that can share best practices around the country. As such, implementing existing digital education tools to develop sustainable education in Malawi further is the opportunity highlighted for consideration with this research.

Thus far, no studies have been conducted to evaluate digital libraries in the Malawi secondary school system, as there are none actively applied outside of the Peace Corps Digital Education pilot at the foundation of this study to be proposed. Relatedly, on August 30, 2023, the University of Malawi showcased the Beekee Box Digital Library at the Grand Challenges Malawi (GCM) launch, held under the theme "Unlocking Strategic Investments through Collaborative Research," hosted by the Malawi National Commission for Science and Technology (UNIMA, 2023). Encouragingly, researchers are working toward sourcing all components of the Beekee Box locally to allow the production and distribution of the digital library to be managed affordably for Malawi's government and school use. They also intend to align its content with the eventually digitized national curriculum. However, the Beekee Box is still a prototype. Additionally, a recent UNICEF (2022) study of education in Malawi justified a more considerable investment into the Information and Communication Technology (ICT) infrastructure and the expanded use of computers. Still, it did not take into consideration currently available technologies that enhance education in rural communities without depending on a considerable effort from the government to make internet and electricity accessible and affordable for the most vulnerable (e.g., an average citizen) of the country.

### **Purpose of the Study**

Therefore, this inquiry aims to understand how the use of open-source, offline resources in the form of digital libraries can serve as a transformative tool for rural Community Day Secondary Schools and their surrounding communities in the Sub-Saharan African country of Malawi. This study assumes that if the future of education is shaped by past-oriented paradigms

(Mbiti, 1981; ter Haar, 1990; wa Thiong'o, 1981) that influence the current education system, education will not produce the outcomes necessary for the future. Thus, education should also be used to build a new future characterized by human peace and productivity, fostering human and planetary survival and regeneration, acting as a catalyst for liberation, and helping individuals realize their full potential (Mayo, 2015) while possibly expanding our perceptions of what is achievable.

### **Research Questions**

Given the challenging reality of life and concerns facing Malawian communities, and the opportunity for digital tools in a largely stagnant education environment, normalized for teachers and students in rural communities, the objective of the intended study is to explore the effect of a The Peace Corps Malawi Digital Education Pilot in five Community Day Secondary Schools. Specifically, the study will provide insight into how using open-source resources in internet-free digital libraries affects rural Community Day Secondary Schools (CDSSs) and their surrounding community. As such, the research questions for this intended study are:

- How do offline digital libraries impact attitudes toward teaching and learning in Malawian CDSSs?
- How does accessing resources through offline digital libraries affect female teachers and students in rural communities in Malawi?
- What factors influence commitment to implementing digital resources in rural Malawian CDSSs?

### **Theoretical Framework**

This Exploratory Case Study is constructed on the foundation of the ongoing Peace Corps Digital Education Pilot as the case studied. The Digital Education Pilot provides an empirically based introduction to the structure, dynamics, and context of this case study's subject of interest;

offline digital libraries are tools to close the agency and awareness gap for rural African communities towards producing locally developed-future-based education and human-centric solutions. Via interviews and focus groups with a sample of Pilot participants, the case study intends to gain insight into the pilot's impact on the personal consciousness of participants as stakeholders in Malawi's contribution to a global culture of future-conscious development.

This study aims to be a critical lens, bringing forward issues of access, gender, epistemological freedom, and human development into light where possible. By framing this research within historical, geographical, national, and systemic realities, I will inquire and analyze participant perspectives, consider how my findings are situated in institutionalized past-oriented structures, and highlight whether my participants emerge to disrupt or reproduce those structures. As a researcher, the worldview or philosophical assumptions used throughout my methods to answer the research questions are generally pragmatic. De Vos, Strydom, Fouché, and Delpont (2014) define pragmatism as a paradigm that focuses on the practical aspects as the truth. Therefore, for its theoretical framework, the study adopts a critical Afro-Futurist and Self-efficacy based speculative view on the role of education in Malawian society, and the combination of Self-efficacy and Afrofuturism best serves my approach.

### **Afro-Futurism and the Afrofuturist**

My study primarily adopts Afro-futurism as a critical qualitative inquiry method for liberation that can challenge the traditions and histories that have shaped public administration in ways that have subjugated and marginalized Black communities (Eseonu & Okoye, 2023). Relatedly, Africa has a historical legacy as the terrain for the future, the complexity of actors, philosophical motivations, and the diversity and sum of resources and human capital to be the hub for future-oriented citizen thought-leaders. Sociologist Alondra Nelson suggests,

"Afrofuturism should be seen as a big tent of expanding borders of the possibilities for Black life" (Yaszek, 2006). The professor and pioneering scholar of Afrofuturism offers an illuminating definition of Afrofuturism as descriptions of "visions of the future—including science, technology and its cultures in the laboratory, in social theory, and aesthetics—through the experience and perspective of African diasporic communities" (Ogbunu, 2020). In Afrofuturism's many forms, questions about the Black experience are projected into the future. One of which projections of black expertise can serve as a catalyst, a call to prayer, atonement, and forgiveness for the African world? Timely, Ogbunu (2020) answers two relevant questions: Why care about what Afrofuturists have to say? And why would their answers differ from that of an average futurist?

It is because the global Black experience is defined by a historical struggle for existence, the right to live, and the right to be afforded fundamental rights in pursuit of (political, social, and economic) equality. Because of this, the Afrofuturist can see the parts of the present and future that reside in the status quo's blind spots. "Futurists ask *what* tomorrow's flying cars are made of. Afrofuturists ask, *who* will build them? And does their commercial use fall out of their utility in military or law enforcement? Futurists labor over questions about the nature of Android technology, consciousness, and empathy. Afrofuturists ask how race might be wired into Android consciousness, whether the android world might be as divided as ours is" (Ogbunu, 2020, pg. 1).

These questions are simple but meaningful. Their answers contain the necessary details for building science fiction worlds and thinking specifically about the current state of human affairs in preparation for the real world that science fiction makes us aspire to.

Generally, the critical theoretical view on the role of education in society keeps in mind the paradox of its use as a means of socialization, often perpetuating oppressive elements of society where the status quo is maintained (Freire, 2013). It is judicious to acknowledge the architecture of modern Malawian curriculum, education structure, and school environment and how global education is designed to make people of low class and power remain in their low statuses. In contrast, the powerful stay atop (Mayo, 2015). I share Freire's (2021) position that if education is used to enfranchise the exploited and oppressed, education will face resistance from the people who have and want to maintain their power.

As a critical theory, Afro-Futurism calibrates our concern with empowering human beings of Africa and its Diaspora to transcend the constraints placed on them by race, class, and gender (Fay, 1987). Central themes that I explore as a critical researcher in this study are the source conditions in Malawi noted previously and their transformations through interpreting local and global meanings of productive life, considering historical problems of domination and alienation, and critiquing current culture while envisioning new possibilities (Fay, 1987). The end goal of the study might be social theorizing towards a desire to reframe and or transform the underlying perceptions of the capacity of rural educational institutions and support the substantial process of decolonizing its curriculum, identifying, acknowledging, and challenging how colonialism has impacted knowledge access and learning through the introduction of education tools and content that have no social agenda into the classroom and challenging users to make distinctions between their curriculum and digital library content. Through an intensive case study via access to research in Malawi's rural secondary education institutions, a critical researcher can expose assumptions of existing research orientations (bound by colonial paradigms, cultural limitations, and regional narratives of inferiority) and reveal their ideological

commitment to a position of underdevelopment and its effect on teachers, schools and the local culture's view of education now and in the future (Morrow & Brown, 1994). As a study of the manifestation of resistance, it will highlight ways key actors come to terms with their struggle against the cultural norms that dominate them.

Mark Dery (1994), often described as the father of Afro-futurism (a subset of the Science Fiction genre), offers a notion that Afrofuturism gives rise to troubling antonymy, asking if a community whose past has been deliberately erased and whose energies have subsequently been spent by the search for identifiable traces of its history, imagine, possible futures? Science Fiction as a pedagogical tool is a natural place to start this discussion. It leaves an individual and society fascinated by alternative outcomes and potential realities for humankind to explore the next steps of our evolution and the possible challenges we will face navigating life on Earth and other planets. Using Afro-futurism as a foundation for discovering and implementing digital technologies in the African Diaspora allows for accomplishing two aims simultaneously: the first is the intellectual and digital capacity to fill in the gaps between the African and Western worlds; secondly, it offers what Samuel Delaney states as institutionalizing:

Material that encourages [the readers] engagement with some of the political questions that the disenfranchised people [in this country], victimized by oppression and an oppressive discourse based on the evil and valorized notion of nationhood ... must face, but cannot overcome without internalizing some of the power concepts and relationships, inescapably entailed in the idea of "nation" itself. (Dery, 1994)

This is a significant justification for the project being situated in the African world. When science fiction takes center stage as a framework for the global education movement, it becomes a tool for exploring equitable access to education across ethnic and national borders. The belief

in the possibility of human capacity beyond current reality is a perfect tool for inspiring and validating the expansive minds of global youth - the future constructors of worlds.

### **Self-Efficacy Theory**

Self-efficacy theory is another theoretical framework that has informed the approach to this study, including the interview questions and the analysis of the secondary and primary data collected in the formation of the Peace Corps Digital Education Pilot, which focused on increasing community access to high-quality digital educational resources, increasing teacher motivation and performance, and expanding teacher access to low-cost professional and/or economic development tools. As a theory, Self-efficacy emphasizes the importance of the individual and the individual's perceptions of their capabilities as key determinants of successful outcomes (Gallagher, 2012). Self-efficacy is a key internal motivational process that can be affected by personal and environmental variables and influences motivational outcomes of choices, effort, persistence, and achievement. The application of self-efficacy explicitly focuses on how individuals and communities can be empowered with a sense of agency to facilitate goal attainment. This is important as self-efficacy theory does not presume that currently successful individuals are inherently better than those who are not as successful. Instead, it would suggest that individuals who are presently struggling may not have been provided with opportunities to obtain mastery experiences or modeling necessary to develop high levels of self-efficacy. Individuals can exert intentional influence over their experiences and actions, the circumstances they encounter, the skills they acquire, and thus, ultimately, the course of their development (Cervone et al., 2006). Self-efficacy theory, therefore, suggests that it is the government's and society's responsibility to provide everyone with sufficient opportunities to engage in mastery experiences, receive positive social persuasion, and witness positively reinforcing models that

will engender a strong sense of self-efficacy (Gallagher, 2012). It is worth noting, however, that self-efficacy theory does not suggest that positive self-efficacy beliefs are the only causes of essential outcomes. Yet, the theory emphasizes the relative importance of personal factors but acknowledges that behavioral and environmental factors also profoundly affect outcomes.

Self-efficacy theory proposes a measured worldview in which opportunities to experience or witness success may promote positive evaluations of one's capacities to succeed in the future, which in turn increases the likelihood of subsequent positive outcomes; a "psychological function of centrality to personal agency is that of mental 'time travel'" (Suddendorf & Corballis, 1997). Humans can mentally reconstruct past events and generate detailed mental images of hypothetical events that may occur in the future. The human ability to deliberate on the past and future, combined with their capacity to form a sense of self and social identity, enables them to select and shape the environments they encounter, develop skills to meet future challenges, pursue personal aims, and thereby function as causal agent (Cervone et al., 2006). Perceived self-efficacy refers to our judgment of what we can and cannot do. More formally, self-efficacy refers to our sense of confidence and competence, qualified by specific demands and features of the situation in which self-efficacy judgments are activated. In an environment where new technology is presented, where a backdrop of colonial legacy and patriarchal cultural norms are prevalent, the anticipation of a conflict with self-efficacy is expected. For example, faced with the innate technological fluency of their students, teachers will struggle with being unable to "teach" in the traditional sense but feel compelled to allow young learners to guide themselves within the bounds of the required curriculum or beyond.

Emphasizing the importance of the individual and the individual's perceptions of their capabilities as key determinants of successful outcomes, the self-efficacy theory allows

consideration of cultural, historical, and demographic elements (e.g., age, gender, class, and personal/community value or aspiration) that are assumed to play a role in the willingness to engage with digital resources and the level of engagement with knowledge that can alter how self and one's future is perceived.

### **Researcher Positionality & Bias**

To clarify this approach to this research, my lens requires framing. I am an American female, multiethnic, and a light brown-complexioned Afro-futurist. As a world-educated woman (i.e., a Returned Peace Corps Volunteer, Fulbright Alumna, and Critical Language Scholarship Alumna) from a middle-class family with college-educated parents, I share many experiences and perspectives with the "elite" in most cultures. As a Muslim, Honduran African American, I am often perceived as mulato/colored and foreign by my African peers. However, because of feeling and being welcome in brown and black spaces (most of the time), I am familiar with the voices of the immigrant, migrant, and oppressed. Yet, I do not personally relate to or identify with the struggles of economic, mental, or spiritual poverty. As a result of growing up in a diverse global community of faith and family, I quickly adapted to new cultural spaces, and I am fluent in learning about and accommodating other ways of life. Further, the sacredness of all-female spaces and the poignant issues of gender-based economic, emotional, and psychological coercion, as well as the power and promise of religion and religious education for women, are all central to my solution-building approach. Consequently, I have infinite respect for the complexity of the Muslim and African Diaspora and have relatedly invested most of my personal and professional energy to support the development of Africans and Afro-descendants. As the mother of two and the daughter of an African American female Doctor of Dental Surgery and a Colonel of the United States Air Force, I critically reflect on myself and global popular culture as the legacy and product of European colonization, worldwide patriarchy, and capitalism.

Nevertheless, my father, an immigrant from Guanaja, Honduras, instilled in me a profound appreciation for science fiction, the poetry of Abrahamic scriptures, and the importance of environmental stewardship. Combined with my love of fine art and art history, these tools have prevented debilitating cynicism and/or confinement to regurgitating a painful past of humanity's egoic choices. These teachings allow me to envision humankind in a variety of destinies, to see what is not evident for most, welcome change, and be hopeful for our future amidst the global rise of nationalism, widening economic inequality, and ongoing ethnic, religious, and gender-based discrimination and violence. Finally, as an International Educator and practitioner in the field of International Development, I am committed to Indigenous solutions by supporting the full expression and potential of every human being and honoring the innate knowledge and natural talent in every community I serve.

### **Conclusion**

In this chapter, I introduced the framework for this exploratory study in the human environmental and social context within which it developed and the condition of the institutional resources and global factors within which it emerged. My commitment to exploring this conversation began with an excitement about the possibility of a human future among the stars and the unwavering belief that the African peoples of this world will be present among them. Though the conditions in the country of Malawi indicate and represent so many of the unanswered challenges of many societies across the continent and around the world, these conditions serve as a perfect petri dish to imagine and offer proof of how simple applications of existing technological tools can unlock the potential and commitment of individual, community and national progress. In the following chapter, I contextualize the broader Africa I have learned. Still, within the philosophical hold of coloniality, buckling under the weight of environmental

stress, bursting with human capital, and ripe to grow the possibilities that Afrofuturist-delinking and embracing of the current industrial revolution can hold for its population.

## **Chapter 2: Critical Perspectives and Considerations for the Development of Digital Education in Sub-Saharan Africa**

The core foundation of the intended case study is based on the evolution and the current state of African epistemic condition, African' disposition (towards themselves and the non-African world), and its role in developing the collective agency needed to productively absorb the next level of duty of natural/decolonized human and environmental capital management. The following chapter points to the conceptual pillars of psychological and spiritual freedom and the historical awareness the average participant in the study (and the reader) requires to align their incomplete understanding of the current (or the perceived state) of African affairs with the future-citizen concept. Consequently, critical surveys and the appreciation of Africans intellectually are crucial as they help individuals navigate it as one of the most complex contexts in modern humanity. Therefore, this chapter aims to be considerate of the pressure and expectations placed on participants with the hopes of promoting honest conversation and to facilitate the promotion of education technology using the appropriate approach, content, and intent.

### **The Decolonized-African Africa's Choices in the Development of the African Mind**

During colonialism, African schools, universities, publications, and language policies of the subjugated population were directly governed by colonial powers. The "language" of the colonizer became the only sanctioned medium for government, commerce, higher education, and to a considerable extent all of intellectual life" (Altbach, 1997). These institutionalized structures

led to cultural, political, linguistic, emotional, and psychological control (Alatas, 2003; Altbach, 1997). In particular, the colonial systems of education played an integral role in assimilating the population into the dominant culture, legitimizing colonial ways of thinking and knowing, and making Africans idolize the West as a place to improve their lives and attain fortune. Perhaps the most lasting impact of the colonial educational system was the extent to which it was used as "a certifying institution" for a Western way of life, where over time, "Western institutions and values, to a degree, became synonymous with power" (Altbach, 1997). As a result, it led to "servitude of the mind" Altbach (1997), where access to social mobility and wealth in the new colonial political and economic system required a Western-style education. Similarly, Phillipson (2000) linked languages and ideologies, arguing that a prolonged state of academic dependency produced a "servitude of the mind" amongst local populations who neglected indigenous ways of thinking and knowing after training in the West. In addition, Mignolo (2003) warned that the dependency relationship had manifested in schools "at the level of the disciplines" and seeped out into the arenas of culture, science, and technology. An essential quality of this globalized academic dependency is that, over time, it gives the impression it is predestined, natural, and permanent. This normalcy has a sinister and invisible legitimizing force for unequal systems of power and privilege and is a key concept at the foundation of this study.

The colonial network and neo-liberal forces are alive and well and are vibrant factors that play a significant role in African underdevelopment (Bhattacharyya, 2009). and commonly seen as the result of the incorporation of the Third World economies into the capitalist world system dominated by the West (Emeh, 2013). The under-education of the continent's population is a significant factor that contributes to the lack of attention to Africans' education by Africans themselves. The foundation for the rationale for African miseducation is adequately laid out by

G. C. Latham (1934). In discussing factors bearing on native education policies in East Africa, precisely the administrative policy of Indirect Rule, as Sir Donald Cameron reflecting on his Governance of Tanganyika Territory in Uganda in 1925:

The only way in which the native can be trained in public affairs—however simply in the early years—is by the system of indirect or tribal administration. The principle is that of adapting for local government the institutions that the native peoples have evolved for themselves so that they may develop constitutionally from their past, guided and restrained by the traditions and sanctions that they have inherited, molded, or modified as they may be on the advice of British officers, and by the general advice and control of those officers.

By design, education and the education administrators in Africa were handed down as tools to maintain the colonial structure even upon independence from said structure. Latham (1934) highlights a tendency of the colonial time to over-emphasize the value of African institutions merely because they are African in ethnicity in a pseudo concern with the ultimate African welfare. As such, "a people's institutions are what they make them", and "they must be free to develop their institutions as the situation to which they have to be fitted develops" were a common sentiment among missionaries and writers of the time. In rebuttal, in an article in *Overseas Education*, Westermann (1930) said:

The possibility is foreshadowed by new African feudalism prepared to be benevolent and paternal to the native so long as he will "stay put" and not raise envious eyes towards a full share in all that Western civilization can give... The time will come and may come soon when the native will unmistakably show his resentment at the implied patricianism of it all. And resentment at the unconscious arrogance that too often underlies British

benevolence has sent vaguely hopeful educational projects in the past and will do so again unless it is kept in check.'

Though this attitude is disturbing, an even more troubling thought is that the Africans' resentment and reaction to this attitude may lead them to demand a complete and uncritical adoption of the Western system of education (Latham, 1934). The greatest danger is the attempt to keep Africa innocent of the West.

How does all this affect educational policy? The purpose of decolonizing education policy is to engage the Africans as much as possible with the conduct of their affairs, with native leadership having greater opportunities to influence native educational policy. Yet, the valid question arises - can Africans use their influence wisely? Latham (1934) continues:

Educated Africans must realize that if they wish to enjoy a more significant share in administering their affairs, they must fit themselves for such responsibility. What is needed is not book knowledge but character. They have to learn self-criticism, reliability, self-control, and a genuine sense of responsibility before they can be entrusted with a considerable share in the direction of the destinies of their race.

People must be free to develop their institutions to meet the needs of the situations they must address. This is the reason why education must be closely linked with government policies that prioritize independence and autonomy. Education in Africa needs to be directed towards freeing the minds of its people and enabling them to evolve with the changing conditions in the world they live in. One primary aim must be to dissuade Africans from taking Western institutions uncritically as their model, as Latham (1934) argues:

The educated westernized native is often too ready to think that what is—or appears to be—good enough for the white man is good enough for him. The aim must be to give

him an accurate idea of the principles of good citizenship on which he may build a social system suited to his needs and designed to secure the true happiness of the community.

Latham argues that one action the West and its intellectuals can take to aid the process of African decolonization is admitting their mistakes and how the West has suffered and is now suffering.

Latham is admitting the need for the African to hear directly from western leaders (making it clear to those who have been indoctrinated, i.e. Africans) that they must be made to see that when the *African-futurist/Climate-conscious African* advises a different method from the cult of Western development, it is not because the African-futurist is trying to hold back African development or to give them a second-rate option. Still, it is because African conditions are *different*. A blind adherence to Western traditional ideas of education and development has and would inevitably lead to more trouble and more significant failure in the future. The quote later highlights the necessity of educated westernized Africans to "rethinking thinking itself; launching epistemic disobedience to Eurocentric thinking; and the painstaking de-colonial process of learning to unlearn to relearn" (Ndlovu-Gatsheni, 2017), calling on African intellectuals and academics to openly acknowledge their factory-faults and miseducation.

The *History Textbooks for Schools in British Tropical Africa (1938)* is a study of problems connected with teaching history in African schools in areas under British control. Its focus is on producing suitable textbooks, noting the work ahead of the Afro-Futurist/ Africanist:

Although the need for such books is urgent, the time has not yet come to plan or write textbooks for a thoroughly articulated African school history course. A large variety of experimental work is required, which should make it possible to determine the lines along which an African history course should proceed... Since, however, Africa is being reshaped by the white man, African students will also have to understand not only the

outward phenomena of European civilization but also the spiritual forces on which they are based, which can be learned greatly from history. The first step should be making the student feel at home in his surroundings and cultural past. He should not be given the impression that his country and people and what has happened to them in the past are not worth serious consideration. Such a preliminary course should start with 'Africa before the White man came. ' Practically every tribe or group of tribes has traditions concerning its past." (*Africa*. 1938, p.103)

African theology, defined as Christian theology from the perspective of the African cultural context (Magezi & Igba, 2018) (distinguished from black theology, which originated from the American and South African context and aligned with liberation theology), emerged almost the same time when African nations were liberating themselves from the shackles of colonialism. Therefore, there was a close affinity between African theology and the movement towards freedom in Africa. The struggle that led to political independence was viewed as a necessary path to the birth of social-political freedom. The exodus story highlighted in African (Christian) theology predicted a departure from an inflexible position of oppression to (Gichaara, 2005) the ability to physically and psychologically flee colonial subjugation as biblically defined and God-ordained.

### **African Intellectualism**

The cultural theorist and novelist Albert Murray once remarked that the mandate of the black intellectual was to provide "technology" to the black community (Banks, 2006). By technology, Murray did not mean mechanics, new media, or the Internet. Instead, he defined it as "those novel analytic approaches he believed necessary to understanding black life on a higher level of abstraction" (Nelson, 2001). Modern African intellectualism has never been simple

because activism is embedded throughout. African intellectuals have produced numerous books and journal articles directly speaking about pertinent issues of epistemic freedom and development. Yet, these works have not succeeded in replacing those of Western theorists such as Michael Foucault, Antonio Gramsci, Max Weber, and Karl Marx, even within African academies (Ndlovu-Gatsheni, 2020). African intellectual productions have not yet gained dominance in global knowledge. At the same time, the African academy has remained ingrained with Western knowledge, values, ways of knowing, and world views that are often taught as universal values and scientific knowledge, a "place that Western thought occupies in non-Western discursive formations" (Diawara, 1990, p.56).

Mkandawire (1995) classified three generations of African intellectuals: The first generation occupied academic positions in the universities at the time of political independence. The second included African scholars that were produced during the hey-day of the Marxist and neo-Marxist schools of thought, some products of African universities themselves who supported African nationalism and critical of the neo-colonial direction that the postcolonial state was taking. The third generation of scholars became the current young academics, produced by African universities and non-African institutions, and have fully digested neo-liberal, postcolonial, and postmodernist thought. Most of them became critical of African nationalism, particularly its antipathy toward democracy and its disdain for human rights (Mkandawire, 1995).

Even though African people have continued to be major consumers of ideas generated by the West and tested on African soil and African minds, some African scholars have begun to engage and critique Western epistemology from an Afrocentric perspective. For instance, Archie Mafeje emphasized, "If we are adequately Afrocentric, the international implications will not be

lost on others" (Mafeje, 2000). Claude (1979) added his voice to the debate on the decolonization of knowledge when he posited that "it is increasingly becoming clear that we cannot overcome our underdevelopment and dependence unless we try to understand the imperialist character of Western social science and exorcise the attitudes of mind which it inculcates."

According to Ngũgĩ waThiong'o (2016), at the center of the African search for self-knowing are six core concerns and demands: complete African self-rule, self-regeneration, self-understanding, self-definition, self-knowing, and self-articulation of African issues after centuries of domination and silencing. While Mbembe (2002) tried to distort these legitimate African concerns as nativism and Afro-radicalism, core aspirations are central in the quest for freedom, development, and identity in a world still dominated by universalized and globalized Western particularistic worldviews. Oyewumi (1997) urged African academics and intellectuals not to remain "outsiders in our land "by reconnecting with the buried African memory —the basis for planting African memory anew in the continent and the world. As a researcher, Africa is the base from which I am looking at the world. This repositioning of world sensing entails taking the African record as the starting point in this research, study, and learning.

### **Decolonization & the Afro-Western Conflict**

Decolonization is the attainment of "self-determination and social justice," seeking "legitimacy for methodologies embedded in histories, experiences, ways of perceiving realities, and value systems." On the other hand, giving "voice to the researched and moves from deficient-based orientation" to "reinforcing practices that have sustained the lives of the researched" (Chilisa, 2019, p.46-47). Chalisa (2019) termed work articulated as "a postcolonial Indigenous research paradigm" and "a framework of belief systems that emanate from the lived experiences, values, and history of those belittled and marginalized by Euro-Western research paradigms" (p. 47).

## **The African Quest for Epistemic Freedom**

Ngũgĩ wa Thiong'o (1986) emphasized that "the most important area of domination was the mental universe of the colonized, the control through culture, and how people perceived themselves and their relationship to the world." The missionary church and the colonial school were meant to establish effective mental control. Ali A Mazrui (1978) documented how the establishment of mission-boarding schools was intended to separate African children from the influence of their parents and the home environment and how this process eventually influenced a new class formation in Africa. The French colonizers became famous for their "cultural arrogance." In contrast, the British became well-known for their "racial arrogance," and all these "arrogances" combined degraded the humanity and cultures of Africa (Mazrui, 1978). Unsurprisingly, the early African educated elites, comprising evangelists, bishops, reverends, nurses, and teachers, were deeply seduced by the salvationists and civilizations' promises of colonial education. Also, being fluent in colonial languages such as French and English was part of the acquisition of knowledge itself. Mazrui (1978) provided a catalog of the benefits of gaining colonial education within a fast-changing colonial environment. However, anything African had to die unless it was beneficial to the colonialism project.

The definitive entry of descendants of the enslaved, displaced, colonized, and racialized peoples into the existing universities across the world proclaimed that they are human beings, their lives matter, and that they were born into valid and legitimate knowledge systems (Ngugi waThiong'o, 2009) enabling the resurrection of enduring struggles for epistemic freedom and cognitive justice – fundamentally, the right to think, imagine, interpret the world, develop one's methodologies and create unrestrained by Eurocentrism. Samir Amin (2009) depicted this as one

of the significant ideological deformations of our time. Epistemic justice is about the liberation of reason itself from coloniality. Africa is one of those epistemic sites that experienced not only colonial genocides but also "theft of history" (Goody, 2006), epistemic ices (killing of Indigenous people's knowledge), and linguicide (killing of Indigenous people's languages) (Ngugi waThiong'o, 2009). African people's epistemic struggles are old and new - they emerged during colonial encounters and are re-emerging within the present global systemic and epistemic crisis contexts. Projected here is what Mungwini et al. (2019) call *epistemological decolonization* - the inextricably linked double task of "provincializing Europe" and "deprovincializing Africa" as they speak to what appears on a global scale as European thought could be claimed as human heritage rather than thought from one geographical center.

John Mbiti, arguably one of the pioneers of African theology, said that the issues that inform African theology are born out of African contextual experience, an African vision of the world, and metaphysics (Gichaara, 2005). He further explained that the African spiritual ethos informs the African psyche irrespective of whether one is Muslim, Christian, or a practitioner of African indigenous religion. The task of the Afro-futurist, therefore, would be to identify where the inherited cultural traditions of the African people would fit into the future's vision towards building interventions by the African community to carve out a distinct niche in new space (Davidian, 2020) and other economies of the future.

### **African Postcolonial Choices**

This contemplative opportunity and challenge for the future-oriented citizen of Africa and the modern African Theologist is to meet their postcolonial situation, with its implicit potential for exploration, and serve the coherence and peace of the African society. African theology is guided by the insight that the African social-economic and political crisis is

profoundly theological, and the African church is unavoidably a significant sight in the ensuing struggle (Mihevc, 1993). Political domination and material poverty issues that characterize Africa in the postcolonial era are central to African theology. Several factors, both domestic and international, have combined to leave African communities and individuals in abject material poverty that other people in the continent are not characterized for. Furthermore, the repressive postcolonial African regimes have inflicted untold misery. A marked choice between parliamentary democratic institutions (preferred by the West) or one-party rule (after the manner of the socialist countries) has been made by many African countries as their preferred choice of governance. It did not take many years before bad political and economic policies combined with corruption and greed by African leadership thwarted the hopes for substantial and qualitative gains that decolonization was expected to bring (Gichaara, 2005). Mazrui (1986) states:

The kind of capitalism that was transferred to Africa was shallow. Western consumption patterns were transferred more effectively than Western production techniques, Western tastes were acquired more quickly than Western skills, the profit motive was adapted without the efficient calculus of entrepreneurship, and capitalist greed was internalized sooner than capitalist discipline. (p. 86)

As such, at the center of African theology, therefore, is the question of human dignity and human worth. Any profound theology cannot afford to disregard its vicinity's social-political predicaments and contradictions. "African theology, therefore, rests on whether or not it succeeds in articulating the Good News of the Kingdom as good news in the concrete existential African situation" (Gichaara, 2005, p.79). The current generations of Africans are hearing the Ancestral voice in no uncertain terms proclaiming:

Warriors will fight scribes for the control of your institutions; wild bush will conquer your roads and pathways; your land will yield less and less while your offspring multiply; your houses will leak from the floods, and your soil will crack from the drought; your sons will refuse to pick up the hoe and prefer to wander in the wilds; you shall learn ways of cheating, and you will poison the cola nuts you serve your friends.

Yes, things will fall apart.

—Achebe, *Things Fall Apart* (1961)

If this is the curse of the ancestors, what is the sin? This is the contract between Africa and the 20th Century, and its terms are wrong. They involve turning Africa's back on previous centuries – an attempt to modernize without consulting cultural continuity and an effort to start the process of dis-Africanizing Africa (Mazrui, 1986).

### **Dead International Aid**

The poor African is called daily to reflect that Africa's economic poverty and the associated powerlessness are not just "homegrown." There are international players whose actions are more subtle than the local immediate agents of poverty, human degradation, and squalor. Whereas neo-colonialism replaced the departing colonial powers in the grand scheme of exploiting Africa's raw material and human resources, globalization is the "new kid on the block" in this economic power game (Gichaara, 2005). Neo-colonial agents, for example, transnational companies and international donor agencies, work with African leaders, masquerading as African "economic saviors," but in the end, they leave Africa much poorer than before. A classic example is the Structural Adjustment Programs imposed by the World Bank and the IMF (International Monetary Fund), through which the IMF and related lending agencies demanded austere lending and debt repayment policies on the part of the so-called "Third World" countries.

These measures included, but were not limited to, the devaluation of local currencies against "international" currencies, freezing of wages, increasing privatization, removal of tariffs, and other protectionist measures coupled with reducing government spending and employment (Y. W. Bradshaw & J. Huang, 1991). These agencies are portrayed as the "Modern Four Horsemen" of the apocalypse, competing and complementing with drought, the HIV/AIDS pandemic, and famine to wage war on an already defeated and prostrate continent (Green, 1989).

International development aid has functioned since its inception as an extension of colonialism. Countries ravaged by colonialism continue to be destroyed by loans that leave postcolonial nations worse off economically than before and keep them in a never-ending cycle of debt to the West. Whether provided by governments or nonprofits, aid perpetuates paternalistic relationships between providers and recipients by assuming a lack of agency on the part of those served and enabling a superiority complex in its purveyors (Hanchey, 2005). Structurally, developmental aid further reinforces the systems it purports to change.

### **Youth, Global Shocks, & Challenges in Sub-Saharan Education**

Climate change and other environmental stresses are increasingly taking a toll on many African countries. Out of 30 African countries, two-thirds are warming faster than the world—the trend is expected to continue in the coming decades (Brookings, 2017). In 2019, approximately 16.6 million people were affected by natural disasters in 29 African countries, compared to 5.6 million people in 2018 (Pandey, 2019). This change translates to 11 million or *more* people being affected by various disasters, including drought, wildfires, floods, landslides, extreme temperatures, fog, and storms.

Climate change is an imminent threat to human and natural life in Africa and has significantly affected poor communities in developing countries, particularly those in sub-Saharan Africa. The impact on human well-being is evident through high mortality caused by

waterborne diseases, malnutrition, loss of life and infrastructure due to cyclones and other events, increased temperatures, disasters resulting in floods, and respiratory diseases (Black et al., 2013). Further, it is established that 50% of Africa's GDP is agriculture, and the agricultural sector provides more than two-thirds of employment opportunities across the continent (World Bank, 2023). Shifts and changeability in climate affect a nation's developmental efforts, including farming, and affect prices and production levels (Bai et al., 2014; Bishop, 2016). Climate change will, in this regard, affect the economic, health, food, and nutritional security of the people of Sub-Saharan Africa.

### **Alternative African Environmental Futures**

Sub-Saharan African countries can respond positively to ecological change's environmental, social, and economic hazards by devising policies, strategies, approaches, and institutions to curtail adverse effects. According to the World Economic Forum (2020), as the world's most rapidly urbanizing region, Africa has opportunities to develop more compact, less polluted countries alongside safer and more efficient public transport. In this regard, there is a need to limit the use of fossil fuels such as oil, carbon, and natural gas by replacing them with renewable and cleaner sources of energy such as solar, geothermal, bioenergy, hydropower, and onshore wind, which increase energy efficiency (Chilunjika & Uwizeyimana 2015). Consequently, it has created a new industrial revolution powered by clean energy technologies. To support this, sub-Saharan African countries should be in line with SDG 13, e.g., adopting sustainable climate change mitigation policies, technologies, and practices such as cover-cropping, regenerative agricultural practices, zero-tillage, conservative agriculture, mulching, and disaster forecasting and preparedness, among others (Chilunjika & Uwizeyimana, 2015; Scheffran, Link & Schilling, 2019). Similarly, there is a clear need to enhance the resilience of

Sub-Saharan African communities to survive the adverse effects of environmental shocks and recover afterward without increasing their vulnerability.

### **Youth Bulge: Justification for Improved Secondary Education**

With 200 million residents between 15 and 24 years of age, Africa has the youngest population in the world, but only eight million are enrolled in higher education (The Economist Newspaper, 2019). An additional 170 million workers are estimated to enter Africa's labor force between 2010 and 2020 (Fox et al., 2013).

Where will they find jobs? The primary sectors of farming, and mining have limited potential to absorb these job seekers. Agriculture is characterized by surplus labor and low-income growth, while productivity gained through mechanization might limit future job creation (Naude, 2017). Even so, unemployment and underemployment are some of the most pressing concerns for youth, as unemployment in the region stands at about 60% (Fleming, 2019), and employment for about 70% of the workforce is vulnerable. Further, Sub-Saharan countries still host the most significant number of refugees globally. Uganda, Ethiopia, and Kenya host about 2.8 million refugees (Signé & Gurib-Fakim, 2022). Yet, nine of the ten countries in sub-Saharan Africa are vulnerable to climate change, attributed to mass migrations due to flooding or droughts that put pressure on resources such as food, water, housing (Fleming, 2019), and education.

Moreover, the average African government spends only \$131 per child on education per annum, which is a mere 10 percent of the world average (UNECA, 2015). For instance, it is found that "A poorly skilled and educated labor force is the top supply bottleneck underscored by global executives when considering manufacturing investment decisions in Africa" as well as that the "non-inclusive, jobless growth," which has characterized recent economic performance,

to be based on "the misalignment of the educational curricula with the needs of the labor market" UNECA (2013). The lack of sufficiently skilled workers is further reflected in Africa, which has lower enrollment and completion rates in primary education than anywhere else, the lowest participation rate in tertiary education, and the highest pupil-teacher ratio globally.

To address this, Africa needs more initiatives to bridge the gap between industry and education by instituting life-long learning, apprenticeships, vocational and technical education, and supporting entrepreneurship and small business management. Also, having the private sector involved more in education might be necessary given that technological innovations are so rapid that Africa's public education systems face great difficulty responding fast enough to provide labor with skills that continue to complement and benefit from capitalization (Canidio, 2013). The private sector can be involved by offering advice on curriculum reforms, internships, on-the-job training, and (co) funding of educational infrastructure to scale up the learning environment (Lazonick et al., 2014).

Further, there is an urgent need to increase investment in technical and STEM skills. These skills are necessary to equip African labor market entrants for future jobs, including robot engineers, industrial engineers, data analysts, cloud architects, software developers, security analysts, and health sector workers (Frey et al., 2016). These are also the skills and experiences that entrepreneurs will need in addition to soft management and social skills.

Additionally, education institutions need to shift towards the imparting of complex, problem-solving skills: creative skills and social skills, including management, leadership, change management, collaboration, critical thinking, curiosity, risk-taking, communication, marketing, and sales, all of which are also required for entrepreneurship. Naturally, this should create a nurturing environment for human capital to Africa's knowledge base, including

improving safety and security, environmental cleanliness, strengthening pollution control and urban design and development, and expanding housing and public utilities like health, recreation, and sporting facilities. It will be essential to establish the "Creative Class" - includes workers in science and technology, business and management, arts, culture, media and entertainment, and law and healthcare professions (Rhule, 2017). The task scope may be out of reach for most governments, and external financial and technical support is needed in Africa to address these challenges.

### **Secondary Education Amid Global Shocks**

The recent COVID-19 pandemic allowed African governments to correct the incongruity and inequality in the educational system. It was an excellent time for educational institutions to reimagine what education looks like and take realistic steps toward adopting a blended learning model. Reaching vulnerable populations in Sub-Saharan Africa will require adopting multiple learning delivery modalities ranging from television, radio, and SMS-based mobile platforms that are more accessible to all, especially the economically disenfranchised (Aborode et al., 2020).

Challenges continue to exist about Internet access and connectivity. These challenges were documented before COVID-19 and cannot be resolved within the short to medium term. Aborode (2020) discouraged using real-time (live) virtual teaching sessions, which consume too much mobile data. Instead, recorded lectures can be uploaded on Learning Management Systems (LMS), which might use voice-over PowerPoint slides for explanations, engaging students for discussions, and questions and answer sessions through forums on the LMS or WhatsApp platform. Another great opportunity that comes with digital transformation is customized learning. Students benefit from customization by developing their curriculum to suit their career

aspirations through data-driven suggestions from the learning management systems (Thelma & Adedeji, 2020).

Ministries of Education in several Sub-Saharan African countries like Nigeria and Kenya have launched a campaign to adopt distance learning mode through radio lessons in FM radio stations and TV lessons in TV stations to minimize the impact on the continuity of learning for students (Aborode et al., 2020). Students living in remote villages can arrange and move to the nearest big towns with high connectivity, download lectures and learning materials, assignments, and examination questions, and return to their villages to work on them before submitting them via the same medium or other pre-arranged mediums.

Further, attitudinal change is essential for all stakeholders. Educators all over the continent have been compelled by current circumstances to use digital tools efficiently to deliver their courses. This era allows educators to join online professional learning communities to pursue in-service career training to stay in touch with the trends and share tips and best practices to achieve the goal of an evolved and high-quality standard of education (Aborode et al., 2020). Instructors and administrators can invite colleague educators from another university or school to deliver a guest lesson or lecture to their students. To make education more meaningful to all students, we must make education more accessible and less expensive.

In conclusion, it must be stated that for all intents and purposes, e-learning and digital education resources as a form of educational delivery have become prominent in institutions worldwide, even in the pre-COVID-19 era. In the future, it is evident that e-learning will be considered part of mainstream education. E-learning digital education resources should be given the utmost attention and adequately implemented to help attain the growth needed for the education system in Sub-Saharan Africa. COVID-19 exposed the flaws and helped us learn from

places where these models have been adopted to form a basis for which we grow from here. Now is the time for stakeholders to craft meaningful initiatives as we prepare for an era where global brick-and-mortar education disruption becomes a regular part of our society. Nations that refuse to accept and use digital technology (Internet and/or non-internet-based) learning cannot survive.

### **Challenges Rural Schools Face in Access to Quality Education Content**

Schools in rural districts struggle to deliver the same educational experiences provided by their larger suburban and urban peers and often operate with higher costs per pupil and stretched budgets. A study done in the Mpumalanga province of South Africa concerning schools in rural areas highlighted that rural areas are remote and relatively underdeveloped (Airi, 2019). The following observation was made:

As a result, many rural communities and their schools are poor and disadvantaged, lacking basic infrastructure for sanitation, water, roads and other transport, electricity, and information and communication technology. The socio-economic realities of rural areas put learners in rural schools at a disadvantage. In addition, many rural communities lack the professional help, support, governance structures, books, and learning materials that they need to provide the necessary support and care for learners. (Du Plessis, 2014)

The realities are similar in Malawi; rural areas are characterized by various factors that negatively influence the delivery of quality education (Du Plessis, 2014). Hence,

Technology's ability to bridge distance, increase administrative efficiency, and customize experiences relatively cheaply holds great promise for rural communities. (Rural Education and Consensus Panel, 2015, p. 25).

To deliver on the promise of technology in rural education, policymakers and other authorities need an evidence-based report about how technology could be brought to bear on the challenges

facing rural educators and help identify what policies and systems need to be implemented to ensure technology can be utilized.

The Internet Society (2017) asserts that the Internet can improve the quality of education in many ways:

It opens doorways to a wealth of information, knowledge, and educational resources, increasing opportunities for learning in and beyond the classroom. Teachers use online materials to prepare lessons, and students to extend their range of learning. Interactive teaching methods, supported by the Internet, enable teachers to give more attention to individual students' needs and support shared learning<sup>1</sup>.

The lack of meaningful access results from the high cost of broadband internet, with many users and agencies not having access to affordable and reliable Internet connectivity (Martin, 2017). Many primary, secondary, and tertiary level schools in Malawi cannot consider even an entry-level internet package amidst the inadequate funding issues they are facing due to high internet accessibility costs.

### **Barriers to Continuing Education & Teacher Training**

Moon (2010) suggested the revolution in communication technologies provides an opportunity to radically reassess the forms and modes of teacher development, particularly in rural areas, and that there is a need for research and development activity to provide the foundation upon which such potential can be realized (Moon, 2010). In this context, a new 'architecture for teacher development' needs to be implemented, a process that should be a mainstream concern for the world's education research community.

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<sup>1</sup> <https://www.internetsociety.org/resources/doc/2017/internet-access-and-education/>

The arguments for prioritizing school-based professional development are now well known, and most of a teacher's career will be spent in school. Considering this, taking them away from school for education and training is costly, but such arguments will rarely be made. Professional development is best articulated close to practice, particularly in contexts where teachers see the relevance of change and can engage in dialogue and the shared construction of new meanings with immediate colleagues and others who might play a support role (Moon, 2006). This argument is particularly true in developing world contexts where resources are stretched and where many people teaching in schools are unqualified or underqualified. A report on education in South African rural communities (Nelson Mandela Foundation, 2004) shared criticisms of teachers (i.e., their lack of professionalism, accountability and their damage to the public's perception of teachers as professionals) who try to justify their lack of qualification, subject knowledge, and sense of vocation.

Consequently, many schools will continue to deliver poor exam results (Matoke, Okibo, Nyamongo, 2015) and academic performance due to low teachers' morale, among other factors. Bedassi (1990) argued that this motivation may be aroused by extrinsic or intrinsic stimuli, important in directing and regulating a learner's behavior. Therefore, teachers must be motivated in various ways (i.e., the organization of seminars and workshops, performance appraisal, timely payment of salary, physical facilities like laboratories and libraries, and verbal encouragement for students (Matoke et al., 2015) and by introducing relevant technological resources.

Curriculum is also a significant factor in this discussion. Bai (2001) pinpoints, "he who controls the curriculum controls future generations." (p.63) This expectation exists because preservice teacher education is generally designed to prepare people to implement the identified public needs through teaching what is in the curriculum (Le Cornu R, Ewing, 2008). However,

the challenge of making curricula consonant with people's needs is the same even in Malawi, and little scholarly work has been done on this (Mkandawire, 2016). For instance, a study by the Association of African Universities (2012) indicates that in Africa, there is a massive mismatch between what students learn and what is needed in the industry. Similarly, the former President of Malawi, the late Bingu wa Mutharika (2011), often argued that Malawi's education system should be reformed to address the needs of the Malawi people. The previous perspectives agree with Ali Mazrui's observed paradox where Africa produces what it does not consume and consumes what it does not produce (Mkandawire, 2017).

Bruner (1996) has been particularly persistent in arguing that if pedagogy is to empower human beings, then it must transmit the 'toolkit' the culture has developed for doing so. One of the most radical proposals to emerge from the cultural–psychological approach to education is that the classroom should be reconceived as a sub-community of mutual learners, with the teacher orchestrating the proceedings. Contrary to traditional critics, such sub-communities do not reduce the teacher's role or authority. Instead, the teacher takes on the additional function of encouraging others to share it (Bruner, 1996).

The findings mentioned above are significant when examining the technological environment of teacher preparation. Technology must be viewed within the larger context of the communities that make up learners. The idea of community has been severely limited to many teachers, especially those working in rural areas. Their memories of their basic training, sporadic interactions with peers, intermittent access to opportunities for interpersonal communication, the development of the learning community, and media-portrayed teaching ideas have all contributed to this (Moon, 2010). However, as the demand for this kind of communication increases, society

is developing new forms of connectivity to offer endless possibilities and opportunities for creating new modes of learning communities (Moon, 2010).

Digital communication technologies are spreading rapidly across Africa. Africa has the fastest-growing telecommunication sectors worldwide, especially the mobile industry, which is growing exponentially (Minges, 2004), and as expressed in the Economist,

The idea that a digital divide separates rich countries from poor, as usually understood, is a myth... Poor countries don't need a PC in every home. What they need is more mobile phones (Economist, 2005).

Technological change offers the opportunity to enrich the pedagogic toolkit for teacher educators and teachers in previously undreamt-of ways. Information and communication tools are becoming increasingly portable, flexible, and powerful, and numerous studies point to the potential of these new technologies as learning tools (Soloway et al., 2005). However, new forms of technological communication require more than just the provision of infrastructure and equipment. As a result, connectivity will eventually become commonplace in even the most remote parts of Sub-Saharan Africa. Therefore, to realize the potential of this, the conceptualization of use and experimentation in use need to be urgently addressed (Leach et al., 2006).

Successful ongoing teacher education and development must be a social process that is very difficult to establish in the teaching situation of millions of teachers. Therefore, a new, imaginative, and future-oriented design for discourse and debate on teacher education and development is needed, one that draws on a wide range of practices and scholarship and embraces the challenge and roles of individuals in creating and working together.

### **The 4th Industrial Revolution & Education Adaptations**

The Fourth Industrial Revolution (4IR), or the digital revolution, is characterized by a fusion of physical, digital, and biological technologies (Schwab, 2016) and is ushering in new possibilities and opportunities for Africa. The 21st Century has different challenges that will need new ideas to solve them, and this new revolution is "characterized by an abundant and mobile internet, by smaller and more powerful sensors that have become cheaper, and by artificial intelligence (AI) and machine learning" (Kayembe & Nel, 2019). Despite Africa's poor track record with industrialization, a renewed desire for (re) industrialization is animating development and policy debates. This continued desire resulted from several factors, such as the Fourth Industrial Revolution (4IR), which was driven by technologies such as automation, additive manufacturing, and the Industrial Internet (Naudé, 2017).

In Africa, the movement of jobs from agriculture to manufacturing is also desirable because manufacturing jobs tend to be situated in urban areas but not rural areas. Hence, manufacturing development goes hand in hand with urbanization, while urbanization is associated with substantial increases in labor productivity due to locational and urbanization externalities (Owoo & Naud'e, 2017). Given these benefits, it is regrettable that manufacturing has hardly developed in Africa. There is evidence of (premature) de-industrialization in Africa, as defined by reductions in employment and value-added in manufacturing (Timmer et al., 2014; UNECA, 2015). These imply a threat to African countries regarding job losses of existing low-skilled routine jobs in manufacturing. However, it also offers opportunities for African countries to develop new forms of manufacturing that would trigger a period of valuable growth (Marsh, 2014). These "new forms of manufacturing" refer to new business models of bringing goods and services to the consumer. These include tools enabling African entrepreneurs to provide products-as-services and establish and grow the sharing (collaborative) economy.

While the 4IR does not bode well for routine jobs in Africa, it is said to hold opportunities for certain types of skills, including creative, innovative, and social skills, such as those associated with entrepreneurship (Brynjolfsson & McAfee, 2012; Autor & Dorn, 2013). Given the continent's large distances, rugged terrain, lack of public transport, and conflicts, drones are already used in farming, surveillance, construction site monitoring, wildlife protection, and deliveries. These drones are all still imported, implying an opportunity for local entrepreneurs (Naude, 2017). The Industrial Internet is in its infancy in Africa. However, it has significant potential benefits in improving the competitiveness of African manufacturing. Further, with the importance of Africa in supplying essential mineral commodities to global manufacturing processes (e.g., bauxite, platinum, and coltan), the need for the roll-out of energy smart grids and renewable energy systems, and the growth of healthcare and transport services in Africa is a given.

### **Theorizing STEM Education in the 21<sup>st</sup> Century Onward**

Globalization and the rapid development of ICT (information and communications technology) are transforming society. Consequently, STEM (fields of science, technology, engineering, and math) is necessary to meet the demands for 21<sup>st</sup> -century workplaces (Hooker, 2017). Technology is ubiquitous, and its integration can be felt in every aspect of human lives in Africa and beyond. Students of this age are digital natives and prefer smart and automated devices. Currently, Africa is a major consumer of technology, and the implication is that a significant portion of its economy is drained from America, Europe, and Asia, owing to the purchases of useful but foreign technologies (Sanders, 2009).

The literature concludes that science, technology, engineering, and mathematics (STEM) education is necessary for economic development, international competitiveness, and job creation. However, the literature does not specify the benefits of STEM education in developing

countries since the consensus agrees that STEM education is generally lacking. Moreover, the gender gap in STEM education is prevalent in some developed and developing countries (UNESCO, 2017). However, STEM has helped enhance teacher training in developing countries, stimulating innovative approaches to secondary education and aligning the demand and supply of skills (Burnett & Jayaram, 2012; Hooker, 2017).

The perception of researchers on STEM education is that learners would benefit even when they do not pursue post-secondary education or/and would benefit more if such students attend college, particularly in STEM-related fields (Butz et al., 2004). These fields and disciplines are being studied from the elementary stage of classroom teaching to the highest level of formal education in the developed world. Yet, STEM education remains a challenge to some developing countries in Africa. Education and, by extension, science aims to equip citizens with the requisite skills to embrace challenges and solve everyday human problems. Africa's classroom integration and limitations in technology in classroom learning can potentially be resolved with solutions from existing information technologies applied to its space.

The natural excitement students express from introducing STEM in the classroom presents another reason for their conscious look into the future with hope and the possibility of acquiring new knowledge. Notably, a more significant percentage of the current workforce never had the opportunity to be prepared in the classroom for what is required to survive in the present work environment; most had to adapt to stay relevant and competitive (Badmus & Omosewo, 2020). STEM education gives present students a glimpse of what is required of their future careers. Although there are challenges to building the capacity of the present educators, helping educators cope with this knowledge area remains relevant for the success of STEM education, especially in Africa.

One of the implications of the 4IR in the education sector is curricula, teaching, and learning. Butler-Adam (2018) explains that students studying the basic and applied sciences need to understand the political and social nature of the world. In contrast, students who study the humanities and social sciences need to understand at least the foundations on which AI is based and how it operates. The statement above highlights how 4IR suggests that humanities and social sciences can join technologies to solve problems.

Digital literacy is a fundamental prerequisite for students to develop adaptive capabilities to participate in the global digital society, benefit from the digital economy, and derive new employment opportunities, innovation, creative expression, and social inclusion (Brown-Martin 2017). Any digital education strategy should consider the impact of change on the education system and present problems. Changes could affect the quality of the graduates if students are not well prepared and there is insufficient investment in resources (Marshall, 2016). Moral and ethical decisions should be taken into consideration. Kayembe and Nel (2019) highlight the risks of the wealthy portion of the population being able to afford new technologies for educational purposes while the poor population is left behind. The human condition, social justice, and how technological advancement and shifting economic power impact society at different socio-economic levels should be considered. The threats in an increasingly interconnected world should be understood, and intercultural understanding, an abiding respect for freedom, and human rights should be promoted alongside intercultural and interpersonal skills (Penprase, 2018, p. 219). According to Chetty and Pather (2015), using technology can resolve social exclusion issues. In other words, new technological advancements can be used to bridge the gap between the rich and the poor and people of different races.

## **The Opportunity for Frugal Innovation Expansion**

A frugal mindset is encouraged when an individual, entrepreneur, or firm is in a resource-scarce environment. Frugal innovation is exciting to emerging economies, as it translates to meeting the needs of a large population with access to disproportionately low resources (Prahalad, 2005). As a result, most emerging economies apply fresh thinking in approaches to innovation. The Economist identifies the virtue of frugal innovations as “*not just about redesigning products; it involves rethinking entire production processes and business models*” (2010). Lévi-Strauss (1967) described the practice by adopting the word 'bricolage,' which means “to do with whatever is at hand.” Again, from an entrepreneurial perspective, Sarasvathy (2001) calls such an approach effectuation, where the innovator or entrepreneur does not intend to predict the future but manages the contingencies with the available resources.

Another important frugal outcome that often addresses a need in a simple, convenient, and affordable manner, as against the existing host of solutions, is *disruptive innovation* coined by Harvard professor Clayton M. Christensen in his research on the hard disk drive industry and later popularized by his book *The Innovator's Dilemma* (Christensen, 1997). Not all disruptive innovations are frugal, as they may build on a new technology trajectory, something that is not always accessible by producers and consumers in emerging economies. For instance, LifeStraw, a straw that could instantly purify dirty water of bacteria and dirt to up to 99.9%, comes from the technology expertise of the Swiss company Vestergaard Frandsen (Hoffman, 2011), where the product is affordable but requires a very high investment in research and development, and technology expertise. Grassroots-level frugal innovators attempt to solve a given problem by adopting locally available ingenuity and, in doing so, creating a novel solution. A scooter-powered flour mill, a terracotta-based refrigerator, and a motorcycle-based tractor are some

innovations emerging from people at the grassroots level (Lim et al., 2021). Africa's rural communities are filled with potential grassroots-level frugal innovators.

### **Rural Science: Valuing Native Knowledge & Ability**

Where the world sees trash, Africa recycles.  
Where the world sees junk, Africa sees rebirth.  
—William Kamkwamba

Rural life, science, and innovation are a foundation for frugal and disruptive development. Yet, until recently, social scientists from the Western tradition assumed a clear distinction between the pre-scientific modes of thought characteristic of pre-technological (or "primitive") societies and the rational patterns characteristic of modern technological society. Currently, this distinction is maintained with less certainty. Evidence shows that “traditional” societies have well-developed methods of collecting and acting upon empirical knowledge compared with the methods of organized science (Horton 1967; Cohen 1974; Barker, Oguntoyinbo & Richards, 1977).

For human progress, this is the best way to interpret environmental knowledge in “peasant” societies in Africa. Suppose modern technological advancement occurs in rural communities. In that case, it is vital to assess *how* the said communities could rely on their knowledge systems for development purposes and where outside help would be mostly needed or best applied to protect local knowledge-generating systems and institutions from erosion by external forces and/or as agent to supplement systems at identified points of critical weakness. There is also the question of what broader role community expertise might be able to play in national schemes for environmental research and education (Richards, 1979). Community

environmental knowledge should be considered similar to an interconnected, complex system of data and values rather than a miscellaneous collection of factual elements.

### **The Boy Who Harnessed the Wind**

As we shift the focus of this study to the localized context of Malawi, the film *The Boy Who Harnessed the Wind*, released in 2019 by Director Chiwetel Ejiofor, is based on the true story of a frugal innovator. William, a Malawian boy, witnessing the desperation of his family during a drought, starts searching in books for a solution until he comes across the picture of a windmill. Since he lacks resources, he goes to the nearby garbage dump. He uses a tractor fan, shock absorber, bicycle frame, and PVC pipe to build a windmill that generates enough energy to pump water from the ground for his family's fields. The boy fused pre-existing global knowledge with his implicit understanding of local circumstances and the modification of the windmill as it was initially geographically used and built in the global North. William created a low-tech product that is easier to operate and more resource-efficient, and he adapted the innovation to his specific cultural and social context. After the windmill became accessible to his home village, William created a new market for innovation - now accessible to many other low-income countries and regions.

As of 2021, William Kamkwamba has been working to further the distribution of innovation in projects such as the *Moving Windmill Project* and IDEO (2021). Founded in 2008 to build community and empower problem solvers, the project partners with local leaders and resilient farmers to secure a viable future for Malawi's families. In this process of innovative adaptation, "good enough" is sometimes better. This young Malawian boy took a complex,

expensive innovation and developed a cheaper, frugal version. He turned old into new, transformed complexity into simplicity, and avoided famine with ingenuity, vision, and trash. What if this is not a model for ethical, technological, and climate-centric education?

### **Conclusion**

The development of digital education in Sub-Saharan Africa must be understood within the broader historical, socio-political, and economic contexts that shape the region. The chapter has explored the lasting effects of colonial education systems, the necessity of epistemic freedom, and the importance of indigenous knowledge systems in fostering a decolonized African mind. The discussion has highlighted how globalization, climate change, and technological shifts, including the Fourth Industrial Revolution, impact education in the region. Moreover, the structural barriers facing rural schools and the challenges of integrating digital tools into mainstream education have been examined. While the COVID-19 pandemic exposed the digital divide, it also accelerated the adoption of blended learning models, emphasizing the urgent need for policymakers to invest in infrastructure, teacher training, and curriculum reforms.

A critical takeaway from this discussion is that sustainable education reform must balance global advancements with local realities. The African educational system should not uncritically adopt Western models but should instead integrate indigenous perspectives, frugal innovation, and localized technological adaptations. The case of William Kamkwamba, who harnessed wind energy to bring change to his community, exemplifies the transformative power of grassroots innovation when combined with access to knowledge and resources. Moving forward, education policies should prioritize digital literacy, STEM education, and vocational training tailored to Africa's labor market needs. Ultimately, by fostering an education system rooted in African realities and global advancements, Sub-Saharan Africa can build a future

where knowledge production and technological innovation drive sustainable development and self-sufficiency.

### **Chapter 3: Digital Learning Mechanisms in the Realm of Information & Communications Technology (ICT)**

A vast and rapid increase in the use of digital tools in education has occurred since the COVID-19 pandemic (Baxter et al., 2023). This chapter, therefore, aims to present a selection of digital tools that have been integrated into education, which require the development of digital competencies by students and teachers. This study explores the unique opportunities the RACHEL device offers, as described in Chapter One's *Pilot Overview*. It focuses on the Digital Education Pilot, which empowers teachers and administrators to utilize digital tools amid the *global pandemic* and *climate challenges*. The study also offers depth to the device's ability and structure by examining what participants have experienced while interacting with the technology throughout the 60-month Digital Education Pilot.

#### **Digital Educational Tools and Definitions**

With the rise of digital technology, education is no longer a confined, one-dimensional experience. Online and offline learning tools are transforming the way teachers and students learn and interact, providing access to content and resources that can be used to create engaging, interactive experiences. *Digital Education Tools* are technology-based tools that facilitate learning and teaching, including online course platforms, virtual classrooms, digital textbooks, learning management systems, and digital assessment tools (Baxter et al., 2023). Open Educational Resources (OER) are freely and publicly available teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property

license that permits their free use and re-purposing by others. *Open access* refers to teaching, learning, and research materials that are freely available online for anyone to use but may not be revised, remixed, or redistributed (Open Educational Resources, 2024).

The advancement of new technologies has caused a demand for developing new human skills. Most of these educational changes are associated with enhanced opportunities to store, manipulate, and diffuse information. Three key features of new technologies are significant for education: the capability to digitalize, process, and transmit information (Markauskaite, 2006). Standard terms used to define these technologies in research and policy documents include 21<sup>st</sup>-century tools, computers, information technologies, communication technologies, multimedia, information and communication technologies (ICT), digital technologies, network technologies, learning technologies, or simply "technologies." Digital education tools can be used by both teachers and students collaboratively, making them ideal for group projects and assignments. They provide a range of benefits, including increased collaboration, real-time feedback, and flexibility. Hence, it is vital to highlight the concepts and instruments necessary to effectively navigate the conditions and meet the criteria for success in a classroom that lacks internet access, has unstable electricity, and is partially without computers. Understanding these components and instruments may assist educators in meeting the challenges of such an environment.

### **A Survey of the Offline Internet**

The range of Digital Education Tools is vast but not directly relevant to this study, as we aim to focus our understanding on mobile *offline* resources. The target offline populations face barriers to Internet adoption, which span four categories: incentives, low incomes, affordability, user capability, and infrastructure (Adie et al., 2023). Barriers to internet use among this population include a lack of awareness of the Internet or its use, cases that would benefit an offline user. Additional obstacles include a lack of relevant/local content and services and

cultural or social acceptance interest (Sprague et al., 2014). A good example is the case of secondary schools in Malawi, where the root causes of these consumer barriers include (1) the slow pace of local government bureaucracy that service providers encounter while developing and localizing relevant digital content and services; (2) low awareness among consumers; and (3) inadequate user capabilities such as a lack of digital literacy characterized by unfamiliarity or discomfort with using digital technologies to access and use information as well as a lack of language literacy, meaning the inability to read and write (Sprague et al., 2014).

### **What is Offline Internet?**

Offline Internet is classified functionally into three major groupings: completely offline systems, hybrid-offline systems, and offline servers. Offline Internet is a specially designed computer system that stores information in vast quantities for learning in low-resource regions and/or emergencies by direct retrieval of data from a Wi-Fi-enabled storage device or a device that periodically updates its local information contents whenever it goes online (Adie et al., 2023). Offline Internet operates without data costs or Internet connection, functioning with existing digital devices in low-resource environments and emergencies. This option offers the panacea to the challenge of cost-efficient and cost-effective remote learning.

### **Existing Offline Systems**

Examples of *entirely offline* systems include universal serial bus (USB) sticks, subscriber identity module (SIM) cards, secure digital (SD) cards, mobile applications (apps), mobile devices, or even computer systems. These are primarily used for personalized digital remote learning. *Hybridized* offline systems are computer systems that store information for direct retrieval of information from a device or mobile app. These systems periodically update their local information whenever they are online or go online for user authentication purposes. They are also used for personalized digital remote learning. An *offline server* refers to specially

designed computer systems storing large amounts of information. These servers can broadcast information directly from a Wi-Fi-enabled storage device, sharing its resources with computers, smartphones, and other devices. They are ideal for rural schools, communities, and refugee camps as they enable collaborative learning while still gathering data on individual users' online learning activities (Adie et al., 2023). The following are select examples of completely offline systems that provide context for the adoption of the RACHEL device in this Africa-based study:

**Completely Offline Systems:**

- *Two Rabbits* is an interactive audio program based on the Cameroonian official curriculum. It is recorded via a hand-crank MPEG-1 Audio Layer 3 (MP3) player featuring songs, stories, and games performed in the Baka style and language. When an initial two-year pilot showed remarkable results, they worked to strengthen the model based on lessons learned and aimed to expand it to twenty villages over two years (Two Rabbits, 2022).
- *The NENA Offline e-reader* has published around 3,000 e-books in all the fields covered by African authors, half in English and half in French. Most are in electronic publication (ePub) and hypertext markup language (HTML) format for offline or online reading on any medium (computer, tablet, smartphone, e-book reader). More complex works are in interactive portable document format (PDF) format (African Union, 2020).
- *Sayans Computers* come with educational software containing resources to enhance research even without the Internet, improving access to information and better learning outcomes. Sayans computers also have low power consumption and are installed with a long-lasting battery bank. They are cheaper to purchase and are continuously used as they use very little power, enabling anyone to obtain a computer. The computers are great for ICT programming and have already been installed with programming software and

tutorials. Computers improve ICT development and learning outcomes for science, technology, engineering, and mathematics (STEM) (African Union [AU], 2020).

### **Hybridized Offline Systems:**

- The *Jara Emergency Unit* empowers children in under-resourced communities to receive a quality education anytime, anywhere. The Jara Emergency Unit is a personal education device that enables children to learn localized education content in any language without needing access to power, a quality classroom, or the Internet. The Jara Emergency Unit is designed for durability and areas with low or non-existing infrastructure. It collaborates with e-learning platforms to provide locally customized content, enabling the technology to be remotely updatable and designed in partnership with the communities (Jara, 2022).
- *Ustad Mobile* provides a free, open-source mobile learning app that enables conflict-affected and marginalized youth to access and share educational content offline. The app is designed for areas with limited connectivity, works on almost any Android phone, and does not require a mini server or Wi-Fi access point (NGL Education Technology Solutions, 2022).
- *Kytabu* is a textbook leasing mobile app for curriculum textbooks used by 11.8 million students in the Kenyan education system. Built to provide low-cost access to digitalized versions of all Kenyan textbooks, Kytabu enables teachers and students to rent textbooks a page at a time, a chapter at a time, or a whole book for periods varying from one day to one week, one month and one school term (African Union [AU], 2020).

### **Offline Servers:**

- *i-Pathways Oasis* is an innovative solution that delivers all of the i-Pathways curricula, features, and functionality to a computer laboratory environment on a single, unique device. Students can connect to the device wirelessly and access the i-Pathways system

and curricula. Students can also complete assessments, engage in all the instant feedback activities, and prepare for their high school equivalency exams. Teachers can also track student progress and provide feedback (i-Pathways, 2022).

- ***Internet-in-a-Box*** brings the best of the world's free knowledge (Wikipedia, Khan Academy, Open Street Map, e-books, and many others) to those working offline, such as anybody nearby with an old smartphone, tablet, or laptop. Using diverse hardware, an Internet-in-a-Box "learning hotspot" can be set up anywhere worldwide, even with solar power (Internet-in-a-Box, 2022).
- ***The Ideas Cube*** creates a Wi-Fi hotspot that users can connect to using a smartphone, tablet, or computer to access thousands of educational, cultural, or training resources. In a library, a school, or a medical dispensary in a rural area, the Ideas Cube provides content in the form of texts, videos, or online courses and allows around forty simultaneous connections. The Ideas Cube can be updated to broadcast new content when connected to the Internet. The data and frequency of user usage are then collected to meet their needs in the field best. The Ideas Cube emits a Wi-Fi signal up to 30 meters, depending on the environment. Up to 40 users can log in simultaneously with a smartphone, tablet, or computer. The battery allows up to five hours of autonomy and can be charged with solar panels (Libraries Without Borders [LWB], 2022).
- ***Scolaryx*** is an educational box that functions as a micro server containing the equivalent of 10,000 lessons available offline. Its administration is relatively simple and can be performed by the head of the school, the learner, or a parent. The Scolaryx box contains a Wi-Fi card to connect to a computer and access educational content without the Internet. It also has high-definition multimedia interface (HDMI) access for classroom class

screenings. Scolaryx can also be used on a mobile phone or tablet, allowing learners to experience the classroom's reality more intuitively (African Union [AU], 2020).

- ***EDBox*** is a nano server that allows students, teachers, and parents to access tens of thousands of educational resources without Internet connectivity. Teachers can use these digital resources in the classroom. Accompanied by a mini projector, the EDBox can simulate complex concepts that must be represented and show or demonstrate the operation of mathematical, biological, physical, and chemical processes. The box is also a library of downloadable resources that enable students to have documentary resources in various disciplines and formats from developed countries. The box affords students an equal opportunity to access knowledge. The pedagogical uses of this device are numerous: self- or teacher training, course preparation, classes before pupils, and provision of free educational content to download on Wi-Fi smartphones for teachers, parents, and students (African Union [AU], 2020).

### **Problems of Offline Internet**

As with any emerging technology, users and developers encounter various issues that should be considered for nationwide application. The first challenge is Offline Internet, which poses a challenge in providing data on users' learning outcomes. The inability of an offline internet system to track learners' activities may lead to uninformed decision-making by the organization. Consequently, the effectiveness of learning experiences cannot be evaluated on the learner's needs, and its impact can neither be quantified nor qualified (Adie et al., 2023). As there is a bias within studies to focus on the positive impact of educational technologies, this often means "unintended consequences are ignored or simply not looked for." By providing increasingly balanced findings, education stakeholders can better understand the actual effects of educational technology interventions on marginalized learners (Zubairi et al., 2021).

Unfortunately, most offline Internet interventions are only interested in measuring the number of downloads or the success of various files. These interventions include a learning analytics component that reports or simulates academic performance, self-regulated learning, learner engagement, and retention of learned content (Zoom, 2020; Dele-Ajayi, 2020).

Another challenge is the "device divide"; the use of viewing devices (computers, smartphones, tablets) that are not owned or unaffordable for many target users of an offline Internet intervention, which further entrenches inequality in access rather than reducing it. Similarly, there is a gender divide as most women worldwide are not engaged in using technology for learning (Zoom, 2020). This disengagement is often attributed to social inequalities, cultural norms, and technological constraints (Cullen et al., 2019). Girls are frequently more likely to have lower levels of digital literacy than their male counterparts. A study conducted by the Malala Fund found that fathers were 36% more likely to support and assist their sons' learning with EdTech during COVID-19 compared to their daughters' learning (Crompton et al., 2021; Zubairi et al., 2021).

Furthermore, institutions and teachers often resist students using their devices in schools (Onyema, 2019). The platform iCampusgh was developed in 2016 by Ghana's Centre for National Distance and Open Learning (CENDLOS). It was designed to be used as an intranet on the iBox, a local server installed in ICT laboratories within schools, with content as part of a wide-scale ICT development program and funding provided by the World Bank. Initially planned to provide ICT-based learning and teaching in under-resourced senior high schools in Ghana, there was low adoption of iBoxes due to concerns from the government, schools, and parents over the use of mobile phones to access ICT-based education (Addae-Kyeremeh et al., 2021).

In addition to stakeholders developing a broader concept of school activities, purposes, and tools, there is an overall need for greater local technical competency. This is especially true for offline servers or nano servers, which require a higher level of local technical competency to support and maintain services than Internet-based services (Kukulska-Hulme et al., 2020).

### **The Remote Area Hotspot for Education and Learning (RACHEL)**

RACHEL stands for Remote Area Community Hotspot for Education and Learning. It is a portable, plug-and-play server that can connect an entire classroom of computers to a world of educational content with a single click. It provides access to copies of open educational websites such as Wikipedia, Khan Academy, and physics education technology (PhET) simulations through a local wireless connection (Hundred, 2022c). RACHEL is an *offline server* designed to store large amounts of information. It directly distributes data from a Wi-Fi-enabled storage device and shares its resources with computers, smartphones, or other devices. This setup is ideal for rural schools and communities, enabling learning inside and outside the classroom and during school hours (Adie et al., 2023).

### **Founding of RACHEL: World Possible's Brief History**<sup>2</sup>

Noberto Mujica, a Cisco Systems engineer, traveled to Ethiopia in 2008 to teach classes at a university. He discovered that many of the computers there lacked usable internet access. To address this issue, he developed the idea of gathering educational materials and storing them on a server, making them accessible to all students. Later that year, along with three colleagues from Cisco, Noberto worked alongside Ethiopian colleagues to form the organization *World Possible*. In 2009, despite facing technical challenges, Noberto and a group of volunteers built the first large versions of an offline educational server named RACHEL (Remote Area Community Hotspot for Education & Learning). That same year, a team of volunteer engineers from Cisco

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<sup>2</sup> This section draws on the history provided in World Possible (n.d.). About us. Retrieved March 7, 2025, from <https://worldpossible.org/>.

Systems and Jeremy Schwartz, a volunteer director with a background in venture capital, traveled to Sierra Leone to pilot RACHEL. Unfortunately, the trip faced significant setbacks due to local issues, leading most team members to cancel their plans. Consequently, World Possible, the organization behind RACHEL, went dormant, but a few RACHEL servers remained active in Africa and India.

RACHEL's impact continues to grow nine years later, reaching an estimated 500,000 learners worldwide. The organization has expanded to include a chapter program with over 90 partners utilizing RACHEL for offline education initiatives and projects. RACHEL has now been introduced in 47 countries, including Malawi. Its free content library of downloadable websites grew to over 100 modules. It has established RACHEL as a credible option for offline education projects in some of the most remote and challenging educational environments.

### **How does RACHEL work?**

RACHEL is a portable server that stores open educational resources and provides access to this content through any local offline wireless connection. As an offline server equipped with leading academic and learning sites, RACHEL is suitable for use in schools, community centers, health centers, and other places of learning worldwide. It is ideal for areas with limited Internet access and inconsistent electricity supply (Airi, 2019). The content available on RACHEL includes websites, simulations, text files, images, audio, and video in digital format.

Additionally, it comes with some essential open-source software that can be downloaded and installed. RACHEL simplifies the deployment of a digital content library, making it accessible even to stakeholders who are unfamiliar with digital education tools or those just beginning their journey toward digital literacy. Different variations of RACHEL relevant to this study are as follows:

- **RACHEL – Pi** is an inexpensive variation of the RACHEL that runs on a small, low-power computer called the Raspberry Pi. The information on the server is preinstalled, and there is enough space available (if more than 64GB microSD is used) to add additional content that may also contain videos. The components in the device (mainly the microSD card) are susceptible to failure over time as it was not designed to run servers and max out at USB 2.0 speeds. These components do not make for a stable long-term deployment. Additionally, the processing power of this device does not enable content updating and usage monitoring tools (Yamanoor & Yamanoor, 2017).
- **RACHEL-Plus** server is designed for use in schools, community centers, health centers, or places of learning worldwide where internet access does not exist or is limited. This is the primary product used by hundreds of partner organizations in over 40 countries worldwide. RACHEL-Plus would be the best option for schools looking to spend around 580 USD (including shipping). RACHEL-Plus should be considered for any actual field deployments. For use at home, as a demonstration, or as a trial run, consider using RACHEL, which can even be custom-built at a low cost.

What makes RACHEL revolutionary is that it can turn unused computers into a learning center by connecting the RACHEL device to the Local Area Network (LAN). The server's digital content can be accessed locally (offline) through compatible devices such as smartphones, tablets, or laptops. When you turn it on, the RACHEL device creates a wireless hotspot (Airi, P. 2019). That is the only connection you need to turn on. It is often called a headless server since it has no other connection.

The following section is a helpful case of a community school trial to custom-build a RACHEL-Pi at a rural secondary school. This provides an interesting potential for schools that

do not have the funding to buy RACHELs directly from World Possible and have the interest in developing the mechanism for a fraction of the cost.

### **RACHEL Trial - Papua New Guinea**

In 2018, the Central Students Association of Divine World University (DWU) conducted a community awareness project at Kupiano Secondary School, approximately 180 km from Port Moresby in the Rigo-Abau district of the Central Province of Papua New Guinea (PNG). The objective was to disseminate information about DWU and other tertiary institutions in Madang Province, as well as provide information on social issues communities face and how these issues could be addressed (Comforto, 2018). Furthermore, they planned to give something to the school as part of this community awareness program. The plan was to begin with Kupiano in 2018 and then implement the same approach for other secondary schools within the Central province, but funding challenges arose. Despite a proposal and letter seeking funding from the Central Provincial Government, no funding was forthcoming. The students organized themselves and started to raise funds with the support of staff, students, and families within DWU and the Madang community (Comforto, 2018). This situation provided an opportunity to trial RACHEL. RACHEL was selected because there were not enough donated books available. The DWU students then planned to introduce RACHEL and supplement Kupiano Secondary's existing library with the few donated reading books they had received. After considering two options, they decided to try the RACHEL-Pi: (1) purchasing the pre-built device from the World Possible online store *or* (2) purchasing a Raspberry Pi with accessories to build a custom device. They chose the latter option as it was the most cost-effective for the pilot project.

The pilot's goal was to complement the existing resources in the school library. Most high school students already had smartphones they could bring to school for educational purposes, so there was no need for any special software or hardware to use the Rachel Pi. In an article, the

guidance and counseling division director expressed her concerns about the negative impact of mobile phones in schools. However, she also emphasized that these devices should enhance schooling ("Impact of ICT Input on Schools," 2016).

This project aims to redefine the role of smartphones in schools by introducing Rachel-Pi. The challenge will be for teachers to integrate lesson plans that can utilize the resources provided by this tool. Additional teacher guides (from World Possible) and documentation of this device are accessible online to support this local project and future use.

The follow-up on the Kupiano RACHEL-Pi initiative is planned to evaluate how teachers and students use the device, the challenges encountered, and how teachers have integrated it into their instruction. Additionally, it will assess students' perceptions of the materials provided by the device and their relevance to their studies. This evaluation will help gather empirical data to support the adoption of this technology in other schools.

### **Challenges of implementing offline Open Educational Resources Pilots**

Such projects still face numerous challenges (Marcus-Quinn & Diggins, 2013; Organisation for Economic Co-operation and Development [OECD], 2007). It should not be assumed that making those materials available will ensure their usage. Accessibility, computer basics skills, information literacy, OER project sustenance, and teacher training (technological, pedagogical, and content) are key issues (MarcusQuinn & Diggins, 2013; Klieme & Vieluf, 2009; Cuadra & Moreno, 2005). Despite the argument that technological advances have made access to information more straightforward, there remains a significant concern that students are not developing information literacy skills. Many students struggle to retrieve and evaluate the information required for problem-solving and decision-making in the workplace and society (Moreira, 2010). There are also issues related to copyright and open licenses. While information technology enables the easy multiplication and distribution of content worldwide at minimal

cost, legal restrictions on reusing copyrighted materials hinder its digital reproduction. Establishing a proper legal and regulatory framework that encourages open licenses like the Creative Commons used in other countries will encourage people to share and reuse copyrighted material without fear of being sued. These challenges and issues each have varying degrees of impact on the implementation's positive or negative outcome. Challenges are inevitable in any ICT project implementation. is expected early in any technology adoption but also contributes to developing best practices (Hall & Khan, 2003).

### **Conclusion**

This chapter explored the use of offline resources to provide educational content in rural schools. It addressed these schools' challenges, explaining why an Internet connection is currently not a viable solution. In doing so, it introduced RACHEL as an offline OER suitable for implementation in rural schools. It demonstrated a procedure for using RACHEL to deliver local content and other supplementary resources that can enhance the quality and accessibility of teaching and learning resources. Furthermore, it discussed some challenges associated with adopting RACHEL as an OER, highlighting the need for trials to be conducted to establish the best practices to manage the inevitable challenges that may arise.

## **Chapter 4: Research Methodology**

### **Research Design**

As summarized in Chapters 1-3, the following research on the effects of digital libraries in rural Malawian secondary schools was founded on the RACHEL pilot in five community day secondary schools. The pilot and this subsequent research were inspired to develop the capacity of rural Malawian/Sub-Saharan youth to build a personal, national, and global vision (beyond scarcity and ecological threats) and to introduce and develop the required technological skills to serve as the future-oriented citizens leading to human survival on earth and beyond. This chapter explains how this pilot case study is structured and implemented to gain insights into the core research questions, including the sampling and data analysis processes.

### **Exploratory Case Study**

Qualitative research focuses on how people or groups of people can have (somewhat) different ways of looking at reality (Hancock et al., 1998). Therefore, perception issues are believed to be best explored qualitatively (Creswell, 2013). As a naturally explorative mode of inquiry, neither the sites, units of investigation, nor the precise objects of reasoning, circumstances, and core problems are often known at the beginning of the research endeavor. Of course, researchers have some questions in mind when they begin their qualitative investigation, but what to ask exactly often becomes clear(er) only after investigating (Diefenbach, 2009). Frequently, new questions emerge during the course of the investigation. In this sense, the (re-)formulation of the research question (or adding new ones) is a sign of progress. As a qualitative researcher, throughout the research process, I felt encouraged to ask myself whether I was asking the right questions and made changes whenever it seemed appropriate to challenge my most basic assumptions and see “things” from as many different perspectives as possible.

Case study is an ideal methodology to provide an in-depth understanding of clearly identifiable case(s) within a bounded system (Creswell, 2007). This study uses case study as the methodology for two main purposes: exploration and description (Yin, 2017). The *Exploratory Case Study* clarifies a situation where information is scarce by gathering in-depth data from multiple sources of information. By including pilot baseline surveys, classroom observations, and interviews with participants from various schools and situations, I sought to develop an understanding of how offline digital libraries affect rural Community Day Secondary School teachers and students and what factors influence their commitment to the continuation (and further implementation) of digital educational resources in the future. This Exploratory Case Study is constructed on the foundation of a recently completed Digital Education Pilot led by Peace Corps Nepal, which provided an empirical base for the structure, dynamics and context of the subject of interest. Specifically, an Exploratory Case Study was used because it develops an initial understanding of the program or phenomenon of interest. Due to this study being the first of its kind, exploratory research is more appropriate when studying something new, when the data collection process is challenging, and when there is a question I want to study. Still, there is no preexisting knowledge or paradigm to study it (George, 2023). The focus is on discovery to obtain an empirically based introduction to the structure, dynamics, and context of the subject of interest. Exploratory case studies explore situations where the evaluated case has no clear or single outcomes. According to Yin (2003), a descriptive case aims to depict the phenomenon within the context in which it occurred to discover more about it or to discover new things. Exploratory case studies can guide future research, adding to a body of research in the early stages (George, 2023). Stake (1995) argues for a flexible design that allows researchers to make major changes even after they proceed from design to research. Flexibility in terms of case

study design stems from adopting the notion of "progressive focusing" (Parlett and Hamilton, 1972). This notion builds upon the assumption that "the course of the study cannot be charted in advance" (Yazan, 2015). Narrative analysis can provide a broad picture of the case and present the text structure and linguistic nuances. At the same time, the exploratory approach involves making discoveries about the data and pursuing these discoveries to construct an analysis.

## **Sampling**

Volunteer Response and Purposive sampling methods were used. As the Peace Corps Malawi digital education pilot initially surveyed 10 CDSSs, five of the sampled CDSSs met the criteria for participating in the pilot (see Chapter 1, *Pilot Overview & Structure*) and, therefore, were sampled again for this study, which was conducted in the same five schools. Selecting a smaller group of individuals or cases from a broader population exposed to the RACHEL devices in the pilot proved to be easier than anticipated. Though no prominent list of the target population (teachers and students) was provided for the study, the five pilot schools kept User Logs and Teacher and Student Feedback Forms, allowing them to track computer users and RACHEL devices for pilot monitoring and evaluation. Therefore, the target population of the study was constructed through the Digital Education Pilot *Point of Contact* in advance of our arrival at the research sites and adjusted upon arrival based upon the availability of students and teachers' relevant frequency of use of the computers, RACHEL and their willingness to sign the research Consent Form.

Patton (1990) suggests that purposive sampling relies on the researcher's judgment when selecting the people/interviewees, cases/organizations, events, etc., to be studied. Purposive sampling can justify the researcher to generalize from the sample being analyzed. Considering the above, purposive sampling is ideal for the study recruitment of voluntary interviewees, which

is within the initial criteria of having engaged the digital library. Students were from Forms 2, Form 3 and Form 4, as they had the most time participating in the pilot and had not yet graduated or stopped attending school for any other reason.

Additionally, voluntary response sampling was applied. The sample population comprised self-chosen participants from the pool of students and teachers who have been traced as users of the RACHEL library and had the confidence and interest to speak to the research team. Moreover, participating volunteers had to express themselves comfortably and be willing to engage in a conversation in English and be share their thoughts with the researcher.

### **Study Population**

#### **Research Area & Pilot Baseline Survey Summary**

RACHEL pilot started with five schools in different districts across the country for school diversity, the staff-school ratio, and manageability of monitoring and evaluation. All the CDSSs in this study are rural communities, defined as schools located significantly far away from urban centers that are often geographically isolated. The CDSSs are all co-educational village schools that are managed publicly; they frequently serve large populations of the poorest students and are characterized by lower academic achievement compared to urban or semi-urban schools. Many pilot students commute long distances and/or have difficulty attending school regularly due to financial barriers. A baseline survey of all five schools was completed in the spring of 2022 in preparation for anticipated school pilot launches between March and July of the same year. The next paragraph will highlight the baseline survey results, providing a background for the general condition of the schools used in the study.

The initial pilot Baseline Survey (see Appendix C) reported that all five schools have four forms (grades); 80% of the schools have one section per grade, and 20% have two sections per grade. All are located in residential areas, 40% have boarding facilities, 80% do not have support for special needs students, and 80% of the schools do provide students with career development advice and support. Regarding facilities, 100% of the schools have access to water via boreholes - 80% of these facilities are in good condition and 20% need repair. All of the schools have access to electricity - 80% of the electricity network is public, and 20% have electricity via solar power. About the facility, 40% of schools do not have telephones, 60% have a playground, and 40% have a school stage. Regarding technology, 40% have computers, with 80% being in poor condition - 80% do not have regular access to computers, and only one (Namasika) has Internet access. None of the schools cannot access Microsoft Word, and three out of five schools use email for administrative purposes.

**School Profiles and Secondary Data Summaries**

The following short descriptions of each of the five pilot schools provide general information about their location (sourced from Wikipedia), in addition to some contextual data collected from the first monitoring and evaluation by the Peace Corps Malawi Education team in spring 2023 and from Researcher Notes and observation of each school visit, primarily during initial

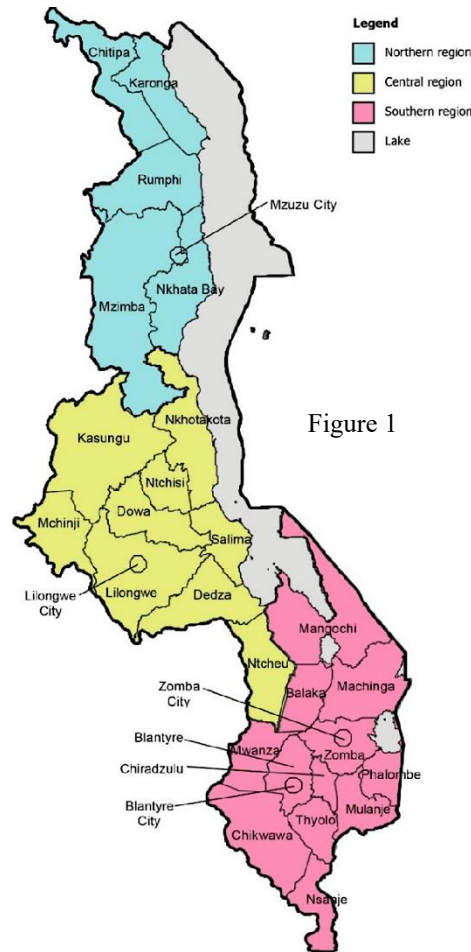


Figure 1

meetings with the schools Head Teachers upon arrival in September-October 2024. *Figure 1*<sup>3</sup> provides an orientation to the district of each school and their proximity from each other.

1. ***Mkaika CDSS*** – is in Nkhotakota, the Central Region of Malawi. It is on the shore of Lake Malawi and is one of the main ports. The 2001 floods hit this town, the worst-hit area of Malawi's Central region. Today, Nkhotakota is the largest traditional town in Malawi and bears a strong Swahili-Arab influence. Most locals are smallholder farmers of Rice, Cassava and maize, while many others are small-scale fishermen. Mkaika CDSS was the inaugural school of the Peace Corps Digital Education Pilot. The launch took place on March 2022 and was attended by the CDSS Cluster Head, the District Education Manager, CEE, village Chiefs/local cultural authorities, the Parent Teachers Association (PTA), all school students (performed local dances and speeches expressing excitement around the arrival of digital technology) in addition to all school Teachers and Administrators. The Peace Corps education team delivered one RACHEL and two tablets that day. At that time, the Head Teacher of the school started the program off strong - his confidence in his ability to administer the program and promote relevant activities among students and teachers increased the motivation and commitment of the school and the surrounding community. He was also verifiably computer literate and owned his laptop and printer. Mkaika CDSS was the first to receive computers from the NGO Computers for Enhanced Education (CEE). Initially, as with all the pilot schools, they received four desktop computers with WiFi capabilities in March 2022, shortly after the school launch. As a result of the large population of students, their incredible relationship with the NGO

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<sup>3</sup> Maduekwe, Ebele & De Vries, Walter. (2019). Random Spatial and Systematic Random Sampling Approach to Development Survey Data: Evidence from Field Application in Malawi. Sustainability. 11. 6899. 10.3390/su11246899.

and honoring their maintenance contract (acquiring a manageable sum of approximately 50 U.S. dollars per year), they requested 20 additional desktops be delivered in August of 2022 and then 17 additional computers within the first year of the pilot.

There were three PC monitoring visits before the study interviews, which provided a summary of the data collection process. Generally, teachers at Mkaika submitted their *User Logs* with gaps in the content, with the biggest gaps around student logins. The cause was that students were not given direct access to the logs or empowered to keep accountability for their RACHEL use. Also, oftentimes, teachers stated that they did not have "local content" on the device as an excuse for their lack of engagement, as they had little interaction with the RACHEL device. A set written schedule for use/access was established, supporting the student and administration's active involvement with the RACHEL. Regarding community, three groups were engaged: the PTA, the Mother Group and some out-of-school youth. However, the pilot school's point of contact (the school monitoring coordinator) did not support teacher development, so many teachers were not as proficient in RACHEL use as expected.

Unfortunately, the original Head Teacher was transferred to another school about nine months before our arrival, and the original Deputy Head Teacher also left the school to pursue a Head Teacher position elsewhere. Additionally, upon arrival at the school to conduct the interviews for this study, only 7 out of the 40 computers were functional. Further, the non-functional computers were haphazardly piled into a corner and illogically stored in a computer classroom, away from the original school library that had been set up with security bars and additional resources to protect and distinguish the computers and the racial device as part of the valued school resource pool. The situation

will be discussed in more depth later in this chapter as instrumentation and data collection procedures are discussed.

2. *Namasika CDSS* – In Machinga, a district in the Southern Region of Malawi, 58% of the population is from the Yao community - a major Bantu ethnic and linguistic group living at the southern end of Lake Malawi. The Yao are predominantly Muslim.

The launch took place in July 2022 and was attended by the village Chiefs/local cultural authorities, the Parent Teachers Association (PTA), school students, and Teachers and Administrators. The Peace Corps education team delivered one RACHEL and two tablets that day. Notably, the delivery of 14 desktops *without* WiFi connections took place in December 2023. This delay in delivery and the capacity to use the RACHEL devices limited school access to tablets and personal smart phone until the WiFi cards were purchased and installed several months later. There were two monitoring visits to Namasika throughout the pilot, and they revealed the following summary: The POC left the school and was replaced by another teacher trained by the Peace Corps. However, the old POC was not active, but the new POC was active. The *User Logs* had gaps in the content, with the biggest gaps in *Student logs*, again, the cause being students were not given direct access to the logs, nor were they empowered to keep accountability for their RACHEL use. The best collection was of *Group logs*.

Additionally, teachers were not active, stating that they did not have "local content" in the device as an excuse for their lack of engagement, as teachers had little interaction with the RACHEL device. The students were moderately active. The administration was not active in the community and had no engagement with the RACHEL device. Upon arrival at Namasika, the initial meeting with administration, we met the new Head Teacher, who

was starting his first week on the job. The Deputy Head Teacher had some involvement with the day's program, but the POC stayed with the researcher, supporting the process the entire day.

3. ***Ntonda CDSS*** - Mangochi is in the Southern Region of Malawi. Located near the southern end of Lake Malawi. Most recently, the area was noted for rescues from child labour on tobacco farms in Mangochi, and the elephant population damaged fisheries, caused several deaths, and damaged property and crops. The launch took place in July 2022 and was attended by the village Chiefs/local cultural authorities, the Parent Teachers Association (PTA), school students and Teachers and Administrators. The Peace Corps education team delivered one RACHEL and two tablets that day. The delivery of 20 desktops *with* WiFi connections took place in April 2023. They have had the same Head Teacher and POC and established a non-written schedule for RACHEL access. There were two monitoring visits to Ntonda throughout the pilot, and they revealed the following summary: The teachers, students and administration were active, though there was no community engagement. Teachers and admin give feedback, and logs were accurate and up to date, with the best kept being the Group Log and the biggest gaps in *Student logs*, again, the cause being students were not given direct access to the logs, nor were they empowered to keep accountability of their RACHEL use. Upon arrival for the interviews in September 2024, we initially met with the Deputy Head Teacher because the Head Teacher was not yet in and never arrived due to work in the district. The POC organized and led ours. Ntonda was the initial school visit of the study, and as a result, the researcher, PC team member, and translator had to adjust our process,

expectations, and working process. The challenge of the first study school will be discussed under *Challenges* later in this chapter.

4. **Bembe CDSS** - is located in Rumphi District, Northern Region, Malawi. Rumphi is famous for the cattle market and being on the way to Nyika National Park and Nyika Plateau. Rumphi is surrounded by hills and is bounded by the Rumphi River in the east and the South Rukuru River in the south. The launch took place in July 2022 and was attended by the village Chiefs/local cultural authorities, the Parent Teachers Association (PTA), school students and Teachers and Administrators. The Peace Corps education team delivered one RACHEL and two tablets that day. The delivery of four desktops *without* WiFi connections occurred in December 2023 – similar to what happened in Namasika. Bembe later received WiFi cards installed by CEE. The POC remained active and evolved into the POC Committee that managed the non-written schedule for RACHEL access for the school. The Head Teacher remained the same, though little feedback was provided to the PC team.

There were two monitoring visits to Bembe throughout the pilot. They revealed the following summary: The teachers, students and administration were moderately active, and the POC was active – demonstrating RACHEL use for teachers. Only one out-of-school youth engaged in the device. Teachers and admin gave feedback, with the best kept being the Group Log and the biggest gaps in *Student logs*, again, the cause being students were not given direct access to the logs, nor were they empowered to keep accountability of their RACHEL use. Upon arrival, we learned that a new head teacher had arrived one year before. The school has maintained its original four desktops in 2 tablets – and was the last of the five schools to receive computers. Upon arrival, we made

accommodations to receive all interview responses in a mix of Chitimbuka, Chichewa and English, assisted by the Education PM/Michael to assist with the translation and further discussed in the Challenges section.

5. ***Meru CDSS*** – It is in the northernmost district in the Northern Region of Malawi called Chitipa and shares its boundaries with Zambia and Tanzania. The biggest ethnic groups are the Lambya and Tumbuka, which account for approximately 50% of the population. Chitipa has more than 19 languages. This rich diversity of languages makes it unique from other districts in Malawi. The launch took place in July 2022 and was attended by the village Chiefs/local cultural authorities, the Parent Teachers Association (PTA), school students and Teachers and Administrators. The Peace Corps education team delivered one RACHEL and two tablets that day, but CEE never delivered computers. The POC changed, and no access schedule was put in place. Again, there were two monitoring visits to Meru during the pilot. They revealed the following summary: The teachers and administration were not active, students were moderately active, and the POC was very active – demonstrating RACHEL use for teachers. There was no community engagement. Teachers and admin gave little feedback, with the best records kept being the Group Log and the biggest gaps in *Student logs*, again, the cause being students were not given direct access to the logs, nor were they empowered to keep accountability of their RACHEL use. Unfortunately, the school has had three Head Teachers since the start of the pilot. Upon arrival in early October 2025, participants only used two tablets. Still, they added personal smartphones, as the current Head Teacher (the only female Head Teacher) did not want to invest in computers (citing personal and school resource concerns). Due to the multiple languages spoken in the community and

the lack of Chichewa ability for most students, all the interviews were conducted in English. Additionally, the RACHEL was removed by PC staff due to its non-use in February 2024, with no secure date for replacement.

## **Data Collection**

### **Semi Structured Interviews**

The data collection method for this study is interviews because they are a powerful way to gain insight into educational and other important social issues through understanding the experience of the individuals whose lives reflect those issues. As a method of inquiry, interviewing is most consistent with people's ability to make meaning through their language. It affirms the importance of the individual without denigrating the possibility of community and collaboration. Moreover, I find interviewing deeply satisfying as a researcher interested in others' stories. However, Diefenbach (2009) believes there is a need for greater methodological awareness, particularly concerning possible downsides of subjectivity in conducting interviews, including the generalization of the findings, conscious and unconscious biases, influences of dominant ideologies and mainstream thinking. I agree with Diefenbach's emphasis on a need for a more critical attitude and to put the interview findings sufficiently about the broader historical context, i.e., influential ideologies and societal structures. At the root of in-depth interviewing is an interest in understanding the lived experience of other people and the meaning they make of that experience (Darsiharjo, 2019; Van Manen, 1990).

Due to the exploratory nature of this study and the intent to review and consider secondary data before engaging study participants, the most appropriate method for data collection is a *semi-structured interview*: a blend of structured and unstructured interviews since, as a researcher, I had an idea of what questions I wanted to ask, but the phrasing and order of the questions were not set. Often open-ended, this semi-structured approach allowed flexibility to

see patterns while permitting comparisons between respondents and the flexibility to ask follow-up questions. Guided by my afro-futuristic lens and the commitment to the framing self-efficacy theory provides, I was committed to avoiding distractions while encouraging two-way communication with the respondents and the comfort to add additional questions to clarify, elaborate, or rephrase their answers if needed. Upon selecting the mode of inquiry, I recognized some validity challenges with semi-structured interviews that could pose challenges when comparing responses between participants if I departed from the predetermined list of questions. Additionally, I was concerned that the open-ended nature of semi-structured interviews could lead to me asking leading questions, leading to *observer bias*, or respondents giving the answers they think I want to hear, leading to *social desirability bias*.

Furthermore, semi-structured interviews can be difficult to conduct correctly due to their delicate balance of prior planning and spontaneity. I approached these interviews eagerly to accept each participant as unique in their willingness to share and live experiences, but it wasn't easy to be encouraging and unbiased. As a researcher, my goal was to maintain what Schutz (1967) calls a "subjective understanding" of what it is like for rural Malawian students and teachers to be in the classroom with offline education technology - their experience and what meaning they create out of that experience was what I hoped to uncover.

The interviews were anticipated to be 30 to 50 minutes long, live, face-to-face and conducted on school grounds. The teachers were planned to be in groups of two to three, and students in groups of five to eight. The rationale is that the interviews will likely be during or near the end of a school day, so there will be competing priorities for all participants and access to the full participant sample size. This way, the interviews may feel more like a focus group.

The selection of interviewees was assumed to be more socio-political and impacted by the cultural and organizational structure, as it was primarily handled by the Head Teachers and/or POC. From a participants perspective, being selected as an interviewee is a privilege because those selected can put forward their worldviews and influence the research outcome (Easterby-Smith, Thorpe, and Lowe, 2012). From a researchers view, selecting participants due to age, gender, ethnicity, tribe or socioeconomic status can influence how the researcher is perceived and impact how and why they do or do not engage the researcher. The interview situation always influences interviewees and is not always a reliable source of information because of unconscious bias. Given the prominence of the collectivist culture in Malawian communities, this was my biggest concern with the teachers. According to Alvesson (2003), often interviewees can unconsciously 'spoil' the data, i.e., that the interviewee (and perhaps the interviewer, too) is not aware of the influences of the interview situation and their internal unconscious reactions to being asked "officially" about certain issues; that interviewees follow "cultural scripts" about how one should normally express oneself on topics. Not only is a school connected to the political and cultural bonds of the community in which it was built, but it is also a place of employment. In a community where employment is scarce, respectability politics and conformity plays a role in one's community-standing and possible work future. Conscious and deliberate attempts to mislead the interviewer are expected as participants are beneficiaries of the pilot and may feel answers to the questions determine if the Digital Libraries will stay at the school. Considering these realities, I added a preface to the interview to remove an assumption the school could be impacted negatively by participating or speaking critically about the pilot.

### **Timeline, Structure and Scope**

September 24<sup>th</sup> through October 5<sup>th</sup>, 2024, I returned to Malawi to conduct interviews during the Peace Corps Malawi Education team's last monitoring and evaluation visit of the pilot's second and final year. Due to the low Peace Corps volunteer recruitment and the small input received in 2023 and projected for later in 2024, the pilot still had not reached its second phase of development, which turned it over to the presumed American volunteers.

I spent one day at the Peace Corps office in Lilongwe at the beginning of the trip getting updates on the country, post, and the pilot schools, in addition to reviewing the Digital Library Pilot evaluation documents and collecting, organizing Consent Forms (Appendix D) and study Permission Forms (Appendix E), and reviewing our travel plan. Most importantly, I reviewed access to the initial transcription and coding tool Nvivo. I had trouble accessing its transcription services and decided to set up accounts with Delve. This alternative qualitative analysis software better suited my needs and will be discussed in the Transcription section.

In summary, the two in-country weeks were a series of road trips covering approximately 1700 miles across Malawi's three regions. Due to the inaccessibility of lodging close to the schools, to reach schools and have the span of three to four hours per visit, we drove about two hours to reach each school early enough to meet the 9:30/10 AM start time. Visits started with a meeting with the administration. The research team divided responsibilities, including me as the Lead Researcher, the Translator (PC Education Program Manager), and an additional Malawi Peace Corps team member conducting PC pilot-related conversations and follow-up meetings with community members unrelated to this study's scope

The overall data collection process occurred in repeated iterations, which deviated from the original plan. Initially, cyclical rounds were anticipated, structured as follows: conducting interviews at CDSS #1, followed by coding, breaking the interviews into excerpts, grouping the

excerpts into codes, and then returning to gather more data from School #2. This process was expected to continue until completion, with new codes compared to old codes to identify additional details or contradictions and observe how the codes evolved as the research progressed through all five schools. However, the intensity of the travel, lack of regular internet and the inability to conduct the interviews fully in English demanded a different approach. The first three interviews were conducted/recorded and then sent to the translator/transcriber. I received one full transcription, saw the level of communication and depth in the answers which became evident on some of the themes that had arisen. As a result, additional questions were added to clarify some of the subject responses. This is discussed in the Challenges Section. The remaining two interviews were completed and submitted for transcription before formal coding of the first transcript began.

Three group interviews were conducted at each school. The first group is typically a student group combination of grades (Form) 2 and 3. This was preferred because the language ability and critical thinking/analytical skills were similar in these groups. Grade 4 students were interviewed separately, as the younger students seemed to defer to the older students when answering or were less confident speaking independently in their presence. This was observed after the first interview when we grouped Forms 3 and 4.

The student interviews took 30 to 45 minutes. The interview group of teachers was typically about one hour to 90 minutes. After each interview, the translator and I discussed relevant issues and observations and adjusted for the next interview, which generally happened about 10-15 minutes after the first. During each interview, the conversation was recorded by a mini audio recorder. Each interview started with an introduction with the review of the Consent Forms and designation of an identifying number for each interviewee that they would announce

before responding to a question to distinguish each speaker in the recordings (e.g., a group of four Form 4 students would be numbered, 4.1, 4.2, 4.3, 4.4). The researcher and translator would work simultaneously. Though starting in all English, we eventually offered every question and answer in both English and Chichewa. If possible, we encouraged the respondents to reply in English so the researcher could know the response direction and then follow up or clarify in depth into Chichewa or whatever local language was most comfortable for them. This evolved into the entire student interviews being conducted in Chichewa most of the time. Teacher interviews were predominately in English originally and moved to Chichewa when the answers in English were superficial or unclear.

To ensure a holistic response to Research Question 2, which focuses on gender, we required at least one female participant in each interview group, with a preference for two. On average, the composition of the groups was as follows:

- Group 1: Form 2 and Form 3 students (six total; one female, five male).
- Group 2: Form 4 students (three total; one female, two male).
- Group 3: Teachers (four total; one female chemistry teacher, one male geography teacher, one male physics teacher, and one female English/Chichewa teacher).

### **Interviews Questions**

All the research questions were constructed to be simple and concise to ensure the same pattern of inquiry and conversation, and probing questions were allowed to be added to dig deeper into a relevant topic. English is the participants' second or third language, so the translator assisted in addressing hurdles that hindered comprehension (i.e., researcher accent, speaking pace, vocabulary choice, etc.). Since the conversations were recorded, it ensured any reflections captured by Chichewa (a Bantu language and the official national language of Malawi, in addition to English) were translated correctly afterwards.

The interview was divided into three sections as there were three sets of five questions, for approximately 15 questions per participant, to ensure each research question is covered by each respondent (see Appendix G - *Final Afro-futurism Centered Interview questions by Related Research Question*). As Semi-structured interview questions, they were all open-ended in style and defined to be needed by the theoretical framework of the study. They were structured to start with the more straightforward questions, moving into the more complex ones and in order of the research questions. After the first interview at Ntonda CDSS, the order of questions and interview questions was adjusted for clarity and to accommodate the fact that some anticipated themes needed more structural support to be revealed in subject responses.

#### **Afro-Futurism & Self-Efficacy Focus**

By focusing on Afro-Futurism as the framework, about 1/3 of the questions effectively focused on participants' views on the future and their visions of their nation, Africa. By adding questions like, "*What do you want Malawi to look like in the next 100 years?*", it enhanced the student and teacher aptitude for exploring how the digital library helped to address questions of major concerns (such as the economy, infrastructure, climate change, etc.) during the interviews. Additionally, to strengthen the lens of self-efficacy in the questions, additions like, "*How do you think access to the information/ content in the digital library can be used to help your local community?*" put the responsibility and creativity for solutions in the hands of the interviewees to connect the opportunity of digital tool access to development outside of their academic career/focus. This was key for students as it provided a wider vehicle to encourage access for friends and family. I was curious to see if creating access for others would instill a spirit of generosity versus scarcity or competition.

### **Presentation with Afro-Futures Images**

Additionally, after reviewing the outcomes and overall experience of the first interview at Ntonda CDSS, it was discovered that the theory guiding this research, Afrofuturism, needed to be understood by the participants in order to get their perspectives on the future of Africa. To address the concern of the lack of comprehension of the future-based questions (and after recalling the Dissertation Committee's interest in the Afro-futuristic images used to enhance my research proposal defense), I repurposed the proposal defense presentation to provide visual context for participants to push their understanding and range of answers for some of the more unusual questions. The presentation emerged as an 18-slide PowerPoint presentation: one large colorful image across from one question per slide as a stimulant for the context of the "future" or underlying subject being discussed. The images were selected to correspond with the question's theme on the slide, and the photos were from various artists and depictions from semi-realistic to interpretive mosaics (see *Appendix H –Interview Presentation with Afro-Futures Images*). At a very basic level, adding the written questions allowed for written comprehension of the questions and deterred some of the pressure on the translator only to do audio comprehension.

### **Translation**

There were two sets of translations throughout the study. The first was the translation of the questions during the interview, and the second was the transcription of the recorded interviews (from Chichewa to English). Translation during the interview, in-person as the conversation unfolded, was so impactful; the word choice and energy of the interpreter (as co-founder of the PC pilot and fellow Malawian) registered sentimentally with the students as they expressed their answers with greater confidence and clarity once the translator's level of investment and sincerity was made clear, and therefore mine as well. I would also argue that since a fellow Malawian emphasized the importance of each question from sincere place of

interest in their thoughts, and not as a test or judgement of their intellectual ability, the questions permitted them to speak any thought that came to mind. However, as the researcher, it was frustrating not to understand the participants' responses. I often asked, "What did he/she say?" shortly after a participant answered to help follow the conversation and to confirm that the responses were logical and were meeting the level of depth needed for quality data and to analyze thoroughly. Additionally, because I relied on the translator, my researcher notes were more internal records of my thoughts throughout the process, in addition to snapshots of the participants' behaviors, body movements, and expressions as they responded to each inquiry.

The second translation stage (i.e., receiving the translated/transcribed interviews) was extremely revealing as it unlocked the full picture of the responses, the personalities of participants and the accurate level of thought put into the conversation by the translator and interviewees during each interview.

### **Transcription**

Due to the unavailability of Peace Corps staff and the sheer quantity of recorded interview hours, an independent Chichewa/English translation and transcription service by a recommended professional who the Peace Corps Education Program Manager was familiar with. Once the first two school visits were completed, the transcription began, and eventually, they were all completed by October 17<sup>th</sup>, 2024, approximately 10 days after I departed Malawi. To clarify, the approach to transcription in this project was *natural transcription*, requiring that the speech be translated precisely as spoken versus allowing the transcription of the essence of the speech and not necessarily the verbatim (Cameron, 2001). For this Naturalist transcription, the text is often in broken English or expressed in a grammatical structure more related to a Bantu language. The structure and pace of the discussion should allow for unambiguous interpretation.

Still, the study's exploratory nature will seek depth in the interpretation that will only be possible via the subtleties of a natural conversation.

### **Researcher Role/ Ethics**

While sitting in the classroom among the interviewees, it was obvious that I was from outside of the community. My presence seemed confusing initially, a reminder of the foreign nature of the project and its oversight from outside the everyday life and culture framework. The fact that the translator was needed and my engagement with the participants was limited created frustration and impatience in my ability to take notes and stay attentive during the conversation. Additionally, because the students were looking at me, they always attempted to speak in English. They often gave unclear basic answers, which prompted me to ask them to "speak in Chichewa" repeatedly. Yet, they also were keenly aware of my disposition. It may have distracted them from their ability to focus on the answer to the question versus my body language or lack of attention (seemingly) to their responses, which also prompted me to remind them that "there was no right or wrong answer" and "this is not a test." As a result, I moved to the back of the classroom or behind or to the side of the seating arrangement to avoid being in the center of the conversation and to let the conversation continue more naturally. Though this obstructed my view, it allowed for greater concentration and less anxiety for the participants.

### **Researcher Notes**

Researcher notes were often collected throughout each school visit and during our commute to and from schools. At the same time, I facilitated a conversation with the team about their observations and shared my own. My notes were often a place where I could record my sentiments and feelings during the interviews where I did not understand what was happening, so I used those moments to reflect on my experience throughout the data collection process. They were used to make internal edits to procedures and suggestions in preparation for the next set of

interviews. All researcher notes were taken by hand and in a small notebook I used throughout the research trip. The notes are primarily integrated into school summaries noted above, and the challenges will be discussed next in this chapter.

### **Challenges**

Several unanticipated challenges arose during the study, specifically in response to the methodology and data collection procedures, which will be discussed case-by-case.

#### **Assumptions of Participant Language Ability**

One of the most significant mistakes made in preparation for the study was assuming that because English (a national language of Malawi) was the medium for participants using the digital library, they could understand, communicate and articulate the level of questions and answers expected in English. This error was quickly corrected within the first three to four questions in the first interview. It resulted in using Chichewa to ask questions and encourage the students to use it for their responses from here onward. This decision led to the discussion pace moving faster and an increased level of comfort with answering, though it was confusing for me as the observer.

Additionally, the decision to interview in Chichewa was partly made by acknowledging my annoyance with the seeming inability of students to speak their minds and articulate their thoughts or even be comfortable communicating directly with adults. The extreme inhibition demonstrated led to me questioning the ability of the students to be empowered in the way I had hoped. I assumed a limitation of their intellect and perspective, which was detrimental to my objectivity as a researcher. As a result of expressing this, the translator began to summarize and or repeat what the student said to ensure comprehension on the recorder, at the very least. However, at some points in every interview, I was still convinced that some participants did not understand, even when the questions were translated.

## **Comprehension of questions by participants**

Asking clarifying questions, repeating questions, and rearranging and/or rephrasing questions were regular occurrences due to participants' lack of understanding of the questions and the adjustment with translation. For example, the community impact question was rephrased for greater clarity from *"How do you think access to the information/ content in the digital library can be used to help your local community?"* to: *"What would happen if your mom, dad, local friends had access to the computer lab the same way you do?"*. Generally, after the Consent Form was signed, the students needed 2 - 3 questions in Chichewa (versus thinking answering in English was required or sufficient) to get used to answering the questions thoroughly. They began to answer naturally by question number five or six. Due to the need for greater question comprehension support, here are a few follow-up inquiries we made throughout the interviews:

- "What is your view of your country?"
- "What recommendations to schools/teachers?"
- "Can the non-students benefit from RACHEL?"
- "What was your relationship with technology before RACHEL came to your school?"
- "What did you think about the pictures?"
- "What would change if your mom or dad or the shop owner or street worker had access to the RACHEL library?"
- "If you had access to all the schools in your home, what would you search for?"
- "What do you want your president to know if he could read our report?"
- "Do you want all girls to have access to a digital library, and why?"
- "Is there any difference in the female students?"
- "What is something new you have learned about Africa?"

Approximately 4 to 5 follow-up questions were asked in every interview and more consistently regarding the future-based questions to get more feedback on the images in PowerPoint. Further, adjustments were made as we were introduced to queries once we saw the participants were struggling to respond. For example, we skipped a question due to the inability of students to grasp the concept or if the inhibition of students prevented them from getting in-depth answers or answering on time. Due to the level of probing for comprehension, we also considered that comprehension issues also affected the data quality. In retrospect, I should have regarded them as pre-interview test questions to get feedback from a small sample of participants to make the research questions less complicated and easier to comprehend for most interviewees.

## **Data Analysis**

### **Thematic Analysis**

This study uses thematic analysis to emphasize finding common thematic elements across participants and incidents. The basic function of the thematic data analysis approach is to organize and simplify the complexity of the data collected into meaningful and manageable codes, categories and themes (Peel, 2020). In this study's thematic data analysis approach, the data collection and preliminary analysis occur iteratively to provide potentially a rich and detailed, yet complex, account of data (Braun & Clarke, 2006). The proposed data collection and analysis process was drawn from predominantly Braun and Clarke (2006), who offered a six-stage data collection and thematic analysis process that includes (1) collecting, (2) engaging with, (3) coding, (4) generating the code categories; (5) conceptualizing the themes; and (6) contextualizing and representing the findings. I followed this process exactly. The transcripts unlocked my understanding of the totality of data captured. Reading transcripts several times before coding allowed me to connect my researcher notes to moments in the conversations with participants that were previously unclear, and it helped me to understand the context for pieces of

the observations and translated answers I was privy to in certain pivotal moments. Overall, reading transcripts them several times motivated me to take on the enormous task of coding that followed.

## **Coding**

The coding stage began by identifying extracts of significance in the transcripts and generating initial codes. At this stage, I relied on my interpretations of the data and inferences about what the data said about instances. The codes developed helped me identify patterns of meaning in the data, inspired by central organizing concepts (Clarke & Braun, 2017) drawn from my research questions and the repetitive ideas that seemed to thread through the transcripts. The analysis involved identifying codes to give meaning to the data extracts so that the codes grew from the transcribed data. This inductive method was preferred rather than coding from a developed priori template of codes constructed to form expected answers to the research questions (Crabtree & Miller, 1999; Fereday & Cochrane, 2008).

My list of tentative codes expanded as the data was reviewed and re-reviewed (Creswell, 2013). Because this case study was exploratory, the inductive coding method guided me to focus initially on what the participants said, and the descriptive notes identified the underlying ideas and assumptions. During the creation of the code list, it was essential for my recollection and consistency of coding all of the transcripts in uniform to develop relative and memorable code labels and to write comprehensive descriptions to represent the codes so that the connotations associated with each of the codes were made clear (see Appendix J - *Delve Coding Results*)

Code labels represent the data analytically and come from the actual words and the behaviors signified in the data. For example, the code "*I have developed new skills*" describes a subject (teacher or student) acknowledging personal and/or collective acquisition of a new

ability. While reviewing the data transcripts, I focused on chunked sections of the data as the extracts (typically comparing answers to the same questions from different participants in the same forms (grades) but across schools) and questioned— "What is this about?"—before assigning a provisional code. However, most extracts were assigned multiple codes. For example, during the Form 4 interview at Bembe CDSS, in response to the question, "How has your access to the digital library impacted your view of your country/ Malawi and your continent, Africa?", participant 4.1 commented: "*I have learned that Africa is developed.*" Drawn as an extract from the transcript, this comment received several codes, including: *Embracing change* - as it showed a welcoming shift in life/culture/habits of self or others, *I can do well in Malawi* - indicating thought that Malawi is a country where their life can be improved, and *Positive about Africa/Malawi* – indicating the general outlook on the continent and country is encouraging. This overlapping approach to coding was required to help capture sentiment and context where the transcript did not. As such, the data analysis process required the transcripts to be reviewed many times. New codes emerged throughout the data collection and analysis. Once all the transcripts were initially coded, a code list of 116 codes with clear code descriptions was established. A final review of the transcripts reassured me that a point of saturation was reached as the coding seemed to become repetitive and fewer outlying comments required the creation of new codes.

### **The Data Analysis Software - Delve Tool**

The qualitative data analysis software called Delve was used to separate words, extracts called *Snippets* in the software, patterns, or recurring responses that stood out for later analysis. The Delve software provided a vehicle for manual highlighting and electronically organizing the qualitative data generated by this case study. Delve is a code and retrieve research tool that

provides a convenient way to build the codebook and review the case interview transcripts. The complex links within the coded data could be explored further using the Delve tools to identify patterns. The reports generated from this database could be exported to the Microsoft Excel program, which provided a filter option to view the data in different patterns and alignments.

### **Generating Code Categories and Conceptualizing Themes**

The next stage in the data analysis involved categorical aggregation (Creswell, 2013), which presented an opportunity to address the first research question. I reduce the codes and generate the code categories at this analysis stage. A code category represents a collection of similar data sorted into the same place and enables me to identify and describe the characteristics of the category. By reviewing the extensive code list, the codes' descriptive statements, and the coded extracts to identify emerging patterns and correlations, I generated three code categories (Peel, 2017), each one representing the foundational interest of each research question. This enabled me to conceptually identify the interconnections evident in 1) how the participants talked about the type of impact the pilot/RACHEL made, 2) the access it may or may not have fostered and 3) factors that influenced commitment to maintaining and promoting use of the device. Subsequently, three data-generated themes and multiple subthemes laid the foundation for answering the research questions. The themes (RQ1: Impact on Attitudes, RQ2: Access to Resources, RQ3: Factors that Influence Commitment (to using /promoting digital resources) combined to represent the effect of digital libraries on teachers and students as they approached, facilitated, and socialized learning with and through the RACHEL devices. However, as these three themes were emerging within my analysis, the coding from the themes *Impact on Attitudes* and *Access to Resources* overlapped significantly. This resulted in a merger of these two into sets

of thematic findings: #1- Offline Digital Libraries Impact Attitudes and Access to Resources, and #2 - Visions of Personal & National Life Influence Commitment to a Digital Future

### **Contextualizing the Data to Represent the Findings**

The interpretations of the data (and informed by the literature) will be presented in Chapters 5 and 6 and then contextualized to address the research questions in Chapter 7 to associate networks the participant generated via the presented three themes. In this final stage of data analysis for the case study, I will interweave the data supported by interview extracts, pilot secondary data and research notes to apply the findings.

### **Validity Checks**

Concerning validity, the goal was to ensure a plausible causal argument rigorous enough to support the research results. Accordingly, multiple sources of evidence were used, data triangulation was executed, and a logical chain of events was defined (Quintão et al., 2020).

### **Multiple Cases & Thick Description**

Nonetheless, there is no assurance that data from interviewing one person tells the whole story. In contrast, data from different interviewees referring to the same issues provided a much broader picture. They enable the interviewer to cross-check and compare the data. As five community-day secondary schools in differing regions and conditions in the country are part of the study, it enabled a broad view of the phenomenon. It offered an opportunity for inconsistencies to be seen.

Thick description builds up a clear picture of the individuals and groups in the context of their culture and the school setting (Holloway, 1997). Focusing on writing/collecting Researcher Notes from entry to exit of each research site and recording the circumstances, meanings, intentions, strategies, and motivations helped to interpret better the characteristics of the description given in the collected interviews (Schwandt, 2001).

### **Triangulation**

Creswell and Miller (2000) defined triangulation as a validity procedure in which researchers search for convergence among multiple and different sources of information to form themes or categories in a study. Fusch et al. (2018) refer to the importance of using different data sources by conducting interviews with multiple participants or archive sources. Intentionally, the study asked different people about the same issues (hoping that certain patterns would emerge) to improve the quality of interview data. Meijer et al. (2002) recommend additional data sources (e.g., data collected from different persons, at different times, or from different places), using different methods (e.g., observation, interviews, documents, etc.), and this was the procedure of this study.

### **Saturation**

In qualitative studies, saturation requires a researcher to collect data from informants so that no further information can be collected, assuring the validity and credibility of information for the study while saving researchers' time and energy in avoiding collecting the same data (Mwita, 2022). By the fifth set of interviews, the transcripts data seemed repetitive as few outlying comments from the earlier responses validated each other— which is the hope of my analysis process.

### **Limitations**

Before conducting the study, I envision any limitations from situations outside my control to be addressed to decrease them (hypothetically) in the study and (practically) for future studies. As such, some of the limitations were,

(1) *Lack Of Previous Research Studies on Digital Education Tools in CDSSs*: Citing and referencing prior studies constitutes the basis of the expected literature review and provides the theoretical foundations for the research question. However, research studies relevant to my thesis

are limited. As a result, I focused on using the offline library as a tool for its functionality and used similar rural settings outside of Malawi. This helped to close the literature gaps but reiterated the need for further development in the area of study is an important opportunity,

(2) *Time and Participant Constraints:* The 10-day window in Malawi to collect data was short and made the effort intense and tiresome. My dependency upon the availability of Peace Corps Malawi staff to use as navigators and translators ensured a commitment to the outcome. Though I coordinated this research in parallel with their Monitoring and Evaluation visit, I used the same pool of participants and had to respect their time and availability. The length of my interviews was not affected and being a former staff and familiar with the schools from my initial work with the pilot helped to confirm my ability to navigate the setting with ease.

(3) *Conflicts From Personal Bias:* I am still concerned about my perspective as a researcher, and bias based on my background and perspectives on certain social phenomena affect the study's validity. Though I attempted to create neutral interview questions and committed to a consistent data-gathering process, my Researcher Notes capture elements of my real-time observations of my conflicts as a person as a former resident of Malawi and former staff member of Peace Corps Malawi.

(4) *Receiving Data Indirectly:* The requirement to use a Chichewa translator during the interviews and then have the recorded interviews transcribed from Chichewa to English, put two layers of interpretation in front of my access to the data. The translator rephrased the questions in response to participant need and the transcriber/translator interpreted what the recordings said, but I believe some of the subtle comments and context may have been lost and/or responses over simplified due to the transcriber's own assumptions of what was important to note. As a result, I feel the data is diluted as it was not fully collected or understood from only the researcher's lens.

## **Conclusion**

This chapter outlined the methodology employed to investigate the impact of offline digital libraries on rural Malawian secondary schools, anchored in an exploratory case study design. The qualitative approach, guided by Afro-futurism and self-efficacy theory principles, prioritized depth and flexibility to capture the lived experiences of teachers and students interacting with the RACHEL devices. By adopting purposive and voluntary response sampling, the study engaged five Community Day Secondary Schools (CDSSs) participating in the Peace Corps Malawi pilot, ensuring alignment with the research's focus on under-resourced educational contexts.

Data collection relied on semi-structured interviews, supplemented by secondary data from pilot surveys and researcher notes. The iterative process allowed adjustments during fieldwork, such as integrating visual aids (Afro-futurism imagery) and rephrasing questions to enhance participant comprehension. Challenges, including language barriers, participant inhibition, and logistical constraints, were mitigated through collaborative translation, triangulation, and thick description, reinforcing the validity of the findings.

Thematic analysis, facilitated by Delve software, enabled systematic coding and categorization of data, revealing emergent themes tied to the research questions. Rigorous validity checks—such as multi-source triangulation, saturation, and reflexive practices—underscored the study's credibility. While limitations, including time constraints and the novelty of the research topic, posed challenges, the methodology's adaptability ensured robust data collection.

By grounding the study in qualitative inquiry and iterative reflection, this chapter establishes a methodological foundation that honors the complexity of rural Malawian educational ecosystems. The insights generated through this approach will inform the subsequent

analysis and discussion, ultimately contributing to a nuanced understanding of how digital libraries can empower future-oriented learning in resource-limited settings.

## **Chapter 5: Thematic Findings 1 - Offline Digital Libraries' Impact on Attitudes & Access to Resources**

*I have gone digital*

-Teacher, Ntonda CDSS

### **Impact on Attitudes on Teaching and Learning**

This research project aims to study these two questions:

- How do offline digital libraries impact attitudes toward teaching and learning in Malawian CDSSs?
- How does accessing resources through offline digital libraries affect female teachers and students in rural communities in Malawi?

As such, this chapter elaborates on the types of attitudes that were impacted, how they were impacted, and to what degree by providing insight on the influence of digital offline libraries in rural Community Day Secondary Schools. I will closely examine perspective shifts in school and community culture, and behavior changes.

### **Perspective Shifts in School & Community Culture**

The introduction of new technology affects the patterns of life in the environment in which it resides, and that is the intent. For these rural communities and their Community Day Secondary Schools, the general exposure to RACHEL, and their individual and collective awareness of its function and contents, truly challenged views on long-standing assumptions about education and the school as an institution. The outcome of this confrontation with new approaches and ways of understanding education sets the stage for additional layers of impact and how to maintain them.

## **Optimism about Education & Attending School**

As expected, student interviewees had positive sentiments about school as a place they need to attend, characterized by an increase in enrollment, as reported by several Head Teachers shortly after the pilot launch and the arrival of their computers. As students who have access to the digital library share their experiences, they inspire others to get interested in education. This led to an increase in enrollment as more students were drawn to the opportunities the digital library provides. Even students who once transferred to private schools are now returning,

*This has helped a lot because, at first, students transferred from this school to private schools, but now the school has a lot of students because of the digital library. As I said, my focus has changed because I can now access information quickly.*

-Ntonda Form 3

The school's population has increased in addition to student attention to their education. Additionally, students shared that some students who had previously dropped out returned, motivated by the availability of computers and the resources offered by the library. The availability of RACHEL and improved access to information has attracted more students, as they see the improvements in education and resources.

Students emphasize impact of the digital library on their personal motivation as they found excitement and motivation in the variety of content available in the digital library, which makes them more eager to attend school, like this Mkaika Form 4 student,

*I love sports, and when you search the digital library, you will find many sports like badminton, football, and netball. Sometimes, when I lack the motivation to go to school, I still go because I look forward to watching some sports at the digital library.*

The presence of the option to explore personal interests has contributed significantly to the student's positive outlook on school. It is encouraging that students explore individual interests via the RACHEL device versus solely academic information, as it is an important component of the sustainability of their interests.

### **Enthusiastic About Spending Time with Peers**

Conversation with participants show that students hold optimism about education and more interest in attending school as RACHEL facilitates better interactions with their peers and teachers. The students spoke about their relationship with each other. RACHEL brought them to learn with each other and interact more. Although some students felt they have less access to RACHEL, not being able to enjoy the privilege of using the technology, many of our interview participants shared the positive impact of the group learning experience. They are inspiring each other and challenged by each other, as evidenced by this student from Ntonda Form 4,

*This has helped my relationship with my friends in a way that some of my friends did not see the benefits of being in groups like this one has said so that we can discuss things. The digital library's coming has attracted my friends to group discussions and made them aware of the need to help each other get more information from the digital library. These are both male and female friends.*

Initially, uninterested in group discussions, the introduction of the digital library has encouraged students to join discussions and share information, improving collaboration among both male and female peers. The use of the digital library has fostered a sense of togetherness, as interacting with others while using RACHEL has made the experience more enjoyable. Sharing knowledge and experiences has deepened connections with peers, enhancing the overall bond between students. The disparity in ability and access to technology and its resources is an interesting reflection and highlights an ongoing and evolving in-cohesivity in learning.

Student relationships with teachers have also improved over time, as the students initially felt fearful of teachers, but now they interact confidently with them due to the realization that building a strong relationship is essential for achieving their educational goals. Teachers also talked about the shift in how students relate to them. Specifically, instances where teachers and students disagreed on ideas, especially when students had access to resources the teachers were

not aware of. However, the digital library has allowed both parties to search for information together, which fosters mutual understanding and agreement, as shared by the following teacher from Namasika,

*The issue comes in because maybe the resources from which you are taking information differ, and you have different ideas. But then, with the digital library, you can have a consensus because you search if they read ahead of you before teaching, and you will be singing the same song.*

The resulting stronger teacher-student relationship has increased the teachers' confidence in their knowledge and reassures students that their ideas are valid. Teachers are better equipped to address students' concerns and approach them with knowledge they have discovered together. Additionally, students actively approach teachers with questions, especially when they encounter challenging topics, and teachers and students engage in meaningful discussions. Teachers also provide valuable insights that complement the information students have found. Further, students acknowledge the challenge of the disparity in access for teachers and students (due to mainly the time for access and the level of commitment to using the digital resource). Students have noted motivating teachers to be more proactive in their engagement with the tools, highlighting the lack of confidence in teachers' abilities. Overall, the digital library has encouraged a collaborative and supportive learning environment, leading to better communication and relationships in the classroom.

### **Intrinsic Encouragement for Working & Learning**

Both students and teachers demonstrated more motivation to learn and work. Students showed an awareness and appreciation for having access to digital resources, seeing them as an investment made specifically for them, and reciprocally, they committed themselves to using the resources for their benefit. They also showed an interest in exploring the new knowledge

available to them and encouraging each other by learning new information. Additionally, access to information has inspired improvements in personal habits, as expressed by this student,

*The availability of information has led people to start dressing well and also to generate electricity.*

-Namasika Form 3

In response, there is a stronger commitment to and excitement for education. In a rural context where positive academic outcomes are scarce, the presence of digital innovation has shown to be desirable and helps to promote a long-term commitment to educational achievement and interest. An interesting reflection has been the level of effort, awareness, and ability that individual students have seen in their peers (i.e., appearance and productivity) and the comparison from where they were academically to where they are now.

Meanwhile, teachers spoke often about individual student interactions that underscored a new level of motivation among students. They highlighted a noticeable improvement in the relationship between students, teachers, and the digital library. Students now actively seek access to the device, often approaching teachers to ask for permission to log in, keen to work independently, and when difficulties were encountered, they proactively brought the laptop to teachers for assistance, captured here by the teacher at Ntonda CDSS,

*When they don't understand, they bring the laptop back to you. They say: 'Oh please, can you assist me with these? I have been trying to understand these, but please, can you explain it a little more so that I understand?'*

This collaborative learning fostered a strong connection between teachers and students, enhancing educational performance and the overall relationship which has become much more interactive and supportive. The comments of students indicate a cultural shift toward student independence and their inherent motivation to explore digital materials, embrace their education and their responsibility for it. Fortunately, teachers did not indicate that they felt they were

threatened or need to undermine the evolution of the new student/teacher relationship. However, some teachers noted a macro-level concern that student independence can threaten teacher employability as they might lose their jobs by a low desire to understand and facilitate their own learning of future learning resources.

### **Digital Tools Enhance Access to Educational Resources**

Most of the Malawian educators were born and raised in a society where gender norms and roles were strictly enforced and expected to be maintained. Their own educational experiences and personal lives reflect the structures within which they are used to operating. Nevertheless, there were positive expressions and an openness to a challenge to traditional gender beliefs noticed from teachers, like this teacher from Meru shares,

*Previously, the perception of technology to gender and culture was that technology was mainly for males, not females, but that has been removed with the coming of the digital library. People view this as now it's for gender equity. Both males and females stand on the same platform to perform the same functions, so that perception has changed. It has put both boys and girls on the same platform.*

The arrival of the digital library has significantly shifted perceptions about technology, especially in terms of gender and culture. Previously, technology was viewed as something primarily for males, but now, with the digital library, both boys and girls are seen as equal users, performing the same functions and having access to the same opportunities.

In addition to gender, the digital library has proven that education and personal development are not limited by ethnicity, or culture, as ethnicity and the common stereotypes of ethnic beliefs and abilities are mitigation factors in Malawi. A teacher from Namasika CDSS spoke specifically about the Yao community, which is traditionally Muslim. The participant once believed that people from their Yao ethnic group could not achieve great things in education,

*Before now, I used to think like many things that, for example that here at our Yao side, no one can go far with education or there is no one who can do great things with education which many think so. But by using digital library I have seen a lot of examples*

*of people and these did not come from one ethnic group. They were from different ethnic groups and yet they made it, they made their dreams come true. So why not a Yao person, why not anyone? So it made me realize that ethnicity, gender or culture doesn't matter when it comes to developing yourself or when it comes to education. You can do whatever you want to do irrespective of where you are coming from, your gender, or your culture.*

Thus, by using the digital library, teachers discovered numerous success stories from people of diverse backgrounds, realizing that anyone, regardless of ethnicity, gender, or culture, can achieve their dreams through education. Namasika is in the Southern District of Malawi, which has a large Yao population, thus it is significant that exposure to more digital educational resources has helped in addressing the obstacles that may have hindered these communities in the past.

Teachers also noted further that if digital libraries continue to be accessible, there will be a significant change in Community Day Secondary Schools, as they will no longer face the disadvantage of limited access to information compared to private schools. Historically, CDSSs have underperformed due to this lack of resources, but the digital library is bridging that gap. It serves as an eye-opener for both students and teachers, as it brings urban-level resources and learning tools to rural areas. A teachers said:

*This digital library is an eye opener to these learners as well as teachers because the things that were present in town nowadays are going rural, so we can learn and students can learn from these computers, and there is no difference between rural area and urban set-up nowadays.*

- Bembe Teacher

The fact that students in rural areas can now access the same information and opportunities as those in urban schools is helping with leveling the playing field and fostering equal educational growth. Teachers believed that education is for everyone but there are practical barriers in education, specifically those between private and public or government schools, and the differences in resources and teacher training for both rural and urban schools which are systemic

factors in Malawi. They acknowledge that the capacity of any learners can be raised via adequate resources, and this was an inspiration to teachers.

### **Technology can be Productive and Not just a Distraction**

Another perspective shift the participants reported are the belief that technology is only entertainment. The reflections from teachers indicate a significant shift in understanding technology and its contents, and its multiple applications for education. Particularly, for smartphones, as a mobile resource so accessible in the developing world and flexible in their capacity, can be enhanced with additional digital tools, with applications for them beyond entertainment and set the stage for more innovation use in the rural school setting.

Participant teachers shared that before the digital library, smartphones were mostly seen as tools for social media or making calls, but the use of the digital library has completely changed this perception. People have realized that smartphones can be powerful tools for downloading information, allowing both teachers and learners to use technology more effectively. In the past, seeing a child with a phone might have raised concerns about them using it for non-educational purposes, but now, there is a shift in thinking. Smartphones are viewed as valuable learning tools, and teachers are now encouraging students to have phones, as they can access educational resources,

*Before the coming in of digital library we only knew that maybe smartphones were for logging in on WhatsApp and other minor things or calls only. But then later we were able to know that we could even download a lot of information using the same smart phones so we graduated from the level where we were. We were able to know a lot; we were able to use technology in a much better way and in a manner that could assist both teachers as well as our learners, yeah.*

-Ntonda Teacher

In sum, the digital library has altered the way people perceive technology, moving away from the idea of it being just for entertainment, to recognizing its educational potential. Teachers and

students now share knowledge and skills more quickly, with teachers encouraging the use of digital library resources instead of carrying multiple books. This has fostered better learning, with students engaging in discussions and exercises while teachers monitor their progress. Teachers also identified some exposure limitations regarding the range of technology and technological applications understood so far. However, one of the fascinating and efficacy-based conclusions teachers came to, is the sheer quantity of resources that were available in the digital libraries and the ability for them to access several libraries at one time in a tiny and a convenient location (i.e., with their smartphone and without the cost of data). The introduction of digital libraries is showing that technology can be a powerful tool in education, especially for remote access to books, information, and study materials, as shared by this teacher,

*Before the digital library, I think we used to view technology as if it only applied to somebody using a computer somewhere or in the banks. It can only be used in the banks. It can only be used somewhere else, in research and life. But then, with the coming of digital libraries, I think there is a difference. We can say that another aspect of technology can also be used here in schools, especially remotely, to assist our students with access to books, information, and other studying materials.*

The digital library has changed the way technology is perceived, revealing that tools like phones and computers, once seen as disturbances, are now recognized as valuable educational resources. With its wealth of educational content, the RACHEL device has enhanced teaching and learning, proving that technology can support, rather than hinder, education.

### **Technology is Valuable and Should be Safeguarded**

Related to the newly developed value for technology by teachers, students acknowledged the cost value and important outcomes of their use of RACHEL by expressing a need to protect technology. Individual students noticed an increasing interest in their studies, valuable career guidance discovered, a recognition of the importance of technology in business, etc. and therefore emphasized the need to take care of the digital library equipment. As a guidance for

future students, they recommend using RACHEL responsibly so others can benefit from them too. This student from Bembe Form 3 made it clear to other students that,

*They should be serious when using the library, not be playful, to learn much from it.*

Other students suggested that clear rules and guidelines should be in place for using the library and its equipment, urging users to focus on academic work rather than using it for recreational purposes. They also advocate for a supervisor to ensure the library is used effectively. A Bembe student adds,

*Tell them how to effectively use the computers and other gadgets so others can use them in the future. There is need for a supervisor of the library facility. They should devote time to academic assignments besides hobbies. - Bembe Form 2*

Overall, teachers and students believe the digital library has significantly improved education by providing easy access to essential information and resources,

*The digital library has supported our community by providing valuable resources to learners, especially when families and the school could not give them. In appreciation of this, we are working hard in our education to make the most of these opportunities.*  
-Mkaika Form 4

For students, the value of technology lies in the opportunity for gains in their career and the explanation of the current and practical realities of today's life, such as understanding the barcode. However, as it was traditionally understood, students see the material value of the equipment, the rarity of its presence, and the need for it to be protected.

### **It is easier to teach**

Teachers predominantly reported that RACHEL makes their work easier and less challenging. Teachers expressed how the availability of learning resources has benefited their work and the learning experience of students. The digital library has provided readily available, well-organized information, which has improved both teaching and learning. Previously,

teachers struggled with gathering scattered points from textbooks, but with the digital library, they can easily isolate key information, making lesson preparation more efficient and effective.

A teacher from Meru CDSS shared,

*Presently, the digital library has inspired me, and it has made my work interesting. Teaching has become a pleasure, unlike when I used to toil the whole night trying to search for information from various books and summarize. But this time, I can easily access information digitally, sometimes even compare notes with other books, and it's easy. In the future, how I look at it will be even more interesting and assist me more.*

As it is noted, the digital library has benefited the teachers by simplifying their work. Before its introduction, teachers had to spend significant time searching for information from distant sources, which made teaching more challenging. Now, the digital library provides instant access to data, transforming the teaching process and making it more enjoyable for educators. The availability of easily accessible information has also led to increased engagement from students, who are more interested and focused on their studies.

Additionally, the participants highlight a shift in how teachers view their work. Teaching has become more fulfilling, as the burden of searching for information and creating notes is now alleviated by the digital library. Teachers can compare notes, access information quickly, and focus on delivering more effective lessons, making their work both more efficient and enjoyable. The digital library has also improved the relationship between teachers and students. With easier access to information, students are more inclined to approach their teachers for further clarification, leading to better communication and a stronger connection between educators and learners. This increased interaction has positively influenced both teaching and learning dynamics.

The teachers also focused on the difficulty of teaching without resources. One teacher touched on the concern about the accuracy of the books they were using previously, which has

been alleviated, and that their interest in their profession is growing. In the past, conducting practical lessons, such as in the chemistry lab, was expensive and difficult due to limited resources. However, the digital library has provided a cost-effective alternative by offering digital simulations and materials that make practical lessons more accessible. This teacher from Namasika shared,

*I think digital libraries will make accessing materials, notes, or demonstrations of practicals easier. In contrast, today, it is difficult for them to do that because in settings like this, once we operate, for example, the chemistry lab, it is the most expensive, and we can't afford to do that. So, I think using digital libraries can help solve such problems.*

The use of multimedia lab demonstrations has also enhanced learning experiences. For example, a lesson that incorporated a video passage allowed students to listen and watch simultaneously, which helped them engage with the content more effectively. This method was successful because students found the use of laptops more engaging than traditional books, particularly when answering comprehension questions.

The digital library has also made lesson planning and delivery much easier. Teachers can upload materials and assignments onto laptops, allowing students to access the content independently or in groups. This approach reduces the need for constant direct explanations, as students can work through the materials themselves and return to the teacher for clarification if needed. The impact extends beyond lesson preparation. Teachers now have digital tools, like Excel, to record and sort student marks more easily. This has simplified administrative tasks and allowed teachers to focus more on their primary role of educating students. The digital library has also facilitated the use of past examination papers for practice, which has led to improved results for students. Group discussions based on these papers have further strengthened the students' understanding of exam techniques, ultimately contributing to better academic performance.

In summary, the digital library has made teaching easier, more interactive, and more effective. It has provided access to valuable resources and tools that were previously difficult to obtain, improving both teaching efficiency and student engagement. It has improved access to information, simplified administrative tasks, fostered collaboration, and led to better student outcomes.

### **Support in Facilitating Learning at School**

The benefits teachers experienced lead to their overwhelmingly supportive of integrating the RACHEL device into their classrooms, so much so that they posed no objection to the administration's recommendations to allow students to bring phones into school, as what happened at Mkaika CDSS,

*We have never allowed students to bring their phones to the school campus, but when the administration was approached a while ago, it gave a green light that the students can be given a chance for special days to bring their phones so that we widen the number of students who can be accessing information on the digital library.*

-Mkaika Teacher

Further, there is an overwhelming sense of appreciation for the variety of content that supports different approaches to education and study, especially the STEM-centered subject area, as in the case of this teacher from Meru,

*I teach Biology and Agriculture, but mainly for agriculture. Information obtained from the digital library has improved and eased my work so much that learners show improvement.*

Teachers in STEM subjects have noticed significant improvements in student performance due to the ease of accessing relevant information from the digital library, which has streamlined their teaching process. Additionally, the study cycles (periods of school that allow for unstructured class time) at the school have become highly popular, with students eagerly collecting laptops to

continue their studies. This shows that the digital library has sparked greater interest in learning, as students are now more motivated to continue where their lessons left off.

### **Value for Personal & Collective Acquisition of New Abilities**

Students and teachers both highlighted the digital library has enhanced the development of specific skills connected to career development in a variety of professions and exposed them to potential pathways that were seemingly unavailable before. Relatedly, participants noted making significant progress in developing valuable digital skills. Initially unsure about typing, participants noted becoming proficient in more advanced computer programs. A student from Mkaika CDSS in Form 3 specified,

*It helps me to type on Excel and so on because at first, I didn't know how to type. I learned to use Adobe photo-shop.*

Through computer studies, particularly programming, students gained an understanding on how applications are created and how devices connect. The digital library has played a key role in enhancing their typing, and it has also inspired their business aspirations. With new technological tools, students and teachers developed a personal connection to the tools needed to be successful in more technical fields (i.e., computer programming and business management).

A student from Mkaika CDSS in Form 3 specified,

*I want to be a businessperson, and the digital library has helped me realize that I can use technology such as spreadsheets to do business calculations to assess whether I am making a profit or a loss.*

The development of new skills also results in confidence building, as students report improved performance and confidence with hands-on applications in a non-threatening environment (Spring, H., & McCluskey, C., 2013), especially when the skill is deemed as relevant to and envisioned as needed in the future. A student said:

*Before creating the digital library, we did not know how to navigate the internet. Now, as students, we know how to use the internet because of the coming of the digital library. If this initiative continues, things will be suitable for the next generation.*

Traditionally, there is a deficit of essential technical ability in most rural Malawian teachers. The environment has traditionally not inspired the teachers' development of these technological skills as there is no mandatory or day-to-day application. As such, there has been a significant attitude shift, introduced by RACHEL, as individuals once struggled with typing and felt disconnected from technology, are feeling empowered by the availability of computers and RACHEL in the institution, which has sparked an affection for technology, making their work more enjoyable, as this teacher from Bembe CDSS specified;

*Previously, I had problems even in typing. You know these technologies are coming at a time when we are old. Still, the presence of these services in the institution has invigorated me to love technology because I can access them whenever possible. The presence of the computers and the library service is so good to me.*

The teacher participants now actively use email, something they did not do before, and gained confidence in using laptops, which were once unfamiliar. Professionally and personally, teachers made notable progress, as tasks like preparing student assessments are now simplified through typing and printing, and they now prefer using a laptop over traditional pen and paper. Overall, they feel a sense of growth and have fully embraced the digital world. As a result of regular application and integration of the RACHEL, the increased comfort of working with technology has made work for teachers and learning for students easier and more enjoyable.

### **An Encouraging Outlook on Africa/Malawi**

Exposure to RACHEL has translated into the belief that the country's future has improved. The digital library's supply of information and tools indicated to participants they are getting closer to a future comparable to the world outside. The introduction of digital library has broadened individual views, allowing them to compare their country, Malawi, with other countries. They

now recognize the potential for growth in Malawi, especially if digital library services were made available in more schools.

*We can do great things while in Malawi and develop the country. - Ntonda Form 4*

The access to global resources in RACHEL has provided a sense of confidence in the possibilities within their own country, as expressed by this Meru Teacher,

*Having access to the digital has impacted my view of my country Malawi in the sense that now, I am able to differentiate with other countries. I am able to see what other countries are doing so now I can also see potential that is in Malawi if we can make this service to be rendered in different schools, many schools, you see there is a lot of potential in Malawi, yeah that's my view.*

Students also note a shift in perspective regarding the value of education. In some local communities, there is a belief that wealth cannot be created through education, and people tend to seek opportunities in countries like South Africa. However, the digital library has helped strengthen the realization that significant progress and development can happen within Malawi itself, proving that they can create wealth and achieve success without leaving the country. Additionally, the students observe a positive shift in Malawi's technological landscape, particularly in schools,

*I have seen that Malawi has improved in terms of technology. For example, the presence of computers in schools like ours. -Mkaika Form 3*

The presence of computers and other technological advancements suggests to the participants that Malawi is moving forward in terms of tech development, which is seen as contributing to the overall improvement of the country.

### **Embracing Change in life, Culture, and Habits (of Self or Others)**

Overall, students and teachers have similarly acknowledged that embracing change contributes to a positive impact on teaching and learning and enables a shift in culture.

Participants noted the introduction of CDSSs brought about significant realization in how learning is to be approached. In the past, information was primarily shared in the classroom, with teachers as the central source of knowledge. Now, the digital library has expanded access to information, making learning more inclusive and interactive. Students no longer rely solely on teachers but can actively participate in research, ask questions, and collaborate on finding answers. This shift echoes optimism about the global development in technology, with computers and smartphones becoming essential tools for education worldwide. The digital library offers endless opportunities for learning, helping individuals develop the skills they need to achieve their dreams, and for building a promising future. A teacher from Namasika CDSSs offered,

*The digital library gives me some, and the future seems more promising. With a digital library, you can achieve whatever you want because you can learn every skill you need. So, I feel like with that, you can achieve whatever you have been dreaming of because you would have information, develop skills, and be exactly what you wanted to be.*

Student comments spoke to the core of social development introduced by RACHEL, that is, it is changing the institution's culture and declaring it in a better way is possible. Their observations on RACHEL bringing in inclusivity spoke to the general conditions of the country, reflecting a large amount of ethnic engender exclusivity in the past being changed. For teachers, the change was typically reflected in the role of students in the classroom - going from one of the dependent to independent, and teacher's role moving from a gatekeeper to a facilitator of access to information. Teachers also showed an interest in the opportunity to rethink their potential, seeing openness to change is a catalyst for enhancing impacts in their own learning and development.

## **Behavior Changes**

After teachers and students were introduced to digital educational tools, their behavior shifted alongside their perspectives. Increased engagement with interactive content and accessing a broader range of materials alone was a catalyst to spark new patterns in participants' behavior overall and day-to day.

## **Commitment to and Focus on Education**

The digital library has significantly impacted the individual's focus on education, helping them overcome challenges where they were previously struggling. Given the social and financial barriers to rural student/family investment in education, student participants expressed that they recognized the value of education. Students reflected on the transformation RACHEL brought to them to learn and personal belief in their potential while still in their current, overwhelming, challenging circumstances, like this Form 2 student:

*I was failing in mathematics, so when I started to use a digital library, I found solutions to my problems. So, I have seen that it is good to be educated. That's why I have changed my mind about stopping to come from school. I am today at school.*

By using the library, students found literal and intrinsic solutions to their problems and realized the value of committing to their education, which motivated them to stay in school and continue learning. The experience has fueled a strong desire to keep learning and has encouraged hard work, and a growing confidence.

## **Improved Academic Performance and English Language Ability**

Due to the nature of the device's content being English-centered and the emphasis on learning English in the Malawian curriculum (as a second national language and tool for access to the global economy), it was natural to assume English language development would be a valuable factor in the use of RACHEL. Indeed, English language improvement was noted by students,

*English. I have found that how can you pronounce some words and how can you answer a comprehension question. - Meru Form 4*

*It has helped our education by showing us many things we didn't know before. For example, English phrases. - Bembe Form 2*

Students have found that digital content, such as videos, helps them understand and pronounce words better and improves their comprehension skills. Having videos and audio resources to hear regularly native speakers, specifically in areas of study like the sciences, helped to promote and clarify global fluency in their English language skills. However, the pace of the videos can sometimes be too fast for some students to fully grasp the material. Participants adjusted by slowing down the videos so that students and teachers could analyze and follow along more effectively.

Relatedly, an Ntonda teacher's reflection on educating students on the classic writings of Shakespeare was a fascinating look into the prioritization of Western historical thought and cultural staples, and English as a tool for the promotion of Western culture in Malawi,

*When teaching English, especially literature, I have been assisted a lot by the digital library, especially when I was teaching the play Macbeth, I could refer my students to go and maybe look for information because, you know, when you are teaching Macbeth it is in Shakespearean English so when you go into the digital library it has been simplified because some explanations make it easier to understand to my students so it has assisted me a lot.*

The teacher's comment, though gives RACHEL a positive light, also presents an opportunity for additional conversation around the need for more localized content and a potential shift to the classical writings of African authors from all over the world. Unfortunately, the teachers never mentioned this, as the teacher never questioned the necessity of the Shakespeare (or validation of its value in the community) as a requirement for students to learn.

Positively, students showed pride in the achievements among themselves and in their peers, particularly around standardized testing,

*I think that in the future there is an access to for learners to doing well in their subject or in the exams. For example, past years we never had 14 points but last year we had 14 points and that boy, that student he was also use this what these things [digital library]. That's means even next year after our year or next year after that means we must do better because of these things. I can see the future.*

-Namasika Form 4

Teachers also expressed the outcome of improving grades and test scores, like this Ntonda CDSS teacher,

*Our school has improved this year's MSCE [national exam] results. And we have been talking for the past two weeks about how these digital libraries have helped our students more, especially the Form 4, even the form 2, because we are almost on top of the country.*

These comments showed both pride and a sense of encouragement.

#### **Motivated to Look for Resources Independently**

Offline digital libraries are encouraged for Malawi as a solution to the limitations of brick-and-mortar rural schools. In addition to being a mechanism to help curb the slow development of education in rural spaces in Malawi, promoting independent, student-led/facilitated education using the foundation of digital tools is a key intent of this research. Participant teachers valued access to RACHEL for this purpose as it allowed for less pressure on them and more student-guided learning during class. Consequently, digital libraries have had a transformative impact on teaching and learning. It has shifted education towards more learner-centered activities, where students can access information independently, reducing the reliance on teachers for information delivery. This teacher from Meru CDSS adds,

*Previously, teachers kept information, but now, learners can access information on their own needs. This has promoted what we call learner-centered activities. As a result, teaching and learning have become less laborious, and learners can excel academically, even sometimes with very little facilitation from teachers from other countries; we hear that sometimes learners can even do it without teachers. They can study independently, write examinations, and pass very well.*

This shift to more learner centered learning has made teaching less labor-intensive and allowed students to excel academically, sometimes with minimal teacher facilitation. RACHEL's resources support collaborative learning, where students work in groups on tasks and challenges, further enhancing their academic performance. Notably, teachers describe model students who frequently visit the digital library are excelling academically, showing the positive correlation between regular library use and academic success. Teachers noted students often complement their lessons by studying in advance through the digital library, asking questions about topics they explored independently, as this Bembe Teacher explains,

*Learners can go into this digital library study room because of that interest. As they watch, they can study in advance while you are at least behind as a teacher. Now, what they do is if you teach, they complement, and they quickly ask.*

This proactive approach students take to learn has fostered a deeper level of engagement in the classroom, making learning more dynamic and interactive. The library's availability has made learning more accessible and personalized; with students taking ownership of their education and making the teacher-student interaction more effective and meaningful. Teachers acknowledge the gatekeeper role they have traditionally maintained in the classroom setting and how giving up this role has allowed for academic progress and enhanced the quality of their relationships with their students.

However, some interviewees expressed opposition to student independence, like this teacher from Ntonda,

*Maybe we should give them some limits. Tell them, say I want you to go and search for this information up to this point; don't go beyond that. I think that may assist us as teachers because if we leave the students to work on their own, maybe they can go beyond what they are supposed to learn, and then when it comes to examination time, performance may go down. Why? Because they have information that may not be of their level.*

Further, as a Ntonda Form 3 student points out that teachers should maintain their monitoring role on the students:

*Teachers should supervise students to make sure they are doing the assignments given at the digital library. They should also ensure the students behave correctly at the digital library because some may use the laptops for other purposes.*

Thus, there is also an opposition to students taking the lead in their educational experience.

Teachers' opposition centers on the belief that students may not be ready for the content they access and therefore it should be limited. This seems to have more to do with the need to ensure examination performance, highlighting how teaching to tests can confine an educator's understanding of the value and opportunity provided by digital education and education in general. It also points to the challenge for educators to see beyond their professional value and promotion (which could be affected by the students' examination scores), and their role as the gatekeepers of knowledge. For those students who want to avoid the pressures the school environment places on them, these offline tools allow them to guide their education in a self-assured and productive manner.

#### **Encouraged to Avoid Harmful Behavior**

Digital libraries have had a positive impact on students' behavior and motivation to stay in school. The engaging nature of the technology has helped students avoid negative influences and distractions, encouraging them to focus on their studies, as suggested by Bembe students,

*More youth should use computers so they can avoid mischievous acts. -Bembe Form 3*

*[RACHEL] has progressed well because when we could be messing around, we went to the digital library together to learn.” -Bembe Form 4*

By making learning enjoyable, digital libraries have contributed to a decrease in school dropouts, as students are inspired by their peers who are using technology to stay engaged in their education. In addition to academic benefits, digital libraries have also helped students connect

with their culture and improve their personal behavior. Through the resources available, students learn ways to preserve their cultural heritage and avoid harmful behaviors,

*This technology is more interesting to us. As a result, we avoid some of the bad things outside. We are interested in coming here to practice some things that will automatically help us. -Mkaika Form 3*

*It has encouraged me not to stop learning or to drop out of school because it is fun. -Bembe Form 2*

The testimony of students indicated powerful transitions in behavior, predictions for positive life outcomes, and sustained commitments to personal improvement and achievement. As the foundation for success lies often in the ability of a person to actualize their agency, these students have at least put up boundaries in their lives to ensure that they are on a path that will lead to positive outcomes. Overall, digital libraries have not only enhanced education but also positively influenced students' personal growth and decision-making.

#### **Assisting Other Students/Peers (In or Out of School)**

In every school, throughout every grade level, students showcased a culture of helping their peers. The use of digital libraries has fostered a sense of unity and collaboration among peers. As some students have become more proficient with computers, they assist others who are less familiar with the technology, creating a supportive learning environment. This exchange of knowledge has extended beyond the classroom, as peers who once lacked digital skills now benefit from tutoring and guidance,

*There is a change in a sense that the ones that us who are using the digital know more information than those who are not taking this seriously. Sometimes those who are not using the digital library come to us for help. - Mkaika Form 4*

As a result, the digital library has not only improved academic performance but also led to increased peer interaction and a greater sense of community. Many now encourage others to

adopt digital libraries, recognizing their value in enhancing education, as expressed by this Form 4 student at Meru CDSS,

*They have changed their access. We have called them, and we teach them how to use a digital library; nowadays, they know how to use it and find information.*

Student comments are connected to the emerging perception of the value of technology and education. Those students known to have the ability and access to digital libraries are distinguishing themselves from their peers. Yet, those in this new social position also welcome the idea of being a bridge for others to the information they have acquired instead of seeing their peers in a lens of competition or holding any concerns of jealousy or envy. Instead, knowledge sharing is the natural default, and this behavior is reflected across all five schools. The sense of community reflects a deep consciousness among the participants that we are all part of the natural/cultural environment wherein we share our learning.

#### **Demonstration of Self-Assurance**

Access to educational technology has provided students a sense of confidence as their skills, vision, and the sense of empowerment increase along with the improvement in education they have received. When they first began using digital technology, it became clear that things previously thought impossible were now possible, as a Form 3 students at Mkaika CDSS highlighted,

*When we first started using digital technology, we have realized that some things that seem impossible to do physically they are possible using digital library.*

Students boasted the digital library has opened up opportunities for them to advance to the secondary school level and beyond. The digital library has provided newfound confidence, offering access to resources that were not available in the past, which has encouraged the participants to believe they can achieve their goals. With the training they have received,

students no longer fear using technology, embracing the opportunity to learn and feeling confident about themselves, as a Namasika Form 3 student shares,

*As my friend said, the digital library has given me confidence that I can achieve what I want because I have access to adequate resources, unlike in the past.*

In reflecting on the limitations of the resources in their environment, the discouragement that most students face in their broad learning environment is articulated well here,

*I want to be a surgery doctor, but some people believe that a person from a CDSS cannot pursue a very good course because of shortage of books and libraries. However, because of the coming in of the digital I now know that I have the ability to do this course, I can easily access subjects related to this course, subjects such as Biology. I will achieve my goal of becoming a surgery doctor through the digital library. -Ntonda Form 4*

Specifically in a rural school, the dire conditions of the resource-poor educational environment do not produce many successful graduates. However, their attitude towards their learning has transitioned into a space of seeing their potential with the access they have now been given and looking to apply it to their future endeavors.

#### **Inspiration to Find Answers for the Community**

The fragility of the agriculture-based economy in Malawi is a frequent concern that students have expressed in their pursuit of knowledge and is reflected in the day-to-day reality of the average CDSS student. By searching for information on rice planting and other agricultural practices in the digital library, the students gained valuable insights on how they can improve their local farming methods. For example, a student discussed introducing an alternative irrigation system, helping to improve food security. By accessing agricultural practices from other countries, they have learned to apply new techniques, which has led to better crop yields in their community, including healthier maize growth. This Form 4 Student shared,

*For example, when we go to agriculture, there are a lot of agricultural practices that other countries use. Additionally, when I see, for example, the things they use to help improve soil fertility, when we use the digital library, we apply those things to our community. When we apply those things to our community, development also improves.*

*For example, maize was not growing well in this place, but now these children have applied manure, and now maize is growing well, but because of what, the [digital] library.*

Overall, the library has been demonstrated as a driver of local development. Moreover, students pointed out the need for the skills that ensure livelihood and the foundations of a healthy society, in addition to the ongoing search for knowledge to understand why and how conditions are what they see every day, and how they can be of service to address them. The library has also been helpful in terms of health, as they discovered a book titled *When There is No Doctor*, which provides guidance on treating conditions like cholera or broken limbs, knowledge that can be applied to assist people in their villages.

Since relationships are at the foundation of community life in rural Malawi, so it was not surprising to also hear a student sought ways to strengthen their ability to build bonds that last and are sufficient to manage the pressures of day-to-day life in RACHEL. Further, after thinking deeply and thoroughly about all available options (with the available resources) in their current conditions in communities, students started to ask deep questions, as was posed by a Bembe Form 2 student in response to a follow-up inquiry asking participants if they have developed any additional life-related questions since using the digital library. The student asked:

*What can we do to avoid losing our lives while using technology? What effective preventive measures exist to help us prevent accidents using technology?*

This was a fascinating testimony to the nature of the power the students now have access to. If this response was translated to me during the interview (though unfortunately not), several follow-up questions would have been asked to determine the types of accidents the student was referring to. My immediate thought went to sexual content since this is an ongoing concern for parents whose children access the internet around the world. However, since the device is offline and the content is solely educational, this left an unsatiated curiosity.

### **Valuing Girls' Access to Educational Resources**

Generally, students indicated a relatively equitable level of access between male and female students and have recognized some gender-based content in RACHEL that has proven to be valuable and inspiring. According to a Form 4 from Mkaika CDSS,

*Digital libraries for gender have changed a lot because when you are using technologies in education with maybe a girl, most people think most things. Therefore, this digital library allows us to share our ideas with other genders.*

The majority of the interviewees were male students, yet there was an overall awareness of the capabilities of females in technology expressed in their responses, which highlights a willingness to expand their view of human capability and to work with females more closely in understanding their ability to contribute with female counterpart support.

Students have made it clear that digital libraries have played a significant role in promoting gender equality in education. Among themselves, they have helped break down barriers, allowing both boys and girls to access information and exchange ideas freely - encouraging collaboration between genders and contributing to gender development at the community level. The availability of digital libraries has challenged previous beliefs that girls might not be able to improve their education or access such resources. Now, with equal access to information, girls can learn more about gender-related issues and further their education, leading to greater opportunities. A student shared:

*All girls should have access to the digital library so that we have the same voice and can advance in education. -Bembe Form 4*

Further, student participants made it clear that youth in Malawi are not bound by their lack of views and experience around gender. They validate that educational environments are vehicles to combat concepts around gender that have been hindrances to female learners and can encourage male learners to support female education towards a more balanced and equal society.

### **Building Interest in Personal Pursuits**

Another behavior that has shifted among the interview participants upon the digital technology arrival, is student excitement about their growing interest in what they wanted to do in life. For example, a student aiming to be a bank manager is using the library to study subjects like additional mathematics. Another student, interested in becoming a doctor, shared that the digital library dispels the belief that students from CDSS schools cannot pursue prestigious courses due to a lack of books and resources. With easy access to subjects like biology, they now feel confident that they can achieve their goal of becoming a doctor, thanks to the wealth of information available in the digital library. A student from Namasika Form 4 said it best,

*The digital library makes me stay committed to my career goal. For example, I want to be a pharmacist, so using these things will give me more knowledge about what I want to be; therefore, utilizing this knowledge will help me achieve my goal.*

The digital library has played a crucial role in helping individuals stay focused on their futures by providing access to valuable resources. The students' aspirations bear witness to the vision for their lives and the understanding of their potentials that the digital libraries have sparked. Most noticeable was the participants' predominant focus on Science, Technology, Engineering, and Mathematics (STEM) related careers and how much access to the information to give them clarity and excitement about these opportunities. The digital library makes a considerable difference in students' belief in their ability to reach these ambitions.

### **Impact of Accessing Resources**

*I search for information, and I find it. So, this is simplified, and we hope it will continue.*  
- Bembe Teacher

While the interview participants frequently made references to their ability to use the Digital Library and its contents, they also highlighted their inability to use the Digital Library and its contents before the introduction of RACHEL, sharing two contrasting experiences

simultaneously. The following is a summary of the participants' views that expand on the access to information, and modes of behavior resulting from using the new digital tools, and the related new perspectives this caused. The aim is to offer an understanding of the influence of access to RACHEL content and computers (or lack thereof) had teachers and students.

### **Reflections on Access to New Tools and Aptitudes**

As teachers and students are introduced to digital educational tools, their behavior have shifted in several ways. Teachers demonstrated increased engagement with interactive content and the ability to supplement traditional teaching methods with digital resources while students became more motivated and self-directed in their learning. However, at the foundation of these shift are the new skills learned because of their access to the tools themselves. These subthemes are a summary of participant access experiences and uncovers what elements were the most effective.

#### **Ability to Operate a Viewing Device/Digital Library.**

Other than the natural curiosity about education technology or the goal of using it for academic improvement, participants shared an innate attraction to learn the tools to access knowledge to the 21st century. Due to the scarcity of computers in rural Malawi, there was little familiarity with computers by students at all five schools before the Digital Education Pilot launch, which was confirmed by this Mkaika Form 2 student,

*We didn't know how to turn on the computer. We learned through the digital library.*

Students spoke in depth about digital libraries having had a significant impact on their lives, particularly in improving their computer literacy. Many students who initially did not know how to operate a computer have learned through the digital library. This student said,

*It has changed my life because I never knew how to use a computer, but right now, I know how to use it, and when going to a digital library, I can find some videos helping*

*me to understand how some humans achieved their goals. So it has changed many things in my life because I can see that this technology is making our work more manageable, and that's all that has changed my life. -Namasika Form 2*

This newfound knowledge has not only enhanced their academic lives, but also strengthened their relationships with peers, as they are now able to help others learn how to use computers, as this Namasika Form 2 student shared,

*Many people have phones and laptops but can't use them properly. As soon as I learned how to use them, I taught them how to use them because of the digital library.*

The availability of digital resources has made tasks more manageable and has empowered students to share information more efficiently, fostering a sense of community.

Furthermore, the digital library has opened doors to new opportunities in ICT for students. As they gain more knowledge and experience, they become more confident in using technology, which has also inspired them to teach others. This has had a positive impact on their personal growth, as they are not only advancing their own skills, but also helping their peers to navigate the digital world. As more computers become available, both teachers and students anticipate that the learning process will become even simpler, further improving their education and relationships with peers, and helping them to pursue their interests more freely and confidently.

### **Inability to Operate a Viewing Device/Tech Prevented Digital Library Use**

Access to computers and RACHEL triggered a range of conversations about the lack of computers and the lack of technology that it accentuated for the participants. As discussed in Chapter 1, secondary education in Malawi is plagued with resource gaps that inevitably create access issues. Students articulated they are observing the impact of deficiencies in school resources and what a lack of access means for their futures,

*I see people who don't know how to use technology as people who are left behind with how things are now. - Mkaika Form 3*

*Those who don't have technology they can't know information about the digital laboratories and some more information about how the earth is going or how the things are in the world -Meru Form 4*

From the student perspective, the lack of access to technology is a significant barrier to education and modern life. Students in schools without digital resources are at a significant disadvantage compared to those with access to such tools. Many students in areas CDSSs are unfamiliar with technology and digital libraries, leaving them unprepared for higher education. As one student points out, this lack of familiarity can create challenges when students transition to college, where they may struggle with basic tools like laptops and Wi-Fi,

*When I go to the lake side, for example Mlomba CDSS, they don't know how to use these things, and they don't even know what a digital library is and how to use a computer. I can say that education without technology cannot go far because, at the secondary level, other schools can't use these things. When they go to college, it will be their first time to see these things; they will be like, 'I don't know anything about laptops, and how do we write?' - Namasika Form 4*

Without early exposure to technology, students risk falling behind, making it difficult for them to compete academically at higher levels. The introduction of the digital library brought to the students an awareness of the disparity in technology skills among rural schools now that they have developed technological literacy among themselves. They also recognize the lack of connection to the larger world that disenfranchises people in rural Malawi:

*Those who don't have this technology can't have enough. - Meru Form 4*

Participants offer a strong argument for increasing access to technology in schools, particularly for institutions like Bembe, where the number of students exceeds the available resources. As one student noted, increasing the number of computers would allow more students to benefit from digital resources, thereby improving their learning experiences and educational outcomes.

Overall, there is a clear consensus that technology plays a crucial role in modern education, and schools need to work harder to promote its use and ensure that all students have equal access to these vital tools.

On the contrary, teachers completed their education without these technological requirements or support, so they felt disadvantaged and were uncertain about their career with these resources,

*I feel that my teaching career is somehow at stake. It might be favoring those who are digitally literate and those who are not. If it comes to the climax that people are using digital gadgets, those not on par with digital technology may not have a chance of staying in the gap. That's what I feel. - Mkaika Teacher*

The comments from teachers reveal a significant concern about the digital divide in the teaching profession. Teachers who are digitally literate feel they have an advantage, while those who are not as comfortable with technology risk being left behind. This could impact the quality of education and the ability of teachers to keep up with modern teaching methods, especially if digital tools become a requirement for effective teaching. As one teacher mentions, it is a challenge to ensure that all educators are on the same level when it comes to using digital resources, especially for new recruits who may need extra support to get up to speed,

*The other challenge is most teachers don't know how to use these digital libraries, so we are supposed to tell them or teach them how we can handle this kind of thing so that if one teacher is left out, we will have to remain with people who have same knowledge on this digital library. - Meru Teacher*

The lack of training or familiarity with digital libraries among some teachers highlights the importance of professional development in this area. Without proper training, some teachers may struggle to effectively integrate technology into their classrooms, which could reduce the overall impact of digital learning tools. Additionally, the issue with smartphones and connectivity further exacerbates the challenges. Teachers can rely on their phones and digital tools for

accessing educational resources, but technical issues, such as disconnections or phone malfunctions, can disrupt the learning process, making it difficult to maintain consistent access to valuable information.

These are significant concerns that require administrators and facilitators of similar programs to help train teachers to not to be intimidated and to see an intrinsic opportunity to gain new knowledge and to take the time to develop the skills that the technologies and education provide. Overall, there is a need for more comprehensive digital training for teachers, better access to technology, and solutions to address connectivity and device reliability to ensure that all educators and students can benefit equally from the digital tools available.

### **Knowledge about the World beyond Curriculum**

The digital library enabling participants to access new ideas from different countries fostered valuable reflection from participants. Specifically, this reflection took place in the context of the digital education pilot program being introduced by an American volunteer agency, and the RACHEL device being an American device with the availability of resources from other countries allowing the comparison of international educational materials.

Students and teachers highlighted learning from the experiences of economically successful countries, such as Japan or China, and how this information can guide Malawi toward greater economic development,

*We understand China was poor just a few years ago, but what has made it where it is today? So, we need to borrow a leaf from them and see that we are up there economically. Otherwise, we see most people in Malawi living below the poverty line, but very few people have a lot of wealth; this is unfair. -Meru Teacher*

The digital library has already started playing a significant role in this transmission of information by providing access to global knowledge, perspectives and resources that were previously unavailable. Participants are learning from different histories, cultures, ideas, and

even practical concepts like architecture, improving their understanding and adapting it to local needs,

*It can help the peoples to change their knowledge in our community. When using computers, we search for knowledge about different cultures for example we can look at how different houses are built in different countries then we can adapt by building same houses. -Namasika Form 2*

The digital library has also opened doors for learning beyond the classroom, offering opportunities to explore new knowledge remotely, connect with global ideas, and understand the broader world. This exposure to different cultures and practices, such as dance or architecture, not only broadens their horizons but also encourages the adoption of new approaches that could benefit their communities. A student shared:

*The use of this technology has the potential to teach and inform us about many things that are not available in other countries or covered in certain books. It allows us to learn from the experiences and knowledge of others worldwide and contribute to our development. -Mkaika Form 4*

Ultimately, the digital library helps bridge the gap between Malawi and the rest of the world, empowering learners to contribute to the country's growth and development.

Participants described their vision of the future in Malawi as the replication of elements of China, India, and the United States, as these economies have played a significant role in the development of Malawi throughout the most recent generations. Students who listened to political speeches from outside other systems of governance verified an interest in understanding their condition through the experience of others, in addition to a desire to seek solutions. However, a lack of criticism of these same global powers and how they have played a role in the issues Malawi faces today, could enable the promotion of similar paths to development which could be problematic versus alternative/African-centric ones.

Nevertheless, there were some concerns expressed about the opportunities technology and digital literacy provide, like from this Ntonda Teacher,

*So today, you can see that they are looking for those who are good at digital or technology. You cannot be employed without technology, so you can work there quickly because you have learned about technology on these gadgets, which means you can work everywhere in the world. So, the world will have skilled people in terms of technology.*

In an economy where migrant employment is ordinary, it is good that Malawian educators are connecting the skills needed in the 21st century with personal opportunities for themselves and their students. This includes access to STEM skills, which means accessing the digital library to find resources and information in Science, Technology, Engineering, and Mathematics. A student shared:

*I am interested in Computer studies. Computer study involves a lot of practicals, such as installing an operating system, and these concepts are difficult to understand in physical books. However, the digital content explains these concepts step by step. -Mkaika Form 4*

The digital library has significantly expanded student knowledge and understanding in various subjects, making learning more engaging and accessible. Students and teachers have found it particularly helpful for subjects like chemistry, mathematics, and computer studies. For example, in chemistry, students can visualize complex concepts like chemical bonding through images and animations that go beyond what physical books provide. In computer studies, the step-by-step digital guides make it easier for students to grasp complex concepts like operating system installation, which might be challenging with just traditional textbooks.

Students shared that RACHEL enhanced their learning experience by providing additional resources that fill gaps in physical books, such as in biology, where students can easily access detailed information about topics like photosynthesis,

*I researched how photosynthesis takes place in plants; I was thinking about what would happen if plants were not here since plants are the basic unit of life, and inside that information, I realized that photosynthesis supports life. -Mkaika Form 3*

Malawian communities are steeped in the agricultural sciences. They depend on knowledge of the natural world and agricultural tilling to manifest its bounty – it is part of the culture; STEM is its natural inclination. However, engineering, computer science and the intricacies of chemistry are subjects that require complex tools to build the next level of understanding. In this way, access to RACHEL is crucial, and students have ignited an innate commitment to deeper scientific understanding and discovery.

### **Quicker Access to Resources than a Traditional Library**

RACHEL providing fast access to information was an important benefit which comes through the conversations with both teachers and students. Still, it is notable that this was often shared in tandem with a frustration regarding a lack of viewing devices and textbooks.

Participants shared the introduction of digital libraries has significantly improved the way both students and teachers access and use information. Searching for information has become much quicker and more efficient compared to the traditional method of using physical books, which are often lost, damaged or out of date, echoed by this Form 4 student at Bembe CDSS,

*It has helped us so that we do not struggle to find answers during our learning process.*

Digital libraries not only save time but also allow students to retain information for future use, making learning faster and more reliable and enjoyable,

*Our interest in education has really changed because initially we could not find the books we were looking for when we go our physical book library. Because the digital library has resources that our physical book library does not have, we end up having more interest to search things that, of course we have another library but coming of digital library has given us more interest in education. Because the digital library has resources that the physical book library does not have. - Namasika Form 4*

Additionally, the digital library has strengthened the relationship between teachers and students. Before teachers presenting material in class, students now have the opportunity to access the digital library, making it easier for them to understand and engage with the concepts being taught.

For teachers, the digital library has made their work more efficient and effective. Instead of sifting through numerous books, teachers can easily find resources online, sometimes even using pre-made notes for lessons. This ease of access to information has made teaching more enjoyable, as it reduces the burden of preparation and allows for more engaging lessons. A teacher from Bembe confirms,

*It has been favorable to me because these laptop computers in the library have made me access information, and it has lessened the burden of looking for information in book after book. Still, with these now, I am at ease because access to information is straightforward. It's just joyous to me.*

The ability to quickly retrieve and simplify information has also positively impacted students' learning, as they can answer questions more confidently and engage in discussions with greater knowledge.

Overall, the digital library has made the process of learning and teaching more efficient, and enjoyable for students and teachers are enjoying their new preparedness for class, the efficiency of resources, and the ease of having so many resources at their fingertips. Teachers benefit from students being more engaged and informed, and students enjoy the selection and varying resource types and perspectives. The resources establish a positive environment for their educational experiences and the learning space they create.

### **Quantity of Resources Drives Access to the Digital Library**

The digital library has sparked a greater interest in education by providing access to resources that the physical library lacked. Finding relevant books in the traditional library is a

challenge, but the digital library offers a wealth of information that fuels curiosity and learning, as confirmed by this Ntonda Teacher,

*It has also made me read more information, unlike books, maybe because I already said that sometimes the information is too shallow in books. Still, with gadgets, we can find many things. As I already said, many things in chemistry. So, as a teacher myself, I have gained a lot.*

As noted above, RACHEL's ability to provide deeper, more comprehensive information, especially in subjects like chemistry, has motivated both students and teachers to explore more content than what was available in textbooks,

*This according to ability we are able to differentiate between once you on a digital library and you can really know what content I am supposed to obtain from here. So we can able to differentiate within rather than when have one source. So in digital library it expose us to many sources that we can source our resources. -Meru Teachers*

The digital library has also changed the landscape of information access in Malawi. Particularly through platforms like RACHEL, students access a wide range of resources that would be costly to obtain in physical form. Participants shared that this shift not only enhances educational opportunities for learners, but it also has broader community benefits. The diverse content available in the digital library supports informed decision-making in areas such as development and social issues, offering valuable resources for personal and community growth. The depth of the knowledge students have access to has made a difference in how they see their interest in pursuing personal goals like careers. In a way, the whole country of Malawi is also affected, as this Mkaika Form 4 student confirms,

*Digital library has changed Malawi in terms of access to information because with RACHEL learners are able to access a lot of information that would otherwise be more costly if it were in the form of physical books.*

In addition, the diversity of content is seen as attractive to a variety of people, possibly serving as a deterrent or/and an aid to solving social development for a community facing challenges, like those throughout rural Malawi.

Additionally, students offered that the valuable information the RACHEL holds helps them with assignments and improves their understanding of various topics. College and university students can also benefit from the digital library in terms of finding resources that support their studies. A teacher commented:

*Again, in the digital library we have a lot of information that can assist even students in colleges and universities, and they can also come and be assisted by getting information that can assist them maybe in writing assignments. - Ntonda Teacher*

The digital library has made it easier for both teachers and students to identify relevant content and differentiate between various sources of information. With access to a broad range of materials, users can obtain diverse perspectives on topics, enriching their learning experience:

*The digital library has assisted me in my performance in class; there are some things in class that you learn but may not understand or may not have been given enough information on the topic. In such cases, the digital library gives you enough information on the topic, consequently increasing our performance. - Namasika Form 3*

One of the interesting features of the RACHEL device is that its content spans K-12 education up to an associate's degree level, making it valuable for both college and university students.

Recognizing the potential of this technology is crucial for schools considering its use beyond regular school hours and for a broader range of students. However, during the typical school day, there are numerous opportunities to apply this technology, enhancing current curriculum content and making traditionally covered topics more relevant.

## **Digital Library Provides Users New Information**

Part of the value of accessing a vast number of resources is the diversity of thought and application those resources can hold. Student participants expressed that access to new information is attractive due to their intense curiosity about the world and a desire to explore their questions and meet their academic needs. However, for teachers, new information can present complexities and additional responsibilities influenced by factors such as age and personal circumstances, even though a motivation for professional development exists. Participants shared that through digital resources, individuals have been able to learn valuable lessons from global events, which have highlighted the dangers of ethnic differences,

*Through digital library services, we are able to appreciate other people's culture, and this has promoted peaceful coexistence among people of different nations, among people of different tribes in a country. So through digital library we have learned lessons like civil wars in Rwanda and other countries which were a result of ethnicity with this, we are able to reflect and live peacefully. - Bembe Teacher*

Despite potential gaps in cultural knowledge, digital libraries give students the freedom to pursue their interests and broaden their perspectives, contributing to their personal growth and societal awareness. There is a profound assumption that the African community is well aware of the historical and relatively recent experiences that have caused discord and undermined the productivity of nations on the continent. This discovery by teachers around the Rwandan genocide was a clear indication of the gap in knowledge and ability for Africans themselves to apply the local learning to enrich their communities and prevent the mistakes of the past. Additionally, this new knowledge encourages reflection and a commitment to living harmoniously, aiding in their understanding global issues, such as the coronavirus pandemic, helping them prevent disease and promote health.

Teachers noted students can independently discover and learn information on a wide range of topics that may not have been discussed at home, including gender issues,

*With digital resources, anyone can easily access information, photocopy it, and share it with children for reading. This enables them to discover information that parents or elders may not adequately discuss. Consequently, when they read it, they gain that knowledge independently. The same is true for gender issues. However, there may be cultural restrictions on specific goals based on gender; digital libraries empower students to read independently and understand that they should be free to pursue their interests regardless of gender. - Mkaika Teacher*

Moreover, bridging the gap for the elders and/or immobile community members is an interesting conversation and opportunity to explore how the mobility of these devices ensures a chance to spread not just the news but to share practical knowledge to help maintain the health and well-being of the most infirm in rural communities.

With the participants, the most common assumption with new information is that it can boost the curriculum, helping teachers supplement materials and hold onto the classroom's attention. Students expressively noted discovering their unique interests in this expanded new pool of information,

*I learned about specific musicians teaching how to play the guitar and keyboard. I'm interested in those subjects. -Namasika Form 4*

*Through digital library I can get information about heroes and what they did to become one and also what I need to do to be like them or pick up where they left off.  
-Ntonda Form 3*

*We access information about how the earth moves and how we can perform in a crisis.  
-Meru Form 4*

From gathering information on personal heroes, the study of music, or pertinent information on how to manage emergencies, it was made clear that it is not the ability to access content, but the type and range of this highly valuable information that has made this digital library opportunity so unique and helpful.

## Visually Recorded Materials Create Access to Desired Information

A significant reflection from the participants on access to new tools was the use of videos and other visually recorded content. Students particularly noted watching videos on how to reach their goals and improve their communities. The interest in visual media is high among youth with the advent of social media (Ståhl & Kaihovirta, 2019), and it supports visual media as a mechanism to help quickly and effectively share information and interest. Participants shared that the videos available in RACHEL have significantly enhanced their understanding of various subjects, particularly in fields like chemistry and mathematics,

*For me its chemistry because I can watch videos demonstrating how to conduct experiments. Sometimes, even if the teacher explains it in class, you might not fully understand, but these videos help to clarify concepts. -Mkaika Form 4*

The ability to watch experiments and demonstrations has helped clarify concepts that might not have been fully grasped through a teacher's explanation alone. For example, in chemistry, videos showing how to conduct experiments provide a more tangible understanding of the material.

Additionally, the digital platforms have had a positive impact on breaking down gender stereotypes, particularly in mathematics, as explained by this Mkaika teacher,

*In terms of gender, female students previously believed that mathematics was complex and primarily associated with males. However, if you explore digital platforms and watch various educational videos, you'll often find females explaining mathematical concepts. This shift shows that they now understand mathematics is for everyone, regardless of gender.*

Female students who once believed math was predominantly for males are now seeing women and girls explain mathematical concepts in videos, helping to shift their perspective and demonstrate that mathematics is accessible to everyone. Enthusiasm for these resources is fueled by the RACHEL initiatives aimed at bridging the STEM gender gap and enhancing skills in these vital areas. Plus, the audio features and the ability to review content whenever it suits the

user significantly boost comprehension. Plus, the real-world applications of these subjects extend far beyond the classroom, opening up incredible opportunities. Videos have fostered a sense of inclusivity and empowerment, especially for students who may have previously struggled with the STEM subjects.

Digital libraries have shown great potential in motivating students to improve their communities and think practically. Videos that focus on community development inspire learners to take action and share valuable knowledge with their families and communities. Additionally, digital libraries provide access to practical content that enhances theoretical learning in the classroom, allowing students to better understand real-world applications of their education. For example, learners can now explain practical concepts to others based on what they have seen in videos, bridging the gap between theoretical and practical knowledge,

*With access to a digital library, they can see because there are some videos where they will see exactly how this world operates, which will help them make informed decisions on what they want to do or achieve. -Namasika Teacher*

*Some people think that education is not essential, but through content like videos on digital libraries, we can understand the importance of education. Some of this information is not available in the physical books. -Mkaika Form 4*

Moreover, digital libraries have allowed learners to access content that challenges traditional practices and mindsets, particularly regarding education. By watching videos that showcase the importance of education and how it is approached in other parts of the world, students are empowered to rethink old beliefs and make more informed decisions about their future. This shift is helping to raise awareness about the value of education, especially in communities where it may have been undervalued, as expressed by this Form 4 Mkaika student,

*Some people think that education is not essential, but through content like videos on digital libraries, we can understand the importance of education. Some of this information is not available in the physical books.*

The foundational Digital Education pilot was always interested in the potential of community access to the digital library. These participants confirm they have seen a correlation between the functional capacity of videos to transcend barriers of illiteracy and a lack of schooling within the community. Further, participants have expressed a willingness to facilitate others' exposure to close the awareness and information gaps they see preventing community development.

### **Reflections on Barriers to Continuous Access**

Though the excitement and benefits of acquiring new education means and the ability to explore them were repeatedly shared throughout the interview, participants also openly discussed challenges faced in terms of access, training, and technical skills. As such, the transition into the taking full benefits of the digital library was slow due to limited infrastructure, digital literacy gaps, and staff turnover. Despite the obstacles, over time, there was a notable improvement in the integration of technology into both teaching and learning practices at all five CDSSs. The following section is a summary of participant experiences and frustrations with the traditional form to access resources and also uncovers what elements of digital integration can cause concerns or should be considered for mitigation.

#### **Removing Hindrance of Traditional Library with Insufficient Learning Resources**

The development of the digital library has established a direct comparison with the resources in the modern paper-based library. This has created a space where criticism of the quality and quality of physical books is justifiable. Book borrowing, mobility of books and their availability were issues in all schools, as a natural concern for the protection of books limited students from taking them off school grounds which further limited access.

For CDSS students, digital libraries have been a game-changer. RACHEL provides students and teachers with access to a quick access to a vast range of multi-user information, making it easier to find and use the resources they need,

*When we go to the physical book library, we can only get one or two books, whereas when we go to the digital library, it's like we have taken the whole library. We are free to search for anything else. - Ntonda Form 3*

The digital library has not only improved focus and engagement by making information more accessible but also helped increase pass rates in CDSSs.

*The digital library has improved our focus on education by making information more easily accessible. In the past, if we visited the physical library and couldn't find the information we needed, we were left with no other options. - Mkaika Form 4*

In support of the students comments above, another student echoes,

*This has improved our education because we have few physical books in our library and what used to happen is that, for example, I want to borrow an Agriculture book and this one also wants the same book, but because we have few books I may end up getting the book but this one cannot and it will be difficult for this one to access the information that was needed. But with digital library we can all get the book and this has made CDSSs to improve. - Ntonda Form 4*

Overall, the digital library has significantly improved the educational experience by offering a wider array of resources, reducing the challenges caused by limited physical books.

### **Hindered by Too Few Viewing-Devices**

After adjusting to RACHEL's presence in the classroom, teachers expressed being hindered by the lack of a sufficient number of computers, phones, and tablets available to access the digital library. Due to the nature of the pilot program, all schools received their computer at varying times. Still, they all started with two tablets to establish teacher access and encourage the administration to build the needed relationship with a supporting NGO (Center for Enhanced Education) that provided free computers for a nominal maintenance fee.

Students and teachers expressed that with a large student population and only a few viewing devices there are times when students scramble for access to these resources:

*They should work hard to promote the use of technology. They should increase the number of computers at Bembe. There are a lot of us students. -Bembe Form 4*

The limited number of laptops and equipment compared to the large number of students, leads to overcrowding and long wait times, some even being unable to enter the library due to high demand. With upwards of 60 to 120 students in the average class, two tablets or four computers is inadequate. Further, a Bembe Teacher described,

*The library room is very small, so this is giving problems for the many students go there at once and access the information. Number two, we only have four computers against two hundred and fifty students and more, so talking of two hundred and fifty students that is minus the community so four computers are really not enough and this is giving us an uphill task to climb in order to access the information, otherwise other issues are okay but the challenges I know are these two. The rooms are small, the computers are not enough.*

To help address this, teachers have implemented schedules, assigning specific days for different classes to use the digital library, which limits daily access to information and, in turn, impacts student potential. Even with a schedule, those few devices need to be maintained, and the structure around them needs to be managed,

*Another problem we see is that we also need to look at the issues of maintaining order and discipline because once students know and feel that they know something, they feel like they can do anything at any time. They cannot differentiate that this is time to do this and now it is time for digital. -Mkaika Teacher*

Another challenge frequently mentioned is the lack of projectors, specifically noted by these two teachers at Meru CDSS,

*Sometimes we just need these facilities in good numbers so that can access information as much as possible like if we have a projector, so we hear in other countries where there are projectors, anyone can operate then learners can access information like that, otherwise this has made teaching and learning easy. Additionally, some of the concepts you may have formulated from the digital library need to be presented using a projector,*

*so we don't have a projector here. So, if we also have a projector, it will ease the problem we are experiencing.*

Projectors would help present digital content more effectively to large groups, as it becomes harder to fully utilize the available digital materials without many more viewing devices. This notes opportunities for similar pilots (via NGOs and donors) or school investments to expand their resources to facilitate greater impact of a digital library.

In addition to limited devices, time constraints and technical difficulties further complicate the use of digital libraries. Participants often struggle to find the necessary information within limited timeframes, as the vast amount of content in the digital library can be overwhelming for any user not familiar with internet research. In some cases, teachers have allowed students to use their phones, but this only partially alleviates the problem,

*Initially, when the project was starting, we only had two tablets, so as a complement, we also come to the office of the administration we ask that if possible can they permit us to allow students to take their phones, so some of the times students bring their phones and they are allowed to navigate through the library and find out whatever they can make from there. -Mkaika Teacher*

These logistical and technical challenges highlight the need for more resources and better organizational infrastructure to maximize the potential of digital libraries in enhancing education. There are instances where some equipment in the library is not functioning properly, hindering students' ability to use the digital library effectively. Teachers feel if they were equipped with their own devices, it would be easier for them to interact with students and provide support, as students are already familiar with using the digital library. In most schools, since most of the resources have been put into the libraries or teachers' offices, when teachers are not available, students find themselves unable to access the equipment and the digital libraries. Additionally, students are pointing out their competition with teachers and the need for teachers to have time to access the library resources which can help improve their learning experience,

*If teachers also have computers and digital libraries, they will not find it challenging to teach learners because learners already know how to use the digital library, so they will easily interact in class. -Meru Form 4*

Overall, insufficient equipment and occasional technical difficulties limited the full potential of the digital library for teachers and students.

### **Power Outages Preventing Access to Digital library Resources**

Further complicating access to viewing devices are power shortages. Given that electricity and the internet are essential foundations of technological development and are current deficiencies nationwide in Malawi, an assumption was that electricity issues would frequently be noted in our interview with the participants as an element of inaccessibility. However, what participants revealed was they adapted their life functioning without regular power. This reflects a general acceptance of the country's infrastructure poverty and a prevailing lack of expectation for the country to produce conditions for access to these essential tools for the average citizen, as this Namasika Form 3 student verifies,

*Our school doesn't have enough electricity. You can see there is not any line of electricity. That means we use underground electricity lines and ESCOM [Electricity Supply Corporation of Malawi] can find out. This is not only us, there is another school that do not have electricity and its challenging because sometimes the teacher says he is available, 'lets go', and going there [to use computers], there is no power so there is a challenge there.*

Students know the issues around national infrastructure that plague the country and the disappointment they meet when their expectations of accessing digital resources depend upon electricity. The instability of electricity is highly debilitating for an educational setting. It limits 1) access to technical resources and 2) hours of access to the school facilities, 3) and it minimizes the safety of buildings and roads for travel to and from school, and 4) it prevents homes for

homework and continued study - leaving entire communities in the dark. Participants share their frustration,

*Sometimes, when you feel like using the digital library, you find there is no electricity, so it becomes a challenge because you want to spare time to spend in the library. Still, you see no electricity, so it's a challenge. -Bembe Teacher*

Power outages are common, preventing both teachers and students from using laptops and accessing the digital library when needed. Some schools, especially those in rural areas, lack sufficient electricity infrastructure, relying on underground power lines, which makes it difficult for teachers and students to use desktops, laptops, tablets or RACHEL if all of devices are not sufficiently charged,

*When there is blackout there is no access in digital library. Sometimes we fail to use the laptops due to blackouts. - Namasika Form 2*

Some of these challenges can be met by preemptive charging of laptops and other devices. However, this takes pre-planning and pre-thought by administrators, which often goes overlooked. On an inspirational note, the challenge of insufficient electricity has prompted the exploration and interest in alternative energy, as indicated by the participants. With time and encouragement, the hope of students to help address this solution in their generation (and for the entire continent) will bear fruit.

### **Low Quantity of Teachers/ Learning Support Prevented Access**

It is easy to underestimate the gravity of introducing a laptop or a smartphone to communities and individuals who have never had it before, and teachers are no exception. Teacher participants eloquently articulated the challenges they faced in accepting the discomfort of learning what they knew was necessary to further their professional skills and responsibilities.

Many, including those with limited technological experience, have adapted and now use these tools regularly, as this Ntonda teacher shares,

*I have worked for 30 years... I am 54 years old, and previously, we used books in the library at our college, not laptops or whatever. But with the coming of gadgets here in the library, there were a lot of problems even teaching us I shouldn't hide, and myself too, but now I can use the laptop every time.*

However strong the resilience and determination, the lack of resources still is astounding. The sheer scarcity of computers in the vast sea of students that each of these schools contains is a mountain to overcome, and each of these teachers has committed to using what they have to create some expansion of learning for their students, which needs to be commended.

Teachers and students also expressed concerns about the strain caused by large class sizes and insufficient teaching staff, which often results in students being unable to get their questions answered,

*I would love schools to have more teachers, unlike the current situation whereby schools have classes of a hundred-plus students with one teacher. This is a challenge because everyone can't ask a question, and in the end, you find out that you are going back home without your questions answered. -Namasika Form 3*

Given the nature of the overcrowded CDSS classrooms, the assumption would be that students and teachers would focus on the lack of teachers as an issue that impacts the school experience and the success of any programs it facilitates. In addition to the large class sizes that teachers must manage, which inevitably leads to them feeling burdened by taking on more responsibility. Teachers are to supervise the digital equipment, but sometimes they are just not physically able to be present due to the schedule of classes and the workload they are holding.

As such, participants expressed the need for a dedicated *digital librarian* to manage the RACHEL and its supportive resources to ensure accessibility, as current teachers may not always be available due to their lesson schedules. Participants emphasized the importance of training for

both teachers and students to ensure effective use of digital libraries. It was suggested that initial training should be provided at the start, followed by in-service training to accommodate the constant turnover of staff.

*Teachers or staff members should be trained, plus in the subsequent times, in-service training should also be there because the staff members keep changing; some go out, and some come in, so those who come in will always need information about the digital library to continue.* -Mkaika Teacher

Training workshops are recommended to equip all teachers with the skills needed to make the most of the digital library. However, they communicate some specific concerns that plague the Malawi educational system, specifically the constant transferring of teachers (both head teachers/principles and subject teachers), making it difficult for those limited number of teachers who were trained in the RACHEL to pass on their knowledge and support of the digital library on to the replacement teachers or to those who are left behind.

### **Conclusion**

In summary, this chapter explores the impact of RACHEL devices (and the digital devices that support them) on rural CDSS students' and teachers' attitudes and access to offline educational resources. The chapter highlights how digital libraries play a critical role in providing learning opportunities, especially in areas with limited or no internet connectivity. By offering a vast selection of digital materials, participants confirmed that offline digital libraries help bridge the digital divide and create a more inclusive educational environment.

One of the key findings is the improved access to educational resources, enabling students and teachers to retrieve information without relying on an internet connection. The offline library narrows gender gaps, transforms culture and personal perspectives to digital learning by providing access to high-quality academic materials anytime, particularly when

electricity is unreliable, fostering self-directed learning, academic growth and a stronger commitment to teaching and learning.

The study also reveals a positive shift in users' attitudes toward digital learning and in school as an addition worthy of investment. Many participants reported increased motivation and academic engagement, and a new appreciation for digital tools that support educational needs and personal pursuits. The convenience and accessibility of offline resources helped create a more proactive learning culture, encouraging students and teachers to explore and utilize a variety of educational materials more effectively.

Additionally, our research finding highlights the enhancement of the participants' research and study habits. With reliable access to educational tools and content, participants, both teachers and students, indicated improved critical thinking skills, better research practices, and a more structured approach to learning. The offline digital library promoted independent learning, allowing users to develop a deeper understanding of various subjects.

Overall, the study underscores the significance of offline digital libraries in fostering educational inclusivity. By providing equitable access to knowledge, these libraries contribute to reducing the digital divide, especially in underserved and under-resourced communities in Malawi. The impact of digital libraries on participant engagement, learning behaviors, and access to resources reinforces the need for further development and expansion of such digital solutions in education in the region.

**Chapter 6: Thematic Finding 2 -  
How Digital Library Impacts Personal & National Visions on Life & Influences  
Commitment to a Digital Future**

*I want [Malawi] to be the most developed country in the world.*

- Form 3 Student, Namasika CDSS

The third question posed by this research is:

- What factors influence commitment to implementing digital resources in rural Malawian CDSSs?

Given the many obstacles to the sustainability of digital libraries and access to offline resources in rural Community Day Secondary Schools, it is crucial to understand participant perspectives on these factors and how they see the potential of these offline resources for themselves, and larger systems of education and life in Malawian society. Under the limitations of the national social, economic, and political context, I explore the participants' ideas and hopes for the future of Malawi with digital libraries, moving forward as an accessible educational tool while highlighting some of the observed barriers to a commitment to this possibility. In the interviews, participants reflected and shared their visions and thoughts on: 1) one's-self in the future and 2) one's-country/Africa in the future. In this chapter, I present how participants commented on and illuminated how they see their futures after being inspired by their interaction with RACHEL.

**Freedom to Envision the Future**

*It [afro-future image] gives me a picture to approach my vision.*

-Meru Form 4

Though I discuss the challenges and opportunities of Afro-futurism in Chapter 7, there is a need to highlight the encouragement participants received to think broadly and share freely about any possible circumstance or view of potential life in Malawi (or elsewhere). Participant

answers to future-based questions, such as “*What do you want Malawi to look like in 100 years?*” provided a window into how they translated the opportunities for self-expression to explore subjects of importance or interest to them. Many struggled with the idea of Malawi in 100 years, but others took full advantage of it and shared their hopes and concerns. Participants used the afro-futuristic questions as a space to be critical of the personal and community conditions they are in, and looking toward the potential future of their country.

*I got excited because I knew we could explain things we wish to change and how we envision Malawi.* -Mkaika Form 2

Despite the excitement, as expressed by the student quoted above, both students and teachers struggled to be creative with their visions of their lives and their country’s future. There was little to no discussion outside of what they know is currently available in more developed countries. Also, they struggled to envision themselves outside of the expectations or limitations of what a Malawian or African life is capable of in their current situation. This pointed out a cap on their consciousness, or unwillingness to push beyond what is seen, and an absence of awareness of the extent to which current human science, technology, and theoretical global and universal engagement has developed, or discomfort in sharing to what extent they have come to know about these areas.

Additionally, most of the factors that influence commitment to a digital norm were based on desires for the country (and Africa) to be impacted positively in the future. There was no consideration of any negative outcomes from climate, political or economic disasters or changes. Encouraging experiences were shared with the digital technology, but there is a naivete by the participants in not considering the outcomes of the current trajectory of major social and

environmental concerns or what may spawn of them. This was a profound limitation in the conversation and highlighted other area of interview questions that could have been considered.

Nevertheless, the following genuine and introspective question was offered by a Meru Form 4 student in response to an interview question, that additionally points to the limited perspectives or consideration of the participants,

*What should Malawians [do] to become popular like other countries?*

In response to the additional question, “*What new questions and thoughts have you developed about your life since accessing the digital library?*”, this student exemplifies a tendency of most of the participants, which is to see Malawi replicate the experiences of more developed countries (i.e., China, Japan, America, India, etc.) in their country, regardless of the historical paths of oppression, inequity, discrimination or violence that may have contributed to their power and prominence. As this chapter centers on visions of personal & national life, it is important to acknowledge how this tendency to idealize current global powers has limited the spectrum of thoughts and creativity of the interviewees.

### **Personal Visions and Motivations**

About personal motivations and visions, responses from both teachers and students painted pictures of concern for their futures and a hope that expanding educational technology can help secure a future they look forward to. Practically, participants centered on elements that meet current needs and can influence their current situation.

### **Motivated or Impacted by Financial Costs and Pressures**

The desire for personal achievement to alleviate their economic concerns, so common to most Malawians, is noticeable in the conversation. Teachers remarked on the cost of life, the daily economic pressures they face, and how it affects their personal decisions. In addition to

day-to-day expenses, teachers also reflected on the general resources available in Malawi as a country, and a need for a stronger, globally competitive economy.

Teachers described digital library as a way to reduce the financial burden of education in Malawi. By eliminating the need to purchase expensive books or travel to institutions, it offers a more affordable way to access learning resources, as this Namasika Teacher pointed out,

*I can say that digital libraries will help minimize the cost that we incur when buying books or whenever we want to access something physically. You can reduce those costs and even study at home using a digital library or study something that will require you to go to tertiary right here and still gain a skill that you would get at the institution there.*

Teachers recognize the importance of digital libraries in minimizing costs and making education more accessible, allowing students to study from home and acquire skills without physically attending institutions. A key focus is on innovation, with the hope that the government will support initiatives to create job opportunities for graduates. In the next 100 years, there is a desire for greater access to technology, with participants envisioning a future where every student has a laptop, and digital resources are used to foster ideas that improve the economy at various levels, from households to national growth.

Education is seen as critical for students to move forward in life, and participants see these digital resources as an opportunity for their actualization. For some participants, lacking material possessions, such as lacking essential tools for life, like owning a wristwatch), is a commonplace challenge.

For students, oftentimes, just accessing school is the biggest challenge. School fees have contributed to a lack of education, and there is a lack of trust in the government's ability to ensure equity and education and social class inequality worsens that,

*They [government] should also support those who are failing to pay school fees. Others are dropping out of school because they fail to pay school fees. - Meru Form 4*

*Additionally, in terms of economy, in Malawi ... Wealth is still going to those wealthy instead of the poor. In terms of the economy, it should be good. The devaluation of Kwacha is also affecting the economy. - Namasika Form 4*

Corruption and mismanagement are ongoing concerns, and especially poignant now that the economy is highly vulnerable after several rounds of currency devaluations. Yet, students feel they can move forward with the resources a digital library provides, as this Namasika Form 2 shares,

*I see that when digital library was introduced, we are able to see world-wide news about how people are living their lives and how digital library works in other countries because we can't afford to go there we can just see through digital library.*

Even if not physically able to access places in the world due to financial constraints, students are beginning their global journey by reading about and watching the world outside, in preparation for when they have full resources to determine how their lives and the country should move forward.

### **Gaining Knowledge on the Development of a Business/ Products**

The impact of financial and unemployment issues often breeds entrepreneurship. However, ongoing youth unemployment and income vulnerability, with teachers' stagnating income and the overwhelming national material poverty, presents a barrier to creativity and difficulty in garnering start-up capital costs.

Students and teachers described RACHEL as a resource that can help individuals, especially those aspiring to run businesses, access information on business management and product creation, as this Ntonda Form 4 student describes,

*Additionally, when we go to science subjects such as chemistry, we learn how to make products like soap and candles. You can do this as a business when you have not achieved your career goals.*

Participants share examples of how digital libraries have positively impacted people in their communities, like a motor vehicle mechanic who learned new skills through RACHEL tutorials, allowing him to perform tasks that were previously only done abroad. The ability to access information on a variety of subjects, including business and technical skills, is seen as crucial for local entrepreneurs to improve their businesses, manage finances, and make informed decisions, as this Ntonda teacher highlights,

*The business community and other community members can enhance their businesses through digital libraries. Why? When we are using the digital library, we are using computers where maybe a businessperson can use that computer to keep their business records and they can even make their calculations easier using the computer and even in the digital library they can have some information that can help them maybe in building their businesses or coming up with a good business plan.*

The digital library is recognized as an essential resource for fostering skill development, self-reliance, and business growth in Malawi. The vast array of information in the digital library is attractive to those seeking to build their capacity beyond their day-to-day jobs. Entrepreneurship skills are not taught in K-12 in Malawi, so for those young people who are exposed to the idea of starting a business, or for established business owners looking to address concerns and barriers to their next level of development, RACHEL is a valuable resource. The anecdotes shared by participants highlight the opportunities for existing entrepreneurs and give participants insight into the process of business development under the conditions particular to poor countries. This demonstrates how offline digital tools can help support market opportunities for exploration.

### **Ability to Use Computers for Career Opportunity**

Computers are a tool for skill and financial advancement, in addition to being a professional resource. The participants noted their academic resources and computer skills evolving simultaneously due to RACHEL's variety of modules that specifically focus on career exploration. Thus, learners have an abundance of opportunities to lay a foundation for choosing a

life path while seeing people from around the world in various fields share their lessons learned in spaces like the *TED X* and *Career Girls* modules.

From the student's perspective, the digital library has positively impacted their career aspirations by providing valuable resources and insights. Several students mentioned how the library has given them the guidance needed to confidently pursue their desired professions, whether it is becoming a policeman, teacher, or hacker like this Namasika Form 3 student,

*I want to be a hacker, so coming to this digital library has improved my future. Yes, and I believe this digital library can assist me in achieving my future of being a hacker. A hacker usually uses a computer; the digital library helps you know what you are doing, so I see that the digital library can help me.*

They appreciate the access to videos and strategies shared by professionals in various fields, helping them understand the steps to achieve their goals. Additionally, students interested in ICT and business management note that the digital library has helped them acquire necessary skills and knowledge, bringing them closer to their chosen careers. One participant emphasized how the digital library also fosters innovation, enabling students to explore science and technology and even create their own projects. This process empowers students to take pride in their work and contribute to the development of their community.

Overall, the digital library is seen as a valuable tool that provides both educational and practical advantages and seen as a crucial tool in shaping and supporting future career development. These perspectives highlight some interesting alternatives for career support through the digital library, serving as a vehicle to spread employment opportunity. Additionally, RACHEL encouraging and facilitating technical-trade schooling/education is an interesting promotional opportunity for the engineering fields that can also be developed into partnerships with direct pathways to employment.

## **Ability to Operate a Computer**

Computer literacy and access serve as a gateway to opportunity and more educational resources, hence just having access to a computer and being able to feel it is significant. As a teacher observed,

*At least a large group of learners from the remotest they have accessed to see this is a computer, feel it, hold the mouse because it was the earlier on, they did not know how to move that indicator to say “ahh” this is the computer. But this time, they cannot feel shy, although some of them are still feeling shy because of little access, this [computer] holds the future most of them will know, especially at Bembe now so many of them try, ‘Can you hold this, move this open this file?’ They try to open this file. -Bembe Teacher*

Touching, holding, and navigating the laptop or desktop has been a transformational experience for some participants,

*When I first saw people using a computer, I thought it wasn't very easy. Still, as soon as I was introduced to the digital library, I noticed it was easy to learn if I put in the effort. Now I am happy that I can operate a computer. -Namasika Form 2*

Here, teachers and students acknowledged how gratifying and necessary it is to have the essential exposure and ability to operate computers, and now there is some commitment at each school to try to expand and support ongoing computer access and literacy in the future.

## **Growing Comfortable with Regular Use of Technology**

Regular access to digital tools generates comfort with them. As such many responses by students and teachers centered on the changing relationship with technology they experienced over the course of their introduction to the new digital resources, including laptops, tablets, and the RACHEL device.

Students highlighted a significant shift in their relationship with technology and education. For example, in the past, when they were faced with difficult topics, students often left them unresolved. Now, with access to digital libraries and technology, they can easily find

more information to better understand the material. This has made education more accessible and simplified,

*[RACHEL] has changed in a way that in the past, when we did not understand a topic, we could leave it like that, but now we can go to the library, be close to the technologies, and access more information about that topic. I can explain that our relationship with technology is now closer.” - Namasika Form 4*

Initially, many believed that education could only be gained through physical books, but now, with the availability of tablets and laptops, searching for information has become more efficient. Furthermore, the fear and complexity once associated with technology have faded as students have grown more comfortable and confident in using digital tools to enhance their learning,

*At first, we thought technology was hard, but as we started to learn how to use a digital library, we saw that it was not hard to understand. -Mkaika Form 3*

From the perspective of teachers, students are now actively seeking smartphones to access information, and many have overcome initial difficulties with using technology like laptops and online resources. This has sparked interest and made learning more engaging. Teachers also recognize the importance of technology, noting that it's become essential for both students and educators,

*I feel like [RACHEL] is having an impact since most students are looking for smartphones because they are hoping to access information. That is an impact. I think they could not have reached that far without technology libraries, but nowadays, most are willing to use smartphones when reading. - Mkaika Teacher*

With the increasing integration of digital tools, students are gaining valuable technological skills, which will help them compete globally. Further, teachers are seeing an increase in a willingness to read from smartphones, implying that there has been an observed lack of interest in reading from books. Many factors may contribute to a low interest in reading (i.e., low reading ability, lack of books, low grade-level reading material, etc.). However, the smartphone and offline

content solve most of these issues with extensive reading material at various reading levels, along with instructions on phonics and pronunciation.

Regarding computers, there is a much higher learning curve for teachers who have completed their entire education without using technology. The teacher from Ntonda touched on some of the computer skills they needed to learn to access the digital library, including just closing a page and opening another page,

*To start opening the laptop that was a problem, searching for information that was a problem, going to Wikipedia relating information from this side to the other side, moving, closing the page, opening another page was a problem. But as of now, she has been assisted. She frequently uses the gadget and gets interested, which also applies to us.*  
- Ntonda Teacher

So, once the participants become skilled in access digital materials, the frequency of use increases dramatically, helping them with learning skills needed for today's workforce and the future. Digital resources have filled a critical gap in teaching, providing much-needed support and transforming education by familiarizing both teachers and students with new technologies.

### **Learning Remotely or Independently with Digital Devices**

The ability to use computers for career and personal progress inspires more frequent use, including outside of the classroom. The COVID 19-pandemic highlighted the importance of digital skills, with virtual lessons becoming an essential part of education, and proved that out-of-school learning and learning without teachers is a valuable opportunity. Also, teachers have learned to embrace and be prepared to adjust to future environmental or public health shocks. Like most virtual educational options, the digital library helps keep students engaged, preventing them from indulging in negative behaviors during their free time by providing them with access to information and a mechanism to guide their own education. As such, it was envisioned that

participant students would eventually gather information independently and collaborated with peers, sharing what they have learned to enhance their education,

*At the same time, they can gather up right there in their homes with their friends maybe to form their group discussions because of having information which they collected from the digital library such that whenever they come to school, really we are teaching students that have got information, why because they have accessed some information ahead of the teachers... You give the learners more information, and then they will study at home, and when they come to school, they are more knowledgeable. -Meru Teacher*

Teachers noted RACHEL has gone beyond the hypothetical and improved teaching in CDSSs by allowing students to access materials outside of school, deepen their understanding, and come to class more knowledgeable,

*It also assists, let's say, when a student from this school has access to information on certain subjects and they engage in group work elsewhere, maybe with other students from other schools, they can share the information that they got from the digital library to assist others in maybe their education. -Ntonda Teacher*

Generally, students and teachers shared that the digital library played a key role in fostering independent learning and group collaboration, which is a bridge to increasing out-of-school learning/studying. Participants and the larger community see the school as a continual resource; that education can take place without teachers present. As such, after-school hours have been used to provide access to digital resources, which has been a successful strategy for some CDSSs as the home is a place where education has an opportunity to attract diverse learners and create more communal and informal educational outcomes.

### **Motivated by Exposure to Scientific Information and Fields (STEM & ICT)**

Students and teachers highlighted the value of RACHEL on science learning. The emphasis on science-related subjects and resources was unexpected but extremely encouraging. It underscored that CDSSs are ripe for further investment in STEM courses and resources through the availability of digital libraries. This finding is extremely valuable for this study, not only

validating the assumption that rural communities have an innate interest in science and the natural world, but that they are keen receptacles for scientific information and problem-solving if tasked concerning their personal and national achievement.

Students and teachers expressed a strong interest in science subjects due to the wealth of information available in digital libraries, like this Form 4 Mkaika student,

*I love accessing biology. There are many things that we hear. For example, we hear that trees breathe. How can one understand this? So, we can watch videos on reactions and how oxygen is formed. We can now trace the process of photosynthesis and how ATP molecules and Adenosine Triphosphate are formed, and we can answer questions related to this when asked.*

Participants found it particularly engaging to explore topics like physics, biology, chemistry, and engineering. For instance, students have learned about the movement of cars, the process of digestion in the human body, and how sound travels through oscillations and waves.

Additionally, chemistry lessons help students grasp how chemical reactions, such as those involved in making fertilizers, work. Teachers, particularly those interested in computer science and innovations like artificial intelligence, also find the digital library a valuable resource,

*Academically, I have been delighted mostly with computer-related and scientific materials, such as innovations and scientific advancements. So, I think I am more attracted to learning about computers when discussing artificial intelligence.*

-Mkaika Teacher

Overall, the digital library offers students and teachers an enriched learning experience, providing them with the knowledge to develop practical skills and understand the scientific principles behind various processes. Participants enhanced their awareness (and the consideration) of opportunities based in the 4IR, as they increase their confidence and skill level for a future in STEM or ICT careers.

The introduction of digital libraries has significantly influenced student and teacher career aspirations. For instance, students aspiring to become doctors, engineers, and ICT specialists have found the digital library to be an essential resource in guiding and enhancing their knowledge,

*I can say that I want to be an Automobile Engineer, so I go into the digital library and search for science subjects that will help me achieve my goal. -Namasika Form 4*

A student interested in ICT, for example, views the library as a foundation for their future career, while another student with a passion for medicine and inspired by the available resources in RACHEL, explored medical fields, like this Form 4 Ntonda student,

*Since the digital library, I have been asking myself more questions about how to achieve my career goal of being a surgeon, especially in managing brain and heart surgeries, just as doctors from India do.*

Students prefer STEM careers. Though the interviewees are likely some of the highest performing students in their school, their influence on their peers and their success moving forward will promote the opportunities STEM careers will inevitably offer. Further, participants' comments reiterate the importance of computer access in their decision-making, both as a tool for solidifying interest in the ICT field and as a vehicle for useful career information on jobs/professional experiences that are found in their community or beyond. Relatedly, just like computer exposure builds ICT interest, access to a lab and practical experiments will expand interest in lab-based sciences like chemistry and physics. Overall, digital libraries are helping learners and educators explore and pursue their career goals by providing valuable resources and knowledge.

## **Growing Knowledge of the World Outside of Malawi/Africa**

Whether inspired by career interest, or other personal prospects, teachers and students are filled with curiosity about the world outside of Malawi. With the digital library they have a tool to access diversity of life and perspectives in the world,

*We have learned other countries are doing some technology on how to make some mechanical implements, so we also operate that idea for also us to do the same.*

-Meru Form 4

RACHEL offers curricula from multiple countries, enabling students to explore different educational systems, compare them with their own, and critically assess their strengths and weaknesses. Recognizing potential biases—whether intentional or unintentional—in the information they receive highlights the inherently political nature of education. However, the ability to examine their own culture in a global context plays a crucial role in shaping students' perspectives and future choices. This opportunity enhances the value of digital resources like RACHEL, reinforcing students' engagement and commitment to their learning journey.

Participants shared the value of digital libraries in enhancing the understanding of various subjects, particularly social studies and biology. Through these resources, teachers and students can explore different cultures worldwide, comparing their own traditions with those of others,

*In this digital library, I can explore much of the culture, particularly the cultures worldwide, like Western and Eastern cultures, what they do, and what else, so it's very interesting.* -Namasika teacher

They also appreciate the opportunity to access and compare content from other countries, deepening their knowledge in subjects like biology and fostering a broader perspective on education,

*We can access some information and see how maybe other the concept the ideas which may be other countries are learning and how deep they go with such content. We can make some comparisons in terms of these subjects. - Meru Teacher*

The participants highlight how the digital library facilitates the exchange of ideas, helping to overcome knowledge limitations and allowing individuals to learn from the experiences and practices of others. Overall, the digital library is seen as a powerful tool for broadening horizons and contributing to progress, as this teacher from Namasika points out,

*Sometimes development has been failing because we believe that what we are doing is right, not because it is indeed right, but because we do not know what others are doing. But because we are able to see what others are doing, it means we are able to learn what they are doing so that we also develop and in the long run we will also develop. So this is possible because of digital library.*

Observing educational practices in other countries enhances teachers' roles as facilitators, inspiring students to engage more deeply with concepts and fostering meaningful discussions that expand their understanding. Notably, exposure to global developments serves as a tool for accountability, highlighting internal challenges within Malawi's education and cultural systems while offering alternative frameworks for comparison and improvement.

### **Exposure to Media/Visuals Motivate and Support Learning**

The ability to use the various viewing devices has encouraged participants to engage a world of resources, and that includes all the visual media the digital library holds. Participants expressed interest and comfort with multi-media and visual media as entertainment and education tools. Many students reflected on using images to understand academic concepts and boost their knowledge in topics that interest them.

During the interview process, as mentioned in the Chapter 4, each interview question was presented on a PowerPoint that corresponded with an image the participants saw next to it. All the photos were Afrofuturistic and or visually related to the question. The images are intended to

jar the viewer and deepen their responses by considering a vision, outcome, or life possibility that does not exist. Most participants took advantage of the challenge and connected the digital library as a potential catalyst for the achievements and alternatives the pictures suggested.

Additionally, the images revealed social, historical, and personal blind spots, reinforcing the need for an educational approach that empowers students to improve their circumstances. They have sparked creativity and aspirations, affirming what both students and teachers envision for the future. While bridging the gap between reality and these images remains a challenge, they serve as a powerful reminder of human potential, strengthening both individual and collective visions for growth and progress.

Students reflected on the images they found in RACHEL in combination with afro-futuristic images presented to them in the interview, centering on the current state of Malawi and the potential future that technology can help achieve,

*I have seen some buildings in the pictures and want Malawi to develop like that. People should come from other countries to visit Malawi. -Mkaika Form 4*

Many of the afro-futuristic images used in the interview illustrated the contrast between where Malawi is now and the progress it could make with the use of digital tools and built upon student interest and ability in STEM. The participants shared the images inspired their aspirations to emulate developed countries in terms of infrastructure, education, and technology, as emphasized by this student from Namasika,

*It has given me the ability to help me achieve my goals. When I watch some videos in a digital library, those videos allow me to know how we, as humans, are powerful and can stand for ourselves. It has also allowed me to use the computer and taught me how important a digital library is.*

In the reflection, there is a recognition of the importance of learning from the wider knowledge of human experiences (and being critical of them), but also an emphasis on preserving and promoting Malawi's culture and history. The following was offered by a teacher from Meru CDSS,

*By looking at the picture, it is more like the whites have enslaved us. Let's say, for example, I don't take history, but in history, we focus much on, we say, world history, and then we neglect our own culture. People don't know more about Malawi. What is Malawi all about? We have a little part of Malawi but more of other countries. So, if we need to, let us be aware of that. We are also supposed to be learning things from our roots.*

The participant's reflection highlights a critical awareness of historical and cultural representation in education, noting that curricula often emphasize world history—primarily focused on other nations—while neglecting Malawi's own rich history and heritage. Their perspective underscores the importance of learning from one's roots to foster a more balanced and meaningful understanding of identity.

The openness and ease with which this conversation unfolded—touching on African and colonial history, as well as aspects of neo-colonialism—were unexpected yet refreshing. It provided insight into how participants perceive historical narratives and their role in shaping current realities. Notably, this discussion was prompted by an image in the interview PowerPoint (see Appendix H – Interview Presentation with Afro-Futures Images), emphasizing how visual prompts can spark deep and necessary conversations. Ultimately, the participant's remarks affirm the relevance of these discussions in the classroom, reinforcing the need for critical engagement with history to encourage awareness and informed dialogue.

## Changes in Mindset

The interviewees reflected on how the digital library has transformed their outlook on education, culture, and personal growth,

*When digital libraries were not around, I used to hear about it in other countries, about things that other people made. When you see the level where you are and compare yourself with them, you think you can't achieve it. As soon as the digital library was introduced, it made me change my mind and work hard to create something great that others could see, just like in other countries. - Namasika Form 3*

The introduction of digital libraries empowered individuals, particularly in rural areas, to access information that was once limited to wealthier or urban populations, making education and technology more inclusive, as this teacher from Mkaika shared,

*We thought things like ... these digital[tools] can only be accessed by people in town or well-to-do people. So, bringing these digital materials within the local community achieved the goal that everyone could use computers or the digital library regardless of whether they were male or female, were born with gadgets, or were of poor background. That does not have to do with literacy. They have to know how to use it.*

For some, it has sparked a sense of self-belief and determination to create something valuable, similar to what they admire in other countries. The digital library has also contributed to changing mindsets on important issues, such as deforestation, and encouraged responsible practices like tree planting. Furthermore, it has improved students' academic performance, particularly in science, and instilled a stronger work ethic, stated by this Form 2 from Namasika CDSS,

*It has changed because I was not doing well in science subjects in the past, but now I am doing well. The digital library has instilled in me a hardworking culture.*

The digital library is seen as a tool that bridges cultural gaps, promotes equality, and nurtures intellectual and personal development. It provides a tool within which users can see themselves

as able to close the gap in ability and opportunity. Additionally, rural communities are characterized by their lack of resources. As such, people from these communities often see themselves outside of the possibility for progress and cannot engage in the benefits of life like people living in more developed parts of the country or world. The digital library offered an opportunity to shift their understanding of themselves, rising above their current circumstance.

### **National Visions/ Motivations**

*I want to Malawi to be like other advanced countries, villages should have computers so that they can be able to communicate with others.*

- Mkaika Form 3

Participants expressed a shared vision for a more self-sufficient and developed Malawi. The following section provides perspectives that both teachers and students share as they painted pictures of a future Malawi with stronger infrastructure, wellness, resilience (both to natural disasters and in the economy), greater independence and the expansion of technology. Undergirding this is a hope that increasing educational technology can secure a future they look forward to and practically influence their current situation.

### **Government and Decisionmakers Impact Others**

It was made clear by participants that leadership in Malawi is responsible for the conditions of the current society. Participants highlighted issues of corruption and mismanagement, and the non-concern leaders show for the current and future citizens of the country. However, there was often a note of hope around the example and success of such educational endeavors (like the Digital Education Pilot), which can help to instill some faith in the population and investment in the future.

Both teachers and students shared ideas on improving Malawi's education and political systems. They emphasized the need for fundamental political reforms, believing that such changes are crucial to addressing the country's persistent poverty and ongoing challenges, even decades after gaining independence,

*Malawi is poor, Malawi has been independent, I think, approximately for is it 50? 57 years. But Malawi still has a lot of Malawians who are poor up to now, so the question is, why? I think the problem is the political structure because no matter how we change the leaders when they get into the positions, they will repeat the mistakes that we have been making. So, I think the change in political structure will lead to many changes.*

- Namasika Teacher

Additionally, participants recognize the efforts made by leaders in improving education through infrastructure investment and foreign aid, but caution against blindly importing educational models from other countries, like this teacher from Meru said,

*Sometimes we just hire certain culture from outside in education, some of these, the government or these leaders need to be censoring whatever they import from maybe other countries. For example, we talk of the curriculum, you find that maybe they say from standard 1 to standard 4 lessons should be taught in vernacular. I feel somewhere this is the culture that has really made our learners to be dull in Malawi.*

They specifically mention that certain policies, such as teaching in local dialect/languages in early grades, may not be beneficial for students' development and suggest that these practices should be carefully reviewed to better serve Malawi's educational goals.

Malawi government leaders should update their priorities which should aim for all citizens to achieve global standards of a higher quality of life. However, there is widespread frustration over the lack of progress in improving government effectiveness in education. Many acknowledge that the current system is largely imported, resulting in stagnant thinking and low national productivity. Teachers, in particular, call for African leaders to develop education

policies that reflect the continent's unique needs rather than merely replicating models from other countries,

*Sometimes, the leaders adopt policies they think worked somewhere without really looking at what it is really that we, as Africans, can do and then how best we can do it so that we help the students or the African kids here because much of what I see is copy and paste. We copy from other countries or different continents. We feel that what they worked there will also work here. So, I would love for African leaders to change their mindset and think in that direction to draft or develop policies that will impact or influence our countries according to how we are. -Namasika Teacher*

Teachers emphasized the importance of creating policies that truly benefit African students and reflect local realities. There is also a strong desire for increased civic education in communities, to help people understand the value of education and new technologies. Additionally, they advocate for a shift toward problem-based education, where students are not just absorbing information but learning how to apply it to address the challenges Africa faces,

*I have noticed that we have many school learners, and these students are just staying. They are not doing anything yet. They went through school, so they had a lot of information but didn't know how to use it. So, my take is that it's like the leaders should formulate a curriculum that would address the problems that our continent is facing, not just swallowing information and not using it. - Namasika Teacher*

There is a strong call to look inward and develop mindset and policy changes rooted in the natural, indigenous intellect of Africa—free from Western influence and priorities. Aligned with the concept of Frugal Innovation, the proposed "problem-based" education approach (Hmelo-Silver, 2004) emphasizes the value of practical experience in learning. By connecting students' and teachers' daily realities with the tools and perspectives needed to address individual and community challenges, this approach aims to foster self-sufficiency and solutions that function independently of government support.

However, participants also highlight the importance of maintaining strong international relationships, particularly with countries like the United States, which support educational

initiatives such as digital libraries. They emphasize that these relationships are crucial for helping students in their country. Additionally, the teachers stressed the need for a thorough review of the current curriculum, arguing that it should be updated to address contemporary challenges and promote innovation. This Mkaika Teacher shared,

*I think our curriculum should address the current challenges because if it is what we used 20 decades ago, it is irrelevant to our current problems. So, I think it should be wired to promote innovations because every country that is well developed is known for innovation and solving problems using technology. I believe more focus and attention should be given in that direction. Then, we are on a good path.*

They believe that a curriculum focused on solving real-world problems using technology would help align the education system with the needs of the future, contributing to the country's development.

The current partnerships Malawi has with nations worldwide, including China and the United States, have been instrumental in some ways. Still, these relationships' underlying intent and outcomes have been detrimental to the Malawi agency. Most participants appreciated the benefits that have manifested in these partnerships in recent years but longingly looked toward the future with less internationally dependent leaders. Participants however have not foreseen educational resources like RACHEL to be developed in Malawi, though there have been efforts in the country (and continent) to develop such technology. Unfortunately, there is no awareness of these efforts or confidence that they would be available in the country.

### **Aim or Desire for Achievement as a Community or Country**

Students expressed an overwhelming desire for the long-term exposure to the information and application of digital libraries. They indicated the more time with these resources the greater familiarity and confidence they would have in their application. A Form 2 student from

Namasika pointed to the importance of a person's confidence in their ability (including skills, access, and motivation) to meet their goals,

*I have questions like: 'Can I change my Malawian country or not? Can I be able to achieve my goals or not?' That's all.*

For some students, the United States represent an image of national/personal success. With limited knowledge about the country, a student stated,

*It [Malawi] should look as good as the USA. - Bembe Form 3*

Another student stated,

*I want Malawi to be like other advanced countries; villages should have computers to communicate with others. - Mkaika Form 3*

Similarly, students mentioned China as a model for Malawi's development, with little knowledge of the social conditions and underlying value systems that promote Malawi's underdevelopment,

*I want Malawi to look like China. China is significantly developed. For example, people can buy things using phones. -Mkaika Form 3*

Ultimately, students want a career; they want a future of economic and material stability and comfort that meets the global standard and they want to contribute to that development at home. But without the consciousness of how other nations have reached these levels of industrialization which came with tremendous waste and social problems, it brings into question whether the mindset of young Africans can genuinely be nurtured to create alternative futures, as they are so profoundly influenced by the dominant versions of unsustainable success perpetuated around the world.

## **Desires for Widely Acquired Technological Resources**

Many students mentioned the overall goal they want Malawi to achieve is for every Malawian to have internet access, allowing the country to compete globally, as this Mkaika Form 4 student said,

*In 100 years, I want every Malawian to be able to use the internet, and Malawi should compete with countries that are advanced in terms of internet access. We should be able to use the internet and satellites, which will allow us to stay informed about what is happening worldwide.*

As Malawi's economy is agriculturally based and still heavily relies on individuals' physical labor for mass production, this student's statement is also reflective of a desire for the improvement of agriculture as an economic, business, and cultural staple. Generally, participants envision a future where Malawi is technologically advanced, particularly in agriculture, where machinery replaces manual labor, leading to more efficient production and local markets for goods, as this Ntonda Form 3 explains,

*Regarding agriculture, Malawi uses manual labor while other countries use machinery. However, if someone can make, for example, a tractor through the digital library, we will no longer have to import tractors, and agriculture can be elementary. This is because we will be using machines, not manual labor.*

They express a desire for Malawi to move beyond traditional farming tools and embrace modern technologies that can drive economic development. Additionally, the participants highlight the importance of improving access to technology in rural areas, with a vision of villagers using smartphones and computers confidently. The use of digital libraries is seen as a potential solution to help locals create their own machinery, reducing reliance on imports.

Given the physical toll and low economic yield of manual labor students have experienced growing up, it is not surprising to see their vision of a developed nation include the end of manual labor in the agricultural sector, as this teacher from Namasika adds,

*I like agriculture but then in 100 years to come I would love our agriculture to move beyond the use of hoes and reach a certain level... when we talk about agriculture, it should be advanced agriculture which we are using machinery and other advanced technological equipment but also not only that but we should also have markets which are there so that we can sell our commodities and then in turn have something which you can economically develop from. When I am talking about that I am about after adding some value because by the end it will be technologically advanced and developed.*

Additionally, this vision involves processing raw goods into exportable products, resulting in increased manufactured goods and profit. The success of adding value to raw commodities lies in the strength of the transportation system in and out of the county, and Malawi has notoriously poor infrastructure. Just like the macro systems students envision to build the economy, they see telecommunications as the parallel industry to secure it. Overall, participants emphasize the positive impact of education and technology on improving agricultural practices and also environmental care in Malawi.

### **Visions for Better Roads, Buildings and Other Public Services**

For students and teachers, national achievement means having access to the services and infrastructure needed for a better quality of life. Participants indicate the absence of basic facilities and access to resources, and students shared their poignant awareness of an overall challenge that national poverty in Malawi poses explicitly to youth. Further, teachers shared honest doubt that the country can produce access to essential services for the average citizen.

Students envisioned a future where Malawi undergoes significant development in infrastructure, technology, and health. They expressed a desire for the country to reduce its reliance on imports by manufacturing its own products, which would stabilize the economy and strengthen the value of the Kwacha. The participants also hope for improved roads, buildings, and overall infrastructure, aiming for a future where Malawi looks more like developed nations,

*I want to see a significant change in Malawi because we should be able to manufacture our products and reduce importations as this devalues the Kwacha. I would also want Malawi to have good roads. - Mkaika Form 4*

Digital libraries are seen as contributing to this development by promoting better planning and construction practices. They also called for widespread access to electricity and medical facilities to improve living standards and ensure that no one must travel long distances for basic healthcare,

*To supplement the last speaker, I would like to see Malawi in next 100 years with no grass thatched houses because they are the ones getting a greater role in destruction of the environment and I would like also to see Malawi full of electricity where no cutting of trees should be done because it is main source of environmental degradation. Malawi should advance with at least full medical facilities every 10 meters because people now travel long distances to access medication, which is a challenge. Malawi at least advances in such areas of health and environmental conservation. - Bembe Teacher*

In sum, in response to the “100 Years” question, students pictured renovations they expected to happen toward a more efficient life in their country. At the core are manufacturing, improved roads, and buildings that can withstand the environmental shocks of flooding and landslides that have continuously devastated rural communities. The desire for the stability of electricity and preservation of natural resources are an encouraging combination, indicative of the desire for more sustainable development.

### **Visions for Improving Human Life and Conditions**

Both teacher and student participants expressed an overwhelming sense of responsibility and concern for their fellow citizens and families. Particularly through the comments about health and lifestyle choices that damage the community and individuals.

From the student perspective, there is a strong desire to see Malawi improve, particularly in healthcare and education, as this Meru Form 4 Student points out,

*I wanted this Malawi to look so nice. We should have more health care. If they can build a structure such as a hospital, we can live a better life because you can see that we live in poor surroundings, in the back of classrooms, we lack some desks. Some students also sit on the floor, which is not good.*

The need for better infrastructure, like hospitals and classrooms with proper furniture, is highlighted as essential for improving living conditions. Technology, particularly digital libraries, are seen as a tool that can positively shift people's perceptions and provide access to valuable information on health, hygiene, and environmental conservation, as the student below details,

*In 100 years, I don't want anyone to die because of a shortage of medicine and electricity in the hospitals. Today, ESCOM [Electricity Supply Corporation of Malawi] is the only company that produces electricity, but I want to see Malawi generate electricity from other sources, such as wind, using [knowledge from] these digital libraries.*  
- Namasika Form 3

In the future, the student hoped, there are more diverse energy sources to address electricity shortages and reduce dependency on a single provider. Additionally, technology is recognized for enhancing security by enabling people to report fraud and other issues. The digital library is further seen as a vital resource for educating people, reducing societal challenges like child pregnancies and overpopulation, and helping future generations make informed decisions for the country's progress.

Public health and the country's health infrastructure are unsurprisingly a primary focus for students. Being raised in and navigating the conditions and effects of material poverty highlights the insecurity of life that could be avoided when the preservation of the human community is valued or prioritized. This Ntonda Form 4 student explains,

*I think this will help to develop the country and will also reduce deaths related to child pregnancies, which are common here in Mangochi. In addition, we will gain knowledge*

*that will help reduce overpopulation, reducing stress on resources such as hospitals and natural resources.*

So naturally, the wellness of the environment is focused on in combination with addressing preventable illness. Improving the human condition is in tandem with managing the natural resources needed to make the human condition sustainable. So, the vision for alternative energy powering hospitals, resources being preserved (inspired by better education) and ending overpopulation are amazing connecting elements and outcomes suggested a comprehensive interest by the participants for their society moving forward.

For teachers, a better Malawi in the next 100 years includes hopes for tackling diseases like cancer. There is a strong call for better health infrastructure, such as cancer treatment centers in every district, to prevent patients from having to travel abroad for care. Digital platforms are seen as crucial for spreading knowledge, particularly in health, enabling people to access information on disease prevention and treatment. The goal is to improve overall community health, leading to a more educated and healthier Malawi in the future, as this Mkaika teacher states,

*[Digital Library access] will eradicate ignorance because one of the major challenges that we are facing, especially in the lakeshore, is that students who are girl children are in early childhood knowledge. They indulge in immoral behavior, and one of the reasons is a lack of access to that information. We know it cannot change over a long time in one day. It will help us build an educated community that can reason and know where and what to do at a specific time.*

This teachers' comments reiterate the opportunity digital library brings for bettering education and its connection to improving the human condition. Though many other factors contribute to the issues of early sexual activity and teenage pregnancy that are alluded in the quote above, better sexual health education and information discrimination tools that address cultural-gender

stigma are a part of the solution. By improving education, we can address the lack of opportunity, the lack of self-worth, and financial dependency that fuels child marriage.

RACHEL, as a mobile-offline resource, shows the potential to enable health workers across the country to facilitate behavior change by bringing about the awareness that education does not stop in school – digital libraries can allow for continual learning to maintain a healthy and balanced society as the norm.

### **Social Realities Specific to Gender Are a Factor**

The modern realities that females have gained access to education and empowerment globally, and actions taken for female child protections in Malawi over the last decade, have impacted this generation of secondary students. As such, the factor of gender was often mentioned as participants envisioned improving human life. Students seemed empowered and took responsibility for social progress, while teachers still have a social lens based on a past of inequity. Traditional beliefs biased against girls have been a hindrance to development, but the younger generation has changed and consistently expressed an aptitude for a new approach to tackle the problem.

Teachers described how local leaders having gained insight on effective community management from RACHEL, and how community-led Mother Groups have found resources to help support and educate girls, as well as to promote equal learning opportunities for both boys and girls, as described by a teacher from Meru,

*Mother Groups who are also able to access some information from the digital library where they get some information in how to handle the girl students and also how to teach how the boys and girls should be able to learn at school it is beneficial to the community...even in the maybe the way we could look at our parents in the farm, we could see perhaps the father whenever maybe father and mother in the garden they work together. Still, later, the husband goes away and leaves the mother alone in the garden planting. But this time, the digital library is from agricultural perception; it gives a guide whereby both genders can see that I think every sex can do every work and every activity.*

The digital library has thus help challenge traditional gender roles, promoting the idea that both men and women, as well as boys and girls, are equally capable of contributing to various tasks, including in agriculture and career development. This shift in perspective has empowered people to challenge gender biases, with many, like this Namasika student, who expresses how the library has encouraged them to value education for girls,

*I think [the digital library] can change the community because some people believe that women are weak, so if I can make something here, I can give it to the other girls in the community. How important it is for a girl to be educated, and how beautiful it is when a girl has achieved something.*

Overall, the digital library helps users understand the importance of gender equality and human rights, reinforcing the idea that everyone, regardless of gender, plays a vital role in the nation's progress. This access to knowledge is helping to break down stereotypes and promote a more inclusive, equitable society,

*Traditionally, people say that education is not for girls but for boys and that girls should concentrate on chores. This is very contrary to the information I find in the digital library. The digital library has a lot of information about girls' rights to education, and we are more encouraged to go to school because of the digital library. -Ntonda Form 4*

Gender in Malawi is profoundly a traditional concept rooted in a deep historical and cultural sensitivity. As such, bringing local leaders, elders, and stakeholder groups to access information and guide their thoughts and question practices is a massive undertaking and an excellent best practice to continue. Though the digital library pilot guidelines required teachers to be cognizant of sharing device access with female and male students equally, the prospect of reconsidering work in the home and activities in community life across gender lines was an unforeseen benefit that developed from this research.

Young minds are typically open to influence, but because young people, male and female, worked side-by-side during the digital education pilot (with the same resources and for the same amount of time), and given relatively the same amount of access, and were able to share their minds and their enthusiasm, and learn together while using new technology, it was unsurprising to see how supportive and encouraged they have become in facing and challenging the failings of traditional roles of gender. Further, to have teachers echo what these students have discovered, validating its impact and the opportunity for change, is a momentous achievement.

### **Socio-cultural Perspectives and Realities Are Influential**

Outside of gender disparities, various cultural practices and shared beliefs also pose significant challenges to improving human life in the country. Student comments reveal some of the root causes behind stagnation in their communities and the obstacles they face in achieving their educational goals. A student from Ntonda shared,

*Most people in Malawi do not believe much in education. Still, if this initiative continues, people will get interested in education, which will help develop the country.*

Similarly, a Namasika Form 3 student noted,

*The relationship has changed in a negative way because in our Yao society most of the youth view these things as useless and they don't like the idea of me spending a lot of time at the digital library.*

The mention of specific ethnicities underscores the need for advocacy from local and faith-based leaders to build trust in the potential of increased investment in digital libraries, educational technology, and expanded school access for marginalized communities.

Furthermore, teachers raised concerns about the impact of technology on traditional cultures. One Namasika teacher feared that increased exposure to foreign cultures through

technology, like the internet and digital libraries, may erode Malawi's own culture as younger generations start to value outside influences over their own heritage,

*Are we not killing our culture if everyone uses technology? Our culture is dying, so who will teach children our Malawian culture? Because we are taking in other people's cultures from technologies and the internet, you know culture is diverse, right? So when you get exposed to and join other people's culture and start to think that your culture is not good enough, and then you begin to change it, it's like you have started losing your culture. Every country or society is best known by its culture, so what will the next generation be like? What will be their culture?*

The worry of the teacher is that this technological shift could lead to the loss of the Malawi cultural identity. However, another teacher points out that digital libraries can also foster greater understanding and equality across cultures, including gender equality,

*We are equal; we differ in culture but are the same. At first, in the past, people could not marry those from Nsanje because we differ in cultures, but now, the education of this digital library helps us to know that we are just the same as we differ in culture. Culture is something that we can learn, and then off we go. -Meru Teacher*

They noted that digital resources have helped people recognize cultural similarities, leading to a more inclusive and balanced perspective, where differences in ethnicity and culture are seen as less of a barrier, thus fostering a sense of unity and understanding.

Another significant socio-cultural factor is the promotion of English as a Second Language. This issue has been debated for decades, as it reinforces Western hegemony while simultaneously providing access to the global economy (Zeng & Yang, 2024). Teachers' concerns about self-doubt and the erosion of cultural identity in exchange for broader opportunities are both valid and pressing. These concerns will be addressed in the recommendations, which will include advocating for the integration of local content into offline digital resources and promoting its relevance to the cognitive and social realities of the national population.

However, this effort requires collective action and a deliberate commitment to curating educational, historical, and scientific content that fosters students and societies that are whole, self-assured, and deeply aware of their intrinsic value. This challenge is closely tied to gender inequities in Malawi and beyond, where traditional norms have often excluded female and minority students from educational opportunities and academic success. Here, I emphasize the need for a balance between global progress and the preservation of traditional beliefs—one that ensures the protection and integration of diverse knowledge systems while upholding the fundamental value of all individuals.

### **Concern for Impact on the Natural World**

Improving human life is indistinguishable from the conditions of our environment. Though the participants expressed concerns about agriculture as an industry and their vision for ongoing effort to build it for economic prosperity, they made little comment on the value of nature - its endangerment or concerns about unsustainable practices. This specifically highlights points in Chapter 1, noting the lack of climate competency and how and why agriculture is in jeopardy due to climate change.

However, the digital library has been a valuable resource for raising awareness about environmental and climate change issues. It provides information on how to protect the environment, which can help preserve forests and improve agriculture, as the following Ntonda Form 4 student shared,

*We will gain knowledge of alternatives to firewood, such as cooking using gas. This will help protect forests, which will, in turn, positively impact agriculture.*

Additionally, RACHEL educates communities on the impacts of climate change and the role of human actions in exacerbating these challenges. One participant highlighted a focus on environmental conservation, advocating for the elimination of grass-thatched houses and a

reduction in deforestation. They also proposed engaging school dropouts and retired individuals in spreading environmental awareness—such as promoting tree planting—through village meetings and community initiatives.

Moreover, the use of digital libraries is credited with enhancing agricultural practices by providing access to new techniques and technological insights, such as growing mushrooms and assessing soil quality. According to a Namasika Form 4 student,

*Many activities in agriculture here in Malawi deplete the soil. When we go to the digital library, we can read more practices and help our local community develop. For example, we can determine whether this soil is good or not. We see the videos on the laptops on how to determine whether the soil is saline or whether the soil is good or not by seeing how they practice on the laptops. We can adopt and develop our local community.*

The participants stressed that RACHELs' resources allow local communities to adopt more sustainable and advanced practices, which can help address issues like soil depletion and support overall community development. Interviewees see the opportunity RACHEL brings to the community to learn sustainable approaches to development.

As people learn about these issues, they become better equipped to manage their surroundings and protect natural resources for future generations,

*I follow contemporary issues and how to deal with human life. The information is there [in RACHEL] about climate change issues, floods, and the like, and the impact of such things on human beings. So, it makes me understand the world better and face the challenges head-on. - Bembe Teacher*

Participants have explored the fundamentals of environmental management and local degradation issues. However, it is equally important to emphasize both the acknowledgment of human contributions to larger environmental crises—such as floods and mudslides affecting Malawi—and the need to challenge traditional beliefs that have justified or downplayed harmful practices. Drawing connections between Malawi's climate challenges and those faced by

neighboring and developed countries reinforces the reality that climate change is a global issue, not just a local one.

### **Value and Preference for Africa's Independence/Self Reliance**

As part of the national vision for realizing its full potential, students and teachers emphasized the importance of Malawi's independence from foreign influence and the need for greater self-reliance. This led to a strong focus on accountability in national decision-making and the exploration of alternative leadership approaches that prioritize and value Malawi's human and natural resources.

The desire for self-reliance and technological advancement is a strong sentiment expressed by the students, with many aspiring for Malawi to be less dependent on other nations in the future, like this Bembe student from Form 4,

*Malawi should be self-reliant. We need to have our resources and electrical power generation.*

There is a clear vision of a future where Malawi has developed its own industries and is no longer reliant on imports. The need for local resource management and the generation of electricity within the country are featured prominently in these aspirations, which is a requirement for the development of the industries they seek. Teachers voiced a strong call for African leaders to invest more in developing local infrastructure and resources. One relayed the idea of creating mega-farms at various levels to boost Malawi's food security and stabilize its economy. The participants saw the digital library to be able to inspire innovative solutions to local challenges,

*In 100 years to come, even to say Malawi is a hunger-stricken country, what if we can have mega-farms? Maybe personally, because I believe that maybe from the T/A level, there should be a mega farm. At the regional level, there should be a mega farm. At the*

*national level, there should be a mega farm so that the government reduces imports that float our Kwacha. Now, if we can have such mega-farms, we can export food and have a lot of forexes, and our Kwacha may stabilize. - Meru Teacher*

Students are also concerned with why African countries, including Malawi, lag behind in technological development compared to Europe and Asia, and they are eager to understand the reasons for these disparities, like this Namasika Form 3 student,

*My first question is, 'Why are Malawi and other African countries be the least advanced in technology compared to European and Asian countries? Why do African countries struggle to develop?'*

The underdevelopment of Africa, specifically Malawi, puzzles its young people. They have the desire for leadership, the desire to grow, the desire for development and to see the productivity that can manifest. They want stability and efficiency in their country which values their capacity and potential to achieve their personal and collective goals. Disenfranchisement is not inherent; it is made, and it is learned by the youth of Malawi, who have (in protest) stated their desire for change and willingness to latch on to the tools and resources in the digital library to manifest this change.

The role of digital libraries in fostering self-reliance, vision, and ambition among the participants is obvious, with many students seeing them as tools that can enable their country to reach goals that are assumed to be only accessible to people in more developed countries, like becoming a doctor,

*Digital libraries can make an individual self-reliant, visionary, and eager to achieve one's goals. The digital library has made it possible for Africans to achieve great things, for example, being a doctor, unlike in the past when you could only find white doctors.*

- Namasika Form 2

This sentiment reflects a strong desire the participants hold for African nations, especially Malawi, to harness local resources, develop technological expertise, and become leaders in innovation. It also highlights the importance of access to information and education, particularly through digital platforms, in achieving these goals.

The discussions from both students and teachers reflect a strong desire for self-sufficiency, development, and the need for more locally relevant educational resources. There is an emphasis on how information access can empower individuals and communities, particularly in Africa. Teachers highlight the importance of not just adopting Western education but adapting and improving it to suit the needs of African countries, especially Malawi. Some teachers also pointed out that the current educational system is sometimes a challenge, particularly when it comes to cultural loss due to the influence of foreign education systems,

*Sometimes, there is cultural erosion since we have just adopted some other education system from different countries. That's the negative part, but on the positive part, we have been resistant to change as Malawi as a whole, but through access to information, we can learn from other people to say: 'Oh, I think we have been doing it wrong and then I think we have to do like this.' So, on the negative part, we feel like we are more like inferior; we feel like everything that is from the whites is better off than ours, but on the positive part, we can adopt some of the things that are doing better that are used there that making them to be progressive, they can progress we are also doing that. -Meru Teacher*

Evidently, the teachers acknowledge the positive aspect of learning from global best practices but also expressed concern about losing their local traditions and cultural identity in the process. The quote above highlights the delicate balance that needs to be maintained between embracing innovation and preserving local knowledge. Additionally, there is a desire for the educational system to be more locally focused, with greater efforts to incorporate Malawian content and curricula that align with students' needs and realities.

In 100 years, the vision for Malawi is a strong, self-sustaining economy where local industries thrive, and access to knowledge—particularly through digital libraries—drives development and innovation. However, there is a sense of frustration and contradiction in teachers’ reflections on self-reliance for Africa and Malawi. As one teacher from Ntonda expressed:

*In Africa, one can encourage people to depend on themselves through the information they access because someone with limited knowledge cannot develop or inspire others to work hard or take initiative.*

As gatekeepers of knowledge, educators play a crucial role in organizing, advocating for, and shaping change. Yet, while their perspectives reflect the complexities of African epistemology, they often feel hollow and unfulfilled. These teachers, shaped by Western theories and values, find themselves inadvertently reinforcing the very limitations they seek to overcome. Though they long for a prosperous future for Malawi, they do not always leverage their platform or access to knowledge to challenge the deeply ingrained sense of inferiority that may hinder progress.

This pilot and research initiative sought to bridge that gap by integrating information with imagery, fostering curiosity and discussion, building practical skills, and helping participants rediscover their intrinsic self-worth. The ultimate goal is to ignite a national conversation about alternatives—the possibilities for Malawian life and the country’s potential to serve as a model for African self-reliance.

## **Aspiring for High Quality Education in the Country/Region**

As a nation priority, participants collectively believe that advancing education leads to both a personal contribution (to one's nation) and nation-wide development as an inherent outcome. Students primarily emphasize the importance of improving education in Malawi and making it more accessible,

*Leaders should facilitate the establishments of Adult Literacy Centers in the communities so that adults are given an opportunity of getting educated. This is very important because parents who have gone to school know the value of education and they encourage their children to go to school.*

As an example of improving access, this Namasika Form 3 student suggested introducing adult literacy programs in communities, to help parents understand the value of continuing education and nurture their children to pursue it. They also advocate for providing more learning materials and ensuring that those who lack educational opportunities have access to them. Participants express optimism about the progress of education and the need to prepare students for future careers by teaching relevant subjects from an early age, like this Mkaika Form 4 student,

*African leaders should ensure that learners study subjects relevant to their career goals from an early age, starting in primary school. This approach will help us become experts in our fields.*

There is a vision for the future of digital learning, where blackboards are replaced by digital libraries and smart boards. Participants emphasized the need to improve education in underperforming regions to ensure students develop the skills necessary for a technology-driven future. A Form 3 student from Ntonda CDSS shared:

*If this [digital library] is encouraged in CDSSs, we will be more interested in learning because the country will need educated people. If I don't go to school, I will suffer. As we move into the future, education will be essential for using technology. Even Facebook requires English—without schooling, there's nothing you can do.*

Students' perspectives on education improvement reflected a mix of concern over ongoing under-education, excitement for a digital future, and an awareness of the need for equity and expanded resources. They underscored the responsibility of leadership to ensure that the education system produces meaningful outcomes that contribute to national progress.

The most encouraging statement shared in the interview was, “*education is advancing in the country*”, by a Bembe Form 4 student. This acknowledgment indicates a belief in RACHEL’s capability to bring about change and the possibilities of improvement; an educational opportunity the Digital Education Pilot sought to provide and is a key for sustainability moving forward.

From the teacher’s perspective, there are several key ideas for the future of education in Malawi. They stress the importance of starting digital education early, particularly at the primary school level, so that students grow up with the skills needed for a digital future. There is a recognition that education must evolve, with a shift toward learner-centered approaches, where students can access information independently. Participants emphasized the need for an education system that focuses more on Malawi's local context, ensuring that students are aware of what is happening across the country, not just in Europe or abroad, as this teacher from Meru explains,

*Still, we know everything is happening in Europe, but we don't know what is happening in Malawi. Soon, we have to change that mindset. At least, we should have certain subjects or any topic we consider in every district about what is happening in Malawi so that all of us citizens and even learners have to know what is happening in Malawi and what real people are doing in Malawi at that particular time*

They predict that as education becomes more accessible and digital, teaching will become simpler and more engaging, attracting more students to become interested in learning as they see their peers progress in life:

*In the future, more students will be more attracted in terms of education because they will see their friends improving in life, so they will make them interested. – Ntonda Teacher*

### **Promoting Post-Secondary/University Education**

Surprisingly, many students did not express interest in attending or expected to attend higher education. This is likely because of the low likelihood of attaining a college degree by rural Malawi students. Nevertheless, the digital library is viewed as a crucial resource for students, providing them with valuable skills and knowledge that help them succeed in their education and future careers. Contrarily, this this Ntonda teacher indicated that digital library has enabled some students to attend universities,

*Since the coming of these gadgets, the students who are using them have been selected to go to universities that means we have started generating students to be good citizens in that community and proceed with their education up to the university level. When they finish that level, they will remain in the community and develop the community because they improved their education through the digital library.*

Some interviewees express concerns about the cost of laptops for university students, which they could not afford, but they are optimistic about the potential for digital libraries to support educational growth. They hope to see a future where every household has at least one university graduate, with the digital library playing a key role in this achievement. The exposure to technology and research at an early age is seen as essential for students' success in higher education and for their ability to contribute to the development of their communities,

*For continuity of learning, when they go to university, they will not have problems researching because they have started here; they will continue. This time, the world is digital. The earlier, the better. - Bembe Teacher*

Overall, the digital library is regarded as an important tool for advancing both individual growth and community development. Digital literacy and technology comfort are a cornerstone for college success and, in most cases, a prerequisite for admission. Higher education will always be a valuable social capital attractive to the most talented and financially able. However, regardless of the talent, access to higher education is still a struggle for most CDSS graduates. Non-attainment of higher education is also an opportunity for technical and vocational education and training (TVET), which is rendered reasonably feasible via offline educational resources.

### **Considering the Positive Impact on Future Learners**

Students and teachers showed empathy and concern for the next generation's well-being, including their own future children. With a holistic optimism about the future of education in Malawi due to the introduction of digital libraries, they believe that access to these resources will lead to a brighter future as students with valuable knowledge can apply it in everyday life, such as teaching their parents about health and agriculture. According to this teacher from Bembe CDSS,

*The information they get from the digital library students can teach their parents how to prevent cholera and some subjects like agriculture methods of applying fertilizer and the like, so the knowledge gained here is also applied in their homes.*

Digital libraries are seen as a key tool in increasing access to education, especially for learners who might have dropped out due to lack of resources. The participants also highlight the transformative impact of digital libraries on education, making learning more interactive and accessible, and replacing traditional methods like chalkboards. There was also a concern about ensuring that younger students, especially in primary schools, can access these tools, with suggestions that introducing digital libraries earlier in education would help students get familiar with them before secondary school,

*Before creating the digital library, we did not know how to navigate the internet. Now, as students, we know how to use the internet because of the coming of the digital library. If this initiative continues, things will be suitable for the next generation. -Ntonda Form 3*

Additionally, there was an emphasis on gender equality, as both genders can benefit from the same access to digital resources, preparing them for future leadership roles, as shared by this Namasika Form 4 student,

*Both boys and girls can use those things by having adequate equipment. For example, these pictures show that young students will someday lead the world.*

Teachers envision an interesting student population as well-informed citizens who are prepared to tackle the nation's most pressing economic and public health concerns, and students see their futures and the future of their peers equipped with the power of technology. They see their younger peers exposed to technology early in their academic careers and comfortably sharing resources and the responsibilities of their future country and the world.

### **Endorsement of Widespread Use of and Resources in Digital Libraries**

There was no indication of discouragement, or the consideration that increased access to digital libraries in CDSSs would bring about damaging or unproductive consequences for either the community or the education system. Instead, participants shared a strong sense of appreciation for digital libraries and their positive impact on education and community development in Malawi, like the following,

*I would love it if digital libraries were adopted in all schools because only five schools in Malawi can access them. This can be very helpful because a digital library has a lot of information. - Namasika Form 2*

*This is one of the initiatives that should be promoted to other schools because it's very easy with digital libraries. The school can afford to buy books rather than spend money on buying them. So, I think it will increase access to information if we can extend this program to other schools. - Namasika Teacher*

Many participants expressed a desire for wider access to these libraries, especially in rural areas, to help students and local communities gain valuable information on various topics, including business, gender equality, and environmental issues. The digital libraries are seen as a cost-effective way to access educational materials, reduce travel costs, and support local initiatives like tree planting and smart agriculture.

Participants also highlight the need for better internet connectivity and greater investment in expanding these resources, especially for communities outside the main urban centers. Overall, they view digital libraries as a powerful tool for self-reliance and empowerment, encouraging both academic growth and community progress.

Naturally and encouragingly, students want their peers to have access to the same resources they have experienced and have benefited from, as this Bembe Teacher states,

*Another recommendation to Peace Corps Malawi, our donors on this issue, is that we have so many CDSSs out there who need this service. I would request the donors through Peace Corps Malawi to consider increasing the services in rural Malawi so that our students and communities are enlightened, which would help promote education.*

Teachers recognize the cost-effectiveness of educational technology and its applications beyond secondary education, including entrepreneurship and community development. Schools, as public facilities, have the potential to serve a broader purpose beyond educating youth. With the right resources and staffing for flexible access, schools can become hubs for community development—supporting entrepreneurship, continuing education, skill-building, social engagement, and even traditional learning. Expanding access to digital tools, such as RACHEL, by extending Wi-Fi coverage and inviting as many people as possible to utilize these resources would further enhance opportunities both on school grounds and within the wider community.

## **Encouragement Of Digitized Local Educational Resources On RACHEL**

For both teacher and student participants, incorporating the local curriculum into offline digital resources is a crucial element for ensuring widespread and continuous use within the current education structure, while also serving as a catalyst for disruption and change. A common concern raised about the digital library was that much of the content does not align with the local curriculum, which undermines its effectiveness for both students and teachers:

*Most of the books there are not aligned with the curriculum offered. So, we have a lot of information that is not specific to topics taught in class, which is a deficiency in the efficiency of this library. Most of the issues books that are found there offer general knowledge. We would love it if it were specific, prescribed textbooks by the Ministry of Education; if found there, that would be wonderful. -Bembe Teacher*

Many RACHEL resources offer general knowledge, but there is a need for knowledge related to textbooks that are specifically prescribed by the Ministry of Education, which would help make the library more relevant and efficient for educational purposes. Additionally, the lack of content organized according to the Malawi school curriculum makes it difficult for students to find what they need without wasting time. Some students also noted that while there is content from neighboring countries, like Tanzania, the material does not reflect Malawi's educational standards or context, which limits its usefulness. There is a strong desire for Malawian-specific resources, such as textbooks by local authors, to be included in the digital library to better support students' learning and align with the national curriculum, as noted by this Namasika Form 4 student,

*Isn't it possible to embrace the Malawian syllabus? Because most syllabi are outside the country, can access Malawian education be possible? For example, books by Malawian authors so that they help in education. We should be able to find certain books when we search, like mathematics books by Malawian authors like Excel and Target. They should be found in the digital library. That was my question.*

Both teachers and students, accustomed to following the curriculum, often feel frustrated and unable to meet the requirements of their assignments when the content on the devices does not align with their specific needs. However, this challenge can be easily addressed if the Ministry of Education digitizes its curriculum content, including syllabuses, and allows it to be uploaded onto these mobile offline resources. The value of local content—seeing one's materials validated and included on an international platform—brings a sense of pride and reassurance, ensuring that subjects are recognized, considered, and contribute to a global effort to provide quality education for all.

### **Conclusion**

In summary, this chapter explored how individuals' visions of personal and national life influence their commitment to digital resources, examining how aspirations for personal growth and national development shape attitudes toward digital learning and resource use. The findings highlight the interconnectedness between personal ambitions, societal progress, and digital engagement.

Key discoveries include the observation that students and teachers with personal aspirations, such as career advancement and educational success, are more committed to using digital resources. Additionally, a lack of aspiration can be addressed through access to digital learning tools. Study participants confirm that digital education devices, like RACHEL, offer valuable resources for skill development, knowledge acquisition, and professional growth, reinforcing the commitment of both teachers and students to digital learning as a means of individual development.

At the national level, the data shows that participants associate digital resources with national progress. This connection fosters greater motivation to continue using and promoting digital tools. Many participants view digital literacy as a way to contribute to the country's development, believing that if sustained and applied, it can drive innovation, economic growth, and global competitiveness for Malawi and its people.

Furthermore, the findings indicate that access to digital resources influences participants' perceptions of opportunity. Those who can easily access digital libraries and technology express a greater sense of empowerment and optimism about their future. In contrast, participants believe that those facing barriers to digital access are at a disadvantage. Both students and teachers highlight the crucial role of government, community leadership, and institutional support in the potential success of national digital engagement. Policies promoting digital inclusion, such as expanding internet access and providing training programs, significantly impact users' willingness to engage with digital learning by enhancing the credibility and accessibility of digital resources. This, in turn, encourages further use of technology in education and other areas of national development.

Another important finding from the interviews is the cultural dimension of digital commitment. Societal attitudes toward technology, education, and progress influence how individuals perceive and anticipate the benefits of digital tools. Participants envision a future for Malawi where digital literacy and technology are highly valued, and where Africans integrate digital resources into their daily lives, reinforcing a culture of generating their own knowledge and value, independent of other nations.

In conclusion, the study emphasizes that personal ambitions and national aspirations are powerful motivators for digital engagement. By understanding these influences, policymakers, educators, and institutions can develop strategies to enhance digital literacy and resource accessibility. Strengthening the link between personal growth, national progress, and digital commitment in Malawi can lead to a more empowered, forward-thinking society and position the country as a contributor to growth in the sub-Saharan region.

## **Chapter 7: Summary and Theorizing the Findings**

In Chapters 5 and 6, I offered comprehensive insight into the impact of the Peace Corps Digital Education pilot, a digital library RACHEL, which exposed five Community Day Secondary Schools in rural Malawi to the existence, capability, and use of a contextually adaptable offline educational tool. This chapter intends to summarize the overall findings from which to derive some theories that evolve from exploring the research questions guiding this research.

### **Assertions on Offline Digital Library Impact on Attitudes Toward Teaching and Learning**

Regarding research question #1, *"How do offline digital libraries impact attitudes toward teaching and learning in Malawian CDSSs?"* the findings reveal significant shifts in attitudes toward teaching and learning in Community Day Secondary Schools (CDSSs) as a result of digital offline libraries. Analysis of participant responses indicates that these digital resources are transforming educational experiences, perceptions of technology, and student-teacher interactions. The following theoretical claims, grounded in the study's results, provide a conceptual framework for understanding the impact of digital offline libraries in rural sub-Saharan educational contexts.

### **Digital Literacy as a Catalyst for Attitudinal Shifts**

Integrating offline libraries fosters digital literacy, encouraging positive attitudinal changes among students and teachers. This aligns with theories of technological determinism (McLuhan, 1964), which argue that access to technology reshapes human cognition and interaction. The results showed that students and teachers developed new technological skills, which enhanced their confidence, motivation, and willingness to engage with digital tools.

## **Technology-Induced Student Autonomy and Motivation**

The findings support self-determination theory (Deci & Ryan, 1985), which suggests that autonomy, competence, and relatedness enhance intrinsic motivation. Students exhibited increased self-motivation and ownership of their learning process as they engaged with digital resources independently. This transition from teacher-dependent to self-directed learning suggests a paradigm shift in student engagement, reinforcing the role of technology in fostering educational independence (Bandura, 1997). Further, the finding solidifies self-efficacy theory's claim that a person's belief in their ability to achieve a specific goal, essentially their confidence in their capabilities to succeed in a given situation, is a key factor in their success (Al Amiri and Qawasmeh, 2021).

## **Redefining Teacher Roles in a Digital Learning Environment**

The introduction of digital libraries challenges traditional teacher-centered pedagogical models by shifting educators' roles from knowledge dispensers to facilitators of learning. This is consistent with Vygotsky's (1978) social constructivist theory, which emphasizes the importance of guided discovery and collaboration in learning. Teachers in the study reported an improved relationship with students and acknowledged the need to adapt to a more interactive, technology-integrated teaching approach.

## **Equitable Access to Information and the Bridging of Educational Gaps**

The study suggests that digital offline libraries mitigate disparities between CDSSs and private institutions by providing students access to previously unavailable information. This finding aligns with the knowledge gap hypothesis (Tichenor et al., 1970), arguing that technological access can widen or narrow educational inequalities. In this case, digital libraries serve as equal agents, empowering students in under-resourced schools.

## **The Social Impact of Digital Inclusion on Peer and Teacher Relationships**

The study highlights the role of digital resources in fostering collaboration and peer-to-peer learning. Consistent with socio-cultural learning theories (Lave & Wenger, 1991), students accessed information and shared knowledge, strengthening social bonds and collaborative learning practices. Teachers also noted an improved rapport with students as digital access facilitated interactive discussions and reduced hierarchical barriers.

## **Challenges of Technological Integration in Rural Schools**

Despite the positive outcomes, the finding of this study underscores persistent challenges, including limited access to digital devices and infrastructural constraints. The digital divide theory (Norris, 2001) contextualizes these challenges, emphasizing that technological benefits are contingent on equitable access and sustainable maintenance. The findings suggest that while digital libraries enhance learning, their effectiveness is hindered by inadequate hardware availability, electricity shortages, and maintenance issues.

## **Digital Resources as a Tool for Socio-Economic and Career Aspirations**

Students expressed heightened aspirations and career clarity due to their exposure to digital resources, particularly in science, technology, engineering, and mathematics (STEM) fields. This supports Gottfredson's (1981) theory of circumscription and compromise, which speculates access to information broadens career perceptions and choices. Digital literacy, therefore, emerges as a critical component in shaping students' future ambitions and socio-economic mobility.

## **Technology as a Vehicle for Cultural and Gender Inclusion**

The findings indicate a progressive shift in gender perceptions, with students and teachers recognizing the role of digital libraries in promoting gender equity in education. This aligns with gender and technology studies (Wajcman, 2004), which argue that digital inclusion fosters more egalitarian educational opportunities. Students reported increased confidence in female participation in STEM-related subjects, challenging traditional gender norms.

## **Educational Technology and Its Psychological Implications**

The study reveals a psychological shift in students' self-efficacy and academic engagement due to digital access. According to Bandura's (1986) social cognitive theory, self-efficacy influences motivation and persistence. The ability to independently navigate digital resources contributed to increased academic resilience and reduced dropout intentions among students.

## **Transformative Potential of Digital Libraries Beyond Academia**

Finally, digital libraries reshape academic attitudes and influence community perspectives on technology. The findings suggest that digital literacy acquired in schools extends to broader societal contexts, reinforcing Rogers' (2003) diffusion of innovations theory, which explains how technological adoption spreads within a community.

In summary, to answer research question number one, the findings confidently suggest offline digital libraries positively impact attitudes toward teaching and learning in rural CDSSs. With the development of digital skills comes heightened self-assurance and enthusiasm for learning. Fostered by naturally occurring self-directed learning that liberates the teacher-student relationship and their ability to equitably pursue all knowledge, offline digital libraries empower

collective aspirations in STEM, contributing to community knowledge and problem-solving promise.

### **Assertions on Accessing Resources through Offline Digital Libraries for Females**

Regarding research question #2, "*How does accessing resources through offline digital libraries affect female teachers and students in rural communities in Malawi?*" the findings under the theme of *Access to Resources* highlight the profound impact of access to digital libraries on female teachers and students in rural Malawi. The responses from participants suggest that digital resources influence educational engagement, equity, and professional development. The following theorizing claims provide a conceptual framework for understanding how digital access reshapes learning opportunities in under-resourced environments.

### **Digital Libraries as an Equalizer in Resource-Constrained Schools**

Access to digital libraries mitigates disparities in educational resources, allowing students and teachers to obtain information that would otherwise be inaccessible. This finding aligns with the knowledge gap hypothesis (Tichenor et al., 1970), suggesting that information access can reduce educational inequalities. The digital library is an alternative to traditional textbooks, bridging the gap between resource-rich and resource-poor schools.

### **Increased Student Engagement and Academic Performance**

The availability of digital learning resources enhances student engagement, motivation, and academic performance. According to Vygotsky's (1978) social constructivist theory, learning is most effective when students actively interact with content. Digital libraries provide interactive and self-paced learning opportunities, enabling students to take ownership of their education and improve comprehension.

## **Teacher Professional Development and Instructional Efficiency**

Access to digital tools allows teachers to refine their pedagogical practices and stay updated with contemporary educational materials. This finding supports the continuous professional development model (Guskey, 2002), emphasizing the importance of ongoing learning for educators. Teachers in the study reported improved lesson preparation, efficiency, and exposure to diverse teaching methodologies due to digital library use.

## **Technology Adoption and the Shift Towards Student-Centered Learning**

Integrating digital libraries encourages a shift from traditional rote learning to a student-centered approach. This transformation aligns with the self-determination theory (Deci & Ryan, 1985), which posits that autonomy in learning fosters intrinsic motivation. Students who accessed digital resources independently demonstrated increased confidence, curiosity, and problem-solving skills.

## **Challenges of Digital Access and Infrastructure Deficits**

Despite the advantages, limited access to digital devices, electricity shortages, and technological illiteracy hinder the full benefits of digital libraries. These findings align with the digital divide theory (Norris, 2001), which argues that technological access disparities can reinforce educational inequities. The study highlights the need for infrastructure development to sustain digital learning in rural schools.

## **Empowering Female Students and Teachers Through Digital Inclusion**

Digital libraries contribute to gender equity by providing female students and teachers greater access to information, breaking cultural barriers limiting their educational opportunities. This finding supports gender empowerment frameworks (Wajcman, 2004), emphasizing

technology as a tool for bridging gender disparities in education. Female teachers reported increased confidence in their instructional capabilities, while female students expressed aspirations beyond traditional roles.

### **Digital Literacy as a Fundamental Skill for Future Opportunities**

The study reveals that exposure to digital resources fosters digital literacy, a critical skill for future career and academic pursuits. The study aligns with media literacy theory (Hobbs, 2010), emphasizing the necessity of digital competencies in the 21st century. Students and teachers acknowledged that digital library use prepared them for higher education, employment, and global connectivity.

### **Cultural and Social Learning Through Digital Access**

Digital libraries expose students to global perspectives, enabling them to learn about diverse cultures, scientific advancements, and historical events. This supports the theory of cultural capital (Bourdieu, 1986), which suggests that access to knowledge enhances social mobility. The study found that students used digital resources to explore topics beyond their curriculum, fostering a broader worldview.

### **Barriers to Sustained Digital Use and the Need for Policy Interventions**

The study highlights systemic challenges in sustaining digital library programs, including inadequate training, device shortages, and policy gaps. This aligns with technology adoption models (Rogers, 2003), which stress that institutional support is crucial for long-term technological integration. The findings suggest the need for government policies that enhance ICT integration in rural education.

### **Community Engagement and the Expanding Role of Digital Libraries**

Finally, digital access benefits students, teachers, and the wider community. Parents and non-students expressed interest in using digital resources for self-education and skill development. This aligns with community informatics theory (Gurstein, 2000), which emphasizes the role of technology in community empowerment. The findings suggest digital libraries can serve as hubs for lifelong learning beyond formal schooling.

In summary, to answer research question number two, the findings confidently point to accessibility to offline digital libraries affecting female teachers and students as a key demographic in improving education in rural CDSSs. The digital library's alternative educational resource broadens the opportunities for personal responsibility (and expands social conditions) for learning, amplifying self-assurance and users' local and global ambitions beyond the academic environment.

### **Assertions on the Factors that Influence Commitment to Implementing Digital Resources**

Regarding research question three, "*What factors influence commitment to implementing digital resources in rural Malawian CDSS?*", the findings are organized around two primary themes: National Development and Personal Development. Each sub-theme highlights digital education's aspirations, challenges, and opportunities. The analysis reveals that stakeholders view digital resources as a catalyst for individual and collective progress, strongly emphasizing education as a pathway to national development, economic growth, and personal empowerment. This section theorizes these findings by connecting them to broader educational, social, and economic theories. It offers insights into how digital education can be leveraged to address systemic challenges in rural Malawi.

### **National Development as a Catalyst for Commitment**

The findings suggest that national development significantly influences stakeholders' commitment to implementing digital resources in CDSSs. Both students and teachers expressed a

strong desire for Malawi to achieve technological advancement, improved infrastructure, and economic stability. This vision of national development aligns with the broader goals of educational equity and access, as articulated in Malawi's Vision 2063. The emphasis on national development highlights the interconnectedness of education and national progress, suggesting that stakeholders view digital resources as a means to contribute to the country's long-term growth and self-reliance (Ministry of Education, Science and Technology, 2018).

### **Personal Development as a Driver of Engagement**

Personal development emerged as a critical factor influencing commitment, particularly among students. The desire for career clarity, improved life conditions, and access to global knowledge through digital resources underscores the transformative potential of digital libraries. Students' aspirations for personal growth and success are closely tied to their ability to access and utilize digital resources, which they perceive as essential for achieving their career goals and improving their quality of life. This aligns with Bandura's (1997) theory of self-efficacy, which suggests that individuals are more likely to engage in activities they believe will lead to personal success and fulfillment.

### **The Role of Leadership in Shaping Educational Futures**

Both students and teachers highlighted the importance of effective leadership in driving national and educational development. The lack of progress in Malawi's educational system was often attributed to poor leadership, corruption, and mismanagement. However, the success of the digital education pilot program instilled hope that educational initiatives could be a catalyst for positive change. This finding resonates with transformational leadership theory, which emphasizes the role of leaders in inspiring and motivating stakeholders to achieve collective

goals (Bass & Avolio, 1994). The call for leaders to prioritize education and innovation reflects a broader demand for accountability and visionary governance.

### **Cultural Influence and the Challenge of Globalization**

The findings reveal a tension between traditional cultural values and the influence of globalization, particularly in the context of digital education. While students and teachers acknowledged the benefits of accessing global knowledge and technology, there was concern about the erosion of local culture and values. This duality reflects the broader debate on the impact of globalization on education, where the benefits of technological advancement must be balanced with the preservation of cultural identity (Zeng & Yang, 2024). The need for localized digital content that reflects Malawian culture and curriculum emerged as a critical factor in ensuring the relevance and sustainability of digital resources.

### **The Intersection of Education and Economic Development**

Economic development was a recurring theme in student and teacher responses, with many participants linking educational advancement to economic growth. Accessing digital resources was a pathway to reducing poverty, improving agricultural practices, and creating economic opportunities. This aligns with human capital theory, which posits that investment in education leads to increased productivity and economic growth (Becker, 1964). The findings suggest that digital education initiatives can address educational and economic challenges in rural Malawi.

### **The Importance of STEM Education in Rural Development**

The study highlighted a strong interest in STEM (Science, Technology, Engineering, and Mathematics) education among students, particularly in ICT, agriculture, and health sciences. This interest reflects a growing recognition of the role of STEM in driving innovation and

economic development. The findings suggest that digital libraries can be crucial in fostering STEM education in rural areas, where access to traditional laboratory resources is limited. This aligns with the broader global emphasis on STEM education as a key driver of sustainable development (UNESCO, 2017).

### **Environmental Awareness and Sustainable Development**

Although environmental awareness was not a dominant theme, some participants expressed concern about the impact of climate change and the need for sustainable practices. The findings suggest that digital education can play a role in raising awareness about environmental issues and promoting sustainable development. This aligns with the United Nations Sustainable Development Goals (SDGs), particularly Goal 13 (Climate Action) and Goal 15 (Life on Land), which emphasize the importance of education in addressing environmental challenges (United Nations, 2015).

### **The Digital Divide and Access to Technology**

The study revealed significant disparities in access to digital resources, particularly in rural areas. While the digital education pilot program provided a valuable opportunity for students and teachers to engage with technology, the lack of widespread access to digital libraries and computers remains a barrier to educational equity. This finding underscores the importance of addressing the digital divide to ensure that all students, regardless of their geographic location, have access to the resources needed for success in the 21st century (van Dijk, 2006).

### **The Role of Gender in Educational Access and Empowerment**

Gender emerged as a significant factor in shaping students' access to and engagement with digital resources. While traditional gender roles have historically limited girls' access to

education, the findings suggest that digital education initiatives have the potential to challenge these norms and empower female students. This aligns with feminist theories of education, which emphasize the importance of gender equity in achieving educational and social progress (hooks, 1994). The findings suggest that digital education can play a transformative role in promoting gender equality in rural Malawi.

### **The Need for Localized Digital Content**

Both students and teachers desire digital resources that reflect the Malawian curriculum and local context. The lack of localized content in the digital library was seen as a barrier to effective learning and engagement. This finding highlights the importance of developing digital resources that are culturally relevant and aligned with national educational standards. The call for localized content reflects a broader need for educational materials that resonate with students' experiences and cultural identities (Freire, 1970).

In summary, to answer research question number three, the findings confidently highlight several factors influencing commitment to implementing digital resources in rural Malawian CDSS. The prevailing idea of national development emphasizes the importance of addressing the digital divide to meet the needs of the 21st century, identifying STEM education as a key to economic progress and environmental reliance. Personal motivations are high, but the barrier of leadership accountability to creating pathways for African-centered content (being digitized and prioritized) is a factor required to move beyond just access to the solidifying belief in a better future for Africa and Africans.

### **Conclusion**

The various assertions offered in this chapter highlighted the connection to many existing theories in education, learning, development, and human behavioral research. However, they also emphasized a disconnect from Afro-futurism, one of the theoretical frameworks that guided the

study. As such, in the next chapter, I will reflect on the success and challenges of Afro-futurism used to establish the research questions and guide the general inquiry. Doing so will solidify the appropriateness of the framework and share the difficulties it can pose when applied as critical lenses for the study of education, but more specifically, the study of education in Africa and its diaspora of globally developing communities.

## **Chapter 8: Afrofuturism: Appropriateness as a Theoretical Framework & Challenges**

### **Did Afrofuturism Inform the Study?**

To structure this chapter, we must revisit the definition of Afrofuturism used to introduce the theoretical framework in the Introduction of this study. "Afrofuturism should be seen as a big tent of expanding borders of the possibilities for Black life" (Yaszek, 2006) as it provides "visions of the future—including science, technology and its cultures in the laboratory, in social theory, and aesthetics—through the experience and perspective of African diasporic communities" (Ogbunu, 2020), and as a critical theory, Afrofuturism calibrates our concern with empowering human beings of Africa and its diaspora to transcend the constraints placed on them by race, class, and gender (Fay, 1987).

Based on the structure, dynamics, and context of this case study's subject of interest, offline digital libraries as tools to close the agency and awareness gap for rural African communities towards producing locally developed-future-based education and human-centric solutions, I remain convinced that Afrofuturism was a practical framework. However, as a novice researcher and budding Afrofuturist, in this chapter, I further explain the framework's capabilities and challenges for research on and by Africans and members of its diaspora and uncover some crucial considerations for Western-researchers of African descent who want to apply this framework thoughtfully and successfully toward a global culture of future-conscious development.

### **Appropriateness of Afrofuturism**

In the quote below, Octavia Butler (a groundbreaking African American science fiction writer, known for exploring themes of race, gender, social justice, and the future, and considered

a pioneer in the genre and a key figure in Afrofuturism) describes the relevance of the black science fiction reader and black science fiction writer:

*When I began to do a little public speaking, one of the questions I heard the most often was, 'What good is science fiction to Black people?' I was usually asked this by a black person... I resented the question. Why should I have to justify my profession to anyone?*

*But the answer to that was obvious. There was exactly one other black science-fiction writer working successfully when I sold my first novel: Samuel R. Delany Jr. Now, there are four of us. Delany, Steven Barnes, Charles R. Saunders, and me. So few. Why? Lack of interest? Lack of confidence? A young black woman once said, 'I always wanted to write science fiction, but I didn't think there were any black women doing it.' Doubts show themselves in all sorts of ways. But still, I'm asked 'what good science fiction is to Black people?'*

*What good is any form of literature to Black people? What good is science fiction's thinking about the present, the future, and the past? What good is the tendency to warn or to consider alternate ways of thinking and doing? What good is its examination of the possible effects of science and technology or social organization and political direction? At its best, science fiction stimulates imagination and creativity. It gets the reader and writer off the beaten track, off the narrow, narrow footpath of what 'everyone' is saying, doing, thinking --- whoever 'everyone' happens to be this year.*

*And what good is all this to Black people?*

*—Octavia Butler, *BloodChild and Other Stories* (1995)*

In reflecting on the poignant question noted above, "*What good is science fiction to Black people?*" and the many other questions outlined in Butler's reflection, I believe her response eloquently established the purpose of Afrofuturism, which, without science fiction, would be even harder to explain and justify. Like Butler, I also hate the question "*What good is science fiction to Black people?*" as it points to the epistemological gaps discussed in the Critical Perspectives highlighted in Chapter 2, as we explored the limitations created by African willingness to deter Africans (and their descendants) from taking Western institutions and products uncritically as *their own* (Latham, 1934), i.e., touting "science fiction as not for blacks" and therefore for whites, only. In Ndlovu-Gatsheni's (2017) view, this exacerbates the necessity

of educating Westernized Africans to "rethink thinking itself, launching epistemic disobedience and the painstaking de-colonial process of learning to unlearn to relearn," from which comes the freedom and vision of the possibilities and potential outside of the current reality of life and its paradigms. Butler (1995) is correct. We shouldn't have to justify the validity of future thinking, of future-based decision-making, of the ability and potential of African and African descendants as contributors to scientific development, and/or even the relativity of our usefulness in the protection of this planet. Thus, the value and lens of Afrofuturism come as a vehicle in the decolonization of knowledge which Claude Ake (1979) posited, as "we cannot overcome our underdevelopment and dependence unless we try to understand the imperialist character of Western social science and exorcise the attitudes of mind which it inculcates." This justifies the need to have more frameworks and more avenues of expression to promote and clarify the importance of Afrofuturism as an instrument of decolonization and its discourse in the fields of development and education, as well as a modern force to reroute young minds via global digital technology to look beyond now and focus on what they want to happen and how.

The black science fiction readers and writers are the foundation and creative products of Afrofuturism. These two sets of minds are valuable potential contributors to productive, new and forward-thinking black epistemologies; ways of understanding the world that challenge the *past-focused* dominance of Western epistemologies and emphasizes the importance of black, indigenous and African intellectual traditions and lived experiences, but shifts them toward the future of our species into *Afro-futurist* epistemologies. Afro-futurist epistemologies accept the inevitable and exceptional developments of the 21<sup>st</sup> century, and draws on literature, music, visual arts, film, and critical theory<sup>4</sup> to build a global discourse from, and the responsibility of

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<sup>4</sup> <https://libguides.pratt.edu/afrofuturism>

the African diaspora to imagine and explore alternative futures centered on the potential of technology for liberation and empowering visions. As we are at the nascent stages of this exorcism of attitudes and the minds inculcated by colonialism, this study complicates Butler's (1995) suggestion that a lack of interest is why there are so few black science fiction writers (and therefore readers, believers) and therefore Afrofuturists. Through the thematic finding #1 (*offline digital libraries impact attitudes and access to digital resources*) and thematic finding #2 (*visions of personal and national life influence commitment to a digital future*), participants repeatedly pointed to desires to expand the borders of the possibilities for their [black] lives (Yaszek, 2006),

This study's findings indicated there was no lack of a vision for a more prosperous and higher functioning Africa. Participants made it very clear they understand the importance of their own skills and abilities in STEM fields and business development to develop their country. They also recognize the importance of rethinking the education system and its contents, noting a gap in the contents of curriculum. Students and teachers demanded more thoughtful and inclusive curriculum – one that meets their needs as a society and as people who have a unique history and experience in the world.

Considering the need for a fully educated and empowered population of men and women ready to commit themselves to building the infrastructure and economy necessary to make a distinct contribution to the world, participants unanimously agreed their leadership should encourage the rethinking of cultural traditions. Both at the highest levels and at the community levels, they urged the reconsidering of social frameworks around gender, ethnic and the environment and human values, to decide whether established traditions will serve them in the future. After accessing information about other countries and communities in and outside of

Africa that are more equipped with the resources and support to make the desires of an independent and resourceful nation possible, participants also strongly advocated for their own access and the proliferation of resources nationwide that would jumpstart a youth culture and leadership culture that can galvanize all of their human capital and provide the physical and intellectual equipment to activate their innate self-value and abilities to better themselves.

“But still, I’m asked what good is science fiction to Black people?  
—What good is any form of literature to Black people?” (Butler, 1995)

Toward evolving and deconstructing the limitations of "blackness" and “whiteness” and their basis in the past (Dyer, 1997) versus their futurity, let's consider a global sociological possibility – reaching the human potential where all knowledge and all intellectual effort is valuable to and produced by every single group of humanity that exists. Then, "what good is the tendency to warn or to consider alternate ways of thinking and doing? What good is its examination of the possible effects of science and technology or social organization and political direction? (Butler, 1995). These remaining questions posed by Butler define the expression of productive and future-oriented citizenry. They point to an individual and the mind of a collective group of people who are active and thoughtful in their nation, on their continent, in the world and who understand their past and present and look forward to their future with a personal and ethical responsibility to consider alternatives for how life, human product, and human governance should look to ensure survival and their place in the future of our world and potentially others. These characteristics were demonstrated among the participants of this study, stimulated by the permission, imagination, and creativity of interview questions centered on Afrofuturism, getting them off the beaten track of only regurgitating what they see and daring them to think freely.

## **Cultural and Contextual Gaps in Research Framed by Afrofuturism**

The relevance of Afrofuturism is a hallmark of this study as it is an aspirational and inspirational conduit for inquiry and the lens from which I, as the researcher, was moved to view the promise of investing into a vision for the Malawian school's potential that so few share. In this study and moving forward, I seek to answer the question, "Is Afrofuturism appropriate for studying education in sub-Saharan Africa, of the poor and poorly resourced products of colonially founded systems?" and my answer is a resounding yes. Malawi's context is the *ideal* test of Afrofuturism's capacity and power. However, there are some unique realities, given the cultural gaps with Western culture.

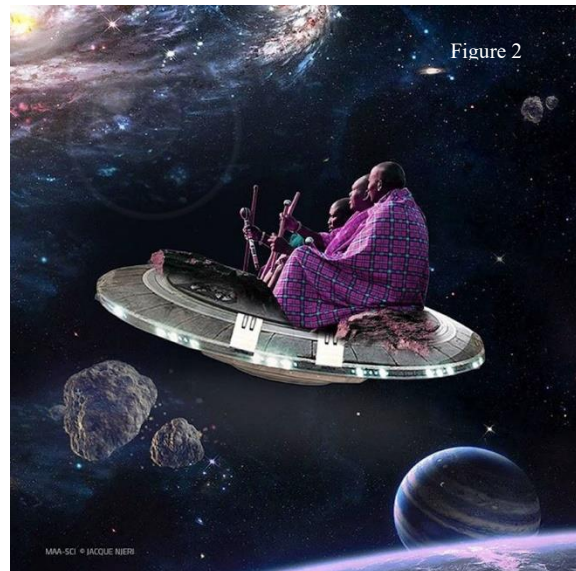
### **Afrofuturist Connections: Cosmology to Modern Technology**

A Western raised and educated Afrofuturist may naturally assume from the pioneering portrayals of African cosmologies (i.e., Dogon, Yorba, Massai, etc.), with their elaborate symbolist rendering of stellar constellations to the patterns of plowed fields (Goody, 1967) or the Chewa people of Malawi's *Gule Wamkulu*, a ritual dance representing their understanding of the cosmic order (Mtuta, 2023), that the nature of the discourse on cosmology would aspire to technological aptitude and production should the right conditions and resources be provided. Though African cosmology answers fundamental questions about the place and relationship of man with the universe inside the ambiance of supernatural power or powers and thus religion (Metuh, 1987), cosmology and technology have little overlap (Shainline, 2020) in African cultural tradition. Though disappointing, the plausible connection fuels the creativity and depth of African inspiration and its diversity of ontological and sociological expression for building ideas of the future. Related to Afrofuturism as a genre of artistic expression, African cosmology is a boon to expand creativity, as explored by Kenya Jacque Njeri, a Kenyan artist in her 2017

project called #MaaSci (a collection of digital collages). In Njeri's exhibition, she asks, "*what if we [Africans] still progressed intellectually without losing bits of what makes us truly African?*" and then she imagines what the Maasai people would look like in space. This awe-inspiring image of Njeri's *MaaSci* (Figure 2<sup>5</sup>.) was one of the images shown to the study participants during the interview as a means to extend their possible answers beyond visions of their everyday lives.

Africans inspired by the complexity and expansiveness of their history and cultural diversity have an enormous amount of fuel to build Afrofuturism as a genre of human expression and human possibility. The challenge is connecting Africans to the knowledge of self, pre-colonial African history, and existing information on tech and media culture with the combined awareness of their epistemological freedom and making it all applicable to regional problem solving; directing it all to tasks that create solutions to the continent's common barriers to development.

### **Participants' Limited Capacity to Envision the Unseen**



The assumption that African historical and cultural cosmology indicates an aptitude of Africans to visualize and imagine a world beyond what is seen is wrong. Both teacher and student participants in every school demonstrated an undeniable struggle to piece together *any* image of their country outside of the context of Western modernity (or any life beyond the confines of

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<sup>5</sup> <https://www.designindaba.com/articles/creative-work/jacque-njeri%E2%80%99s-vibrant-graphic-art-reimagines-maasai-people-outer-space>

their current reality). This jarred the fundamental preface that visions of an "African" future can and must lie outside of western foundations. Specifically, in response to the interview question, "*What do you want Malawi to look like in 100 years?*" there were no references to anything different than what they currently see in the world but may not have access to (i.e., nationwide internet access, advanced agricultural technology, improved health care infrastructure).

### **Researcher's Hidden Assumptions**

The responses of study participants challenged my belief that the capacity of Afro-futuristic visualization was innate. I realized that Afrofuturists are equipped with visions of the future through exposure to world history and global education; a familiarity with how far humanity has come in its technological pursuits and how creative we have become in our desires for and expectations of life beyond this world's current state of affairs. I erroneously hoped to replicate this life-long accumulation of knowledge and experience for my participants with a digital library and PowerPoint of Afrofuturistic images.

During the interviews, I wondered, "why are they not thinking about AI, robotics, space flight?". After adding the PowerPoint and calling attention to the Afrofuturistic images as a boost for the conversation, only toward the middle of the data collection process did I realize I had overlooked a significant consideration - access to media. With all of the notations on the lack of school resources and my personal experiences visiting the homes of potential Peace Corps Volunteer host families in similar resource poor communities, witnessing the same deprivation in students' homes, if not more so than in schools, I completely overlooked that there is no place other than school for students to be exposed to concepts of space flight, self-driving vehicles and or plans to colonize mars.

Participants thought the future-based questions were challenging to understand, not in words, but in rationale, context, purpose, and seriousness. It was evident by their perplexing reactions that it was the first time any of them had ever been asked questions requiring them to think or challenge their reality from the perspective of the future.

After dispelling my frustration with a seeming lack of depth in the answers to the future-oriented questions, I turned my attention to participant reactions to the PowerPoint slides and pictures by adding a final question to each group, "Any thoughts on the pictures and slides?". Students struggled even looking at some of the images; the discomfort on many of their faces indicated a difficulty to understand what they were seeing- some not comprehending at all, while others connected the question to my intent with the images, saying, "*They are trying to help us understand the questions.*"

At Namasika CDSS, a female teacher laughed loudly after being asked about Malawi in 100 years. I immediately asked her why she laughed, and she took a more somber and pensive air. Her laugh was an autonomic response, a combination of shock and discomfort. After about one minute of quiet and staring at the question/image, she said, "*I looked at the picture and wondered if this was possible.*"

At Mkaika CDSS, during the interview, the same "*Malawi in 100 years*" question also caused laughter to erupt by some, while simultaneously, pensive and disturbed expressions emerged in other participants' face. On one occasion, after every question, one young man in the group of Form 4 and Form 3 students looked at me for an extended period. I interpreted his quiet reflection on his current situation as interest, excitement, and curiosity - he seemed grateful to have the opportunity to experience the exchange and to express himself in this new way. It was this interaction during the experience that confirmed the success of the PowerPoint. The pictures

seemed of more interest to the older students as they seemed to be more inspired by the future-based questions, and more comfortable sharing their opinions on the country's current state once the assignment was clarified by braver students who set a precedent for how to respond. The younger students seemed to look at the questions and not the pictures - the pictures did not seem helpful to adding to their comprehension, hence a lack of capability to respond sufficiently.

### **Contrasts with Reality and the Effects of Media**

Relatedly, generally the participants' understanding of technology seemed limited to computers and smartphones. Even with the presentation images pointing to space travel, they did not think of spaceships as technology. I remember asking some Bembe and Meru CDSS Form 2 students in response to the *MaaSi* image (Figure 2), "Is there any technology in this picture?", and they abruptly answered with a resounding and clear "No." The concept of technology was later explained through the images by the translator in response to the recognition that we had failed to define a key term thorough enough to be recognized in its various forms, which was highly unfair but also made me reflect on why I assumed they understood the scope of the term.

As such, for most of the interviews, my conversations with participants stayed safely in the confines of how the devices are related to their study or, at the most, branched out to consider agricultural equipment like tractors. Similarly, the idea of the future remained focused on current human progress in infrastructure or health care. There was no question or discussion about the human or environmental cost of the development in the future of humanity the images coveted.

The afro-futuristic images shown to participants attempted to provide an introduction to the missing awareness or considerations of other potential realities for African life (i.e., Africans living on other planets, satellites, an African man pushing away colonial pillars, eco-friendly cities in Africa, drones delivering packages, black women traveling through space, African

flying cars, etc.). Being raised in the West and consuming Western media, I never realized the access it provided is fundamental to become aware of a possible “future” in the cosmos. As a young person, the conversation around television programming and movies was that they were bias misrepresentation of reality, and should be consumed in moderation or critically, as to avoid damaging one's sense of esteem or peace, particularly as a person of color living in a America’s “inherently” racist and violent culture. So, as a family, we gravitated to nature shows (like the National Geographic series) and science fiction (like Star Trek). They were refuges for the mind, protection from us being weighed down by a society rife with stereotypes. I devoured this kind of media, reveling in the parts of human and non-human life I would seek out to be a part of as a witness, creator, and later a student and consumer of the fine arts.

In contrast to my experience growing up in the United States, exposure to images of 21st-century technology (both real and fictional) for my participants was minimal; meaning the cultural and critical tools to distinguish concepts of the future, alternate realities, etc., were not at hand for them in the same way. So, I take responsibility for my lack of consideration for the contextual and cultural differences and how socio-economic status impacts exposure - for not realizing that it should have been expected that the participants would not know what they were looking at or that they would struggle to make sense of the images and concepts I was challenging them to digest and critically review.

### **Conclusion**

Afrofuturism succeeds when the onlooker or practitioner believes in the relevancy of the future; when they want to break away from the status quo mentality because they recognize it dulls the senses and circumscribes critical perspective needed to grow beyond the existing human condition. With what I have learned from this study, I recommend that any future attempts at Afrofuturistic-center research, specifically in the context of sub-Saharan African education,

should push participants much further in their conceptualization and belief in the relevancy of the future. I should have asked participants what Malawi would look like in *1000* years – truly breaking any connection with their current reality. I should have created a pre-interview exercise that required an expression of their creative nature and ability - for example, giving them crayons and paper to draw images of what “technology” means to them and then asking them to draw images of ideas that they did not think of on their own (i.e., human life on the moon or humans living underwater). After centering images in the interview, I confirm the visual arts are a requirement for practicing imagination in the context of a rural African school. By using this expression, you confirm a participant’s right to creativity and validate the basic and fundamental nature of thinking creatively; that even though their current circumstance may not support daily use, they have the power and freedom to create their own Afro-futures, even if it's in their own mind.

## **Chapter 9: Conclusions and Recommendations**

## **Conclusion**

This study has provided a comprehensive understanding of how offline digital libraries influence attitudes toward teaching and learning in Community Day Secondary Schools (CDSSs) in Malawi. The integration of digital resources fosters autonomy, collaboration, and career aspirations while also presenting challenges related to infrastructure and accessibility. While digital inclusion enhances student engagement, teacher development, and gender empowerment, the full benefits can only be realized by addressing policy limitations and systemic barriers.

The findings underscore the intricate relationship between personal and national aspirations in the pursuit of digital education. Digital resources serve as a bridge between individual growth and collective progress, highlighting the need for policies that align digital education initiatives with both local realities and global advancements. For Malawi to harness the transformative potential of digital learning, systemic challenges such as the digital divide, cultural preservation, and gender equity must be carefully addressed. By doing so, digital education can become a catalyst for economic and social transformation, ultimately fostering a more equitable and sustainable future.

## **Future Research and Policy Considerations**

Given the study's findings, further research should explore the long-term effects of offline digital libraries on educational outcomes, as well as the policy interventions required to enhance digital equity in rural settings. Additionally, future studies should investigate scalable models for digital resource distribution and sustainable ICT integration in rural educational systems. Ensuring that digital education becomes a cornerstone of Malawi's development agenda will require collaborative efforts among policymakers, educators, and community leaders.

## **Ethical and Cultural Considerations**

When reflecting on the use of offline digital resources in rural Malawian schools, it is crucial to acknowledge the ethical and cultural implications of transferring Northern/Western educational practices into a region still grappling with the legacies of colonial and neo-colonial interference. While this study supports the implementation of educational technology—particularly given the dire conditions of many rural schools, which lack desks, books, and adequately trained teachers—it also raises concerns about sustainability. Successful digital integration requires the development of high-quality, contextually relevant learning materials and an understanding of the socio-cultural and motivational factors influencing teachers’ willingness to adopt new technologies (The Bank Group Results Measurement Framework, 2016–2025).

Focusing solely on the need for more formally trained teachers risks overlooking alternative solutions to motivation and skill-building, such as digital literacy, entrepreneurship, and frugal/green technology initiatives. To ensure long-term sustainability, future research should examine culturally grounded strategies for technology integration. The use of curriculum-mapped, offline, open-source resources (such as digital libraries) offers a promising approach to fostering digital education in sub-Saharan Africa, particularly in resource-constrained settings like Malawi.

## **Decolonizing Education and Reimagining the Future**

This study challenges stereotypical perceptions of rural educational institutions, particularly the notion that a lack of basic infrastructure—such as clean water, electricity, and sanitation—implies a lack of talent, ability, or value among students and teachers. However, the findings also point to the pressing need for support in the decolonization of Malawi’s national

curriculum. Colonial legacies have shaped access to knowledge and learning structures, necessitating the introduction of educational tools and content that prioritize intellectual liberation and regional solution-building. Digital resources should not merely replicate existing paradigms but should instead challenge learners and educators to critically distinguish between their present realities and the possibilities for Malawi's and Africa's future.

Through further intensive research within Malawi's rural secondary schools, critical Afrofuturist scholars can interrogate the assumptions embedded within existing educational frameworks—assumptions bound by colonial paradigms, cultural constraints, and narratives of regional inferiority (Morrow & Brown, 1994). Afrofuturism, as a field focused on resistance, empowerment, and liberation, must also emphasize Africa's contributions to global social and technological advancements. Researchers should explore how millions of people living in conditions similar to those of this study's participants can navigate the cultural norms, information barriers, and material deficits that shape their realities—ultimately envisioning and forging alternative futures for themselves and their nations.

### **Recommendations**

This study builds on established research by international organizations examining Malawian secondary education, its challenges, and potential strategies for the national government and donor partners to enhance its effectiveness. The following recommendations are intended to guide the multiple stakeholders involved in ensuring the sustainability and scalability of the digital education pilot that forms the foundation of this study. In alignment with the aspirations of the study participants and my own vision for Malawi's educational future, these

recommendations aim to promote higher-quality education and address the barriers that hinder access to quality learning in rural Community Day Secondary Schools.

### **Expand Access to Knowledge**

The study points to concerns that the efforts of the government to expand secondary education have been conducted within a system that makes very little knowledge available to students. This is partly due to unqualified teachers and sparse learning resources. Many teachers report having limited knowledge and may give insufficient explanations, so instructional time is poorly used, and students may learn little additional material in school. Consequently, when educational institutions run without textbooks class time has to be spent in transcription. As a result, CDSSs and students are not being oriented toward the economy and industry of the future.

In response, the recommendation for educators and education policy makers is to increase self-directed learning with offline digital tools and ensure young people have the green economy skills that will allow them to build careers and lead the world into the Green Industrial Revolution. The expected outcomes of these two efforts support the follow developments in teaching and learning:

1. Students can consult multiple texts and authors, have enough time to cover the curriculum or contemplate its contents in class.
2. Digital tools with audio/visual capability will aid in literacy and expand access to learners with disabilities in under resourced classrooms.
3. Teacher development time and access to digital tools will provide resources for teachers to develop and improve skills

4. Curriculum and teaching and learning materials must drive the uptake of green job opportunities.
5. Industry participation in curriculum design and development will be encouraged to ensure new graduates meet job demands.

### **Increase Local/Regional Content**

The study points to participant concerns that western historical thought and cultural staples that offer little value in the communities they serve, remain uncritically taught or evaluated.

Additionally, teachers are trained to blindly follow the curriculum without the requirement or opportunity to engage additional conversation, themes or content from classical or modern African perspectives and intellectual producers of knowledge. As result, teachers and students are riddled with self-doubt and lower the value of their own culture while gaining access to and idealizing others.

In response, the recommendation for educators and education policy makers is to distill and implement a local framework for the value and approach to education centered in the progress of the African consciousness and the immediate need of future oriented African citizens. In support of this, local/African diaspora produced content can be launched and grounded in offline digital resources as a tool for easy distribution, disruption and the promotion of change. The expected outcomes of these efforts support the follow developments in teaching and learning:

1. Educators will be permitted to add content to nationally applied digital tools and expand the relationship with the curriculum in a way that will ensure their commitment to the production and promotion of knowledge that they value.

2. Outdated and harmful western-centric materials will be replaced
3. The promotion and institutionalizing of African language translations of academic products will minimize English as a tool for Western dominance and promote the preservation of African cultures.
4. African think tanks (i.e., ACET and CODESRA) devise alternative K-12 curriculum of organized educational, historical and scientific content that promotes a future-focused student/societal product: self-assured human beings that certain of their human value and the necessity of their contribution to society.

### **Challenge School Structures & Model Alternatives**

The study points to participant concerns access to computers are an ongoing challenge as they are not broadly available in rural areas and their maintenance is system has yet to be resolved by CDSSs leadership both budgetarily and technically. Further, though there is general positivity about greater student independence in learning using digital tools in the classroom, there is still a prevailing sentiment that the independence of student learning threatens teacher employability.

The resulting reduction in teacher's sense of authority (due to no longer being the sole source of information) and therefore being unable to teach in the traditional sense, will further discourage educators. Relatedly, regular transfers of trained and effective teachers and head teachers due to the Ministry required transfers creates gaps innovation support and thwarts the sustainability of improvement.

In response, the recommendation for educators and education policy makers is to proliferate the use of Wi-Fi-free/disabled smartphones in the classroom as sustainable where computers are not available and promote the radius of RACHEL Wi-Fi to support community access. Further, textbooks and other relevant learning resources should also be distributed via

WhatsApp to ensure access for as many students as possible. Additionally, school administrators can encourage and facilitate learning partnerships between students and teachers as a template for the classroom, emphasizing a more egalitarian accountability for student success. To do so, effective Head/teachers need to stay in place and build upon the cluster system (a small, interconnected cohort of schools) to replicate best practices versus making it difficult for talented educators and administrators to apply new approaches with new teachers and circumstances. This will ideally lead to the promote efficient schools and an education/school culture that is empowered and leads its development versus solely waiting for government interventions.

The expected outcomes of these efforts support the follow developments in teaching and learning:

1. A national school policy on smartphone use/ access at during school hours to ensure teachers and students can share and encourage digital material and connectivity at a basic level.
2. Teachers will have room for error and therefor growth. Teachers will build trust and leadership with and among students and build interest and value for the minds/interests of students.
3. Community members are involved in schools; out-of-school youth-led program will aid teacher creativity with activities, add human resources and add stake in learning outcomes. Students will also produce more community-engaging STEM/digital activities that promote behavior change opportunities and continuing education interest
4. The interaction between stakeholders (parents, teachers, community) will be mutually reinforcing so children are sent to school and promote the learning process.

## **Improving IT Infrastructure**

The study points to participant concerns centered on accessing adequate textbooks and learning materials, and on improving basic infrastructure. However, even with internet connectivity the lack of electricity still prevents student and teacher from engaging in digital learning. Relatedly, there is no clear focus on digital skills in the national curriculum. As such educational is not resilient to disruptions caused by expected or unexpected environmental and public health emergencies.

In response, the recommendation for educators and education policy makers is to improve the ICT infrastructure in rural communities particularly in schools as part of short-term policy priority of increasing access to practical computers, the internet and offline education tools as an investment in local economic growth. Relatedly, the scaling up equitable digital learning requires a robust digital learning infrastructure that ensures access to electricity, digital devices, connectivity, and data for children, adolescent, and youth in school, but also for those out of school and at all levels of education. Ideally, digital learning platforms should be cloud based so students are able to access their learning profiles from any device, anytime, anywhere. As such, a strategic rethinking and broadening of the education delivery model is needed, including digital skills being included in Teacher Education curriculum.

The expected outcomes of these efforts support the following developments in teaching and learning:

1. Teacher/Education professionals expand/ develop local technical skills and enable the country to assemble and maintain digital mobile technology

2. Improving ICT in rural secondary schools in addition to other relevant elements such as, finance, infrastructure, personnel and their training, software, and textbooks.
3. CDSSs nationally should have access to at least one offline digital library per every 100 students
4. The emerging educational digital ecosystem builds resilience to disruptions caused by pandemics, raining season, floods, distance to schools, etc.
5. Disadvantage children/people with little or no access to formal education (i.e., in remote villages and refugee camps) can have access to a learning guides and tool.

### **Expand Peace Corps Approach to Digital & STEM Learning**

Finally, as a presently serving Direct of Programming and Training for the Peace Corps, whose approach to English education was central to this study, study points to concerns around the agency's minimal commitment to facilitating student exposure to computers and lack of interest in addressing lab and practical STEM/experiments access in our partner schools. Further, the agency maintains a focus on building English language ability in isolation; primarily for the purpose of communication to sell labor.

In response, the recommendation for the agency and other N/GOs to consider building exposure to computers to builds ICT interest and access to lab and practical experiments to expand interest in the lab-based sciences like chemistry and physics. Further, continuity and expansion of the digital library pilot cannot not solely be based in student and teacher interest, but the access to the devices must be sustained. The expected outcomes of these efforts support the follow developments in teaching and learning:

1. Continuation/expansion of the RACHEL pilot

2. Programmatic focus on building access to science resources and offline education tools,
3. Promotion of English for Science will make an investment into the foundation the language of digital literacy and STEM, building learning about the status of science in the world and to connecting schools to areas, peoples and organization of similar interest.

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