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Access Denied: Internet Access and the Right to Education in South Africa

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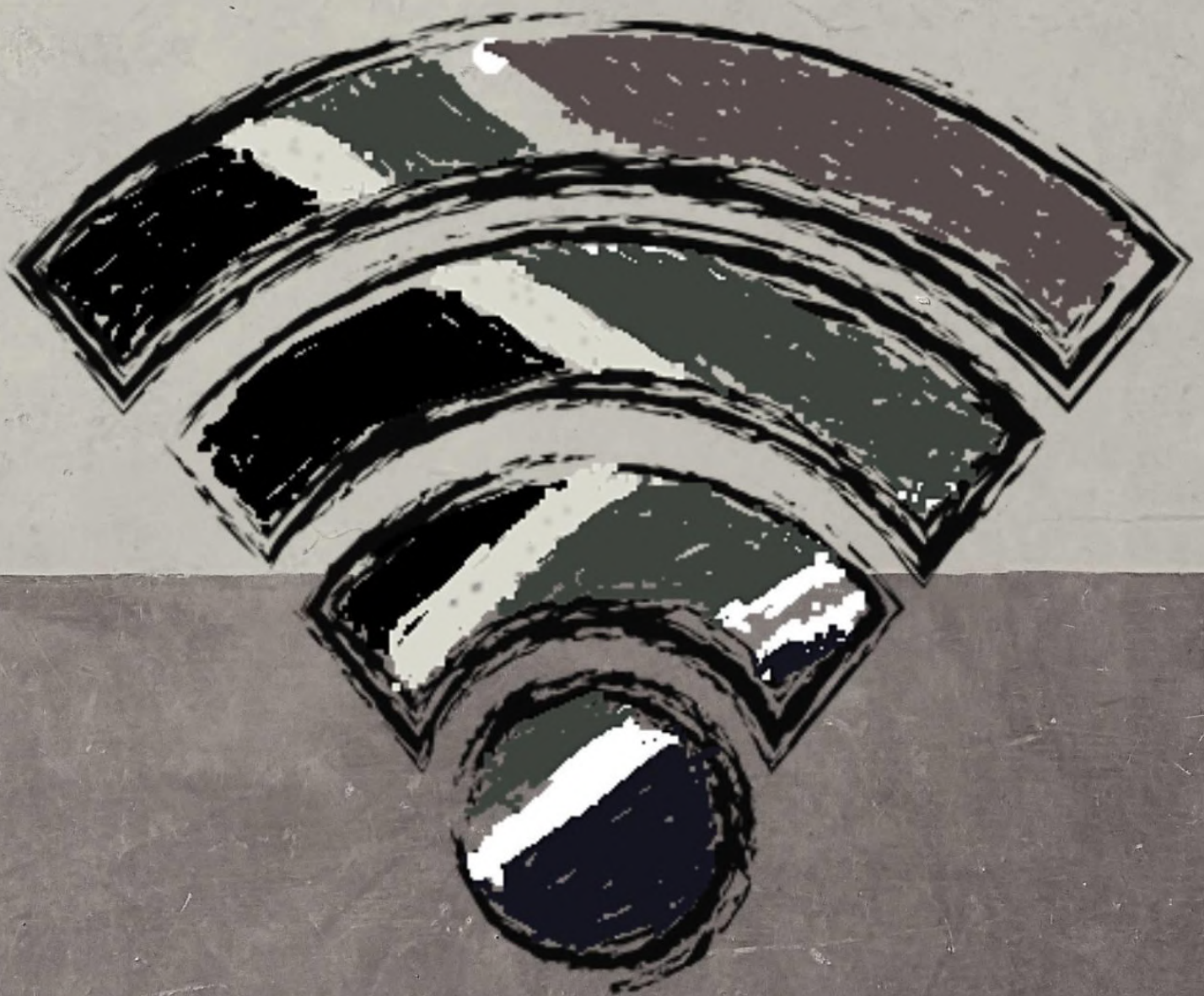
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access denied

internet access and the right to education in South Africa

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access denied: internet access and the right to education in south africa

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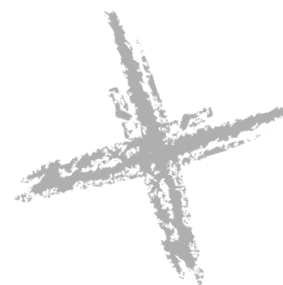
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LIST OF ACRONYMS

ACHPR	African Charter on Human and People's Rights
ACRWC	African Charter on the Rights and Welfare of the Child
CERD	Convention on the Elimination of All Forms of Racial Discrimination
CESCR	Committee on Economic, Social and Cultural Rights
CRC	Convention on the Rights of the Child
CRPD	Convention on the Rights of Persons with Disabilities
CSIR	Council for Scientific and Industrial Research
DBE	Department of Basic Education, formerly the Department of Education (DOE)
DCDT	Department of Communications and Digital Technologies
DHE	Department of Higher Education
DTPS	The Department of Telecommunications and Postal Services
ICASA	Independent Communications Authority of South Africa
ICESCR	International Covenant on Economic, Social and Cultural Rights
ICT	Electronic information and communications technology
MMA	Media Monitoring Africa
SITA	State Information Technology Agency
STEM	Science, Technology, Engineering, and Mathematics
UN	United Nations
UNICEF	United Nations Children's Fund
USAASA	Universal Service and Access Agency of South Africa
USAF	United Service and Access Fund
USAO	Universal Service and Access Obligations
WEF	World Economic Forum
WSIS	World Summit on the Information Society



PREFACE

The COVID-19 global pandemic has led to the temporary closure of schools all across the world. Globally, it is estimated that more than 1 billion children are out of the classroom.¹ In South Africa, it is estimated that nearly 12 million children have been affected by the shutdown of schools during this unprecedented crisis.² We are only beginning to touch the surface of understanding the short, medium and the long-term effects of COVID-19. However, amidst the prevailing uncertainties, the inherent importance, and critical reliance on the internet has emerged as a constant. It cannot be gainsaid that the current global health crisis has made it “clear that internet access is not only an essential public good and basic need — it is a lifeline.”³

As part of South Africa’s response to the pandemic, South African schools have been temporarily closed, with various attempts of phased reopening, subsequent closures, and further attempts of returning learners to classrooms.⁴ While the response by the South African government has been complicated and uncertain, remote, and online learning has become central to the continuation of the school year. However, and owing to disproportion means of access and connectivity, for many South African learners going digital is not an option. Some learners have expressed concern and anxiety that they are falling behind with limited or no access to online learning resources. These learners are isolated and often feel that there is no one to ask for help.⁵ Parents and caregivers, who are facing their own challenges and anxieties occasioned by the pandemic, are struggling to afford the data necessary to facilitate online learning.⁶ The pervasiveness of existing issues pertaining to access, connectivity, and digital literacy have been magnified by COVID-19, and there are grave concerns that many learners are being left behind.

Despite these overwhelming challenges, there have been important steps by both the South African government, the private sector and civil society to assist in facilitating access to the digital environment. There appears to be a shifting narrative that COVID-19 has been a wakeup call, and a “motivating factor towards digital transformation in the education sector”.⁷ As we reflect on these steps, it is important that we remain mindful of the broader issues pertaining to access, which will be discussed throughout this report. However, we must be equally mindful that while these issues are likely to remain in a post-COVID world, it is clear that new, innovate, and meaningful solutions to ensure that learners are afforded necessary educational opportunities both on and offline are within reach.

During the lockdown in South Africa, the Department of Basic Education made educational resources available online, worked towards making electronic readers available online, and entered into partnerships with mobile network operators to ensure that that platforms carrying curriculum content were zero-rated.⁸ In March 2020, shortly after South Africa had gone into a lockdown period, a non-profit organisation, Africa Teen Geeks, in partnership with the Department of Basic Education and the Sasol Foundation, developed a free science, technology, engineering, and mathematics (STEM) Lockdown Digital School, through an artificial-intelligence-based educational platform, affectionately referred to as Ms Zora. By April 2020, the STEM Lockdown Digital School expanded into community television in order to reach even more learners.⁹ Further to this, there has been intergovernmental efforts to advance access for learners. The Department of Communications and Digital Technologies has published directions which provide a framework for the zero-rating of websites for education and health.¹⁰ Websites identified for educational purposes include local websites offering free access to educational content resources, local commercial websites that offer all learners unconditional or free access to educational content, and national and provincial education department websites. Additionally, the Department of

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Communications and Digital Technologies has partnered with the Department of Basic Education to identify 152 sites in 76 education districts. These sites will be equipped with Virtual Classroom infrastructure.¹¹

The telecommunications industry also played an active role in supporting access to education during this critical time. Telkom, Africa's largest integrated communications company, made government and education sites access-free on their network.¹² Vodacom and MTN, major mobile network operators in South Africa zero-rated learning platforms.¹³ In addition, Vodacom offered a zero-rated e-school portal with content for grades R to 12 (approximately learners between the ages of 5 and 18).¹⁴ The MTN Foundation partnered with the Department of Basic Education and the Siyavula Foundation to support Grade 10, 11 and 12 learners (aged between 15 and 18).¹⁵

Prolonged and heightened tech-dependence will become a ubiquitous part of society, and we will no doubt continue to see significant shifts in the education landscape. Along with the increasing acceptance that "internet rights and freedoms are more important now than ever before,"¹⁶ it is increasingly apparent that it is possible to provide internet access to learners. South Africa still has a long way to go in terms of providing meaningful access and connectivity, and the current crisis has magnified how access to digital literacy skills as well as affordable and quality internet coverage remains unevenly distributed in South Africa. However, the collective efforts of government, the private sector, and civil society have illustrated that providing internet access to learners is achievable. While the challenges, particularly in the current context may at times appear insurmountable, the opportunities are endless.

At worst, COVID-19 has shown us what is possible and what is within our available means. At best, it will signify an intentional and meaningful stride towards a "new normal" where education is available to all learners, both off- and online.



INTRODUCTION: THE SOUTH AFRICAN DIGITAL DIVIDE



South Africa is currently the most unequal country in the world, with a GINI coefficient that has increased from 59.3 in 1993 to 63.0 in 2017.¹⁷ More than two decades after the racist apartheid system ended, over half the country still lives below the national poverty line, and the education system is rife with inequality.¹⁸ Unfortunately, the South African education system is still divided by its apartheid legacy: the schools that were historically restricted to white learners remain better resourced than the schools that were historically available to non-white learners.¹⁹ Indeed, many schools in the latter category remain under-resourced and in crisis.

Added to this, the schools struggling most are typically located in South Africa's rural and peri-urban communities, where educational infrastructure "has been in crisis for multiple decades."²⁰ Many schools in rural communities face difficulties with electricity and lack access to piped water, libraries, or safe sanitation facilities.²¹ Structural and institutional inequalities in the provision of education are at the core of ongoing social, economic, and political inequalities. The perpetuation of structural inequalities is deepened by governance challenges, both in rural, peri-urban and poorer urban areas, resulting in schools in poorer areas being marginalized and run down. Education lies at the heart of realising numerous other human rights and social goods including democratic participation, economic opportunity, and access.²² The lack of economic opportunity manifests itself in extremely high unemployment. For instance, according to the World Bank in 2017, South Africa's unemployment rate (27%) was significantly higher than that in any other upper-middle-income country (see **Figure A**).²³ Unemployment is particularly acute among young job seekers aged between 15 and 24 (55% using the official definition, and 69% using the expanded definition).²⁴

Moreover, the divide in education quality created by apartheid also corresponds to a "digital divide"—a divide between those who have access to electronic information and communications technology (ICT) and the requisite skills to make effective use of the access, and those who do not. It appears from the available information that rural schools are much less likely to be connected to the internet than urban schools, resulting in wide disparities in computer and digital literacy between rural and urban learners.²⁵ In an increasingly globalised and tech-driven economy, lacking digital literacy and computer skills is a form of illiteracy that can lead to unemployability in many professions and higher-paying industries.

To bridge the digital divide, the South African government has committed on paper to implement connectivity plans, with a special focus on schools, hospitals and government facilities. However, due to poor planning, inaction, non-communication, and a lack of outreach and coordination among the stakeholders involved, there have been severe delays in implementation. As a result, many South African learners continue to suffer the consequences through the duration of their basic education and beyond.

Understanding the scope of the challenge is compounded by there being insufficient information on the legal, policy, and economic landscape shaping internet access in South African schools. This report seeks, in part, to fill that gap and highlight the challenges being faced, as well as proffer solutions for how these challenges can be addressed. In our view, the implementation of universal internet access in South African schools is economically feasible, legally supported, and essential to achieving both equal access and enjoyment of fundamental human rights – thereby making this a constitutional imperative which the state and other relevant stakeholders cannot ignore.

the impact of internet access in schools

The internet “provides unparalleled access to information, and facilitates connections to educational resources, virtual labs, ideas and people.”²⁶ It can radically transform the learning experience of learners and ensure that their education is connected to the skills they need to succeed after graduation. Various educational systems are moving away from modes of traditional instruction, and incorporating new subjects, in order to better and more efficiently prepare learners for the future.

“The model of chalk and board is outdated. It is destroying learners’ morale to learn.”

- Mr Makwarela, Principal, Vhulaudzi

South Africa has recognised the important role that access to the internet in schools plays in preparing the next generation to be competitive in the “Fourth Industrial Revolution”²⁷ (4IR). As the World Economic Forum (WEF) described, the “Fourth Industrial Revolution” requires a workforce with advanced science, technology, engineering, and mathematics (STEM) skills and is accompanied by a strong demand for professionals who can “blend digital and STEM skills.”²⁸ President Ramaphosa recently announced the establishment of a Presidential Commission for the Fourth Industrial Revolution.²⁹

The focus on 4IR has already made its way into the realm of education. In May 2019, the then Minister of Higher Education, Science and Technology, Naledi Pandor, announced that she was setting up a task team to identify the priority areas and interventions that should be undertaken to “advance digital skills and absorption by industry”.³⁰³¹ Technology is changing the face of work and these initiatives acknowledge the need to equip the youth with basic digital skills. People who are working in ICT jobs, obviously benefit from adequate STEM training from a young age. Access to the internet in schools facilitates this. However, it also assists people who do not participate in tertiary education. The rise of the online and gig economy mean that employers such as Uber and UberEATS offer new job opportunities, particularly for at-risk youths.³² As a result, it is critical for learners to learn essential digital literacy skills in school so that they will have the foundation needed to compete in the modern era.

computer-aided learning tools

Recent state-of-the-art economic research suggests that computer-aided learning tools can result in significantly improved test results in traditional subjects in developing countries, in this case mathematics and language (Hindi).³³ The computer-aided learning (CAL) tool used ('Mindspark') enabled individualised learning programmes in order to ensure that learners are taught at the right level. This addresses an important problem in developing countries, which is that curriculum and pedagogy are often not matched to learner progress. Investing in hardware alone (such as rolling out computers to schools and homes) is not enough: the software in this case played a critical role in improving learning outcomes, and internet access plays a critical role in delivering modern software to end users.³⁴ An important dimension of the intervention was not that the CAL replaced human teachers but rather significantly improved their productivity. This is an important issue in South Africa, where teachers currently employed in low-performing schools score worse on mathematics tests than learners in top-performing schools.³⁵

Internet access is critical to helping young learners understand and learn science and maths, in particular.³⁶ Technology and internet access can improve the ease and speed of learning certain mathematical concepts.³⁷ Multiple methods and modes of studying science, both text and video, for instance, can be "especially helpful in understanding certain scientific concepts."³⁸ The internet also plays an important role in encouraging the building of a STEM identity for learners of colour who do not picture themselves as being able to be a scientist, for example, or who would not otherwise come into contact with scientists who look like themselves.³⁹

This lack of training and exposure affects the quality of the supply of the workforce in South Africa, as well as its competitiveness globally. Education is critical to the supply of e-skilled workers in the South African workforce.⁴⁰ According to the e-Skills Council, the lack of computers and internet access in secondary schools, especially in rural areas, is the primary cause for the shortage of e-skills in the South Africa employment market.⁴¹ South Africa ranks low—21 out of 31 countries⁴²—for digital fluency.⁴³ The e-Skills Council recommended over a decade ago that access to ICT resources should be facilitated in less privileged communities to address these shortages.⁴⁴ Further, as the WEF described in its 2018 report, "low ICT adoption... is another important restraint on South Africa's competitiveness... The digital skills [] and critical thinking skills [] of the current workforce are inadequate for the progress of a successful economy in the Fourth Industrial Revolution."⁴⁵

South Africa Connect,⁴⁶ one of South Africa's connectivity policies, sought to address this skills gap through its prioritization of connecting schools "and introducing ICT skills development in the school curriculum."⁴⁷ However, slow progress on these efforts means that "[t]he world is changing faster than schools can keep up with."⁴⁸

Scholars, particularly those in rural or impoverished areas, bear the brunt of this failure and miss out on the capacity of the internet to arm them with tools to participate in the modern economy. Access to digital space is a way for people to improve their social and economic conditions.⁴⁹ In fact, the internet offers an "important opportunity to make up for many, although not all, of the deficiencies of [the] educational system,"⁵⁰ providing access to information, platforms for the exchange of ideas, and a means to take part in public (local, national, and global) life. Internet access can facilitate a new way to access educational resources, including textbooks and educational content, workbooks, instructional programs, and adaptive learning technologies.⁵¹ Ultimately, access to the internet offers an opportunity to address some of the resource deficiencies and the resulting inequality in access to information, learning outcomes (including basic literacy and mathematics), and successful transition to tertiary education or employment.





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This is particularly important in the context of the unemployment crisis in South Africa, as mentioned above. South Africa's unemployment rate is currently 27.6% using the official definition (i.e. the percentage of people actively seeking work), and 38% using the expanded definition (i.e. including discouraged work-seekers).⁵²

demand and supply of information and communication technology skills

There is substantial demand for learners that have information and technology skills. The South African government has repeatedly recognized the importance of ICT skills for development and opportunity. While the demand for digital skills may be well-established, the number of jobs in respect of computer programmers, for example, has not grown significantly in South Africa between 2008 and 2018 (see **Figure B**). There were approximately 70,737 computer programmers in South Africa in 2008, and 78,768 in 2018.⁵³ The lack of ICT skills, at least partly due to limited internet access in schools, is likely an important contributing factor to the limited job growth in this area.

Increasingly as nations move services online and as governments move essential services and information online, being able to access the internet isn't just good for jobs, the economy and skills development, it is an essential aspect of good governance and will be a basic necessity of citizenship. Without access and skills, young people will be left behind and denied not only the opportunity but the ability and possibility of participating effectively in democracy. COVID-19 has shown how if one has access to a device, not only can one participate in diverse schooling but the public can also follow events in Parliament.

the current state of affairs

Between 14.2 million and 15 million learners did not have access to the internet at school in 2017, according to the Statistics South Africa General Household Survey.⁵⁴ Access varies substantially between different segments of society in South Africa, reflecting the very high levels of inequality and the segregation of population groups during apartheid. There is, therefore, a substantial 'digital divide' between learners in schools located in former whites-only areas and other schools. This is reflected in substantial variability in rates of internet connection at schools across provinces (**Figure C**) and by metropolitan area (**Figure D**). This varies for example between a low of 1.7% of learners in Limpopo to 19.5% in the Western Cape. In the City of Johannesburg, 28% of learners have access to the internet in school. The lack of internet access at school in poorer, rural provinces is not mitigated by internet access at home: 2% of learners in Limpopo belong to a household that has internet at home.

Differences between metro and non-metro areas further reflect the 'digital divide' between schools in South Africa. By far the largest number of unconnected learners are in non-metropolitan areas in KwaZulu-Natal and the Eastern Cape, and in the largely rural provinces of Limpopo, Mpumalanga and the North-West (see **Figure E**).

According to the National Education Infrastructure Management System (NIEMS), as of 2018, only 4,675 of 23,471 schools had internet connectivity for teaching and learning.⁵⁵ Of the schools that are connected, many lack the capacity, resources, or physical requirements to enable meaningful access. Meaningful access requires, at a minimum: a high speed and reliable connection, an adequate number of devices to allow reliable and frequent use by learners, IT professionals

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managing the devices and connectivity to ensure sustainable use, and adequate training of administrators and teachers to facilitate meaningful use of access and technology. Added to this, many schools lack even basic infrastructural necessities, such as electricity, lockable doors, and security devices to support internet infrastructure. In many instances where rural schools are connected, schools lack either adequate security measures for preventing device theft, or adequate teacher and administrator training in how to use the internet in a pedagogically effective manner. Teachers that have access to the internet and internet-ready devices often do not have the skills to effectively teach learners with those devices, leading to instances of under-use of equipment.

policies related to access to the internet

Numerous policies have been put forth by the South African government in recent years with the goal of increasing internet access in rural parts of the country. Through these policies, the government outlines its goal of increasing internet connectivity throughout the country, and the infrastructural and monetary challenges associated with connecting South Africa's most rural citizens. There are three key sources of commitments regarding access to the internet in schools, that inform the broader discussion in this report.

commitments on access to the internet in schools

- **South Africa Connect (SA Connect)** is the government's primary policy for broadband access in the country. The policy, first published in 2013, set the goal of connecting all schools to the internet by 2020 at speeds of at least 10 megabits per second, with all schools to be connected at 100 megabits per second by 2030. In SA Connect, the government recognises the essential role that internet access plays in improving the ability of South Africans to compete economically on the international stage in an increasingly digitised global society.
- **Universal Service and Access Obligations (USAOs)** are licensing obligations imposed by the Independent Communications Authority of South Africa (ICASA) on telecommunications operators (the "Operators"), known as Universal Service and Access Obligations ("obligations," or USAOs). As of 2014, ICASA has required the Operators to each connect a designated number of schools to the internet. Specifically, Cell-C, MTN and Vodacom were each required to provide internet access to 1,500 schools, 140 of which are for institutions of persons with disabilities ("IPWDs"), over a period of five years.⁵⁶ Operators were further required to provide each school with three teacher laptops and 24 learner laptops.
- **Internet for All (IFA)** is an initiative created by the World Economic Forum (WEF) to facilitate "physical and digital platforms at the global, regional and national level, that will create millions of new internet users, with a focus on the hardest to reach."⁵⁷ In South Africa, the initiative has four main components: addressing internet infrastructure; increasing skills and awareness around the internet, particularly in rural areas; developing local content to drive usage, including educational content; and working to increase the affordability of data and devices.

These policies and initiatives are overseen and implemented by various government departments, organs of state and private actors. Ensuring access requires bringing together different kinds of expertise, effective program management, resource coordination, and oversight. Both SA Connect and IFA were previously overseen by the DTPS. In May 2019, President Ramaphosa announced that

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the DTSP and the Department of Communications (DOC) would be combined to form a new department: the Department of Communications and Digital Technologies (DCDT), to ensure better coordination between their mandates.⁵⁸

methodology

This report has been prepared to shed light on the reality of internet access in schools, and offer recommendations as to how this can be improved. The study was conducted in the following stages: desk research; preliminary interviews; field research; and follow up interviews.

From 8 to 27 March 2019, researchers conducted field research in the Limpopo and Gauteng provinces in order to analyze existing access in schools, the impact of current levels of connectivity, and ICT implementation. Researchers visited seven secondary schools and two primary schools in Limpopo. Limpopo was selected for the field visit both because the province has a large number of unconnected rural schools and because the Vhembe District Municipality in Limpopo was identified by SITA and Broadband Infraco (BBI), entities implementing SA Connect, for Phase I of SA Connect.⁵⁹ The researchers focused on examining levels of access in rural schools, particularly the impact of access (or lack thereof) on school administrations, teachers and learners and on education and skills development generally.

This report is the result of the research study. While we do not purport to have conducted a comprehensive survey of schools in South Africa, it is the result of extensive legal and policy research and a series of conversations with key stakeholders. The report outlines what human rights law and standards require for the realisation of the right to education and the role of internet access in ensuring the non-discriminatory enabling of that right and others, as well as the barriers to implementation and effective access. The report concludes with recommendations proposed for the way forward.



HUMAN RIGHTS AND INTERNET ACCESS

Chapter 2 of the Constitution of the Republic of South Africa, 1996 (the Constitution) sets out the fundamental rights in the Bill of Rights. The Constitution applies to both public and private actors, and imposes both positive and negative obligations on the state to protect, promote and fulfil the rights in the Bill of Rights.⁶⁰ International law also plays an important role in South African law: when interpreting the Bill of Rights, the Constitution explicitly directs courts to consider international law and “promote the values that underlie an open and democratic society based on human dignity, equality and freedom.”⁶¹ Both international law and the Constitution of South Africa guarantee the right to a basic education and protect all people from discrimination in the enjoyment of their rights. As discussed below, access to the internet has become an essential component of the right to education.

This position is further bolstered by international human rights law. Both the UN and the African Commission on Human and Peoples’ Rights have affirmed that “the same rights that people have offline must also be protected online.”⁶² Access to the internet enables the full array of fundamental rights, including socio-economic rights. The internet can, for example, promote individuals’ right to health by providing previously unconnected individuals with knowledge about health information, medical care, and accessing services. The state is required to both take positive steps to promote access, as well as a negative duty not to interfere with access to the internet.⁶³

access to the internet is critical to the right to education

Access to the internet has become essential to achieving the right to education. Like many features of the right to education that have already been recognized by South African law, access to the internet enables a learner to participate more fully in their education and to develop skills essential to promoting their lifelong development and success. Given this reality, unequal access to the internet that disadvantages rural and non-white schools violates not only the right to education, guaranteed by the SA Constitution and international law, but also the right to equal protection of the law.

best interests of the child

It is by now well-established under domestic and international law that the best interests of the child is a primary consideration and of paramount importance. In this regard, section 28(2) of the Constitution provides that “a child’s best interests are of paramount importance in every matter concerning the child.” Similarly, article 3 of the Convention of the Rights of the Child (CRC) provides that “[i]n all actions concerning children ... the best interests of the child shall be a primary consideration.” As UNICEF notes, the “wording of the principle indicates that its scope is very wide, going beyond state-initiated actions to cover private bodies too, and embracing all

actions concerning children as a group.”⁶⁴ On education specifically, it describes that to prepare the child “for responsible life in a free society,” it is important to teach the “less ‘academic’ subjects such as health and sex education, politics, budgeting, citizenship and social relationships. Above all, learners must feel that their education is not divorced from real-life...”⁶⁵ As the world around learners moves increasingly online and becomes technology-based, their education must too, not to become irrelevant. Access to the internet goes still further, to facilitate and give meaning to children’s right to participate. Access to the internet is more than simply one-way communication as its open a range of tools and possibilities enabling children to participate directly in matters that affect them.

the content of the right to basic education

Section 29(1) of the Constitution guarantees that all people have a right to a basic education, which requires an education of an appropriate standard.⁶⁶ As has been explained by the Constitutional Court, education provides “a foundation for a child’s lifetime learning and work opportunities”, which helps to erase some of the lasting effects of educational inequalities created by apartheid.⁶⁷ Unlike other socio-economic rights in the Constitution, the right to a basic education is unqualified and immediately realisable. Generally, this means that any limitation on the right is presumed unconstitutional, unless shown otherwise.⁶⁸ The government cannot rely on budgetary constraints as an excuse for failing to realise the right.⁶⁹



Courts in South Africa continue to define the contours of the right to a basic education, adding to the list of its essential components. Having a school, classrooms and appropriate learning facilities, school furniture such as desks and chairs, textbooks, teachers (including teaching materials), proper and safe sanitation facilities, stationery, and transportation have all been deemed essential components of a basic education.⁷⁰

Failure to provide these essentials is a violation of the learners’ right to an education, and failure to provide these essentials to some learners, while providing it to others, constitutes





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discrimination.⁷¹ When learners are not provided essential tools, like textbooks, they are adversely affected and disadvantaged. They bear the responsibility – and undue burden – of having to obtain these components for themselves, and may not enjoy the full benefit of it.

However, the list is neither finished nor exhaustive. It is by now apparent that access to the internet should be recognised as another such essential component, given its role in public and economic life. This notion is explored further below.

access to the internet as a component of a basic education

Access to the internet shares many features with those resources already deemed essential to the right. Resources such as textbooks and basic school furniture were found to be essential components of a basic education because their absence impedes the learner's ability to participate in the school lessons that teachers assign.⁷² Like textbooks, internet access can build literacy⁷³ and improve cognitive development.⁷⁴

Similar to transportation, internet access can facilitate access to educational resources for learners in remote areas.⁷⁵ Like basic teaching materials, the internet and IT technology facilitate learner participation in classroom learning.⁷⁶ Interestingly, “[w]hether textbooks will continue as a meaningful category of learning materials is itself put in question by developments enabled by the internet”.⁷⁷ Moreover, the DBE itself acknowledges the essential nature of internet access for education, and holds the position that ICTs should be regarded as “an essential transformative tool for education and training” as well as essential to the “creation of a pool of globally competitive human resources.”⁷⁸

“The internet helps students who do not have textbooks. They also gain a wider knowledge than what the book is providing. As an example, if you tell a student to research hydraulics, it surprises the teachers even what they learn, even if it is beyond their age or capacity... The internet opens everything for students.”

- **Edson Sanyika, IT teacher, LEAP 5, Limpopo (11 March 2019)**

Access to the internet enables students to learn beyond the confines of their instructors' knowledge. Beyond the access to limitless information it presents, it also enables and facilitates access to innovative learning programs on topics like coding, engineering, 3D printing, or computer programming, which are being taught in better-resourced schools.⁷⁹ This does not diminish the role to be played by teachers: teachers continue to play a critical role in coaching learners to problem solve, facilitating their experiences, and mentoring students as they develop their skills.⁸⁰

Given the national curriculum's necessary use of research-based assignments, learners without access to the internet struggle to participate.⁸¹ Schools without internet access fundamentally undermine access to knowledge and information, as well as an environment in which learners can develop these basic skills. The ability to ask the right question, the skill to identify appropriate sources to answer that question, and the means to reflect on and develop this process of inquiry,

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are at the very core of what an education is meant to provide.⁸² The lack of access to the internet – as well as the necessary training on conducting research – has knock on effects for a learner’s ability to pursue tertiary education, applications, bursaries, information about loans and coursework that are online. Learners are also ill-equipped for the tertiary or work environment that often requires learners to have basic computer literacy skills.

Furthermore, access to the internet can also help reduce costs. For instance, the Deputy Minister of Education has noted that the effect of digitising textbooks and teaching materials, for instance, can save provincial departments billions of rands, but that this can only be done with appropriate connectivity.⁸³ Access to the internet can also enable physical accessibility through distance learning. For example, internet access can be used to connect students to remote laboratories or to online resources, in the absence of access to physical facilities.⁸⁴

international law guidance

As already outlined above, there is a growing recognition in international law of the importance of the internet to the right to education. The United Nation’s Human Rights Council’s 2016 resolution “on the promotion, protection, and enjoyment of human rights on the Internet” emphasises that:

[A]ccess to information on the Internet facilitates vast opportunities for affordable and inclusive education globally, thereby being an important tool to facilitate the promotion of the right to education, while underlining the need to address digital literacy and the digital divide, as it affects the enjoyment of the right to education.⁸⁵

treaty obligations

- **Article 15 of the International Covenant on Economic, Social and Cultural Rights (ICESCR)** provides that states parties recognise the right of everyone “[t]o enjoy the benefits of scientific progress and its applications”. In 2018, the Committee on Economic, Social and Cultural Rights (CESCR) expressed its concern at South Africa’s low rate of internet access, particularly in rural areas and in schools, and at the lack of affordability of the Internet for the most disadvantaged groups.⁸⁶ The CESCR went on to recommend that South Africa “adopts relevant measures to ensure the accessibility and affordability of the Internet, particularly in schools, rural areas and for the most disadvantaged groups”.
- **Article 29 of the Convention on the Rights of the Child (CRC)** provides that states agree that the “education of the child shall be directed to the development of the child’s personality, talents and mental and physical abilities to their fullest potential;... [and] preparation of the child for responsible life in a free society.”
- **Article 11 of the African Charter on the Rights and Welfare of the Child (ACRWC)** provides that “[e]very child shall have the right to an education” that is directed to promoting and developing them to “their fullest potential” and preparing them “for responsible life in a free society.”

Providing access to the internet is critical to satisfying states’ obligations under the CRC and the ACRWC, since preparation for a responsible life in a free society takes on new meaning in the digital



age. Many education experts, for instance, recognise that the internet and ICTs have transformed the nature of literacy, as internet proficiency has become an essential skillset in the modern workplace. The explosion of knowledge and information resulting from greater internet access around the world makes it necessary for public schools to place greater emphasis on instructing children on how to use technology to find the information they need, rather than continuing to emphasise rote memorisation of facts.⁸⁷ The DBE's White Paper on e-Education defines digital literacy as being regarded as "a 'life skill' in the same category as literacy and numeracy."⁸⁸

Other experts identify the positive impact of internet use on the cognitive development of children and adolescents. Researchers in early childhood education found that the internet can help young children "build problem-solving skills [and] enhance concept development" in part because of the interactive nature of information gathering and engagement with websites on the Internet.⁸⁹ Moreover, researchers in learning sciences have concluded that learners should develop their "complex cognitive skill of information problem solving" through instructional support and practice in schools.⁹⁰ This involves learning from teacher instruction how to evaluate online content for "trustworthiness of sources and information in terms of relevance and reliability," which studies have shown that learners are unable to do without educational support.⁹¹

Given the pervasiveness of the internet in modern global society, relevant curricula necessarily includes some component of the internet in order to be sufficiently acceptable.⁹² One principal interviewed for this report lamented: "It is pathetic - especially for learners in Grade 12 that do not know what a laptop or computer looks like. Instead, they are just playing with their cell phones at home and educators are not telling them how to use it fruitfully."⁹³ Having access to this technology, and being able to take advantage of it, would enable learners to "acquire the skills and capabilities they require for the acquisition of further knowledge."⁹⁴ As one civil society member noted, "We don't just put kids in a car and say drive. We need to think like that with the internet."⁹⁵ Since students who do not or are unable to access the internet suffer disadvantages, educators should ensure they are learning the skills they need to avoid such challenges.

the right to equality and non-discrimination

The discriminatory access to the internet further undermines the right to equality and non-discrimination, guaranteed both by the Constitution and under international human rights law. Because access to the internet is critical to the right to education, it should therefore follow that all South African learners have the right to equal access to the internet. However, due to the current digital divide, this is not borne out in practice, and serves to entrench the existing socio-economic divides in the country.

Section 9 of the Constitution contains a guarantee of equality before the law and provides that everyone has the right to equal enjoyment of rights and freedoms. It further provides that the state may not unfairly discriminate against anyone on one or more grounds which includes race, ethnic or social origin, culture, or birth. However, despite this guarantee, South Africa still finds itself divided in many ways by the apartheid legacy, including to some extent in relation to the education system.

The right to equality is given content through the Promotion of Equality and Prevention of Unfair Discrimination Act (Equality Act). The Equality Act goes further than section 9 of the Constitution, defining discrimination as any act or omission—including policy, practice, condition or situation—which directly or indirectly either disadvantages or withholds "benefits, opportunities or advantages" from any person based on a prohibited ground. In addition to the stipulated grounds, section 14(3) of the Equality Act further includes any other ground that "causes or perpetuates



systemic disadvantage...or adversely affects the equal enjoyment of a person's rights and freedoms in a serious manner."⁹⁶

equality and non-discrimination in the context of the right to education

Equality in the context of the right to education was dealt with in *Minister of Basic Education v. Basic Education for All*.⁹⁷ In that case, the Supreme Court of Appeal (SCA) analysed the issue of textbook shortages for poor, rural school children in Limpopo through the lens of the right to equality and non-discrimination.⁹⁸ Notwithstanding the budgetary constraints and other challenges raised by the DBE,⁹⁹ the SCA nevertheless held that the failure of the DBE and the Limpopo Department of Education to provide textbooks to be unfair discrimination.¹⁰⁰ The Court found that the Limpopo provincial government was dysfunctional; it handled the procurement and delivery of the new textbooks poorly; that the DBE's plans for rolling out the new curriculum were flawed; and that the DBE had failed to adequately monitor the delivery of textbooks and maintain an accurate database.¹⁰¹ The SCA held further that the DBE's defence of "budgetary constraints" was a contrived excuse, instead finding that the textbook shortage was caused by the DBE's poor preparation for the rollout and "woeful" logistical ability.¹⁰² Moreover, the evidence before the SCA revealed that the textbook shortage was particular to Limpopo and that most, if not all, of the affected learners were black and from poor communities located in rural areas.¹⁰³

International and domestic organisations are increasingly recognising the impact and inequality of the digital divide. In its 2018 resolution on the internet, the United Nation's Human Rights Council called upon "all States to bridge the digital divides... and to enhance the use of information and communications technology, in order to promote the full enjoyment of human rights for all."¹⁰⁴ The UN General Assembly has similarly recognised the "need to close the digital divide, including with regard to such issues as Internet affordability, and to ensure that the benefits of new technologies, especially information and communications technologies, are available to all." Because the digital divide falls along impermissible lines, perpetuating the harms of the apartheid regime, more urgently needs to be done to address this.

It is learners in rural and under-resourced communities already disproportionately impacted by lack of provision of basic materials, like textbooks, that lack internet access and technology. Most of the learners affected by the lack of internet access in their schools are poor, black, and live in rural areas. Learners from rural high schools are much less likely than learners from urban schools to report no computer access or internet at their schools.¹⁰⁵

Moreover, as a result of apartheid laws, race and geography are "inextricably linked,"¹⁰⁶ such that disparities between rural and urban learners has a racially discriminatory impact.¹⁰⁷ Rural schools in poor areas in South Africa are mostly, if not exclusively, attended by black learners.¹⁰⁸ Additionally, most schools that lack internet access in rural areas have learners that are overwhelmingly from a low-income background.¹⁰⁹

One principal described this phenomenon: "Primary schools around here don't have computer labs. Only learners coming from a well-to-do family have that knowledge of what a computer is."¹¹⁰ This kind of inequality has a lasting impact on a learner's ability to thrive in secondary school as well as prepare for, apply to, and thrive at a university.¹¹¹



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The state's failure to take reasonable measures to address the digital divide of South Africa points to there being some measure of unfair discrimination in line with the SCA's judgment. This impedes the learner's right to education, and disadvantages the learner in both education opportunities and future employment prospects.¹¹² Learners in South Africa who do not have access to the internet are at a significant disadvantage when it comes to engaging substantively in life outside of school, preparing for life after, or attending college.¹¹³

The impact of the digital divide in practice

The government, learners and teachers alike recognize the importance of access to the internet in realizing scholars' fullest potential in school and beyond. Teachers in schools without access described what is referred to as the "homework gap,"¹¹⁴ or how learners without access to the internet at home or at school struggle to do their assignments.¹¹⁵ "[T]he curriculum requires that they do a lot of research. The learners only have the textbooks and so only have the information contained therein."¹¹⁶ A principal stated that "[i]nternet would be helpful. Then, if we give learners activities to do they will research for themselves. I'm not sure how they do it now. They end up just copying from other learners because they don't have access."¹¹⁷

Assignments that require research are intended to educate learners in important life skills, which can be an equalizing force in society, providing each citizen with the skills and knowledge to access opportunities regardless of background. However, learners with no access to the internet to complete these assignments are typically already suffering from certain inequities and are placed at an even greater disadvantage.

The lack of experience with digital technology, rudimentary digital literacy skills and internet-based research also places learners at a disadvantage once they arrive at university with learners who were trained effectively in these areas as part of their education. According to one teacher: "Many learners don't understand how technology works and this hurts them if they go to University. At Uni, everything is done on the PC and a lot of children don't know the first thing about using one so they are behind before they even start."¹¹⁸ Another urged, "Learners must learn it! They go to university and don't know how to operate it."¹¹⁹ A number of learners expressed concern as well, noting "Before you go to university you need to learn how to use a PC... We can't type or know how to use the laptop so when we go to University we will be at a disadvantage."¹²⁰

Additionally, for learners who do not continue on to university, if they are not taught these skills in school they may miss the opportunity for formal instruction on it entirely. This is critical on two fronts. First, it places these learners at an even greater disadvantage in the marketplace, and second, it means they lack not only the technical training but also miss out on instruction on cyber awareness and staying safe online.¹²¹ As stated in SA Connect, "[a]s ICTs become more complex, the ability to optimize their use correlates strongly with education and income. Those marginalized from education and therefore employment and income are most likely to be marginalized from the type of communications services required to participate meaningfully in a modern economy and society."¹²²

Learners with access to the internet, on the other hand, remarked on ways in which it contributes to their education and how they use it to improve themselves. As one learner described, "I have to apply to university this year. I use the internet to look up what marks I need for university and to do research online on careers. I look up the requirements for different careers I want to pursue."¹²³ Since teachers commonly expressed a concern that learners are not exposed to enough careers and opportunities,¹²⁴ internet access can help fill this gap.¹²⁵



BARRIERS TO IMPLEMENTATION AND EFFECTIVE ACCESS

There are various barriers both to implementation and effective access that must be addressed before all learners can benefit from access to the internet in schools. These barriers include the lack of a comprehensive and coordinated strategy for implementation of the various policies; lack of infrastructure and adequate facilities; lack of funds; lack of adequate training and IT support for teachers and administrators; pervasive misconceptions among teachers and parents about internet use; and an overreliance on NGOs and corporate social responsibility.

Mere physical access to a computer that is connected to the internet will not close the digital divide in South African schools. Rather, continued maintenance and support of connected schools, affordable access, security, and trust in the technology—as well as teachers who know how to integrate technology and internet access in their classrooms—are all required for real, meaningful, and lasting access to the internet that impacts learner achievement.¹²⁶ Addressing these issues will require utilizing existing resources more efficiently and effectively.

variable progress on current policies

“There are all these policies around connectivity but nothing really happens around it. The goal posts just keep changing.”

– Dudu

There are numerous government initiatives generally aimed at achieving universal access for all South Africans, as well as ones focused specifically on connecting all South African schools. These efforts acknowledge the important role internet plays in a modern society as well as its necessity to modernising education and building digital literacy skills to develop a citizenry capable of competing economically on the world stage.¹²⁷ As the government explained in the national broadband policy, “[t]hose marginalised from education and therefore from employment and income are most likely to be marginalized from access to the type of communications services required to participate meaningfully in a modern economy and society.”¹²⁸

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Despite the importance of internet accessibility and the desire to have cheaper data prices, current government policies and initiatives aimed at school connectivity suffer from a lack of a comprehensive and well-coordinated strategy, which has delayed the implementation of sustainable connectivity programs.

south africa connect

As outlined above, SA Connect is the main government policy designed to connect public schools to fast and reliable internet. The targets for school connectivity were as follows:

Target	Penetration Measure	Baseline (2013)	By 2016	By 2020	By 2030
Broadband access in Mbps user experience	% of population	33.7% internet access	50% at 5 Mbps	90% at 5Mbps 50% at 100Mbps	100% at 10Mbps 80% at 100Mbps
Schools:	% of Schools	25% connected	50% at 10Mbps	100% at 10Mbps 80% at 100 Mbps	100% at 1Gbps

The policy was first published in 2013, and aims to connect all schools to the internet by 2020 at speeds of at least 10 megabits per second, with all schools connected at 100 megabits per second by 2030.¹²⁹ However, following missed targets, this has since been revised, although the policy has not been updated.

As part of the revision of these targets and the implementation of SA Connect, the DTSP contemplated a two-phase plan.¹³⁰ Phase I of the plan was to focus on connecting schools with existing fibre lines nearby.¹³¹ The government intended Phase I to connect a total of 6,135 facilities (not just schools), 2,700 of which the government was to connect by March 31, 2018.¹³² DTSP was to have all 6,135 phase-I sites connected by 2020.¹³³ Phase II was meant to connect an additional 35,211 facilities, corresponding roughly to 90 per cent of the population, though DTSP did not provide a specific time for the completion of this phase.¹³⁴

However, by June 2018, DTSP was already behind schedule for Phase I, having connected only 187 total facilities.¹³⁵ Delays in connection targets have further indicated that only 1,172 of the original 6,135 facilities would be feasibly connected by 2020,¹³⁶ leaving a shortfall of 4,963 facilities. Furthermore, DTSP received budget cuts from the treasury – from R1.9 billion in 2017 down to R1.7 billion in 2018.¹³⁷ Specifically, the budget for SA Connect’s phase-I plan was cut drastically through the 2020/21 financial year, with cuts of 33.8 per cent in 2017/18, 82.9 per cent in 2018/2019, and 75.9 per cent in both 2019/20 and 2020/21.¹³⁸

According to a report from DTSP, SA Connect was four to five years behind schedule as of December 2018.¹³⁹ The Chairperson of the Parliamentary Portfolio Committee cited DTSP’s inaction as contributing to the slow progress on SA Connect’s goals.¹⁴⁰ Specifically, the Chairperson remarked that DTSP did not address the delay in implementation seriously enough, and should have acted to prevent budget cuts by informing the Treasury of the funding needed to carry out



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their implementation plan (otherwise, the Treasury would not be aware of the issues brought on by a cut in funding).¹⁴¹

Numerous other factors contributed to the delay, including confusion and disagreement over the appropriate procurement process. Initially, President Zuma moved to directly grant Telkom the contract to carry out the project. However, the National Treasury notified the Government that a public tender process would need to be undertaken.¹⁴² In 2016, an open tender offer solicited bids from private companies to lead SA Connect's implementation of Phase I, but the tender was ultimately now awarded.¹⁴³ The implementation was then passed to Broadband Infraco (BBI), one of South Africa's state-owned telecommunications operators.¹⁴⁴

Phase II will require laying new fibre lines. A physical connection leads to more stable and reliable internet overall, but laying fibre lines requires operators to physically dig up earth and place cables in the ground leading to a site, or close thereto, a demanding undertaking, both in terms of cost and program management.¹⁴⁵ Given ongoing delays and problems in Phase I of the project, the National Treasury blocked funding for Phase II until a feasibility study could be completed.¹⁴⁶ In a March 2019 progress update on SA Connect, the Department reported that one billion rand had been provisionally allocated to SA Connect for Phase II for 2021/22 financial year.¹⁴⁷

universal service and access obligations

USAOs required of South Africa's operators by ICASA are the second main initiative for connecting schools in South Africa. In respect of schools, these USAOs apply to MTN, Cell-C and Vodacom: they are each required to provide internet access to 1,500 schools, 140 of which are for IPWDs.¹⁴⁸ Operators are further required to provide each school with three teacher laptops and 24 learner laptops.¹⁴⁹

However, the meaningfulness of connectivity brought about through these USAOs depends on ensuring a high-speed connection, as well as effective coordination with the DBE.¹⁵⁰ For example, the minimum speed of 1Mbps set out in ICASA's specifications is not capable of providing much content. Furthermore, the operators are obliged to make the connection available but not to fund the usage of the connection. Schools are therefore often asked to buy their own prepaid airtime in order to use the connection and pay for their own insurance of the devices. Without sufficient funds to ensure high-speed internet access for the long term, the connections established by the operators will likely fail to deliver on meaningful access. Added to this, a number of schools in Limpopo that had been previously connected through these operator obligations quickly lost their access after devices were stolen, and could not be replaced by the schools as the cost of the insurance had been too high. For others, the lack of IT expertise among the teachers at the schools has led to equipment falling into disrepair, rendering computer labs useless for learners.

internet for all initiative

The IFA initiative, housed under the DTSP,¹⁵¹ was established by the WEF to "bring together stakeholders from the public and private sectors, non-profits, academia, international organisations, donors and civil society to create multi-stakeholder partnerships."¹⁵² In May of 2017, a target of additional 22 million new users in South Africa by 2019 was added to the Africa IFA regional programme.¹⁵³ In South Africa, although there has been some progress, the initiative is significantly limited by a lack of funding; it does not have a line item budget and depends on voluntary partnerships with the private sector for developing/implementing any of its programs.

a lack of coordination and inefficient implementation

“There are quite a number of projects that are not well connected and if they were, [they] could achieve better outcomes.”

– Moyeni

A lack of a comprehensive and coordinated strategy among the various government programs, departments, and among private and public actors, to ensure affordable and sustainable access has hampered efforts to establish widespread connectivity. It has led to significant delays in implementation and undermined the sustainability of successful connectivity. For example, both SA Connect and the USAOs for operators provide funds for or require the provision of a certain minimum number of devices and equipment to schools along with providing the connection.¹⁵⁴ However, there appears to be no coordination or planning between these two programs. As a result, the same school may receive equipment through one program and then be provided access and devices again through the other. A more coordinated process is needed to ensure a distribution of resources and focus on sustainability rather than duplication.

The national and provincial DBEs are key to effective and sustainable access to the internet. Both SA Connect and USAOs depend on DBE in numerous ways. However, neither the funding for SA Connect nor obligations imposed on operators allocate additional funds for DBE to complete its role in facilitating connectivity and ensuring the sustainability of these programs. Thus far, both SA Connect and operators working to meet their licensing obligations have met with significant problems in communicating and coordinating with the relevant DBE.

First, the DBE, in coordination with provincial departments of education, is responsible for providing operators with the list of schools they are to connect. At least one provincial department failed to produce a list of schools for nearly half a year, delaying the process.¹⁵⁵ The DBE also listed schools that were already connected,¹⁵⁶ wasting time and resources that could have been spent on schools without any access.¹⁵⁷ The provincial DBEs have also been constrained in monitoring the use and implementation of the devices.

“Operators couldn’t get a list of schools [in Mpumalanga]. Operators were sitting there, waiting, and don’t get their list so they move on to the next province... They think if it takes us four months to get the list of schools, maybe they don’t need this. They say there is a need but officials aren’t acting like it.”

– Moyeni

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Second, DBE is responsible for ensuring schools have the requisite facilities and infrastructure to facilitate and sustain an internet connection. Some of the listed schools to be connected are simple mud huts with no doors; some lack any form of electricity; and others get their power from generators.¹⁵⁸ Without greater infrastructural support or more stable sources of electricity, operators are unable to set up the Wi-Fi routers and devices required under the obligations. This has been, and will continue to be, a challenge for SA Connect as well, since the funds for that policy do not include infrastructure upgrades. There appears to be limited basic coordination between the various DBEs, operators, or SA Connect to ensure that infrastructural upgrades precede technological upgrades. the provision of access and IT. In addition to infrastructural updates, security is key to keeping the equipment in schools, where teachers and learners can use it. However, there appears to be no comprehensive policy in place for ensuring security, financially and practically.¹⁵⁹

Third, there is a lack of communication between various actors to prepare individual schools. DBE fails to communicate to provincial education departments and district and school officials that a school is about to be connected.¹⁶⁰ Operators arrive at schools listed by DBE only to face local officials and school administrators who do not know why they are there.¹⁶¹ As a result, operators have to engage with provincial and district officials, essentially taking on functions that the regulations stipulate are the DBE's responsibility to perform.¹⁶²

Fourth, there is a lack of general cooperation between the Department of Higher Education (“DHE”) and the DBE. DHE, which focuses on “develop[ing] capable, well-educated and skilled citizens” and “improving low participation rates in the post-school system,”¹⁶³ could work with DBE, DTSPS, and schools to ensure that teachers understand how to integrate internet access and devices into their curriculum in a way that supplements their teaching and strengthens learners' ability to teach themselves.¹⁶⁴

It is important to note that one of the central constructs of South African public education is the decentralisation of public education to provinces. Provincial departments are responsible for implementing norms and standards for the education system alongside the Minister of Basic Education.¹⁶⁵ The majority of spending on education comes from provincial education department budgets and provinces are responsible for developing their own annual performance plans.¹⁶⁶ Teachers and administrators are, for example, paid directly from provinces based on learner enrollment.¹⁶⁷

This level of provincial control has led some provinces to report significant overspending on things like personnel costs in provinces like Limpopo and the Eastern Cape, where there has been a failure to redeploy teachers to larger and more popular schools based on changing learner demographics.¹⁶⁸ These provinces spend over 90 per cent of their basic education budgets on staff compensation, while other provinces spend about 70 per cent. This proportion in spending has caused other educational expenses, like textbooks and improved school infrastructure, to go underfunded.¹⁶⁹

Further, provincial governments are responsible for infrastructural development at schools and for ensuring that learners attend schools capable of providing a safe and effective learning environment.¹⁷⁰ The quality of schools on this front varies widely from province to province and can interfere with the learning environment.¹⁷¹ Connectivity is ultimately unequal across provinces.¹⁷² For example, the Western Cape has connected nearly all of their schools,¹⁷³ whereas some provinces either have failed to discuss connectivity needs with their schools, or have neglected to undertake necessary infrastructural developments at schools ill-equipped to support internet infrastructure.¹⁷⁴

Ultimately, achieving the goal of equal access to the internet requires better coordination between various actors. Government actors engaged in programs related to connectivity should coordinate





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their efforts and lean on each other's capabilities, connections, technology, and infrastructure to ensure sustainable, high-speed, quality access. Provincial and national departments of basic education need to work in tandem to ensure effective and sustainable rollout. At the national level, DBE must work closely with DTPS, Department of Rural Development and Land Reform, and the Department of Science and Technology to achieve connection in all South African schools. DBE can and should make use of existing research institutions, like the CSIR, to ensure access translates into effective use. Finally, the process of connectivity, and the coordination between the various departments and stakeholders, should be transparent. Decisions and data from public programs should be readily accessible to ensure accountability during the process of implementation.

poor infrastructure and inadequate facilities

The apartheid government neglected the vast majority of schools, especially rural schools, resulting in "huge school infrastructure backlogs."¹⁷⁵ While the current government made headway in many of these areas,¹⁷⁶ the infrastructure, facilities, and provisions generally afforded to South African primary and secondary schools are still woefully inadequate.¹⁷⁷ These deficiencies present a challenge to effective implementation of internet access which needs to be addressed to improve the learning environment, ensure learner safety, and make meaningful access to the internet possible. The government's constitutional duty to provide basic resources like classrooms, desks, and books, and to ensure a safe and conducive learning environment¹⁷⁸ must also be realised to facilitate the implementation of access to the internet. Finally, processes must be put in place so that these efforts are not undermined once they have been implemented.

physical conditions

"Infrastructure might be a problem [to connect the school]. The buildings are in bad conditions."

- Mr. Makwarela, Principal, Vhulaudzi

Many school buildings in South Africa are in poor physical condition. The quality and shortage of physical space at many schools makes it necessary to renovate the buildings or build new ones before some technological solutions can be carried out. This may explain, in part, why schools that are already better off tend to be the first connected under new initiatives, but this only exacerbates the existing resource disparity.

Insecure buildings require significant renovation, while even highly functional structures may require enhancements such as barred windows and reinforced doors and ceilings to guard against theft.¹⁷⁹ During interviews, school administrators routinely voiced concerns about the security of devices,¹⁸⁰ and recounted that theft of previous technology was commonplace.¹⁸¹ Due to licensing requirements by operators, if schools do not maintain insurance or use the devices as expected, they may be ineligible for replacements in the event of theft or damage, even if the schools never used the devices due to lack of training or other challenges largely out of their control.¹⁸² This rigid replacement policy makes the physical integrity of school buildings even more important. Increasing physical security may also embolden otherwise hesitant teachers and administrators to make use of the technology, allaying fears that devices will be stolen if removed from the storeroom.¹⁸³

“The facilities are in rough shape... The kitchen is pathetic. It gets wet when it’s raining.”

– Mr George Maluleke, Head of Facilities, Hlalelani Primary School

While two other buildings have been renovated by the department, after advocacy by parents of students at the school, the administrative building at Hlalelani Primary School is still in need of repair.

Furthermore, facilities often fall short of basic standards, making effective use impossible for educators and learners. At one school, learners described having to drag their own desks and chairs around as there was no classroom dedicated to their program.¹⁸⁴ At another school, the principal noted, “Sometimes the classrooms are full and we end up teaching outside. We’ve written many letters requesting more classrooms.”¹⁸⁵ At schools where the lack of adequate indoor space pushes some learners outside, teachers are unable to make use of technological solutions given to them.

electricity and infrastructure

Electricity at schools is essential to maintaining a network and using devices to access it. Recent data from the DBE shows that 269 South African schools remain without electricity.¹⁸⁶

Furthermore, even at schools that do have electricity, it may be insufficient to meet their needs, or unreliable. In part, establishing sufficient electricity requires ensuring that there are enough electrical outlets across the campus. As one teacher noted, “electricity is a problem. I have to use



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a long extension cord to run the projector...if the class is far, the cord doesn't reach."¹⁸⁷

A school may also need reliable electricity to continuously run air conditioning to maintain the temperature of servers. This provision can be costly and may require the school or its provider to invest in a generator to support the network and protect the system in the case of power outages.¹⁸⁸ Schools also have to deal with repairs and maintenance of electrical infrastructure, including both upgrades and replacement after vandalism or natural damage. To ensure the sustainability of access, reliable electricity with sufficient access point should be a priority.

supplies

“Half of the students don't have textbooks and have to share.”

- Sylvia, Principal, Humbelani

Many schools still struggle with insufficient access to traditional learning materials.¹⁸⁹ While the internet and devices to access it can supplement or replicate some basic supplies, it is not yet possible to replace these materials wholesale. Many learners described the challenges presented by having to share textbooks.¹⁹⁰ One teacher noted how in one of her classrooms there is no chalkboard and learners must take notes from the teacher's oral lessons alone.¹⁹¹

Additionally, many schools in South Africa suffer from overcrowding and

very high learner-teacher ratios.¹⁹² While the national average learner-educator ratio in primary schools is 35.2 learners to every teacher, and 27.7 learners to a teacher at the secondary school level, class sizes of 40-60-plus learners are commonplace.¹⁹³ These figures are accompanied by low numbers of devices at schools that are connected, leading to limited availability per learner. Hlalelani Primary School, for instance, recently had 20 computers donated but has 637 learners currently enrolled.¹⁹⁴ For secondary schools with similar or worse ratios of learners per device, the number of devices and other restrictions on learner access severely limit the time each individual learner has to use a device. Teachers also pointed to the issue of overcrowding in the computer lab. When multiple learners are forced to crowd around the same computer, teachers struggle to effectively supervise and monitor access to ensure learners are on task.





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“Having a laptop, a projector and the internet in each class would be very helpful. It would mean that teachers could pre-prepare slides and show them. This would be faster and easier. We would not have to write everything on chalk board with very limited space.”

- Zuluzani, Teacher, Vhulaudzi

Teachers and administrators also deal with a shortage of devices. Many teachers rely on their personal computers to prepare for lessons, but not all are digitally literate, or have their own device to work from. Some administrative offices only have one device connected to the internet. As a result, teachers and administrators must share access, and in some cases teachers are forced to use their own personal data to complete school-related tasks, such as uploading marks. Teachers are required by the Department to upload their marks.

“We need a local network. Educators in building on one side of the campus have to come to admin office to enter marks which is time-consuming.”


- Mr Makwarela, Principal, Vhulaudzi

Other serious infrastructure problems interfere with the learning environment more generally. These problems can “exacerbate problems within the classroom,” and “could contribute to low literacy and matriculation rates.”¹⁹⁵ Basic sanitation, for one, remains a serious issue, with more than 8,700 schools with pit toilets and nearly 8,000 without piped water.¹⁹⁶ Some schools prepare lunch for the learners outside in facilities that are open to the elements. Several principals raised concern about the sanitation and efficiency of these kitchens, but the National Education Infrastructure Management System report for 2017-2018 did not report on this issue.¹⁹⁷ Such problems can distract teachers and learners alike from engaging effectively with all educational materials and instruction, including e-learning opportunities.

schools lack private funds

data costs

Though schools receive internet at reduced rates, the cost of data can be prohibitive for some.¹⁹⁸ Schools connected through USAOs receive internet at a rate of 50 per cent of normal data costs.¹⁹⁹ Under the USAOs, the government is meant to pay for the discounted price through the Universal Service and Access Fund (the “Access Fund”).²⁰⁰ Although the Access Fund has money set aside, paid in by the Operators, for funding the data prices for schools, it is unclear which department is statutorily empowered to use these funds to pay for internet access.²⁰¹ One government official said the funds have not been accessed for this purpose,



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however, it is unclear why this is the case.²⁰² Thus, schools often do not stay connected because there is no funding available and they cannot afford to pay for the internet out of their own limited budget. Operators have even gone so far as to propose amended regulations which would allow them to use the money they would have otherwise contributed to the fund for the purpose of funding schools' access to the internet at the reduced rate, and then paying the remaining balance back into the fund.²⁰³ Even though the Operators sent their draft amendment proposals to regulators,²⁰⁴ there has been no response from regulators or change in the system. The USAOs could be interpreted to require Operators to use a portion of the Access Funds to ensure schools have their internet paid for.

lack of security

During interviews conducted with principals and teachers in schools in Limpopo, administrators routinely voiced concerns about the security of devices,²⁰⁵ and recounted that theft of technology was commonplace.²⁰⁶ According to administrators, schools are not provided additional funds for security measures to protect devices and they must find funds in their already limited budgets. Security upgrades to buildings (e.g. bars on the windows or reinforced doors) and in some circumstances continuing measures (e.g. security guards) require additional funds, which should be provided for along with access and equipment to ensure access is sustainable. Additional funding for these measures should be provided by the provincial or national departments rather than paid for out of local school budgets.

insurance

“DBE said schools could afford to insure but they don't increase the budget to afford it...it's putting schools under tremendous strain.”

– Moyeni

Challenges around security and device theft also raise issues related to insurance costs. Schools connected through service obligations must independently provide the funds for continued insurance for devices. The Department of Basic Education has not increased its budget allocation towards insurance, and many schools cannot otherwise afford it on their own.²⁰⁷ Schools simply do not have the funds necessary to protect their equipment with their constrained budgets.²⁰⁸ As a result, after an Operator has installed a connection and set up a computer lab, including providing the three teacher laptops and 24 learner laptops, and sometimes tablets and the equipment is often stolen. Without insurance, the equipment will not be replaced, and the effort, time, and money invested in connecting the school is wasted. Cost of insurance should be covered by provincial or national departments rather than paid for out of local school budgets.



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lack of adequate training and IT support for teachers

“Some teachers know how to use the internet but I cannot say most.”

- Robert, Teacher, Humbelani

Many rural schools that have computers and are connected to the internet do not end up using these technologies to their utmost capacity because a significant number of teachers do not know how to use the technology, much less how to integrate it into a productive classroom lesson.²⁰⁹ As one researcher described, “If teachers don’t know how to teach with technology, having connectivity won’t matter.”²¹⁰ Many educators, particularly in rural areas, were born before the wide-scale use of technology in classrooms, and thus did not have an opportunity to develop their computer skills in school.²¹¹ It is reasonable for teachers to “teach the way they’ve been taught.”²¹² Thus, if soon to be instructors are not taught in ways that incorporate technology and the internet, they are unlikely to use such tools in the classroom. This observation led another researcher to note, “we need to change the universities. They’re still talking at students, telling them to teach with technology and aren’t changing [their own instruction].”²¹³

“I need teacher training because I am BBT - Born Before Technology! I and the other BBTs have to rely on young teachers.”

- Samuel, Teacher, Tshinavhe

Another obstacle South African school teachers face to integrating technology in their classrooms is the lack of technical support to troubleshoot and fix technological problems, such as a poor internet connection.²¹⁴ A typical school might need upwards of “three IT technicians for a school of 1,000 kids... [but] in a rural school, [they] wouldn’t have that kind of technical support.”²¹⁵ To ensure the proper implementation of internet access and lasting connectivity, schools require trained information technology (IT) professionals to properly install, maintain, upgrade, and fix hardware and software.²¹⁶ As part of their licensing requirements, operators connect schools to the internet, install devices, and “go there for a day or two, show teachers how to switch it on, etc. and then they go [away].”²¹⁷ Although these operators try to train teachers to use the technology, without repeated instruction teachers are unable to effectively retain the imparted knowledge. The lack of follow up is especially concerning because rural schools cannot afford to pay for technical support when they have technological problems. Technology should be protected, upgraded and replaced as needed to ensure effective access. Every connectivity program should be established with a plan for regular upgrades in the technologies installed, and for continuing to provide service once free or discounted rates conclude.

Teachers who do not know how to integrate technology into their pedagogy or lack access to reliable technical support will shy away from using IT in their classrooms. In these cases, learners will not reap the educational benefits of internet access or exposure to modern technologies.²¹⁸ For access to make its way to learners, teachers need to be adequately trained on how to use

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technology for curriculum delivery, and technical support should be made readily available.²¹⁹

Moreover, the government, not the operators, is responsible for training teachers and providing technical support to ensure reliable access. Under Section 29 of the South African Constitution, everyone has the right to receive an education of adequate quality.²²⁰ What this means for school funding policy is that the government should provide sufficient resources for educational infrastructure, teacher training, and development.²²¹ Perhaps in recognition of these obligations, the Department of Education (DOE)'s White Paper on e-Education stated that the DOE should develop a national policy framework for training policies and programs "to enable teachers to understand and use ICTS" for "teaching and learning."²²² The White Paper acknowledges that such teacher training programs require extensive staff development and support.²²³ In addition, in terms of technical support provisioning, the White Paper states that Provincial education departments should "plan and budget for the appointment of ICT in Education specialists at provincial and district levels... to provide ongoing professional and technical support."²²⁴ The state could consider adopting additional degree requirements for university students completing certain programs correlated with good ICT skills to give back to communities in need of ICT support. Youth are a valuable resource that can be trained to serve as ICT support for the school.

South Africa has implemented some initiatives that provide ICT training for teachers. For example, the Vodacom Mobile Education Programme is a partnership between Vodacom and the Department of Basic Education to support ICT training for teachers in centres established in each of the provinces.²²⁵ One of those centres, the Makhado ICT Resources Centre, provides training to teachers on how to use devices, manage lessons, and access information for education.²²⁶ Since its inception in 2011, Vodacom claims to have trained over 100,000 teachers on how to effectively integrate ICT in the classrooms.²²⁷

While this initiative is certainly a step in the right direction, it is insufficient in a country with a total of over 400,000 teachers.²²⁸ Moreover, many of the centres are located too far away from many rural areas and schools, which are the very locations in which ICT training is sorely needed. As a teacher in Tshinavhe, Limpopo noted, "The Makhado ICT Resources Centre would be too far to go to...There is nothing around here."²²⁹

Teacher training on the use of IT in the classroom and in support of the curriculum must be done on an ongoing and regular basis and be a component of professional development of teachers, rather than a one-and-done solution. Such training can take into account best practices developed through previous programs on teacher training around the use of technology (like ICT4RED). Current teachers should be provided with means to access training centres on a regular basis if training is not conducted at or near their school. Public-private partnerships can help with this training.

pervasive misconceptions among teachers and parents

Another major problem in South African rural schools is negative guardian and teacher attitudes toward the internet. Much of these are driven by fears around the internet and children having access to it. These in turn are fed by a failure to drive at scale digital literacy with schools and educators. A study that was coordinated by the United Nations Children's Emergency Fund (UNICEF) "sampled children of both genders between the ages of nine and seventeen in three South African provinces, the Western Cape, the Eastern Cape and Gauteng."²³⁰ Within each province, data were collected in urban and rural sites to obtain evidence of "how the Internet is being used by children in the global South for the purpose of determining whether children's digital rights are currently being realized."²³¹ For those children who could not always access the Internet, the cost of data was most often the cause (47 per cent), and for learners who





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had zero access to the Internet, 51.2 per cent reported the reason was that their adult guardian would not let them.²³² In fact, 69.3 per cent of learners reported that teachers never or hardly ever permitted them to use devices with internet access or access to data for class assignments, and 46.4 per cent reported never or hardly ever being encouraged to explore and learn new things online.²³³ Some parents, guardians, and teachers prohibit access to the internet for children for fear of exposure to sexual content or other “negative” content online that may harm the child.²³⁴

In each of the nine schools visited for purposes of this project, learners were not, as a general matter, allowed to bring their devices to school or use their device during the school day. Several schools referenced this policy as parent-driven. Some schools permitted learners who have phones to bring them in on a certain day or during a certain week in order to apply to universities with the help of a teacher.²³⁵ Meanwhile, learners with devices noted how it could be helpful to them were they allowed to bring them, especially on days when teachers were absent. A student should be allowed to bring their devices to school to access the network, even if they are not allowed to use the devices during class.

Education on the internet’s potential, combined with implementation of adequate security measures (including training learners on browsing security protocols) will be important steps to overcoming some of the misconceptions around the internet.²³⁶ Online safety needs to be incorporated into the curriculum. While many who go online use the internet for entertainment purposes, the internet can enable a much larger range of activities, including educational ones. Learners, teachers, and parents should learn to unlock the power of the internet to enhance the educational experience of learners.²³⁷

an overreliance on NGOs and corporate social responsibility

The slow progress and lack of confidence in government efforts among the public and civil society have led to a great deal of reliance on targeted NGO and private charity programs to meet specific needs. These programs focus on bringing the internet to schools and incorporating internet-learning into school curriculums. While these programs achieve certain favourable short-term outcomes and provide a benefit to the community, many of them suffer from their own sustainability problems and are insufficient to guarantee connectivity. Ultimately, ensuring access for all requires government investment and implementation. While lessons can be learned from these private programs, widespread provision of services is the responsibility of the State.

Many of these projects and initiatives have produced positive outcomes and have shown the advantages that can come from internet implementation in rural schools. One such project, the Bulungula Incubator, has connected schools for the purpose of creating learning programs in rural areas.²³⁸ Through the program, learners are given access to tablets and the internet and are taught part of the curriculum on the internet during one-hour weekly sessions. The project has been a success in teaching children digital and internet literacy skills needed later in higher education.²³⁹ Literacy rates have also increased among learners as a result of this project.²⁴⁰ However, the project faces problems related to sustainability similar to those experienced by government programs.²⁴¹ For example, teachers in this program often do not have the digital literacy skills necessary to successfully integrate the use of the internet in classes.²⁴² In addition, budget constraints make it difficult to divert funds into keeping the school connected to the internet.²⁴³ Furthermore, safety is a major issue. The project reported that around 90 per cent of tablets provided to schools were either lost or stolen over recent years.²⁴⁴

These problems persist in other non-profit programs to connect schools to the internet as well.

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Project Isizwe is a non-profit organization that works with local internet service providers to provide infrastructure for creating local community internet hotspots at a reduced cost. While the project does not select locations, many of the hotspots end up in schools, libraries, youth centers, and police stations.²⁴⁵ Like Bulungula, however, Project Isizwe is limited by funding. While partners are willing to fund access for a period, the project faced challenges in providing continued access.²⁴⁶ Additionally, Project Isizwe lacks control over which sites are connected, so there is no guarantee that schools will necessarily receive connectivity over other sites of the sponsor's choosing.²⁴⁷

Webrangers is a programme run by Media Monitoring Africa (MMA) that focuses on digital citizenship and giving children critical media and digital literacy skills. It is a youth-led programme and what makes it stand out is that it is being run with DCDT, Google, Facebook, MTN, and the Film and Publications Board. As such, it offers a means of a multi-stakeholder partnership that can be scaled across schools. Importantly, its import was affirmed at the launch of the 2020 programme where the Deputy Minister of DCDT stated: "my last challenge for this coming year is in addressing the closing of the digital divide and impacting as many children as possible." Another initiative, ICT4Red, was a program run by the Council for Scientific and Industrial Research²⁴⁸ (CSIR) with the goal of increasing teacher and learner digital literacy in rural schools.²⁴⁹ The program involved introducing teachers to tablets and internet use through "gamification"²⁵⁰ to gradually teach digital literacy concepts.²⁵¹ As teachers progressed in the program, they would gradually unlock new items for their school, such as tablets for learners and projectors for classrooms.²⁵² Overall, the project was successful in that teachers became adept at using their devices and felt empowered to train other officials at their schools.²⁵³ The program showed that it is possible to teach digital literacy in ways that integrate it into the education system, and simultaneously reinforce the role of teachers in the classroom. Similar to other programs mentioned above, ICT4Red suffered from lack of continued support and interest from the DBE, despite the success of the initial program.²⁵⁴ As discussed above, the lessons learned through this program should be incorporated into teacher training programs more broadly.

THE ECONOMICS OF UNIVERSAL INTERNET ACCESS IN SCHOOLS: ITS FEASIBILITY

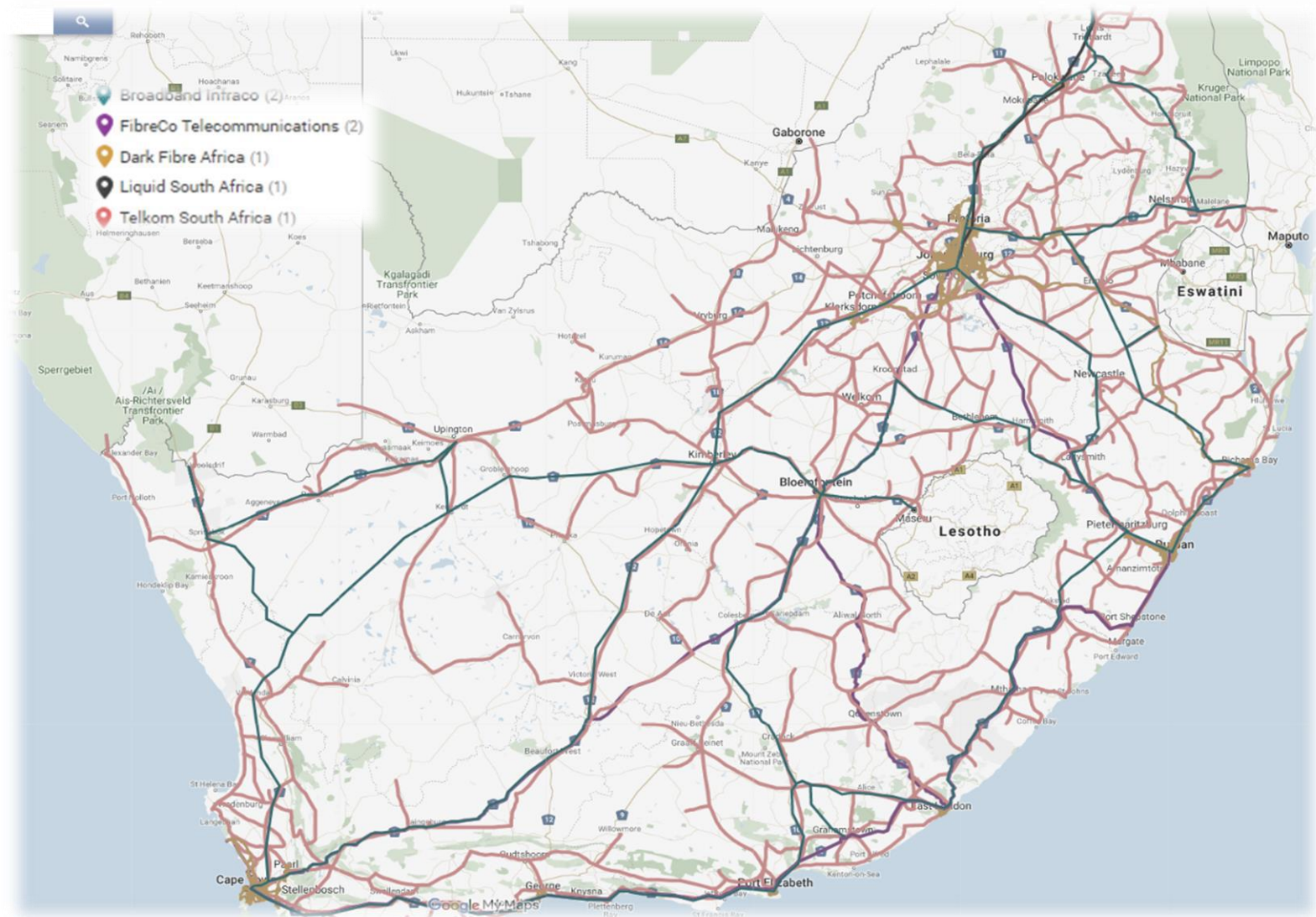
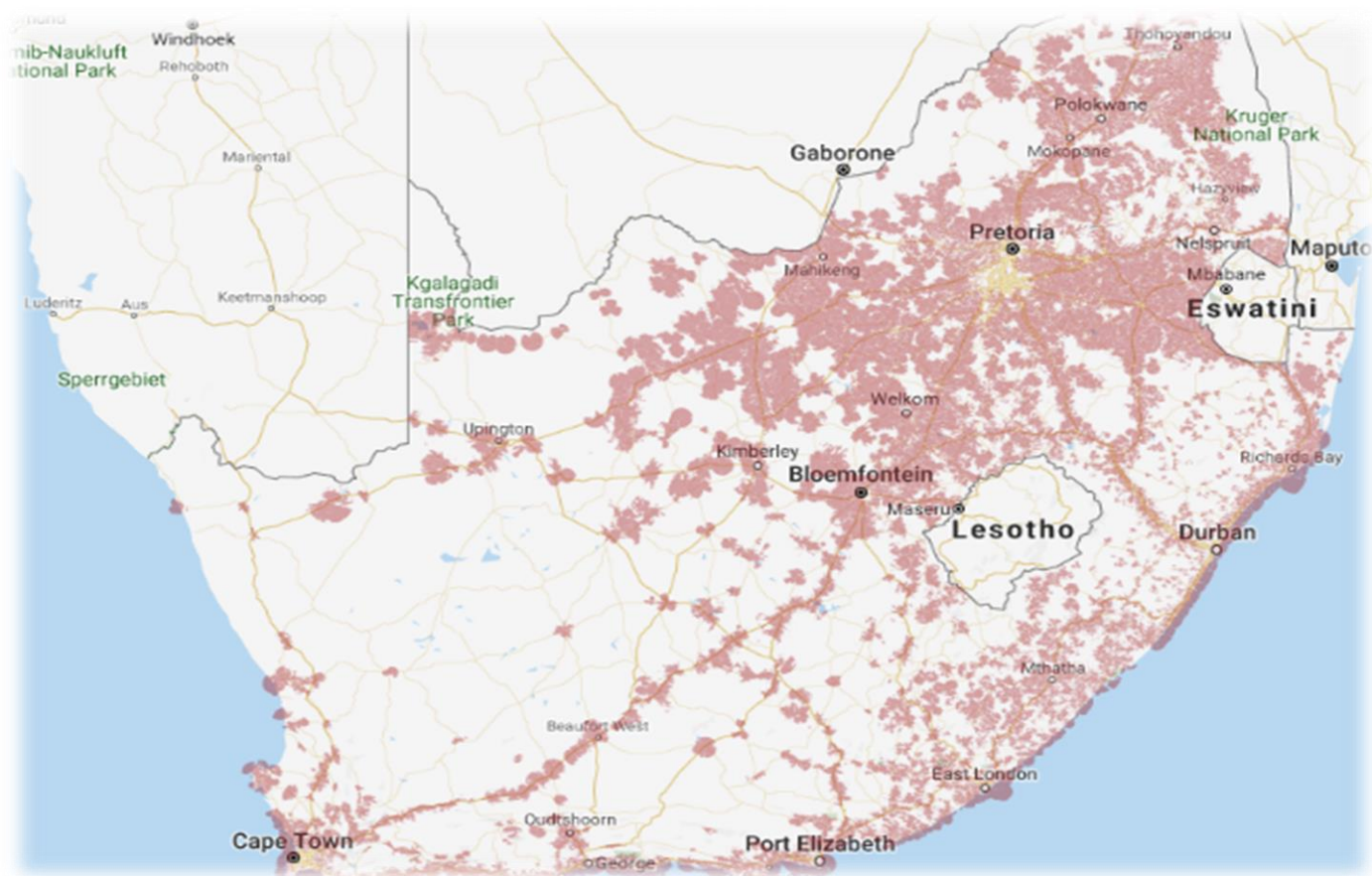


Figure 1: Distribution of fibre infrastructure in South Africa.

Source: *Many possibilities* (2019). Available [here](#).

The targets set by SA Connect for internet access in schools by 2020 are that 100% of schools should have an internet connection of at least 10 Mbps and 80% should have a connection of 100 Mbps. By 2030, 100% should have a connection of 1 Gbps. Speeds of 100 Mbps are realistically only likely to be delivered by a fibre connection so we focus below on the feasibility of providing fibre connections to schools, although we note that LTE connections may be capable of providing an interim solution in areas where new fibre infrastructure has to be deployed to connect schools. According to Vodacom and MTN²⁵⁵, their LTE networks currently cover 83% and 90% of the population respectively which implies that over 80% of schools could already be provided with at least an LTE connection. It is unclear, therefore, why ICASA found it sufficient to set a much slower target of 1 Mbps as the minimum connection speed for the school connections to be completed by MNOs under their license obligations. New ISP obligations should be placed on operators regarding school connectivity speeds before additional spectrum licenses are granted. New obligations should include an internet speed in line with SA Connect goal of 100 Mbps because upgrades are likely to be more burdensome and less efficient than installing a reasonable speed the first time.

According to SA Connect, at the time of its publishing in 2013, 86% of the population lived within 10km of a fibre access point. This is supported by the map of fibre infrastructure shown in Figure 2, which illustrates that fibre infrastructure available in South Africa is extensive, and not only in populous urban areas.



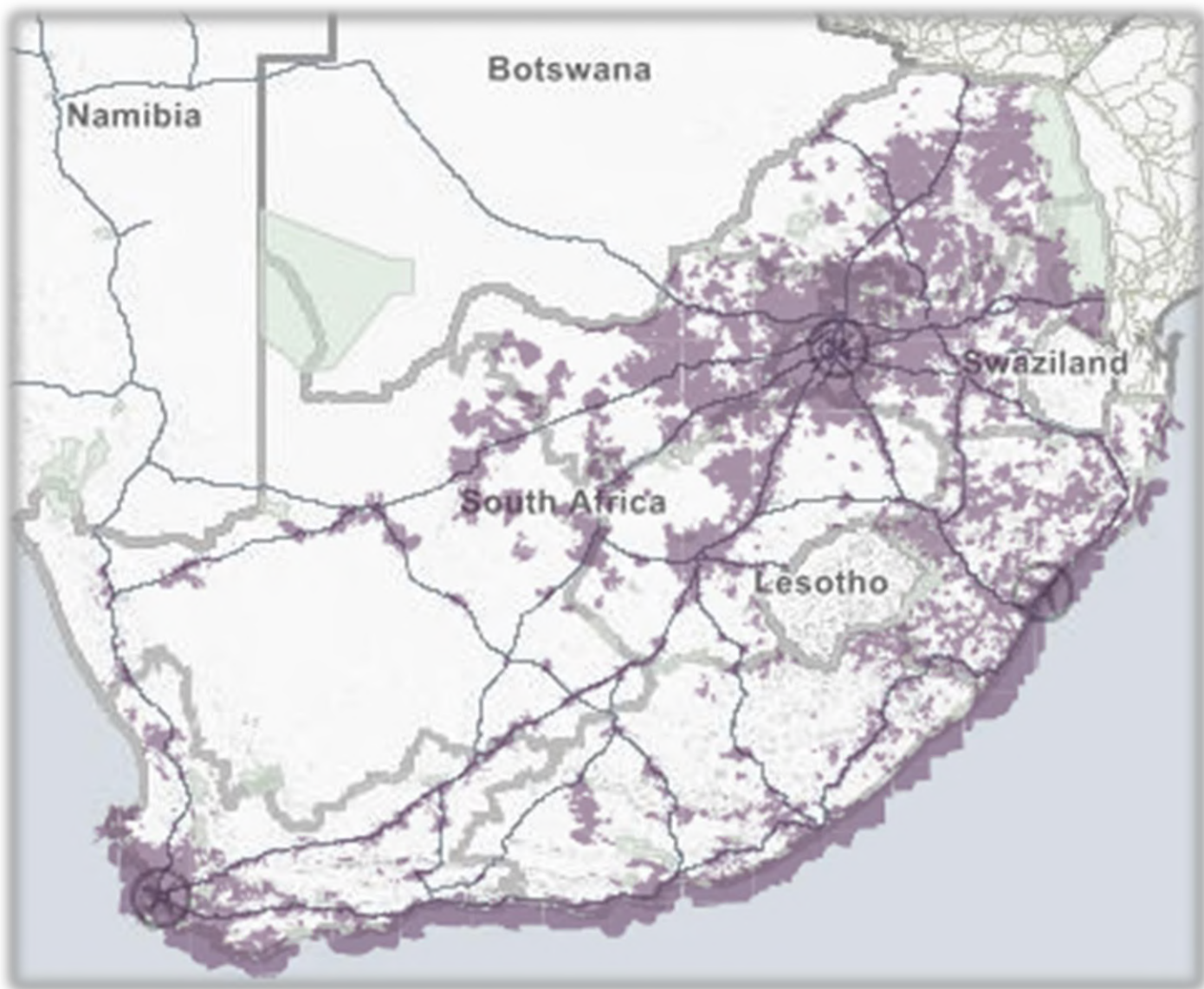


Figure 2: 4G coverage in South Africa by MTN and Vodacom

Source: [MTN](#) and [Vodacom](#) websites

In addition to the fibre shown above, we note that fibre is increasingly deployed by the mobile operators in rolling out backhaul to their base stations, particularly in the case of deploying LTE networks. This suggests that where the mobile operators have LTE coverage, there is likely to be some additional fibre infrastructure available. The LTE coverage maps of Vodacom and MTN are shown in Figure 2.

For further illustration of the feasibility of connecting schools with fibre, we have mapped the distribution of schools in each province and overlaid the fibre distribution map from Figure 1. In Figures A and B, we present the maps for Gauteng and Limpopo as examples of urban and rural areas respectively, where the orange dots represent public schools and the purple dots independent schools. In Gauteng, which accounts for 11% of schools in South Africa, it is clear from Figure 3 that the vast majority of schools are located close to fibre access points. There appears to be little reason therefore why fibre access could not be provided to these schools relatively cheaply and quickly. Overall, data from the Department of Education shows that 41% of schools are in urban



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areas, accounting for 55% of learners.²⁵⁶ These schools are likely to have a range of connection options available, including fibre and LTE. Again, there is therefore no reason why all these schools cannot quickly and easily be connected.

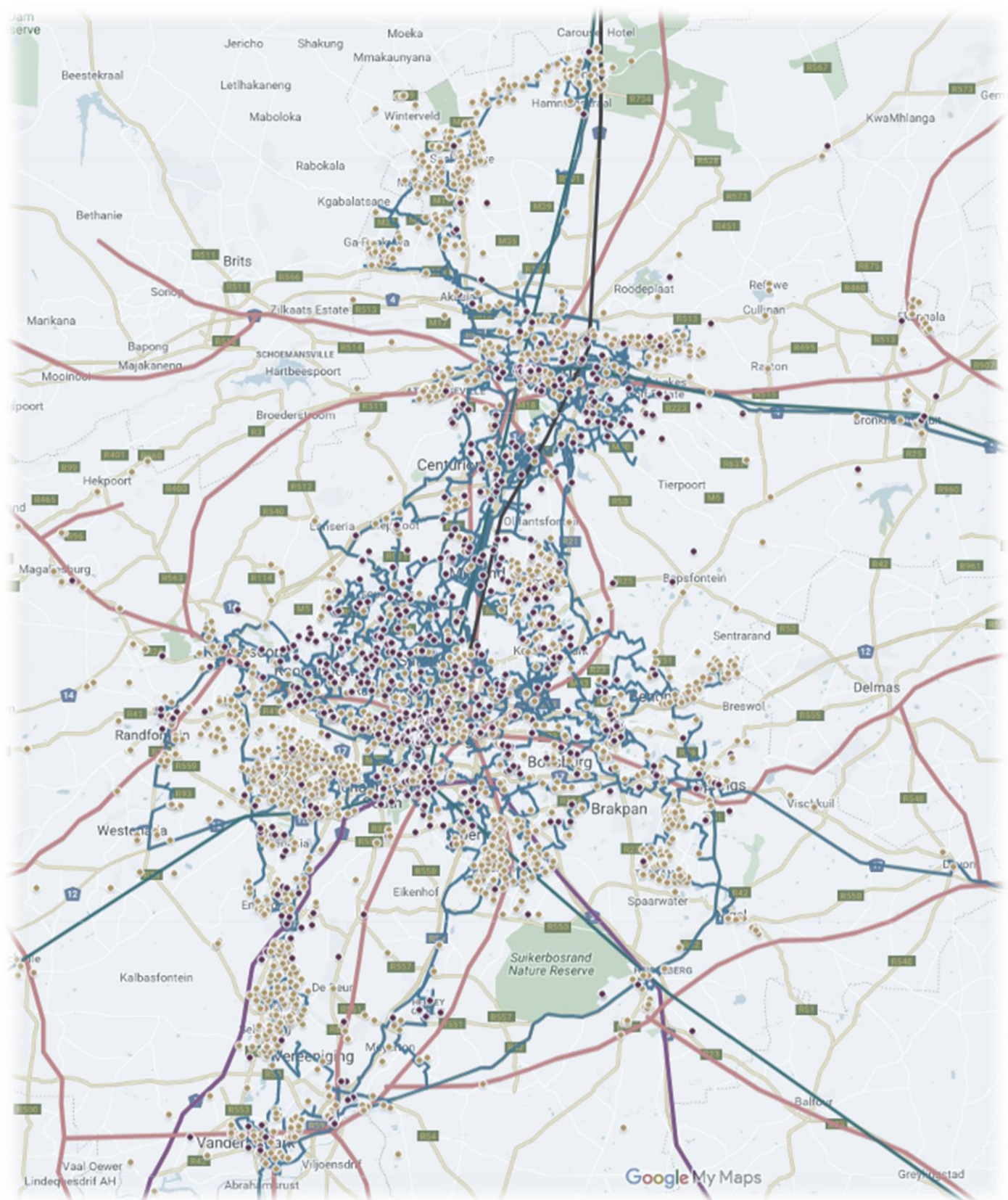


Figure 3: distribution of schools and fibre in Gauteng

Source: Many possibilities (2019). Available [here](#); Department of Education (2018). Available [here](#).

In Limpopo, which accounts for 16% of schools in South Africa, fibre coverage is less dense but still focused in areas in which the majority of schools are located (see Figure 5). In addition, many schools are clustered in particular areas, suggesting that a large number of schools could be connected with the same fibre build. These patterns are reflected in other provinces with a large rural population such as KZN and the Eastern Cape.

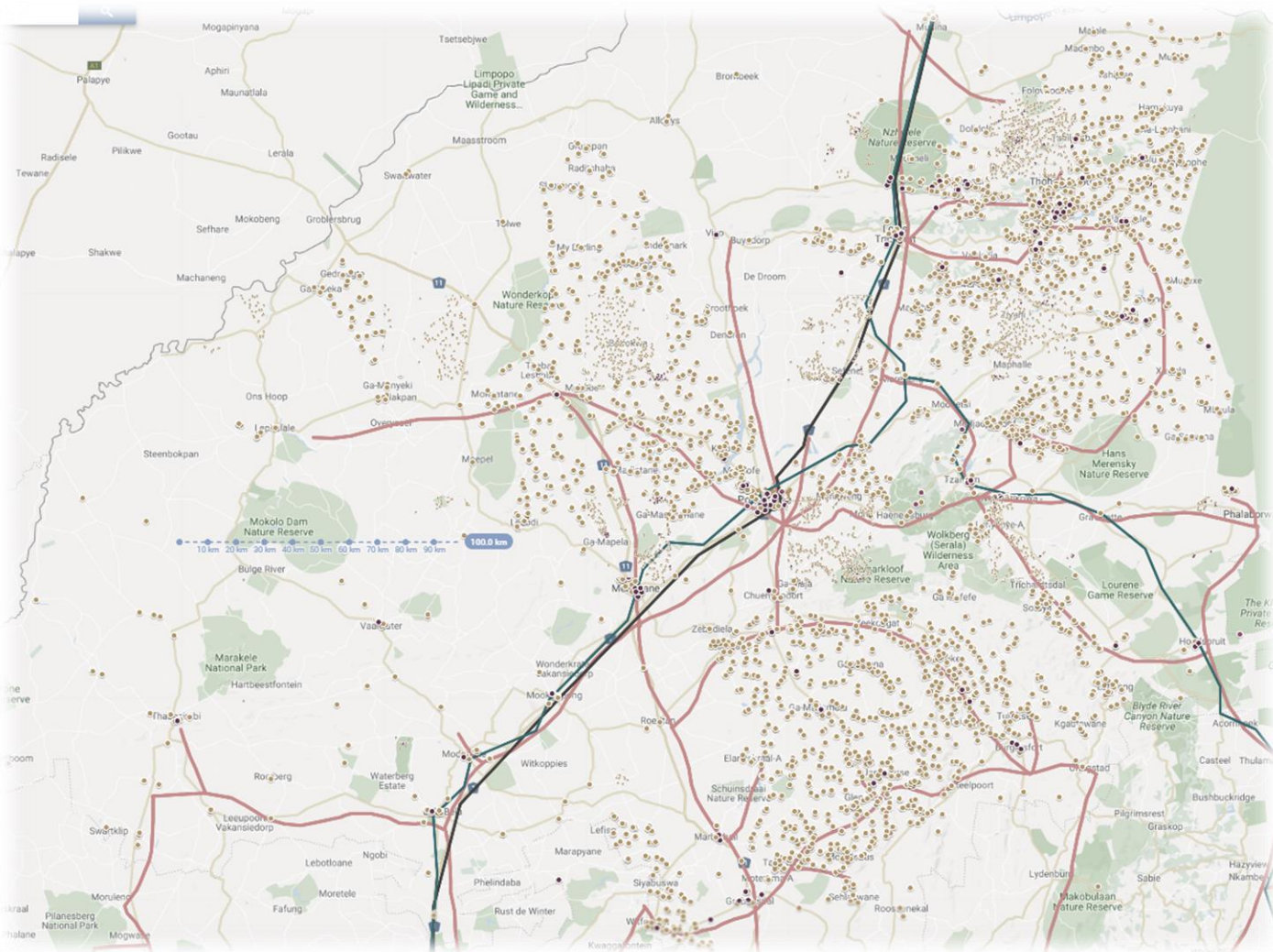


Figure 4: distribution of schools and fibre in Limpopo

Source: Many possibilities (2019). Available [here](#); Department of Education (2018). Available [here](#).

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For reference, we have also mapped the distribution of fibre in relation to the schools visited on the research field trip. All the schools are located within close proximity of fibre infrastructure; the longest distance from a school to the nearest fibre is around 4.5km.

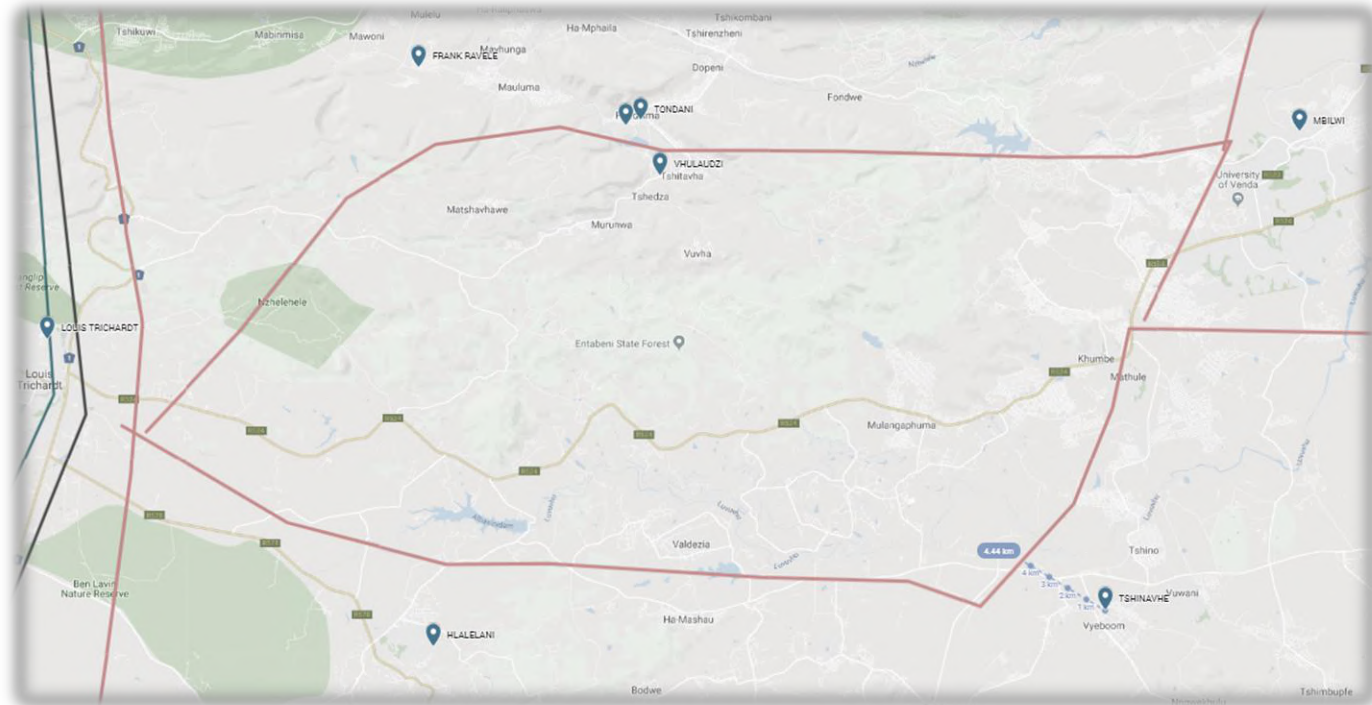


Figure 5: distribution of fibre in relation to schools visited on the field trip

Source: Many possibilities (2019). Available [here](#); Department of Education (2018). Available [here](#).

The Western Cape Province has rolled out broadband to over 1200 of the 1441 public schools in the province through a competitive tender process which was won by Liquid Telecom. The Western Cape Province has a 55:45 urban/rural split in terms of the location of schools which is slightly higher than the 41:59 national average. This suggests that it may be more costly to achieve a similar outcome in the rest of the country; however, it should certainly be feasible to make substantial inroads into urban areas and rural areas where fibre is located close by. Taking a similar approach, in May 2019, the Eastern Cape Province recently awarded a tender to Liquid Telecom in partnership with SITA for the rollout of broadband to 2700 government sites, including schools, which will initially achieve speeds of 100 Mbps rising to 1 Gbps over time.²⁵⁷ These examples illustrate that rolling out high-speed broadband to large numbers of schools is financially feasible where competitive processes are followed.

THE WAY FORWARD

Given the essential nature of access to the internet in the context of South African schools, the obstacles to universal student access must be overcome. The following recommendations aim to address these obstacles by calling on government actors, the private sector, and civil society to improve their response to students' needs.

1. Government actors engaged in programs related to connectivity should **COORDINATE** their efforts and lean on each other's capabilities, connections, technology, and infrastructure to increase the speed, quality, and efficiency of realizing their projects' goals.
 - 1.1. Intra-agency communication should be facilitated.
 - 1.1.1. Policies housed within the same Department, like the Internet for All and SA Connect, should report to the same Deputy Director within the Department. Or at a minimum, these projects should work closely with one another to advance their mutual goals.
 - 1.1.2. Provincial and national governments should be more in conversation.
 - 1.1.3. Schools should be informed of policies and programs that affect them and be drivers of change in their schools.
 - 1.2. Interagency communication should be facilitated.
 - 1.2.1. The Department of Basic Education should work closely with the Department of Telecommunications and Postal Services, the Department of Rural Development and Land Reform, and the Department of Science and Technology to achieve connection in all South African schools.
 - 1.3. The Department of Education should make use of a research facility like the CSIR or experts on ICT.
 - 1.4. The Department of Education should communicate more effectively with the private sector on schools to be connected under their licensing obligations.
2. Plans for connectivity projects should focus on the **SUSTAINABILITY** of access.
 - 2.1. Greater attention should be paid to the physical functionality and infrastructure schools need in order make effective use of the technology.
 - 2.1.1. Reliable electricity with sufficient access points should be a priority.
 - 2.2. To ensure sustainability, local schools cannot be the primary financial supporter of the project.
 - 2.2.1. Physical security and insurance for devices and equipment should be provided by the provincial or national department rather than paid for out of local school budgets.
 - 2.3. Training on ICT should be a core part of the training teachers receive so that they are able to help maintain and make use of the technology.
 - 2.3.1. This training should be an ongoing and regular component of professional development rather than a one-and-done solution.
 - 2.3.2. It should take into account best practices developed through previous programs on teacher training around the use of technology (like ICT4RED), such as by creating incentives to encourage skill development.
 - 2.3.3. All teachers should be trained on how to use technology and the internet, both for content and to develop new teaching methods.
 - 2.3.4. Current teachers should be provided with means to access training

- centers on a regular basis if training is not conducted at or near their school.
 - 2.3.5. Public-private partnerships can help with teacher training.
 - 2.4. The state should consider adopting additional degree requirements for university students completing certain programs correlated with good ICT skills to give back to communities in need of ICT support.
 - 2.5. Youth are a valuable resource that can be trained to serve as ICT support for the school.
 - 2.6. Technology should be replaced and upgraded as needed to ensure effective access.
 - 2.6.1. There will always be a need for more and faster connectivity, so put in place contingencies that sees regular upgrades in the technologies installed.
 - 2.7. Schools should be connected at the speeds set out in SA Connect.
 - 2.8. Every connectivity program should be established with a plan for continuing to provide service once free or discounted rates conclude.
3. The process of connectivity should be **TRANSPARENT**.
- 3.1. Decisions and data from public programs should be readily accessible to hold government accountable during the process of implementation.
4. There should be a focus on developing and educating teachers on **ELECTRONIC CONTENT** that can be used with devices.
- 4.1. There is a need for content in more local languages, and more relevant, educational content in general that can be accessed through the internet.
 - 4.2. Some educational sites should be zero-rated so that they may be freely utilized within the curriculum.
5. **SCHOOL HOTSPOTS** should be implemented carefully so as not to interfere with the learning environment while simultaneously making access available to members of the community.
- 5.1. Hotspots should have firewalls in place to safeguard individuals accessing the network as well as to protect the network from cyber-threats.
 - 5.2. Hours should be limited to address noise concerns based on the surrounding environment.
 - 5.3. Security measures should be in place to ensure user safety.
 - 5.4. Students should be allowed to bring their devices to school to access the network, but not to use them during class.
 - 5.5. Students from neighbouring schools not yet connected should also have the opportunity to access the network.
6. **NEW ISP OBLIGATIONS** should be placed on operators regarding school connectivity before additional spectrum is granted to them.
- 6.1. New requirements should take into account concerns regarding sustainability.
 - 6.2. New obligations should include an internet speed in line with SA Connect because upgrades are likely to be more burdensome and less efficient than installing a reasonable speed the first time.
7. **ACHIEVING EFFECTIVE CONNECTIVITY**.
- 7.1. The USAOs should be interpreted to require Operators to use a portion of USAAF funds to ensure schools have their internet paid for.
 - 7.2. This should include providing schools with the instruction to properly set in place firewalls.

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- 7.3. Fines should not be smaller than the cost of implementation.

8. **CRITICAL MEDIA AND DIGITAL LITERACY SKILLS** need to be incorporated into the curriculum.
 - 8.1. A multi-stakeholder approach is essential to ensure not just that content is relevant but that it covers all essential areas and is kept up to date and at pace with shifts in technology.
 - 8.2. Beyond the skills needed to be safe online, children need to be equipped with skills of how to leverage the internet for deepening democracy and democratic practice. Children thus benefit from looking at their digital footprint, and also how to take action, protect themselves, and critically engage content.



CONCLUSION

The South African government is increasingly investing in the growth of this country's digital economy, and in research, innovation and employment in the industries created by the fourth industrial revolution. This is a recognition of the omnipresent nature of technology and the way that it changes areas such as education and employment. Ensuring access to the internet in schools assists to equip young people with the science and technology skills necessary to pursue tertiary studies and careers, particularly in IT-related fields. Moreover, it creates new jobs which are accessible to all people, not just those with tertiary training in computer skills. To make the most of the opportunities presented by the fourth industrial revolution and technology in general, internet access in schools is essential. This access ensures that learners are taught basic computer skills and internet literacy and increases the number of people who can access exciting opportunities.

Studies also show that internet access in schools assists learners to grasp study material, particularly for maths and science. Internet access, educational software and hardware such as computers and tablets can be used to ensure that learners in the same class can study different material that caters to their level of understanding. However, it must be noted that merely providing access to the internet and hardware is not enough to guarantee improved results. This is because teachers and learners face numerous challenges with which they must grapple. Schools with poor learning and teaching environments because they lack proper sanitation, classroom space or other facilities, cannot be saved by internet access alone. Rather internet access and the enabling software and hardware must be thought of as part of a network of enablers that together assist in the realization of the right to education.

This research study examined the statistics around internet access in schools and found that there is massive digital inequality between learners in schools which were disadvantaged during apartheid and which are in rural areas, and learners who attend more privileged, generally urban schools. The truth of the matter is that this inequality often presents along racial lines and divides people based on their socio-economic status and geographic location. Because internet access is an enabler of the proper realization of the right to education, the digital divide hampers the state's ability to ensure equal access to basic education. This is contrary to the constitutional duty to provide education in a non-discriminatory way and results in the exclusion of many young South Africans from the new opportunities that the modern technological era offers.

There are numerous reasons for the digital inequality South Africa faces, ranging from a severe lack of coordination between government departments responsible for implementing policies to provide internet access to schools, to a lack of teacher training around using ICT in the classroom, to the other challenges, such as access to classrooms, desks, sanitation and learning materials which undermine efforts to improve school environments. This research study carefully examines these barriers and makes recommendations for ways to address them and move forward.

The South African education system is fraught with difficulties. Litigation against the state to ensure access to crucial resources such as textbooks and basic sanitation has been fairly successful. However, it appears that the government has embraced, and is pushing towards, the fourth industrial revolution as a driver of growth and employment. These efforts will be undermined if young South Africans are not properly equipped with computer skills, an understanding of online safety and internet literacy, as swathes will be unable to participate in these new initiatives. The learners excluded from these initiatives will likely be those who already face the most serious

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obstacles to their education, and this will only perpetuate the cycle of inequality. In addressing the challenges faced by the basic education system, the government must consider how provision of internet access, along with other basic resources, may improve fulfilment of learning outcomes and act as the foundation for the achievement South Africa's goal to be a global competitor in the international digital market.



FIGURES

Figure A: Unemployment among upper-middle-income countries (World Bank, 2017)

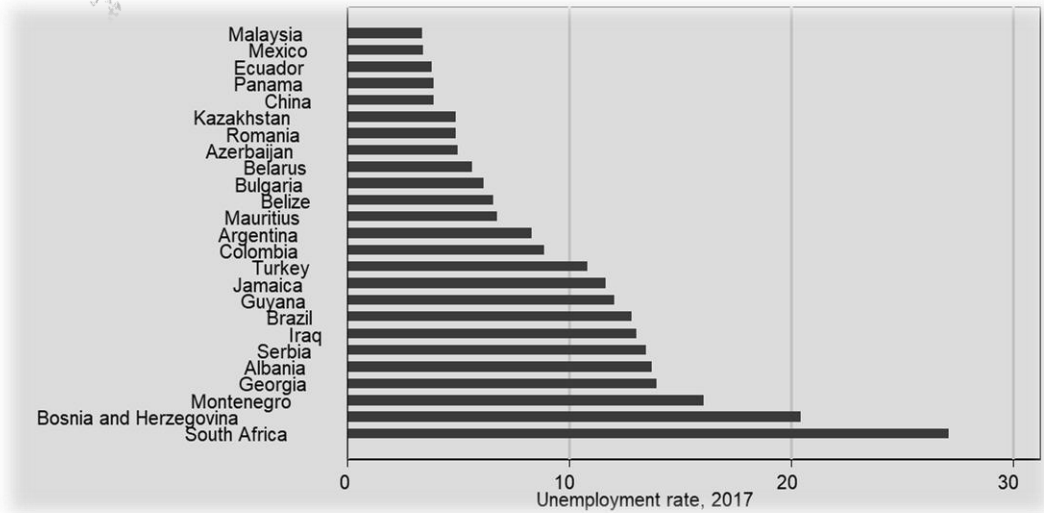


Figure B: Employment in South Africa vs other upper-middle-income countries (World Bank)

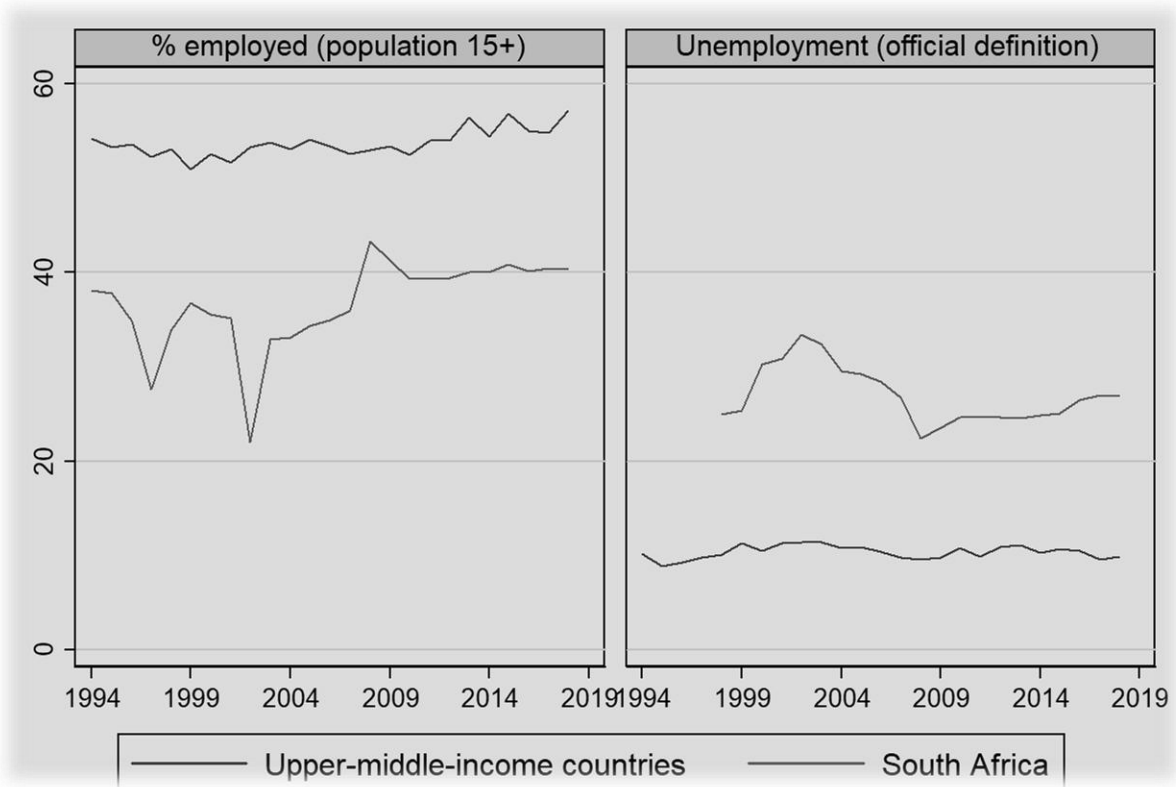


Figure C: Demand and supply of computer-related jobs in South Africa (2008 vs 2018)

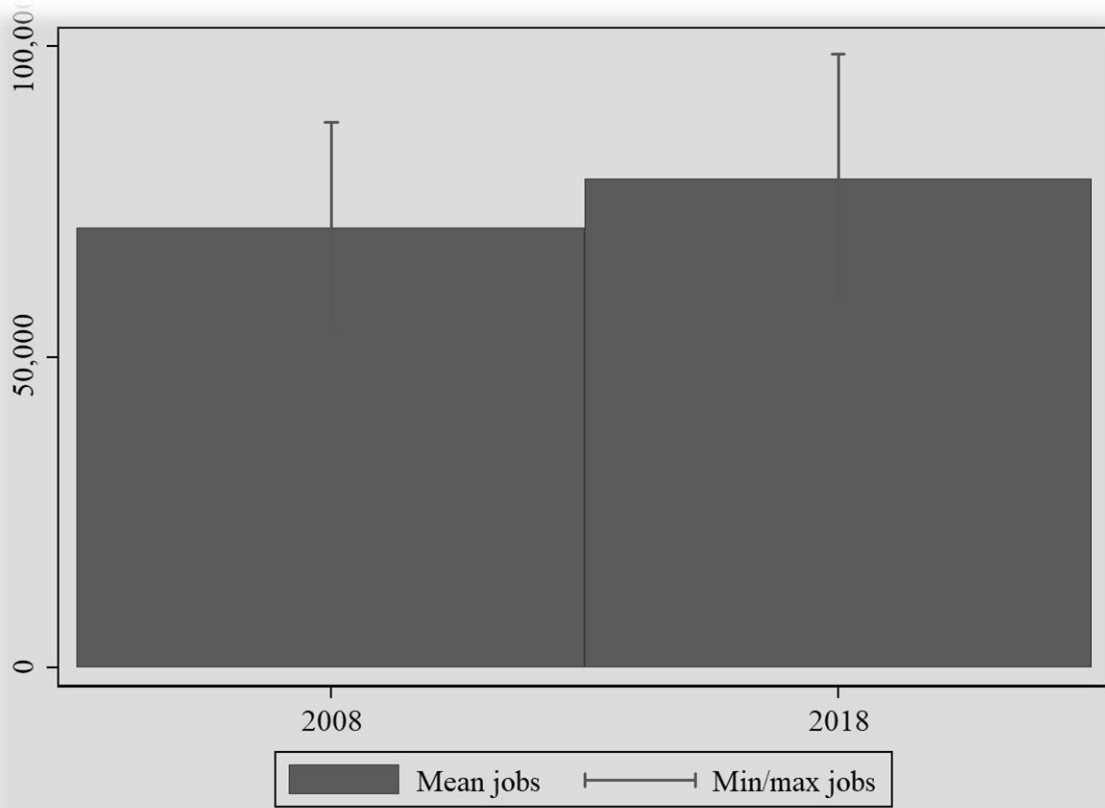


Figure D: Internet access at school and at home, by province (GHS, 2017)

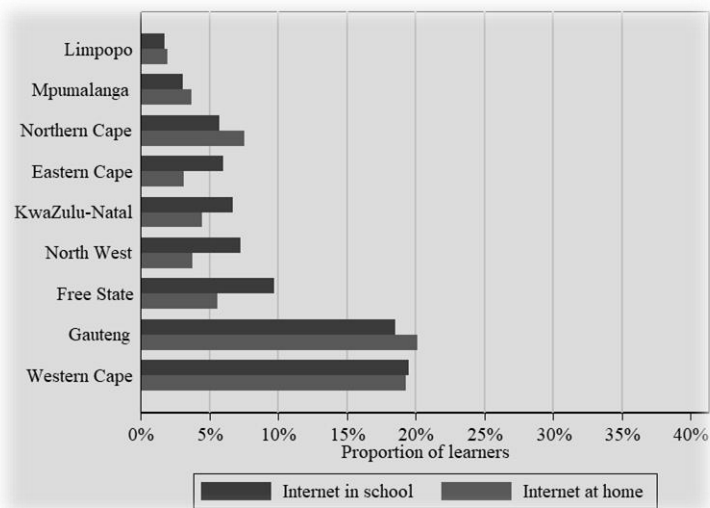


Figure E: Internet at school and at home, by metropolitan area (GHS, 2017)

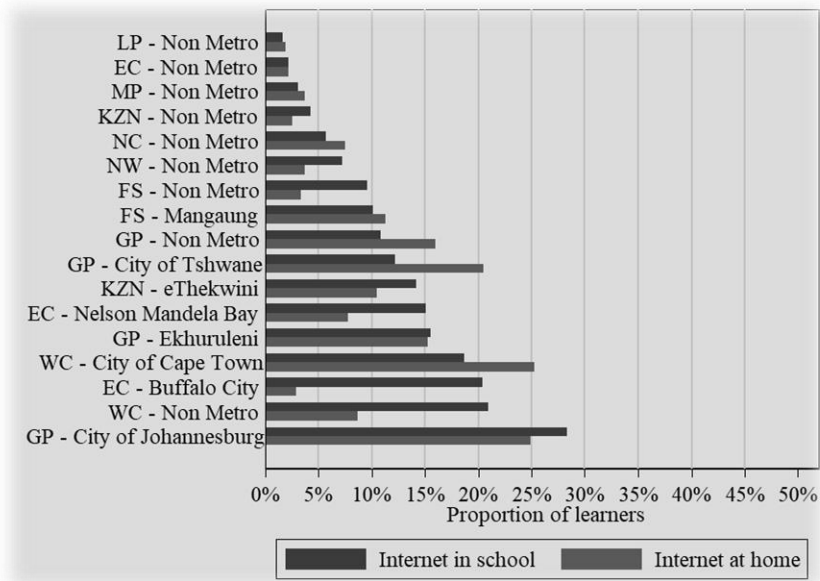
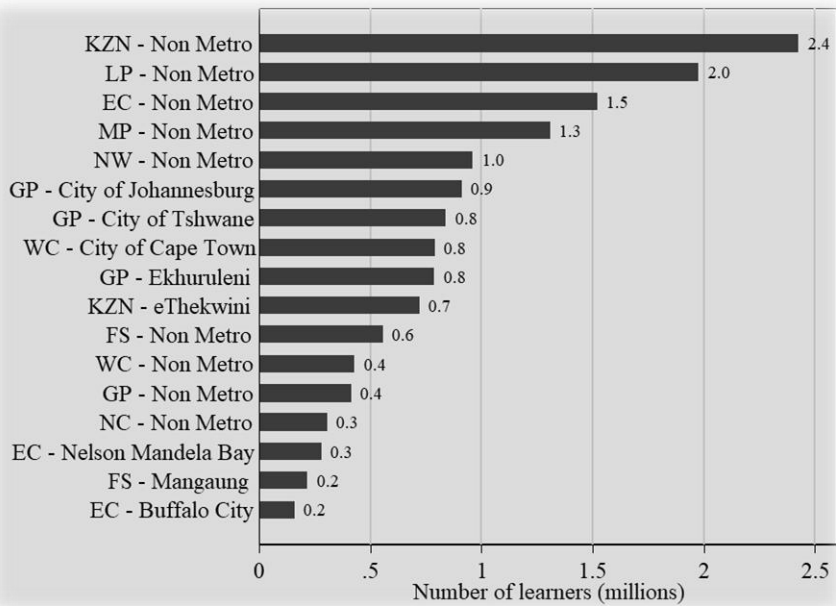


Figure F: Number of learners that do not have internet access at school, by metro area (GHS, 2017)



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- ⁹⁶ Equality Act Section 14(3) (“[T]he position of the complainant in society and whether he or she suffers from patterns of disadvantage, or belongs to a group that suffers from such patterns of disadvantage... whether and to what extent the respondent has taken such steps as being reasonable in the circumstances to (i) address the disadvantage which arises from or is related to one or more of the prohibited grounds; or (ii) accommodate diversity.”).
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- ⁹⁸ *Minister of Basic Education v. Basic Education for All* (20793/2014) [2015] ZASCA 198.
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- ¹⁰⁰ *Minister of Basic Education v. Basic Education for All* (20793/2014) [2015] ZASCA 198.
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- ¹²⁶ Rebecca A. Hill, Paul Beynon-Davies, Ian Owens and Michael D. Williams, *Beyond Access: Bridging the Digital Divide*, ECIS, https://www.researchgate.net/publication/221407981_Beyond_Access_Bridging_the_Digital_Divide (Jan. 2004).
- ¹²⁷ South Africa Connect: Creating Opportunities, Ensuring Inclusion: South Africa’s Broadband Policy, GN 953 of GG 37119 (6 December 2013).
- ¹²⁸ South Africa Connect: Creating Opportunities, Ensuring Inclusion: South Africa’s Broadband Policy, GN 953 of GG 37119 (6 December 2013), at 24, available at https://www.gov.za/sites/default/files/gcis_document/201409/37119g0953.pdf.
- ¹²⁹ South Africa Connect: Creating Opportunities, Ensuring Inclusion: South Africa’s Broadband Policy; GN 953 of GG 37119 (6 December 2013), at 10, 24.
- ¹³⁰ Id. [South Africa Connect: Creating Opportunities, Ensuring Inclusion: South Africa’s Broadband Policy, GN 953 of GG 37119 (6 December 2013).]
- ¹³¹ Interview with Sidney Arnold, Administrator, Internet for All Initiative, in Pretoria, S. Afr. (Mar. 20, 2019)(on file with authors).
- ¹³² Progress on SA Connect: Presentation to Parliamentary Portfolio Committee, Department of Telecommunications & Postal Services, <http://www.ellipsis.co.za/wp-content/uploads/2017/03/170613saconnect.pdf> (Jun. 13, 2017).
- ¹³³ Progress on SA Connect: Presentation to Parliamentary Portfolio Committee, Department of Telecommunications & Postal Services, <http://www.ellipsis.co.za/wp-content/uploads/2017/03/170613saconnect.pdf> (Jun. 13, 2017).
- ¹³⁴ Progress on SA Connect: Presentation to Parliamentary Portfolio Committee, Department of Telecommunications & Postal Services, <http://www.ellipsis.co.za/wp-content/uploads/2017/03/170613saconnect.pdf> (Jun. 13, 2017).
- ¹³⁵ Presentation to the Parliamentary Portfolio Committee, DTPS, http://www.ellipsis.co.za/wp-content/uploads/2018/06/181030SA_Connect.pdf (Oct. 30, 2018).
- ¹³⁶ Presentation to the Parliamentary Portfolio Committee, DTPS, http://www.ellipsis.co.za/wp-content/uploads/2018/06/181030SA_Connect.pdf (Oct. 30, 2018).
- ¹³⁷ Simnikiwe Mzekandaba, *Budget: Cabinet trims SA Connect budget*, IT Web, www.itweb.co.za/content/wbrpOqgPKEJvDLZn (Feb. 21, 2018).
- ¹³⁸ Presentation to the Parliamentary Portfolio Committee, DTPS, http://www.ellipsis.co.za/wp-content/uploads/2018/06/181030SA_Connect.pdf (Oct. 30, 2018).
- ¹³⁹ Presentation to: Portfolio Committee on Telecommunications and Postal Service, DTPS (Dec. 31 2018).
- ¹⁴⁰ Simnikiwe Mzekandaba, *Budget: Cabinet trims SA Connect budget*, IT Web, www.itweb.co.za/content/wbrpOqgPKEJvDLZn (Feb. 21, 2018); SA Connect Progress; USAASA 2018/2019 Annual Performance Plan, Parliamentary Monitoring Group, <https://pmg.org.za/committee-meeting/26448/> (May 22, 2018).
- ¹⁴¹ See id. [SA Connect Progress; USAASA 2018/2019 Annual Performance Plan, Parliamentary Monitoring Group, <https://pmg.org.za/committee-meeting/26448/> (May 22, 2018).]
- ¹⁴² Interview with Malesela Letsoala, SA Connect, DTPS (Apr. 30, 2019) (on file with authors).
- ¹⁴³ Interview with Malesela Letsoala, SA Connect, DTPS (Apr. 30, 2019) (on file with authors); Duncan McLeod, *Why SA Connect Tender was Cancelled*, TechCentral, <http://www.techcentral.co.za/why-sa-connect-tender-was-cancelled/70251/> (Nov. 22, 2016).
- ¹⁴⁴ Progress on SA Connect, Department of Telecommunications and Postal Services, <https://www.ellipsis.co.za/wp-content/uploads/2017/03/170613saconnect.pdf> (Jun. 13, 2017).
- ¹⁴⁵ Interview with Sidney Arnold, Administrator, Internet for All Initiative, in Pretoria, S. Afr. (Mar. 20, 2019)(on file with authors).
- ¹⁴⁶ Progress on SA Connect, Presentation to Parliamentary Portfolio Committee, Department of Telecommunications and Postal Services <https://www.ellipsis.co.za/wp-content/uploads/2017/03/170613saconnect.pdf> (Jun. 13, 2017).
- ¹⁴⁷ SA Connect Progress Report, Department of Telecommunications and Postal Services, <https://pmg.org.za/committee-meeting/28096/> (Mar. 12, 2019).
- ¹⁴⁸ General Notice – Vodacom Amended Universal Service Obligations 2014, GN 402 of GG 37718 (4 June 2014); General Notice – Cell C Amended Universal Service Obligations 2014, GN 403 of GG 37718 (4 June 2014); General Notice – MTN Amended Universal Service Obligations 2014, GN 401 of GG 37718 (4 June 2014).
- ¹⁴⁹ General Notice – Vodacom Amended Universal Service Obligations 2014, GN 402 of GG 37718 (4 June 2014); General Notice – Cell C Amended Universal Service Obligations 2014, GN 403 of GG 37718 (4 June 2014); General Notice – MTN Amended Universal Service Obligations 2014, GN 401 of GG 37718 (4 June 2014).
- ¹⁵⁰ In the current process of spectrum licensing there is an opportunity to increase connection obligations.
- ¹⁵¹ Interview with Sidney Arnold, Administrator, Internet for All Initiative, in Pretoria, S. Afr. (Mar. 20, 2019)(on file with authors).
- ¹⁵² Id. [*Internet for All*, World Economic Forum, <https://www.weforum.org/projects/internet-for-all>.]
- ¹⁵³ World Economic Forum, *Internet for All: A Project of the Work Economics Forum’s Digital Economy and Society System* (2018), http://www3.weforum.org/docs/WEF_Internet_for_All_4_pager.pdf.
- ¹⁵⁴ See e.g. General Notice – MTN Amended Universal Service Obligations 2014, GN 401 of GG 37718 (4 June 2014); South Africa Connect: Creating Opportunities, Ensuring Inclusion: South Africa’s Broadband Policy, GN 953 of GG 37119 (6 December 2013) at 24.
- ¹⁵⁵ Interview with Moyeni Nkosinkulu, ICASA (Mar. 2019)(on file with authors).
- ¹⁵⁶ Interview with Cheryl Dinkelmann, MTN, (Apr. 17, 2019)(on file with authors).
- ¹⁵⁷ In some cases, this phenomenon has also led to some schools concealing their previous connectivity, which can lead to schools receiving more than they were allocated, thus wasting more Operator resources and expenses. There have also been instances of Operators given lists of more affluent schools for which connectivity was never needed in the first place as they already had connectivity solutions.
- ¹⁵⁸ Interview with Cheryl Dinkelmann, MTN, (Apr. 17, 2019)(on file with authors).
- ¹⁵⁹ Id. [Interview with Cheryl Dinkelmann, MTN, (Apr. 17, 2019)(on file with authors).];[General Notice – Vodacom Amended Universal Service Obligations 2014, GN 402 of GG 37718 (4 June 2014); General Notice – Cell C Amended Universal Service Obligations 2014, GN 403 of GG 37718 (4 June 2014); General Notice – MTN Amended Universal Service Obligations 2014, GN 401 of GG 37718 (4 June 2014).]
- ¹⁶⁰ Id. [Interview with Cheryl Dinkelmann, MTN, (Apr. 17, 2019)(on file with authors).]
- ¹⁶¹ Id. [Interview with Cheryl Dinkelmann, MTN, (Apr. 17, 2019)(on file with authors).]

- ¹⁶² *Id.* [Interview with Cheryl Dinkelmann, MTN, (Apr. 17, 2019)(on file with authors).]; [General Notice – Vodacom Amended Universal Service Obligations 2014, GN 402 of GG 37718 (4 June 2014); General Notice – Cell C Amended Universal Service Obligations 2014, GN 403 of GG 37718 (4 June 2014); General Notice – MTN Amended Universal Service Obligations 2014, GN 401 of GG 37718 (4 June 2014).]
- ¹⁶³ About Us, Department of Higher Education & Training of South Africa, <http://www.dhet.gov.za/SitePages/AboutUsNew.aspx>.
- ¹⁶⁴ Interview with Sidney Arnold, Administrator, Internet for All Initiative, in Pretoria, S. Afr. (Mar. 20, 2019)(on file with authors).
- ¹⁶⁵ Shaun Franklin and Daniel McLaren, *Realising the Right to Basic Education on South Africa*, Studies in Poverty and Inequality Institute, <http://spii.org.za/files/2015-SPII-Realising-the-Right-to-a-Basic-Education-in-SouthAfrica.pdf> (Nov. 2015).
- ¹⁶⁶ *Id.* [Shaun Franklin and Daniel McLaren, *Realising the Right to Basic Education on South Africa*, Studies in Poverty and Inequality Institute, <http://spii.org.za/files/2015-SPII-Realising-the-Right-to-a-Basic-Education-in-SouthAfrica.pdf> (Nov. 2015).]
- ¹⁶⁷ *Id.* [Shaun Franklin and Daniel McLaren, *Realising the Right to Basic Education on South Africa*, Studies in Poverty and Inequality Institute, <http://spii.org.za/files/2015-SPII-Realising-the-Right-to-a-Basic-Education-in-SouthAfrica.pdf> (Nov. 2015).]
- ¹⁶⁸ *Id.* at 50. [Shaun Franklin and Daniel McLaren, *Realising the Right to Basic Education on South Africa*, Studies in Poverty and Inequality Institute, <http://spii.org.za/files/2015-SPII-Realising-the-Right-to-a-Basic-Education-in-SouthAfrica.pdf> (Nov. 2015) at 50.]
- ¹⁶⁹ Shaun Franklin and Daniel McLaren, *Realising the Right to Basic Education on South Africa*, Studies in Poverty and Inequality Institute (Nov. 2015) at 112.
- ¹⁷⁰ *Id.* at 67. [Shaun Franklin and Daniel McLaren, *Realising the Right to Basic Education on South Africa*, Studies in Poverty and Inequality Institute, <http://spii.org.za/files/2015-SPII-Realising-the-Right-to-a-Basic-Education-in-SouthAfrica.pdf> (Nov. 2015) at 67.]
- ¹⁷¹ *Infra* section c, subsection d.
- ¹⁷² I.A. Meyer and P.R. Gent, *The State of ICT Education in South Africa*, National Education Collaboration Trust, <http://nect.org.za/publications/technical-reports/the-state-of-ict-in-education-in-south-africa/> (Aug. 23, 2016).
- ¹⁷³ Interview with Adele Botha and Marlien Herselman, CSIR (Mar. 19, 2019)(on file with authors).
- ¹⁷⁴ Interview with Cheryl Dinkelmann, MTN, (Apr. 17, 2019)(on file with authors).
- ¹⁷⁵ Christina Amsterdam, School Infrastructure in South Africa: Views and Experiences of Educators and Learners, Conference Paper (May 2010), https://www.researchgate.net/publication/259290274_School_Infrastructure_in_South_Africa_Views_and_experiences_of_educators_and_learners.
- ¹⁷⁶ See, e.g., Noluthando Mkhize and Samona Naidu, Improved School Infrastructure for SA's Learners, *Vuk'uzenzele* (Mar. 2014), <https://www.vukuzenzele.gov.za/improved-school-infrastructure-sa%E2%80%99s-learners>.
- ¹⁷⁷ BEKEZELA PHAKATHI, School infrastructure is still largely inadequate, *Business Day* (Apr. 2019), <https://www.businesslive.co.za/bd/national/2019-04-08-school-infrastructure-is-still-largely-inadequate/>.
- ¹⁷⁸ Chris McConnachie, Ann Skelton & Cameron McConnachie, *The Constitution and the Right to a Basic Education*, in *Basic Education Rights Handbook: Education Rights in South Africa* (Faranaaz Veriava, Anso Thom & Tim Fish Hodgson eds., 2017).
- ¹⁷⁹ [could include examples from fact-finding]
- ¹⁸⁰ See, e.g., “We are worried about security... It is a high crime, high risk area.” - Simon, Principal, Frank Ravele.
- ¹⁸¹ [INSERT # of schools we visited that had previous devices stolen?]
- ¹⁸² Interview with Moyeni Nkosinkulu, ICASA (Mar. 2019)(on file with authors).
- ¹⁸³ Interview with Moyeni Nkosinkulu, ICASA (Mar. 2019)(on file with authors) (describing “[because of the] fear from schools that stuff will break or be stolen...there is stuff sitting in the storeroom unused.”)
- ¹⁸⁴ Interview with learners at Vhulaudzi (on file with authors).
- ¹⁸⁵ Interview with Sylvia (Principal), Humbelani (on file with authors).
- ¹⁸⁶ National Education Infrastructure Management System report for 2017-2018
- ¹⁸⁷ Interview with Justice (Teacher), Vhulaudzi (on file with authors).
- ¹⁸⁸ National Education Infrastructure Management System report for 2017-2018. See also Shaun Franklin and Daniel McLaren, *Realising the Right to Basic Education on South Africa*, Studies in Poverty and Inequality Institute (Nov. 2015) pg. 140 (number of schools without electricity in 2009 was 3603, with 800 more having unreliable access. By 2015 the number of schools without electricity had fallen to 913, but the number of schools with unreliable electricity had risen to 2.854).
- ¹⁸⁹ Shaun Franklin and Daniel McLaren, *Realising the Right to Basic Education on South Africa*, Studies in Poverty and Inequality Institute (Nov. 2015) pg. 140.
- ¹⁹⁰ Class sizes in public vs private schools in South Africa, *BusinessTech* (2018), <https://businesstech.co.za/news/government/259185/class-sizes-in-public-vs-private-schools-in-south-africa/>.
- ¹⁹¹ Interview with Sara Dooley Henning, Peace Corp Volunteer (Mar. 2019) (on file with authors).
- ¹⁹² Shaun Franklin and Daniel McLaren, *Realising the Right to Basic Education on South Africa*, Studies in Poverty and Inequality Institute (Nov. 2015) pg. 140 (in 2015, over 20,000 schools either had no libraries or had unstocked libraries).
- ¹⁹³ Class sizes in public vs private schools in South Africa, <https://businesstech.co.za/news/government/259185/class-sizes-in-public-vs-private-schools-in-south-africa/> (July 18, 2018); [cite to interviews # of students in a class, student-teacher ratios from schools visited]
- ¹⁹⁴ Interview with George Maluleke, Hlalelani Primary School (on file with authors). This also limits their capacity to make their resources available to learners from other schools or individuals in the community.
- ¹⁹⁵ Upholding 29(1)(a) in South Africa: The Right to Basic Education, Pulitzer Center, <https://pulitzercenter.org/projects/upholding-291a-south-africa-right-basic-education>; see also Christina Amsterdam, School Infrastructure in South Africa: Views and Experiences of Educators and Learners, Conference Paper (May 2010), https://www.researchgate.net/publication/259290274_School_Infrastructure_in_South_Africa_Views_and_experiences_of_educators_and_learners (citing academic studies on the impact of school infrastructure on attendance, learner morale, classroom participation, and educational outcomes).
- ¹⁹⁶ Upholding 29(1)(a) in South Africa: The Right to Basic Education, Pulitzer Center, <https://pulitzercenter.org/projects/upholding-291a-south-africa-right-basic-education>.
- ¹⁹⁷ [ADD CITATION TO INTERVIEW WITH PRINCIPALS][check for literature about any attention being paid to these upgrades]
- ¹⁹⁸ Interview with Moyeni Nkosinkulu, ICASA (Mar. 2019)(on file with authors).
- ¹⁹⁹ Interview with Cheryl Dinkelmann, MTN, (Apr. 17, 2019)(on file with authors).
- ²⁰⁰ Operators contribute a percentage of their annual turnover to the fund for the purpose of addressing gaps in access.
- ²⁰¹ Interview with Cheryl Dinkelmann, MTN, (Apr. 17, 2019)(on file with authors).
- ²⁰² Interview with Moyeni Nkosinkulu, ICASA (Mar. 2019)(on file with authors).
- ²⁰³ Interview with Cheryl Dinkelmann, MTN, (Apr. 17, 2019)(on file with authors).
- ²⁰⁴ Interview with Cheryl Dinkelmann, MTN, (Apr. 17, 2019)(on file with authors).
- ²⁰⁵ See, e.g., “We are worried about security... It is a high crime, high risk area.” - Simon, Principal, Frank Ravele.
- ²⁰⁶ At least 5 of the 9 schools visited experienced theft of prior devices or physical digital equipment (Tshinavhe, Hlalelani, Louis Trichardt, Humbelani, and Vhulaudzi all mentioned prior theft of devices or physical components).
- ²⁰⁷ Interview with Cheryl Dinkelmann, MTN, (Apr. 17, 2019)(on file with authors).
- ²⁰⁸ Interview with Cheryl Dinkelmann, MTN, (Apr. 17, 2019)(on file with authors).
- ²⁰⁹ Moyeni Interview (“Most of the schools [about 70%] don’t use the [tech]...because of [the lack of] teacher training. They still prefer chalk and board.”); One learner described: “I don’t feel like the teachers understand the practical use of the tech. Grade 12 Learner, Tshinavhe; This lack of use is particularly a problem because ICASA’s policy is to consider if schools were using the tech before it was stolen. If so, DBE may provide replacements. If not, however, for regardless the reason, ICASA considers the school’s lack of use to mean “they don’t need it, and it won’t be replaced.”



²¹⁰ Interview with Dr. Marlien Herselman, the Chief Researcher at Council of Science and Industrial Research (CSIR) in Pretoria, South Africa; See also Thato interview. Thato Mfikwe, the chairperson of the Internet Society Gauteng Chapter in South Africa who worked on connecting rural schools, echoed Herselman's concerns, saying "there is no point in having technology if [teachers] don't have [computer] literacy skills."

²¹¹ Tshinavhe School.

²¹² Adele interview

²¹³ Adele interview

²¹⁴ *Africa: Internet Advances*, AfricaFocus Bulletin, 2005, <http://www.africanfocus.org/docso5/jtco504.php>.

²¹⁵ Jean-Paul Van Belle, et. al, *School-level ICT Adoption Factors in the Western Cape Schools*, Department of Information Systems, University of Cape Town, 4.4 (2006);

²¹⁶ Jean-Paul Van Belle, et. al, *School-level ICT Adoption Factors in the Western Cape Schools*, Department of Information Systems, University of Cape Town, 4.4 (2006); See also Interview with Richard Weibl, Center for Careers in Science and Technology (Apr. 2019) on file with authors. ("It's not enough to run a cable from a switch box to the school or dump computers in them. Telkom brought the computers to the school and ran the line into the room that was the computer lab; then they said if you have trouble, there's the number you call. Problem was, everyone was calling them. In the end, Telkom said they couldn't afford to sustain that level of support because the call volume was way beyond their capacity.")

²¹⁷ Sidney Interview.

²¹⁸ Agnes Chigona, et. al, An empirical survey on domestication of ICT in schools in disadvantaged communities in South Africa, 6 IJEDICT 21, 2010; Sidney Jackson Interview ("If the teachers are not already educated in using the technology, then much of the tech given to the schools ends up being unused and sitting in a storeroom.")

²¹⁹ Sidney Jackson Interview ("If the teachers are not already educated in using the technology, then much of the tech given to the schools ends up being unused and sitting in a storeroom.")

²²⁰ Constitution sec. 29.

²²¹ *Basic Education Rights Handbook* at 40, *supra* note 19.

²²² Department of Education White Paper on e-Education, Notice 1869 of 2004, Government Gazette No. 26734 (Aug. 2004).

²²³ Department of Education White Paper on e-Education, Notice 1869 of 2004, Government Gazette No. 26734 (Aug. 2004), at 2.

²²⁴ Department of Education White Paper on e-Education, Notice 1869 of 2004, Government Gazette No. 26734 (Aug. 2004), at 26.

²²⁵ Mathevela, Mlungisi & Uwizeyimana, Dominique, *The Challenges Facing the Integration of ICT in Teaching and Learning Activities in South African Rural Secondary Schools*, 5 *Medit. J. of Soc. Sciences* 1087, (2014).

²²⁶ Franke Revele Interview.

²²⁷ Mobile Education Programme, Vodacom.com, <https://www.vodacom.com/foundation.php>.

²²⁸ Education Statistics in South Africa 2016, Department of Basic Education, 22 (June 2018),

<https://www.education.gov.za/Portals/0/Documents/Publications/Education%20Statistic%20SA%202016.pdf?ver=2018-11-01-095102-947>

²²⁹ Tshinavhe school Interview.

²³⁰ See Joanne Phyfer, Patrick Burton, and Lezanne Leoschut, South African Kids Online: Barriers, opportunities & risks: A glimpse into South African children's internet use and online activities, GLOBAL KIDS ONLINE (2016), http://globalkidsonline.net/wp-content/uploads/2016/06/GKO_Country-Report_South-Africa_CJCP_upload.pdf.

²³¹ Joanne Phyfer, Patrick Burton, and Lezanne Leoschut, South African Kids Online: Barriers, opportunities & risks: A glimpse into South African children's internet use and online activities, GLOBAL KIDS ONLINE (2016), http://globalkidsonline.net/wp-content/uploads/2016/06/GKO_Country-Report_South-Africa_CJCP_upload.pdf.

²³² Joanne Phyfer, Patrick Burton, and Lezanne Leoschut, South African Kids Online: Barriers, opportunities & risks: A glimpse into South African children's internet use and online activities, GLOBAL KIDS ONLINE (2016), http://globalkidsonline.net/wp-content/uploads/2016/06/GKO_Country-Report_South-Africa_CJCP_upload.pdf, at 64. Many parents reported being worried about their child's online safety or the possibility of their child seeing inappropriate content online.

²³³ Joanne Phyfer, Patrick Burton, and Lezanne Leoschut, South African Kids Online: Barriers, opportunities & risks: A glimpse into South African children's internet use and online activities, GLOBAL KIDS ONLINE (2016), http://globalkidsonline.net/wp-content/uploads/2016/06/GKO_Country-Report_South-Africa_CJCP_upload.pdf.

²³⁴ Joanne Phyfer, Patrick Burton, and Lezanne Leoschut, South African Kids Online: Barriers, opportunities & risks: A glimpse into South African children's internet use and online activities, GLOBAL KIDS ONLINE (2016), http://globalkidsonline.net/wp-content/uploads/2016/06/GKO_Country-Report_South-Africa_CJCP_upload.pdf.

²³⁵ Interview with Frank Ravele.

²³⁶ Interview with Thato Mfikwe, Soweto Wireless User Group (Feb. 2019) (on file with authors).

²³⁷ Interview with Thato Mfikwe, Soweto Wireless User Group (Feb. 2019) (on file with authors).

²³⁸ Interview with Tess Peacock, Bulungula Incubator, in Johannesburg, S. Afr. (Mar 18, 2019)(on file with authors).

²³⁹ Interview with Tess Peacock, Bulungula Incubator, in Johannesburg, S. Afr. (Mar 18, 2019)(on file with authors).

²⁴⁰ Interview with Tess Peacock, Bulungula Incubator, in Johannesburg, S. Afr. (Mar 18, 2019)(on file with authors).

²⁴¹ See sections b, c, d and e above.

²⁴² Interview with Tess Peacock, Bulungula Incubator, in Johannesburg, S. Afr. (Mar 18, 2019)(on file with authors).

²⁴³ Interview with Tess Peacock, Bulungula Incubator, in Johannesburg, S. Afr. (Mar 18, 2019)(on file with authors).

²⁴⁴ Interview with Tess Peacock, Bulungula Incubator, in Johannesburg, S. Afr. (Mar 18, 2019)(on file with authors).

²⁴⁵ Interview with Duduzile Mkhwanazi, CEO, Project Isizwe, in Johannesburg, S. Afr. (Mar. 18, 2019)(on file with authors).

²⁴⁶ Interview with Duduzile Mkhwanazi, CEO, Project Isizwe, in Johannesburg, S. Afr. (Mar. 18, 2019)(on file with authors).

²⁴⁷ *Id.* [Interview with Tess Peacock, Bulungula Incubator, in Johannesburg, S. Afr. (Mar 18, 2019)(on file with authors).]

²⁴⁸ Council for Scientific and Industrial Research, <https://www.csir.co.za/about-us>.

²⁴⁹ Interview with Adèle Botha and Marlien Herselman, Council of Scientific and Industrial Research, in Pretoria, S. Afr. (Mar. 19, 2019)(on file with authors).

²⁵⁰ Gamification is the process of using video games to teach pedagogical concepts by locking access to new content behind skill-based level assessments.

²⁵¹ *Id.* [Interview with Adèle Botha and Marlien Herselman, Council of Scientific and Industrial Research, in Pretoria, S. Afr. (Mar. 19, 2019)(on file with authors).]

²⁵² *Id.* [Interview with Adèle Botha and Marlien Herselman, Council of Scientific and Industrial Research, in Pretoria, S. Afr. (Mar. 19, 2019)(on file with authors).]

²⁵³ *Id.* [Interview with Adèle Botha and Marlien Herselman, Council of Scientific and Industrial Research, in Pretoria, S. Afr. (Mar. 19, 2019)(on file with authors).]

²⁵⁴ *Id.* [Interview with Adèle Botha and Marlien Herselman, Council of Scientific and Industrial Research, in Pretoria, S. Afr. (Mar. 19, 2019)(on file with authors).]

²⁵⁵ See: Vodacom Interim Results, 30 September 2018. Available [here](#); Tech Central, 27 November 2018. 'MTN achieves 90% 4G coverage in South Africa.' Available [here](#).

²⁵⁶ The dataset from the Department of Education only categorizes 82% of schools into urban or rural; the remaining 18% are classified as "no response".

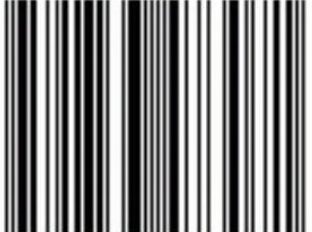
²⁵⁷ MyBroadband, 3 May 2019. 'Eastern Cape broadband fight over – Liquid and SITA sign a deal.' Available [here](#).



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