



Ushirika wa Maendeleo ya Elimu Barani Afrika
الرابطة لأجل تطوير التربية في إفريقيا
Association for the Development of Education in Africa
Association pour le développement de l'éducation en Afrique
Associação para o Desenvolvimento da Educação em África

**STUDY ON THE USE OF ICT IN EDUCATION
AND REMOTE LEARNING DURING CRISES
AND
THE REQUIRED INVESTMENT FOR DIGITAL
TRANSFORMATION FOR AFRICAN COUNTRIES**



**COUNTRY PROFILE REPORT
KENYA**

This study was commissioned by the African Development Bank Group (AfDB)
and the Islamic Development Bank (IsDB)





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Study on the Use of ICT in Education and Remote Learning during Crises and the Required Investment for Digital Transformation for African Countries

KENYA

Report produced by:
Association for the Development of Education in Africa (ADEA)

Study commissioned by:
Islamic Development Bank (IsDB)
African Development Bank Group (AfDB)

December 2022

ACKNOWLEDGEMENTS

The Association for the Development of Education in Africa (ADEA) expresses its deepest appreciation to the Islamic Development Bank (IsDB) and the African Development Bank Group (AfDB) for commissioning this study, in a collaborative endeavor in support of the advancement of educational outcomes in Africa, and for providing the strategic leadership throughout the study.

ADEA also acknowledges the resource person, Prof. Veronica McKay, who worked tirelessly to produce this country profile report.

ADEA wishes to thank the Technical Team of IsDB and AfDB comprised of Jawara Gaye, Lead Education Specialist - IsDB; Ben Abdelkarim Oussama, Principal Education Economist - AfDB; Sameh Hussein, Senior Technical Cooperation Coordinator/Africa & Latin America - IsDB; Isatou Cham, Lead Specialist Policies - IsDB; Kadir Basboga, Senior Regional Integration & Trade Promotion Economist - IsDB; and Sissao Moumine, Senior Education Economist - AfDB; Jessica Muganza, Senior Education, ICT and Digital Officer - AfDB; Michael Onobote, Senior Education Officer, ICT & Innovation Expert - AfDB for the invaluable technical review comments and inputs. The overall strategic guidance was provided by Idrissa Dia, Director Economic & Social Infrastructure - IsDB; Dr Martha Phiri, Director, Human Capital, Youth and Skills Development Department - AfDB; Hendrina Chalwe Doroba, Manager Education & Skills Development Division, AfDB; Riad Ragueb Ahmad, Director, Cooperation & Capacity Development Department - IsDB; Ammar Abdo Ahmed, Manager, Human Development Division - IsDB; and Syed Hassan Alsagoff, Manager, Science Technology & Innovation - IsDB.

Furthermore, ADEA wishes to express its sincere gratitude to Linet N. Makori, country focal person, Kenya National Examinations Council, for his invaluable support for the study.

ADEA and the commissioning partners express sincere gratitude to the Mastercard Foundation led by James McIntyre, for the invaluable technical review and feedback throughout the study process.

ABBREVIATIONS

ACE	Adult and Continuing Education
AfDB	African Development Bank
CBC	Competency Based Curriculum
CoK	Constitution of Kenya
CPD	Continuing Professional Development
DLP	Digital Literacy Programme
ECDE	Early Childhood Development and Education
ECDE	Early Childhood Development and education
EiE	Education in Emergency
GCIR	Global Country Risk Index
GDP	Gross Domestic Product
GER	Gross Enrolment Rates
GoK	Government of Kenya
GPE	Global Partners for Education
HDI	Human Development Index
ICT	Information & Communication Technology
IIEP	International Institute for Educational Planning
KICD	Kenya Institute of Curriculum Development
KNALS	Kenya National Adult Literacy Survey
KNBS	Kenya National Bureau of Standards
NER	Nett Enrolment Rates
NESSP	National Education Sector Strategic Plan
ODEL	Open and Distance e-Learning
SAGA	Semi-Autonomous Government Agencies
SET	Science, Engineering and Technology
SIP	School Improvement Plan
SDG	Sustainable Development Goal
STEM	Science Technology Engineering and Mathematics
STEM	Science, Technology, Engineering and Mathematics
ST&I	Science, Technology, and Innovation
TE	Technical Education
TVET	Technical Vocational Education and Training
TVETA	Technical and Vocational Education and Training Authority
UNHCR	United Nations High Commissioner for Refugees
VET	Vocational Education and Training

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EXECUTIVE SUMMARY

Kenya is a lower-middle-income country with a population of 47 million as of 2020, a gross domestic product (GDP) of approximately USD 100 billion, and a GDP per capita of USD 1100. By 2018, Kenya had a literacy rate of 82% (World Bank) – with approximately 16.5 million students in schools, with almost 500,000 teachers distributed in almost 90,000 schools.

The latest World Bank economic analysis for the country highlights the success of education reforms in Kenya, indicating that the country has embarked on ambitious reforms to address the quality issues and has achieved “near-universal access and coverage”. Primary education in Kenya is compulsory for all children aged 6-13 years. The education system is expanding to accommodate more students, especially in pre-school, primary and post-primary education.

The improvements, according to the World Bank, may be attributed to sustained high spending on education both as a share of total government expenditure and as a share of gross domestic product. The total expenditure as a share of GDP reached 5.3% in 2018; higher than the average for other lower middle-income and upper middle-income countries (except for South Africa) and the share of the government budget on education also increased, reaching 19% in 2020. Education spending per capita is also relatively high when compared to other countries in the region. This has been cited by the World Bank as being one of the key factors contributing to the high quality of Kenya’s education (worldbank.org).

Moreover, the report points out that prior to the onset of the pandemic, the government of Kenya had embarked on ambitious reforms that sought to improve the quality of education by amongst others introducing a Competency Based Curriculum (CBC), reforming professional teacher development and developing a new textbook policy. These reforms had to some extent stood the country in good stead during the pandemic.

Between 2017 and 2019, the number of pre-primary schools grew by 11% and the number of secondary schools by 17%. Primary education has almost reached universal level while secondary school enrolment had increased by more than 50% in the seven years prior to the onset of the pandemic. The World Bank attributes these achievements to the increased spending and increased enrolments at all levels, as well as consistent improvements in the achievement of learning outcomes before the pandemic (www.worldbank.org).

In addition, the ICT Integration in Primary Education (Digital Literacy project) is one of the key flagship Programmes highlighted in the Jubilee Manifesto (www.go.ke). The primary goal of this project is to align the integration of ICT into teaching and learning for standard one pupils in all primary schools by ensuring the improvement of ICT infrastructure; the development of digital content; capacity building for teachers, and procurement of ICT devices (smarclassroom.nl).

ICT integration will undoubtedly play an important role in Kenya’s education system:

- For **Early Childhood Development and Education (ECDE)**, the plan is to enhance the quality of teaching and care in pre-primary schools to respond to the needs of the 3- to 5-year-old age group by finalising the development of the new curriculum and support materials and recruiting and capacitating teachers through pre- and in-service training.

- Improving learning achievements **primary school level** also relies on increasing the number of qualified teachers and building their capacity in the new curriculum by using ICT delivered training programmes to develop more innovative teaching of languages and STEM subjects.
- At the **secondary level**, the focus is on the development of the new Competency Based Curriculum. The use of ICT is deemed essential for teaching all subjects, and for developing the talents of students in all areas, from STEM to sports.
- At the **TVET** level, the plan emphasises that the priority will be on assessing training needs of learners and instructors from the perspectives of both personnel and content, as well as the development of a Competency Based Curriculum and occupational standards. Since there are no structures for pre-service and in-service professional development of trainers, ICT delivered training for developing capacity at this level is the most promising.
- Kenya's higher education sector was initiated with the establishment of the University of Nairobi in 1956 and its attaining independence in 1970 at which stage it split into the Makerere University in Uganda, the University of Dar es Salaam in Tanzania, and the University of Nairobi which was Kenya's only higher education institution. Within three years, its student numbers doubled, from 218,628 in 2011-12 to 443,783 in 2014-15. With the increasing number of universities being established, the numbers of enrolments grew from 564,507 in 2016/17 (Republic of Kenya 2015; 2017). With this expansion, the country has need focused on quality and on the need for expansion of higher education for national development, as is emphasised in Kenya's Vision 2030 document which technological innovation and high-level skills as critical for development. Table 5 below shows the expansion of student numbers and the growth in the HE Section which is discussed in section 7 below.

Kenya's interventions made in education during the pandemic, as discussed below, relied on the use of ICT, however, the entire education sector faced challenges in respect of access to ICT facilities including radio, television, computer, mobile phones, internet, and electricity – all necessary to support e-learning platforms – this was irrespective of the of geographical location, urban or rural, or the socio-economic status of households¹. As this report concludes, education will need additional resources as the country continues to recover from COVID-19 in the context of fiscal consolidation and in terms of ensuring that the country is shock-proof and resilient.

The expansion of ICT access and capacity can go a long way towards quality and equity, especially in hard-to-reach areas. The high illiteracy rate is indicative of school attrition, little or no schooling but can be compensated through blended models of adult education.

Currently Kenya has a very low penetration level which has resulted in many problems during the COVID-19 closures across the education system.

¹ Mutegi, R. (2020) ICT INEQUALITIES AND E-LEARNING IN THE WAKE OF COVID-19 IN KENYA. *International Interdisciplinary Journal of Education*. 9 (4) 220 – 227.

Table 1: ICT infrastructure and penetration

ICT modality	Status
Network coverage mobile	94%
Mobile cellular subscriptions (per 100 people)	114.2
Households with a computer (% of households)	9%
Female mobility phone ownership as % of female population	4%
Population covered by a mobile cellular network	96%
Urban households with internet access	56%
Rural households with internet access	15%
Individuals using the Internet at home (% of population)	18%

Source: World Development Indicators database

Butcher (2017)² points to Kenya's aim to become a **knowledge society** (KS) which values the development and dissemination of knowledge, and which has adequate infrastructure and the culture to support this. Education and innovation (E&I) are regarded as critical in stimulating innovation and development. As Butcher and associates (2017) indicate, ICT is both an enabler for E&I and is critical in driving development towards knowledge which will in turn contribute to economic development. They point out regarding Kenya the following:

- Recent policies are unanimous that Science, Technology and Innovation (STI) are critical for the creation of a knowledge-based society, improving livelihoods in line with Vision 2030.
- Higher education institutions have begun to increase R&I through their linkages with industry.
- While the introduction of ICT in education is still in its infancy, it has nevertheless contributed to a culture of enhanced R&I.
- Kenya's stable political environment places the country in a strong position increase R&I.
- While Kenya is firmly committed to promoting knowledge-driven development it is debatable as to whether the country has sufficient capacity and financial commitment to achieve this goal.

Key findings

While the country has strong political will undergirded by a range of policies in support of ICT-integration, the acuteness of the digital divide has left much of the population unable to access learning opportunities, including lessons presented on radio, television, computer, mobile phones, internet, and lessons presented on other learner management systems. One of the main contributing factors was the lack of a reliable supply of electricity – necessary to support e-learning – thus exacerbating the digital divide.

The study found that problems associated with the digital divide were irrespective of the of geographic location. This is because of the high costs associated with connectivity and devices are so prohibitive.

² Butcher, N. (2017). African leadership in ICT Assessment of Knowledge Society Development in 16 African countries. Neil Butcher and Associates. Report prepared for Gesoci.

As the findings of this study show, the digital divide is particularly acute among those living in rural and remote areas, with the digital divide reflecting pre-independence stratifications of disadvantage that intersect with socio-economic status of households, geographic location, gender, age and ability – intersections that contribute to, and maintain disadvantage. As this report concludes, education will need additional resources as the country continues to recover from COVID-19 in the context of fiscal consolidation and in terms of ensuring that the country is shock-proof and resilient.

Much work needs to be done in expanding infrastructure, ICT access and capacity towards ensuring quality and equity in education, especially in hard-to-reach areas. Moreover, the high illiteracy rate is indicative of school attrition, little or no schooling which is bound to increase as a result of COVID-19 learning losses and school attrition rates. Currently Kenya has a very low digital penetration level and low levels of infrastructure which need to be expanded in Kenya's pursuit to realize its vision of a knowledge society.

The two sections of this report need to be read as a composite study with the findings of a primary research corroborating those of the desk review.

1. THE REVIEW PROCESS

This report emanates from the first phase of this study and involved an extensive review of the literature to identify relevant extant information to inform the data gathering process for the preparation of the country report. The report is structured to include:

- National policies, strategies and programmes that exist in the country for the use of ICT in education.
- A brief overview of the status and the types of ICT infrastructure being used in the various education sub-sectors (including primary, secondary, technical and vocational education and training, tertiary and non-formal education).
- A list of major partners identified during the review.
- A list of the major initiatives underway.
- An exploration of the factors that enable and constrain the use of ICT.
- Impact of COVID-19 on the education sector and role of ICT.

Data collection was largely done via desk research, using published sources on the Internet, and to a much lesser extent given that country teams comprised of policymakers and researchers with ground knowledge were not initially set up or organised as anticipated, through telephone and e-mail discussions with country-based contacts, where available to the consultant.

1.1. The literature review process

This country profile forms the initial stage of a mixed methods data collection process employed to gather secondary data for the ICT in Education project. This first stage of the study entails a careful review of secondary documents gathered from a range of sources including public government items dealing with the country's economic and social, legal framework, ICT infrastructure, the availability of ICT tools within the country's education sector system strategy as well as teachers and students' capabilities.

The country profile is utilising secondary literary sources provides an initial profile that offers a baseline and frame of reference for understanding the key issues, for the country's experiences, priorities and challenges regarding ICT and remote learning strategy specifically as has been accelerated by the COVID-19 experience. The literature sources assist in identifying information gaps that will inform the second phase of the study which involves a primary data collection process. To this end, the country profiles inform the development of instruments as well as provide a backdrop for the interpretation of the data collection comprising surveys and focus interviews to be conducted in the second phase of the study.

This review of literature provides a background to what policy initiatives are in place, budgetary allocations, key challenges, and lessons learnt. It will also show the country's interpretation and response regarding ICT in Education, remote learning, and COVID-19 with implications for the country's resiliency levels and the required investment to attain a standard level of resilience. In addition, the literature review provides initial information about the partners engaged in this area and will inform the detailed partner mapping, for which the primary research activities will enable the identification of further key expert informants and partners to provide ways forward for the study.

Essentially the ICT in education study relies on the use of both primary and secondary data collection for profiling and suggesting proposals for the use of ICT in education in African countries subsequent to the COVID-19 pandemic, across the subsectors of basic education, TVET and higher education specifically focusing on: (1) existence and breadth of ICT policies and strategies; (2) availability and utilization of ICT infrastructure in learning facilities; (3) the level of the workforce's digital competence including learners' abilities; (4) the availability of electronic systems for learning and assessments; (5) the existence of e-education materials; (6) partners engaged in supporting the use of digital technology in education; (7) challenges related to implementing e-education; (8) and examples of success stories and good practices.

Ultimately the data gathered per country from this mixed methods study will be analysed according to the following thematic areas: (1) common SWOC analysis on the use of ICT in education and remote learning; (2) required enabling factors to support the strong national resilience to future crisis; (3) the key gaps concerning ICT infrastructure, e-learning systems, the ICT literacy of both learners and students, and e-curricula; (4) opportunities for initiating and enhancing regional programs for e-education; (5) key partners and stakeholders currently engaged in supporting the use of digital technology per country, area of support they are engaged in; and (6) best practices that might be replicated.

1.2. Limitations of the study

There are obvious limitations of studies only based on the use of secondary data. Data sources are themselves limited and those available might be incomplete and not current. In this study, the subsequent primary data collection process outlined in Part 2 of this document, uses interviews with key informants and partners and conducts surveys with a sample of government officials, educators, learners and other stakeholders, is intended to ensure that the limitations of the secondary study are minimised.

2. BACKGROUND

The Republic of Kenya is a country on the east-coast of Africa, with a population of around 50 million citizens of which 73% are aged below 30 years. Kenya is a presidential representative democratic republic where the president is both the head of state and of government, and of a multi-party system. Executive power is exercised by the government with legislative power vested in both the government and the National Assembly and Senate. The country has 47 semi-autonomous counties governed by elected governors (www.knqa.go.ke). Kenya's economy is the largest in eastern and central Africa, with Nairobi serving as a major regional commercial hub. With its increasing economic growth leading to 2019, Kenya is regarded as one of the fastest growing economies in Sub-Saharan Africa. (Overeem, 2020).

According to the African Development Bank³ the Kenyan economy grew by 6.7% in 2021 after 0.3% contraction in 2020. Growth was driven by services on the supply side and by private consumption on the demand side, with both benefiting from supportive policies and thereafter by the eased COVID-19 restrictions (www.afdb.org). Inflation climbed to 6.1% in 2021 from 5.3% in 2020. The fiscal deficit reduced a fractionally from 8% of GDP in 2020 to 7.9% of GDP in 2021.

Growth is projected to decelerate to 5.9% in 2022 and 5.7% in 2023, driven on the demand side by a decline in domestic and external demand caused by lower income and by an increase in food and fuel import costs and on the supply side and inflation is projected to edge up to 7% due to greater energy and food inflation. Risks could stem from the 2022 general election, a surge in COVID-19 infections, limited access to external resources, and natural factors.

The number of people in extreme poverty declined to 16% in 2021 from 17% in 2020, and unemployment fell to 12.3% from 14.3% over the period, attributable to per capita income growth, social safety-net programs, and economic recovery (AfDB, 2022). Despite reforms having been made, it is still confronted by inequality, poverty, unemployment, underdevelopment with a small portion of the population relying on food aid (World Bank, 2019).

Kenya has a significant informal sector economy comprising small-scale operations which rely on low-tech, mainly mobile technology. The informal sector contributes 70% of the economy's GDP and the sector is supported by the Protection of Livelihood Bill of 2018 to regulate the operations from local to national level. About 60% of young people between 18-35 years of age operate in the informal sector economy with half of them being women.

Kenya is 25th on the 2021 GCRI⁴. Over 84% of its land is classified as arid and semi-arid and so exposed to extreme natural events-drought, locust invasion, and flood, which have displaced communities, disrupted social services delivery, and induced social tensions. An average drought results in a food deficit of 20–30%, reduces GDP growth by 3–5%, and affects the livelihoods of over 80% of the population. In line with its Vision 2030, Kenya has introduced policies and frameworks to tackle climate change. Mitigating climate change methods include increasing the share of renewables in the electricity generation mix, increasing tree cover to at least 10% of land area, building a low

³ <https://www.afdb.org/en/countries-east-africa-kenya/kenya-economic-outlook>

⁴ The Country Risk Index incorporates the latest available macroeconomics, political, social, technological, environmental and legal data from a range of recognized national and international statistical sources and incorporates proprietary data from Global Data Economics Research. The model also features judgments from in-house economists.

carbon and efficient transportation system, and increasing the uptake of adaptation technology across all sectors (AfDB, 2022). Kenya, being the home of Nobel Peace Prize winner, Wangari Maathai, (renowned for amongst others, creating a women’s movement which has planted more than 30million trees in 20 countries) is on track to meeting the five climate action targets of SDG 13 by 2030.

Ranking 84th of 167 countries in the digital readiness index: Shortfalls of electricity occur periodically and the GoK aims to address these shortfalls by generating wind- and solar-powered electricity and establishing a nuclear power plant.

Two-thirds of Kenya’s student population is in the primary level stage, with approximately 16.5 million students in primary schools (KNBS). The expected study time for basic education is eight years for primary education and four years for secondary education, with approximately 3.5 million students under the 8-4-4 curriculum. However, with the introduction of the Competence-Based Curriculum, which is under implementation together with 8-4-4, and is projected to replace the latter in 2027, the basic study time is eleven years.

Kenya has a strong private schooling system with 32% of learners enrolled within the private school sector. The majority of 68% of the total school enrolment is in public institutions. (<https://holisticthinktank.com/>).

Data from the Kenya Bureau of Statistics indicate that in the year 2020, there were 16.5 million learners enrolled in primary and secondary schools. This translated to about 66% of all learners being enrolled in primary schools and constituting the biggest cluster of the student population in Kenya.

Table 2: Number of schools according to level and type

Level	Public	Private	Total
Pre-Primary Schools	28,148	18,147	46,295
Primary Schools	23,246	9,191	32,437
Secondary Schools	9,112	1,301	10,413
TVET Institutions	1,358	903	2,261

Source: Kenya Bureau of statistics

Table 3: Learner enrolments by level

Level	Public	Private	Total
Pre-Primary Schools	1436.9	1396	2832.9
Primary Schools	5191.4	4978.7	10170.1
Secondary Schools	1751.5	1768.9	3520.4
GRANT TOTAL	8379.8	8143.6	16523.4

Source: Kenya Bureau of Statistics Economic Survey, 2020

Table 4: The distribution of teachers per educational level in the education sector in Kenya

Level	Total
Pre-Primary Schools	95,241
Primary Schools	218,077
Secondary Schools	113,115

Source: Kenya Bureau of Statistics Economic Survey, 2020

Table 5: Number and type of universities and total student numbers in Kenya

Number of institutions/students	Total
Number of accredited public universities	31
Number of public constituent colleges	9
Number of private chartered universities	21
Number of private constituted colleges	3
Number of students	562,066*

*Source: Commission for University Education; *Statista, 2021.*

3. LEGISLATIVE LANDSCAPE

The legal basis of the education system in Kenya is founded on the Constitution of Kenya (CoK), 2010 under Articles 43.1.b that recognizes that “every person has the right to education” and 53.1.b “every child has the right to free and compulsory education”, Article 237 establishing the Teachers Service Commission among others.

The overriding education policy is the Basic Education Act of 2013 which makes provision for the right to free and compulsory basic education and the establishment of pre-primary, primary, and secondary schools, adult and continuing education centres as well as special and integrated schools for learners with disabilities.

The Kenya Institute of Curriculum Development Act 2013 provides guidance on national curricula, their design, development and implementation. The institute is mandated to research and develop the curriculum framework for learning content, materials, for the phases of the schooling subsystem.

The Teachers Service Commission Act of 2012 established a single employer and unified teacher terms of service and prescribes the provisions for teacher registration, the regulations for the teaching profession, the prescripts for dealing with cases of misconduct. It also provides for the determination of teacher remuneration.

Other legislation includes the Children’s Act of 2001 which requires the government to provide free basic education to every child and the Persons with Disabilities Act 2003 which ensures inclusive provision for learners with disabilities. The Basic Education Act of 2013 outlines the regulations for funding and provision of basic education. The Kenyan government spends 5% of the GDP annually

to finance the education sector with promaru school financing being the largest budgetary segment followed by secondary school financing. This may be partly attributed to the provision of free primary school education for all learners (MOE-NESSP).

The National Education Sector Strategic Plan (NESSP) for the period 2018 – 2022 has assumed oversight of educational transformation in the country, reflecting Kenya’s improvements specifically in:

- The country recorded a marginal growth in the Human Development Index (HDI), from 0.55 in 2013 to 0.59 in 2017.
- Expected years of schooling, defined as the number of years during which a child entering school can expect to spend in school during their life cycle, increased from 11 in 2013 to 12.1 in 2017.

Despite improvements in several health-related indicators, unemployment remains a challenge. The NESSP indicates that Kenya recorded a 39.1% unemployment rate, (higher than the unemployment rate in Ethiopia, Tanzania, Uganda and Rwanda). The indicators included in the table below also show improvements in internet servers and mobile subscriptions albeit from a very low baseline.

Table 6: Kenya basic development indicators

	2013	2014	2015	2016	2017
Human Development Index (HDI)	0.55	0.55	0.56	0.585	0.59
Education					
Expected years of schooling	11.1	11.1	11.7	11.9	12.1
Health					
Life expectancy at birth, total (years)	65.6	66.2	66.6	66	67.3
Fertility rate, total (births per woman)	4.1	4	3.9	3.85	3.79
Mortality rate, infant (per 1,000 live births)	39.6	38.2	36.5	35.6	34.9
Population and Infrastructure					
Rural population % of total population)	75.2	74.8	74.4	73.95	73
Total mobile money transfer (KES Bn)**		2,372.0	2,816.0	3,356.0	3,638.0
Individuals using the Internet (% of population)	13.0	16.5	21.0	26.0	30.2
Secure Internet servers (per 1 million people)	4.7	7.6	8.9	10.8	12.3
Secure Internet servers	212.0	350.0	421.0	522.0	623.2
Mobile cellular subscriptions (per 100 people)	71.8	73.8	80.7	81.3	81.9
Mobile cellular subscriptions (Mn)**		33.6			
			37.7	39.0	42.8

Source: Table included in the Kenyan Ministry of Education’s NESSP (2018 – 2022)

3.1. Kenya’s Education Sector Structure and Policy Framework

The Education Sector Policy framework is committed to the provision of quality education, training, science and technology, and to the building of a just and cohesive society that enjoys inclusive and equitable social development. A competency learner centred curriculum straddles the system with a view to developing citizens who value education as a lifelong process, economic growth and better employment opportunities. Education is seen as the key enabler for the Sustainable Development

Goals, specifically those aimed at gender equality, poverty eradication, good health and well-being, decent work, and economic growth.

The structure of the education system is shown diagrammatically in Figure 1:

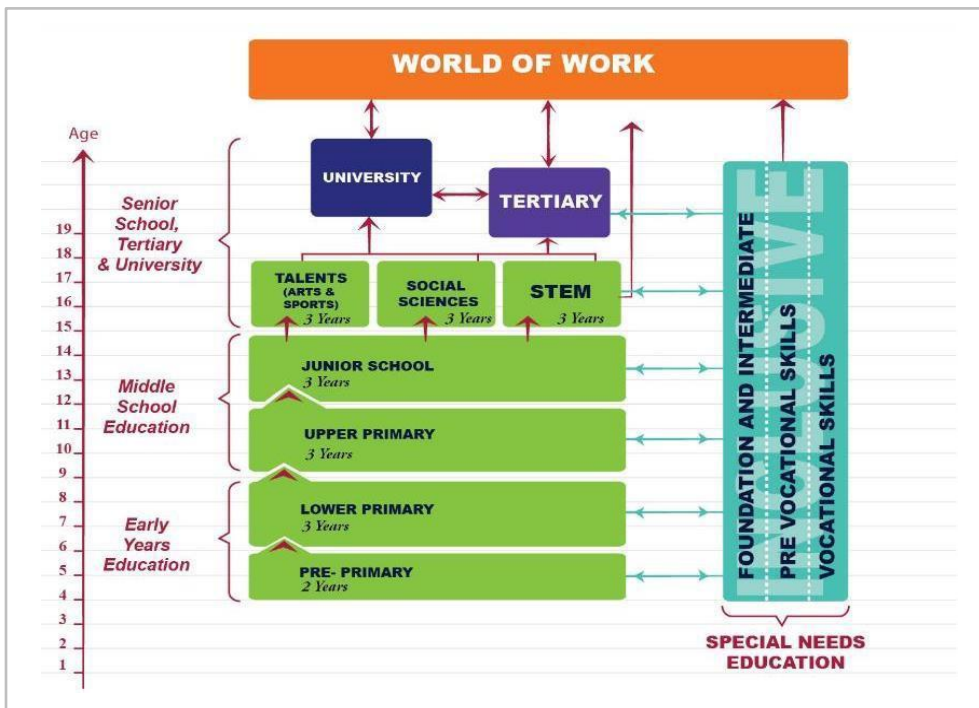


Figure 1: The Structure of Kenya’s Education System

Source: NESSP

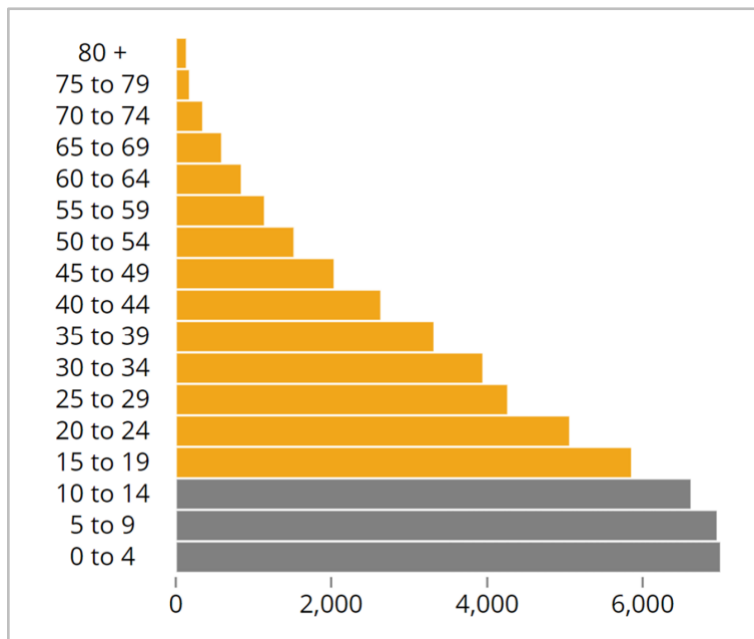


Figure 2: Population breakdown by age (in thousands)

Source: <http://uis.unesco.org/en/country/ke>

With 39% of the population aged 14-years and younger, the expansion of learning opportunities across the entire system becomes a critical need. Digital learning strategies could make an important contribution towards expanding access across the system.

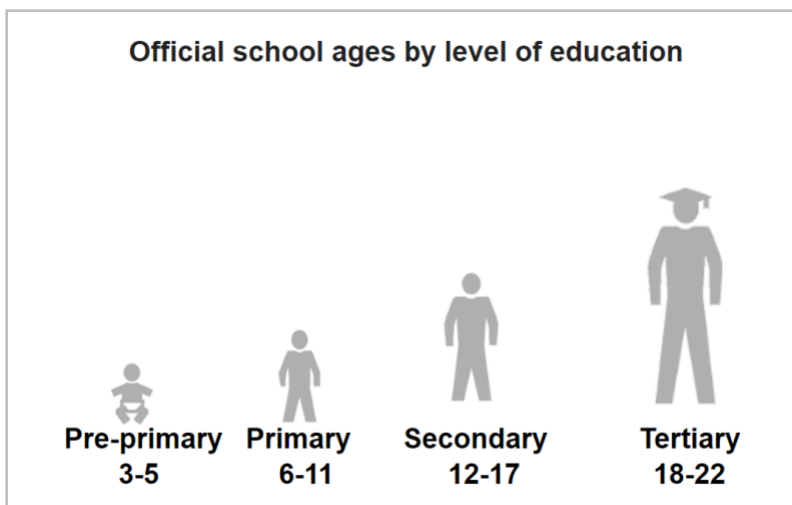


Figure 3: Age breakdown of learners by subsector

Source: [Kenya | UNESCO UIS](#)

The Kenyan system of general education has a 2:6:6:3 structure representing:

- € two years of pre-primary.
- € six years of primary education (three in lower primary and three in upper-primary).
- € six years of secondary education (three lower-secondary, and three uppers secondary); and three years of tertiary education and training.

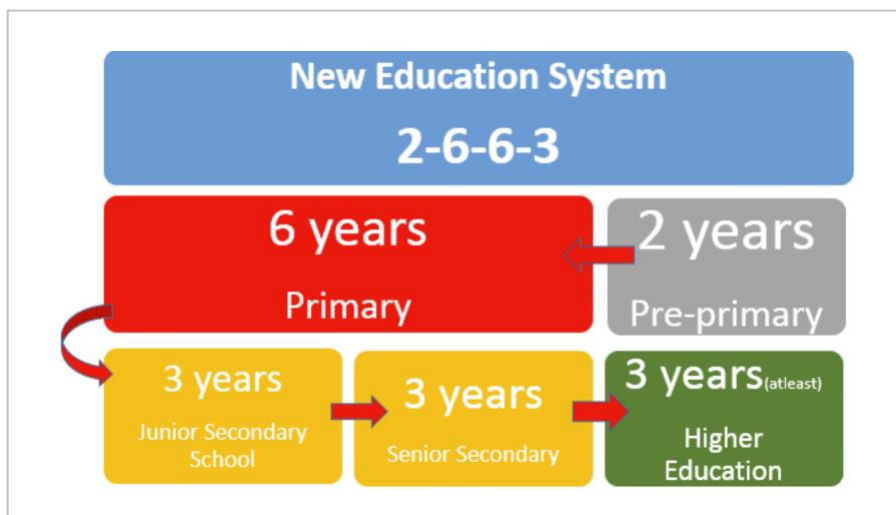


Figure 4: Phases of education

Source. www.kenyayote.com

3.2. Pre-primary and primary

Pre-primary: While not compulsory, the pre-primary phase is aimed at 3-4-year-olds and focuses on the basics in language, mathematics, and environment, psychomotor, creative and religious activities.

Lower primary: Pre-primary feeds into the Junior Primary phase which starts at Grade 1 at an average age of 6 years. The focus of learning activities here is literacy, Kiswahili or Kenyan sign language for deaf learners, English language, indigenous language, mathematics, environment, hygiene and nutrition, religious education and movement and creative activities. The Kenyan Qualifications Authority points out that during this phase of schooling, ICT and appropriate contemporary issues are mainstreamed in all learning activities for enhancing learners' appreciation of the world around them.

Upper-primary: During this phase, primary level learners are exposed to a broad curriculum and given the opportunity to explore and experiment. Compulsory subjects here are English, Kiswahili or Kenyan sign language for the deaf, home science, agriculture, science and technology, mathematics, religious education, creative arts, physical and health education and social studies. Learners at this level may do an optional foreign language selected from among Arabic, French, German and Mandarin languages (JET, 2020).

3.2.1. Pre-Primary Education

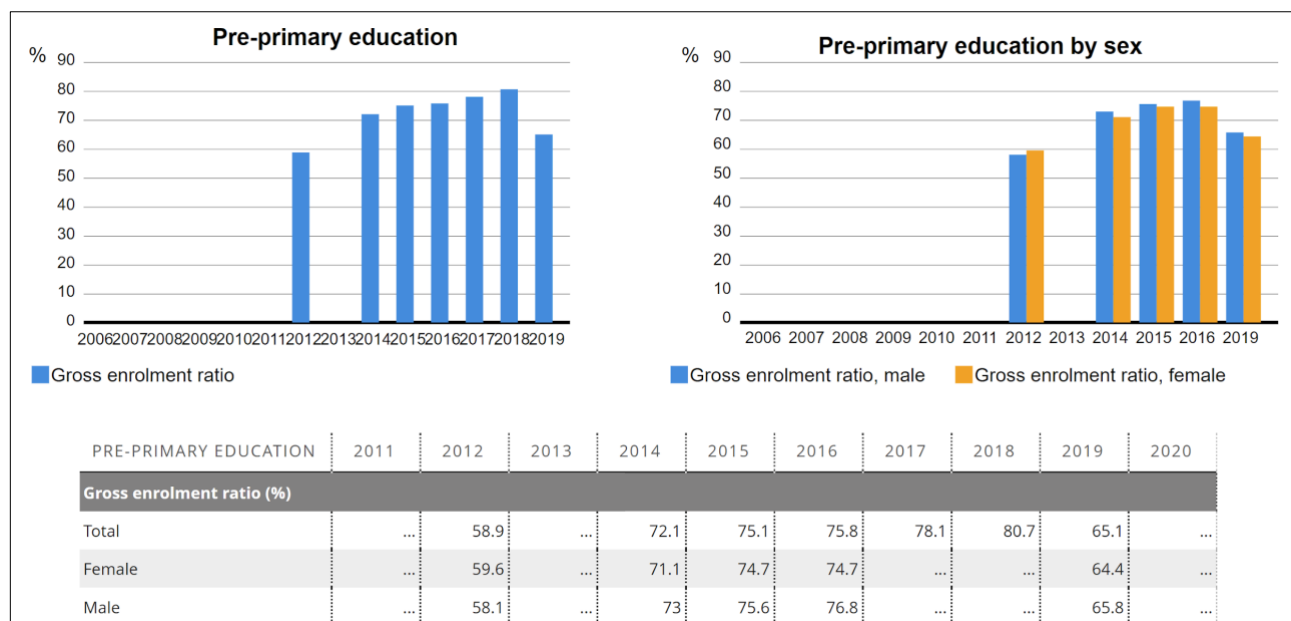


Figure 5: Pre-primary enrolments

Source: [Kenya | UNESCO UIS](#)

As shown above, (JET, 2020) more children are enrolling in pre-primary centres although enrolment rates at this level show that a substantial proportion of children at pre-primary school going age are not enrolled. While in absolute numbers, enrolments in pre-primary schools increased from 2.8 million in 2013 to 3.4 million in 2018, the national pre-primary Net Enrolment Rate was 77.2% in 2018, meaning that accounting for age-school, close to 25% of children who are supposed to be enrolled in pre-primary learning were not enrolled. A large proportion of them are out of school, while a few (albeit

under-aged) are directly enrolled in primary schools. Access at pre-primary levels remains low in arid and semi-arid areas with the enrolment rates being as low as 18%.

Table 7: Trends in the pre-primary sector

	2013	2014	2015	2016	2017	2018*
Males	1,411,309	1,476,383	1,607,353	1,634,194	1,681,530	1,730,237
Females	1,454,039	1,543,482	1,560,502	1,565,647	1,612,283	1,660,308
Total	2,865,348	3,019,865	3,167,855	3,199,841	3,293,813	3,390,545
GPI	1.03	1.05	0.97	0.96	0.96	0.96
Gross Enrolment Rate (GER), %	71.6	73.6	76.4	76.6	77.1	78.4
Net Enrolment Rate (NER), %	66.9	70.4	74.6	74.9	76.9	77.2
Number of ECDE Centres	40,145	40,211	40,775	41,248	41,779	42,317
Number of ECDE Trained Teachers	83,814	88,154	92,906	97,717	106,938	112,703
Number of ECDE Untrained Teachers	17,248	16,630	14,281	13,102	11,338	10,452
Total No. of Teachers	101,062	104,784	107,187	110,819	118,276	123,155
Number of ECDE Training Colleges	131	140	143	147	276	

Source: Cited in NESSP (2018 – 2022)

There are a number of constraints facing the provision and development of Pre-primary education in Kenya including regional disparities in access; lack of policy establishing a minimum level of funding for Pre-primary; inadequate regulation and enforcement of quality standards; lack of comprehensive system for monitoring children’s development across sectors; weak inter-sectoral coordination, which should bring together interventions from key sectors such as health, nutrition, education and social protection for a comprehensive delivery of pre-primary education/child development services. In addition, the high turnover of trained teachers; shortage of instructional materials and teacher professional development impact negatively on pre-schooling (NESSP, 2018 - 2022).

ICT could make an excellent contribution in addressing the need to train teachers and to provide quality materials across this subsector.

3.2.2. Primary Education

Kenya has made tremendous strides in terms of access to primary education for the period 2013-2018. Over this period, total enrolment in primary rose by 5% from 9.8 million to 10.5 million. With a national NER of 91%, only 9% of children expected to be in primary schools are not enrolled in primary school. With the country about to close the gender gap in primary enrolment, it is noted that in some regions, especially in non-ASAL areas, there are actually more girls enrolled than there are boys. Another important indicator is the fact that close to eight out of 10 children who enrol in Grade 1, continue to and complete Grade 8 with the same number transitioning to secondary. However, the large number of over-age primary enrolments, coupled with high repetition rates, suggest an enrolment bulge, especially at the lower grades. In such cases, the development of high-quality digital learning materials and online teacher development can make a major contribution towards enhancing quality and equity at lower cost ratios.

Table 8:Trends in the primary subsector

	2013	2014	2015	2016	2017	2018*
Males (thousands)	5,019.7	5,052.5	5,127.9	5,214.5	5,293.9	5,364.3
Females(thousands)	4,837.9	4,898.5	4,962.9	5,054.9	5,109.8	5,178.3
Total Primary (thousands)	9,857.6	9,950.8	10,090.9	10,280.1	10,403.7	10,542.6
GPI	0.96	0.97	0.97	0.97	0.97	0.97
Gross Enrolment Rate (GER), %	105	103.5	103.6	104.1	104.0	104.0
Net Enrolment Rate (NER), %	88.1	88.2	88.4	89.2	91.2	92.4
Primary Completion Rate, %	80	79.3	82.7	83.5	83.6	84.2
Primary secondary transition, %	74.1	76.1	81.9	81.3	81.8	83.3
Number of public primary schools	21,205	21,718	22,414	22,939	23,584	24,241
Number of private primary schools	6,821	7,742	8,919	10,263	11,858	13,669
Total number of schools	28,026	29,460	31,333	33,202	35,442	37,910
<u>Average school size</u>	<u>352</u>	<u>338</u>	<u>322</u>	<u>310</u>	<u>294</u>	<u>278</u>

Source: Cited in NESSP (2018 – 2022)

The national primary level education outcomes mask disparities based on gender, location and socio-economic factors. The various household surveys show that children from households that are classified as (1) non-poor, or (2) from non-ASAL areas, or (3) from urban areas are more likely to “survive” in schooling and have higher chances of being in primary school and transiting from primary to secondary. Furthermore, about 9 out of 10 children from urban areas are likely to be enrolled in Grade 6 compared to 7 out of 10 children from rural areas.

There are several constraints hindering access to primary education. Children cannot attend primary schools mainly due to factors, such as direct costs on uniforms and school meals; indirect costs; poverty; insecurity; long distances covered to schools; as well as lack of food and water at home. Those most affected are children from low economic status, urban informal settlements, and those in ASAL areas, including in refugee camps. Cultural practices exclude girls from enrolling as do safety issues relating to their transit. Inadequate sanitary facilities and early pregnancy contribute to poor school attendance and dropping out of school.

3.2.3. ICT in primary schooling

Part of the proposals for education reforms aims to integrate ICT in teaching, learning and assessment in primary education. The government has continually invested in ICT integration in education to enhance access, quality and equity in education. There are various initiatives in ICT integration in education by both the government and other stakeholders. Key among these is the Digital Literacy Programme (DLP), which targets all public primary schools. In this programme, each school is provided with digital resources for effective curriculum delivery however this is not without problems. The use of tablets has been hampered by unreliable electricity supply, unreliable and/or lack of internet connection, lack of ICT skills among teachers, unwillingness of teachers to integrate ICT in teaching and learning, and sustainability of the programme. The NESSP reform strategy undertakes to:

- Conduct a digital literacy evaluation survey in all public primary schools.
- Construct computer laboratory in public primary schools.
- Equip all public primary schools with hardware and software infrastructure for ICT education.

- Build capacity of ICT champion teachers in integration of ICT in teaching, learning, assessment and management.
- Develop digital content for all subjects of the CBC for primary schools.
- Build capacity of head teachers for skills in ICT integration in teaching, learning and management; and
- Establish an ICT integration in education support system at the national, county, sub-county and institutional level.

It is likely that most of these reform measures will have been impacted on during the COVID-pandemic as is discussed later.

3.3. Secondary Education

Despite increases in secondary enrolments in absolute terms, access to secondary schools is still low as shown in the following table, the Secondary Sub-Sector for the period 2013-2018. In absolute numbers, enrolments at secondary school level increased from 2.0 million in 2013 to 2.9 million in 2018 and the GER and NER was estimated at 70.3% and 53.2%, respectively. This means that close to 50% of secondary school going age children are not enrolled in secondary schools with disparities by region: In the North Eastern and Coast regions, more than 7 out of 10 do not attend up to the end of secondary education, the majority of whom are girls. Obstacles to school retention and participation rates at the secondary school level are attributed to the direct and indirect costs of schooling.

Table 9: Trends in the secondary subsector

	2013	2014	2015	2016	2017	2018*
Males (thousands)	1,127.7	1,213.3	1,348.5	1,396.9	1,450.8	1,505.30
Females(thousands)	967.6	1,118.4	1,210.5	1,323.6	1,380.0	1,437.40
Total Secondary (thousands)	2,095.3	2,331.7	2,558.0	2,720.5	2,830.8	2,942.70
GPI	0.86	0.92	0.90	0.95	0.95	0.95
Secondary GER, %	54.3	58.7	63.3	66.8	68.5	70.3
Secondary NER, %	38.5	47.4	47.8	49.5	51.1	53.2
Public Secondary Schools	7,686	8,297	8,592	9,111	9,111	9,643
Private Secondary Schools	1,048	1,143	1,350	1,544	1,544	1,756
Total # of Secondary Schools	8,734	9,440	9,942	10,655	10,655	11,399
Average school size	267	271	273	266	266	258

Source: Cited in NESSP (2018 – 2022).

The quality of Kenya’s human capital in turn, depends on a well-functioning schooling system with acceptable global competencies that provide for the development of individual learner’s potential. This is identified and proposed in the reform strategies and which include the competency-based curriculum and the early identification of, and nurturing of learners’ talents across the three learning pathways at Senior Secondary School level.

3.3.1. ICT in secondary schooling

According to the NESSP, Information and Communication Technology is one of the main drivers of a knowledge-based economy. The government of Kenya has made considerable investments in the

integration of ICT in education to enhance access, quality and equity in education. There are various initiatives in ICT integration in education by both the government and other stakeholders. Key among these is the Computer for Schools Programme, aimed at equipping secondary schools for the utilisation of ICT and providing ICT learning resources and guidelines for integrating ICT into learning. However, the NESSP points out that the use of ICT in teaching and learning remains poor across schools. Internet connectivity remains a challenge for secondary schools while teachers need to have their capacity enhanced.

As part of the education reform, outlined in the NESSP, the use of ICT in teaching and learning in secondary schools will be enhanced through the following activities:

- Provide ICT infrastructure in secondary schools (electricity, internet and ICT-tech).
- Build capacity of teachers and management on the use of ICT in teaching and assessments.
- Facilitate the development and dissemination of e-content for secondary education.
- Develop a monitoring and evaluation framework for assessing ICT integration.
- Establish an ICT integration in education support system for secondary schools at national, county, sub-county, and institutional level.

3.4. Adult and Continuing Education

According to the NESSP (2018 – 2022), Adult and Continuing Education (ACE) includes a range of organised education and training to meet the ever-changing demands of society for improved skills in literacy and numeracy and other lifelong learning programmes for illiterate adults and out of school youth, aged 15+ years. ACE also provides an alternative pathway for over-age learners who drop-out or could not attend school due to various social and other factors and who may wish to continue learning to acquire the skills and knowledge to empower them personally in their daily lives as well as to participate in the broad economic and social dimensions of their society.

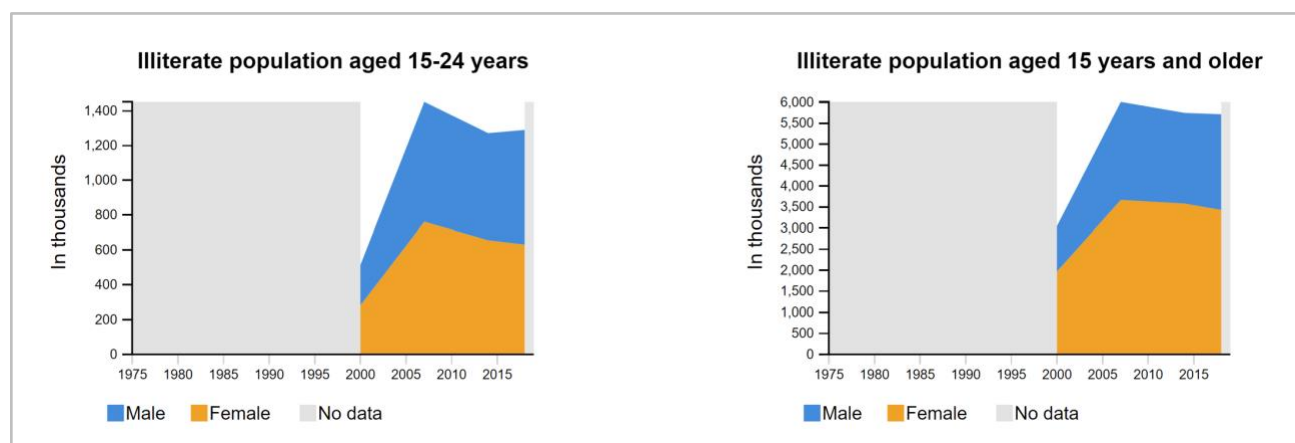


Figure 6: Illiterate population

Source: [Kenya | UNESCO UIS](#)

The number of illiterates is likely to increase because of school closures and the reluctant return rates. This will increase the demand for ACE programmes. Currently enrolments in ACE programmes in Kenya are low overall with female enrolment rates doubling those of men. The NESSP points to reasons for low enrolment rates as being due to a lack of qualified teachers and their high turnover; inadequate learning centres, stigma associated with adult learners, competing responsibilities on the

part of learners; irrelevance of curricula. Other reasons for poor participation are suggested to be lack of political will; lack of personnel to handle non-formal education for out of school youth and adults; outdated curriculum which does not conform to the changing needs of the learners; lack of access to ACE for persons with special needs and a lack of reliable data necessary for planning purposes and development of ACE.

As part of the reform, the NESSP proposed to increase access and retention in ACE programmes by 10% amongst others by enhancing the facilities including those for adult learners with disabilities; and establishing linkages between ACE programmes and TVET.

Since the quality and content of ACE programmes is considered irrelevant, reviewing the ACE curriculum and support materials for revision is considered critical as is the recruitment and enhancement of the skilled ACE instructors through initial and in-service training.

Providing an accelerated curriculum for adult learners with “equivalences” to schooling for purposes of accreditation. Developing materials for the ACE accelerated curriculum; develop a framework for rolling out the ACE accelerated curriculum and building the capacity of educators.

3.4.1. The integration of ICT in adult education

The NESSP points to the importance of utilising ICT in ACE as a learning and teaching tool and to provide learners with the relevant technological skills to meet the challenges of the 21st Century across all levels.

- As the NESSP states, there is currently little information available on the utilization of ICTs in ACE. To Integrate ICT in teaching, learning and assessment in ACE, the following activities will be undertaken: Conduct a baseline survey on the status of infrastructure across all levels of ACE.
- Conduct needs assessment to identify the gaps in integration of ICT in ACE curricula.
- Continually train ACE curriculum instructors and trainers on ICT integration.
- Integrate ICT in ACE curriculum design and delivery.
- Facilitate the acquisition of ICT resources across all levels in ACE.
- Promote the use of e-learning as a mode of delivery of ACE programmes; and

Given the lack of data needed to manage ACE centres and programmes, there is a need to develop a monitoring and evaluation framework for assessing the impact of ICT integration in teaching and learning in ACE. The NESSP also draws attention to the need to build the capacity of managers of ACE institutions and to conduct a Kenya Adult Literacy Survey by 2022. Coupled with the above, there is a need to address the stigma as well as a general lack of information about what ACE entails through awareness raising and advocacy. It has been found elsewhere, (e.g., in South Africa) that utilising ICT for ACT teaching enhancing the image of the programmes.

3.5. Inclusive education

The NESSP focuses extensively on expanding inclusive education for learners with disabilities at Basic Education to increase access and the participation rate of learners and trainees with special needs and disabilities in primary and secondary by 2022.

The Education sector policy for learners and trainees with disabilities recognises the need for Kenya to move towards inclusive education as well as providing education and training specifically for learners and trainees with severe disabilities. Inclusion will be the overarching principle in advocating for the right of every learner with a disability to be enrolled in a regular classroom on an equal basis with others. Reforms include supporting and strengthening infrastructure, curriculum and personnel among others in existing schools to accommodate learners with special needs and disabilities, upgrading and equipping a workshop to produce assistive devices, technologies and materials. Conduct a needs assessment to establish specialised learning resources, assistive devices and technologies required to support inclusive education.

Attending to the ICT needs for learners with disabilities should include universal design and where required adapted technology. This will enable the country to progress towards a more inclusive system that extends beyond the enrolment numbers of learners with disabilities who are currently reaching, and qualitatively improving their experience of learning.

3.6. Technical Vocational Education and Training (TVET)

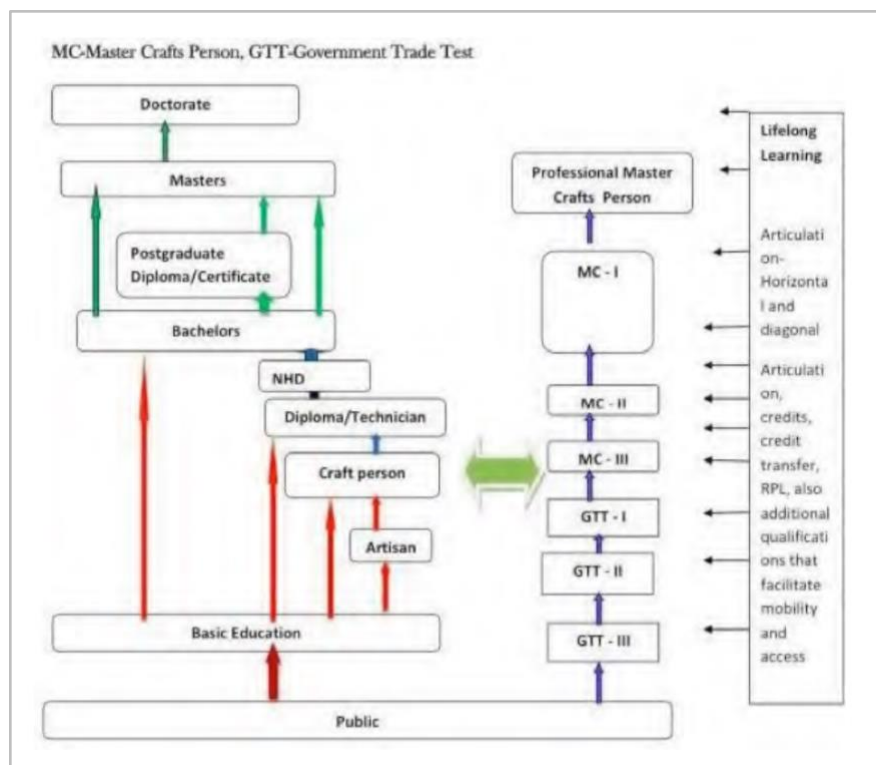


Figure 7: Education and training progression pathways

Source: Cited in NESSP.

Figure 7 shows the articulation across the education sector with TVET in Kenya takes the form of Vocational Education and Training (VET) and Technical Education (TE). TVET institutions comprise formal and informal entities located within the framework. The data as shown in the following table indicates that as of 2018 there were 1,300 institutions and 363,884 in 2018. There are more males than females enrolled in the different TVET courses, especially in public institutions that are STEM-oriented.

Table 10: Trends in TVET

	2014	2015	2016	2017	2018*	
National Polytechnics Male						
	13,166	14,660	12,463	22,754	29,290	47,171
Female	7,329	8,602	8,078	14,161	19,202	32,207
Total	20,495	23,262	20,541	36,915	48,492	79,378
GPI	0.56	0.59	0.65	0.62	0.66	0.68
Public Technical and Vocational Colleges						
Male	31,956	29,632	32,221	17,589	29,584	49,454
Female	23,989	21,232	23,087	9,569	17,982	34,948
Total	55,945	50,864	55,308	27,158	47,566	84,402
GPI	0.75	0.72	0.72	0.54	0.61	0.71
Private Technical & Vocational Colleges						
Male				27,280	35,951	41,623
Female				30,298	38,689	43,997
Total				57,578	74,640	85,620
GPI				1.11	1.08	1.06
Vocational Training Colleges Male						
	42,942	45,473	47,625	46,340	59,756	66,894
Female	28,627	28,222	29,840	34,565	44,685	47,590
Total	71,569	73,695	77,465	80,905	104,441	114,484
GPI	0.67	0.62	0.63	0.75	0.75	0.71
Grand Total Male						
	88,064	89,765	92,309	113,963	154,581	205,142
Female	59,945	58,056	61,005	88,593	120,558	158,742
Total	148,009	147,821	153,314	202,556	275,139	363,884
GPI	0.68	0.65	0.66	0.78	0.78	0.77

Source: Cited in NESSP.

Through the TVET Policy, the Government aims to provide an enabling environment to promote capacity building including development of the requisite TVET human capital, sustainable financial mechanisms for training, ICT infrastructures and effective partnerships and linkages for knowledge generation and sharing. The TVET Policy recognises that the strengthening of partnerships between industry and TVET institutions will provide a foundation for ensuring the relevance and quality of training as well as for informing curriculum design and development to better align the curriculum with the requirements of industry. The Policy makes provision for both initial training as well as continuous and re-training of persons. Specifically, the policy refers to the need to promote the use of Information and Communication Technologies to promote ICT as a tool for management, teaching/training, learning and research; to provide ICT infrastructure and to promote private investment in ICT for technical and vocational education, training and research.

The goal of Kenya's Vision 2030 is to make Kenya "a newly industrialising middle-income country, providing high quality life for all its citizens, by the year 2030". To achieve this goal, Kenya will be aiming to produce industrial goods and services to generate real income for the country. Through this, the country hopes to be a middle-income economy capable of providing high quality life for her citizens

by providing a critical mass of well qualified workers for undertaking product and system design (Ministry of Education, Science and Technology). The policy gives projections of the numbers of engineers needed for a population of 40 million.

One of the challenges of the system is to provide learning opportunities since of all applicants who qualified for admission, only 40% find opportunities and the remaining 60% are effectively left without any training, constituting a huge loss to the national economy.

There are other considerations arising from high levels of poverty that makes it difficult for most Kenyans to participate in TVET. Moreover, the NESSP points to the fact that few TVET graduates can be employed directly by industry due to a mismatch between training offered and the actual skills demands of industry. The curriculum delivery mode in the majority of TVET institutions is theory based as opposed to the desired combination of theory and practical and continuous competency development monitoring and assessment modes.

3.6.1. Integrating ICT into TVET

TVET can benefit immensely from ICT training and development for expanding access and for information and communication sharing through ICT-mediated channels and systems. This will be necessary to enable the GoK to achieve its targeted gross enrolment ratio of 30% in TVET by the year 2030. The use of ICT is regarded as a way to make teaching more flexible with online and other digital means being more adept to the provision of competency-based and modularised teaching and learning processes. ICT-mediated learning make blended learning a viable option through incorporating not only traditional face-to-face and print-based delivery, but through the use of a variety of electronic technologies (including online and eLearning and even simulation) can improve the learning process while allowing the student to spend more time for work integrated learning in the workplace.

Despite the huge increase in infrastructure investment into institutions of learning, and the subsequent rise in student enrolment, the sector is grappling with lecturer shortages that hamper improvement in quality standards and lead to ever growing student-to-faculty ratios (JET, 2020). These problems of expanding access can only, feasibly, be tackled by way of distance education.

ICT will enable the delivery of TVET courses that are competency based and aligned to the labour market demands thus reducing the mismatch between skills training and industry demands. This relies on a massive rollout of staff training and capacity development. Distance and blended approaches for learners and educators should offer many advantages of quality and costs.

3.7. University Education

The university sector in Kenya is regulated by the Universities Act. The Act provides for the development of university education, the establishment, accreditation and governance of universities. The Act is premised on a policy framework whose objectives are to: enhance equitable access to university education. As shown in Table 10, there have been fluctuations in the enrolment rates at universities over the period:

Table 11: University Enrolment by gender

	2013/2014		2014/2015		2015/2016		2016/2017		2017/18	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Public	173,987	115,746	217,164	146,170	258,688	174,068	286,840	192,472	255,875	171,090
Private	39,980	31,666	42,454	37,994	39,125	38,804	43,547	41,648	46,764	39,453
Total	213,967	147,412	259,618	184,164	297,813	212,872	330,387	234,120	302,639	210,543
Grand Total	361,379		443,782		510,685		564,507		513,182	
GPI public	0.67		0.67		0.67		0.67		0.67	
GPI private	0.79		0.89		0.99		0.96		0.84	
Total GPI	0.69		0.71		0.71		0.71		0.70	

Source: NESSP (2018 – 2022).

The number of public universities increased from 8 in 2012 to 32 in 2016. Chartered private universities increased from 15 to 18 during the same period.

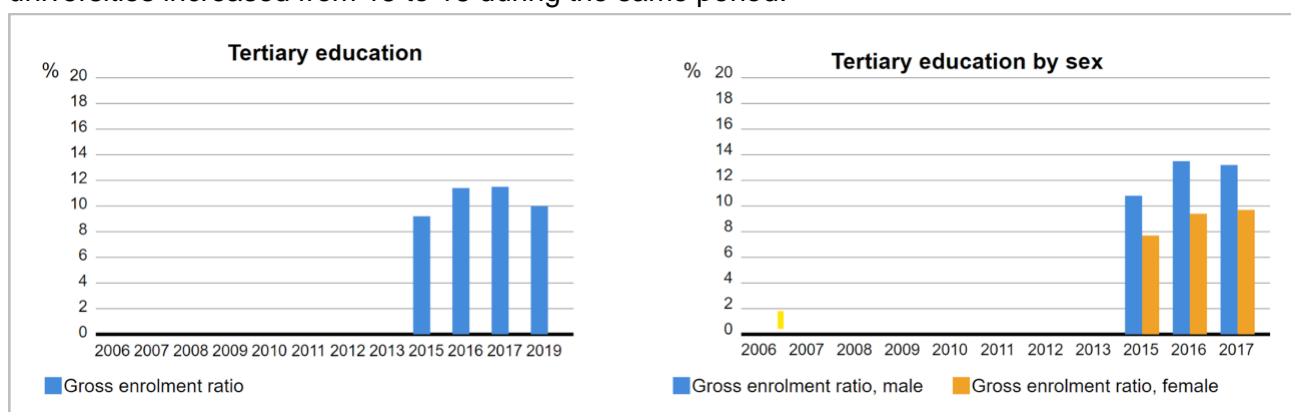


Figure 8: Tertiary enrolments by year and gender

Source: [Kenya | UNESCO UIS](#)

The sub-sector faces several quality and relevance issues that are of concern.

The establishment of new universities has, however, not been matched with adequate funding to support infrastructure development. The lower rates of female students and those with special needs are noted as a challenge. The NESSP also points to the lower enrolments in Science, Technology, Engineering, and Mathematics (STEM) in the universities and the fact that the number of staff with doctorate degrees is low. The growth in enrolments has outstripped the growth in funds allocated for student loans, a problem likely to increase – and a problem that could be ameliorated by using distance education to lower the costs to students.

3.7.1. The reforms in Higher Education

Reforms include increasing gross enrolment rates in universities and expanding infrastructure more with specific focus on the provision of ICT facilities with priority given to new universities. This will ensure that all universities meet the minimum infrastructural requirements provided at tertiary level.

Enrolment rates need to be accompanied by high retention rates and the NESSP points to ways to enhance retention and completion rate in all courses in the Universities. It involves putting up measures to address factors that keep students out of university education or delay their completion. While infrastructure is offered in the NESSP as a solution, the post-COVID-19 pandemic adaptations using distance learning could provide a way of providing high quality materials and tuition to ensure retention and throughputs.

The reforms also aim to increase access to Science, Engineering and Technology (SET) programmes which have high industry demand. In addition, this will also ensure that universities have adequate capacity to admit the many students who apply to join SET Programmes. The programme targets to increase enrolment in SET related courses from 20% of total student enrolment to 60%.

The NESSP proposes Open, Distance and E-learning in University Education stating that ICE has the capability of bridging the geographical and space gaps that inhibit access to education. Open Distance and E-learning (ODEL) has provided an opportunity for learners to access education through technology irrespective of their physical location. The objective of the programme is to strengthen and expand e-learning programmes in all universities.

Distance learning can also increase the growth of Science, Technology, Engineering and Mathematics in education and training institutions has not been rapid enough to support the ST&I sector. Universities in Kenya have shifted focus away from Science, Technology, Engineering, and Mathematics STEM-based courses. As a result, the large proportion of Kenyan enrolment is concentrated in nonscience-related fields. Second, universities do not have enough sufficiently qualified faculty with the capacity to teach STEM related programmes of sufficient quality to meet required standards. Another issue is that costs associated with delivering STEM related programmes are higher than those associated with delivering courses in the social sciences and humanities because of the need to invest in expensive equipment needed in delivering STEM based programmes. In addition, the low number of students transitioning from secondary education with the skills and qualifications required for enrolment in STEM programmes is another factor undermining the admission of students to STEM disciplines in higher education.

The use of e-learning and ICT tools can enhance the capacity of secondary and higher education institutions in the STEM areas to harness the best academics globally to present modules online and to develop materials for students where this capacity is lacking.

This will support ICT-based distance and open learning programmes offered by different universities with a target to have 30% of degree programmes available on e-learning mode. This will be facilitated through the following activities:

- Establish the Open University of Kenya;
- Review the standards and guidelines for ODEL;
- Develop digital content for university Programmes;
- Build capacity for university academic staff in ODEL; and
- Review funding policy to accommodate ODEL students including student loans and bursaries.

The above mentioned activities will significantly increase the capacity of the higher education sub-sector to expand its reach. Most of the Kenya's universities have already adapted to different technological advancements to improve the efficiency of their respective institutions.

The University of Nairobi offers its programmes by contact and distance enabling the institution to offer a full suite of qualifications in Human and Social Sciences, Pure Sciences, and teacher education qualifications, tourism and business management. The university offers a range of Masters Qualifications including a Masters of Distance Education, as well as Masters in pharmacology, a Masters in Physics and a range of Masters of Education qualifications. In addition, the university offers a Post-graduate Diploma in Education making it a large teacher development provider at a distance. As part of Kenya's education reform process, Open, Distance and E-learning in University Education has been identified as a modality for expanding the system.

As the NESSP indicates, ICT has the capability of bridging the geographical and space gaps that inhibit access to education. Open Distance and E-learning (ODEL) has provided an opportunity for learners to access education through technology irrespective of their physical location. The objective of the programme is to strengthen and expand e-learning programmes in all universities. This will support ICT-based distance and open learning programmes offered by different universities with a target to have 30% of degree programmes available on e-learning mode. This will be facilitated through the following activities:

- Establish the Open University of Kenya;
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- Develop digital content for university Programmes;
- Build capacity for university academic staff in ODEL; and
- Review funding policy to accommodate ODEL students including student loans and bursaries.

As indicated above, there has been a rapid expansion in the number of private and public universities in Kenya with distance education playing a significant role in expanding the outreach of universities since the institutions are not constrained by building infrastructure. The following universities advertise themselves as Distance Universities:

- JKUAT offers Business and Information Technology qualifications.
- Egerton's programmes include community development, Security studies, and criminal justice.
- St. Paul's University includes degrees in community development, business and administration and leadership.
- KEMU is a private university offering online distance education programmes.
- African Nazarene University allows learners to pursue a more flexible and accommodating mode of study, using a blended mode.
- Kenyatta University offers a range of Education, Humanities, Social Sciences and Business, Agriculture, Engineering at undergraduate and post graduate levels.
- Other distance universities include Strathmore University, Daystar University, Moi University and KCA University.

The strong backdrop of Distance Education in the country provides a positive reference point for the rest of the sector: Distance Education and online e-learning can also be used to enhance equity and inclusion for female students and students with disabilities who seek to study at university level.

3.8. Teacher education

There are a number of constraints facing pre-service teacher education in Kenya. (“There are a number of constraints facing pre service”) Some of these include:

- Insufficient Teacher Training Institutions with limited infrastructure and facilities. There are 26 public primary teacher training colleges and three public diploma teacher training colleges, spread across the country.
- The lack of adequately trained teacher educators for teacher development across the teacher training colleges. There has been insufficient attention given to the lack of capacity among those deployed to the teacher training colleges who lack pedagogical and adequate knowledge in current teacher development trends, especially with regards to skills in coaching and mentoring the teacher trainees as well as ICT pedagogical skills;
- The policy framework on the selection and deployment of teacher educators is inadequate and utilises the same staffing norms used for employing teachers in secondary schools thus resulting in high staff to student ratios and limits the provision of the broad range of teacher skills required;
- The entry requirements for selecting teacher trainees has been cited as a problem. Since the entry requirements are low, this results in low throughput rates of students. The minimum entry requirements need to be increased to mitigate the trend of high attrition rates and low pass rates. Improving the entry requirements will also contribute to both public and private TTCs producing teachers of better quality;
- Lack of teacher internship programmes: Presently, there is no provision for teachers graduating from the teacher training institutions to undergo a pre-service induction programme. Instead, newly recruited teachers are immediately deployed in classrooms, and are required to learn most of the pedagogical applications and teaching codes and standards “on-the-job”.

Providing digital support, tracking and monitoring of student teacher placements in schools for practicums could enable improved teacher development. Students could be enabled to share their practices and develop online communities of practice, sharing video clips of their lessons and enabling wider reflection.

3.8.1. Digital resources

Expanding digital materials through the development of OERs and MOOCs for use across the various subsectors.

While the utilisation of OERs and MOOCs have not been mentioned as part of the reform strategy, these can be used to improve quality and more especially given the lower rates of staff with PhDs and lower teaching abilities. The use of OER materials can rapidly impact on learning. They will provide immediate relief by reducing the reliance on costly and unaffordable textbooks; address the shortages of learning materials; make available a range of quality materials and expand learners’ access to repositories for learners, teachers and researchers. OER also offers opportunities for supplementing

face-to-face learning. Since they are free, they offer many affordances for low-income countries and for low-income learners, providing free access to knowledge, which can be reused and repurposed.

- Both local and international contents and online learning resources should be sourced and developed relevant materials should be made available for institutions across the educational subsectors.
- Promote and encourage the design, development, acquisition and hosting of indigenous content.
- Facilitate data and content sharing among educational institutions.

This will require the development of OER policies, funding and the establishment of materials development units or partners to adopt or adapt OER/MOOC materials for core learning in all education subsectors as well as for Continuous Professional Development (CPD) of all educators. The resource development should ensure possibilities of remixing OERs and MOOCs with national curricula.

These digital materials can be deployed to widen access and improve quality and should be developed in conjunction with users and expertise.

4. THE COVID-19 LEARNING CONTINUITY IN BASIC EDUCATION

The Kenya Basic Education Response Plan was developed through a wide consultative process that involved several stakeholders, officials, education partners, line ministries, teachers, the Education in Emergency Working Group, specialists from the International Institute of Education Planning (IIEP), Global Partnerships for Education, the World Bank.

A Strategy was developed to ensure amongst others, uninterrupted learning, the production of learning materials, to provide psychosocial support to learners, teachers, and education officials, to ensure the full re-enrolment of when schools reopened. A multi sectoral COVID coordination mechanism was established and the estimated budget costs for implementing the response and recovery activities totalled USD 24,004,870.

For this programme, the Global Partnership for Education (GPE) had allocated the Government of Kenya (GoK) US\$11 million, including a grant agent supervision fee of US\$200,000, the GPE COVID-19 accelerated funding window was designed to capacitate governments to mitigate the impact of COVID-19 on their education systems and help recovery. According to the World Bank, the funds were intended to support the Ministry of Education to implement the Kenya GPE COVID-19 Learning Continuity in Basic Education Project.

The project aimed to ensure the continuation of learning by improving access to online and distance learning for all students in primary and secondary schools and facilitate a smooth transition in the return to school specifically for vulnerable students. The Project focused on the following three components:

- Expanding existing remote learning opportunities for learning continuity for all basic education learners.

- Facilitate the smooth transition back to school for girls and vulnerable students when schools were reopened and to ensure that learners returned to school.
- To provide extensive project coordination, communication as well as monitoring and evaluation.

The project was expected to run from 20th July 2020 to 31st December 2021 with the World Bank as the supervising entity with a view to:

1. Providing online and distance learning for approximately 60% of primary and secondary school students;
2. providing school meals for about 1.75 million learners;
3. training about 150,000 head teachers, teachers and curriculum support officers to capacitate them on the methods of online and distance learning;
4. providing support for students needing online-based psychosocial support.

4.1. The digital divide and vulnerable groups – before and during the pandemic

Kenya's strategy for the continuation of teaching and learning during COVID-19 focused extensively on groups considered to be vulnerable. Their strategy refers specifically to the conditions determined by physical, social, economic and environmental factors or processes, which increase or contribute to the susceptibility of a community to the impact of hazards. A vulnerable group is therefore a population that has some specific characteristics that make it at higher risk of falling into poverty than others living in areas targeted by a project.

Many factors contribute to vulnerability in different communities. The identities and cultures of vulnerable and marginalised groups (VMGs) are inextricably linked to the land on which they live and to the natural resources on which they depend. VMGs are often poorer than others within their communities, their rights not always respected, and they are often excluded in development or other participatory planning processes. Consequently, members of these communities often feel excluded. These distinct circumstances expose VMGs to different types of risks and levels of impacts from development projects, including loss of identity, culture, and customary livelihoods, as well as exposure to disease (minorityrights.org). Moreover, gender and intergenerational issues among these are complex. Annex A contains the links to plans that were necessary to address the general learning and social challenges of the different VMGs who by their definition constitute the "digitally have-nots".

As Odongo & Rono (2017, 2021) explain the concept of the "digital divide" in Kenya and argue that while it places emphasis equal access to specific types of ICT technologies, the concept is mainly focused on "media and technology", and as they put it "reducing the social complexity to the virtual binary" thus stratifying the population into "information-haves" and "information-have-nots". The gap exists between those who have effective and efficient access to digital technology but this cannot be understood without understanding the intersections of economic, political and social conditions and how these impact the digital and culture divide in Kenya. The intersections influence the use of electronic information and communication tools among individuals resulting in layers of digital poverty. These authors argue that Kenya's half decade of political independence ought to have closed the digital and culture divide gap, but rural and marginalized communities still experience layers of poverty including "information poverty" which give rise to differing patterns of technology adoption, usage, and skills. As they argue Odongo & Rono (2017):

Inequality in ICT access, use and skills reflects pre-existing inequality in other areas of [Kenya's] economy and society. The ICT sector in Kenya is more active in urban areas, resulting in wide regional disparities in the distribution of ICT facilities. Despite the high overall diffusion rates of ICT in Kenya, there remains a clear digital empowerment gap in access and use between various demographic groups. Household income, education and gender are the key determinants of existing digital inequality.

Mutegi (2020), in considering the digital divide, argues that Kenya needed to make contingency plans for the COVID-19 pandemic after years of impressive improvements in educational outcomes. The addressal of the digital divide should have started before the pandemic. In a study extrapolating the data from the Kenyan Integrated Household Budget Surveys (KIHBS) of 2005/2006 and 2015/2015 as well as Kenyan Census data of 2009 and 2019, it was found that apart from access to a radio (of which there were shortages), there were huge disparities in terms of access to all other ICT facilities. It was for this reason that Mutegi (2020) commends the use of radio (either stand-alone or in-built in mobile phones) as the modality of choice for teaching and learning whilst the roll out of electricity to enable ICT integration was being fast-tracked. The views expressed by Odongo & Rono (2017), and Mutegi (2020) resonate with those of the various respondents referred to in Part 2 of this study.

ICT integration has long been the vision of the government of Kenya leading to the establishment of The National ICT Policy for Education and Training with Vision 2030 aiming to create an e-enabled and knowledge-based society providing ICT to schools by 2015. In addition, Mutegi (2020) reports on the low ICT skills of the workforce, stating that even where ICT infrastructure has been put in place this was not fully utilized because most teachers lack the necessary ICT competences. This gap was confirmed by the Ministry of Education's (2019) evaluation of the Schools' Improvement Program (SIP) which draws attention to the fact that National ICT Policy on Education (2006)⁵ has not met its ICT implementation goals – as was revealed after the onset of the pandemic.

The ILO⁶ (2021) refers to the role of the Kenya Institute of Curriculum Development (KICD) played in adopting technology-based remote teaching and learning approaches and points to the challenges of teachers being unprepared and lacking the requisite technological competencies. Over time, both primary, secondary and even some private schools had to halt teaching as the use of ICT was not achievable.

Mutegi (2020) argues that Kenya's education infrastructure does not have the capacity to effectively deliver and sustain online teaching and learning, particularly for those in rural areas with the worst affected being VMGs. For instance, Mutegi (2020) points out that the radio and television lessons introduced during the pandemic were not accessible to all learners as radios were not fully available. Kenya has used the radio to transmit audio lessons since 1963 through the national broadcaster (then the Voice of Kenya). However, as the National Census (2019) shows, access to radio is a challenge for many households since approximately 56.9% of households do not have a radio. The National Census (2019) furthermore shows that only 40.7% of households have access to television which meant, during the school closures, that the KICD-developed television programmes were not

⁵ Ministry of Education, 2008. About the ministry. The Government of Kenya (2005). Sessional Paper No.1 of 2005, a policy framework for education, training, and research. Nairobi: Government Printers.

⁶ Barasa, P. 2021. Digitalization in teaching and education in the context of COVID-19: Kenya Digitalization, the future of work and the teaching profession project with GIZ: ILO: Geneva.

accessible to 59.3% of households in Kenya. Moreover, Mutegi (2020) estimates that fewer than 30% of rural households own a television.

Mutegi (2020) further argues that these challenges have led to learning losses and deepened inequalities in education. Around 17 million students and more than 320,000 teachers were affected by the closure of 30,000 primary and secondary schools in 2020, and COVID-19 crisis response interventions including airing radio lessons through local FM stations to increase reach and to distribute the KICD radio lessons timetable especially in the lake zone and coastal counties, and in Kibera and Kayole (informal settlements in Nairobi County). Efforts to provide remote learning revealed a significant digital divide. This was starkly revealed with more than half of all students excluded due to lack of appropriate electronic devices, access to electricity and internet connectivity.

This raises the need for massive infrastructural development – from the rollout of electricity to ensuring greater access to ICT – more especially computers/laptops and connectivity to schools and households. The Piper et al⁷ study on the PRIMR and Pupil E-Readers and teachers' tablets showed positive results arising from amongst other learners having their own devices rather than relying on school computer laboratories. Other countries in Africa (including South Africa) have found laptops and tablets to be of benefit and offer examples for how they can be maintained on site and protected from theft.

The Kenyan National ICT Policy of January 2006 emphasized incorporating ICTs in education. The Kenyan government's Jubilee Manifesto and Vision 2030 (Republic of Kenya, 2007), as well as the NESSP, advocate for the integration of ICT in education (see Kenya's ICT Policy and NESSP). The ICT policy in education emphasizes the curriculum and professional development, and the investment program No. 25 in the National Education Sector Plan (MoEST, 2014) focuses heavily on improving learning outcomes through ICT.

Despite interventions made in Kenya, the COVID-19 pandemic has starkly highlighted the inequalities in access to the internet and digital technology. While the ITU shows an increase in the numbers of internet users in Kenya, as discussed above, the digital gap in Kenya persists and reflects pre-independence disadvantages which intersect across class, gender, age and location with ruralness and remoteness being significant barriers.

The findings of this study, as discussed in the subsequent section of this report reveal how the digital divide is exacerbated by distances from towns and cities and is therefore acute in rural and remote areas that the lack of infrastructure such as electricity, with low or no internet connectivity and where it is available, is too costly to use. The findings also suggest that the digital divide as intersecting with disability and hence the challenges faced by learners with disabilities.

Digital inequalities, as shown in the latter section of this study, the digital divide was starkly revealed by the closure of education institutions during the Covid-19 lockdowns. With high data bundle costs, Kenya, despite being the Silicon Savannah, the country has a vast digital divide.

⁷ Piper, B., Jepkemei, E., Kwayumba, D., & Kibukho, K. (2015). Kenya's ICT Policy in Practice: The Effectiveness of Tablets and Ereaders in Improving Student Outcomes. *FIRE: Forum for International Research in Education*, 2(1). Retrieved from <http://preserve.lehigh.edu/fire/vol2/iss1/2>

According to the Kenya 2019 Census, 44.4% of those aged 25 - 34 had used the Internet in the previous 3 months but in Busia, the usage was only 32%. Moreover, those without electricity or residing in areas with no network faced learning challenges.

Intersections of class, age, gender or residential area and disability posed serious

The COVID-19 pandemic has directed attention to this divide. It would be a mistake for governments not to address these inequalities.

4.2. COVID-19 ICT interventions to mitigate school closures

The following COVID-19 mitigation strategy was proposed with all interventions supporting Kenya's long-term vision for the integration of ICT in education includes the following:

- Revamp KICD through broadcasting equipment,
- Explore the possibilities of providing Radios and TVs to targeted schools,
- Provide offline resources such as textbooks, study guides and equipment to learners from poor, marginalised and vulnerable households
- Establish partnerships with service providers to provide network coverage in learning institutions including those in marginalized and remote areas to support digital learning
- Encourage partnerships to establish regional toll-free call centres
- Liaise with relevant agencies for zero rating of e-learning platforms and devices including school programs transmission for schools and education stakeholders to easily access online materials
- Build the capacity of MoE, KICD and officials in relevant areas including on alternative delivery modalities to be able to support continued learning
- Activate ICT champions in all schools and school clusters to guide, advice and monitor digital delivery of the curriculum among all learners.
- Develop partnerships to equip select community centres in informal settlements with technology to deliver digital content.
- Provide alternative power sources such as solar where main grid power is not accessible
- Explore possibilities of providing hardware, software and data access to field offices/officers to strengthen their capacity for emergency response and to match the new dispensation.
- Liaise with relevant agencies to control internet and protect digital or online implementation from cyber bullying and to ensure integrity of the content accessed to learners
- Publish the link to the Kenya Educational Cloud
- Establish an online M&E platform for learners and teachers to provide feedback on online/Radio lessons
- Strengthen the Ministry ICT Platform to enable teleconferencing and Virtual communication
- Develop an ICT platform for MoE field officers to be able to access and monitor the online learning programs and emergency initiatives.

4.3. Improving teachers' pedagogical ICT knowledge

There is a growing awareness, however, that providing hardware is insufficient to yield the desired educational reforms. The government is now focusing on improving teacher skills and pedagogy as

the key to the effective implementation of ICT to enhance teaching and learning, and eventually improving quality of education (see Piper, 2015).

One such initiative is the African Digital Schools Initiatives in Kenya – a programme aimed to harness the potential of ICT to enable learners to access quality learning especially in the area of Science, Technology, English and Mathematics (STEM) subjects. However, the use of ICT-driven learning also aims to tackle Kenya’s need for employment both through developing entrepreneurial skills and so that learners can take up the opportunities for self-employment in the digital space as well as critical 21st century skills for creativity, innovation, team work and higher order cognitive skills for analysis, synthesis and application of knowledge. Schools which form part of the ADSI school project benefit from the successful integration of ICTs across all areas of the school (administration, research and learning) with a specific focus on improving the quality of teaching and learning in STEM subjects (GESCI <https://www.gesci.org/our-work/african-digital-school-initiative-ads/kenya-2016-2020/>).

Despite the recent policy reforms, use of ICT is limited particularly in basic education where most schools are rural. The Piper study makes a case for the durability and versatility of handheld devices, such as tablets or smartphones, rather than personal computers.

The UNESCO Guidelines⁸ suggest the use of low-cost devices for use in education. When considering the use of ICT in education settings, planners too often focus on expensive ‘cutting-edge’ ICT when low-cost technologies in low resourced settings. These included systems built for use on basic mobile phones (‘low-bandwidth’), and systems with strong offline functionality (‘no-bandwidth’).

Moreover, with the high costs of connectivity, the telecoms need to work with education. Zero-rated data connectivity for accessing, using, downloading content from educational websites should be free of charge and the internet data consumed by accessing these websites should be excluded from charges and monthly data caps. This requires the telecom sector and other concerned agencies to create a list of websites to be automatically exempted from billing.

That the workforce needs to be capacitated on the integration of ICT goes without saying but it is reiterated, that the educators should not be expected to become the digital design technicians. Teachers cannot develop digital ICT content. However, teachers can develop written textual content, but the digital content will need to be digitised and made interactive and loaded onto learning platforms or on clouds for teachers. The Kenya Institute of Curriculum Development, traditionally a prestigious institute for curriculum and materials development, could be resourced and capacitated to play a role in leading the development of national e-materials for national use.

As mentioned above the COVID-19 response focused on mobilizing funds and support from education partners, including the Global Partnership for Education (GPE). In late March 2020, the UNICEF Kenya Office was provided with a GPE grant of US\$140,000 to support the Ministry of Education, Science and Technology in planning its response to the pandemic. The World Bank also granted GPE, which had made an accelerated funding request, US\$11 million for the period 15 June 2020 to 31 December 2021 to assist with the pandemic response. The GPE and World Bank-funded COVID-19 Learning Continuity in Basic Education project aims to:

⁸ UNESCO 2022. Guidelines for ICT in education policies and masterplans. ISBN 978-923-100518-3; <https://education.go.ke/index.php/downloads/file/797-ministry-of-education-covid-19-guidelines>

- expand access to and delivery of online content to all students in basic education through radio, television, e-cloud platforms and mobile phones;
- train teachers and curriculum supervision officers in distant teaching methodologies;
- develop an integrated monitoring and evaluation system for remote learning interventions;
- bring parents and caregivers on board to monitor student learning;
- build the capacity of ministry of education officials to conduct virtual meetings during the COVID-19 period and beyond (globalpartnership.org).

The Ministry of Education, Science and Technology, working through KICD, and Microsoft are planning to produce voice recordings of educators in science, technology, engineering and mathematics to be distributed through available technologies to promote continuous learning of the sciences. US\$700,000 was assigned for this activity. KICD developed digital health literacy content in April 2020 on the COVID 19 and a digital guide on how to access this content on the established Kenya Education Cloud (e-cloud) (UNESCO 2020).

- Kenya already meets the requirements as a GCI adopter.
- The country needs to ensure digital devices are available to educational institutions per student.
- Schools to have robust wired and/or mobile internet access (with possible offline work at home).
- There is a need to assess and audit for the existence of a usable subject curriculum already covered by other online courses.
- Commence with development for materials not available – in a phased manner starting with compulsory subjects.
- Ensure that the workforce develops basic digital skills.
- Explore the use of social media and conferencing apps) in teaching and learning.
- Upgrade policies to align with new practices in terms of ensuring inclusive and equitable access, fairness of access, data privacy and security, etc.
- Increase access to online teaching and learning materials and distance learning programmes.
- Uninterrupted radio and TV curriculum lessons should be provided for basic education during the emergency and post COVID -19 and broadcast across the country, including in remote and insecurity troubled regions.
- Human resources need to be capacitated for effective and efficient response to COVID- 19, recovery and future outbreaks.

4.4. Opportunities to be capitalised upon

There are many advantages that Kenya can capitalise upon: The country now has a permanent Education in Emergencies (EiE) Working Group led by the Ministry of Education with 35 members from the UN and NGOs. As soon as schools were closed, an EiE plan was developed which included continuity of learning, coordination and data collection, communication, monitoring and evaluation, and preparation for schools re-opening. In the recent years, Kenya has made investments in improving quality and learning outcomes at all levels of basic education. These investments and the gains made during the pandemic need to be consolidated and utilised for continued curriculum delivery.

As mentioned above, there are approximately 3.2 million pre-primary, and 15 million learners in primary and secondary schools in Kenya; and close to 150,000 refugee learners (Covid-19 Strategy). The Ministry of Education, has therefore, found it necessary to increase measures to facilitate learning by enhancing curriculum delivery through four different platforms: Radio, TV, Kenya Education Cloud and YouTube. The platforms provide learners with out of classroom learning experiences and are aligned to the school calendar.

The Kenya Education Cloud hosts interactive digital content including radio lessons, textbooks for all levels, and online courses for teachers on curriculum implementation and on the use of ICT in learning.

In the area of Quality Assurance, the Ministry continues to assure quality of programmes on TV, radio and online through development of online and offline monitoring tools for head teachers and Principals, development of guidelines for Head Teachers and Principals on learning through radio, TV and online content and mechanisms for communication with all stakeholders. All the COVID-19 interventions were aligned with the National Education Sector Strategic Plan (NESSP) 2018-2022 and other policy and legal requirements.

4.5. Continuation of ICT modalities post-COVID-19

Given the investments made and the innovation arising from the pandemic, it was recognised that there is a need to build the Resilience of Broadcasting of Education Content and to continue providing e-learning platforms during and after the crisis to ensure all learners can access e-content. The following proposals refer specifically to the role of ICT:

- Provide Radio and TV live broadcasts on a timely and predictable manner for continued learning, including broadcasting through community radio channels.
- Strengthen the Kenya Education Cloud at KICD so that teachers and learners can access digital content.
- Install supervisory, control and data acquisition technology to support virtual learning.
- Provide live streaming of model lessons for peer learning and continued improvement in delivery of content.
- Build capacity of teachers on interactive remote learning methodologies.
- Support decentralised access to connectivity.
- Establish a remote tutoring service for learners and teachers to access remote learning opportunities.
- Establish linkages with line ministries to ensure provision of electricity in rural areas and centres of mobile charging units to avail charging of gadgets in areas not covered by the grid.
- Leverage on the Digital Literacy Programme at school level to continuously provide e-learning content during and after emergencies and crisis in Kenya, also explore use of Smart Boards
- Develop appropriate digital learning activities in response to COVID-19 for improved learning outcomes.
- Support home-based learning and power boosters to ensure wide coverage of learning.
- Share education content in local and minority languages including sign languages using captions, audio provision and graphics with increased screen space for the TV interpreter to support the hearing impaired.

The production of learning-continuity programs which included radio and TV broadcasts, and online lessons, and the provision of resources such as radios, textbooks, study guides and equipment was rapidly put in place. This was accompanied through free call-in numbers for asking questions, or through establishing a remote tutoring service using toll free numbers at a local level in preparedness for potential future school closings. It also included continuing professional development programmes to build the capacity of teachers to deliver the learning material through alternative delivery modalities and to assist with the preparation for the reopening of school. The use of the mass media played an important role in this regard.

5. ICT IN EDUCATION READINESS

While many gains have been made in ensuring the continuity of education during the pandemic, there are readiness problems that need to be addressed.

5.1. Electrification

The lack of electricity at pupils' homes mitigates against the country's ICT policy and its commitment to achieving Sustainable Development Goal 7 of ensuring universal access to affordable, reliable and modern energy services for all by 2030. As the chart shows the proportion of pupils with access to electricity at home is low and will be an impediment to implementing ICT in education. This is a 2017 figure and more recent figures may give a new perspective (SACMEQ, 2018)⁹ which draws on a representative sample of learners across schools in Kenya:

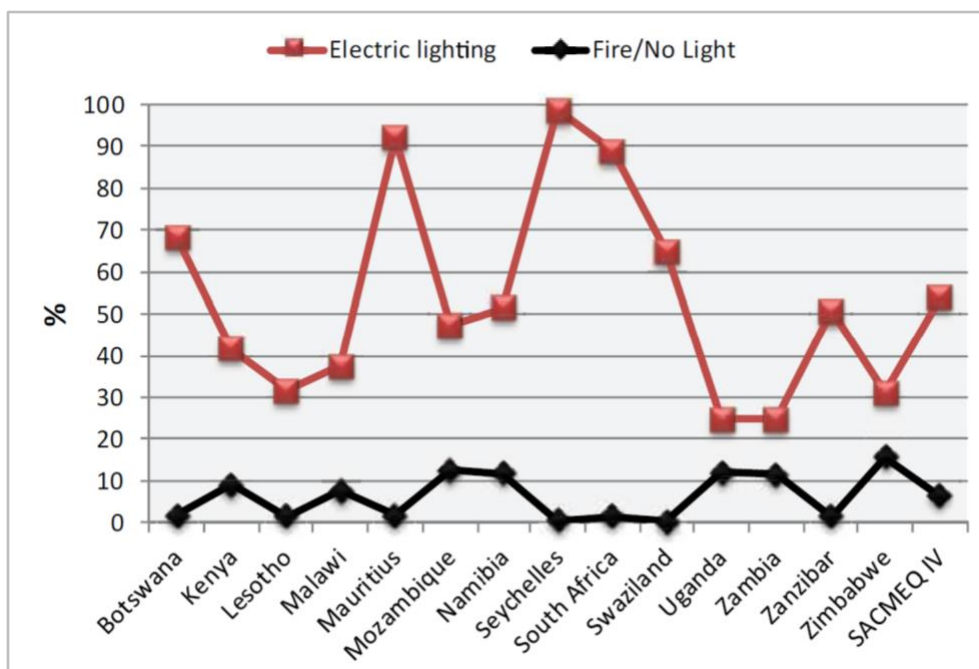


Figure 9: Distribution of learners with access to electricity at their homes

Source: Kenya, MoE, SACMEQ (2018).

⁹ Department of Educational Planning and Research Services, Research Unit. SACMEQ 2017.

5.2. Digital lesson availability

The Kenyan Institute for Curriculum Development has the potential for being capacitated to develop national courseware. The number of schools and the high number of learners can provide the basis for economies of scale and for curbing costs thus making the system more efficient. To make this possible, the African Digital Schools' Initiative (ADSI) offered a comprehensive programme for implementing digital school development in secondary schools in order to transform secondary schools into modern ICT-enhanced digital schools and Digital Schools of Distinction. The resources, as discussed earlier in this report, were developed by teachers in the ADSI programme for use by students in secondary schools. The content topics were discerned through the identification of "Difficult to Teach" and "Difficult to Learn" Concepts drawn from the secondary education curriculum in Kenya. <https://oer-studentresources.gesci.org/>

The presentation of the ADSI materials made blended learning a possibility, and if more broadly used this may further expand equity and quality learning in the country (GESCI).

The SACMEQ report shows very low rates of computer and television use in the representative sample of schools whilst the use of radio was almost ubiquitous. More recent statistics since the onset of the pandemic need to be provided.

Table 12: Resources available in a representative sample of schools

Equipment	SACMEQ III		SACMEQ IV	
	%	SE	%	SE
First-aid kit	33.9	3.7	51.1	4.03
Fax machine	1.1	0.7	1.3	0.69
Typewriter	19.8	3.0	10.5	2.24
Duplicator	14.7	2.7	7.1	1.64
Radio	89.4	2.3	57.8	4.30
Tape recorder	13.9	2.6	5.1	1.40
Overhead projector	0.6	0.4	4.2	1.47
Television set	8.0	2.1	8.6	2.07
Video-cassette recorder	4.5	1.5	5.9	1.78
Photocopier	3.5	1.2	11.0	2.35
Computer	11.4	2.1	19.7	3.08
Website	1.5	0.8	7.5	1.82
CD Player	2.1	0.8	6.2	1.82
Clock	91.0	2.2	86.3	2.51

Source: MoE, SACMEQ Kenya (2017).

As shown in the SACMEQ analysis, in 2017 only 19.7% of schools had computers. Indeed, there was some improvement in many of the categories in SACMEQ IV compared to SACMEQ III. At least 7.5%

of the sampled Standard 6 pupils were in primary schools with a website, which is an important development. There was a notable increase in the percentage of pupils in schools with electricity from 22.7 in SACMEQ III to 43.4 in SACMEQ IV. As the SACMEQ report states: “Given that a link was found between computer use and improved achievement, schools should be further encouraged to set up ICT facilities for teaching and learning”.

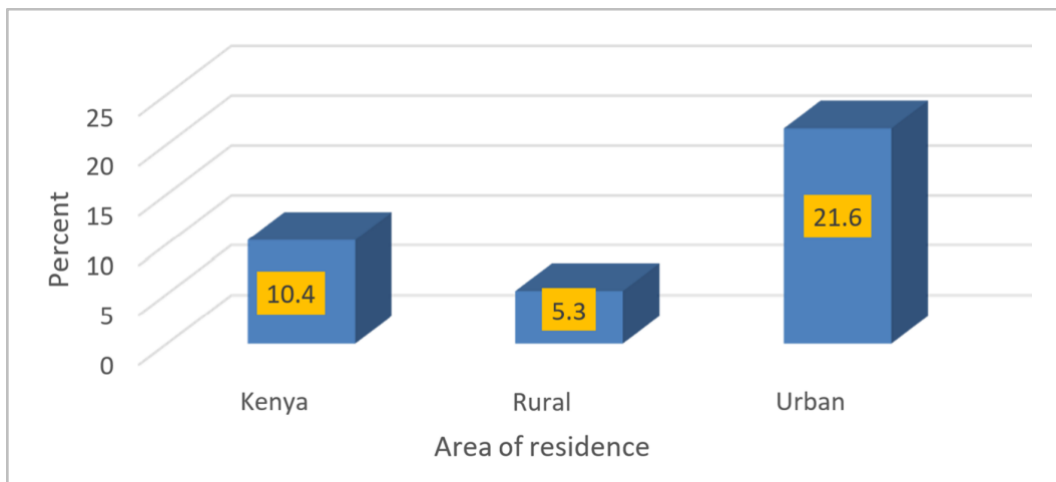


Figure 10: Proportion of households with access to internet connectivity¹⁰

Source: Kenyan Census data (2019).

The Kenyan Household Census data (2019) show that only 13.4% of poor households have internet connectivity and 36.2% of non-poor households with 5.3% of rural households owning a computer as opposed to 21.6% of households in an urban area. The national average as per the 2019 census data was 10.4%. This implies that around 90% of households in Kenya have no computers.

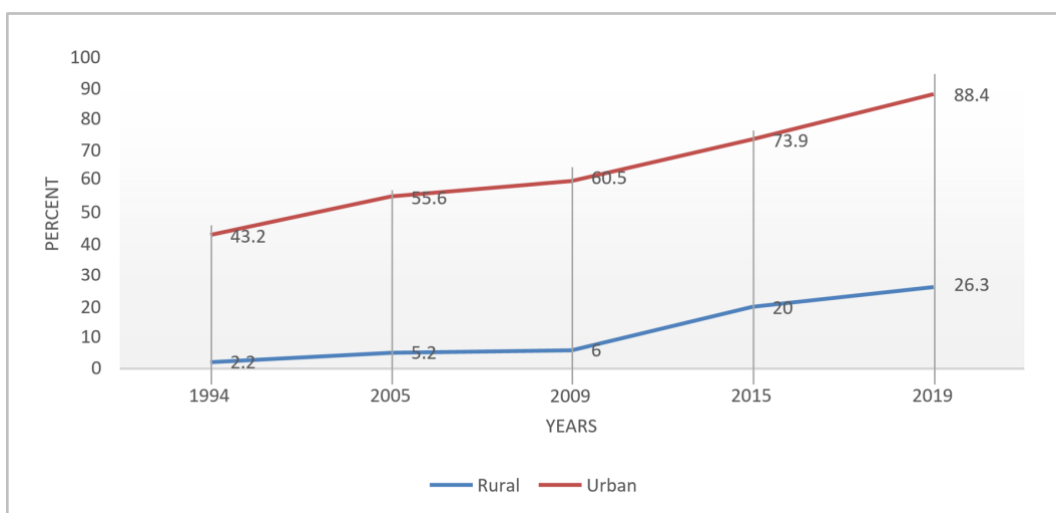


Figure 11: Proportion of households with access to electricity by area of residence

Source: Kenya Household Census data (2019).

¹⁰ Figures 10 and 11 are recreated by Mutegi (2020)

The Digital Literacy Programme in Kenya

At its inception, the Digital Literacy Programme aimed to integrate ICT into teaching and learning in all public primary schools in Kenya. In order to do this, the programme undertook to improve the ICT infrastructure; to develop digital content; to offer capacity building for teachers and to procure ICT devices. Phase 1, which ended in June 2019, was themed “*Learning to Use*” and focused on exposing teachers and students to user-friendly technology. Phase 2, which was initiated in July 2019, was themed “*Using to Learn*” and focused on setting up shared digital learning resource centres in schools with appropriate infrastructure and tools. Phase 3, yet to be initiated, is themed “*Using to Produce*”, and will focus on using technology to create and innovate, including toward employment creation.

In the early stage of the programme, 150 primary schools were supplied with devices, over 63,550 teachers were trained on ICT integration and 1.2 billion Kenyan shillings were disbursed for infrastructure. As of 2018, 22,675 public and private schools were connected to an electricity supply to support the programme and digital content was developed for classes 1, 2 and 3. Overall, 80,980 teachers benefited from digital learning training. In the classroom, teachers have observed changes in the learning of their students, with digital devices increasing student attentiveness and allowing them to experience learning in practical and fun ways. It has also reduced absenteeism and increased admissions in schools. In addition, the development of teacher capacity in the use of ICT has led to collateral enhancement of ICT capacity in communities.

In terms of ICT infrastructure, several challenges to its implementation have been recorded: battery failure for those relying on solar power; high power bills; need for technical maintenance of facilities and provision of first-line support; lack of internet connectivity; lack of data on connectivity; inconsistent connectivity; destruction of telecommunication installations in areas prone to internal conflicts and border insurgencies; theft of tablets and computers; and lack of secure storage for ICT equipment.

Source: Government of Kenya, *Education Sector Report (2018)*; Government of Kenya, *Third Medium Term Plan 2018–2022: Transforming Lives: Advancing Socio-economic Development through the Big Four, 2018*.

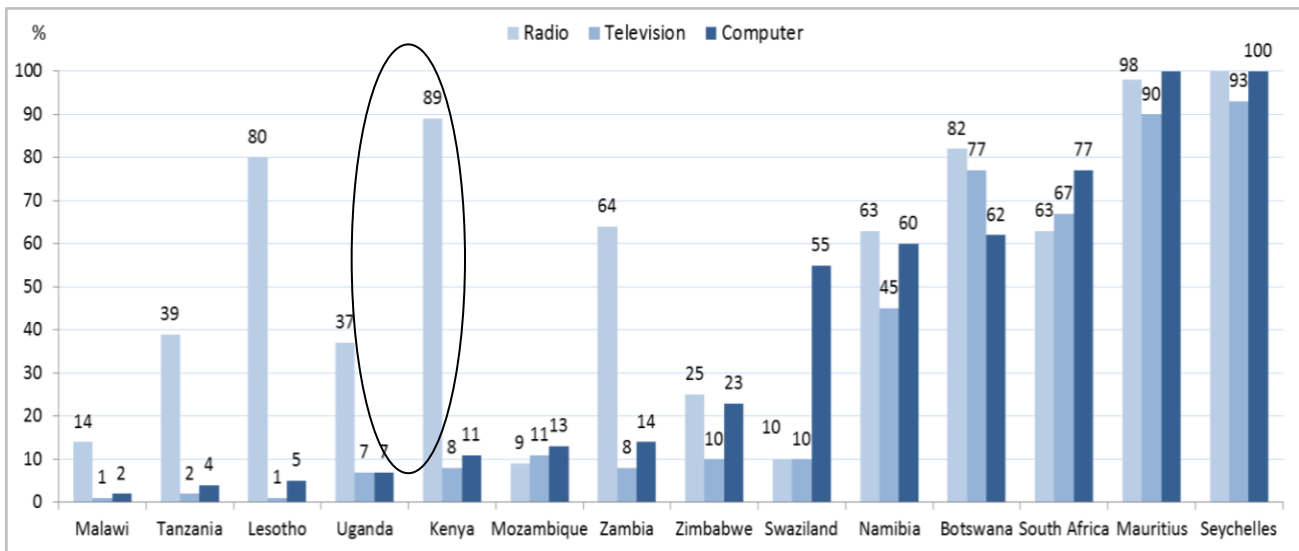


Figure 12: Proportion of Grade 6 pupils in primary schools with radio, television and computers, by country (2007)

Source: Hungi et al., 2011.

While the above figures date back to 2007, what this chart shows is the very low baseline of TV and Computer access among learners in Kenya.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. SWOC Analysis

The following SWOC analysis based on the findings of the literature review. Section 22 below offers a further elaboration of the SWOC based on in the findings of the primary research where the views of learners, educators and officials are expressed as aligned with a SWOC analysis.

6.1.1. Strengths

The country has immense political will to improve the sector. Education is regarded as the key enabler for the Sustainable Development Goals, specifically those aimed at gender equality, poverty eradication, good health and well-being, decent work, and economic growth.

The Education Sector Policy framework is committed to the provision of quality education, training, science and technology, and to the building of a just and cohesive society that enjoys inclusive and equitable social development.

A competency learner centred curriculum is being developed to straddle the system with a view to developing citizens who value education as a lifelong process, economic growth and better employment opportunities. Competency based learning lends itself to ICT enhanced learning.

The latest World Bank economic analysis for the country highlights the success of education reforms in Kenya, indicating that the country has embarked on ambitious reforms to address the quality issues

and has achieved “near-universal access and coverage”. Primary education in Kenya is compulsory for all children of 6-13 years. "The education system is expanding to accommodate more students, especially in pre-school and post-primary education." (“The World Bank lauds Kenya’s education sector gains”).

6.1.2. Challenges

In terms of ICT infrastructure, several challenges to its implementation have been recorded: battery failure for those relying on solar power; high power bills; need for technical maintenance of facilities and provision of first-line support; lack of internet connectivity; lack of data on connectivity; inconsistent connectivity; destruction of telecommunication installations in areas prone to internal conflicts and border insurgencies; theft of tablets and computers; and lack of secure storage for ICT equipment.

Kenya has huge regional inequalities in all education outcomes with high attrition rates and very low learning outcomes particularly in the north and northeast of the country, in arid and semi-arid areas. Education outcomes are much lower in rural areas and for lower income populations. (*Lessons from Kenya’s Education Reforms – World Bank*) Moreover, the net enrolment rates are significantly higher in pre-primary, primary and secondary education, for children from households in the top 20% of income distribution, when compared to the bottom 20%. (“School reforms push Kenya past peers, catches eye of World Bank”).

The system needs to focus on equity and efficiency in resource use as the school system prepares to expand to accommodate more students, especially in pre-school and post-primary education. According to the World Bank¹¹ continued and accelerated improvements in the sector will depend on:

- Adequate resources to achieve sector objectives and implement ambitious reforms by protecting spending in the short-term.
- Prioritising and mobilising additional resources in the medium term.
- Ensuring that resources are allocated more equitably, particularly development spending, teachers and school capitation grants.
- Exploiting whatever relevant data is salvable to ensure more effective management, particularly at the local level, as well as improving coordination and reducing the fragmented management of the sector¹².
- All teachers will need to be trained en masse if the vision of ICT in Education is to be realised. This will require that teachers reskill and learn ICT pedagogies (www.worldbank.org).

6.1.3. Opportunities

The country has accelerated ICT in education, and this has provided the foundations for online and ICT processes especially in the wake of curriculum reform and the implementation of the competency-based framework across the system.

It is necessary that the system caters for those learners who are not currently reached. Expansion of learning opportunities by way of distance education will enable the system to reach refugee camps

¹¹ *Lessons from Kenya’s Education Reforms – World Bank*.

¹² <https://www.worldbank.org/en/country/kenya/publication/lessons-from-kenya-s-education-reforms> June 7, 2021.

and other children out of school. The integration of ICT in education can improve equity in the system, improve quality and reduce costs through economies of scale.

6.1.4. Weaknesses

- Lack of ICT infrastructure in schools.
- Lack of electrification.
- Lack of financial means.

6.2. Partnering with the private and non-state sector

Many successful partnerships were established and activated during the pandemic resulting in the permanent establishment of the Emergency in Education committee comprising of state and non-state partners. These partners should be further utilised in a coordinated way to avoid duplication in order that they can provide services and solutions that are sensitive to the socioeconomic realities of the country. Kenya has worked with many partners who have provided technical and/or financial support to the system. Part 2 of this study presents a further analysis of partners who may be drawn upon in the country realising its ICT policies in education.

The following partners have been reflected in the literature:

6.2.1. Partners involved in ICT and Digital materials provision

The review of the literature refers to a number of partners who are active in the field. These are listed hereunder, however, a full table of partners and their roles is included in Section 22 as identified during the primary research:

- Public Universities.
- Global Partnerships in Education.
- UNESCO.
- Kenyan Institute for Curriculum Development (KICD) which has played a major role in text-based materials development as well as radio and TV broadcast programmes.
- Reference is made in some of the documentation to the possibilities of working with China. This needs to be explored as one of the gaps during the primary research phase.

6.2.2. Research, monitoring and evaluation

- British Department for International Development.
- International Labour Organisation.

6.2.3. Health and social services

- World Food Programme.
- World Health Organisation.
- UNICEF.
- United Nations High Commissioner for Refugees given the number of refugee camps.

6.2.4. Partners involved in infrastructure and cloud-based solutions

- CISCO.

- Microsoft.

7. LIMITATIONS AND GAPS TO THIS STUDY REQUIRING FURTHER RESEARCH

- With the excellent policies in place, primary research would enable the determination of progress made and the way forward in terms of implementation. This will entail a determination of obstacles and proposed solutions for overcoming these.
- The Ministry would be required to provide implementation plans and strategies for inclusivity and how vulnerable and marginalised students and learners are included in the proposed ICT strategies.
- There is clearly a need for the county to participate in decisions on what funding and resources would be needed to enable the country to progress in terms of implementation across the various subsectors of schooling and post-schooling regarding the requisite infrastructure needed for management, record-keeping monitoring as well as learning assessments.

8. RECOMMENDATIONS

8.1. The utilisation of OERs and MOOCs across the various subsectors

While the utilisation of OERs and MOOCs have not been mentioned as part of the reform strategy, these can be used to improve quality and more especially given the lower rates of staff in universities with PhDs and low teaching abilities. The use of OER materials will help in the provision of quality alternatives for teaching and learning and consequentially to expand access to educational resources; reduce the cost of textbooks; and help enhance access to quality knowledge repositories for learners, teachers and researchers also offers opportunities for supplementing face-to-face learning. Since they are free, they offer many affordances for low-income countries and for low-income learners, providing free access to knowledge, which can be reused and repurposed.

- Both local and international contents and online learning resources should be sourced and developed relevant materials should be made available for institutions across the educational subsectors.
- Promote and encourage the design, development, acquisition and hosting of indigenous content.
- Facilitate data and content sharing among educational institutions.

This will require the development of OER policies, funding and the establishment of materials development units or partners to adopt or adapt OER/MOOC materials for core learning in all education subsectors as well as for Continuous Professional Development (CPD) of all educators.

The resource development should ensure possibilities of remixing OERs and MOOCs with national curricula.

These digital materials can be deployed to widen access and improve quality and should be developed in conjunction with users and expertise.

8.2. Considering the youthful demographics

The youthful population will require expanded access to quality education, especially in Pre-primary education, expanding access to primary and secondary schooling, TVET and HE and for ensuring inclusivity of learners with disabilities, girls and out of school youth. The paper points to the growing demographics of young people (1 – 14 years; 15 – 24 years), and the number of out of school youth and the increasing unemployment rates. These numbers are bound to escalate because of the impact of the pandemic and the high numbers suggest the potential for an increase in the demand for education across the sector and a consequential need to pronounce on the expansion of the system.

8.3. Realigning policies

As the report outlines, there has already been substantial growth and improvements in terms of access to schooling with an expanded focus on improving equity and quality. The COVID-19 pandemic - has accelerated the adoption of digital forms of learning across the education sector, moving beyond the envisaged implementation of the national policies. It is likely that blended and hybrid learning, and structured online programmes will increasingly be used post-COVID-19. Policies will therefore need to be upgraded in line with current practices.

As discussed in this study, the major challenge and way forward for the education sector includes building resilience and ensuring education continuity by enabling educators to conduct distance education and online teaching. This entails that all students have necessary tools to follow online classes; as well as intensifying online teaching and learning through collaborative platforms and improving the Online Learning Management System of the Higher Education Institutions. The ushering in of the new competency-based curriculum (CBC) will provide the impetus for introducing new modalities.

Increasing remote learning provision and the introduction of ICT across the sector

More work needs to be done to address the digital divide and changing world of work to provide equitable opportunities for lifelong learning and skills development. Taking advantage of the ODL solutions to expand the accessibility and quality of the educational systems to various vulnerable groups of learners, including people with disabilities and girls.

The increasing youth demographics make it imperative to provide young people with skills, growth, and employment opportunities, and ODL offers a more affordable way of expanding provision than traditional education modes. Many countries have responded to the growing demand for higher education by investing in ODL, recognising that this mode of delivery brings the advantages of flexible, continuous and lifelong learning and a cost-effective means of increasing access to education.

This will require the Government to make available the necessary infrastructure, facilities, for harnessing the use of ICT for high quality accessible education.

Funding – both national and international – will need to be budgeted for. Policies and budgets should consider initial, reoccurring and maintenance costs.

8.4. Appropriate modes of ICT: fit for purpose

Mobile penetration has increased tremendously and therefore provides a huge potential for use in teaching and learning.

Since radio (standing alone or when in-built in mobile phones) is widely accessible by most of the learners both in rural and urban areas, the learning institutions, KICD should transmit e-learning programmes using radio programs to promote equity in access to e-learning programs in the interim until the infrastructure is in place.

The paper also recommends that the government of Kenya needs to provide e-learning facilities such as electricity and internet to all regions to promote the use of internet-supported applications such as Microsoft teams, google meet, google class, Zoom, and Webinar among others to enhance interactive e-learning programs to all learners across the country.

Mobile technology offers the affordances of a wide scope for research and data collection, sharing best practice, motivating and reminding learners and teachers, for enabling administration, collecting data from learners/teachers/ schools, for giving schools or learners feedback. These uses need to be considered when planning appropriate resourcing and interventions.

TVET has a central role in addressing these developments through the transfer of knowledge and skills. In recent years, and more specifically with the onset of the COVID-19 pandemic, there has been an increased focus on ICTs for the delivery of TVET. ICT is now considered by many governments as a critical component of a responsive, demand driven TVET system tasked with meeting the needs of trainees/students for more flexible individualized training. International organizations such as UNESCO and ILO had had already made commitments Kenya with regard to its use of ICT to deliver TVET in both formal and non-formal settings (unevoc.unesco.org).

8.5. Expanding digital materials through the development of OERs and MOOCs for use across the various subsectors

This will require the development of OER policies, funding and the establishment of materials development units or partners to adopt or adapt OER/MOOC materials for core learning in all education subsectors as well as for Continuous Professional Development (CPD) of all educators.

The resource development should ensure possibilities of remixing OERs and MOOCs with national curricula.

These digital materials can be deployed to widen access and improve quality and should be developed in conjunction with users and expertise such as the two Kigali Institute National units, the universities and with KICD.

8.6. Developing digital skills and new pedagogies for 21st century teachers

The introduction of digital skills and new pedagogies should not focus only on technology but also on the development of instructional methods and the ICT integration competencies of teachers. Educators require the knowledge and competencies to teach and guide students throughout the

learning process. To develop the digital skills of their learners and to evaluate and select the quality of knowledge to teach.

Changes in modes of teaching with the use of changed course materials and methodologies should be accompanied by changes in assessment approaches. Educators will require training in the development of such tools.

8.7. Addressing the challenges regarding education including for vulnerable persons

There is a need to upgrade infrastructure using universal design that can include learners with disabilities.

A gap between rural and urban areas on providing accessible and quality education for all making provision for physical access for persons with disabilities.

There may be a need for further modernization of educational policies in the field of education especially in relation to the use of ICT and ODL solutions.

9. CONCLUSION

Despite Kenya's massive educational sector reforms and the progress made in universalising education, this study shows that the interventions made in education during the pandemic faced many challenges with the digital divide being an acute factor that resulted in much of the population unable to access ICT facilities including radio, television, computer, mobile phones, internet, and electricity – all necessary to support e-learning. This finding was irrespective of the geographical location since high connectivity and device costs made connectivity and devices prohibitive. However, the digital divide was particularly acute among those living in rural and remote areas. As this study shows, the digital divide reflects pre-independence stratifications of disadvantage, intersecting with socio-economic status of households, geographic location, gender, age and ability. As this report concludes, education will need additional resources as the country continues to recover from COVID-19 in the context of fiscal consolidation and in terms of ensuring that the country is shock-proof and resilient.

Much work needs to be done in expanding infrastructure, ICT access and capacity towards ensuring quality and equity in education, especially in hard-to-reach areas. Moreover, the high illiteracy rate is indicative of school attrition, little or no schooling which is bound to increase as a result of COVID-19 learning losses and school attrition rates.

Currently Kenya has a very low digital penetration level which, as this study shows in Part 2, requires attention if Kenya is to achieve its pursuit of being a knowledge society. The next section of this report presents the findings of a primary research study, the data of which corroborates the findings of this desk review.

10. FINDINGS AND RECOMMENDATIONS FROM THE PRIMARY RESEARCH

This second part of the report, as a sequel to the literature review presented in Part 1, presents the findings and interpretations deduced from the primary research conducted as a component of the investigation into the integration of ICT in education. As mentioned in Part 1 of this study, this ADEA study is conducted as part of the larger study of 30 African countries (all of which are members of the Islamic Development Bank and the African Development Bank). This large-scale country study seeks to explore the use of ICT in education during a crisis with a view to providing actionable recommendations for the needed investment in digital infrastructure and curriculum development.

The specific objectives of the large-scale African study are to:

1. Gather information that will support the design of ICT-oriented education policies and strategies in the member countries.
2. Identify opportunities and challenges in the target country and its ability to harness and support the use of ICT across basic education (from pre-school to secondary school), and in the post-school sector including TVET and higher education.
3. Identify the curricula changes required for the adoption of ICT in the education levels mentioned above.
4. Enhance regional cooperation in digital education to improve economic competitiveness of Africa.

The Secondary and Primary data collection focused on the following aspects for all the education levels (basic education, TVET and higher education) in all the countries studied:

- Existence and level of ICT infrastructure.
- Existence and breadth of ICT policies and strategies.
- Level of digital competence of the workforce.
- Existence of cross-country e-education programs and challenges related to implementing e-education.
- The utilization level of ICT infrastructure in learning facilities.
- Challenges experienced in ICT implementation.
- Availability of ICT for learning.
- The ICT abilities and training needs of the workforce and the students.
- Partners currently engaged in supporting the use of digital technology in education and the areas of support in which they are engaged.
- SWOT analysis of the use of ICT in education.
- To gather experiences of good and challenging practices in the use of ICT in education.
- To identify critical needs and gaps in using digital technologies in terms of ICT and other infrastructure and pedagogic requirements.
- Prioritising needs for improving ICT in education.

11. METHODOLOGICAL APPROACH

This primary research component followed a mixed-methods research approach, which is often considered to be a “value-add approach” since it relies on the “mixing” of both quantitative and

qualitative methods, as well as secondary and primary data with the merged sources of data better able to respond to the research questions of a study.

The study utilised a mixed-methods approach conducted in two phases.

The first phase undertook a desk review and analysis of the relevant literature from government and institutional websites. The desk study also considered national and international studies that reviewed changes in the post-schooling sector after the onset of the pandemic.

The second phase entailed a questionnaire administered to a predefined sample. The investigation followed a “concurrent mixed” or “multi-methodological” approach, gathering and mixing qualitative and quantitative data and integrating these to offer a more nuanced understanding of the integration of ICT into the education sector in the target country, and to better understand the impact of the pandemic.

Mixed-methods research entails the gathering and merging of data from various sources and draws on the complementary strengths of the data sources to gain an enriched understanding. The approach used here relies on collecting both quantitative and qualitative data and mixing these against the backdrop of the broad literature review conducted for this study.

The approach takes advantage of “mixed-methods contingency theory,” which allows for the coexistence of quantitative and qualitative research approaches, enabling the researcher to answer questions from a number of vantage points and to fill in the gaps that emerge when one methodology does not provide all the information required. It is argued that the mixing of methods in one study can explore the research objectives and answer research questions from various perspectives.

This methodological choice is especially relevant to understanding and identifying both weaknesses (needs) and best practices, describing and explaining the interaction between contextual conditions, actions and education policy in order to understand the use of ICT in education before, during, and after the COVID-19 pandemic period, and to provide recommendations for the proposed investment in digital infrastructure, policy change and curriculum development.

11.1. Research design for primary data gathering

The previous section of this report entailed the collection of secondary data drawn from relevant literary sources. This review was conducted with the intention of providing a frame of reference for understanding the key issues, the countries’ priorities, challenges and experiences regarding ICT and remote learning based on the Covid-19 experience. The literature review also assisted in identifying research questions and informed the design of the primary data collection tools whilst providing a backdrop for the interpretation of the findings.

This latter section refers to the gathering of primary data sources to ensure a collection of comprehensive country-level data on the status, needs and gaps in the use of ICT in education and remote learning in the countries under investigation, in pursuit of understanding their use of ICT across the education subsectors before, during, and after the COVID-19 pandemic.

11.2. Country focal points

ADEAs appointment of regional coordinators and country focal points in each of the countries played a critical role in enabling access to the Ministries and to the various subsectors, to source relevant literature and administer the surveys and interviews in line three instruments developed for this study.

In this study, the ADEA consultant, Prof Veronica McKay was accompanied by Ms Linet N. Makori from Kenya, who was appointed by ADEA as the country focal person. She was responsible for identifying the sample of respondents in terms of the sampling protocol, for administering the survey, conducting the focus group interviews and gathering the data. In addition, she played an important role in enabling the streaming of the Google Form instrument used across the surveys in all countries participating in the research.

Following a start-up team meeting the country teams were responsible for identifying the sample and then sending the Google link to the questionnaire and the KII form to the identified sample in terms of the sampling stratification protocol.

Primary data collection was conducted as follows, with the adoption of semi-structured questionnaires (written or oral) through individual Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs):

- Key Informant Interviews were used to obtain in-depth oral or written information from key individual respondents. Due to restrictions as a result of the COVID-19 pandemic and the large number of target countries, three scenarios to conduct semi-structured interviews were possible: i) Face-to-face; ii) Online, one-on-one interviews (e.g., Zoom, Teams, Skype, Google Meet); or iii) Written questionnaires (emailed or paper-based). In the case of written questionnaires when required – respondents were required to respond to the questions on the Google Form to ensure authenticity.
- Focus Group Discussions typically brought together a group of up to 12 targeted participants. The process in this case comprised semi-structured questions developed for the respondent group and presented and captured on the FGD Google form. FGDs are used to understand multiple viewpoints and different perceptions and perspectives on the topic, as understood through the group's collective voice. The country focal persons facilitated the group discussion, ensuring that all participants had an opportunity to engage, and steered the discussion in the direction required to ensure the questions were answered. The country focal person facilitated and then compiled the FGDs responses onto the Google form for ease of administering and analysing.
- A Google form questionnaire was administered to the identified sample. The survey comprised 60 questions which were a mix between quantitative short answer responses (using Likert-scale type questions, multiple choice or fixed answer responses.) Each of the sections concluded with open-ended questions with the survey including 12 long-answer responses which were usually explanations for the section of questions. The open-ended questions allowed the respondents latitude to reflect on the topics being explored and were useful in interpreting the quantitative findings.

11.3. The use of web-based platforms

Due to time constraints and the current COVID-19 environment, virtual engagements played a significant role in the process, with the web-based Google form used for the questionnaire and Teams and Zoom platforms for KIIs and FGDs.

Online or web-based survey tools have become common data gathering instruments especially since the onset of Covid-19. Web-based technology offers advantages for designing surveys and obtaining respondent feedback. The origin of web-based surveys can be traced back the methodology used for postal surveys, with online research tools successfully and efficiently transcending their predecessor as a tool of choice for a vast range fields of study particularly since the onset of the pandemic.

With the exponential growth in mobile technology the web-user population has increased resulting in web-based survey tools becoming one of the most widely used data gathering methods. Google forms offer ease of design allowing respondents to “click” their responses to multiple-choice or Likert scale questions and to type in notes where open-ended responses were required. The design tool allowed questions to be streamed for various respondent types, with some common questions and some specific questions streamed to different respondents such as government officials, students, and parents.

Similarly, the KII and FGD allowed for modification of appropriate questions for the different targeted sample groups in order to encourage participants to express their thoughts and provide detailed descriptions of their perceptions in response to the various questions posed. A discussion of the operationalisation of the sample is discussed in 12.4.

11.4. Sampling for the KIIs and FDGs

Multistage sampling was applied, and for the participants of KIIs and FDGs a snowball and purposive sampling was conducted, with guidance from the Ministry of Education, to ensure a practical level of coverage to capture the needs and aspirations of the various levels. Moreover, ADEA utilised its existing networks with the country focal points facilitating access to relevant government institutions. The following respondent nomenclature was defined to ensure sufficiency of the sample:

- International and regional development partners.
- Relevant Government line ministries and heads of institutions and training facilities.
- Policymakers, Technical leads and Implementers, faculty, chairpersons (curriculum developers, statistics, planning, financing, ICT).
- Decentralized education authorities (officials).
- Heads or designated officials of teacher unions, teacher associations, and parent teacher associations.
- Head teachers and teachers/trainers from primary and secondary public and private schools, TVET and higher education institutions.
- Learners from the above identified schools/institutions and their parents.
- ICT development partners, private sector, telecoms, and civil society organizations who have an interest in ICT in education.

The focus groups aimed to explore both the existing and aspirational infrastructure, and the following possible advocacy for various stages of readiness:

- Pre-integration and baseline contexts and advocacy needed.
- Transitional arrangements and related advocacy.
- Development of implementation, skills and abilities.
- Expansion of usage.
- Scaling up for system-wide integration.

Note on the sample: This study does not claim that the findings are representative of, or generalizable to, the general population, however, the qualitative responses elicit many insights and experience trends that can enrich considerations for implementation. The findings represent “voices” of the various subsectors in education, from government officials, educators and learners, and are used interpretively against the backdrop of the previous literature review. The following subsections refer to the findings from both the questionnaire and the interviews.

11.5. Field testing

Following the internal review and approval between ADEA, IsDB and AfDB, the survey instruments and interview guides were field-tested by focal point persons who were broadly engaged in this research (across 30 countries) in order to:

- Explore the adequacy of the questions as they relate to the research topic;
- Ensure that the content of the interview is appropriate for the target population;
- Identify if there are confusing and misunderstood items, or items which should be included;
- Enable adaptations and enhancements of the tools as needed;
- Suggest considerations – not initially planned;
- Test the duration of the KIIs/FGDs;
- Allow researchers to practice under real conditions; and
- Confirm the readiness of the tool.

11.6. Primary qualitative data analysis strategy

The data analysis aimed to draw lessons, challenges, recommendations, and prioritised areas for IsDB and AfDB investment and related cost estimations. The analysis of the impact and gaps of gender and inclusiveness in ICT in education is also key in informing targeted investment opportunities towards access and quality learning and skills for all groups, with a focus on basic education, TVET and higher education levels.

Section 22 of the findings refers to the common strengths, weaknesses, opportunities, and threats pertaining to the use of ICT in education from the vantage point of the various stratifications of the sample with a view to identifying enabling factors required to support national digital learning initiatives and potential barriers.

11.6.1. Raw data management (data cleaning)

One of the advantages of web-based surveys lies in the ability to collect data. However, like all captured data the process needed to undergo cleaning-up and organising into meaningful units of analysis. This entails:

- Transcription of KIIs and FGDs with the responses being input into the Google form format by the respondent, in the case of KIIs, and by the fieldworker/note taker in the case of FGDs.
- Detecting missing data, anomalies, unusable or irrelevant information.
- Excluding duplicate, incomplete and ambiguous content.
- Organising data according to relevant categories. Data analysis design.

The raw data obtained from KIIs and FGDs (semi-structured questionnaire) were collected and processed by coding, analysis and interpretation of results. It is important to note that these operations are complementary and do not follow a linear path but take a progressive, iterative and recursive form, as the different countries may have followed differing forms of sequencing as a result of the iterative process.

A descriptive and interpretive approach through the manual analysis of qualitative data was conducted. It is in fact a content analysis which involved reading each of the responses independently, coding them by topic and collecting key statements for purposes of quotation. The data were organized on a spreadsheet according to the theme. While the researcher had preconceived ideas of the themes the application of a search process for key concepts and themes the study also allowed the themes to emerge through the engagement with the text. The categories were examined to identify themes and subthemes.

In this study, the researcher followed an innovative abductive approach, listening to the intermingled voices (of learners, parents or teachers), and listening to what the respondents were expressing and (whilst listening to the researcher's own voice against the backdrop of understanding the context (McKay 2018, Mabunda & McKay 2021)). This guided the interpretation of text and the determination of themes.

11.7. Limitations of the study

Since the survey and many of the interviews were conducted either on a web platform or as a web-based questionnaire, there was an inherent bias in the selection of the sample which was limited to "users" who in themselves constituted a particular stratification. To avert this, the fieldworker was requested to invite "non-users" for physical meetings and to conduct interviews telephonically so that answers could be keyed in by the fieldworker.

With the time and resource constraints of any research study, the sample for this study was not sufficiently large enough for the findings to be generalizable. However, from the findings obtained it may be claimed that the study met the criteria for adequacy of information, despite the sample sizes being smaller than anticipated, as it was sufficient for saturation to be reached.

As with all studies, the limitations need to be articulated. They pertain to:

- Country contextual incidences such as strikes, holidays and also survey fatigue amongst officials.
- Cost estimation of digital learning systems in an African context.
- COVID-19 protocol causing limited travel and physical interactions.
- The lack of accurate and updated data.
- Government bureaucracies in terms of tedious procedures to conduct interviews or receive official documents for review.

- The limited size of samples.
- The inherent bias of a study using web-based interviews or surveys.

11.8. Ethical considerations

At the start of each KII or FGD, an oral or written explanation was communicated to the participants to explain the research, assure the participants of confidentiality, and seek informed consent. Participants were aware that of the voluntary nature of the study and that they could withdraw or withhold a response if they so wished. Similarly, the questionnaire allowed the respondents the possibility of not responding to some or all questions should they so choose. Lastly, respondents were assured of the security of data collected and data protection.

12. THE SAMPLE

This section considers the responses to the questionnaire and to the focus groups (FG) and key informant interviews (KII) which were both captured on the respective KII or FG Google form.

As discussed above, the sample of respondents in Kenya are given in table 13.

Table 13: Breakdown of the sample

Instrument	Sample
Questionnaire	60
<ul style="list-style-type: none"> • Students/learners 	50%
<ul style="list-style-type: none"> • Educators 	18.3%
<ul style="list-style-type: none"> • Government officials 	10%
<ul style="list-style-type: none"> • Other (Telecom, parents, ICT provider) 	1.7%
Key informant/focus group interviews	7

12.1. Respondents to the questionnaire: Sample

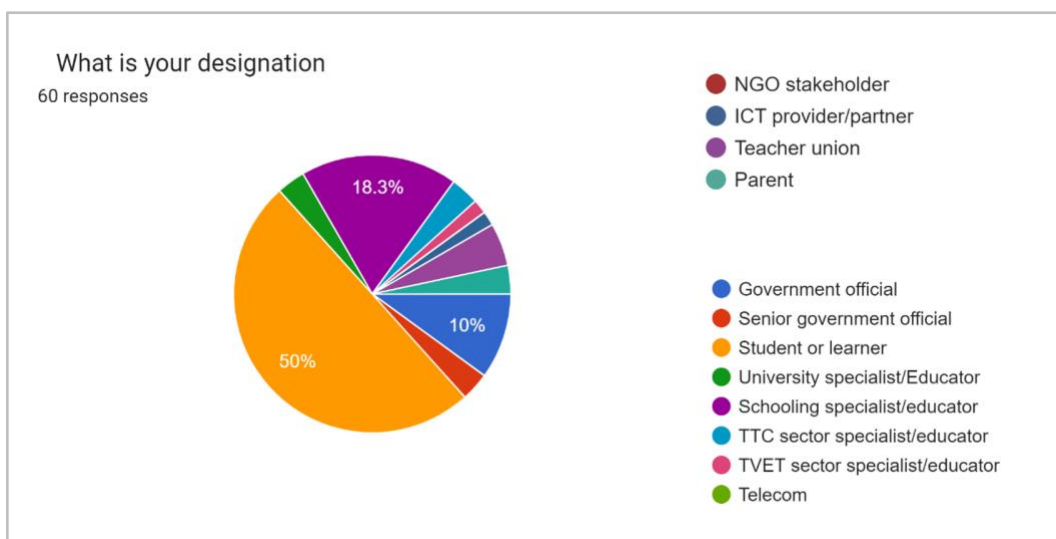


Figure 13: Breakdown of questionnaire sample

12.2. Learner participants: Sample

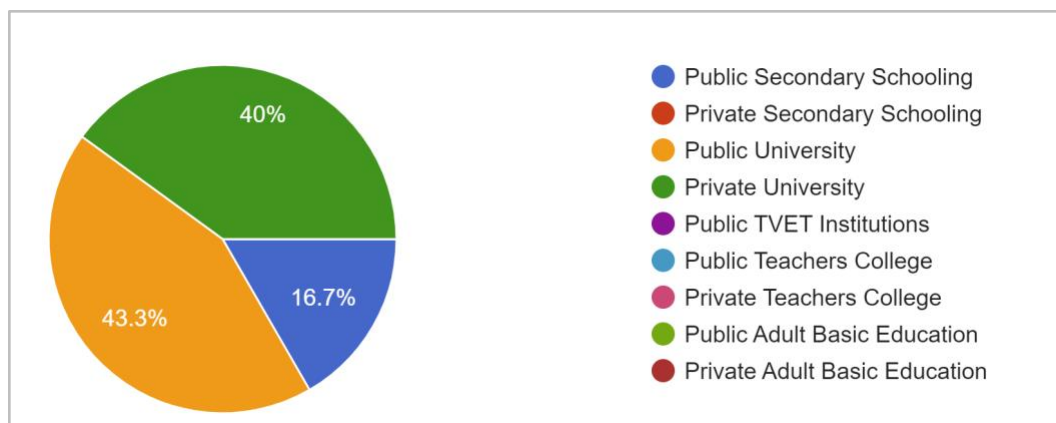


Figure 14: Breakdown of Learner sample

The sample comprised 43.3% students from public universities, 16.7% students from public secondary schools and 40% of students from private universities.

12.3. Focus group and key informants' interviews: Sample

The even KII/FG respondents comprised the following sector educators/officials:

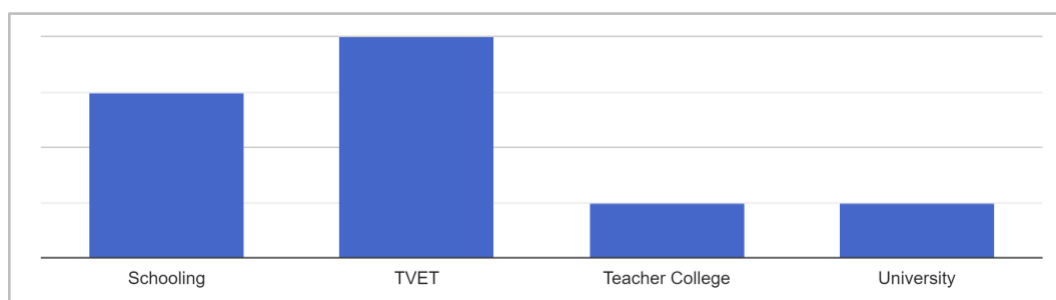


Figure 15: Breakdown of sample of officials from KII/FG interviewees

13. RESOURCES AND TEACHING MODALITIES BY EDUCATION SUB-SECTOR

While the survey aimed to explore the context of teaching by subsector before and after the onset of the pandemic, questions such as the availability of resources pertain to the current situation at the time at which the survey was conducted.

The following charts reflect the views of government officials and practitioners on the extent of ICT access across the different education subsectors.

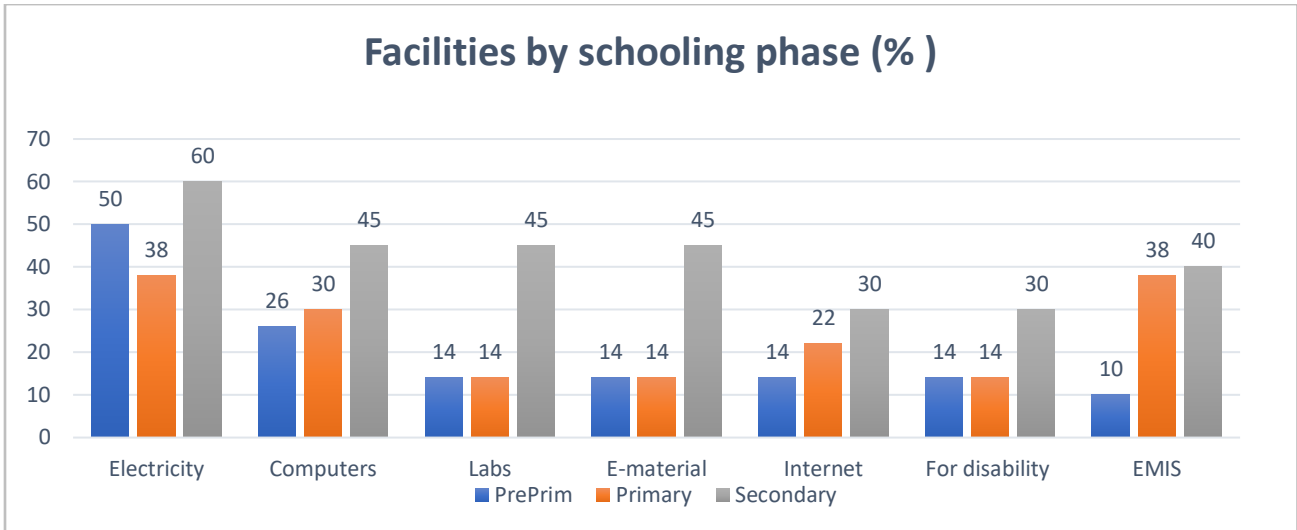


Figure 16: Facilities by schooling phase

The findings show that secondary schools are better resourced with more secondary schools having access to power/electricity (whether solar powered or other), and having more access to internet connectivity, computers, computer laboratories, e-materials, an EMIS, and also more facilities for learners with disabilities.

It was therefore not surprising that the respondents who participated in this survey referred to the need for early introduction to ICT from the lower phases of schooling to ensure better education and better digital literacy skills as learners proceed through the schooling phases.

As the following figure shows, ICT learning resources were more common in the post-school or tertiary sector with more TVETs and universities offering distance education as a mode of learning and with online learning being more prevalent in universities (70%) which suggests that more blended models are being used. Only 35% of TVETs were perceived as having facilities for students with disabilities and only 50% of universities.

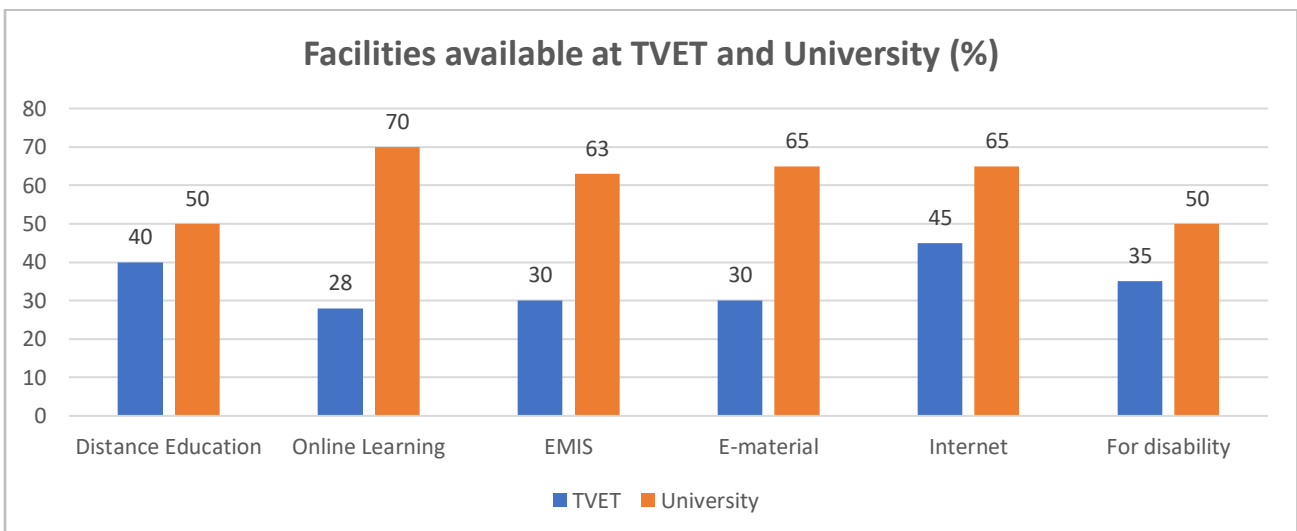


Figure 17: Facilities available at TVET and University levels

While the estimates show perceptions, rather than official statistics, it is clear TVET institutions lag behind universities with regard to the use of ICT in education. Nevertheless, one of the TVET officials who responded to the questionnaire pointed out that:

- TVET institutions have embraced the use of ICT, and this has already enhanced access, inclusivity and quality of teaching and learning.

In their qualitative responses, respondents pointed out that universities had made optimal use of ICT in teaching and learning, and that the situation had improved subsequent to the onset of Covid-19. The following figure reflects the perceptions given in the questionnaire (based on the 5-point Likert scale where respondents were required to indicate the level of implementation from low to high in in each subsector). The scales pertained to the use of ICT in education before and after to the onset of Covid-19.

It is clear that subsequent to the pandemic the majority the use of ICT at schools had almost tripled and that both learners and teachers had acquired improved ICT skills with increased usage of ICT by TVETs and universities. The largest change reflected in this figure refers to the changes made to the national curricula which required ICT utilisation – changes which were necessitated by the emergency.

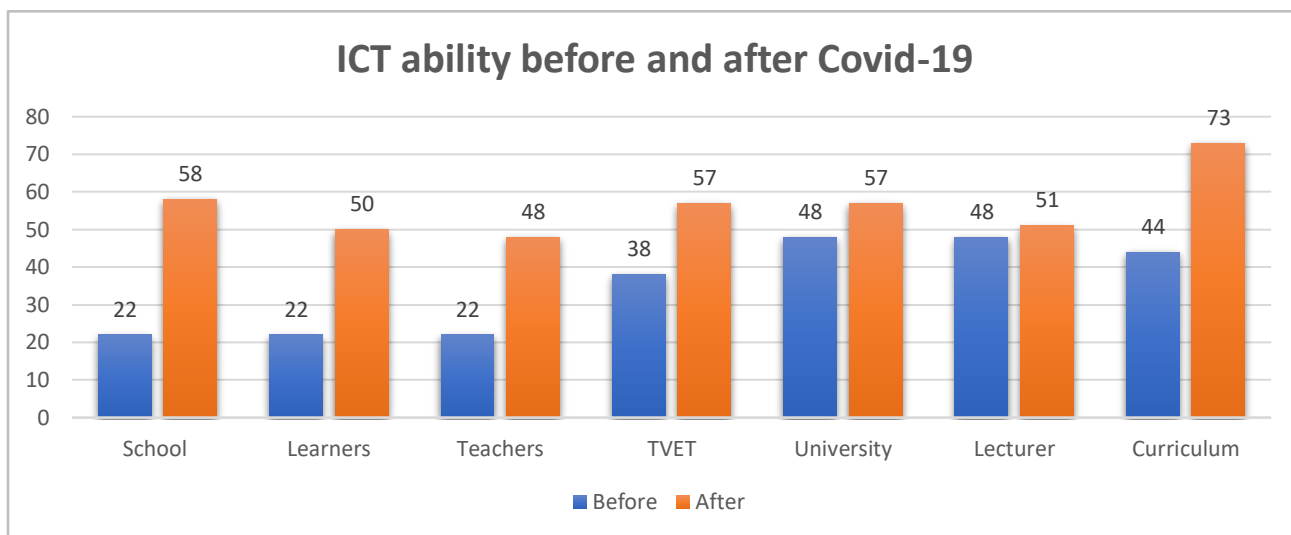


Figure 18: ICT abilities before and after the onset of the pandemic

13.1. Schooling

In analysing the qualitative responses, it was clear that within the schooling sector, the pre-Covid-19 situation comprised mainly of traditional contact classes. Respondents indicated that the low number of schools that had access to computers or computer laboratories meant that learners were not given ICT exposure. However, after the onset of the Covid-19, respondents indicated increased digital learning and stated that “the use of social media was best strategy”. Another indicated “As a teacher I needed skills. During this period, the ministry of education trained me on remote teaching, but I could not implement properly because connectivity was a problem”.

Another teacher explained that with the help of computer ICT department teachers prepared links which were to be used in Google classrooms. These were sent to learners who used them to join the

online classes. Teachers /lecturers taught and demonstrated from wherever they were, while learners listened and participated from their homes. Assignments too were sent [to learners], done and submitted online.

13.2. Teacher training college

The mode of teaching was generally face-to-face with practical and class-based learning activities. As one of the respondents explains, “as a teacher training college lecturer I did not previously engage in ICT-related learning, but ICT opens many possibilities.”

13.3. University

While universities already engaged in online learning to some extent before the pandemic, universities embraced online learning and adopted virtual learning as best they could within the limitations of household ICT infrastructure. This was explained as follows:

- ICT integration is good for learning, but most households don't have Smartphones or other tech for home use.
- Conferencing platforms and learner management systems were not previously used; however, online sites were used for making available learning content and for teaching.

13.4. TVET

While TVET officials indicated that their students were adept to the use of technology, the practical nature of TVET offering meant that contact teaching was the dominant mode with TVETs mostly offering hands-on training. However, respondents indicated that the transition to online learning was a challenge mainly because of the lack of resources.

14. ICT POLICY CONSIDERATIONS

Respondents were required to respond to the question “Do your policies for ICT and education make provision for the use of ICT in the following subsectors?”

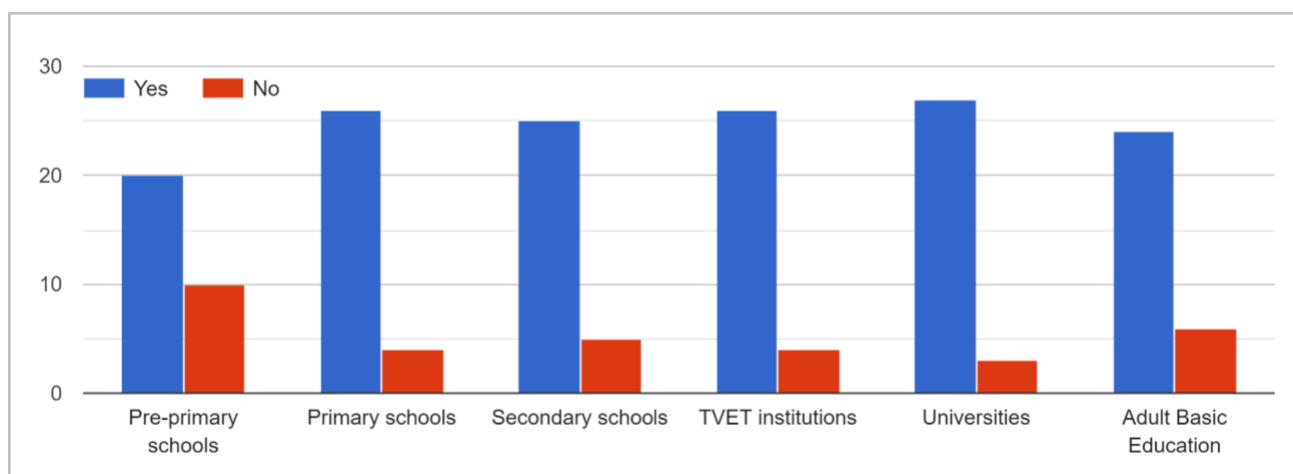


Figure 19: Policy provision for ICT integration across the education subsectors

It was clear from the above figure that respondents were aware of the policy provision for the integration of ICT in learning across the various subsectors. However, there were some uncertainties particularly in the areas of Pre-primary education and Adult Basic Education.

As respondents explained in response to Question 36, there are adequate policies for the implementation of ICT in education. Educators and officials were required to list the relevant ICT policies in education and to indicate their views on its implementation. The following were listed.

The Ministry of Education’s ICT Policy in Education was partially implemented due to the high cost of infrastructure. In addition, the “lack of knowledge of the existence of the policy” was a problem. The inadequate training of teachers and inadequate sensitization was cited as a problem and the lack of know-how demonstrated in the challenges experienced in conducting online assessments Ministry of ICT and education policies - both ministries refer to ICT policies and strategies. Good progress is being made albeit slowly and barriers include low skill levels and sometimes attitude towards the use of ICT.

ICT policy in education by the Commission for Higher Education Implementation is ongoing and various universities have integrated ICT in all their courses a good example being Maseno University where everything is ICT-driven. However, this is not without challenges of infrastructure such as poor connectivity, the high cost of roll-out and a lack of commitment by learners to embrace ICT strategies.

14.1. The social justice mandate of ICT policies

The respondents were required to state the extent to which they considered the policies to make provision for providing ICT resources and the extent to which the policies might ensure equity of learning, the inclusion of learners with disabilities, gender inclusivity and also catered for learners who were geographically excluded. The blue and red bars indicate that the respondents did not consider the policies to offer benefits of inclusivity.

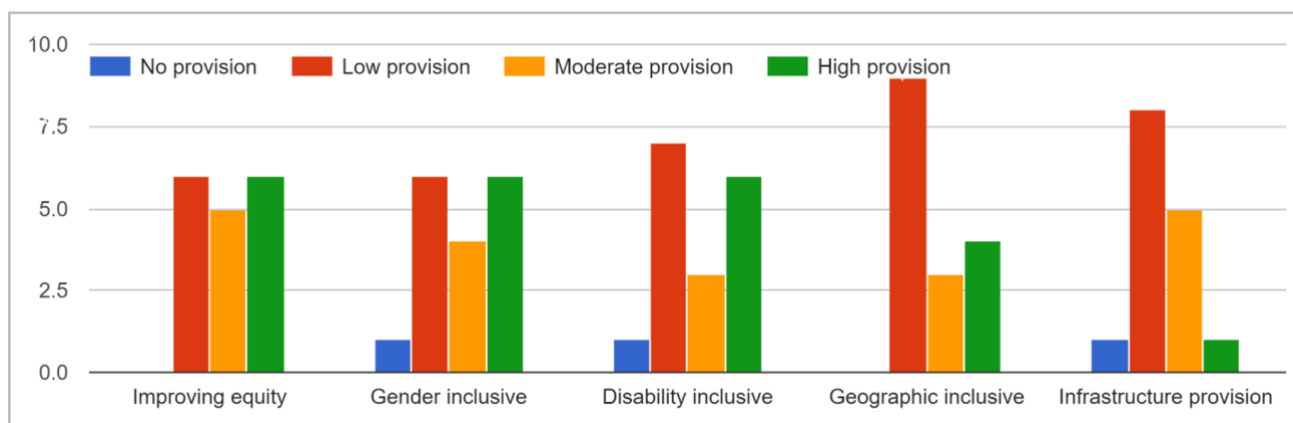


Figure 20: Policy provision for inclusivity

14.2. Capacitating the workforce

Question 38 of the survey explored the extent to which policies made provision for various forms of ICT training, various modalities of digital teaching and materials development as well as for information management. As shown below, the respondents were unanimous that the policies required the integration of ICT to form a component of pre-service teacher training but less so as an in-service training need. There was general agreement that the policies made manifest the need for developing online e-materials and for institutional EMIS.

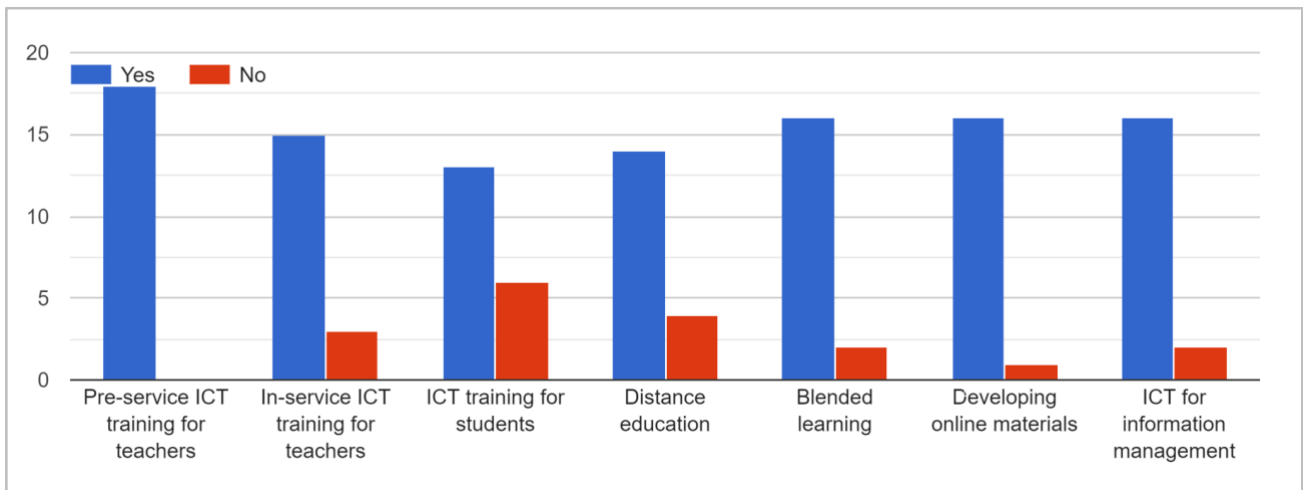


Figure 21: Provision made by policies for training and development

The survey focused on specific focus areas of policy implementation with respondents requested to rate the implementation policies with regard to advocacy; oversight/management of the implementation of ICT; monitoring and evaluation; the provision of devices; cyber security; strengthening of network capacity and the development of EMIS in education. In the following chart, the green bars depict high levels, orange moderate levels of implementation; with the red and blue bars depicting little or no implementation respectively.

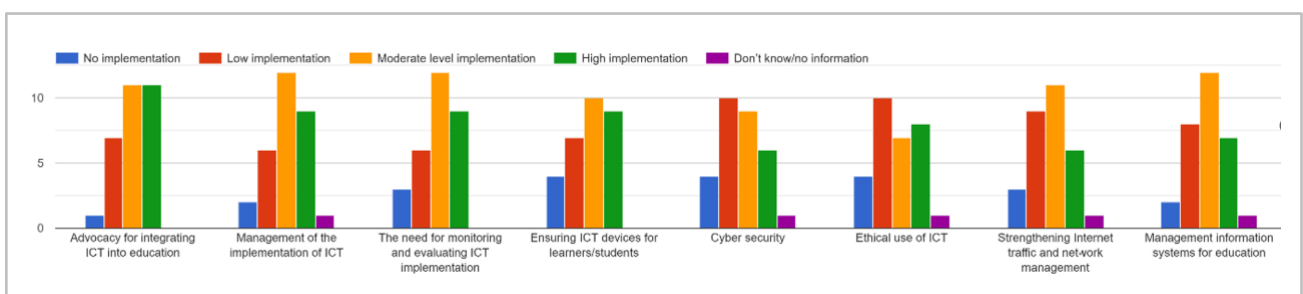


Figure 22: Elements of policy implementation

15. ENSURING THE CONTINUATION OF TEACHING AND LEARNING DURING THE PANDEMIC

The KII/FG interview schedule required respondents to describe the strategy that was initiated to ensure the continuation of teaching and learning during the Covid-pandemic. As is shown in this

transcript, the transition in Kenya was possible because of the prior policies and infrastructure already in place and as a result of the role played by the KICD. However, respondents explain below, this was only partially successful as a result of inadequate digital infrastructure in educational institutions and due to the lack of reliable electricity across many regions.

15.1. The transition to online learning subsequent to Covid-19

The respondents were required to explain the change from pre-Covid-19 to how implementation changed subsequent to the onset of Covid-19 implementation. The above charts (specifically Figure 5) depict the accelerated change made towards online learning showing relatively low usage prior to the onset of the pandemic and increased knowledge and related ICT-skills subsequent to the pandemic.

In explaining the change, interview respondents pointed out that this was made possible by:

- The government introduced radio and TV lessons and with some schools utilising e-learning using Zoom and Google teams amongst others.

Educators indicated that they were trained to conduct online teaching as well as on how to use “online conferencing tools that were obtained for free such as Zoom”. However, they explained that the transition was not without challenges and that the “digital divide” was noted as the most significant barrier to learning.

15.2. The digital divide

Respondents pointed out that in many homes, learning institutions, and in particular those in rural areas had little or no connectivity and “when it was available it was not enough for delivering learning or accessing learning content”. Moreover, “in the urban areas high-speed connectivity is available, but still many learning institutions are unable to afford high bandwidth due to costs”.

As respondents indicated, the high costs result in challenges in accessing high-speed connectivity with this being out of the reach for most learners and a greater problem in remote rural areas. The high costs and financial constraints leave a large proportion of students unable to access internet connectivity. While universities are attempting to provide students with data bundles, a majority of those living in the rural areas totally lack connectivity.

One of the respondents indicated that for most public institutions, the onset of the pandemic was a double challenge, firstly because of the lack of preparedness and the need to make rapid emergency-type changes, and secondly, because of the digital divide and the lack of adequate infrastructure, data and devices. This challenge persisted despite government providing TV signals to KICD in order that TV channels might be used to present lessons.

While the challenges were at the schooling level, universities faced similar challenges. All education institutions were encouraged some form of online learning using media such as radio and TV. Universities too had to shift from face-to-face and were required to adopt online modalities. Lecturers mostly used Zoom and Google classroom for teaching and any text-handouts were sent out by WhatsApp, but challenges were experienced since learners were sent back home to mainly rural areas where they had limited infrastructure and ICT resources.

The respondents in the survey and those participating in KII/FGs also referred to the critical role played by the Kenya Institute of Curriculum Development (KICD) in ensuring the continuation of learning by propagating digital teaching and learning approaches. Despite the abilities, the respondents in this study referred to the problems with Kenya's education infrastructure does not have the capacity to effectively deliver and sustain online teaching and learning, particularly for those in rural areas with the worst affected being VMGs (vulnerable and marginalised groups). In this sense the findings of the primary data confirm the discussion of the desk study (see section 7.3.7 of this report). Moreover, as mentioned earlier in this report (Section 5), the radio and television lessons introduced during the pandemic were not fully accessible to all learners since neither radios nor TV are fully/universally available. (As discussed in Section 5, the National Census (2019) shows that approximately 56.9% of households do not have a radio and 59,6% of households do not have a television (and as estimated, fewer than 70% of rural households do not own a television).

Section 5 of this report refers to Mutegi's (2020) estimate that around 17 million students and more than 320,000 teachers were affected by the closure of 30,000 primary and secondary schools in 2020. This is despite the excellent abilities of the KICD's contribution of airing radio lessons through local FM stations, to increase reach and to distribute the KICD radio lessons timetable especially in the lake zone and coastal counties, and in Kibera and Kayole (informal settlements in Nairobi County). Efforts to provide remote learning revealed a significant digital divide which, as the respondents in this research study showed, was exacerbated by the lack of appropriate electronic devices, access to electricity and internet connectivity.

15.3. The digital divide and its impact on teaching and learning

When asked how the digital divide impacted on teaching and learning, the participants to the KII and FG explained that the digital divide in Kenya is wide, but the divide is also diverse. Due to this teaching ICT is a major challenge since learners do not have access to ICT resources. Respondents pointed out that this problem has many dimensions:

- Those who do not have access are disadvantaged. Those who do have access perform better.
- Some areas are 4G converted and some have no connectivity and, especially, the last mile connectivity is a major problem.
- Access to functional digital devices and technical support largely hindered teaching and learning.
- Mostly, urban schools, are better endowed. The lack of electricity and internet in many schools affects use of ICT in learning.
- The digital divide in the country is vast and is highly affected the effects of online learning and teaching in university education.
- Due to lack of electricity in some areas of the country where university students are drawn, students are unable to learn at home. The high costs of acquiring electrical gadgets such as laptops , printers ,modems , routers have also made online learning impossible. Many students lack digital abilities, and this has been a contributor to the learning losses. The lack of compulsory inclusion of ICT studies in the curriculum has also led to the divide.

16. VIEWS ON THE TRANSITION TO ONLINE LEARNING

The questionnaire requested respondents (government officials, IT sector and subsectors of educators) to describe how they experienced the transition to online teaching and learning.

16.1. Officials' and teachers' views

The survey required stakeholders to express their “personal” views on whether online learning had been successful or not.

Although schooling attempted to introduce online learning platforms through the use of Zoom and Teams, government officials rated the transition to online learning as less effective than they had hoped for stating that while the integration of ICT in learning offers benefits for learning, the majority of households do not have smartphones for children to use at home. Moreover, the state of ICT readiness in schools meant that schools were unable to truly implement ICT in education. However, officials referred to the way in which government adopted ICT with “A lot of electronic and virtual meetings, workshops, reporting was adopted across government.”

Some teachers ranked the process with some stating that it was only 20% successful with one indicating that “Urban students were [more] able to learn as compared to their counterparts in the rural areas”.

Others indicated the transition as being 60% successful with large numbers indicating the intervention as being 50% successful or fairly successful.

One of the officials rated the intervention as “moderately successful” and explained that:

It benefited 50 percent of the Learners within the country. Only Learners who had access to digital gadgets like TV, radio and Smart Phones benefited. Learners from ASALS and rural areas never benefited ... with the strategy being most effective where parents were able to get all the infrastructure needed for online classes and therefore classes could continue normal.

A number of respondents pointed to the health and safety element of online learning indicating that:

The health, safety and wellbeing of both the learners and educators were considered by introducing online learning. It was much safer because there was no face-to-face interaction amidst the pandemic. As reported in the previous section of this report, remote learning was mainly used to reach Learners through the utilisation of TV channels like EDU TV and radio stations through KICD to air learning sessions. One of the respondents indicated that “it is good and exposes learner's to diversified modes of learning”. However, teachers indicated that ICT “was used to a certain extent but not yet fully exploited” due to the unevenness of learners' circumstances.

At the classroom level teachers used WhatsApp and Google classrooms to reach their learners but this relied on learners' access to devices and connectivity as well as electricity. Some teachers pointed out that the remote learning strategy during COVID-19 “was a rapid emergency response” and not a “strategy”.

It primarily aimed at upholding access to quality and inclusive education for all learners under pandemic conditions. As an emergency remote learning strategy, there were challenges in ensuring access to quality, equitable and inclusive education for all.

16.2. Parents' views on the transition

Parents surveyed were more positive and enthusiastic. (It is recognised that parents who responded to a Google survey was a “biased sample” who would have had access to ICT as well as ICT skills). However, as the parent commented “As a parent my experience was OK since the learning was interactive and my daughter got to learn and see her classmates online and also homework and projects would be sent, which was a great way to keep my daughter’s mind occupied”. Others commented on online learning and the platforms used, enabled learners to better interact with each other regardless of their differing circumstances.

16.3. ICT provider's view of the transition

The one respondent who was an ICT provider indicated that the intervention had been successful in that “the use of ICT enabled work and schooling to continue during the pandemic and therefore it was very beneficial”.

17. BENEFITS OF THE TRANSITION TO ONLINE LEARNING

- Teachers commented on how online learning has improved learning for learners with physically disabilities.
- ICT in education sector has enhanced research and scholarly communication amongst our children.
- It has been found to be cost effective in terms of books and educational resources – many of which are freely available online.
- ICT makes learning interesting by giving a lot of examples with pictures to illustrate what is taught, adds to content in books.
- Respondents pointed out ICT has many advantages. It will
 - promote higher order of thinking.
 - enhance subject learning at all levels.
 - improve learner's engagement and knowledge retention.
 - develop literacy and ICT capability.
 - bring about inclusion.
 - more people and in an effective manner.
 - enable the use of innovative educational resources.
 - increase hands-on learning opportunities.
 - support homebased learning.
 - help students and teachers to keep up to date on the learning process.
 - make learning more interactive and easier for both students and teachers.

18. CHALLENGES IN THE USE OF ICT

Generally, respondents pointed to access to ICT and the associated skills as being a major challenge. TVET officials pointed out that the biggest challenge with regard to ICT implementation is the need for funding to improve both technical skills and ICT infrastructure. Some officials referred to the “lack of well-defined policies on implementation of ICT education”, with the most common challenges across the sector being:

- lack of internet connectivity
- inadequate ICT infrastructure
- resistance from educators
- resistance from learners

Officials stated the following as the main challenges experienced with the transition to remote learning:

- Poor infrastructure such as electricity
- Problems with synchronous classes, signalling the need for a-synchronous teaching to cater for those who missed classes. It is important that online lessons are so that learners could replay these if necessary.
- As one of the respondents indicated “the experience was a new one and had many challenges ranging from connectivity to the internet, power fluctuations in various areas to also finding a conducive environment [learning space] to sit and learn at home without interruption.
- Broadband subscriptions are available on university campus but totally lacking at rural areas. Only middle-class families are able to provide their children with internet connectivity.
- Data bundles are unaffordable, data speeds are slow and there are regular blackouts
- Lack of financial ability and high costs of data are interlinked problems.
- The lack of reliable sources of electricity is a problem. Interventions such as rural electrification is improving but “we are not there yet”. Common blackouts lead to disruption of the learning process and most schools in rural areas have electricity problems – some because of outages and others are disconnected due to non-payment.
- Some schools use solar energy. All public primary schools have electricity or solar, but problems are caused by maintenance and sustainability.
- Some areas are not likely to get connectivity soon. However, there is hope that one time they too will be on the grid.

18.1. Rural learners

Ruralness and remoteness were specifically identified by respondents to the survey as a problem associated with the digital divide. As one of the officials pointed out that living in remote rural areas means that learners lack:

- computers /laptops /smartphones because they are more likely to be poor
- Wi-Fi/funds to purchase bundles for online classes.

One of the officials concludes that poverty is the prime problem indicating pointing out that “we need to eradicate poverty especially in remote areas and amongst the marginalized communities in Kenya”.

19. FUTURE CONSIDERATIONS FOR ICT IN EDUCATION

Notwithstanding the challenges, respondents stated that there was “the will to incorporate e-learning to schools despite lack of infrastructure” which could and should be overcome. In expanding the reach of online learning problems associated with assessment also need to be “ironed out” since the “perception of online exams and credibility of the online teaching is negative. People believe if you do your study online, the standard is low”.

It was pointed out that at tertiary level a few institutions use “a blended approach to learning with certain classes only offered online”. Many learners are ready to use online modalities and have no issues regarding the use of ICT, “because they find it interesting and fun, but training is required to enable many teachers to use technology”.

While “learners like this very much, teachers are not always as enthusiastic about using ICT in education mainly because they lack skills and ability”. “The attitude among teachers is low because they lack capacity and resources”.

This attitude extended to “the university sector [which] has since continued to lecture students through online platforms. This was based on policy decisions”. Universities were using some online modalities and the pandemic accelerated this shift to blended-learning – it was the right time to implement digital learning in the universities. Students have divided opinions with some opting for online learning because they did not have to attend in-class learning and can undertake other tasks alongside studying whilst others prefer to attend on campus lectures because they do not have the necessary resources (devices and data) necessary to meet the demands of online learning. Moreover, electricity and poor internet connectivity are common among rural households and impact learning.

With regard to continuity with ICT learning at university level, respondents indicated that “lecturers continue to have divided opinions”. Those teaching “theoretical” subjects are more inclined to consider “online learning is the way to go” while those undertaking practically oriented courses would rather have their students attend the face-to-face lectures”.

19.1. Assessing learning

The closure of schools brought about many attempts to conduct online assessments and while facing many challenges these gave rise to innovative approaches, such as:

- Homework and assessments were shared via parents’ mobile phones and by email. Learners attempted these and sent them back to school (however, the digital divide excluded many learners).
- Practical work was assessed via video-recordings of processes and the records were uploaded on portals.
- Issues of assessment credibility and integrity are matters to be addressed as Kenya moves forward to more online approaches.

19.2. Workforce digital competences

While some respondents indicated that educators had good competences between most activities in the sector a digitalised, others indicated that they

- have not been trained and if they are, they are only trained on packages;
- need a continuous upgrade of ICT training;
- do learn some skills during their ICT in pre-service training;
- learn on the job; and
- are not monitored hence a good number in the work force still remain and opt to stay ICT non-competent by deliberately not training in the area.

19.3. Learners most at risk requiring special attention

- Vulnerable and marginalised groups.
- Learners from remote parts of the country.
- Pastoralist communities in the arid areas of Kenya.
- Most rural public-school learners.
- Learners with special needs and disabled.

19.4. Learners with disabilities were identified as a high-risk group

- Due to lack of special resources.
- Getting to places with internet connectivity was difficult.
- Some require specialised devices which are not available.
- University students with disabilities lack specialised /assistive devices to enable them to use digital learning.

19.5. Female learners

The extent to which female learners were considered to be at risk was depended on cultural factors and of course socio-economic factors. However, respondents pointed out that female learners were as capacitated as were boys. They cope as well as their male counterparts and were equally capable. “Many are well capable ... Greatly too. Just like the boys”. Moreover, “female students at the university level have well adopted use of ICT in university education”.

19.6. E-learning materials development

Respondents were required to estimate the level of policy compliance with regard to the availability of e-learning materials and to make proposals for a way-forward with regard to the development of learners support e-materials.

While this figure shows low to moderate implementation of most e-resources there were proposals on how the KICD could fast-track the development of materials through the use of OERs and even MOOCs. However, Kenya’s strength in its local development of materials as demonstrated by the KICD has resulted in the majority of the respondents referring to locally produced materials as being moderately to highly available. As shown in the following chart, there was a moderate to high level of locally and internationally produced e-learning material with relatively low levels of continentally produced e-materials. The use of learner management systems was scored as low-moderate.

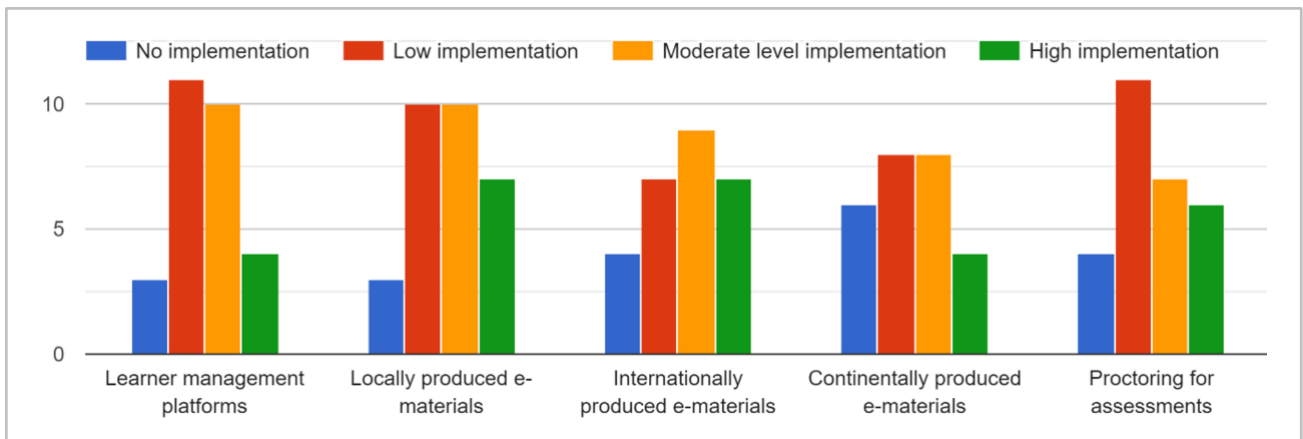


Figure 23: Availability of e-materials, proctoring and learner management systems

20. STUDENTS' EXPERIENCES OF ONLINE LEARNING

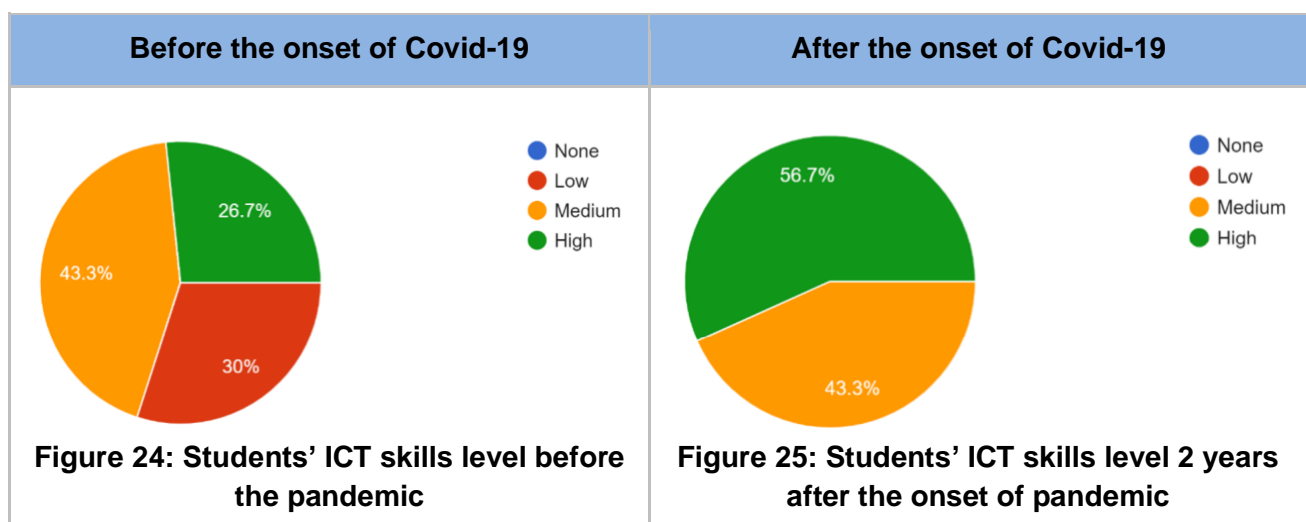
20.1. Student perceptions of ICT competences

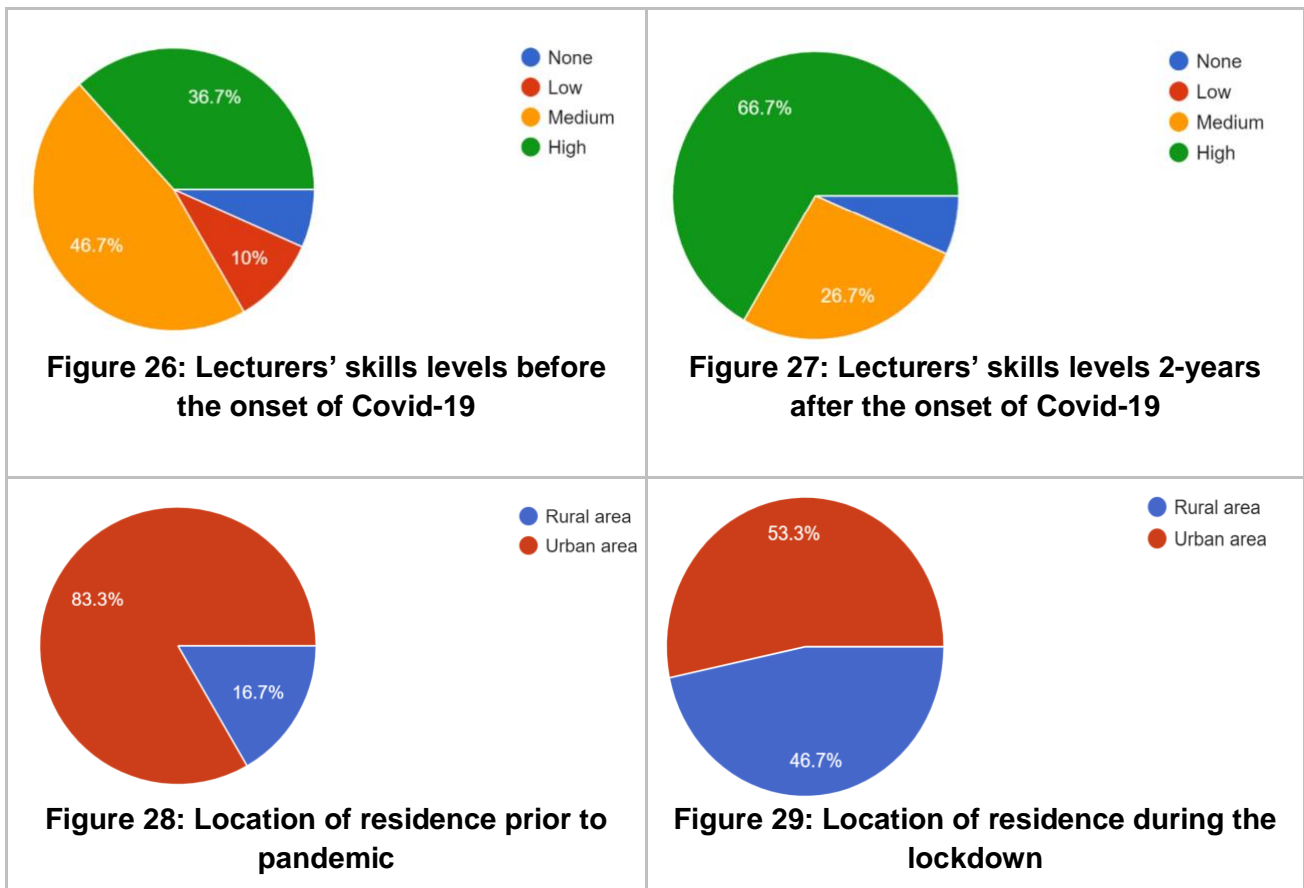
The following cluster of charts show a number of changes in the skills' level of the students and their lecturers (as a workforce indicator) suggesting that that prior to the pandemic 17% of lecturers had no- or low-level ICT skills levels.

However, they point out that two years into the pandemic, all lecturers had moderate to high ICT skills with only 6% categorised as "low skilled".

Similarly, students indicated that prior to the onset of the pandemic 30% of students had "low ICT skills" whereas, within two-years of the pandemic, all student rated themselves as moderately skilled (43.3%) or highly skilled (56.7%).

These findings suggest a need to conduct a skills audit to determine the new baselines because much of the basic training proposed for staff and students may be unnecessary and more advanced levels of training may be offered.





Figures 28 and 29 show high levels of student migration to and from rural areas. Interestingly 46.7% of the students/learners were located in the rural areas during the lockdown period – showing the high number of students who “ordinarily reside” in rural areas and the high number of students who need to migrate to urban areas for their studies. Given the earlier discussion of the rural-digital divide, these data are significant in planning blended models where students may be required to study from (rural) homesteads.

20.2. Student views on learning modalities

In response to the “main” modes and modalities of student learning, it was found that the mobile phone was the most used device following by the use of laptops (and Teams/Zoom platforms). However, since this sample was biased towards university students and private university students, this sample-limitation needs to be considered.

Nevertheless, the high use of mobile phones highlights the important role that mobile technology offers for online learning – whether students use the phone as a learning device or as a hot-spot in the absence of broadband connectivity.

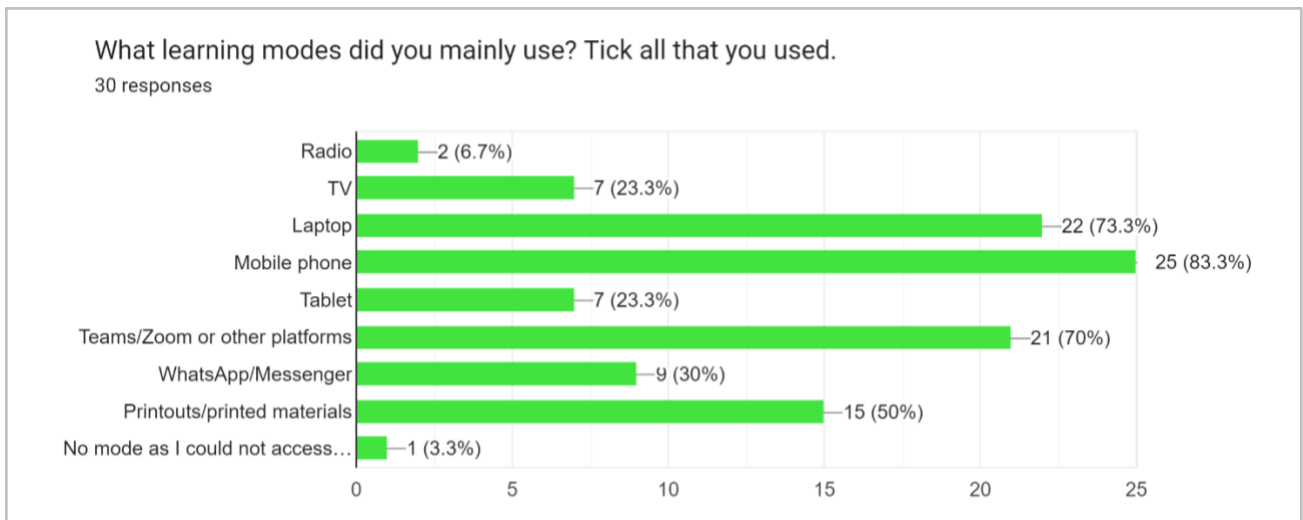


Figure 30: Learning modes mainly used by students

20.3. Challenges students experienced with learning

The list of challenges experienced by students showed that 30% did not have access to electricity and 76.7% had challenges with connectivity (or costs of connectivity 46%).

While 20% stated they did not have access to a laptop, a further 13.3% had to share a device with a friend or family member. Not having an optimal space to learn was mentioned by 13.3% while 20% indicated that they had limited ICT-skills. In line with the officials' views of access to e-learning materials (as discussed above) 30% of students indicated that they did not have adequate e-learning materials.

These kinds of challenges need to be addressed for further ICT implementation.

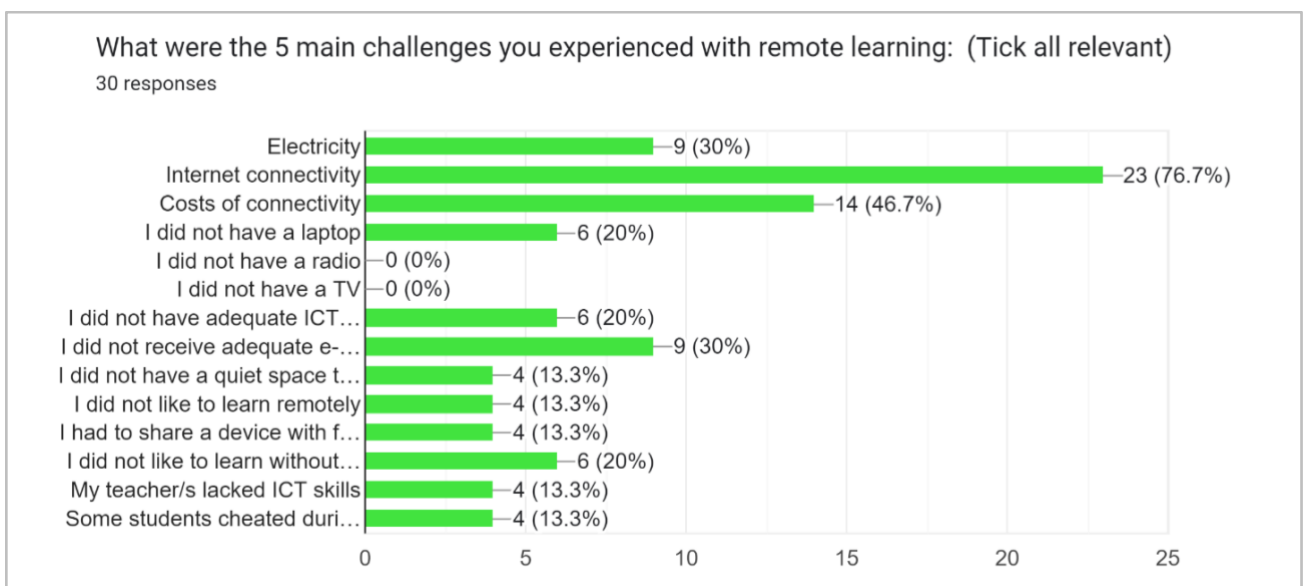


Figure 31: Main learning problems experienced by students

20.4. Institutional contact with students

It would seem from students' reports that most interaction with institutions pertained to administrative communication. This may highlight the need for more pedagogical communication from teachers who only communicated 30% of the time. The fact that 26.7% had no contact with their institution shows why so many students "did not keep up with their learning".

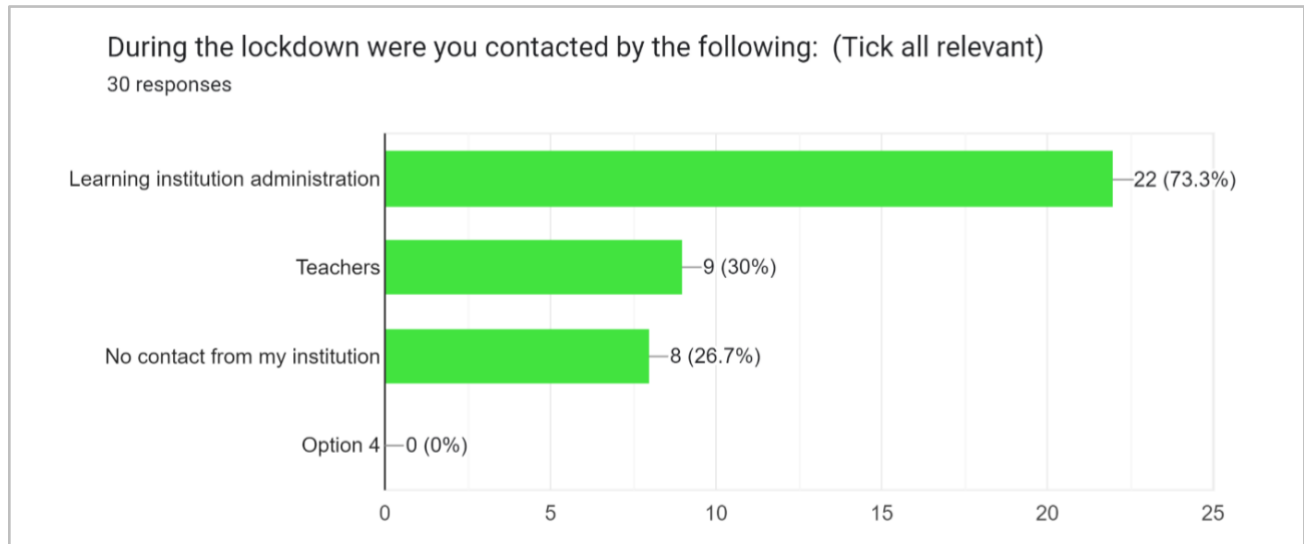


Figure 32: Student contact with the institution

20.5. Student motivation to continue learning

While 10% of students indicated that they "did not keep up with learning", 60% formed study groups with friends or (20%) sought help from friends suggesting the importance of collaborative learning as a mode of student support for online learning. This important student support activity should be integrated into all student support programmes with a view to increasing "connectivism" during learning.

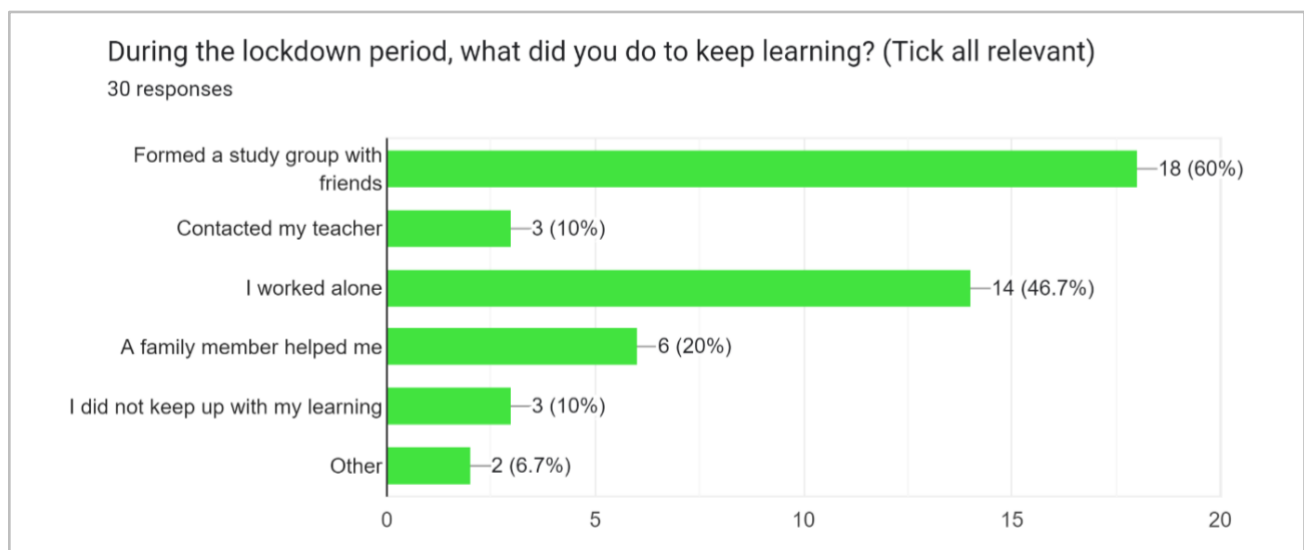


Figure 33: Student sources of motivation to continue learning

20.6. Improving online learning

The following chart shows that 66,7% of students believed that free data bundles would improve their learning experience. A further 70% required a device or an upgrade to an existing device.

Despite students rating their ICT skills (and those of their teachers) highly, training for students and teachers were cited by 40% of the students as ways of improving the learning experience.

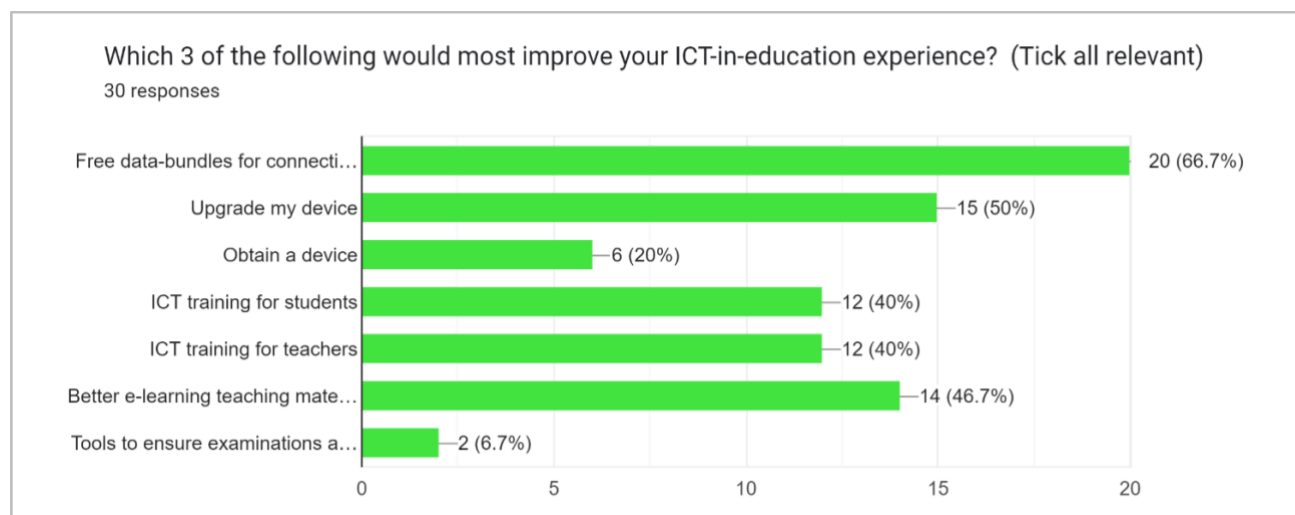


Figure 34: Student proposals for improving their ICT in education experience

20.7. Students' positive learning experiences

In response to the request to describe any good remote learning experience, students referred to the following:

- It's flexible.
- I sharpened my typing skills.
- Free data bundles for learning.
- It was fun learning from anywhere.
- I was able to learn about crypto currency and investment options in that field.
- Doing projects.
- It's good since I was able to study in peaceful environment.
- It was more convenient.
- I learned how to read and attend classes online.
- Online learning brought a new perspective.
- Time saving.
- Group work with friends.
- I learnt how to interact with others through the internet.
- Could re-watch the lectures at my own time.
- The last mentioned "advantage" of re-watching pre-recorded lectures refers to a-synchronous learning which features strongly in the literature as an optimal mode.

20.8. Students' experiences of online learning challenges

Among their less-positive experiences, students listed the following:

- Easily distracted.
- Poor Internet connection.
- Lack of a computer. That messed me up.
- Lack of internet during learning hours.
- Lack of internet and materials for learning.
- Poor internet and expensive internet.
- Low network, bad connection, slow network.
- Internet and devices.
- Classes were held at odd times.

In describing what they believed could improve ICT in education, students indicated the following:

- Better and cheaper access to materials.
- Free internet, cheap laptops and mobile phones.
- Good technology.
- Provision of data bundles so that everyone can have equal access to the Internet.
- Improved training centre for ICT.
- Fast and good internet connectivity.
- Training both teachers and students.
- Improving skills on Zoom and other software to improve learning.
- Electricity.
- Introducing ICT in education from primary school to develop skills and across the student/pupil life.

As these two students conclude:

- There should be a global campaign for the adoption of ICT in teaching.
- Just practice! As they say practice makes perfect.

21. THE STRENGTHS, WEAKNESSES OPPORTUNITIES AND CHALLENGES OF ICT USAGE

Interviewees were required to indicate what they considered to be the strengths, weaknesses, opportunities and challenges ICT presented for the education sector. These need to be read in conjunction with those outlined in the previous part of this document. The SWOC as gathered during the primary research are captured below as follows:

21.1. SWOC analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> • A willing and ready workforce • Training facilities for teachers • Robust fibre optic infrastructure • Fibre cable for connectivity • The availability of power/electricity • Government policy to provide devices to candidates • Teachers who are ready to embrace ICT, good mobile network • Good legal and policy framework, good ICT ecosystem • A willing and supportive leadership • A national passion to lead in the ICT arena • Willing teachers • Donor goodwill 	<ul style="list-style-type: none"> • Poor infrastructure • Expensive internet subscriptions • Unaffordable cost of computers • The vastness of the country and • Too much role duplication by different ministries • Low awareness of the potential of ICT • Lack of sufficient competencies • Poor policy implementation • Lack of sufficient funding • Lack of electricity and connectivity
Opportunities	Challenges
<ul style="list-style-type: none"> • There are opportunities for providers of new devices and internet connectivity • Support from private sector offering a wide array of resources on the internet • Opportunity for new policy formulation, for policy implementation and proper monitoring and evaluation on progress <p>Funding of ICT projects partnerships and collaboration</p>	<ul style="list-style-type: none"> • Overcoming the digital divide • Overcoming poverty • Overcoming poor infrastructure particularly in rural areas

22. IDENTIFIED PARTNERS IN KENYA

Name of Partner/ Donor/ Organisation	Contribution	What is the Contribution for	What is the duration of the funding
World Bank	\$200 Million	Improve access, quality and equity of education in Kenya. Works towards becoming an upper-middle income economy as outlined in the national development plan Vision 2030.	Secondary Education Quality Improvement Project (SEQIP) is expected to run for a six year period and will support 7,852 primary and 2,147 secondary schools in

			30 countries that are economically and educationally disadvantaged.
East African Children's Education Fund, known as EACEF		EACEF funds one-time capital projects such as the construction of classrooms, libraries and other school facilities and leverages its network of international partners to implement locally driven initiatives such as student-to-student peer mentorship and school feeding programs.	EACEF was founded in 2007.
Coca-Cola Africa Foundation		Equip students in Africa's primary schools, high schools and tertiary institutions with the knowledge and skills that every child deserves The Coca-Cola Africa Foundation's partnership with the Zawadi Africa Education Fund is providing scholarships to academically gifted girls from disadvantaged backgrounds in Africa to pursue higher education in the United States at schools such as Yale, MIT and Harvard.	Coca-Cola Africa Foundation was established in 2001.
The MoneyGram Foundation		"MoneyGram Foundation is focused on inspiring minds and improving lives." ("MoneyGram Foundation educational grants – funds for NGOs") Since its inception in 2013, the foundation has impacted more than 75,000 children in 22 countries.	Established in 2013.
Safaricom Foundation	KES 3.5 Billion	Investment in education is geared towards addressing this gap by advancing Literacy and Numeracy programmes as well as Technical and Vocational Education and Training to increase youth employability.	Established in 2003.
UNICEF giga project	KES 5 Billion	"giga aims to connect all schools in the world to the internet." ("Patchwork Kingdoms Visual Cinnamon")	Established in 2019
JICA		Improve basic education in sub-Saharan Africa.	Established in the 1990s.

Microsoft		Collaborating with key stakeholders to provide laptops loaded with the syllabus to about 240,000 teachers.	
Intel Corporation		"Intel Corporation has partnered with Safaricom in an e-learning initiative aimed at promoting use of computers among primary and secondary schools in Kenya." ("Intel, safaricom launch campaign to promote e-learning in primary and ...").	Established in 2020.
UNESCO		Digital Literacy Program (DLP).	

23. CONCLUSION AND RECOMMENDATIONS FOR THE INTEGRATION OF ICT IN EDUCATION

With a view to areas for funding and development, government officials and educators were asked to rank the following ICT needs on a 3-point scale. As can be expected, the following chart shows their ranking – which suggests the greatest needs being more computers, internet connectivity and pedagogical support for teachers. The development of ICT policy and the development of student ICT competencies were regarded as relatively less important.

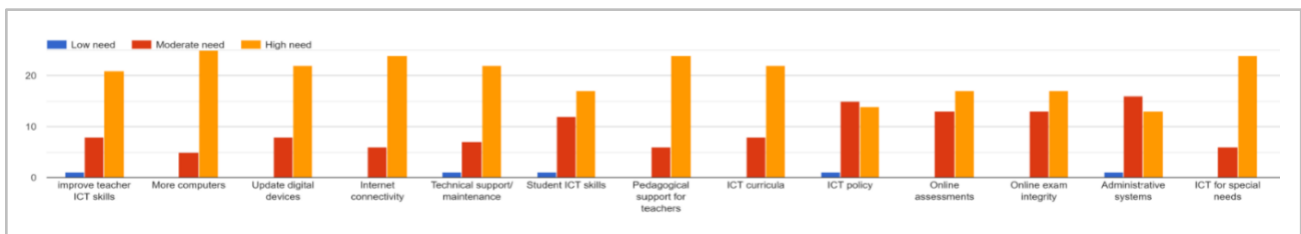


Figure 35: Ranking of development needs in the sector

Cumulatively the findings from the primary research resonate with those of the literature review lending support to the recommendations made in the previous section. The main recommendations emanating from the primary findings pertain to:

23.1. Improving the basic infrastructure

Much of the findings refer to problems associated with the lack of basic infrastructure. Ways of making internet facilities available in the absence of generated electricity and the use of solar or lithium power banks could go some way towards equalising access. The digital divide is as much about having access to optimal and reliable power sources as it is to devices and connectivity. The Government of Kenya needs to provide electricity and internet to all regions to enhance interactive e-learning programs to all learners across the country.

23.2. The use of mobile technology

Mobile penetration has increased tremendously and therefore provides a huge potential for use in teaching and learning. The findings in this section corroborate the high usage of mobiles for learning among students and educators. Mobile technology offers the affordances of a wide scope for research and data collection, sharing best practice, motivating and reminding learners (which appeared to be low according to student reports), as well as for enabling administration, collecting data from learners/teachers/ schools, for giving schools or learners feedback. These uses need to be considered when planning appropriate resourcing and interventions.

23.3. The focus on post-school education

TVET appeared to have fewer ICT resources and usage when compared with universities. TVET has a central role in addressing national resource deficits and an expansion of TVET can be made through the use of ICTs for delivery. meeting the needs of trainees/students for more flexible and individualised training. Similarly, the low implementation of ICT in the adult basic education sector needs to be addressed to ensure lifelong learning opportunities of those who will need to be skilled and reskilled.

23.4. Addressing the digital divide

Clearly this study shows that ICT in education is hampered by the digital divide especially among vulnerable groups and also by rural- and remoteness. While economic means drives the digital divide, access to resources could be addressed by donors and through subsidy. Lowering the costs of or providing free internet data for students, the provision of Zero-rated sites for learning are mentioned by the respondents in this study.

More work needs to be done to address the digital divide to provide equitable opportunities for lifelong learning and skills development. Taking advantage of the ODL solutions to expand the accessibility and quality of the educational systems to various vulnerable groups of learners, including learners with disabilities and girls.

This will require the government to make available the necessary infrastructure, facilities, for harnessing the use of ICT for high quality accessible education.

The Ministry for ICT and the telecoms could develop strategies to bridge the digital divide so as to equalise learning.

23.5. The need for e-learning materials

The use of OER materials – drawn on continental and international materials – will help in the provision of quality alternatives for teaching and learning and consequentially to expand access to educational resources; reduce the cost of textbooks; and help enhance access to quality knowledge repositories for learners, teachers and researchers. Since they are free, they offer many affordances for low-income countries and for low-income learners, providing free access to knowledge, which can be reused and repurposed. Both local and international contents and online learning resources should be sourced and developed relevant materials should be made available for institutions across the educational subsectors.

23.6. Realigning policies

While policy adaptation was not ranked as significant, this report shows how the Covid-19 pandemic has accelerated the adoption of digital forms of learning across the education sector. Policies will therefore need to be upgraded in line with current practices. Funding – both national and international – will need to be budgeted for. Policies and budgets should consider initial, reoccurring and maintenance costs.

23.7. Developing teachers' digital skills

As this study has shown, teachers have been catapulted into acquiring at least the most basic skills. This finding proposes that a skills audit be conducted across various teacher demographics so that training and capacitation can be bespoke for the relevant categories of teachers. As shown in this report, pre-service teachers are receiving training. Training interventions that are directed specifically at utilising the features of growing learner management systems may address the most needed ICT skills. The introduction of digital skills and new pedagogies should not focus only on technology but also on the development of instructional methods to support and guide students throughout the learning process.

23.8. Learners with disabilities

There is a need to upgrade infrastructure using universal design that can include learners with disabilities. A gap between rural and urban areas on providing accessible and quality education for all making provision for physical access for persons with disabilities.

24. CONCLUSION

This latter section based on primary research corroborates the findings of the desk review presented in the previous section. It is concluded that despite Kenya's massive education sectoral reforms and notwithstanding the progress made towards universalising education, Kenya's education system faced many challenges during the pandemic when the system needed to rely on the use of ICT.

While the country has strong political will undergirded by a range of policies in support of ICT-integration, the acuteness of the digital divide has left much of the population unable to access learning opportunities, including lessons presented on radio, television, computer, mobile phones, internet, and other learner management systems. One of the main contributing factors was the lack of electricity or the lack of a reliable supply of electricity – necessary to support e-learning – thus exacerbating the digital divide.

While the study found that problems associated with the digital divide were irrespective of the geographic location. This is because of the high costs associated with connectivity and devices which prohibit online learning. As the findings of this study show, the digital divide is particularly acute among those living in rural and remote areas, with the digital divide reflecting pre-independence stratifications of disadvantage that intersect with socio-economic status of households, geographic location, gender, age and ability – intersections that contribute to, and maintain disadvantage. As this report concludes,

education will need additional resources as the country continues to recover from COVID-19 in the context of fiscal consolidation and in terms of ensuring that the country is shock-proof and resilient.

Much work needs to be done in expanding infrastructure, ICT access and capacity towards ensuring quality and equity in education, especially in hard-to-reach areas. Moreover, the high illiteracy rate is indicative of school attrition, little or no schooling which is bound to increase as a result of COVID-19 learning losses and school attrition rates. Currently Kenya has a very low digital penetration level and low levels of infrastructure which need to be expanded in Kenya's pursuit to realize its vision of a knowledge society.

The two sections of this report need to be read as a composite study with the findings of a primary research corroborating those of the desk review.

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ANNEXES

ANNEX A: LITERACY RATES

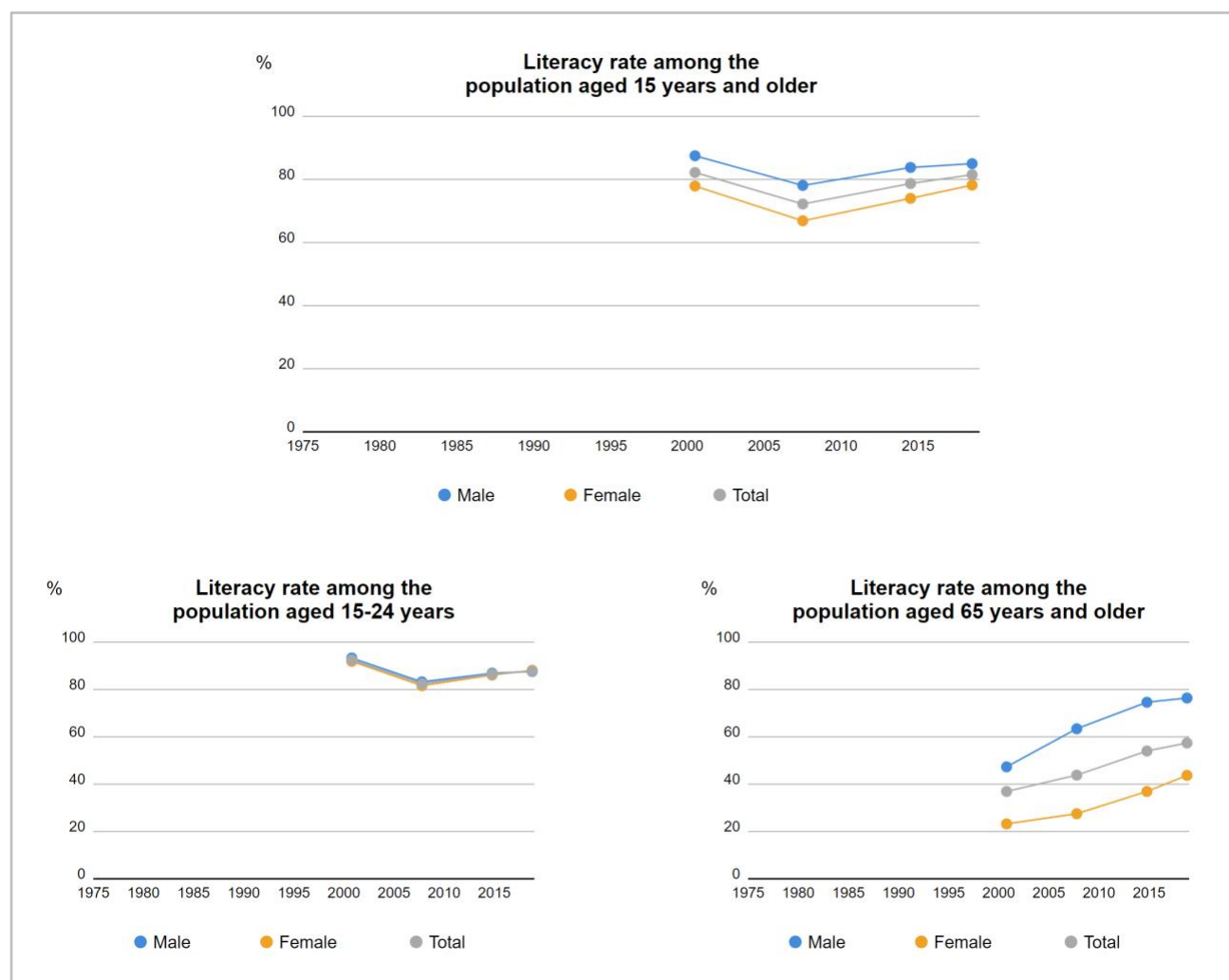


Figure A.1: Literacy rates

Source: [Kenya / UNESCO UIS](#)

ANNEX B: OVERVIEW OF THE STATE OF DIGITAL DEVELOPMENT BASED ON ITU DATA

Digital Development Dashboard ^{BETA}

An overview of the state of digital development around the world based on ITU data



Kenya

INFRASTRUCTURE & ACCESS



Network coverage

Population covered by a mobile-cellular network (2020)

96%



Population covered by at least a 3G mobile network (2020) (ITU estimate)

94%



Population covered by at least a 4G mobile network (2020) (ITU estimate)

77%



Mobile phone ownership

Individuals owning a mobile phone (2019)

47%



Female mobile phone ownership as a % of total female population (2019)

47%



Male mobile phone ownership as a % of total male population (2019)

48%



ICT access at home

Households with Internet access at home (2019)

18%



Households with Internet access at home, rural (2015)

15%



Households with a computer at home (2019)

9%



Households with Internet access at home, urban (2015)

56%



Mobile and fixed telephone subscriptions

Mobile-cellular subscriptions per 100 inhabitants (2020)

114



Fixed-telephone subscriptions per 100 inhabitants (2020)

0



Mobile and fixed broadband subscriptions

Active mobile-broadband subscriptions per 100 inhabitants (2020)

47



Fixed broadband (% of total): 256kbit/s - <2Mbit/s (2020)

2%



Fixed broadband (% of total): 2 to 10 Mbit/s (2020)

57%



Fixed broadband subscriptions per 100 inhabitants (2020)

1



Fixed broadband (% of total): >10 Mbit/s (2020)

39%



Fixed broadband (% of total): Unspecified speed tier

NA

International bandwidth per Internet user (kbit/s) (2020)

882



Total fixed broadband subscriptions (2020)

674191



Kenya

INTERNET USE



Percentage of population using the Internet



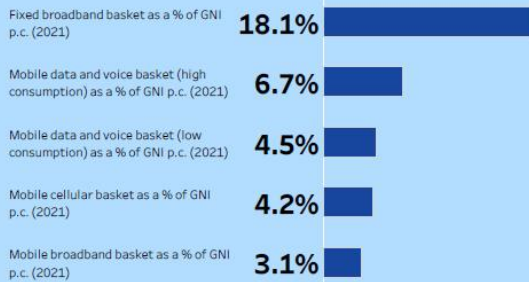
Broadband traffic



ENABLERS & BARRIERS



ICT prices



ICT skills



About this dashboard

The Digital Development Dashboard reports the latest values for selected indicators drawn from three ITU data sets:

- Telecommunication/ICT infrastructure and access data**, collected annually through one short and one long questionnaire. These indicators are defined in the [ITU Handbook for the Collection of Administrative Data on Telecommunications/ICT](#).
- Price data**, collected through an annual questionnaire. Price indicators are also defined in the [ITU Handbook for the Collection of Administrative Data on Telecommunications/ICT](#).
- Data on access to and use of ICTs by households and individuals**, collected annually through one short and one long questionnaire. These indicators are defined in the [Manual for Measuring ICT Access and Use by Households and Individuals](#).

This version of the Dashboard uses data collected up to November 2021. When a value is not available, NA is reported. In some cases, it is possible that the value reported for disaggregated indicators is for a different period than the main indicator. For most indicators, values are rounded to the nearest integer. As a result, it is possible that the sum of the values of disaggregated indicators does not add up to 100%.

ICT skills

- Basic skills:** the highest value among the following four computer-based activities: copying or moving a file or folder; using copy and paste tools to duplicate or move information within a document; sending e-mails with attached files; and transferring files between a computer and other devices.
- Standard skills:** the highest value among the following four computer-based activities: using basic arithmetic formula in a spreadsheet; connecting and installing new devices; creating electronic presentations with presentation software; and finding, downloading, installing and configuring software.
- Advanced skills:** the value for writing a computer programme using a specialized programming language.

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