

Accelerating ICT integration in Kenyan secondary schools: Lessons from the GESCI experiment.

Kenya, like most developing countries is experiencing a rapidly growing youth population. The implication of this bulge is that one of the biggest crisis the countries face in the 21st Century is that of creating jobs and economic opportunities for young, educated people. A critical factor in the employability of youth is their need to have modern workplace skills underpinned by digital literacy. Africa loses \$ 4billion a year to hiring expatriates to provide STEM services¹. Although government has taken significant steps to integrate ICTs in primary schools, this brief argues it is now important to consider accelerating ICT integration in secondary schools. Some benchmark studies, based on GESCI's intervention in pilot schools in three countries and the hosting of stakeholder policy forums on the topic, has found that GESCI's African Digital Schools Initiative has been successful in improving teaching capacities and 21st Century skills among learners. In this briefing, we summarize the main findings from the baseline study, lessons from implementation, look at what works best and highlight key lessons learned in Kenya.

Introduction

Most African countries face challenges of integrating ICT into their economies which relate to the lack of human and financial resources, which translate into inadequate and insufficient skills supply, irrelevant or incomplete regulatory frameworks, including policies and legislation, and inadequate infrastructure and communication platforms. A recent, GESCI Assessment of Knowledge Societies in 16 African countries² finds Kenya is well placed to take advantage of its growing integration of ICT into the different sectors of its economy. (See Box 1-p2)

Underpinning the success of a digital economy is the availability of people with skills for the modern workplace, which include using ICT. Recognizing this, Kenyan leadership in 2013 committed to giving first year primary school students access to laptops, an ambitious \$600m (£425m) Digischool scheme benefitting 1,2m children. The scheme was significantly adjusted in 2016 when financial sustainability challenges became insurmountable. A broader approach of introducing Digital Literacy in primary schools was adopted. This brief calls upon policy makers and education stakeholders to consider accelerating strategies for integration of ICT into secondary schools, primarily because secondary graduates are not sufficiently equipped with the appropriate skills and find themselves under-employed because of it.

Increasingly the Kenyan economy demands 21st Century skills.



1 IOM 2015

2 GESCI's (2017) African leadership in ICT Assessment of Knowledge Society

Box 1: Kenya's ICT Integration in Education Profile

Kenya's Vision 2030 and the STI policy and strategy provide the framework for creating a knowledge-based economy.

- Current restructuring of the education system and implementation of the digital learning programme also shows promise in gearing the country's direction towards ICT and STI.

- Kenya has made significant progress in Integration and application of ICT within the learning process in the education sector especially through the DigiSchool initiative which has seen equipping of class 1 pupils with tablets across over 19,000 out of the 23,951 public primary schools in Kenya as at the end of 2017. However, in Kenyan secondary schools, the government is yet to roll-out any national-reaching initiatives. Several organizations have rolled out new initiatives but which are still dominated by technical aspects.

- With devolved governance, continuity in government reforms, and a fairly stable political environment, Kenya is in a good position to leverage innovation.

- Kenya is firmly committed to nurturing a knowledge-driven development agenda. However, the issue of whether there is sufficient capacity and financial commitment to these goals remains debatable.

- Whilst Kenya has developed comprehensive policy frameworks, the relationships between research institutions and industry remain disjointed.

- Universities are competing to set up software and hardware incubation centres that would link them to industry.

Source: GESCI's (2017) African leadership in ICT Assessment of Knowledge Society

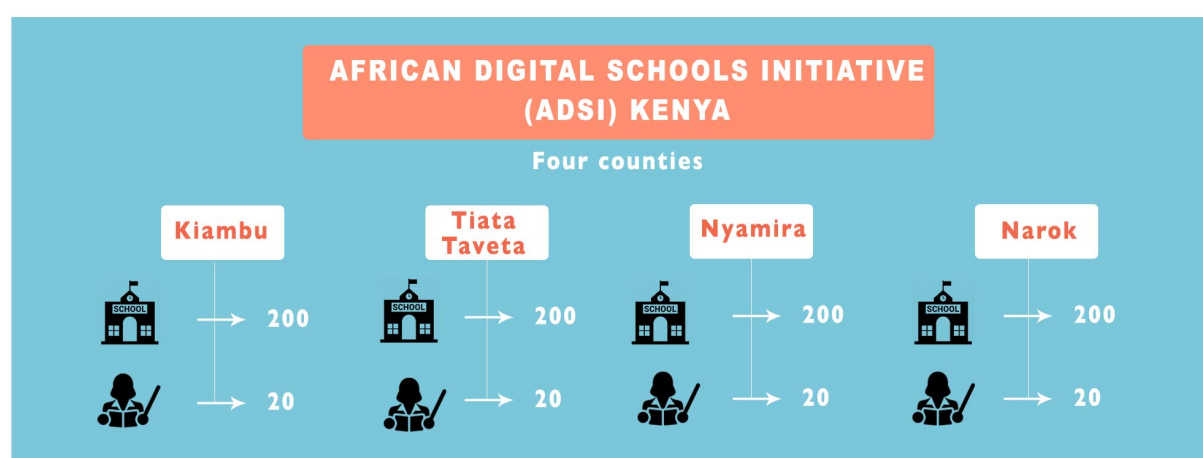
The GESCI solution

Since 2016, The Global E-Schools and Communities Initiative (GESCI) in partnership with the Mastercard Foundation and the Ministries of Education in Kenya, Tanzania and Cote d'Ivoire are piloting a five year African Digital Schools Initiative (ADSI) (2016-2020) - a comprehensive multi-country multi-year programme to implement an effective, sustainable and replicable model of digital whole school development in secondary education that will lead to improved student 21st century skills development, learning outcomes and readiness for the knowledge economy workplace.



Box 2: GESCI's African Digital Schools Initiative

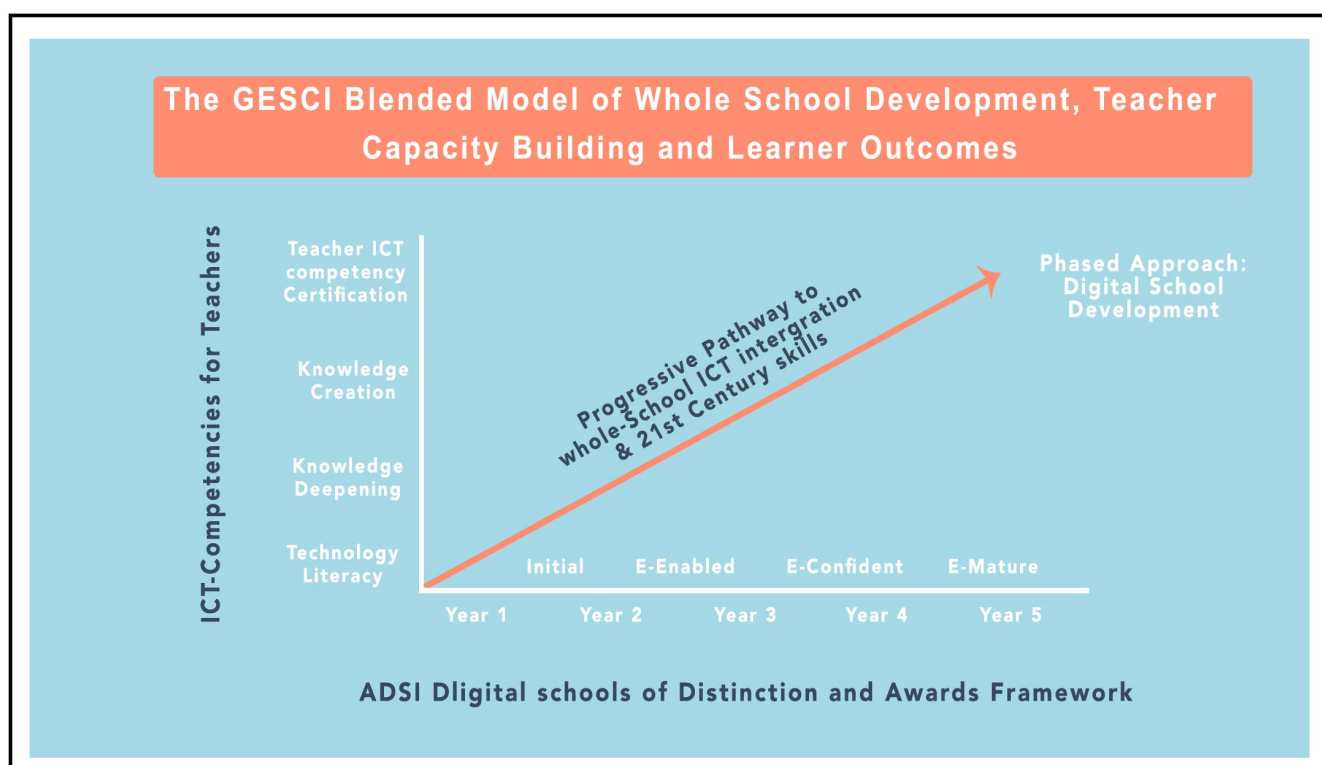
GESCI offers an innovative solution on the use of ICT to promote innovative practice and quality teaching across the curriculum and on a whole school basis but with a particular emphasis on teaching and learning focused on the Sciences, Technology and Mathematics (STEM) subjects. In Kenya, ADSI is being implemented in 4 counties namely; Kiambu, Nyamira, Narok and Taita Taveta. The main inputs include: sensitization and joint course development programmes; and mobile technology deployment to the schools in the form of a minimal toolkit of laptops and projectors to explore technology use in the classrooms; development of toolkits to capture changing processes in classroom teaching and learning practices; to create databases, MERL frameworks and national reference groups for sustainable documentation and institutionalization of the model implementation.



GESCI's Theory of Change

GESCI's Model of School Transformation builds the capacities of strategic change agents to create an enabling environment by harnessing the contributions of all key actors, including students, to transform schools for youth empowerment through 21st Century learning. The model combines top-down and bottom-up approaches.

At the heart of the model are the schools as learning organizations preparing their students for life, work and citizenship in the knowledge economy and society. The expected outputs are numerous but primarily ensure schools become digital leaders in their communities, teachers are empowered to become creative users of digital technology with greater competencies in their subject areas and learners improve their results in STEM subjects and are more able to be employed in modern workplace environments. Another critical element of ADSI is an embedded support from county coordinators and an expert working group that has oversight over project implementation. The expert groups include local authority education officers and active stakeholders in the sector. The assumption is that empowering local education authorities will deepen their knowledge, expand the GESCI practices and influence policy on ICT integration locally and nationally.



The Sources of Knowledge on Promising Practices

Under the ADSI program, baseline studies have been carried out to inform the project design and implementation. Through the analysis of the Kenya baseline study (2016), evidence has been generated on issues around institutionalization and ownership of ICT policies at the school level, teacher professional development for ICT integration, the status of digital schools development and the learners knowledge attitudes and practices.

As part of the 'knowledge deepening module' of the ADSI program, GESCI also focuses in generating policy recommendations. As such, several policy forums have been convened with teachers in the ADSI project to use their experience from implementation to generate policy recommendations. The recommendations were then validated by school principals of ADSI schools and education officials.

Together, the baseline, policy forums and observations from implementation have unearthed critical insights related to implementation experiences and challenges of integrating ICTs in schools operating in fragile circumstances or rural settings. They also generated key findings about what works in ICT Integration strategies in low-resourced schools, for whom and in what contexts. The studies were designed primarily to inform policy and practice within GeSCI and its funders, and secondarily to contribute to the debate on ICT Integration in education with other development actors and stakeholders in schools.

What lessons have been learnt?

GESCI's Policy Forums on ICT strategies identified that critical voices are missing in national discourses on the use of ICT to improve learning and education - that of the end users and implementers - head teachers, teachers, students and school communities. Stakeholders raised questions on: What are the implications for schools and communities envisioned in the national ICT policy? What is the status of digitalization in schools? What is the capacity of teachers to use ICT for teaching and learning? What are the learners' attitudes towards ICT? Will they become sufficiently skilled with ICT integration and 21st Century Skills to find jobs in the new modern workplace?

The following issues have emerged. GESCI considers them key in informing the discourse around ICT integration in education moving forward:

- National ICT Policies may be well known at school level but are difficult to implement without a road-map or an implementation plan. Head teachers reported that they are aware of the existence of a National ICT policy but struggle to implement it in their schools without clear guidelines. The majority of schools surveyed had not translated the national policies into local visions, actions and plans to integrate ICT in education within their schools.

Lessons Learnt: GESCI offers a phased approach for schools to shift from basic e-initial to e-mature by achieving standards on a set of norms on ICT Integration, including Leadership and Vision (see table below). Since the GESCI intervention, 71 out of 80 schools in the ADSI program have been evaluated as having shifted from e-initial to e-enabled and awarded a School of Digital Distinction Award. This award has proven a high incentive for schools to profile their success in their communities and with local authorities

Norms by which Schools use to shift their Digital status from “e-Initial” to “e-Mature”

ICT Norm	Standards determining the digital status of a schools ICT Integration					
Leadership and planning	Digital Vision of Schools	ICT Plan integrated into work	ICT integration to support learning	Acceptable use policy for ICT and internet	ICTs support inclusive education teaching and assessments	
ICTs in the Curriculum	Teachers understanding of how to integrate ICTs	Planning for ICT integration	Teacher use of ICTs in the students learning	Student experience in ICT learning	ICT integration in inclusive education	
Professional Development	Teachers participation in ICT professional development	Planning for continuous professional development	ICT skills focus of training	Teacher e-confidence	Peer-to-peer sharing on ICT best practice	ICT supported inclusive education training
School ICT Culture	Access to ICT resources	Evidence of ICT use with community	Website/ Online presence	Engagement in ICT projects	Uses ICT for organization and management	
ICT Infrastructure	Planning an acquisition of ICT resources	LAN and broad band access	Website/ Online presence	Availability of software and digital content	Availability of ICT equipment	Required licencing standards

Source : GESCI ICT Integration Roadmap ADSI

- A Teacher ICT-Competency Framework is essential to support capacity development in ICT integration in schools. Currently there is no national or county framework for teacher professional development in Kenya especially with regards to teaching through ICTs. Teachers reported that they have not been trained in this area and therefore lack the capacity to use and teach through ICT. Even for the few who have been trained, they reported that they still lack the confidence to use the skills in the classroom. Prior to the start of ADSI less than a third of Kenyan teachers knew how to prepare lessons that involve the use of ICT by students; use a spreadsheet, or engage in a discussion forum on the internet.

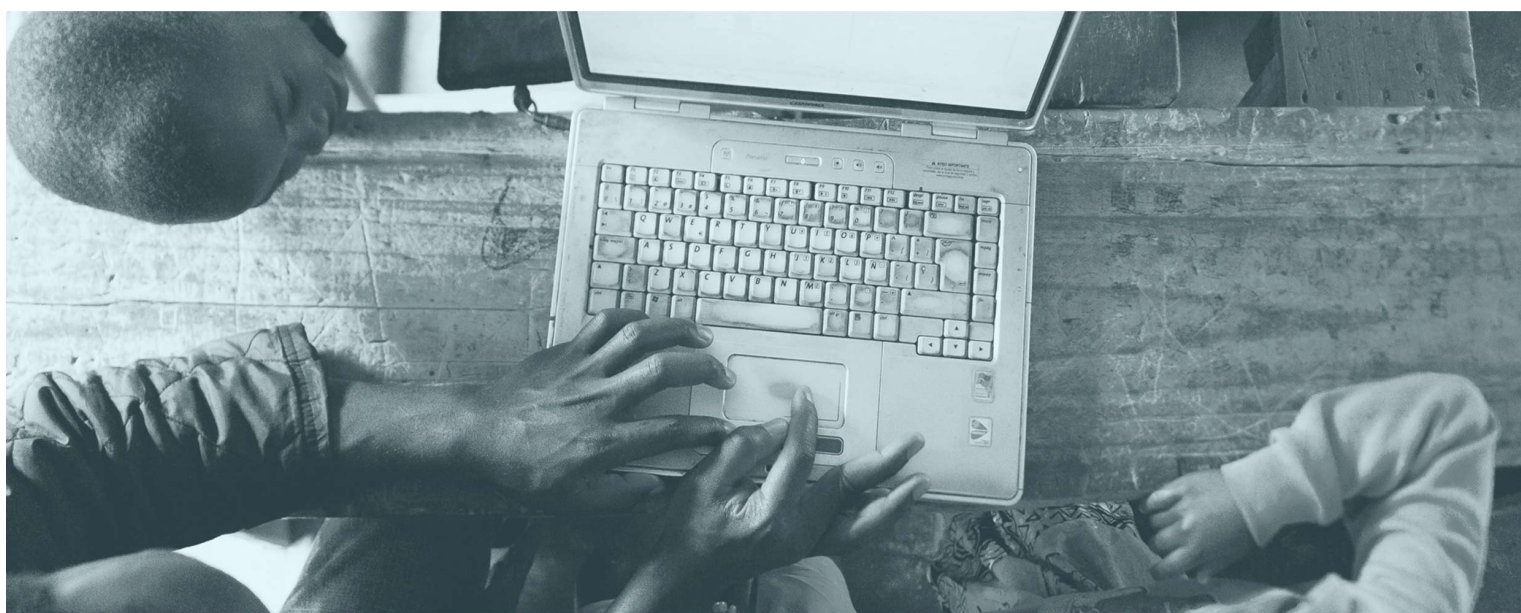
Lessons learnt: There is benefit in having a phased roadmap (like that for ADSI) in bringing teachers through a progression of pathways from 'initial' to 'technology literacy' to 'knowledge deepening' to 'knowledge creation' use of ICT in professional practice. Kenyan teachers involved in the ADSI programme have progressed to knowledge deepening levels, where students are encouraged to apply their ICT skills to research knowledge to solve complex, real-world problems. Currently, 757 out of 800 teachers in the ADSI are undergoing professional development at the 'knowledge deepening' level having successfully passed the initial ICT Integration at 'Technology literacy' level.

For two years running, the National ICT Teacher of the Year award by Centre for Mathematics, Science and Technology Education in Africa (CEMASTE⁵) has been won by ADSI program teachers. This has further served to underscore the potency of the ADSI model and approach.

- A minimum requirement for effective ICT integration in teaching is the provision of appropriate e-infrastructure and equipment. Most secondary schools lack the basic infrastructure and equipment necessary for integration of ICT in education. This is especially among the schools in rural areas and counties.

Lessons Learnt: The GESCI intervention, which selected schools with minimal e-infrastructure, has successfully transformed these schools into digital leaders with a minimum of 5 laptops, 2 projectors and internet router per school, most of whom were in rural counties. This provides the bare minimum for teachers in low-resourced schools to become ICT competent and creative in their subject areas. Of course challenges still abound; the poor teacher to student ratio, poor internet connectivity as well unstable electricity supply.

- An appropriate mindset of using ICTs for active learning needs to be promoted. A number of schools reported that even where there are ICT appropriate facilities, teachers and head teachers used the equipment for administrative use only rather than for teaching and learning. Teachers report they mainly used computers for monitoring their student grades. Schools report that adopting the GESCI whole school development program, where key steps in becoming a digital school of distinction require schools to develop an ICT culture, has prompted attitude shifts and growing investment in ICT infrastructure.



⁵CEMASTE⁵) is a public education institution established in the year 2003 to provide and coordinate In-Service Education and Training (INSET) for practicing teachers of Mathematics and Science in Kenya.

"We have seen a lot of improvements in our learning. We only used to have 1 desktop for the secretary. We have made tremendous improvements as we have managed to purchase 5 desktops for learners to use. I more laptop and one projector so that teachers can be able to download own content. We also have bought a sub-woofer for sound projection"

"At the school level, we have mandatory ICT training to every teacher. Technology integration is in line with the school vision because we aim higher at ensuring that our graduates acquire requisite competencies and become good ambassadors in the community. As such, our focus in the long run is to ensure that formal ICT trainings are offered to the community around the school to make it a knowledgeable society'
Head teacher on ADSI programme"

- Learner-centred approaches which use 21st Century skills sets are challenging to assess.

Policy makers and education stakeholders are focused on value for money improvements in learner outcomes. National examinations seldom measure the intangible 21st Century skills of problem solving, critical thinking, communication, and teamwork – prerequisites for the modern workplace. Even technology as a subject is not examinable in most countries, even in Kenya.

Lessons Learnt: GESCI offers a student 21st Century competency passport certification based on a portfolio of student-produced artifacts and assessments that are drawn from international and regional frameworks for student 21st Century achievement in STEM at secondary level. The ADSI approach has proven the potential of ICT to not only accelerate but also improve learning and classroom experience for both students and teachers. Through beneficiary accounts, stories and classroom observations, GESCI has collected evidence that the use of ICT is already helping teachers to deliver education better and the students to learn effectively.

"Learning through ICT is very interesting. For example in Biology, when you are learning about the human heart, you see the circulation of blood from the heart to other parts of the body live. It was very interesting" Student, ADSI school"

"Before the digital program came, teaching was not that interesting. The classroom was not interactive especially for science subject. Like if you are teaching 'an atom', you simply explaining something you are unable to show, more of imaginary things. When you have a laptop and a projector, you're able to show what exactly you are talking about" ADSI Teacher"

- Digital Skills are needed for Future Jobs. Less than 30% of Kenyan teachers reported that their students use ICT in mastering subjects taught. Despite low ICT literacy among the students, - most did not own internet enabled mobiles - most of them have very positive views on ICT and believe it can help in improving learning. Students reported that access to ICTs is challenging both at school and at home. The levels of exposure to ICT is also disparate across the urban and rural settings.

Lessons Learnt: Students participating in GESCI's African Digital Schools initiative after one year are showing tangible improvements in 3 out of the 4 STEM subjects. A comparison of the 2016 and 2017 school mean scores for ADSI schools also show that majority of the school improved their performance as follows; in mathematics; 73% of the schools improved in Maths with an average 2.06%, 28% improved in Biology by 1.93%, 72% improved by an average 3.38% in Physics. Anecdotal evidence has also suggested that overall the performance of the children in the target schools has improved significantly and that the learning experience is much better as the lessons are more lively and participatory. There have also been observable improvements in students communication, expression and presentation skills



Policy Recommendations

The following are some of the policy lessons learnt from the GESCI experience:

1. Demystify ICT Policies for better understanding, ownership and implementation

Understanding a policy and how it relates to one's local context is the first critical step in implementing a policy. The majority of the school heads know there is an ICT policy, yet there is very minimal understanding of what it entails. This makes it difficult to implement. Therefore, Ministry of Education needs to do more in breaking down the ICT policies among the critical stakeholders who are at the implementation level

At Policy Level:

- Conduct inductions for all head teachers on the ICT policy and how they can implement it in their different local contexts.
- MProvide a framework and manual for use by head teachers for integrating ICT in all secondary schools in collaboration with all stakeholders.
- As part of the performance targets, each head teacher should come up with a school ICT integration plan to guide implementation.

2. Create an enabling environment for ICT integration

Integrating ICT in learning at the school level requires different resources, norms and a supportive culture. Apart from the resources and equipment, an important indicator is the extent to which the school is e-ready. Creating an environment that promotes a culture where ICT thrives is essential.

At Policy Level:

- Define and adopt a 'full package' approach for effective ICT integration in secondary schools. One that combines a focus on school leadership, teacher capacity strengthening and wholesome infrastructural development.
- Ensure that the basic ICT integration package includes; computers, e-content, internet (infrastructure); teacher training (ICT skills); curriculum integration (computer studies); ICT school budget (equipment, construction); and access to labs (ICT culture).
- There is a need for a mass campaign to sensitize public and key stakeholders on the benefits of ICT in general but also on the 21st Century skills.

At School Level:

- Institute school ICT integration committees comprising; teachers, BoM and Parents association to help improve ownership, spearhead planning and follow-up as well as develop ICT use policies at the school level.

3. Design and align ICT content to the education curriculum

The use of ICT in schools and for education appears to be an additional component in the education system for most of the teachers and stakeholders at school level. This has served to deny it the attention that it deserves. Some stakeholders are also concerned that in the past, the content has not been well aligned with the syllabus. There is an urgent need for movement towards making ICT an embedded component rather than an add-on in the education system

At Policy Level:

- Government through MOE should develop and avail a compulsory ICT literacy syllabus for all levels of education
- KICD should review the curriculum for ICT integration suitability periodically to keep it up to date with emerging issues, new trends and aligned to the competence based curriculum.
- KICD should digitize the curriculum and fund its implementation. KICD and MOE should ensure that there is digital content for all levels of education to enhance learning in all secondary schools.
- KICD should harmonize the content in the books with the content in ICT platforms to ensure that the level of learning and depth is the same regardless of the methods of teaching and delivery.

4. Make ICT integration a collaborative process

There is evidence that the government has made significant efforts to disseminate information about the ICT policies. However, there are still disparities in awareness and knowledge of ICT integration policies especially among teachers and school leaders with most rural schools exhibiting the lowest awareness levels. This could be a sign that most of these policies have been developed without participation of critical education stakeholders especially at the school level. This creates challenges in buy-in, ownership and implementation.

At National Level

- Policymakers need to be more consultative and include key implementers in policy formulation and dissemination and translation of their policies to key stakeholders and the general public.
- Constantly inform and update the public as well as other stakeholders about ICT policy in the education and training system to support greater buy-in and uptake.

At County Level

- County Directors of Education should work in collaboration with School Principals to ensure that ICT is integrated in every subject across the curriculum

At School Level

- Involve teachers and learners in developing the digital content in schools to increase ownership and alignment to end user needs and abilities.



5. Streamline teacher professional development

For effective integration of ICT into learning in Kenya, the teachers must have the necessary ICT competencies and knowledge on how ICT can improve how they deliver education. At the moment, there seems to be no national framework on how to help teachers upskill on ICT let alone learning how to teach using ICT.

At National Level

- Make it mandatory for all pre-service teacher training institutions to train teachers on ICT integration in their teaching subjects.
- Develop a national framework for teacher upskilling for ICT integration in education to ensure there is uniform and structured teacher development.
- TSC should work with different development partners to expand online teacher professional development to all teachers to enable them train anywhere anytime through an online platform.

At County Level

- Institute a follow-up and on the job mentorship framework to help teachers get continuous support, knowledge sharing, progress monitoring and challenges handling.

At School Level

- Ensure every school has an ICT integration 'expert' from among the teachers to drive the adoption of ICT and provide technical and moral support towards ICT integration. ☐
- Review workload for teachers to help them find spaces for continuous professional development and planning for ICT integration.

6. Accelerate the provision of ICT infrastructure for all secondary schools

Despite the national drive towards integrating ICT in education, there is evidence that there are great disparities and inequalities on the requisite infrastructure for different regions. With inadequate or poor infrastructure such as electricity, it becomes difficult to equip schools with the necessary equipment. Across the regions, research reports indicate that there are many challenges that hamper efficient implementation including cost of infrastructure, electricity, teachers' skills and leadership.

At National Level

- All secondary schools should have in place minimum essential ICT infrastructure such as regular electricity with power plugs in every classroom, guaranteed access to internet and essential equipment of at least 5 laptops, 2 projectors per 10 teachers.
- The government in collaboration with various stakeholders should provide hardware and software resources to all schools.
- Set-up budget vote head in the capitation grants to facilitate acquisition and maintenance of ICT resources as well as training in the school to ensure ready support for teachers and reduce downtimes.

At County Level

- Strengthen the capacities of pedagogical supervisors (curriculum support officers) in secondary education to assist in monitoring progress supporting teachers on ICT integration.

At School Level

- Monitoring and tracking of resources usage should be ongoing in the schools to ensure maximum utilizations and leverage.