The African Digital Schools of Distinction Model:

Baseline Study on ICT Integration in Teaching and Learning of STEM Subjects in Kenya, Tanzania & Côte d'Ivoire Secondary Schools

A Synthesis of Baseline Reports

1.0 Project background

The Global E-Schools and Communities Initiative (GESCI) in partnership with the Mastercard Foundation[1] and the Ministries of Education in Kenya, Tanzania and **Côte d'Ivoire** is embarking on 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.

The ADSI model presents a portfolio of system- wide ICT innovation elements that can address policy coherence needs for ICT integration in teaching and learning - inclusive of: a blended learning teacher development approach, whole school involvement, school leadership capacity building, converging technologies of e-learning and m-learning, use and development of open education resources, an online repository of materials, digital school awards, accreditation and certification to incentivize ICT integration and progression, policy dialogues to raise awareness and influence new policy formulation and institutionalization of new/good practice.

The ADSI programme involves a substantial horizontal and vertical upscale from its SIPSE[2] pilot – as in: on a geographic level across the three project countries, targeting up to 1,400 STEM teachers, 140 schools, 35 school support teams, 140 school based coordinators, 560 School Board Management / Parent Teacher Association members with an outreach to some 250,000 students; on an institutional level targeting government institutional co-participation from national levels (ICT, curriculum, teacher development and evaluation institutes, departments and ministries) to local levels (schools, communities, county and regional directorates) in the development and management of the project (inclusive of monitoring, evaluation and learning).

Baseline studies are critical in helping generate an evidence base upon which development interventions are designed and implemented and to help in establishing benchmarks and indicators upon which progress will be monitored and against which the project will be ultimately evaluated. Baselines also have an additional benefit of deepening understanding of the context in which the project will be operating and to set benchmarks.

Therefore prior to the start of ADSI project, GESCI engaged different partners drawn from the universities under the component of institutionalization across the three countries (Kenya, Tanzania and Côte d'Ivoire) to carry out baseline studies across the target schools and regions. The Baseline Study on ICT Integration in Teaching and Learning of STEM Subjects in Kenya, Tanzania & Côte d'Ivoire Secondary Schools produced 3 reports. This document provides a synthesis of the 3 baseline reports from the three

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project countries. It is intended to provide only the key highlights and where possible we have tried to highlight the general contextual differences for the three countries. One may need to read the individual reports to get the whole picture on some aspects.

The baseline reports are here: Kenya [Kenya Baseline - Final](#) , Tanzania [ADSI - Baseline Report - Tz - Final](#) and Côte d'Ivoire? [Baseline report - CIV -English](#),

2.0 Purpose of the Baseline Study

The purpose of the baseline survey in each country was to provide a benchmark for onward progression of ADSI digital school development and for ICT integration in STEM teaching and learning over the five-year period of programme implementation. The ADSI programme general research questions and the baseline strategic and specific objectives are outlined below.

2.1 The ADSI Programme Research Questions

2.1.1 **Institutionalization:** What is the general context of the ADSI project in terms of the historical, education, policy and reform factors which can support or constrain the ADSI project implementation and expansion across the three countries?

2.1.2 Digital Schools Development: What is the status of school readiness for the pedagogical integration of ICT in teaching and learning of STEM classroom practices?

- What types of policies both at school level (micro) and outside the school (macro) are in place to help inspire better and greater use of ICT in school and classroom practices?
- What have been the rollout characteristics in terms of goals, planning, supports and resources for ADSI expansion of project schools in Kenya, Tanzania and Côte d'Ivoire?

2.1.3 Teacher Development: What is the status of teacher readiness for the pedagogical integration of ICT in teaching and learning of STEM subjects?

- To what extent do teachers use ICT in STEM classroom practices?
- What is the level of teacher competency for ICT integration in professional and classroom practices?

2.1.4 Learners: What are students' attitudes toward the use of ICT in STEM lessons?

- To what extent do learners use ICT in STEM classroom activities, assignment and projects?
- To what extent do the learners improve achievement in STEM with the integration of ICT in classroom practice?

The baseline study focused on the first questions in each domain related to the context and status of ICT use in the ADSI project schools prior to the roll-out of the intervention.

3.0 Baseline scope, methodology and approaches

The baseline was carried out using a mixed methods approach across the three countries. The following table describes the scope of baseline studies.

Table 1: baseline design and scope

Aspect	Kenya	Tanzania	Côte d'Ivoire
Counties/Regions	Kiambu, Narok, Nyamira, Taita Taveta	Morogoro & Pwani	Abidjan & Yamoussoukro
ADSI schools	80	40	20
Baseline timelines	2016 (Q3&4)	2017 (Q4)	2017 (Q3)
Baseline schools	64	20	10
Methods and approaches	Desk review, survey, qualitative interviews and observation	Desk review, survey, qualitative interviews and observation	Desk review, survey, qualitative interviews and observation
Baseline target groups	Students, school heads, SBCs, STEM teachers	Students, school heads, STEM teachers	Students, school heads, STEM teachers
Sample/coverage	• 68 schools (17 in each of the four counties) • 67 school heads in interviews • 66 School Based Coordinators • 405 STEM teachers in teacher survey 1 • 64 STEM teachers in teacher survey 2 • 56 STEM lesson observations • 638 Student Survey	• 20 schools (10 in each of the two Regions) • 67 school heads in interviews • 91 STEM teachers in teacher survey 1 • 83 STEM teachers in teacher survey 2 • 17 STEM lesson observations • 143 Student Survey	• 10 schools (7 in Abidjan, 3 in Yamoussoukro) • 10 school heads in interviews • 93 STEM teachers in teacher survey 1 • 10 STEM teachers in teacher survey 2 • 10 STEM coordinators • 106 Student Survey

4.0 ICT in education context (Kenya, Tanzania & Côte d'Ivoire)

As expected, the three countries have varying 'ICT in education' contexts in as far as policy, legislative, operational context and practice frameworks that promote the incorporation of technology in education is concerned. One thing they all share however, is the great national desire by the respective governments to mainstream ICT in the education sector as well as in the different spheres of life as can be well attested by the various policies that have been formulated. The following is an overview of the 'ICT in education' landscape across Kenya, Tanzania and Côte d'Ivoire as revealed by the respective baseline studies.

In Kenya, a developing country which has recently achieved middle-income-country status (Brookings, 2014), there has been a growing recognition of the need to mainstreaming ICT into the education sector as well as other spheres of life. Promotion of ICT use in schools and other educational institutions has largely been articulated through sessional and policy papers (GOK, 2004; 2006; 2008; 2012). There are also other policies, visions and actions that provide evidence of the government's focus on increasing the use of ICT in education as listed below:

- The National ICT policy (GOK, 2006) recognizes the need to strengthen and streamline training through promotion of ICT in Education at all levels especially by improving ICT curricular and ensuring that teachers and trainers at all levels acquire the necessary skills.
- The launch and focus of the country Vision 2030 (GOK, 2008), has given the Ministry of Education the responsibility for taking the lead in developing of well trained teachers at all levels to fully participate in the knowledge economy and more so in enhancement of 21st century skills.
- Sessional paper No. 1 of 2012 (MOE and MOHEST, 2012), clearly puts into focus the role of ICT in Education as it brings many benefits to the classroom. However, it tends to put more focus on the need to have educational institutions equipped with ICT facilities for the promotion of modern tools in teaching and learning.
- The National Education Sector Support Programme 2013-2018 (MOEST, 2014) also recognizes the importance of teachers in Kenya to be provided with modern and relevant experiences in using modern methods, including ICTs in curriculum delivery and implementation.
- There have also been efforts by the government to improve school infrastructure to support the growth and use of ICT. The government of Kenya has for instance provided tablets to primary schools through the Government and Public Private Partnerships (PPP), but the computers seem to play a minor role in the teaching / learning process in most schools. At the secondary school level however, not many of the schools in Kenya have computers central to their educational process. Even where computers have been available, *they have* been used in collecting administrative data such as enrolment data, student attendance, basic information on teachers and basic information on schools. There is little evidence that ICT has been used for instance in improving learning, teaching or resource allocations and use.

In Tanzania, the government has identified enhancing technological integration in education as one of the pivotal issues in its leap towards being a middle-level income earner and a semi-industrialized country by 2025 (MWTC, 2016). To this end, there have been a number of initiatives directed towards ICT integration in enhancing teaching and learning at all levels of education;

- The government and partners have been equipping schools with computers and ICT. A recent report by the Ministry of Education, Science and Technology (MoEST) indicates that approximately 31.4% of government secondary schools (out of 3,601) have been equipped with computers ranging from 1 to 68 computers (MoEST, 2017). The report further states that nearly 20% of these schools are connected to the Internet. Although the report focused on government schools, it is clear that the number of private schools with computers connected to the Internet is high as well.
- Similarly, there are many initiatives in developing digital content and making them available for students to access via the Internet. For instance, the College of Information and Communication Technologies (CoICT) in collaboration with Halotel Tanzania developed the Halostudy system with digital content for all science and mathematics subjects for Form 1 to Form IV. The content was enhanced with multimedia elements to facilitate self-learning and was deployed in 426 secondary schools connected with Halotel Internet. Christian Social Services Commission (CSSC) developed an eLearning platform with content for secondary schools in Tanzania (CSSC, 2014). Other initiatives that

have developed content for secondary schools in Tanzania include Shuledirect (Mtebe & Kissaka, 2015), and retooling project (Mtebe, Mbwilo, & Kissaka, 2016).

Nonetheless, the impact of ICT integration has not managed to enhance students learning in several secondary schools in Tanzania as the pedagogical integration of ICT in teaching and learning is still low as many teachers graduate with insufficient skills to use ICT in the classroom.

In recognizing the role of teachers in ICT integration, the government and partners have continued to improve ICT infrastructure in schools and colleges, increasing ICT awareness among teachers and learners, and increase in the use of ICT to facilitate administrative functions in schools. One of the notable efforts of the government was equipping thirty four (34) teacher training colleges with computers and Internet connection through the Swedish International Development Agency (Sida) . The main aim was to ensure that pre-service teachers are trained in the use of ICT for teaching and learning so that they can use these skills in secondary schools once they graduate .

In Côte d'Ivoire, the government has since 2012, initiated a process of education and training system reform in order to make it more efficient thanks to access to digital technology. This desire led to the adoption of Decree No. 2012-994 of 19 September 2012 which put in place the E-Learning programme that integrates a digital technology into the education system. Indeed, education officials became convinced that digital technology could contribute to meeting of current major challenges of the education system, namely: governance, teachers' skills development, improvement of school results and quality of teaching-learning and universal education.

There is a growing realization that digital technology has the potential of transforming pedagogy and presenting an opportunity for national school system progress. However, just like in many developing countries, in Côte d'Ivoire ICT is used mainly to collect enrollment data (through online registration system), students' attendance, and basic information about teachers and schools. Thus, ICT mainly helps administrators and managers to get a better idea of the education system size and to evaluate efficiency indicators for making decisions on basic resource allocations and improving school performance.

Having identified the causes of the internal inefficiency of the education system, in particular, the obsolescence and insufficiency of training materials and school equipment, the maladjustment and the non-mastery by teachers of teaching methods geared towards the learner, the Sectoral Plan for Education (PSE) 2016-2025 undertakes a number of measures aimed at correcting these dysfunctions. Thus, several strategic actions have been defined to achieve the expected results, including the use of digital in educational activities to improve learning. The strategy will consist of:
  (i)   training of trainers in the production of digital pedagogical resources and their use,
  (ii)   the development of Open and Distance Learning (ODL),
  (iii)   the acquisition of 2050 educational tablets for 30 primary schools on experimental basis,
  (iv)   support for the administrative and pedagogical management of schools, particularly in monitoring attendance and learning outcomes ".

Côte d'Ivoire has committed itself to the sustainable development goal No. 4 (SDG 4) - to promote an inclusive and fair education of quality and lifelong learning for all, it has decided to use innovative training methods, facilitating the use of Information and Communication Technologies (ICT) for easier access to education and training, including distance learning (also known as FAD). The use of digital technology, in particular distance learning (ADF) in general and Mobile Learning in particular, is today high on the government's agenda on new strategies.

5.0 Summary of key findings

The core of the analysis across the three countries rests on triangulation of the information collected from the various sources through the various methods. In each of the research questions, different dimensions were explored. This section presents the synthesis of the findings across the three countries in each of the 4 aspects as follows:

5.1 Baseline findings on institutionalization

The question aimed to explore the level of institutionalization national ICT strategies for the pedagogical integration of ICT use in both the STEM and other subjects. This was important in providing contextual information for the ADSI project. It was important in highlighting any historical, education, policy and reform issues with the potential to either support or constrain the ADSI project implementation and expansion. To do this, the following three dimensions were explored;

    i)   incorporation of ICT in school vision, leadership and planning
    ii)   ICT support in curriculum, pedagogy, organization and management of the school
    iii) ICT policy adherence, use and results achieved

In terms of institutionalization, the Kenya context is characterized by the following by a very robust national legislative framework for ICT integration. Most of the stakeholders expressed great awareness of these policies. At the school level, most of the school heads ware aware of the policies, were knowledgeable of the policy provisions and seemed to generally understand the importance of ICTs in education and had encouraged teachers to embrace ICT. Many of the schools have computers, a few have computer labs as well.

However, there was very little evidence that ICT had been used beyond collecting administrative data such as; enrolment, student attendance and some information on teachers and school equipment. Even though not widespread, evidence emerged about instances when ICT has been used for teaching and learning and there is high optimism in the potential role of ICT in improving learning and teaching.

> *"Students are excited and motivated to learn. Teachers download content for their regular teaching, making teaching effective. Using ICT facilitates tracking of students' transition rate. Students can also access and download revision materials through ICT." Head teacher*

> *"Make student and teachers ICT compliant...Using ICT in teaching and learning is in line with government policy on digitization... ICT is the pillar for industrialization, hence important for both teachers and students" SBC*

On the other hand, **Tanzania** doesn't have any specific laws that touch specifically on ICT. However, it would appear that they already have many initiatives going that are aimed at integrating ICT in education. The majority of heads of schools and school coordinators in the schools visited were aware of national projects (initiatives) designed to improve school performance with ICT integration having been identified as one of the key strategies. In fact, some reported to have been involved in implementing some of the projects.

Heads of schools were aware of their ICT needs and some had strategies in place to achieve their ICT goals. There were reportedly local initiatives going on in some schools such as meetings with parents, providing in-house training among staff members and other strategies being employed by heads of schools towards implementation of ICT integration in their schools.

'I have received few computers from friends - Sokoine University. We had also support from Hallotel who provides us with 10GB bundle each month for wireless internet connection. Currently, our computer lab is having 20 computers; they are all working. Due to shortage of computers we have no computers in classrooms and in offices.'
(Head of School, Morogoro Region)

'Teachers help each other to make sure they know how to use ICT in teaching. Shortage of computers is the greatest challenge. There are many teachers amounting to 64 and 651 students. No training has been provided to teachers. But some teachers have taken self-initiatives to attend ICT course elsewhere'. (Head of School, Pwani Region)

In addition, majority of school leaders had positive attitudes about their performance, discipline, and ICT use in their schools regardless of having no ICT policy to guide them. School heads, ICT coordinators, and teachers interviewed considered themselves as computer literate and aspired to improve performance and ICT use in their schools over the coming five years. Most of the teachers were using computers for setting examinations and recording results.

However, school leaders also aired their concern that materials (content) from the internet were not aligned to the syllabus making them hard to use. They also had concerns with the teachers whom they said needed to be constantly encouraged and motivated to use ICT in lesson preparation and teaching. The majority also raised concerns on the poor level of equipment (such as computers, laptops, printers) and infrastructure (computer labs).

'There is no special room for computers. The existing computer room was teachers' tea room. Teachers are now taking tea outside because the room is used as a computer room. Thus, a school needs a special room for keeping computers. The other challenge is that the school does not have electricity.' Head of School, Morogoro region

'About 75% of teachers are positive on the use of ICT in teaching and learning and towards improving students' performance. On the other hand, 100% of students are positive and very interested in learning using technology. As I said earlier, the majority are very positive in using computers. Due to weak infrastructure, here at school very few teachers are using computers in teaching and learning.' (Head of School, Morogoro Region)

As for Côte d'Ivoire, there exists legal and regulatory provisions in the field of ICT at school (decision taken since 2012, institution of a TICE material in training programmes), yet major players at the school level seem to be unaware of these provisions and constantly cited lack of a national ICT policy in schools, which should define its objectives, content and how they could be implemented. When asked about their own vision of the integration of ICTs into teaching within their school, most of the school heads did not have any clearly articulated vision or planning based on goals and activities within a defined time frame.

ICT mainstreaming is at a rudimentary stage. The use of ICT by teachers is often limited only to recording of student grades and averages.

The study further revealed that apart from the ENEACI project as it is implemented in its pilot phase, no specific planning is deployed by school heads. In other words, school leaders encourage STEM teachers to use ICT in their educational activities without any planning being given to them.

However, most of the school principals have got high regard, knowledge and recognition of how the use of ICT in teaching and learning is a source of increasing motivation and more active participation of students in the course. They also hope that ICTs will solve the problems of lack of computer rooms/laboratories in most cases and become a reflex for teachers and students for research at school and beyond.

5.2 Baseline findings on Digital Schools of Distinction

In addition to the objective of promoting teacher training in ICTs materials and online repository of resources and lessons involving ICT and STEM, the ADSI seeks to strengthen a whole school approach to ICT capacity and integration. GESCI has adopted a digital schools of distinction framework which provides a road-map of digital readiness bringing schools through a progression pathway from E-initial 'initial' to 'e-enabled' to e-confident', 'e-mature' 'and ultimately whole school ICT Integration.

Within each of these four phases of schools' changing levels of digitalized competency there are specific norms that are monitored, each with a number of components of standards that reflect the phase of the school's progress on the Digital Schools of Distinction (DSD) pathway. According to the ADSI model, there are five key norming areas, namely:

i) **ICT, Leadership & Vision** that expresses the policy direction of ICT at school level and that defines a vision and strategy and a positive attitude towards the use of ICT. ;

ii) **The place of ICT in the curriculum**: schools will show the integration of ICTs through the learning and teaching programme.

iii) s. Staff will clearly demonstrate how ICT can be used in the programme to enhance student learning.

iv) **The technological culture of the school**: here, the schools will demonstrate the awareness that ICTs have an impact on the quality of learning and teaching, on the attitudes and behaviors of students and on the school community in it all together.

v) **ICT professional development** will include a demonstration of the commitment to ICT-related continuing professional development, with a mechanism in place to inform teachers of professional development courses, as well as support and encouragement for professional development at a school level. And finally,

vi) **ICT resource and infrastructure** criteria will imply that schools have appropriate ICT resources, including hardware, software and infrastructure for support.

The table below indicates the important standards supporting the achievement of the ICT or Digital Norm of best practice.

A Roadmap of Norms which Schools use to shift their status from "Initial" or "e-Enabled" to "e-Confident" or "e-Mature" as per GESCI's Framework for ICT Integration.

ICT Norms	Standards determining the digital status of a schools ICT Integration per Norm:					
Leadership and Planning	Digital Vision of school	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	Teacher Understanding of how to integrate ICTs	Planning for ICT integration	Teacher Use of ICTs in student learning	Student Experience in ICT learning	ICT integration in Inclusive Education	
Professional Development	Teacher 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	IICT 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	

ICT Infrastructure	Planning and Acquisition of ICT resources	LAN and Broad band Access	Integrated Technical Support for ICTs	Availability of Software and Digital Content	Availability of ICT Equipment and management	Required Licencing Standards

Source: GESCI Digital Schools of Distinction Roadmap ADSI Kenya

All schools participating in the ADSI programme are assessed in terms of their digital readiness and are encouraged to shift their practices in order to graduate to higher levels of digital distinction. The more comprehensive the standards a school has on each Digital Norm the more They progress on the DSD pathway. The individual assessment of schools in terms of this Road Map of Digital Norms and Standards is shared with all schools. This raises awareness of the expectations among all stakeholders on how to achieve effective ICT integration across the whole school. A key strategy of project management of ADSI is to establish the enabling conditions, needs, resources and priorities of the schools in relation to ICT in STEM teaching and learning so that the intervention can respond appropriately.

The e-readiness of schools for the pedagogical integration of ICTs in teaching and learning of STEM classroom practices is largely determined by the context in which they operate. The three country contexts have been elaborated in the previous section on Institutionalization. In regard to the DSD pathway status, the findings of the Baseline, indicate that the implementing schools from all three countries to varying degrees can be classified as in the "Initial'' stage. The table below illustrates the general situation across most of the ADSI schools per country.

Norms	Kenyan Schools (n=67)	Tanzanian Schools (n=20)	Côte d'Ivoire Schools (n=10)
Leadership and Planning	Only one or two Head Teachers indicated they asked the ICT teacher to create an ICT plan / curriculum for the school.	Majority of school leaders had positive attitudes about ICT use in their schools regardless of having no ICT policy to guide them. Some put strategies in place to achieve their ICT goal by holding meetings with parents and providing in-house training among staff members. One Head Teacher spoke about making their school a platform for the community to become part of a knowledge society.	No Head Teacher clearly articulated a vision or planning based on goals and activities within a defined time frame for ICT integration in their schools.
ICTs in the Curriculum	Some schools introduced computer literacy classes for students, though this is not an examinable subject. Less than 30% of teachers reported that	Schools had no ICT curriculum, nor were there any regulation for use of ICT in schools. In the majority of schools, heads of schools were responsible for setting	Although the MOE has developed programmes and ICT implementation Guides for Preschool Classes, Primary and Secondary Cycle One, a lack of learning materials and training

	their students use ICT in mastering subjects taught.	standards for ICT use in their respective schools Students in some schools experience up to 4 hours ICT training weekly.	to efficiently conduct an introduction programme of digital resources is faced by all schools. However, 77.4% of teachers said they had access to online educational resources.
Professional Development	Less than a third of 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. More than 90% agreed or strongly agreed that they could adapt the use of technologies that they are learning about to different teaching activities, and that they were also thinking critically about their use of technology in the classroom. More than half (54%) of the teachers have personal computers and 50% have access to internet at home. 60% of the teachers involved in the study indicated that they have accessed online courses.	Most of the teachers were using ICT for setting examinations and recording results. Some teachers have taken self-initiatives to attend ICT courses elsewhere. Overall teachers had low familiarity of ICT use as a pedagogical tool. Teachers' perceptions on their knowledge on how using a specific ICT facility can change the way learners understand and practice concepts in a specific content area is ranked as moderate. Teachers' competence for teaching in 21st skills ranked as low. Over 57% of teachers had used educational software previously, the remainder had not. Those that accessed educational software however self-assessed their competence in assessing learners' understanding of key subject matter concepts, skills and processes as low.	The use of ICT by teachers is often limited only to the entry of homework and the recording of student grades and averages. ICT in teaching is very limited or even absent for the majority of teachers. Only 16% had technological knowledge of education content, and maths teachers, who constituted a third of teachers, fared on average worse than other STEM teachers. 91.3% of teachers have access to computers at home. 75% indicated that they had access to the Internet at home. The majority of teachers (68.5%) said they did not use educational software related to the courses taught.

School ICT Culture	In most schools computers are not accessible to teachers and students. Over 60% of Staff indicated that ICTs have enormous capacity to provide benefits in the classroom. Some schools provided ICT training to teachers. Others allowed their teachers to attend workshops in ICT held elsewhere	None of the schools had computers in classrooms, and a few that were available in offices were used mostly for administrative activities and for examination purposes. Very few schools had computer laboratories. All schools visited had internet problems and had no websites. A few schools had ICT coordinators who supported the networking and equipment.	Most of the schools had computer laboratories though with varied levels of equipment functionality. School leaders and STEM coordinators are aware of the usefulness of ICTs. As a result, many have developed outreach strategies for this tool within their institution. In some schools there is awareness among parents of students, teachers and students on value of ICTs
ICT Infrastructure	87% of teachers surveyed had access to computers either at school or at home, 76% used LCD projectors, 67% had access to TVs; 50% had access to radios and 38% could access digital cameras. 75% had smart phones and 53% used internet or wifi modems	88.8% of teachers had access to computers either at school or home, 67.5% had access to Internet modems, and 65% had access to LCD) projectors. However, a minority of teachers (19.5%) had access to radio while 11.7% had access to digital cameras All teachers had access to mobile phones, 74% to smart phones. The majority of them (96.7%) indicated that they use mobile phones to access the Internet.	81.5% of teachers answered that they did not have access to computers within their school. Only 18.5% of teachers, one in five teachers, responded positively to the use of computers at school. However, when computers are available in the school, a total of 60% of teachers have access to them, either "quite often" (20%), "very often" (26.7%), or "always" (13). 3%). However, 40% of teachers say they rarely use computers in their school.

Some notable quotes;

"Work with the BOM to get more ICT resources, get support to train teachers on how to integrate ICT in the class, ask the ICT teacher to create an ICT plan / curriculum for the school" (School Principal quote).

The computers at school are loaded with word, PowerPoint and other simple ICT contents. Moreover, we have received some contents from SHULE DIRECT contents-online components which enable students learn and download materials. The integration of ICT in teaching and learning is not implemented for the time being. Apparently, there is no direct connection between ICT and national examinations; and as such ICT has not direct impact on students' school progress.' (Head of School, Pwani Region)

5.3 Baseline findings on Teacher Professional Development

The baseline research questions in this domain therefore focused on understanding the status of teacher readiness for the pedagogical integration of ICT in teaching and learning of STEM subjects. It specifically checked the following;

  i)   The levels of exposure to ICT both at school and home environments.
  ii) The extent of teachers use ICT in STEM classroom practices
  iii) The levels of teacher competency for ICT integration in professional and classroom practices.

The following table provides a comparative analysis of the findings across the three countries

Table 6: baseline findings on Teacher Professional development

	Kenya (n=469)	Tanzania (n=174)	Côte d'Ivoire (n=103)
Teacher readiness to use ICT	54% have a personal computer at home. Half of them have access to the internet. 75% had smart phones and 53% used internet or wifi modems	About 52.8% have access to computer at home. Among them 44.6% have access to internet at home	91.2% had used a computer at home. Majority have accessed the internet through their home computer.
Teacher ICT access in school	87% of teachers surveyed had access to computers either at school or at home, 76% used LCD projectors, 67% had access to TVs, 50% had access to radios and 38% could access digital cameras.	Majority (about 89%) have access to computers at school and use them often. **67.5% had access to Internet modems, and 65% had access to Liquid Crystal Display (LCD) projectors. However, a minority of teachers (19.5%) had access to radio while 11.7% had access to digital cameras**	The use of computers by teachers in their schools remains very low. Only 18.5% had access to a computer in school. Among these 60% have access to them regularly.
Teacher ICT competencies and main usage	Teachers self-rating on ICT skills moderate. 88% indicate using ICT tools to record grades and 79% to maintain student records. About 19% use ICT tools to track students' attendance	Self-rating on ICT skills very high (76.3%) reported to use computers to record grades and others (68.8%) use to keep students' records. A small number of teachers (21.1%) indicated that they used computers to take students' attendance.	Majority of teachers (94.6%) primarily use computers to record students' grades. Only 8% of them use computers in order to track students' attendance. However, nearly one-quarter of teachers (23.9%) use computers

			to track students' records.
Teachers perceptions on usefulness of ICT	Teachers have an average perception on the usefulness of ICT in education and learning.	Teachers' perception on the usefulness of ICT in learning and education is moderate	Teachers' perception of usefulness of computer is high. This is especially with regards to enhancing learning of students, and making clear presentations.
Teachers awareness of ICT policy, implementation and frameworks	75.9% were aware of the ICT policy. Majority could describe how the policy is implemented in their schools, the strengths and weaknesses.	66.3% claimed awareness of the policy. Among them about 25% were not aware of whether or not policies have been adopted/implemented at their school	57% claimed awareness of the ICT in education policy. However, one third could not describe the implementation strategies, challenges and weaknesses
Use of ICT in education, pedagogy and curriculum assessment	About 60% of teachers indicated having used an educational software which is related to their subject area. However, only about 30% reported on the use of ICT by their students in mastering subjects taught. low levels of teachers' use of ICT in curriculum and assessment in their various classrooms.	57.1% of teachers had used educational software. A good number of teachers do not have experience of using educational software for enhancing teaching and learning. Those who use ICT in curriculum and assessment is low	Very minimal use of ICT in education. 68.5% of teachers said they do not use educational software for the subjects taught. 72.7% think that students do not use ICT to deepen their understanding of courses they receive
Use of ICT in general	The teachers reported their responses on the general knowledge and skill of ICT highest reported use of ICT was in "emails" followed by "word processing application". The least was reported in teachers' use of presentation software	Teachers report high levels of skills in usage of ICT in general. Word processing, presentations, search engines and internet usage skills rank highest	Teachers reported average level of skills in ICT usage with word processing ranked first followed by use of email. Use of presentation soft ware rare
ICT in organization and management of classrooms	Teachers' use of ICT in facilitating teaching at	Teachers' use of ICT to facilitate teaching in the classroom is high	The use of ICT in facilitating teaching at

	the classroom is extremely low		the classroom is very low
ICT in Professional development of the teacher	About 60% of the teachers indicated that they have accessed online courses and about 70% were aware of a number of internet issues related to ethics.	47.78% of teachers access online courses to support their professional development. Half the teachers (50%) indicated they were able to list Internet issues related to ethics. Teachers' levels of using ICT in professional teacher learning is high.	No framework for teacher development in place. 80.2% teachers have not benefited in the refresher courses in last two years. However, 77.4% have access to online educational resources
Teachers response on TPACK domains	Teachers' self-rating and responses on TPACK/TK/TPK/TCK/TPCK high. However, evidence from observations showed very low scores on most of the TPACK domains	Teachers' self-rating and responses on TPACK/TK/TPK/TCK/TPCK low	Teachers' self-rating and responses were high on most TPACK domains

Some notable quotes;

We are using the National Curriculum on ICT. NO any curriculum changes the school undergone in the last few years. The school head and ICT coordinator are responsible with sets and standards for ICT use. Currently there are no formal or specified rules in the use of ICT. However, the rules and ethics on the use of ICT will be developed by 2018.'
(Head Teacher, Pwani Region)

'About 75% of teachers are positive on the use of ICT in teaching and learning and towards improving students' performance. On the other hand, 100% of students are positive and very interested in learning using technology. As I said earlier, the majority are very positive in using computers. Due to weak infrastructure, here at school very few teachers are using computers in teaching and learning.'
(Head of School, Morogoro Region)

> *'Teachers help each other to make sure they know how to use ICT in teaching. Shortage of computers is the greatest challenge. There are many teachers amounting to 64 and 651 students. No training has been provided to teachers. But some teachers have taken self-initiatives to attend ICT course elsewhere'.* (Head of School, Pwani Region)

> *'Teachers have been collaborating informally as they use technologies/ ICT in preparations of notes for their students. There is no formal collaboration between students and teachers in projects. The greatest barriers to ICT includes the following: infrastructures, limited fund and devices such as computers, projectors and ICT software's. Moreover, Interment connections remain another great challenge. Teachers had received training from Kamala-Swedish government and ADSI.'* (Head of School, Pwani Region)

5.4 **Baseline findings on learners' attitudes and knowledge of ICT**

This aspect was aimed at exploring the knowledge, attitudes and practices among learners with regards to ICT use. It was to investigate the extent to which learners use ICTs in STEM classroom activities, assignments and projects and the extent to which learners improve STEM outcomes with the integration of ICT in the classroom. To do this, 4 dimensions were explored namely:

i) student ICT exposure/access/readiness
ii) student use of ICT
iii) students' perceptions of computer/ICT usefulness
iv) student responses to tasks they have learnt to do at school.

The following were the findings on learners' attitudes and knowledge of ICT for Tanzania.

- 57% of students surveyed in the baseline had ever used a computer before out of which half had been doing so for the past 3 years.
- There is evidence that the government has made significant efforts to equip up to 31.4% of secondary schools with computers and several partners from the private and development sector also working to increase access to computers also including; Universal Communications Service Access Fund (UCSAF), British Council Tanzania, Halotel and Tigo. Some partners have also developed various eLearning systems in order to facilitate sharing of digital content and provide interaction between teachers and students synchronously and asynchronously via the Internet.
- Generally, 40% of students indicated they have learnt to do tasks at school using ICT. However, even those who agreed to have learnt computer skills at school, only a minority of students were capable of doing some more extensive features of the ICT facilities such as using computers for

presentation (11.5%), identifying trustworthy information in the Internet (16.2%), and organizing information obtained from internet sources (24.96%).

- Overall students' perceptions of the usefulness of computers in supporting teaching and learning were average with the majority of the items having mean score above 3.0 (out of 5). Most students perceive the use of ICT can specifically enhance teaching and learning.

The following were the findings on learners' attitudes and knowledge of ICT for **Côte d'Ivoire.**

- More than 70% of the students surveyed said they had used a computer at home or elsewhere (such as a cybercafe or library) at least once with slightly more than one-quarter (26.7%) of students reporting less than one year experience of using a computer.
- At school level, most of the students (between 77.4% and 92.5%) had never used this tool during class, regardless of the subject taught. Even among those who receive computer courses, teaching of this discipline is highly theoretical because 55.7% of students said they had never used a computer during these courses.
- When it comes to performance by the various computer tasks most students were unable to carry out many of the tasks. The task performed by the highest number (just slightly more than half) students was that of "look for information on an unknown subject with a computer" with a 52.8% affirmative answer. The second task that students learned in school "Accessing information with a computer" with a score of 42.5%. The task with the lowest score at (18.9%) is "Present computer information" to an audience
- Despite students' limited knowledge of the potential of computers for learning, students are aware of the usefulness of ICTs. The students express a strong interest in technology and a willingness to discover the immensity of the tasks that can be accomplished through the computer.

The following were the findings on learners' attitudes and knowledge of ICT for Kenya

less than half of the students had ever had access to a computer at home and a big majority of them had only used a computer for one year, only 5% had used computer for 7years.

- At the secondary school level, there was no evidence that the government and any other key development players had invested in improving ICT infrastructure or equipment.
- In terms of student ICT usage, more than 50% had never used a computer in school and even those who had used computer in school, not many of them could perform the different tasks that are ordinarily supposed to be done with the computer.
- Despite the low competencies in the use of computer for various tasks however, the students had highly positive perceptions of computer usefulness in education.

6.0 Conclusions and recommendations

As stated earlier in this report, this is an executive summary of the key findings based on the 3 different baseline reports from each of the project countries. The findings have informed the key conclusions and recommendations herein have been derived from a careful interpretation of the implications of the conclusions to the ADSI project. However, one may need to read the main reports to appreciate the big picture. The following are the key findings;

6.1 Conclusions on the context

This baseline has highlighted the contextual similarities and differences worth noting across the three countries in as far as ICT integration in education is concerned. In particular, it has revealed the following similarities:

- o Across the three countries, there is a strong recognition across all levels (national, school and individual) of the potential that integrating ICT in education holds in improving education and learning. This is evident from the many different policies and programmes that have been rolled out across the three countries.
- o All the key actors in the education sector also express high optimism and appreciation of the importance of incorporating the use of ICT in the delivery of education and learning. However, there is very minimal evidence that the desire and vision have been effectively translated to practice as access to infrastructure and equipment remains low in most schools, for most teachers and students.
- o While there are a few case studies where significant progress has been made in integrating ICT in education, there are still infrastructural, equipment and capacity challenges in integrating ICT into learning and teaching.
- o Across the board, students and teachers report very positive views on the importance of ICT in learning despite their limited access and exposure to ICTs.

- The baseline has revealed the following differences;
  - o The Kenyan context is characterized by more robust laws on ICT integration than Tanzania and Côte d'Ivoire. However, when it comes to the vison and planning at the school level, Kenya and Tanzania appear to be almost at the same level. Yet, in terms of exposure and use of ICT at the school level, Côte d'Ivoire seems to have made better progress than the rest.
  - o Côte d'Ivoire on the other hand could be said to be way ahead when it comes to access and exposure to ICT by the students.
  - o Tanzania is way ahead of the other two countries in terms of the number of initiatives that have taken place in equipping secondary schools with computers and training teachers in ICT.

6.2 Conclusions on the status of institutionalization of ICT in education

Across the three countries, the baseline has provided evidence that the use of ICT in schools has been a major focus among governments. This is evident from the many policies, regulations and national visions that the various ministries in the respective governments have put in place which support the integration of ICT in schools. However;

- o There are no elaborate frameworks for integration or implementation of the policies in schools and each of the schools tend to rely on the goodwill of the school heads and other development partners to develop school visons and implement ICT integration projects.

- o Even where there seems to high awareness of the national plans to enhance the use of ICT in teaching and learning of STEM subjects and indeed all the subjects, the translation and understanding of what exactly the policies mean or what steps need to be taken to implement remains vague amongst most of the school heads.
- o Across the board, most of the policies are mainly about the improvement of infrastructure. It appears not so much effort has been put in thinking through training of teachers as well as creating enabling environments for ICT integration. Further, most of the implementation of ICT integration projects tend to be externally driven and mostly determined by availability/who is giving resources to support infrastructure as well as the desire of school heads to make their schools the 'schools of choice'.
- o There is great desire and enthusiasm from the school management to raise their schools to digital schools of distinction. However, this is limited by inadequacy of ICT infrastructure and teachers' skills in ICT.

Recommendations

- *There is need to promote technological infrastructure-building, human and resource development that will allow teachers to create ICT environments such as school's learning management system which will facilitate greater opportunities for access, collaboration and learning among students and teachers.*
- *There is need to promote institutional conditions of ICT deployment and integration that will underpin or support teacher ICT implementation efforts in the classroom and the computer lab. The ADSI experiment can provide great learning for the government.*
- *The baseline highlights the need for ADSI to strategically target policymakers with an 'essential minimum package' approach for effective ICT integration in secondary level schooling. One that combines a focus on school leadership, teacher capacity strengthening and wholesome infrastructural development. ICT integration should therefore encompass; computers, e-content, internet (infrastructure); teacher training (ICT skills); curriculum integration (computer studies); ICT school budget (equipment, construction); and access to labs (ICT culture).*

6.3 Conclusions on the status Digital School of Distinction development

The findings of the baseline have attempted to give a common view of the status of the school in terms of the level of digitalization across the three countries. Nevertheless, the findings have pointed out several manifestations of inequalities and disparities even across schools in different regions of the countries. However, when assessed against the ADSI ICT integration roadmap, it is possible to conclude that most of the schools appear to be in the 'initial' stage in their Digital School of Distinction Development because of the following reasons.

- o Most of the schools lack a clearly defined ICT integration vision, strategy, plans and standards that guide the path to implementation. There is a big gap between the visions at the national and school levels such that discretion is left to school heads, heads of departments or teachers themselves would independently decide what direction to take from acquisition of equipment, management of ICT integration and in some cases even teacher capacity strengthening.

- Most of the teachers have a general understanding of how the integration of ICT can help improve teaching and learning experiences and outcomes. However, their access and use of ICT equipment for ICT integration especially computers is still disparate and minimal in many of the cases. This becomes a much bigger problem considering the fact that students also have very limited access and opportunities to use the equipment and facilities.
- While teachers rate their computer skills highly in most cases, the findings have also revealed that their use of computers is mainly on basic tasks such as word processing, accessing email and in a few cases presentations. The majority do not have the confidence to pass on these skills to the students and mainly use computers in collection and storage of administrative information and processes as opposed to in learning and teaching.
- In most of the schools, ICT was being used on peripheral areas of school productivity (student register, finances, admin) and teacher productivity (materials searches, exam paper / revision question downloads, data review trends). This cloud the bigger picture on the need to use computers more for learning and education.
- Most schools still lack the requisite infrastructure and equipment. Only a few have computers and most that have computers do not have internet or even emails. Even when there is internet, most of the time it is unreliable. Findings revealed that while there are few cases where there reportedly exists formal resources (ICT laboratories for Computer Studies) and informal resources (educational use of mobile phone, internet, and social media software), usage of ICT remains low for lack of capacity.

Recommendations

- *Government and partners assist schools in practically operationalizing ICT policies and relevant policies in school management and teaching and learning practices.*
- *The government and other development partners should continue to equip schools with computers and other ICT facilities in order to increase access teachers and students.*
- *With many teachers having access to mobile phones, there is a need to find means of utilizing the potential of mobile phones in equipping teachers with competence of ICT integration through mobile devices can be a greater catalyst for ICT integration.*
- *School heads and ICT coordinators should be equipped with special skills to be able to develop and maintain school websites*

6.4 Conclusions on the Status of Teacher Professional Development for ICT Integration

Across the three countries, the results of the study suggest significantly low ICT competencies of teachers that relate to their perceived technology literacy knowledge. Even for those who have reportedly attended or participated in a number of trainings, their competency still remains low. Across the three countries, there none that has a framework for teacher professional development in ICT and very little is known about the levels that they go in training teachers. It appears most of the TPD programmes have focused on very basic skills. The following issues are also evident;

- For most teachers, when it comes to using computers generally, the skills with high levels of mastery is word processing, using internet and search engines. There is very minimal capacity to carry out any other technical tasks beyond these.

- o When it comes to using computers in the school setting, there is little evidence that computers and ICT have been used for teaching and learning purposes as most teachers and head teachers only use computers for collecting and storing administrative data and information.
- o When it comes to teachers rating themselves in the use of ICT for TPACK, teachers across Kenya and Côte d'Ivoire rate themselves very highly. It turns out that this contradicts their actual knowledge. In Kenya, the observation revealed small performance on the various TPACK domains. In Côte d'Ivoire on the other hand, some the technology subjects in which the teachers rated themselves are yet to be mainstreamed in the curriculum.
- o There have been attempts to help teachers in developing their capacity to use ICT. The three countries however don't seem to have a clear national framework so most of the teachers have opted to self-improvement using the online modules often provided by non-government players.

Recommendations
- *ADSI should strengthen its already existing framework that ensures teachers are taken through technology literacy to knowledge deepening levels of ICT use along all the domains if the ICT-CFT Framework.*
- *ADSI modules should give much attention to the domain relating to organizational and management support, Pedagogy and Curriculum and assessment which garnered the lowest rating in teacher self-assessment.*
- *The continuous mentoring and support approach for teachers already applied in ADSI schools is also critical for strengthening knowledge and practice and already responds to the identified need for on-going teacher processional development as a life-long professional learning endeavour.*
- With many teachers having access to mobile phones, there is a need to find means of utilizing the potential of mobile phones in online training to enhance convenience and greater access for online modules and content for teacher professional development.
- *Schools should select some teachers within their schools who will be trained in handling technical issues related to ICT facilities to provide ready support for teachers at the school level.*

6.5 Conclusions on the status of student attitudes towards and use of ICT

Across the countries, there are varied levels of readiness, exposure and access to ICT by students. The baseline reports have also individually highlighted the inequalities that exist across regions of Kenya and Tanzania especially with regards to rural and urban splits.

- o However, there is a very strong and positive perception on the potential role of ICT for education and students' attitudes toward the use of ICT in STEM lessons are positive.
- o The learners' use of ICT in STEM classroom activities, assignment and projects was minimal, while the improvement of achievement in STEM with the integration of ICT in classroom practice had not yet been ascertained.
- o Further, the findings indicate that most of the students in the study have low competencies in the use of computer for various tasks even where there are reports of a good ICT infrastructure in schools.

7.0 Implications of the findings and discussion

7.1 Discussions on the implications of the findings to the implementation of ADSI project.

The findings of the baseline highlight several contextual and operational issues that may have implications for the implementation of the ADSI project. The key ones ae listed below with some recommendations.

- Across the three countries, the national vision and plans that support the integration of ICT in education provides a very supportive environment for the roll-out of the ADSI project. However, the inability of governments to provide the requisite infrastructure continues to slow down ICT integration. There is need for greater advocacy, engagement and support to be able to shift norms among policy makers so that they can be able to back up their ambitious plans with requisite resources and infrastructure at the school level.
- Even in places where the national legislative and policy framework supports the integration of ICT in education like Kenya, most head teachers are lost for lack of a framework to domesticate these policies in their schools. Greater effort is required to support government to invest in translating and disseminating policies for greater uptake and ownership by the school leadership. ADSI provides a great opportunity for these governments to learn 'what works' in ICT integration in education. Part of the ADSI teacher professional development content could include providing technical support for Head teachers in interpreting and domestication of the national policies and plans at the school level.
- The disparities in awareness and knowledge of ICT integration policies could be a sign that most of these policies or even ICT projects are developed without strong involvement and leadership of education stakeholders especially at the school level. As a result, most of the policies seem to focus mainly on investments in infrastructure with little attention in strengthening the capacity of teachers to use ICT for teaching. This needs to change through constant use of evidence from implementation to engage at the policy level.
- In places where there has been teacher professional development programmes to support the adoption of technology-based pedagogical practices, the number of teachers covered has been low and the trainings have been haphazard. This means there is great demand for the online courses and

continuous mentorship provided through ADSI therefore needs to create awareness among teachers of the exiting opportunities and benefits that they can accrue of the online modules.

- There is a huge support for ICT literacy across the three countries. This coupled with the wide recognition and optimism among key players in the education sector on the potential benefits of ICT in education provides fertile ground for the implementation of the digital schools initiative as there is already a great demand form students and teachers but also buy-in by other key education stakeholders. This demand needs to be marched with a focus on strengthening the capacity of teachers to assist students in the uptake and use of ICT both in school and their daily lives.
- The teachers self-rating appears to be in most cases higher than the reality. This could be problematic in that it may hinder the acquisition of basic knowledge among teachers because they assume they know. There is also an issue around how teachers and head teachers perceive ICT that could hamper its utilization in education. Across the three countries, school heads who have computers only view them as equipment to help them in administration and not teaching. In improving teacher capacity to use ICT, there is need for ADSI to over-emphasize the educational benefits that computers can bring in teaching and learning.
- There is evidence to suggest that teachers have considerable good access to other ICT technologies especially the mobile devices. There is need to explore the possibility of leveraging these platforms to enhance the online learning experiences by diversifying to the use of ICT tools (smartphones, tablets, computers, etc.) in distance learning.

7.2 Discussions on the implications for MERL components of ADSI

As expected, the midline will be designed to mirror the baseline on some aspects to allow for comparability and to measure progress made so far towards achievement of the intermediate outcomes and impact (direct or by proxy). However, the baseline findings have also revealed a number of areas that merit attention moving forward especially for the ADSI MERL components. There are evidently areas that may need further inquiry to fill the information gaps that have emerged from the analysis of the baseline which we will explore by enhancing some of the baseline research questions or coming up with additional ones. The following are some of the key recommendations for the midline:

- Since ADSI engages at multiple levels, it is important to gather views and perspectives from all these levels to help enrich our knowledge. To complement the information from the main target groups (teachers, students), the midline will also target policymakers and public officials (from relevant ministries and sectors) beyond the school level to help capture any relevant changes in the policy environment, perception on the importance if ICT, implementation frameworks but also gather their feedback on the ADSI Projects so far.
- The midline will seek to enrich some of the baseline findings by testing knowledge at two levels; asking for self- reported knowledge as well as testing the actual knowledge on some of the critical aspects as will be agreed with the project management team. This will also help in addressing some of the contradictions in the reports.
- Another aspect that will be included beyond the testing of knowledge will be introduction of self and collective efficacy questions to explore the levels of confidence for these who have acquired skills and engaged with the project especially teachers.
- The qualitative aspects of the midline will also be enhanced to improve the level of triangulation and interpretation of the findings and nuances.

- There will also be a strong focus on the barriers and motivators for development of digital schools of distinction. Part of this will be to check what makes individuals embrace technology and what is the ideal environment/circumstances in which digitalization of schools happen.

7.3 Discussions on the policy implications of the findings

Similarly, the baseline findings have also revealed several issues that may have implications on how ADSI and the entire GESCI engages at the policy level. Despite the robust national policies and regulations supporting the integration of ICT in education, most schools do not have any localized plans and visions for implementation and ICT integration appears to be sluggish and uncoordinated. Most of the progress made so far seem to depend mainly on personal interests and drive of the individual school heads and teachers as well as availability of resources. If not carefully considered, this trend could prove to be a major barrier to the development of ICT in education. ADSI and other development actors therefore need to come up with a strategy to engage the policymakers. The following are the recommendations on what may need to happen at the policy level:

- There is need for policymakers to be more consultative and inclusive in policy formulation and the government should be deliberate in ensuring wider dissemination and translation of their policies to the key implementers.
- Governments need to inform and communicate to the public as well as to other stakeholders about ICT policy in the education and training system to support greater buy-in and uptake at the public level. This will have benefits for students especially.
- Policymakers should create an institutional framework for continuing professional development of ICT teachers to ensure teachers have more opportunities to gain and use skills and knowledge in ICT.
- There is need for governments to expedite the equipment to secondary schools and training of key actors (teachers, students, administrative and technical staff) to build a digital culture within the schools.
- For greater support for the teachers, there is need to strengthen the capacities of pedagogical supervisors in secondary education to assist in monitoring progress on ICT integration.
- Put in place ICT integration strategies in the official curriculum as a specific subject that introduce students to the use of ICT tools (smartphones, tablets, computers, etc.). Popularize the use of digital resources by students in and out of the classroom