ICT in the Classroom for Quality Education

Strengthening learning and teaching methods in under-resourced schools in developing countries.

iicd

People - ICT - Development

HIGHLY SKILLED TEACHERS: THE CORNERSTONE OF QUALITY EDUCATION

Quality education is a foundation for other forms of development: it empowers people to become better informed, more gainfully employed, healthier and fosters a more democratic society[1]. In many developing countries, over 80 students per teacher is the norm[2], which often leads to hiring unqualified or underqualified teachers, thus resulting in weak and inefficient educational systems. Selecting and training teachers, supporting them with a well-managed educational system and motivating them to remain in the profession is therefore critical[3].

IICD

The **International Institute for Communication and Development (IICD)** is a non-profit foundation specialised in the use of Information and Communication Technology (ICT) as a **tool and driver for development and change**. **IICD** uses **ICT** to help **build the capacity of people, organisations** and **governments** in developing countries to generate **social change** in their own communities and take charge of their own development.

Despite the proven importance of education and its combative effect on poverty, 75 million children – the majority of whom are girls – are still not in school. For those children who do make it to a school, **quality** is an issue: 130 million schoolchildren worldwide are unable to read, write or do basic math[4]. If all students in low-income countries left school with basic reading skills, it is estimated that world poverty could decrease by 12%[5].

Teachers can do their job better in an **environment conducive to education**, at well-run schools, with support from parents, communities and (local) governments, with well-designed curricula and strategies for continuously improving teaching and learning. ICTs enable teachers to **continuously develop** their teaching methods and the content of their lessons. ICT-enabled solutions improve access to relevant educational resources, stimulating tools for engaging students and new ways of communicating with all participants in educational systems. Furthermore, building **ICT capacities** of teachers can lead to equipping students with critical **21st century skills**, such as **digital literacy**, **critical thinking**, **collaboration**, **communication** and **problem solving**. These skills make students more employable and better equipped for life after school. With the appropriate combination of ICTs in schools and classrooms and with training and capacity building, these technologies can enhance quality of teaching and students' abilities to engage with the digital technologies that have become ubiquitous in modern society.

IICD'S APPROACH TO ICTS FOR IMPROVED TEACHING AND LEARNING

IICD believes that equipping teachers with pedagogical tools and access to information can bring about large-scale social changes in entire educational systems. Many of the gaps in education in developing countries can be bridged with the help of ICTs and enhanced capacities for creating, sharing and using information and materials. IICD uses its ICT expertise to support partners and local stakeholders in efforts to meet local needs and solve local problems in education.

IICD has almost 20 years of experience in bringing ICT solutions to classrooms from crowded urban areas to the remotest of locations[6] in primary, secondary, vocational and tertiary education. This experience has shown that simply equipping schools with innovative tools is not enough to improve teaching and learning in the classroom. IICD's **social innovation process**[7] takes a holistic approach in which all stakeholders are involved from the start. **Local stakeholders take the lead,** from assessing needs in the schools to developing their own educational materials[8], and IICD supports them with advice, training and on-the-job coaching throughout each phase of a project.
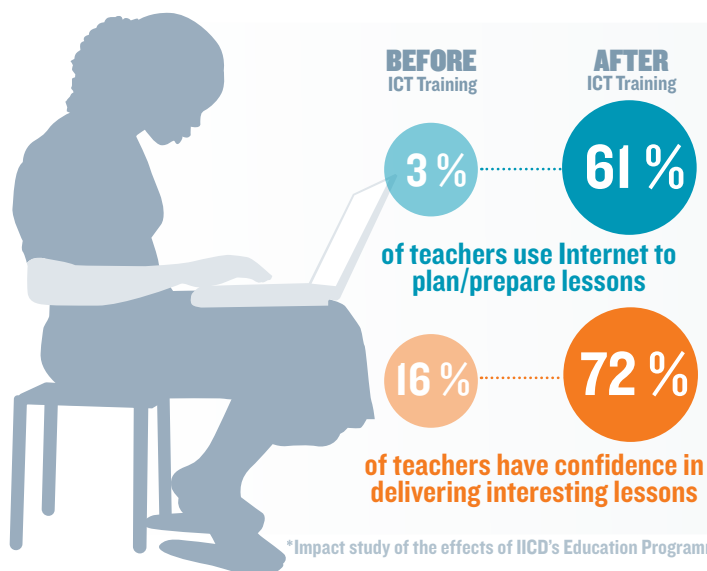
The **quality and professional development of teachers** is central to the achievement of quality education for children and overall improvements to educational systems. IICD develops teachers' abilities to integrate technological, pedagogical and content knowledge[9] in the classroom[10], helping alleviate common challenges like crowded classrooms, resource shortages and outdated pedagogical methods. Introducing ICT in schools can also help reduce the time needed for the most tedious tasks, diminish the isolation factor in remote rural schools and enhance professional development opportunities. Use of ICTs in the educational environment reduces the overall burden on teachers, and capacity building initiatives lead to professional opportunities that not only enable but also motivate teachers to continuously develop their craft.

IICD offers its expertise and experience in supporting teachers and classrooms with ICTs by:
- **capacitating local and supporting partners** working in education by guiding them through the use of ICTs in their projects
- **training teachers and other local stakeholders** (including district education officers, school managers, parent-teacher associations, among others) in integrating ICTs into their educational activities
- **connecting people to the appropriate technical solutions** for meeting their goals
- **innovating our own solutions** when no pre-existing functional or affordable technologies are available
- supporting teachers and schools by **advising governments and lobbying for strong ICT environments**.

By engaging with ICT in the classroom at these important entry points and encouraging local stakeholders to lead social innovation, IICD offers integrated solutions that avoid ever adopting a one-size-fits-all approach.
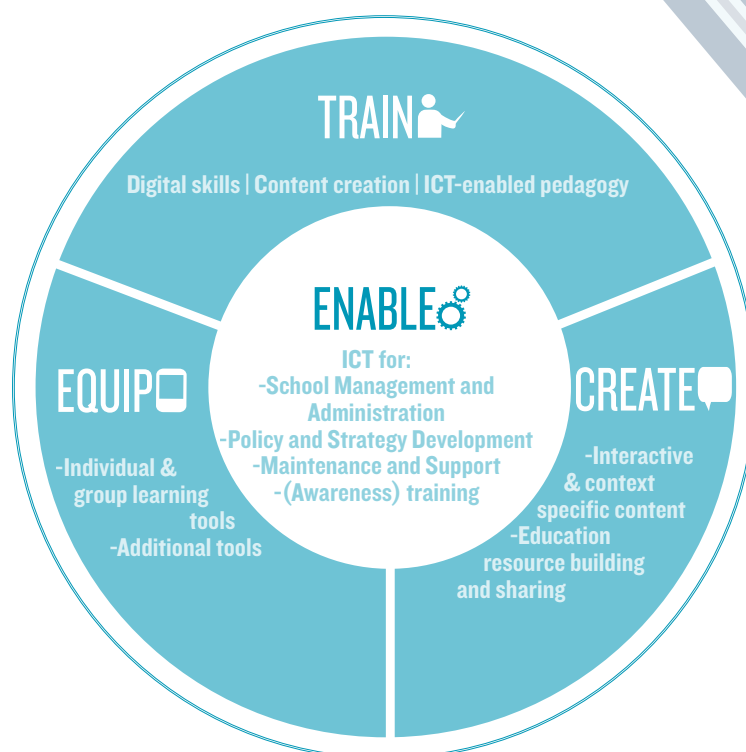
BEFORE
ICT Training

AFTER
ICT Training

3 %

61 %

of teachers use Internet to plan/prepare lessons

16 %

72 %

of teachers have confidence in delivering interesting lessons

"**ICT has changed my way of teaching. I get more interactive with students, because I can access more information for them. I interact more with them and they get motivated because I bring a variety of teaching methods by using a projector. The students can access the computer so they get motivated and interested in learning. They want to learn that 'new' thing, and in learning that they get more knowledge and they can interact with others and learn a lot.**"

Faith Kashu – Teacher (Ilkerin Primary Boarding School, Kenya)

*Impact study of the effects of IICD's Education Programme in Ghana in 2013

IICD'S ICT IN THE CLASSROOM SOLUTIONS FOR IMPROVED TEACHING AND LEARNING

The success of ICT in the classroom cannot be achieved through one single solution. For this reason, IICD offers a range of integrated ICT solutions that aim to holistically overcome challenges and change classroom dynamics. Each of our solutions is made up of four parts: 1) equipping schools with locally appropriate ICT tools, 2) training local stakeholders on the effective use of these tools, 3) creating relevant educational materials, and 4) enabling the ICT environment to support sustainable changes in education.

TRAIN
Digital skills | Content creation | ICT-enabled pedagogy

ENABLE
ICT for:
-School Management and Administration
-Policy and Strategy Development
-Maintenance and Support
-(Awareness) training

EQUIP
-Individual & group learning tools
-Additional tools

CREATE
-Interactive & context specific content
-Education resource building and sharing

EQUIP

EQUIP
Equip schools in rural areas or informal settlements with solutions appropriate to their situation and ambition

Individual learning tools
-tablets and mobile devices
-laptops
-thin client computer lab

Group learning tools
-projector
-Interactive whiteboard

Additional tools
-Online/offline storage of resources
-video equipment
-energy solutions
-connectivity solutions

A tool that works brilliantly in one setting may entirely fail to deliver in another; this is why IICD's solutions always use a **locally relevant combination of ICT tools**. Tools can focus on individual learning, such as with tablets, simple mobiles or smartphones, and laptops (including netbooks and *One Laptop per Child*). Tools can also be used for **group learning**, like projectors and (low-cost) interactive whiteboards or computer labs. Video equipment is used in teacher peer-training sessions. In rural areas, **energy and connectivity solutions** may be needed to support schools that are off-grid or that lack conventional connectivity. Solutions used here can be solar panels for energy or mobile Internet modems, among others. Offline schools can also benefit from a Network Attached Storage (NAS), which allows them to store and use educational resources.

TRAIN

Professional development of teachers so they are able to confidently interact with ICT tools and use them for improved teaching and for training students

-Digital skills building

-Content creation and adaptation skills

-ICT-enabled pedagogy

TRAIN
The IICD methodology for training teachers consists of three distinct areas:

Digital skills building: Training in basic ICT skills and ICT-assisted learning familiarises all teachers with the different types and uses of digital materials. By the end of this step, teachers are ICT literate and familiar with ways of integrating simple ICT tools into usual classroom routines. They are able to apply their newly acquired skills immediately and can train their students in these same digital skills.

Content creation and adaptation: Teachers are trained in generating relevant learning materials for their classes by accessing information online and using digital tools to create lessons and presentations. By the end of this step, teachers are able to judge, create and adapt materials for their classrooms and students.

ICT-enabled pedagogy: Teachers start delivering lessons in the classroom with basic ICT-enabled methods. In addition, ICTs (like video and other multimedia tools) can be used for peer-to-peer learning to improve pedagogical methods. By the end of this step teachers are able to confidently use ICT tools in the classroom to deliver classes in an interactive and engaging way that integrates technology, pedagogy and content knowledge in all subjects.

These steps never occur in the form of one-time trainings: continuous professional development of teachers is an essential component of all IICD's ICT introductions in schools. Ideally, initial training of teachers takes place both in-service at schools and pre-service at a teacher training college, but additional on-the-job training is equally important. IICD promotes and facilitates peer support mechanisms whereby teachers develop content together and exchange digital lesson plans to ensure continuous professional development.

CREATE

Technology tools have no pedagogical value without educational content. There is great need for **good quality**, **relevant**, **contextualised** and **up-to-date educational materials** in developing countries, and digital materials have many advantages: they can be **quickly** and **easily reproduced**, **shared** and **distributed**. It is easy to work with several people on the same materials and they can be adapted to keep them up to date or make them applicable in different learning contexts[11]. Finally, content can be made interactive using multimedia components or games, which helps teachers **make lessons more engaging**. The diversity of educational materials that teachers can create with ICTs allows students to learn through their own preferred learning style (visual, auditory or reading/writing preference). Another way to make sure educational resources are available is collecting relevant materials and sharing them with others through **eLibraries**. These resources can be made **available offline**, which is a great solution for rural schools.

ENABLE

In order to enable the educational environment for any integration of ICT in the classroom, IICD focuses on the larger **ICT environment**, which includes ensuring not only smooth functioning of the classroom but also the school, its administration, and the larger regional and national education systems and ICT policy. To make **school administration** more efficient, IICD offers school management and information systems (SMIS) for improved efficiency and accuracy of educational data collection and decision-making. To engage the larger community in education, IICD offers **ICT training of parent-teacher associations, school management committees and school/government administrators**. To ensure that infrastructure and hardware continues to support ICT in the classroom, **ICT maintenance and support for schools** works at both the school level and with local NGOs and technical service providers. Finally, IICD also supports **policy and strategy development** in ICT for Education at the national, regional and organisational levels, connecting local experts and ICT advocates with higher-level policy developers*. This holistic approach, addressing all areas of the educational system, helps ensure that ICT in the classroom initiatives continue in environments conducive to leveraging these ICTs for improved teaching and learning.

*IICD has supported the governments of Bolivia, Burkina Faso, Ecuador, Malawi, Tanzania, Suriname and Zambia with the development of an ICT in education policy or strategy.

CREATE

Content experts (teachers) create and adapt materials appropriate to the local situation

-Interactive content creation (content for interactive whiteboards, educational games)
-Context specific content creation (including content for indigenous learning context)
-Education resource building and sharing (eLibraries)

ENABLE

Ensure an enabling environment for the solutions and for implementers, with support from all important stakeholders

-ICT for School Management and Administration
-ICT Policy and Strategy Development
-ICT Maintenance and Support for schools
-ICT (awareness) training of PTAs, SMCs, administrators, local government

IMPACT AREAS

Each solution IICD puts on the ground incorporates the different elements described above – training, equipping, creating and enabling – as we strongly believe that this is the only way to do justice to the complexities of quality education. Depending on circumstances and needs, some elements receive more focus than others in a particular ICT solution. IICD applies its approach to ICT in the classroom solutions in the following impact areas:

MAKING EDUCATION RELEVANT WITH LOCALLY GENERATED CONTENT

EASING CLASSROOM WORK WITH DIGITAL TOOLS AND SKILLS

INCREASING ENGAGEMENT OF STUDENTS AND TEACHERS WITH INTERACTIVE LEARNING TOOLS

DEVELOPING TEACHING PRACTICES THROUGH ICT-ENABLED PEER-TO-PEER PEDAGOGICAL TRAINING

During the solution design process, IICD together with all relevant stakeholders identify the best applicable tools and the need for tailored trainings. In terms of technologies, our ICT solutions always use a locally-relevant combination of information and communication tools. To address infrastructure challenges, such as lack of broadband connectivity and electricity, IICD advises on the use of alternative solutions found in mobile Internet and solar energy.

ADDRESSING INFRASTRUCTURE CHALLENGES:
ICT SOLUTIONS FOR OFF-GRID SCHOOLS

IICD strives to develop integrated solutions that take all circumstances of a given educational system into consideration. As many rural schools in developing countries are off-grid or have unreliable access to power and Internet, connectivity can be a challenge.

In Ethiopia, Kenya and Malawi, IICD works with rural schools that have limited facilities, and it is often these unconnected schools that can benefit most from ICT solutions. Before rolling out solutions in schools, IICD provides thorough assessments of the schools involved: we look at technological options and power needs, but also at interest and involvement of the school staff. Innovation here means providing solutions for areas with limited electricity or connectivity, in some cases using thin client (NComputing) computer labs or working with low-energy tablets. Opportunities for integrating ICTs in these schools become more abundant and feasible each year: solar panels become cheaper and more innovative, and mobile Internet is more and more available, allowing for relatively cheap Internet connectivity through mobile modems in even the remotest of locations.

6

Number of projects in 2014
Kenya (4), Ethiopia (1), Malawi (1)

19

Number of schools involved
Kenya (15), Ethiopia (4)

MAKING EDUCATION RELEVANT WITH LOCALLY GENERATED CONTENT

EQUIPPING TEACHERS TO CREATE EDUCATIONAL MATERIALS ADAPTED TO THE INDIGENOUS LEARNING CONTEXT

In Bolivia and Peru, schools supported by IICD operate in remote mountain locations and cater for students from Quechua and Aymara communities. To these students, textbooks with examples from the cities make little sense.

In order to tackle the lack of relevant content, schools now use culturally and linguistically contextualised educational materials including games, stories and poems accessed and developed through ICTs. Ultimately, they become a crucial tool to improve the teachers' didactic methods. The Andean culture is predominantly oral, which makes multimedia tools a great way to record, document and distribute traditional knowledge and use it in the classroom.

Teachers are trained in the use of participatory video and school radio, and they in turn educate their students on how to record their own audio-visual content. The methodologies used support the objectives of the Peruvian and Bolivian governments regarding the access to and use of digital educational content in their schools.

RECENT RESULTS

12 Number of projects in 2014
Kenya (2), Peru (6), Bolivia (2) and Uganda (2)

504 Number of schools involved
Kenya (4), Bolivia (295), Peru (181) and Uganda (24)

INCREASING ENGAGEMENT OF STUDENTS AND TEACHERS WITH INTERACTIVE LEARNING TOOLS

LOW-COST INTERACTIVE WHITEBOARDS FOR STIMULATING LESSONS

In Kenya, IICD currently works with schools that implement ICT in the classroom using simple interactive whiteboards.

With a small, low-cost device called 'ProjectorPal'[13], teachers are trained to use a regular projector and laptop to create an interactive whiteboard in the classroom. Compared to a regular interactive whiteboard, this solution costs significantly less, uses less energy, is less vulnerable to damage and can be moved from classroom to classroom, making it an excellent solution for rural schools.

Developing educational materials suitable for usage with the interactive whiteboards is another aspect of the training programme. As a result, we now see teachers browsing the Internet for materials that fit their classrooms and students, including news articles and videos. In Ghana and Uganda, teachers work with laptops and projectors in the classrooms. Here too, teachers are taken through an elaborate training programme, focused on developing both the technological and pedagogical aspects of using the tools. This makes sure that teachers are not just able to use them practically, but that they are also using them to enhance their teaching.
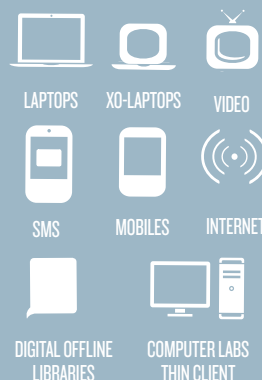
RECENT RESULTS

15 Number of projects in 2014
Kenya (2), Ghana (5), Uganda (1), Peru (5), Bolivia (2)

83 Number of schools involved
Kenya (8), Ghana (21), Uganda (2 schools and 2 TTC), Peru (50).

ICT TOOLS

LAPTOPS   XO-LAPTOPS   VIDEO

SMS   MOBILES   INTERNET

DIGITAL OFFLINE LIBRARIES   COMPUTER LABS THIN CLIENT

"ICTs have also helped us connect with the outside world, we are in a very remote place but the gap between the outside world and this place is now lesser because of ICT, I can go to the Internet... so students get updates of what's happening out there even if they are not there..."

Faith Kashu – Teacher in Kenya

ICT TOOLS

INTERACTIVE WHITEBOARDS   LAPTOPS   VIDEO

PROJECTOR   MOBILES   INTERNET

"You can see now that more pupils are looking for these chances, the schools equipped with ICT tools. A Projector Pal has attracted and retained students in schools because it is more interactive and they enjoy learning."

Daniel Kimutai - Regional Coordinator NCCK-Northrift Region, Kenya

EASING CLASSROOM WORK WITH DIGITAL TOOLS AND SKILLS

TEACHTAB AND LEARNTAB FOR TURNING OVERCROWDED AND UNDER-RESOURCED CLASSROOMS INTO COLLABORATIVE LEARNING CENTRES

In many Sub Saharan African classrooms, 80 students per teacher is the common reality. IICD recently started a pilot with LearnTabs and TeachTabs in Malawi, where class sizes can reach 150. These android tablets designed by IICD allow the teacher to easily reach all students while they work individually or in small groups.

Teachers are trained on how to use the tablets to design and present content. Students and teachers alike are trained in the use and maintenance of the devices. The larger TeachTab acts partially as a server, able to share information with and monitor the smaller student LearnTabs and giving the teacher control over the whole classroom. The TeachTab also allows the teacher to interact with and prompt questions to the whole classroom at once using the interactive whiteboard functionality. Using the LearnTab, students can work in small groups, collaboratively post answers to quizzes prompted by the teachers or edit the same document or project together.

With these tablets, equipped with materials designated by the Malawi Institute of Education (MIE), classrooms are able to work much more efficiently. Teachers work with the MIE teachers' guide to develop their own lessons based on this curriculum. While books and other educational materials are not always widely available, the tablets only need one digital copy of a textbook, many of which are freely available from the MIE or other sources.

RECENT RESULTS

30 **Number of schools** that use individual laptops

DEVELOPING TEACHING PRACTICES THROUGH ICT-ENABLED PEER-TO-PEER PEDAGOGICAL TRAINING

CRAFTING PEDAGOGICAL APPROACHES WITH VIDEOS FOR PEER FEEDBACK

In Ghana, Ethiopia[14], Uganda, Kenya and Peru teachers record and reflect on their own teaching using a video camera, laptop and a projector.

Teachers are trained in basic ICT and multimedia skills to record, store, display and access videos for self-assessment. Initially, teachers are guided in the process, but once they learn how to operate the video equipment, discuss what they see and assess their own teaching; they can repeat this process on their own. This makes for continuous learning and improvement of their pedagogical skills. As one Ethiopian teacher states: "I learned how to use video in my own classroom to evaluate myself. On the latest videos I can see that because of this, my teaching skills have improved."

Teachers see their own teaching styles on camera, discuss it in groups with other teachers and come up with new techniques to involve students. This helps greatly in improving the quality of teaching, especially if it is combined with other ICT tools in the classroom.

RECENT RESULTS

8 **Number of projects in 2014**
Kenya (1), Ghana (3), Uganda (2), Ethiopia (1 with 15 partners), Peru (1)

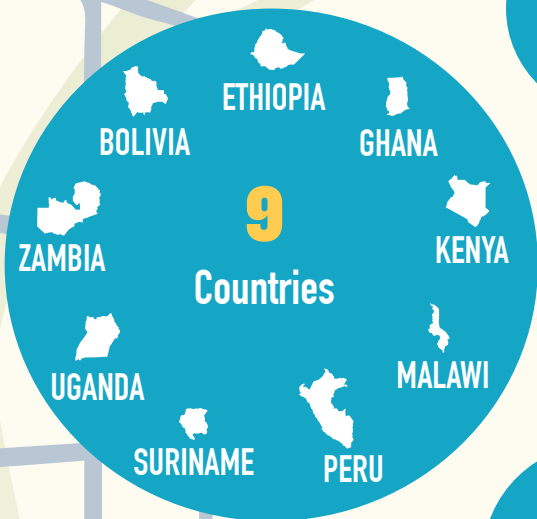**102** **Number of schools involved**

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2. African schools keep an eye on the prize - Meeting the target for universal primary education (Africa Renewal Online, August 2012): www.un.org/africarenewal/magazine/august-2012/african-schools-keep-eye-prize
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4. Education for All – Global Monitoring Report 2013/4, UNESCO
5. EU leading action to boost literacy in developing countries (European Commission memo, 21 Jan 2013) http://europa.eu/rapid/press-release_MEMO-13-20_en.htm
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9. Technological Pedagogical Content Knowledge (TPACK) model, Matthew Koehler and Punya Mishra (2012): http://www.tpack.org/
10. See also the links to the UNESCO ICT competency framework for teachers: http://unesdoc.unesco.org/images/0021/002134/213475e.pdf
11. Myths and misconceptions about digital teaching and learning materials in Africa, Michael Trucano, WorldBank (2013): http://blogs.worldbank.org/edutech/myths-digital-materials-africa
12. Documenting Indigenous knowledge through participatory video in Peru (IICD, 2013): http://www.iicd.org/articles/documenting-indigenous-knowledge-through-participatory-video-in-cusco-peru
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ICTs in the Classroom

IICD in Education

9 Countries

ETHIOPIA
GHANA
BOLIVIA
KENYA
ZAMBIA
MALAWI
UGANDA
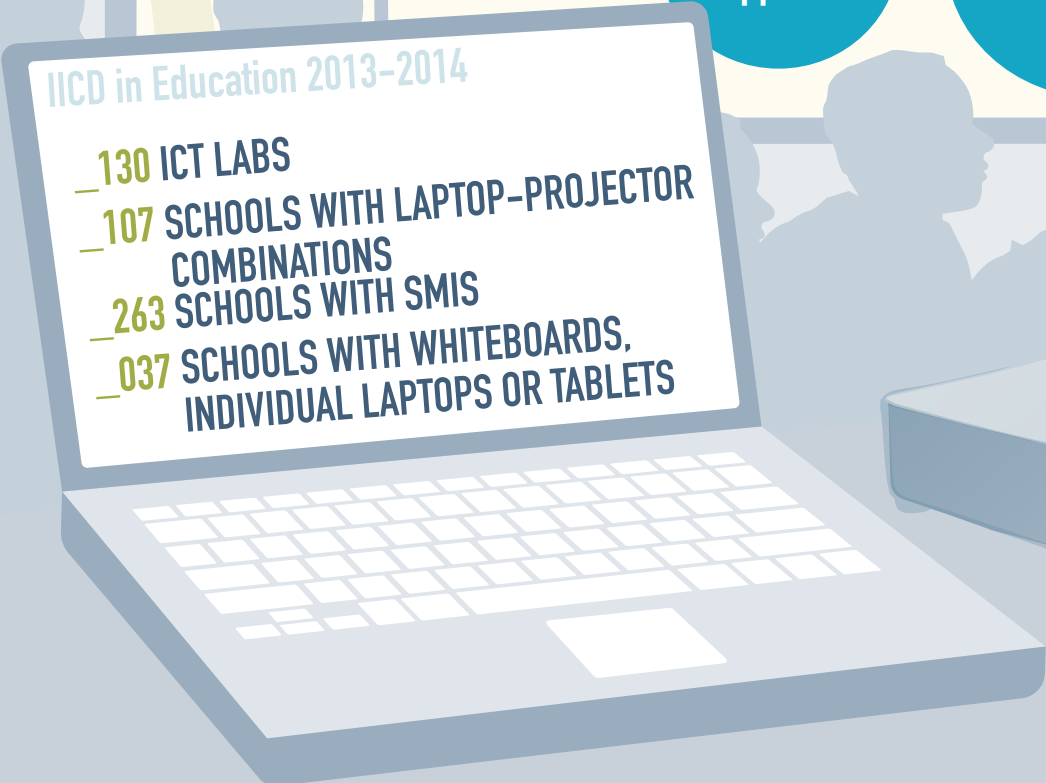SURINAME
PERU

4200 teachers trained

750 schools supported

120 000 students learning with ICT in the classroom

650 administrators & government officials trained

46 partners supported

408 parent-teacher associations trained

IICD in Education 2013–2014

_130 ICT LABS
_107 SCHOOLS WITH LAPTOP-PROJECTOR COMBINATIONS
_263 SCHOOLS WITH SMIS
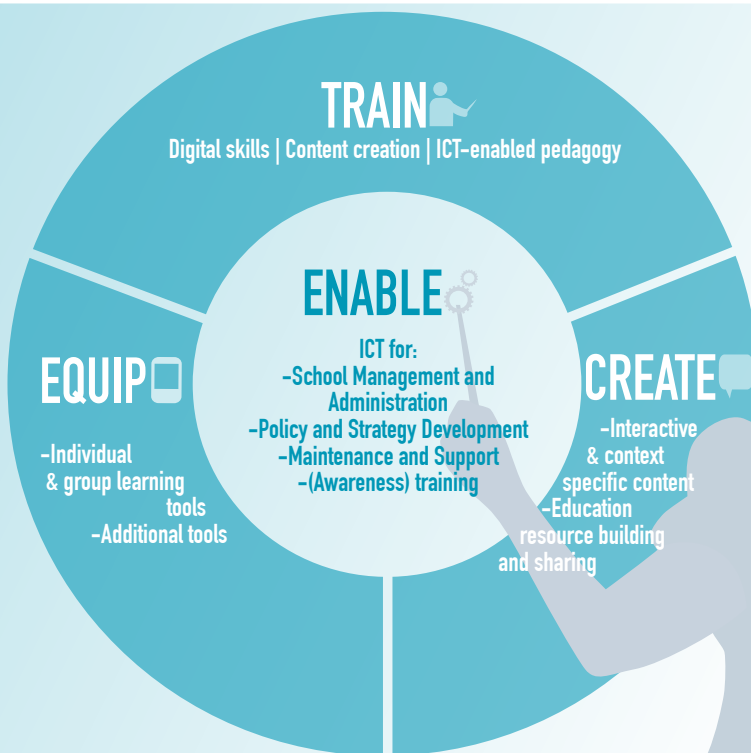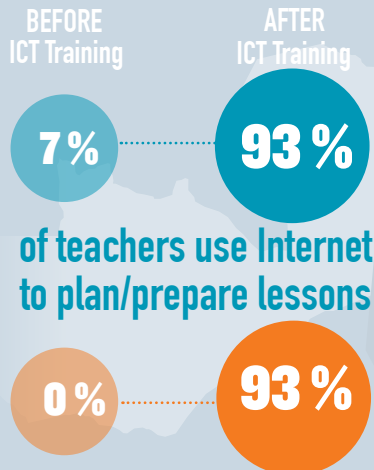_037 SCHOOLS WITH WHITEBOARDS, INDIVIDUAL LAPTOPS OR TABLETS

TEACHERS TAKING THE LEAD

Research done in 8 primary schools in the Teso-sub region, Serere district, Uganda (which included interviews with head teachers, school teachers and pupils), showed that teachers have taken over the programme. "That ownership really was so positive. Normally, if the project team is not coming to the field the programme becomes dull. But in this case, the ICT project interested the teachers and they took it over"

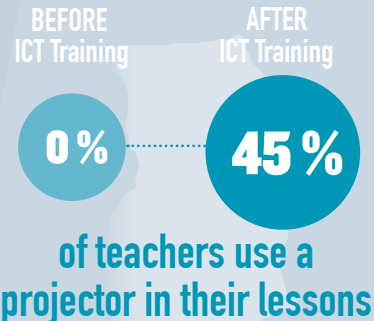**Solomon Ogurumo – Monitoring and Evaluation Officer at Health Need Uganda**

TRAIN
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ENABLE
ICT for:
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-Maintenance and Support
-(Awareness) training

EQUIP
-Individual & group learning tools
-Additional tools

CREATE
-Interactive & context specific content
-Education resource building and sharing

ZAMBIA:

BEFORE ICT Training | AFTER ICT Training
7 % | 93 %

of teachers use Internet to plan/prepare lessons

0 % | 93 %

of teachers have confidence in delivering interesting lessons

GHANA:

BEFORE ICT Training | AFTER ICT Training
0 % | 45 %

of teachers use a projector in their lessons

*Impact study of the effects of IICD's Education Programme in Ghana and Zambia in 2013

IICD's vision is a world in which people are fully able to use information and technology to better their own future and that of their society.

IICD's mission is to enable 15 million low-income people in developing countries to access and use ICTs to address the challenges that they face, understanding that ICT offers opportunities for increased well-being and sustainable economic development in all sectors.

IICD leads the Connect4Change (C4C) consortium in which five Dutch NGOs have joined hands to set up and support ICT4Development programmes. Our partner in the 'ICT for Education' programme is Edukans. Edukans is an expert in education in developing countries in Asia, Africa and Latin America. Other consortium partners are Akvo, Cordaid, ICCO and Text to Change is a preferred partner.

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Beogende Instelling*

ANBI