Supportive Learning Through Technology

Exposing the Issue

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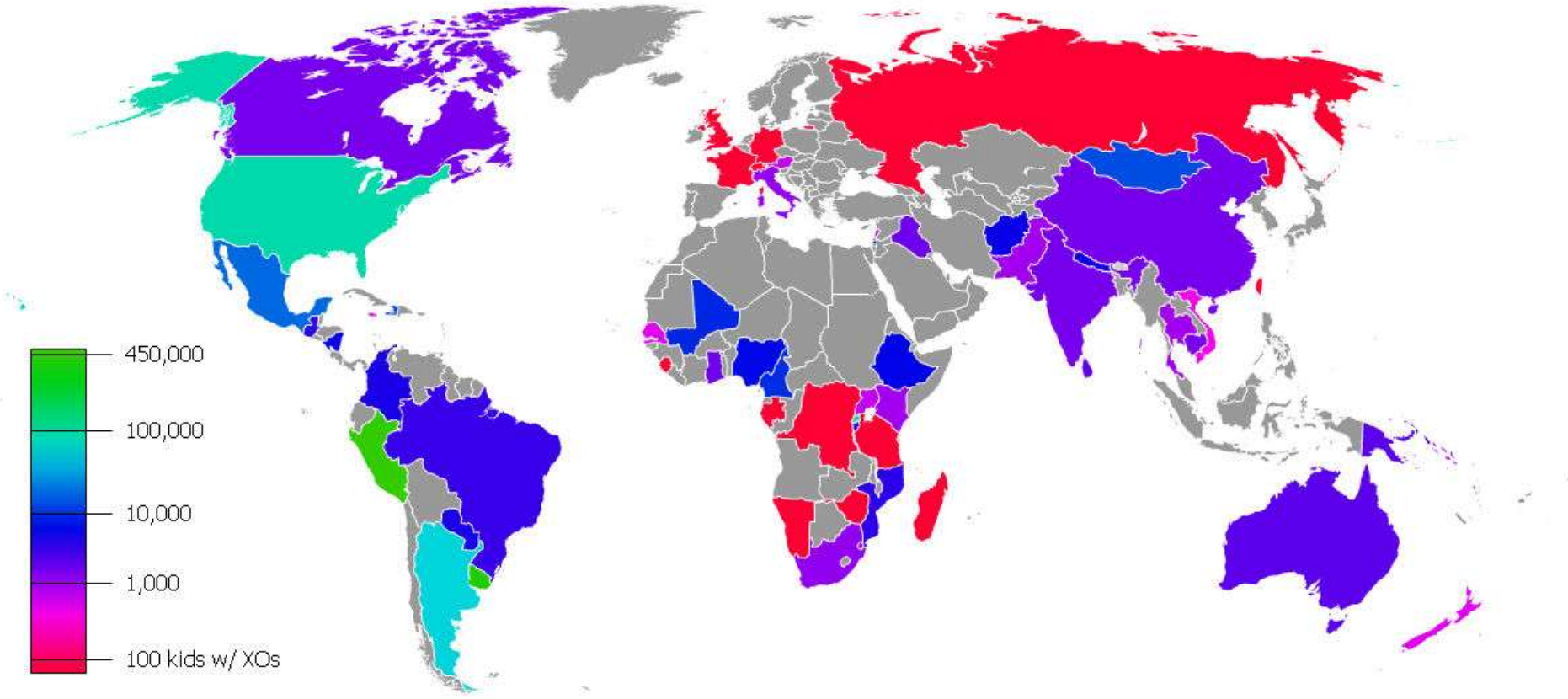
Supportive learning through technology

- Significant interest
- Countries embarking in ambitious programs
- Predominant model until 2006: computer labs

OLPC in the world



BID

Technology in education has potential

- Personalizing education
- Providing feedback
- Increasing motivation
- Allowing monitoring

But…

- Interventions are complex:
  - Seven inputs
- Costs are large
  - OLPC: $100 per student/year
  - Spending in low income countries: $50 per student/year

Important questions

- Evidence on impacts?
- Cost-effectiveness?
- What type of programs work?
- In which contexts?






Supportive Learning Through Technology

Review of the Evidence

Paul Glewwe






Conference Programme

Welcoming Address

Panel 1: What Have We Learned About Improving School Participation?

Panel 2: Teacher Characteristics, School Governance, and Incentives

Panel 3: What Have We Learned About Enabling Learning?

Panel 4: Supportive Learning Through Technology

Panel 5: Evidence Gaps: Secondary Education and Girls

Panel 6: Evidence Gaps: Early Childhood Education

Panel 7: From Evidence to Action: Next Step for Scaling Up Evidence

Concluding Remarks

Can Technology Work?

- Results are not promising in developed countries
- In developing countries, teachers are poorly motivated and poorly educated: technology may be more promising
- What we know from existing evidence:
  - Computers are effective when interactive and targeted at the learning level of the student
  - Computers seem to work best if after school, not during school
  - *How* computers are implemented matters for its effectiveness
  - Mixed results and limited evidence
  - Computers have not always been cost-effective

Different Types of Technology Interventions

- Desktop Computers, in School
- Desktop Computers, Before and After School
- Desktop Computers, in School and Before & After School
- Laptop Computers
- Desktop Computers at Home
- Other Technology Interventions

Desktop Computers in School Angrist and Lavy (2002): Israel

- Provided computers and software, and trained teachers to "integrate computers into teaching"
- Focus on schools with grades 1-8
- Analysis focuses on math and reading (Hebrew) among students in grades 4 and grade 8
- Program increased availability and use of computers
- No significant effect on students' test scores; estimated impacts mostly negative but insignificant

Desktop Computers in School Linden (2008); India

- Provided computers, newly designed educational software and backup power supply
- No teacher training, students use during school
- NGO operated schools for kids in grades 1-3, whose teachers are local women without formal training
- Implemented in 11 schools in 2004-05 (12 controls)
- Focus on math in grades 2 and 3
- Students performed much worse in math (0.57 standard deviations lower on math test)

Desktop Computers Before or After School
Linden (2008); India

- Same program as on previous slide, but children use computers before or after school
- Implemented in 19 schools in 2005-06 (18 controls)
- Increased math scores by 0.27 standard deviations
- Grade 3 students did very well, while grade 2 students did not have large benefits

Desktop Computers in School
Barrera-Osorio & Linden (2009): Colombia

- Teachers received computers and 8 months of training on how to use then in the classroom
- Focus is on language (Spanish), for students in grades 3-9
- Averaging over all grades, no significant effect on 8 math and language skills examined
- Authors conclude that computers were not used well; students report increased use of computers only for computer science class, not math or Spanish

Desktops in school and before/after school Banerjee et al. (2007); India

- Schools already had computers, but not using them
- Program hired and trained instructors, who taught children to use computers (educational games with math focus); 1 hour in school + 1 hour out of school
- Focus on children in grade 4, started in 2002-03
- 55 in program + 56 control schools
- After 2 years, math scores increased by 0.47 standard deviations; no effect on reading scores

Interactive and Targeted Learning in Schools

- A Computer Assisted Learning (CAL) math programme delivered at school significantly improved student test scores in India
  - Software was interactive and targeted
  - Students were able to progress at a rate at which they learn
  - Math scores: 0.35 sd (first year) and 0.47 sd (second year) higher
  - Lowest performing students made the largest gains

Laptop Computers
Cristia et al. (2012); Peru

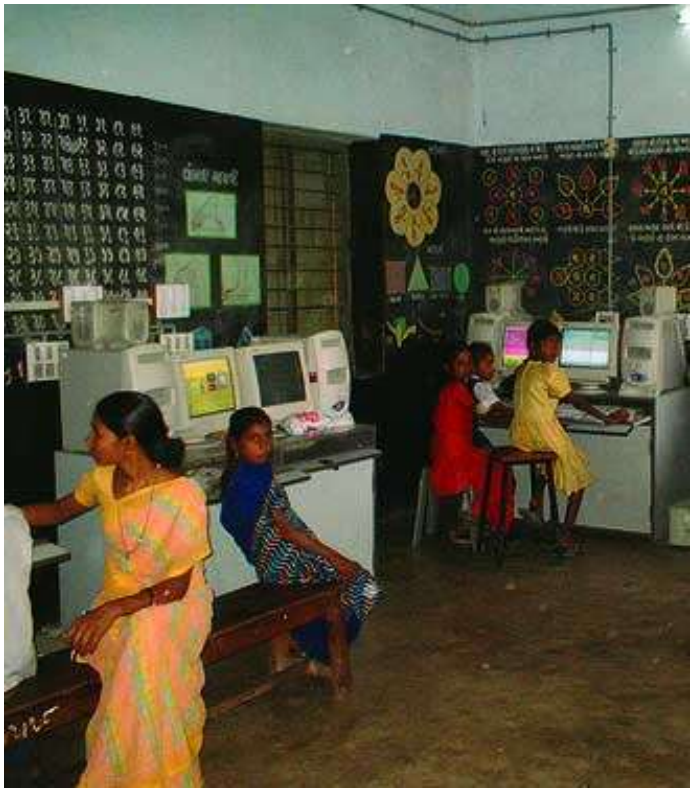
- Examines One Laptop per Child (OLPC) program, which has been implemented in 36 countries
- Laptops costs about $200 (expensive!)
- Implemented in 2009 (209 schools, w/ 110 controls)
- Standard software + 209 age-appropriate e-books
- After 15 months:
  - No effect on enrollment, math or reading tests
  - Small positive effects on abstract thinking skills (Raven's test), verbal fluency and coding

Desktop Computers at Home
Malamud and Pop-Eleches (2011); Romania

- Government program offering vouchers that poor families can use to purchase computers
- "Regression discontinuity design" methodology
- Program implemented in 2008
- Data collected for children age 7-22 (mostly 7-19)
- No special software provided; parents and children report little educational software by lots of games
- Impact : *lower* grades in Math, English & Romanian, but higher scores on computer skills test (Raven?)

Context and Implementation

- Simply providing technology to schools is not enough
  - In India, a CAL math programme was only effective when introduced after school
  - In Colombia, computers and teacher training was ineffective as teachers did not incorporate the technology into lessons



Technology in the Home

- Few and mixed results as to whether technology in the home is effective
  - In Romania, computer vouchers improved cognitive and computer skills, while negatively affected school grades in Math, English and Romanian
- *How* technology is implemented in the home may matter
  - In Romania, how parents monitor computer usage and homework seems to matter

Cameras in Schools to Monitor Teacher Absence Duflo, Hanna and Ryan (2012); India

- Remote primary schools with high teacher absence
- Cameras provided to teachers in 2003-04
- Tamper resistant cameras automatically record time and date of each picture
- Teachers take 2 pictures per day showing them with students; paid Rs 50 for each day > 10 days/month
- Teacher absence rate dropped from 42-44% to 21%
- Test scores increased by 0.17 standard deviations in first year.

Cost-effectiveness

- Some promising effects for technology in developing countries
- Still technology has not always been cost-effective
- Two effective CAL programmes in India were less cost-effective than a remedial tutoring programme ($1 per tenth of a sd) and an English teacher training programme ($0.24 per tenth of a sd)
  - After school CAL programme (run by NGO Gyan Shala): approximately $3.22 to $4.59 per tenth of a sd
  - CAL programme (run by NGO Pratham): $7.60 per tenth of a sd
- Technology in the home – potentially even larger associated costs

Supportive Learning Through Technology

Lessons from the
One Laptop per Child Program in Peru

Julian Cristia
Inter-American Development Bank

OLPC: A popular (but untested) program

- Two million laptops distributed
- In 36 countries
- No large-scale experimental evaluation yet

Program features

- Each student and teacher gets a laptop
- Laptop specially designed for children in poor regions
- Software:
  - Standard applications and games (no CAI)
  - Not targeted to the curriculum
  - Equipped with 200 stories, Wikipedia

OLPC in Peru

- Goal: increase learning in poorest areas
- Target: rural, poor, isolated schools
- 900K laptops distributed
- $180 million spent only in hardware
- Complementary inputs:
  - Training: one-week for teachers (70%)
  - On-the-job tutoring: (37%)

Evaluation

- Strong support from the government
- 320 primary public schools
- Experimental
- Results after 15 months of implementation

Results

- Positive on:
  - Digital competence
  - General cognitive skills
- No effects:
  - Enrollment, attendance, studying/reading at home
  - Math and Language

Why no effects on Math and Language?

- No software aligned to curriculum
- Weak training
- Little guidance to teachers

Message 1: Laptops alone are not enough

- Software is critical (DVD player but few DVDs…)
- Teachers need training
- Students left alone may learn but Math and Language?

Message 2: Focus on use

- How computers are used determine impacts
- Policy targets in terms of use (not access)
- Monitor use: a window to the classroom

Message 3: Pilot and evaluate

- There is uncertainty about the most effective models
- Programs are expensive
- Hence:
  - Pilot (and evaluate) first
  - Scale-up later

ICT AND EDUCATION IN TANZANIA – ENTERING NEW TERRITORY

Using evidence to inform decision making

- Education continues to consume biggest share of budgetary allocation
- Access gains – quality issue remains
- Use of ICT in education pushed as way to improve learner outcomes/performance
- But what do we know in Tanzania about what is working in the use of technology in education?

- WE DO NOT KNOW.....

- However,

There are a plethora of ICT related projects/initiatives in education in Tanzania:

- **ICT Tanzania Beyond Tomorrow Programme:**
  - This project aims at setting up a programme for ICT in education at all levels in Tanzania. Thus all other projects will be governed by the Programme. This allows for a focused, prioritised and purposeful use of scarce resources.

- Sweden projects
  - **Use of ICT to enhance teaching and learning of Science, Math and Languages in Secondary Schools:**
    - The idea will be to take client devices as close to the students as possible. Rather than making students leave their class room environment to move into a computer lab, this project will bring the technology to the students. Several students will share a device and/or maintain one device per student. Results will be compared against control groups

- **ICT for in-service training:**
  - This project is in project documentation stage. It will target Teachers in the field concentrating on how technology can assist. Whereas the first project concentrates on students this one concentrates on the skills and capacity of the teachers. MoEVT feels that the facilitator role of the teacher will be crucial in disseminating ICT skills to students.
- **OUT Transparency Enhancement Project:**
  - The Project seeks to extend good practices of ICT integration obtained from the initial OUT project to other institutions nation wide. Thus components such as performance monitoring of students, teachers and the institutions will be available. Security around exams will be tightened through online and in cases on demand examinations.

- **Support to Tanzania Libraries, Tanzania Institute of Education, Human rights centre in government:**
  - These are being supported by SPIDER and joint and linked projects such as shared e learning and elibrary platforms. Each sub project receives a maximum of 80000 usd and is limited to a two year time period.

- **The Ministry of Communication Science and Technology (MCST) community information centres project**
  - The project aims at establishing a Programme that will utilize the Fiber Optic Backbone for community learning centres. It will set the standards for operations, participation of multiple stakeholders and sustainability of these centres that will be hosted mainly at post offices.

Bridge IT

- The Bridgeit project in Tanzania is a replication of a successful project in the Philippines known as text2teach. Locally, the Bridgeit Tanzania project is known as Elimu kwa Teknolojia (or ET), which means "Education through Technology."
- During this two-year "pilot" project, Bridgeit was to reach a minimum of 600 primary school teachers and a minimum of 10,000 primary school girls and boys (with at least 50% girls) in 150 Tanzanian public schools. Results to date:
  - 40,402 students reached and 1,544 teachers trained;
  - Programme operating in 150 schools;
  - 20 teachers trained as life skills trainers on Passport to Success life skills program in 20 pilot schools;
  - Participatory teacher's guide, 126 videos, and 131 learner-centre lesson plans developed and distributed to each school.

The World Bank has gone into agreement with the Government on projects worth 220 M USD

- 1) Linking all higher education institutions into a network through the National Fiber Optic Backbone that includes a mechanism to share knowledge resources such as a common elibrary system, students info system or other knowledge sharing tools.
- 2) Regional capacity building and technical assistance to develop contemporary, industry standard IT skills and competencies (IT Business Outsource program)
- 3) Regional ICT Teacher competency development with the aim of training teachers in required ICT skills for teaching and learning.
- 4) IT parks that will invite major IT companies to settle in Dar es Salaam to impart skills for innovative ICT business projects.
- 5) Technical Assistance to develop a Science and Technology Policy

- But all such programmes and projects are not guided by rigorous evidence to know what is working and what is not

- A move towards RCTs in Tanzania: now about to evaluate one of the programmes to see what is working and what is not working

- First randomised testing in use of ICT in education in Tanzania

- Tanzania 21st Century Basic Education Programme (TZ-21) which aims to improve the quality of instruction in reading, mathematics and science in lower primary education in Mtwara and Zanzibar leading to increased learning achievement
- TZ-21 is a five-year, $48.9million dollar USAID funded project
- Design has following components:
  - Computerised EMIS, Whole School Development, BridgeIT, Mobile Computer Labs

- 2 project objectives:
- 1: Provide opportunity for teachers to bring innovative teaching methodologies so as to be more effective in school management and encourage parent participation
- 2: to provide a school-based education Management System (EMIS) to deliver real time data for education planning and management at school and local level

- Assumption: By taking a holistic approach to primary education that includes the effective integration of ICT and EMIS, this partnership will equip primary school students, teachers, and administrators with the skills they need to be successful in the 21st Century.

- Supported by the World Bank – lead researcher is World Bank

- Implementation of project:
  - 612 primary schools in Mtwara
  - All schools (612) will receive at least 2 laptops to implement school based EMIS
  - 45 schools will receive BridgeIT
  - 30 schools will receive Mobile labs
  - Schools to be selected by first stratifying the sample and interventions at the district level based on district level student participation and then randomly assigning the schools to each of the groups

Groups

Group	Treatment	No. Of Schools in Mtwara
Group 1	EMIS only	All primary school in Mtwara
Group2	EMIS + Whole School Development	All primary school in Mtwara
Group 3*	EMIS + Whole School Development + Bridge IT	44
Group 4*	EMIS + Whole School Development+ Mobile Labs	29

* Interventions in Grade 1,2,3 and 4

- The aim of this impact evaluation is to measure effectiveness of ICT interventions packages on improving student learning outcomes in grades in context where resources are relatively constrained.

- COSTECH – growing commitment to use evidence in advising Government of Tanzania on policy issues

THANK YOU.