The Use of Technology in Education

Aprajit Mahajan

Stanford University

New Delhi, India | July 26, 2012

Can Technology Work?

- Investment in ICT in education has grown steadily over the past decade

- Results on improving learning in developed countries not very promising

- In developing countries, where teachers are poorly motivated and educated themselves, there seems to be greater potential

- Given excitement around ICT, it is essential to determine how best to introduce new technologies and encourage use

What We Know

- Technology is effective when interactive and targeted at the level of learning of the student
  - Especially in schools that rely on rote learning

- *How* the programme is implemented matters a lot

- Even when technology is effective, it is not always cost-effective

Interactive and Targeted Learning in Schools

- Computer Assisted Learning (CAL) math programme delivered at schools significantly improved student test scores in India

  - Students able to progress at their own pace

  - Math scores 0.35 sd higher in 1st year and 0.47 sd higher in 2nd second year. Lowest performing students made the largest gains.

  - Gains fall to .10 sd a year after the program.

Using Technology to Teach English

- 'PicTalk' machines
- Activity flashcards
- Schools randomly assigned to treatment group:
  - Machines ONLY
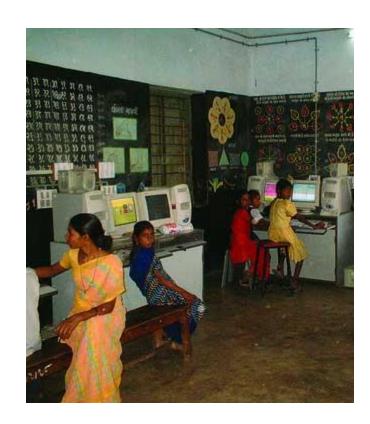 - Activities ONLY
  - Machines & Activities
- 1st year - implemented by externally hired and trained assistants
- 2nd year – existing teachers trained to implement program

Using Technology to Teach English

- All interventions equally effective on average
  - Average gains of 0.25-0.35 sd in English test scores

- Weaker students benefited more from teacher directed card activities, stronger students benefited more from the more self-paced machines

- Treatment implemented through the teacher training program improved students' math *and English* scores

Context and Implementation

- Mixed evidence on whether better to use technology as a replacement for or supplement to classroom curricula
  - A CAL programme in western India only effective when introduced after school. The during school programme lowered student performance.
  - However, another CAL programme in India that replaced (some) classroom time had a large positive effect.
- Important to consider relative productivity of existing learning environment

Integrating into the lesson plan

- The technology must be fully integrated into lesson plans and teachers need sufficient training

    - In Colombia, the provision of computers to schools and teacher training was ineffective, as teachers did not incorporate the technology into their lessons

Technology in the Home

- There are few and mixed results as to whether technology in the home is effective
  - Laptop voucher program in Romania improved cognitive and computer skills, but negatively affected language and math grades
  - One Laptop per Child (OLPC) in Peru had some positive effect on cognitive skills but no impact on math or language test scores
  - Computers used primarily for non-educational activities

- *How* technology is implemented in the home may matter
  - Parental involvement/supervision can be important factor

Cost-Effectiveness

- Some promising effects for technology in schools in developing countries, but not always cost-effective

- Two effective CAL programmes in India were less cost-effective than a remedial tutoring programme (US$1 per .1 sd) and an English teacher training programme (US$0.24 per .1 sd)
  - The after school CAL programme run by the NGO Gyan Shala was approximately US$3.22 to US$4.59 per .1 sd
  - The CAL programme run by Pratham was US$7.60 per .1 sd

Not Just Computers

- Cameras to monitor teacher attendance in Udaipur

- Cybersmart Africa – interactive whiteboard

- e-readers, Ghana

- Text2Teach, Philippines

- Educational video games, Chile

Policy Lessons and Recommendations

- ICT is not the panacea for education that it is often purported to be

- It can serve as a beneficial tool for improving learning outcomes

  - Can provide a more interactive learning tool

  - Can be easily tailored to children's current learning level to help them learn at their own pace

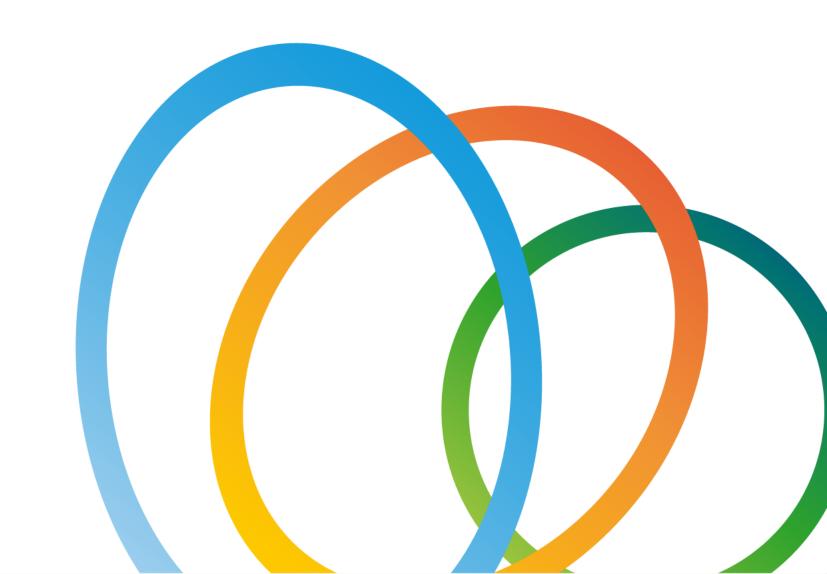- **But the implementation details matter**

Policy Lessons and Recommendations

- Technology should be fully integrated into subject matter instruction
  - Teachers need to be given sufficient training, both in how to use the technology and in how to teach students to use it
- Important to consider the relative productivity of the current learning environment
  - ICT programmes may be more beneficial when the current quality of teaching is low
  - When the quality of teaching is high, replacing teaching time with computers may be detrimental to learning.

Room for Innovation

- Using ICT to improve early grade reading specifically

- During school hours or outside of school?

- Train existing teachers or implement externally?

- Focus on students at a certain level? Do different subsets of students benefit differently?

- More cost-effective technology (projectors, pictalks, etc.) that may be more easily used on a large-scale basis

Technology for Education - A practitioner's view

Sriram Raghavan

InKlude Labs, India

Outline

- **Technology that worked**

- **Technology that did not work**

- **What should you look out for?**

    - Cost

    - Scaling

    - Application

- **Infinite possibilities**

- **Q&A**

Technology that worked

Technology that worked

- Empirical evidence: Monitoring teacher attendance improves student learning outcomes (JPAL, 2006)

- Thesis: Any teacher is better than no teacher

- Project: Temporary teacher replacement system

- Technology: Used mobile SMS platform to let temporary teacher fill in for a regular teacher who is absent

- Challenges:

  - Institutional acceptance

  - Updating numbers

  - Institutionalization

Technology that did not work

Technology that did not work

- Thesis: A computer with peripheries is enough to aid a teacher

- Project: Multi purpose device comprising a computer, projector and CD/DVD writer installed in schools in Andhra Pradesh

- Reasons for failure:

  - Complexity of device discouraged usage

  - Technology was not aligned with study material

  - Design inhibited interaction and hands on learning

  - Classis case of solution seeking a problem

What should you look out for?

Cost Awareness

- Consider total cost of ownership, such as fixed cost of equipment, power needs, maintenance and upgrades

- Understand the cost of services that can be multiples of cost of product as in the case of staff, warranties etc

- Innovate in financing: for example the pay per use model

Scaling

- Scalable technology does not always lead to scalable solutions

- Solutions may work differently in different environments

- Technology should be adapted to the environment

Application

- Just because a solution is conceivable on a technology platform, does not mean it will work on the ground

- Rigorous pilots are required

- RCTs are a good way to know what works

Infinite possibilities

Infinite possibilities

- Using mobile phones for information dissemination

- Customized devices like leap frog

- Using mobile phones for gaming – Improving on fine motor skills

- Audio devices

- Low cost tablets

Questions?