Computing and the Developing World

CSEP 590B, Spring 2008

Lecture 8 – Computers and Education

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Highlights from Lecture 7

- Yaw Amokra
  - OpenMRS
- David Edelstein
  - Village Phone Operators
- Joyojeet Pal
  - Computers in Schools

What was the most interesting idea from Lecture 7?

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OpenMRS

- Medical Record System
  - Clear need
  - Diverse problem
- Computing Ecosystem
- Computing Education problem

- Mundane topics – but very important

Village Phone Operators

- Cell phone operators – sell airtime as business
- Question
  - Is there a business opportunity in selling services?
  - Value based services

Computers in Education

- Rural India
  - Awful schools [More later . . .]
  - Substantial donations of computers to schools
    - Government and NGO
  - Parents don't want their kids to be farmers

Interview study results

- Parents view “learning computers” as important for creating opportunities
  - Leads to greater attendance
- Parents have essentially no understanding of what computers are
  - View of computers diminishes with exposure
- Positive aspects of government run programs
- My interpretations
  - No evidence of students learning from computers
  - Positive view by students and parents
  - Novelty factor

Today

- Rural education
- Computers in the classroom
  - Vadadora (Baroda) Study
  - Multimouse
  - Mischief
- Digital StudyHall
- Classroom computing
- Language learning

Rural Education

- High teacher absenteeism
- Low resources
- India wide survey [2005]
  - 44% of children 7-12 cannot read a basic paragraph
  - 50% cannot do simple subtraction
- Varodara
  - 20% of students enrolled in grade three could answer grade one math competencies

As minister of education, what studies would convince you that a nation wide laptop initiative was a good idea

- Study questions
- Study mechanics

Vadadora (Baroda) Study

- Poverty Action Lab (MIT)
  - Randomized studies of development projects
  - Medical model
    - Half get the placebo, compare outcomes

Questions: Is there any evidence that anything helps education for the poor?

- Negative results
  - Decreasing class sizes
  - Hiring teachers aides
  - Buying text books
  - Providing flip charts

Balsakhi (Teaching Assistant) Study

- Young women from the community work with weaker students
  - working with groups of 15-20 students who have not mastered skills
  - curriculum simple and standardized
  - low pay (750rs per month)
- Very low cost program
  - Distinguished from other remedial education by use of unskilled teachers and low costs

Computer Aided Learning

- Pratham project
  - Computers already placed in schools, but not used
  - Hired team of instructors to provide children with supervised computer time
  - Two hours per week
  - Two children per computer
  - Educational games tied to math curriculum

Randomized Trials

- 3 year study across approx 180 schools in 3rd and 4th grade in Vadodara and Mumbai
- Pre and post tests for all students
- Apply interventions at half the schools
- Do students receiving Balsakhi achieve higher scores?
- Do students receiving CAL achieve higher scores?

Results Summary

		Treatment: Pretest	Comparison Pretest	Treatment Posttest	Comparison Posttest
Balsakhi: Vadodara					
Yr 1	Math	-0.007	0.000	0.348	0.171
	Lang	0.025	0.000	0.794	0.667
Yr 2	Math	0.046	0.000	1.447	1.046
	Lang	0.055	0.000	1.081	0.797
Balsakhi: Mumbai					
Yr 1	Math	0.002	0.000	0.383	0.227
	Lang	0.100	0.000	0.359	0.210
Yr 2	Math	-0.005	0.000	1.237	1.034
	Lang	0.056	0.000	0.761	0.686
CAL: Vadodara					
Yr 2	Math	-0.054	0.000	1.129	0.810
	Lang	-0.009	0.000	0.719	0.709
Yr 3	Math	0.125	0.000	0.813	0.232
	Lang	0.116	0.000	0.118	0.014

Observations

- Balsakhi had stronger effect on poorer students
- CAL also had a stronger effect on poorer students (but not as significant)
- Balsakhi $2.25 per student per year
- CAL $15.18 per student per year
  - Including 5 yr depreciation on computers

Randomized studies

- Study Bias:
  - Selection bias
  - Publication bias
- Study design and scale
- Randomization approaches
- Differential Attrition
- Hawthorne and John Henry

Multimouse

- Many to one use common
- Oldest, brightest, and/or richest kid controls the mouse
- Simple idea:
  - Allow multiple mice to be used
    - Low level windows programming: RawInputAPI
    - Released as MultiPoint SDK
  - "One Mouse Per Child"

What concerns could be raised about MultiMouse?

Give concerns directed at the multimouse concept, not about classroom computing in general.

MultiMouse Activity patterns

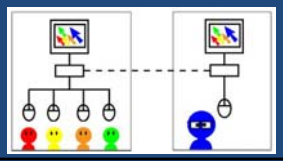
- Competitive clicking
  - "Select the CAT"
- Independent workspaces
- Shared jigsaw puzzle
- Group voting
-
-
-

Multimouse Observations

- Kids rapidly pick up UI and game control
- Engaging. Kids participate.
- Game playing issues
- Gender specific sharing / cooperation issues
- Even kids without mice are engaged

Mischief

- Extension of Multimouse for distance education
- Participants use mice to communicate with a public screen during a PPT lesson
  - Lecture given by a remote instructor



Context

- Neema Moraveji, MSR Asia, 2006
- Chinese rural schools
  - Shortage of qualified teachers
  - Moderate level of technology available
    - PPT, Internet, Data Projector, Student input devices
- Teaching practices
  - Individual attention, public reinforcement, hand raising, unison response

System features

- Student cursors
- Student List
- Hand Raising
- Gestures
  - Yes / No
  - Multiple choice

Group Scribbles

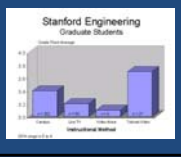
- SRI, Menlo Park, CA.
- Students use personal devices to annotate “stickies”, which are then placed on a public display
- Targets elementary school instruction
  - Teacher directed activities

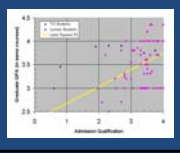
Digital StudyHall

- How can technology help education in very poor schools
- Capital expenditure $500-$1000
- Weak teachers

Tutored Video Instruction

- Video recorded lectures shown with facilitator
  - Original model: lectures stopped by students for discussion
  - Peer tutors
- Developed by Jim Gibbons at Stanford University
- Positive results reported in Science [1977]





Digital StudyHall

- Randy Wang, Microsoft Research India
- Tutored Video Instruction for primary education in rural India
- Initial sites in Lucknow, India
- YouTube + Netflix

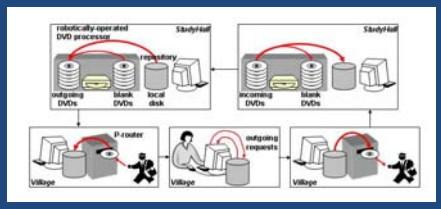
Key components

- Lesson database
- Mediation based pedagogy
- Hub and spoke model
- Content distribution by DVD

Digital StudyHall Lessons

- Content generation problem
  - Need to have good teachers, with good pedagogy
  - Teaching to students matching the target population
- Technology solutions scaled back
  - e.g., Automatic DVD based networking not used
  - DVD players instead of computers in the classroom
- Video processing and distribution technologies important
- Training, teacher support, oversight is critical

Initial Technology Vision



Other UW TVI Projects

- Intro programming [1998-2001]
  - UW Intro programming lectures recorded and offered at regional community colleges
  - CC instructors served as facilitators
- Algorithms [2006]
  - UW Algorithms course offered at Beihang University, Beijing
  - Teaching assistants as facilitators
  - Language and cultural issues successfully addressed

Computers in Eritrean high schools

- Eritrea
  - 5 Million People
  - Very poor –
    - ranked 157 / 177 in HDI
    - GDP per capita $281 (171 / 179)
  - Few resources, subject to drought
  - Long war of independence
    - Recent war with Ethiopia
    - Unresolved border dispute

Set up a computer lab in every high school in the country

- Recycled computers
- Computers used for basic computer training
  - How to use a computer
  - How to use basic applications
- National training program for high school teachers

Computer Usage Models

- Single ownership.
- Single user per terminal/computer.
- Multiple users per computer.

- Costs [India]
  - Desktop PC, US $500
  - Maintenance, US $40 / year
  - Teacher, US $500 / year
  - Laptop, US $200

Parents Attitudes [India]

- Should computers be at home, or at school?
- Parents felt overwhelmingly that computers belonged at school
  - Cannot learn at home
  - Only teachers can teach
  - Children learn better when they collaborate
  - Don't want the responsibility
  - Lack of power at home
- Parents conservative with technology (e.g., kids aren't allowed to touch the TV)

What would it cost to make computers available to all children in India?

- Scenario 1: One-on-one computing
- Scenario 2: Single access computer lab
- Scenario 3: Multiple access computer labs

OLPC

- Constructionist teaching philosophy
- One on one usage
- Massive deployments through MOE
  - Initially, minimum purchase 1M units
  - Target: 150M units by Dec 2008
- Open source ideology
- Substantial press attention
- Device
  - Designed for kids
  - Low cost
  - Rugged
  - Simple
  - Light weight
  - Low power

Lowcost devices

- ASUS EEE
  - Intel Celeron (900 MHz)
  - 512M SDRAM
  - 800x480 Color LCD
  - 802.11 b/g
  - XP/Linux
- Classmate PC
  - Intel Mobile ULV 900 MHz
  - 512M SO-DIMM
  - 800x480 Color LCD
  - 2 GB Flash
  - 30 GB HDD
  - 802.11 b/g
  - XP/Linux

Earlier Initiatives

- Simputer
  - 1998
  - Low cost, portable computer aimed at developing world
    - Rugged, Linux based
  - Developed by IISc Faculty
    - S. Manohar, Vijay Chandru, V. Vinay
  - Attempted to make a more commercial machine
- Computador Popular
  - Stripped down PC for kiosk applications
  - Project aimed at getting state subsidies

OLPC Status

- Nov 16, 2005. Negroponte and Kofi Annan show prototype
- May 23, 2006. Working prototype
- Nov 12, 2007. Buy one, give one
- Jan 2008. Separation from Intel
- May 2008. XP announcement
- May 2008. XO 2.0 announced.

OLPC Critique

- Lack of evidence that constructionism and/or one on one computer deployments help education anywhere
- Project is establishing a model that is in conflict with local schools
- Mass deployments through governments will gut education budgets
- Project will have difficulty against commercial competition
- Logistics of large scale deployments will be difficult
- Support model non-existent
- Project assumes children will be allowed to control the computers
- Excessive hype

MILLEE: Mobile and Immersive Learning for Literacy in Emerging Economies

- Learning English (or French or Spanish or Mandarin or . . .) creates the greatest opportunities for economic advancement
- Language is one of weakest subjects in rural schools
- Can games on mobile devices be used for language learning?

Design work

- Iterative design with kids
- Big questions
  - What types of games are appropriate
- Usability questions
  - Iterative design

Basic results

- Focused use of cell phone games
  - Word learning, and pronunciation
  - Standard approach
    - Receptive, Practice, Activation
- Games provide motivation and engagement
  - Some issues of students wanting to get to the game playing phase (and skip the learning phase)
- Viewed as a supplement to an English class
- Speech recognition is future work

Did I miss anything?

- What other applications are there of technology to education in the developing world?

Lecture Summary

URLs

- Poverty Action Lab
  - http://www.povertyactionlab.com/
- Digital StudyHall
  - http://dsh.cs.washington.edu
- Group Scribbles
  - http://groupscribbles.sri.com
- OLPC
  - http://laptop.org
- Pratham
  - http://www.pratham.org
- Microsoft Research India Emerging Markets Group
  - http://research.microsoft.com/research/tem/