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?

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

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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
- Vadadora
  - 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

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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

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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://dish.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/researchtem/