

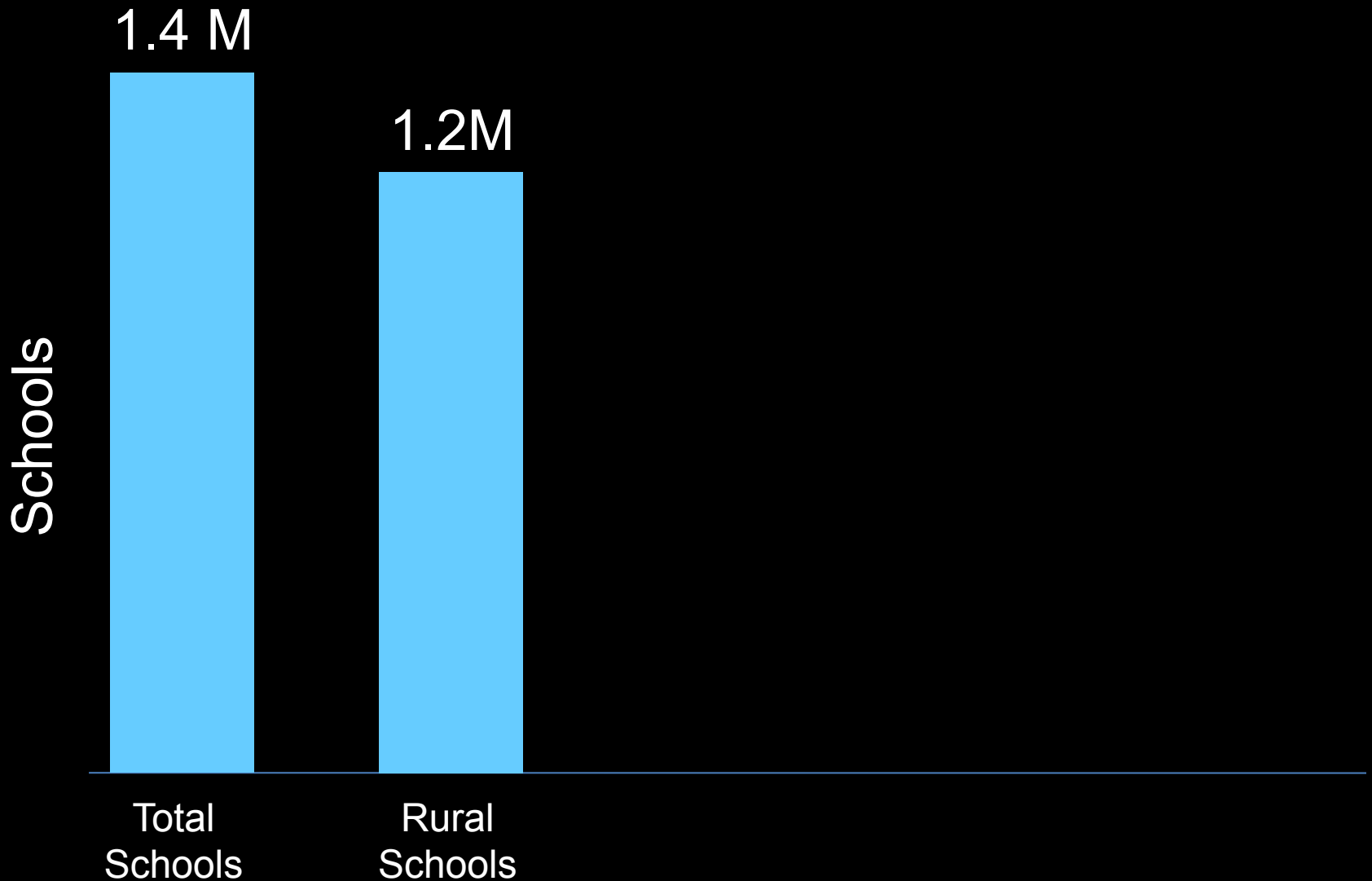


# MOOCs in the Developing World Lessons from India

**Bill Thies & Ed Cutrell**  
**Microsoft Research**

*Joint work with dozens of colleagues, acknowledged throughout the talk*

# Classroom Environment in India



# Classroom Environment in India

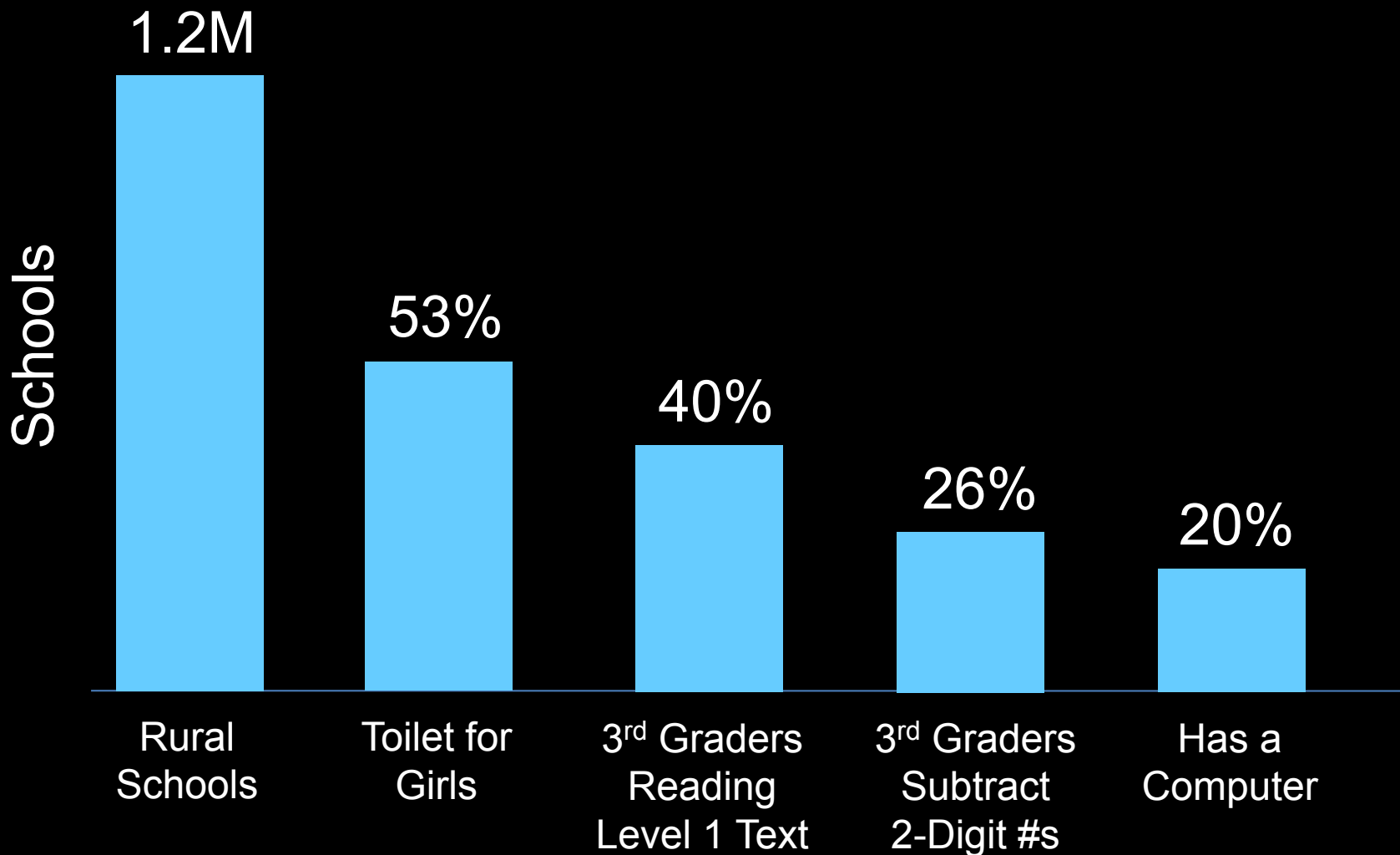






Photo: Randy Wang

Chinhat, Uttar Pradesh

Slide: Kentaro Toyama

Home / Product Guides / Laptops & Notebooks / Netbooks / Negroonte: We'll Throw OLPCs Out of Helicopters to Teach Kids to Read

# Negroonte: We'll Throw OLPCs Out of Helicopters to Teach Kids to Read

BY MARK HACHMAN NOVEMBER 2, 2011 01:10PM EST 7 COMMENTS

*Nicholas Negroonte plans to airdrop OLPC tablets to remote villages to teach the children within them to read, he told the audience at the Open Mobile Summit on Wednesday.*

204      
SHARES



Nicholas Negroonte plans to airdrop OLPC tablets to remote villages to teach the children within them to read, he told the audience at the Open Mobile Summit on Wednesday.

The tablets won't be accompanied by any adults or teaching resources; Negroonte said that he was convinced that they were designed for children, and that he wanted to see if the tablets could be used to teach them to read without additional instruction.

"We will literally take tablets and drop them out of helicopters," and return a year later to see if the effort was a success, Negroonte said. A new tablet design can withstand a 30-foot drop, and even be left out in the rain.



Photo: Randy Wang

*Lesson:*

Technology Amplifies Human Intent and Capacity; It Doesn't Substitute for Them



Kentaro Toyama

*Boston Review 2010, iConference 2011*

Leverage existing technologies



*Some photos courtesy Nithya Sambasivan*

# Same Language Subtitling

(Brij Kothari et al.)



- 30 minutes per week: Children's ability to read a paragraph jumps from 25% to 56% [1]
- 90% prefer having subtitles on songs due to interest in lyrics
- Reaches over 200 million people in India

How to deliver educational videos?

Use local mediators

# Digital Green

(Rikin Gandhi et al.)



Record Farmer Best Practices



Mediated Screenings in Villages

*In last few years:*

3,000 videos | 260,000 viewers | 3,400 villages

## Collections

 MOST LIKED MOST VIEWED MOST ADOPTED

30 Videos | 03:51:56

**NPM Pest Managem...**Andhra Pradesh | Telugu  
By: SERP 54.8k |  197.3k |  28k

12 Videos | 01:39:01

**NPM Growth Enhanc...**Andhra Pradesh | Telugu  
By: SERP 36.7k |  145.8k |  17.4k

25 Videos | 05:11:48

**Sowing**Odisha | Oriya  
By: VARRAT 34k |  84.1k |  6,954

9 Videos | 01:19:50

**Paddy**Bihar | Thethi  
By: BRLPS 21.8k |  35.6k |  6,143

7 Videos | 01:08:29

**System of Rice Inten...**Bihar | Thethi  
By: BRLPS 21k |  34k |  5,922

16 Videos | 03:01:05

**Paddy**Odisha | Oriya  
By: VARRAT 20.7k |  54.4k |  4,723

7 Videos | 01:29:08

**Wheat**Bihar | Thethi  
By: BRLPS 20.6k |  28.8k |  1,340

14 Videos | 02:35:25

**Maternal and Neonat...**Uttar Pradesh | Hindi  
By: PATH 20.2k |  56.4k |  151

2 Videos | 20:25

**Brinjal (Baingan)**Bihar | Hindi  
By: BRLPS 18.7k |  24.9k |  998

19 Videos | 03:54:41

**Paddy**Odisha | Oriya  
By: PRAGATI 16.8k |  39.6k |  5,040

20 Videos | 02:30:41

**Curative**Karnataka | Kannada  
By: BAIF 16.3k |  56.8k |  2,996

15 Videos | 02:41:08

**Compost and Manure**Odisha | Oriya  
By: PRAGATI 14.9k |  45k |  1,279

# Digital Study Hall

(Randy Wang et al.)



Record best teachers in cities



Mediated playback  
by rural teachers

>2000 videos | 140 teachers | Hard to evaluate [Anderson, ICTD 2012]

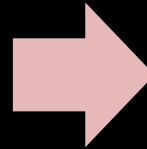
# DVD Player as a Programmable Device

- 16 general-purpose 16-bit registers
  - (No heap/stack)
- Virtual machine instructions
  - Arithmetic - Comparison - Branch/Jump - Timing
  - (No indirect jump)
- Display:
  - Pre-built MPEG-2 videos with mask and highlight layers

# Children's Books on TV-DVD [ICTD 2010]



\$0.50 for 1 book in print



\$0.50 for 10,000 books on DVD

Wikipedia  
Subset on TV-DVD  
[CHI 2011]



A lot is possible without a computer

What if you do have a computer?



# A Solution: Multipoint Mouse

(Pawar, Pal, Toyama and others, ICTD'06, CHI'07, CSCL'09)



Before MultiPoint



After MultiPoint

# One PC, Multiple Mice, Endless Possibilities

 Watch a Video



## Introducing Windows MultiPoint Mouse SDK 1.5

Windows MultiPoint Mouse Software Development Kit (SDK) gives education publishers the ability to build interactive applications that allow up to 25 students, each with their own mouse, to simultaneously engage on a single PC.

 [Download SDK](#)

### Benefits to Schools and Partners

MultiPoint Mouse SDK offers a wide variety of benefits for Education ISVs, Schools and Teachers.

▶ [Learn more about the benefits](#)

### Case Studies

Read how customers are successfully and creatively using applications built on the Multipoint Mouse SDK to drive positive learning outcomes.

[View Samples](#) 



Teachers fuel creativity and cooperation in Russian schools with Curriculum Curiosity from Noviy Disk.

### Related links

- ▶ [MultiPoint Solutions](#)
- ▶ [Microsoft Mouse Mischief](#)

Design to engage a group of learners

How many students can you engage?



# Clickers for Classroom Polling



+ Pedagogical benefits

– Very expensive

# qCards: Low-Cost Audience Polling Using Computer Vision

(Andrew Cross et al.)



# Polling an Audience of 300

[UIST 2012]



# Polling an Audience of 300

[UIST 2012]



90% of people captured  
98% of those captured accurately

# Polling an Audience of 1,800



# Enabling Local Production of Content

[Andrew Cross et al., CSCW 2014]

The screenshot shows a web browser window displaying a VidWiki page. The browser's address bar shows the URL `http://vidwiki.org/Hc` and the page title is "Player - Vidwiki". The VidWiki header includes the logo, the word "alpha", and navigation links for "Home", "Dashboard", and "Contact Us". A user is logged in as "Hi, Bill!". The main content area features a video player titled "Stocks vs. Bonds" by Khan Academy, with a note that "annotations in English are 100% complete". The video content shows a hand-drawn diagram on a black background. The diagram is a balance sheet with "Assets" on the left and "Debt" and "Equities" on the right. "Assets" is bracketed as 10m. "Debt" is bracketed as 6m and "Equities" is bracketed as 4m. "Equities" is further broken down into "stock" and "bonds". The Khan Academy logo is visible in the bottom right of the video frame.

# Enabling Local Production of Content

[Andrew Cross et al., CSCW 2014]

The screenshot shows a web browser window displaying the VidWiki website. The address bar shows the URL `http://vidwiki.org/Hc`. The page title is "Player - Vidwiki". The website header includes the "VidWiki" logo, navigation links for "Home", "Dashboard", and "Contact Us", and user options for "logout", "English", and a help icon. The main content area features a video player titled "Stocks vs. Bonds" by Khan Academy, with a note that "annotations in English are 100% complete". The video content shows a hand-drawn diagram on a black background. The diagram is a balance sheet with "Assets" on the left and "Debt" and "10m shares" on the right. Brackets indicate values: "10m" for Assets, "6m" for Debt, and "4m" for 10m shares. Above the diagram, "Debt" is linked to "bond" and "Equity" is linked to "stock". The "khanacademy.org" logo is visible in the bottom right of the video frame. A red "Feedback" button is located on the right side of the page. The footer contains copyright information: "© 2014 - VidWiki :: Technology for Emerging Markets, Microsoft Research. Supported in IE 10 +, Chrome Version 32 +, Firefox 27 and Up."

# Enabling Local Production of Content

[Andrew Cross et al., CSCW 2014]



The image shows a screenshot of a web browser displaying the VidWiki website. The browser's address bar shows the URL <http://vidwiki.org/Hc>. The page header features the VidWiki logo with the word "alpha" in small text next to it. Navigation links for "Home", "Dashboard", and "Contact Us" are visible. On the right side of the header, there is a user greeting "Hi, Bill!", a "logout" button, a language dropdown menu currently set to "हिन्दी", and a question mark icon. The main content area is dominated by a large blue rectangle containing the text "vidwiki.org" in white. A vertical red "Feedback" button is located on the right side of the page. The footer contains the copyright notice: "© 2014 - VidWiki :: Technology for Emerging Markets, Microsoft Research. Supported in IE 10 +, Chrome Version 32 +, Firefox 27 and Up."

# Lessons in Scaling Educational Technologies in India

- Technology amplifies humans, it does not substitute for them
- Leverage existing technologies
- Use local mediators
- Design for shared usage
- Enable contribution, not only consumption

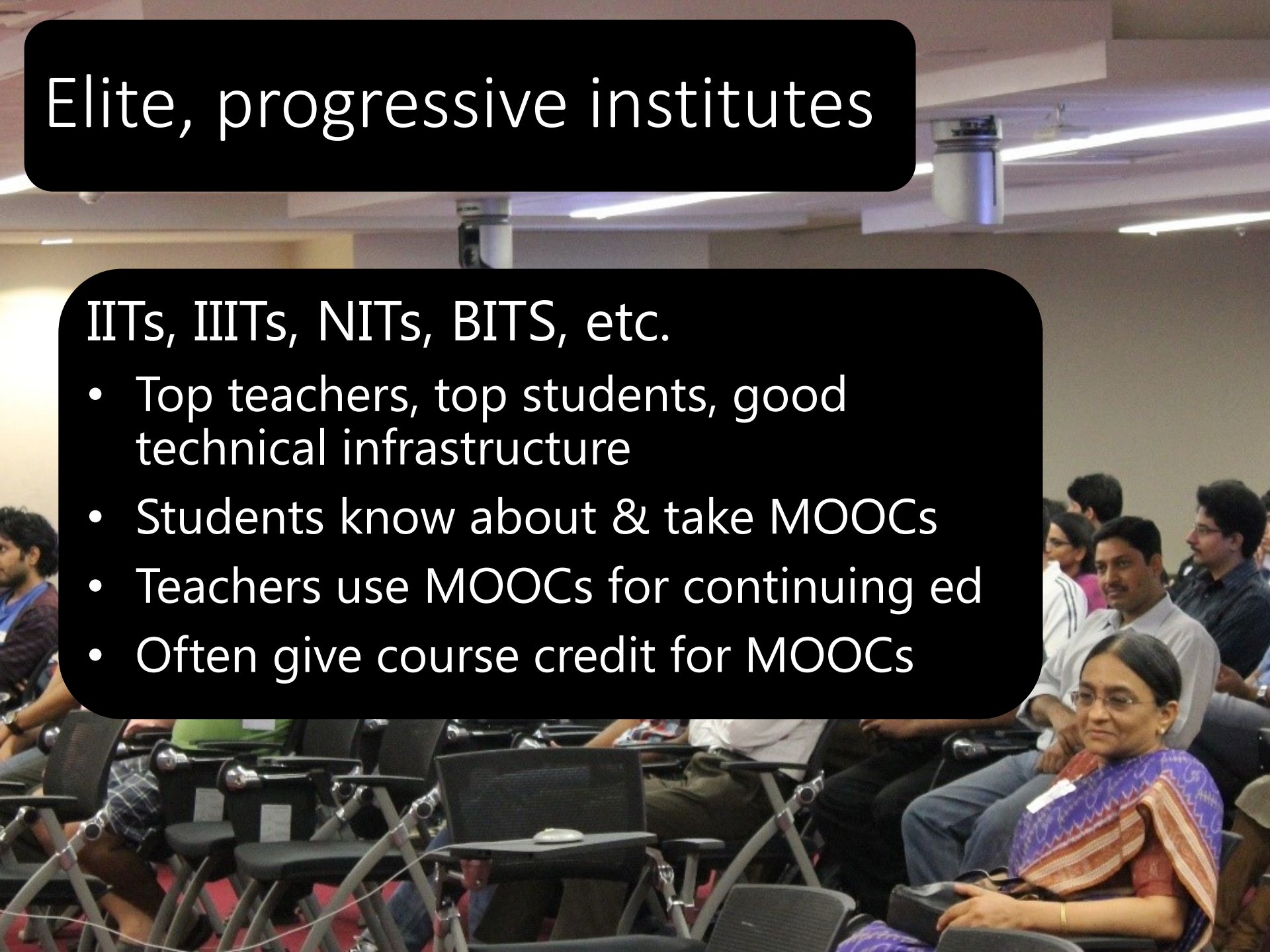
*So...*

*What about MOOCs?*

# Elite, progressive institutes

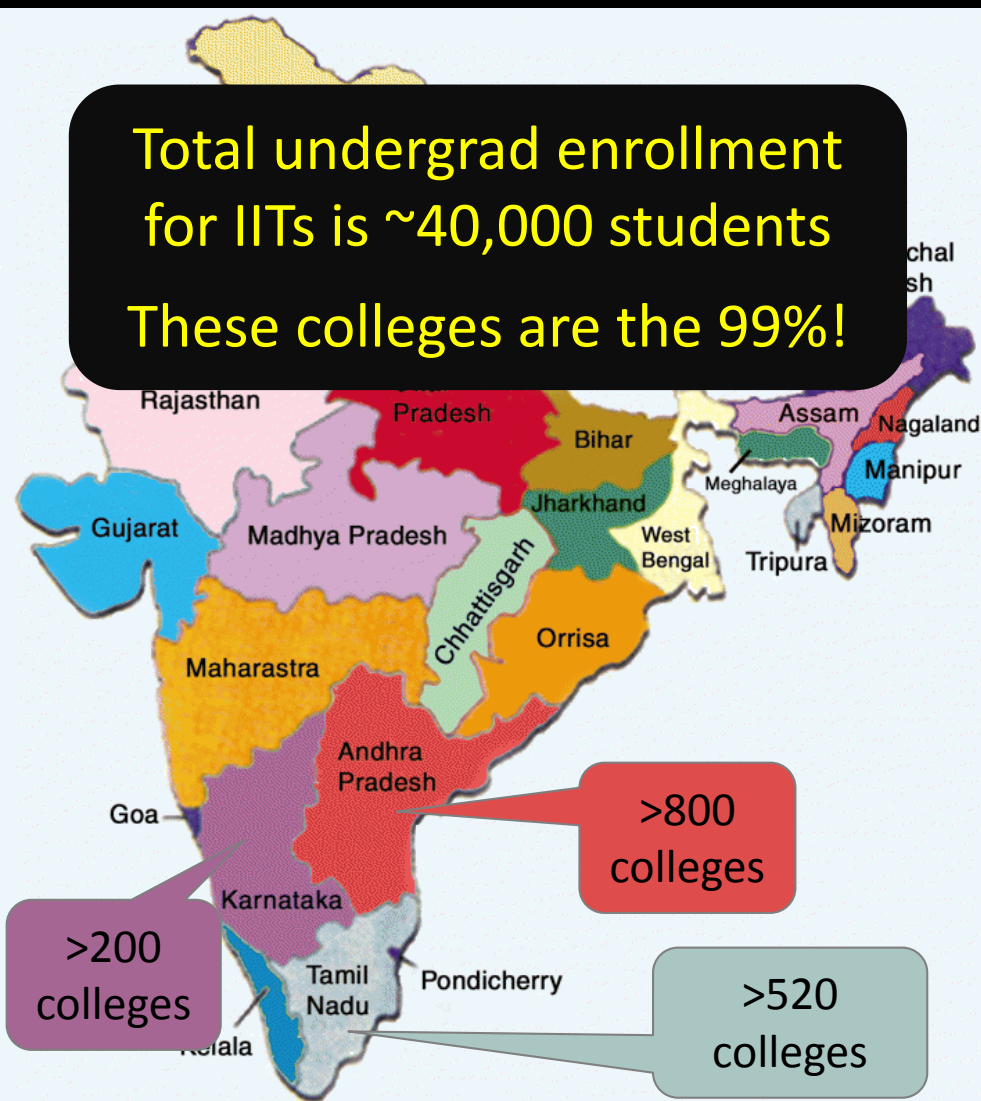
IITs, IIITs, NITs, BITS, etc.

- Top teachers, top students, good technical infrastructure
- Students know about & take MOOCs
- Teachers use MOOCs for continuing ed
- Often give course credit for MOOCs



# Most engineering students in large state technical universities

Total undergrad enrollment for IITs is ~40,000 students  
These colleges are the 99%!



Large universities with many affiliated colleges

- Centralized curriculum
- Single shared exam
- A few high quality colleges, long tail

Technical universities:

Colleges: ~4700

Faculty : ~50,000

Students: ~3,800,000

# The *other* 4 million students

- Deep teacher constraint, lower quality
- Wide variability in students, driven by job acquisition over learning
- Relatively poor technical infrastructure
- MOOCs mostly unknown & unused by students or teachers

From our recent survey in Karnataka:

~80% of students *never heard of edX, Coursera or Khan Academy*

<3% had ever watched even one online educational video (from anywhere)

*MOOCs reach the elites.*

*Why not the majority?*

# Should we blame awareness?

$n$  even

$f(x) = x^2, x^4, x^6, \dots$

•  $f(x) = x^n \geq 0.$

$x$

0:13:15 / 1:05:25

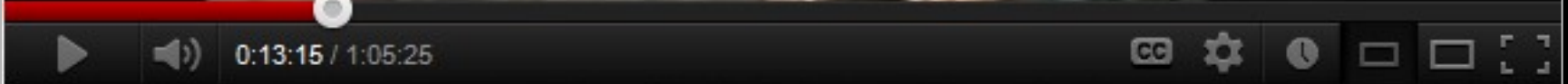
CC ⚙ ⌚ 🖥 🖥 🖥

# Should we blame awareness?

## India's NPTEL initiative (started 2003)

- Highly resourced, professional recordings, wide distribution of 100s of IIT courses
- Broad awareness
  - ~50% of surveyed students knew about it, almost all teachers aware

**Little sustained use or systemic change**



A photograph of a monkey sitting on a brick wall, holding a black cable in its mouth. The monkey is light brown with a white chest. The background shows a brick wall and some debris on the ground.

# Should we blame dearth of devices & infrastructure?

Based on our survey in Karnataka, colleges have very limited bandwidth & computer labs

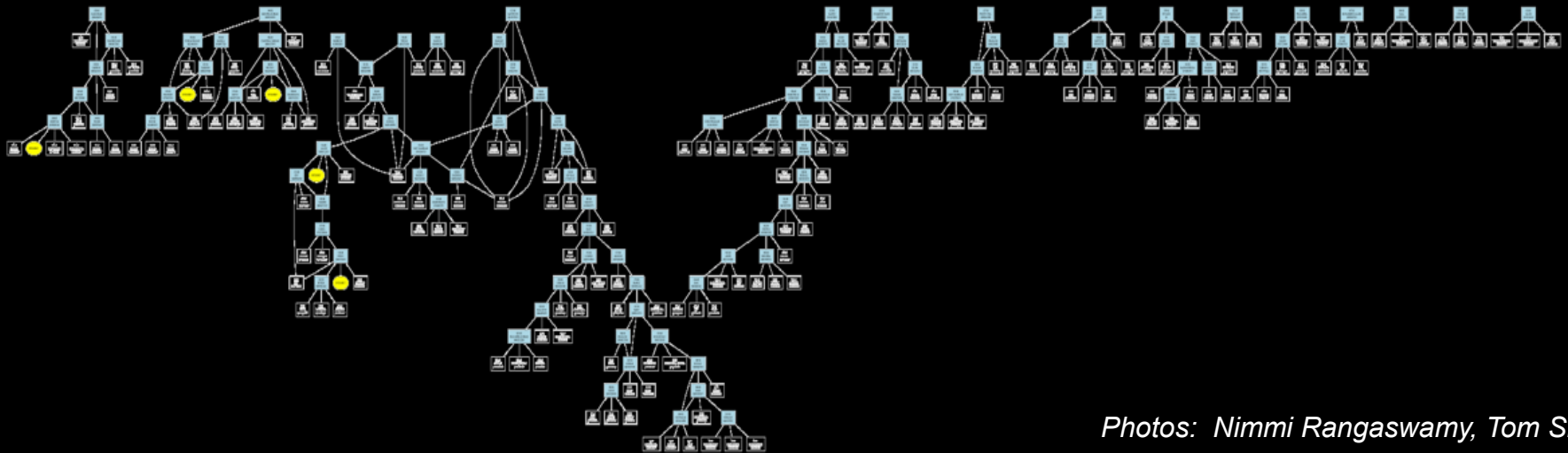
~60% of CS students on internet <2 hrs/day

~45% of CS students have own laptop/PC

~20% have smartphones, most pay-go or wi-fi

# Where There's a Will, There's a Way

[Smyth et al, CHI 2010]



Photos: Nimmi Rangaswamy, Tom Smyth



Should we blame content?

Shorter videos/lessons?

More interactivity?

Online or offline community?

Credentials?

Relevance to curriculum?

Poll—Do you consistently:

a) Exercise

b) Floss

c) Wear a seatbelt

# People don't do what's "best" for them



"How many calories do you burn by downloading diet apps?"

Junk & high fat foods versus fruits & veggies

Spend today versus save for tomorrow

10% of curable blind don't go to have surgery, even when cost-free

*Many people don't wear seatbelts or stop smoking, although they understand the implications.*

*MOOCs reinforce positive behaviors  
of top students and teachers*

*How can we get the rest of them to  
“buckle up” using online educational  
content?*

# Massively Empowered Classroom (MEC)

Platform built by MSR India

## Classic MOOC framing

*Replace classroom: Provide world-class teaching for students willing and able to do the work.*

## MEC re-framing

*Embrace the classroom: How do we act as a bridge to empower the existing ecosystem of institutions, teachers, and students to take advantage of online educational technologies?*

# Massively Empowered Classroom (MEC)

The screenshot shows the MEC website with the following elements:

- Header:** "Massively Empowered Classroom" with a subtitle "A community initiative by Microsoft Research." and a "Sign in to your Account" button with social media icons (Windows, Facebook, Google+, YouTube).
- Video Player:** A video titled "Massively Empowered Classroom" with a play button and a duration of "00:00:00".
- Text:** "What is MEC?" followed by a paragraph: "The best engineering jobs in India (and around the world) demand graduates with more than just a degree in CS or EE. The best jobs are going to candidates who can demonstrate that they really understand their discipline. Microsoft Research India is excited to introduce MEC (short for 'Massively Empowered Classrooms'), a research project designed to bring the highest quality classroom material to every undergraduate engineering student in India. MEC is geared to be a fun, social, and interactive learning place for students and teachers! Many features distinguish the MEC from a traditional online learning platform."
- Navigation:** Three blue arrows labeled "Sign In", "Find Your Course", and "Register".
- Quote:** "Thank You MEC for providing this wonderful opportunity to be a part of today's exam. The courtesy extended to us was indeed heart-warming. - Shakti"
- Trending:** A section with three video thumbnails:
  - Thumbnail 1: A person holding colorful blocks. Title: "UNIT1: Introduction (Part 1)".
  - Thumbnail 2: Handwritten notes on "Analysis of Algorithms" with terms like "Complexity", "Simplicity", "Efficiency", "Resources", "Time Space", and "Running time". Title: "UNIT2: Analysis of Algorithms - Efficiency Part 1".
  - Thumbnail 3: Handwritten notes on "Analysis of Algorithms" with "Time complexity" and equations  $f(n) = n^3$  and  $g(n) = 5000 n^2$ . Title: "UNIT2: Analysis of Algorithms - Orders of growth".
- Browse by University:** A grid of university logos including IIT Bombay, IIT Madras, IIT Kharagpur, MHRD QEEE, IIT Guwahati, IIT Roorkee, and IIT Delhi.

## Local control

- Synched curriculum
- Class-level analytics
- Local supplementation

## MOOC-like content

- Short, high-quality videos
- Periodic quizzes
- Forum & community

## Course supplement

- Required classroom attendance
- 21<sup>st</sup> Century textbook

# MEC deployment

Pilot course:  
Design and Analysis  
of Algorithms (DAA)

## 2013 Pilot:

3 state technical  
universities

>120 colleges

>4000 students

## 2014 Pilot (ongoing)

5 state technical  
universities (so far)

Large gov't pilot (MHRD)

>1000 colleges (as of Feb 20)

Deep instrumentation

1,609



# Blended Learning via Intermediated Video Lessons



## Potential Benefits:

- Overcomes device / bandwidth constraints
- Retains role for teacher
- Increases student engagement

(Note: NOT flipped classroom)

# Eliminate speedbumps... but focus on the road, car & driver

- Accent
  - High quality Indian instructors
- Content
  - Synched curriculum, short videos, interactivity
- Awareness
  - Facebook, systematic evangelism
- Bandwidth
  - Offline Windows app, mobile Android app

**Larger context of students, teachers and institutions give the structure to improve behavior**

massive + open + online  $\neq$  inclusive

need to empower the *majority* of teachers, learners

# How to Increase Social Inclusion?

## Lessons learned from the school of hard knocks

- Technology amplifies humans, it does not substitute
- Leverage existing devices
- Use local mediators
- Design for shared usage, large audiences
- Enable contribution, not only consumption

## Directions for MOOCs

- Use MOOC to strengthen existing classrooms
- Use classrooms to bring people to MOOCs
- Intermediated video instruction

# Acknowledgments

Andrew Cross

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Rahul Kumar

Rosa Arriaga

Satish Sangameswaran

Siddharth Prakash

Sridhar Vedantham

Srinath Bala

Sriram Rajamani

Vidya Natampally

Viraj Kumar