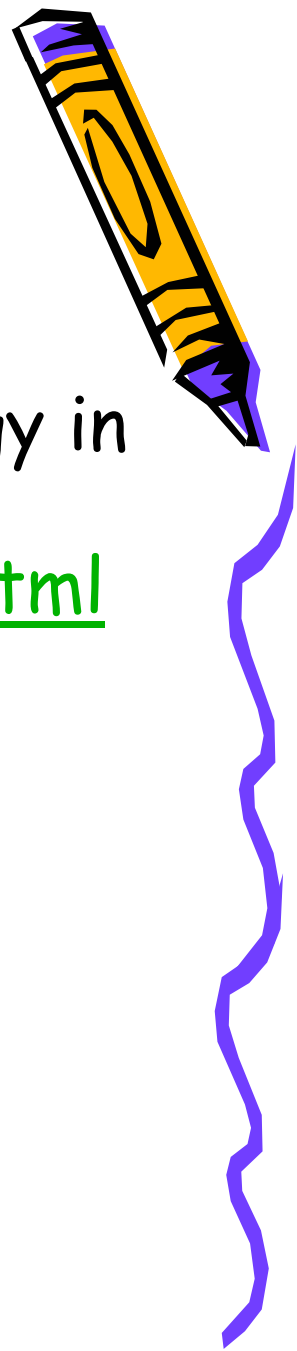# Technology for Universal Education

SIMS 290 Guest Lecture, April 19, 2005

Matthew Kam

Computer Science and Berkeley Institute of Design

Workshop Announcement

- Needs and Opportunities for Technology in Developing Regions
- bridge.berkeley.edu/workshop_needs.html
- Tentative topics
  - Education
  - Energy and the Environment
  - Informal trading markets
  - Microfinance, micro-enterprises
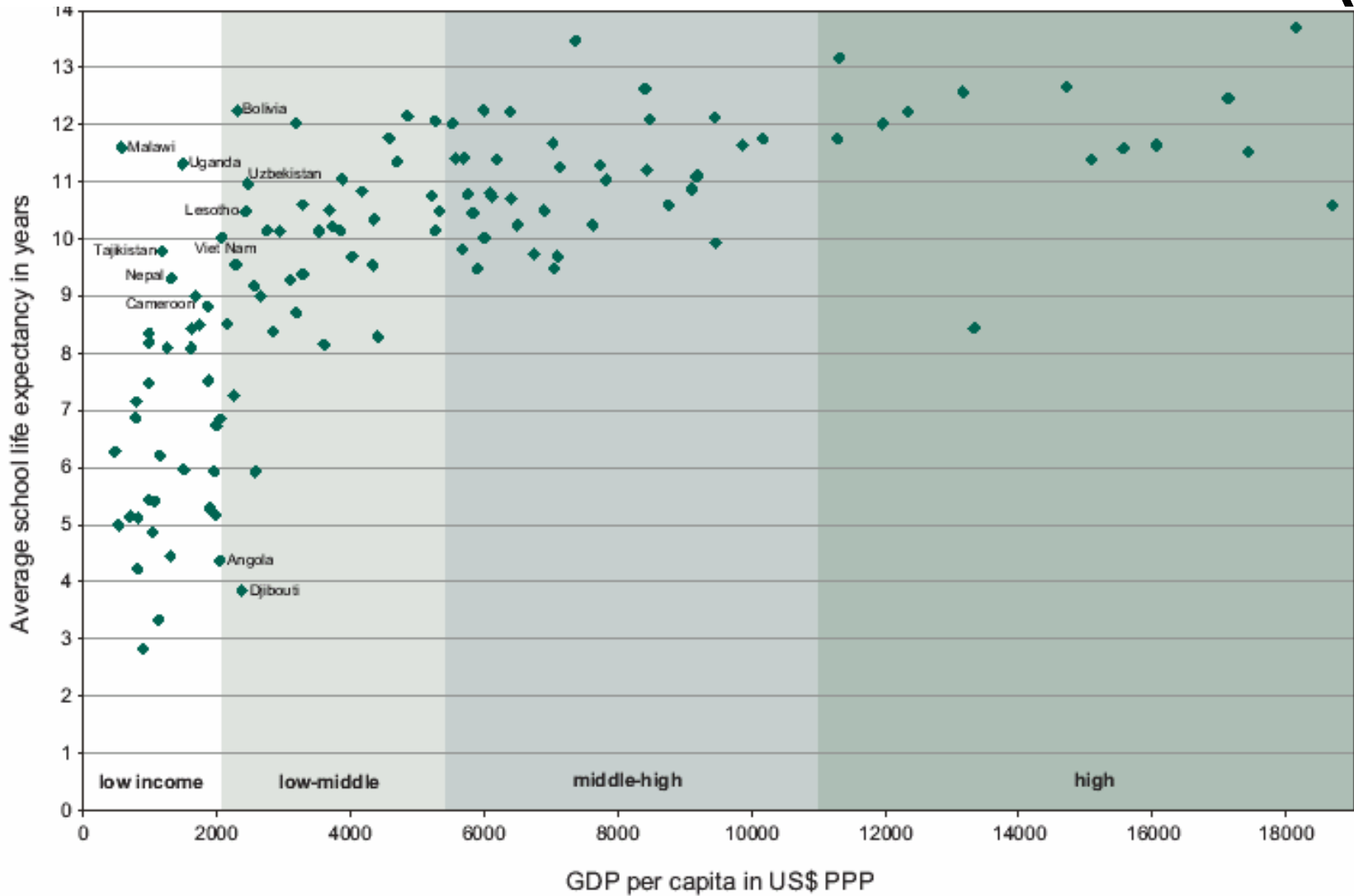- Asia, Eastern Europe, Latin America

How long can children expect to stay in school?

School life expectancy in years

No data available | <5 | 5 to <7 | 7 to <9 | 9 to <11 | 11+
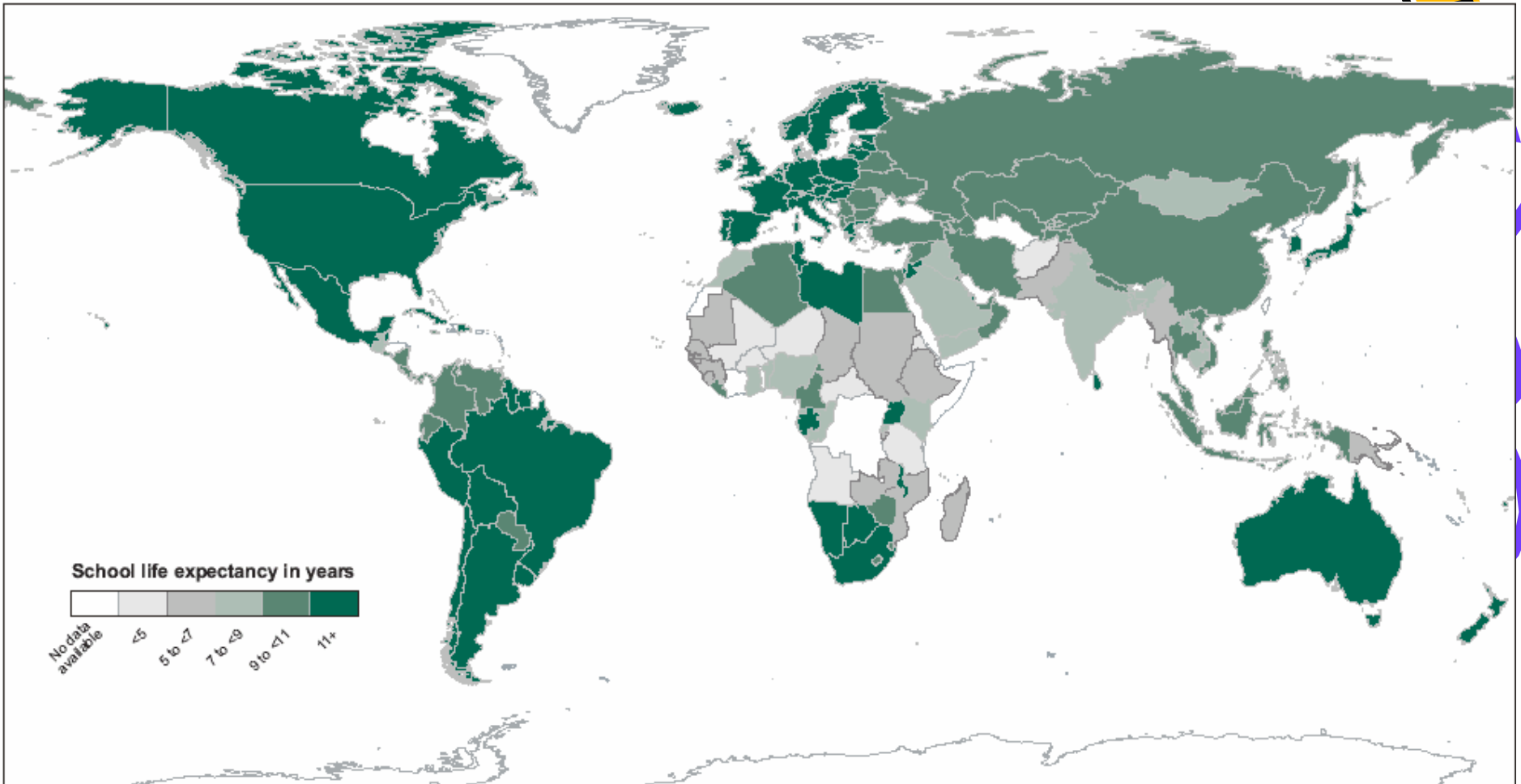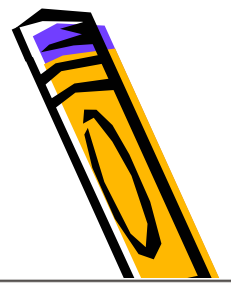
Source: UNESCO, 2004

How does duration of schooling relate to national wealth?

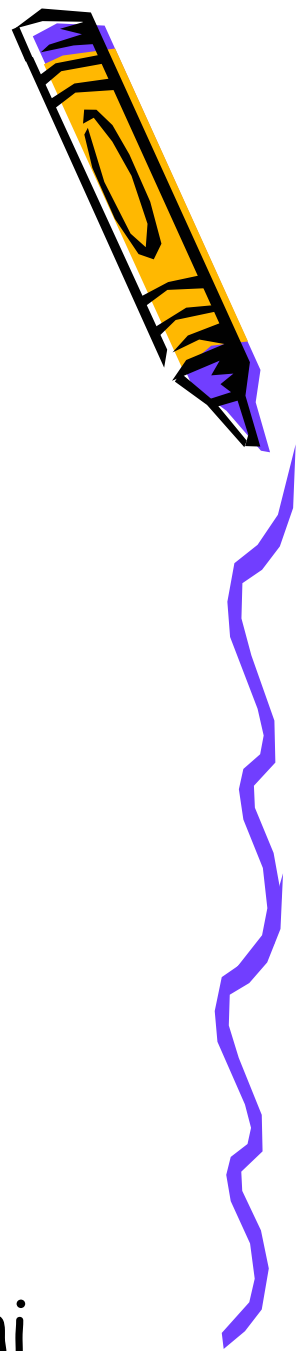
Source: The World Bank, 2003

India, A Land of Disparity

States & Capitals
INDIA

N

JAMMU & KASHMIR
• Srinagar

HIMACHAL
PRADESH

CHINA
(Tibet)

ARUNACHAL PRADESH

PAKISTAN

Shimla

Chandigarh
PUNJAB

• UTTARANCHAL
Dehradun

SIKKIM

HARYANA

• Itanagar

NEPAL

DELHI

UTTAR
PRADESH

Gangtok

BHUTAN

ASSAM

NAGALAND

RAJASTHAN

• Dispur

• Kohima

• Lucknow

• Jaipur

• Patna

Shillong

• Imphal

BIHAR

MEGHALAYA

MANIPUR

GUJARAT

• Bhopal

• Ranchi

Agartala

• Aizawl

Gandhinagar

MADHYA PRADESH

JHARKHAND

WEST
BENGAL

TRIPURA

MIZORAM

CHHATTISGARH

Calcutta

BANGLADESH

• Raipur

MAHARASHTRA

ORISSA

Bhubaneshwar

Mumbai
(Bombay)

• Hyderabad

ARABIAN SEA

ANDHRA
PRADESH

BAY OF BENGAL

Panaji
GOA

KARNATAKA
Bangalore

LAKSHADWEEP

• Port Blair

• Chennai
(Madras)

ANDMAN & NICOBAR ISLANDS

TAMILNADU

KERALA
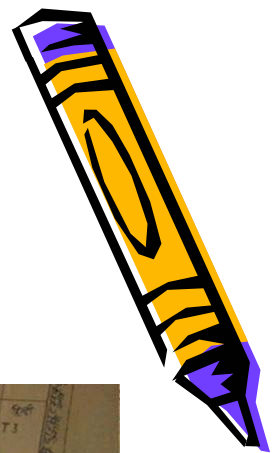
Map not to Scale

Thiruvananthapuram

Background

- 3-year pilot in village schools pioneered by Dr. Urvashi Sahni

Background:
CSCL and Computer Literacy

Background:
Hindi Courseware

Background:
CSCL and Hindi Courseware

Background:
CSCL and Student Authoring
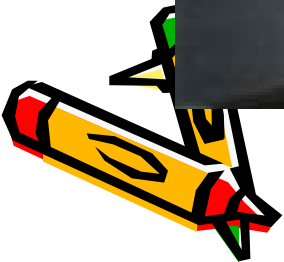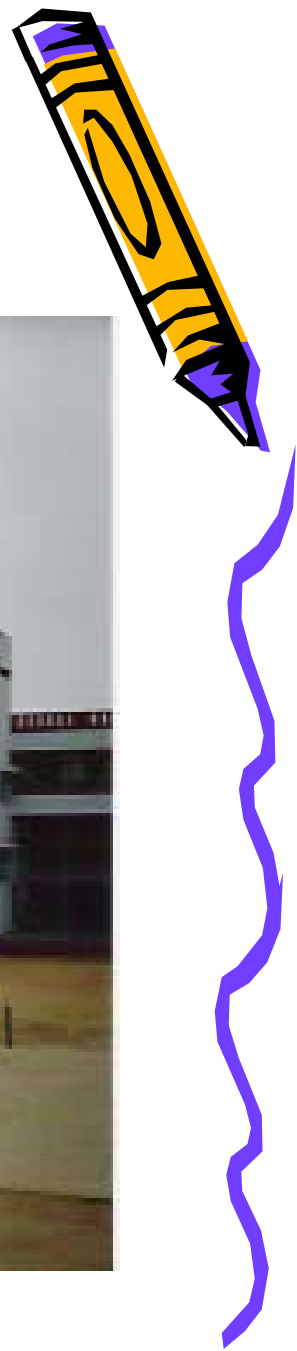
The Study Hall

Contrast:
Bright Uniforms
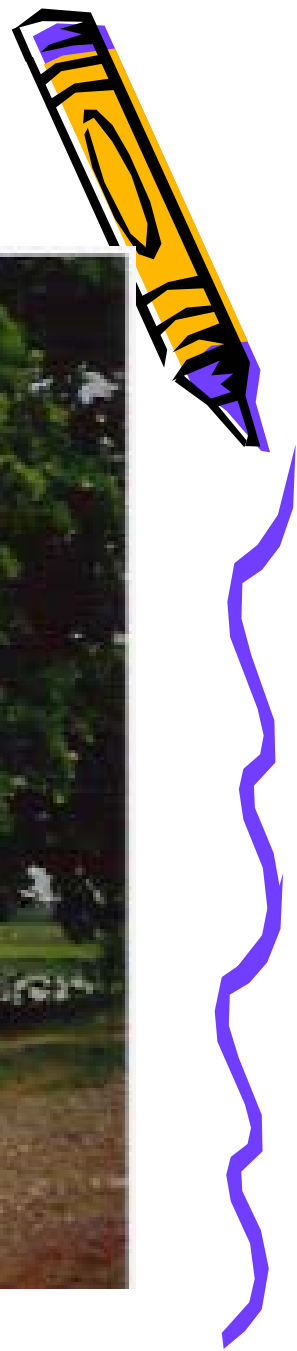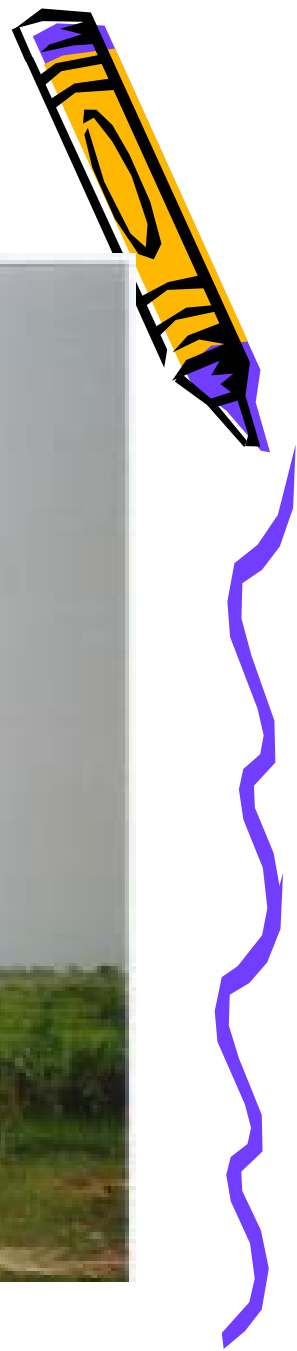
Contrast:
Furnished Classrooms

Contrast:
Swimming Pool and Facilities

To the Village Schools

To the Village Schools

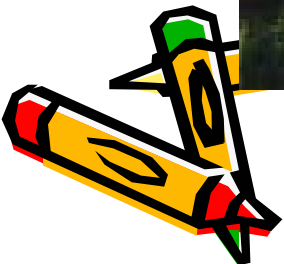# Rural Public Schools

Rural Schools:
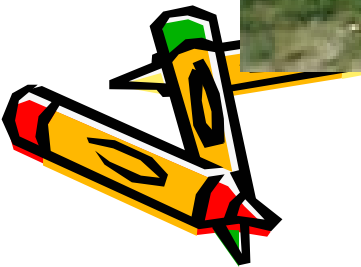# Life as a Student

Rural Schools: Household Circumstances

Rural Schools: Attendance
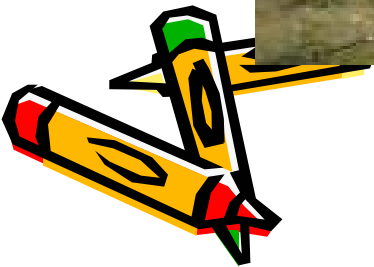
Rural Schools: Physical Environment

Rural Schools:
Physical Environment

Rural Schools:
Lack of Electricity

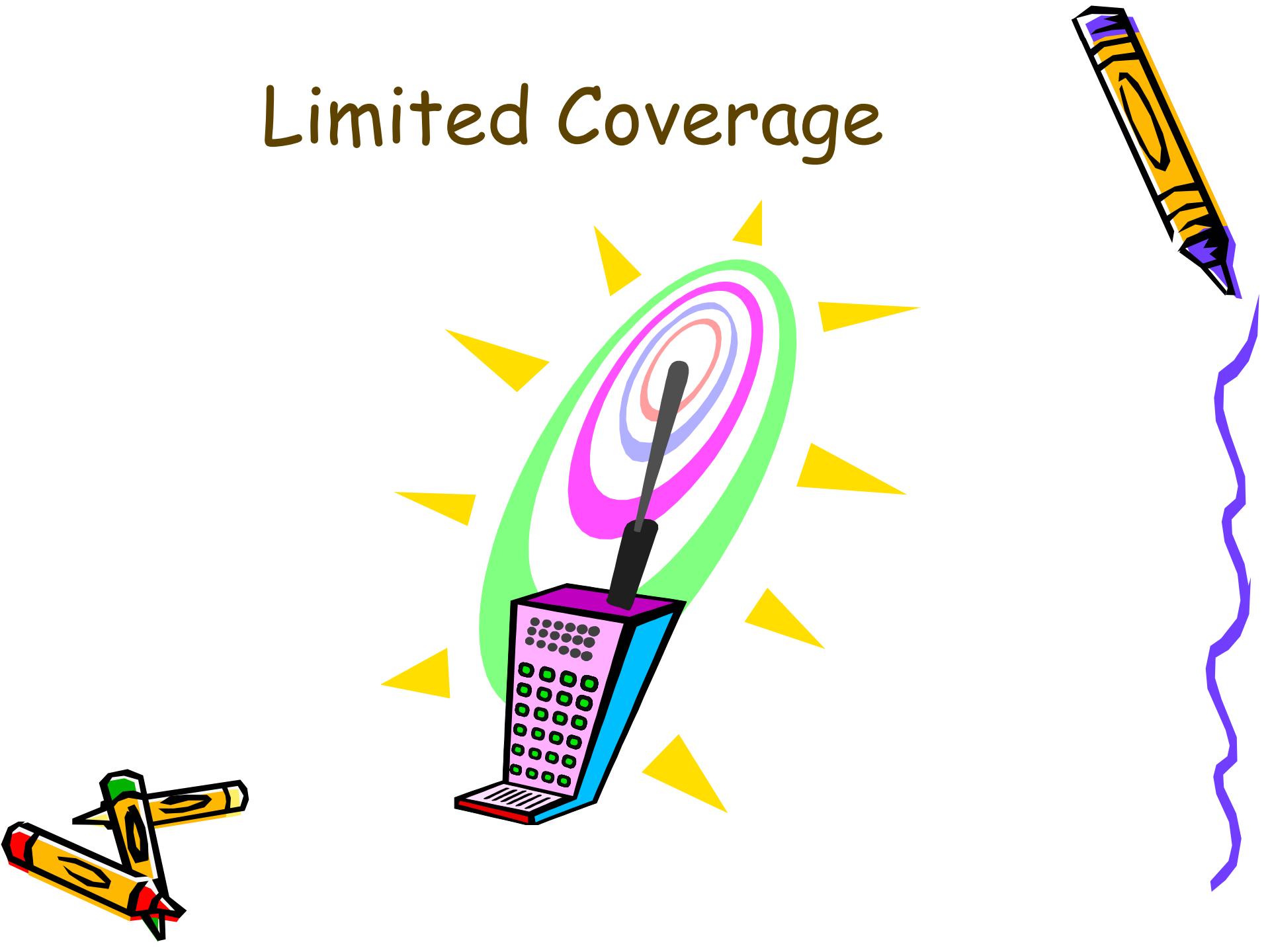# Rural Schools:
Lack of Electricity

Rural Schools:
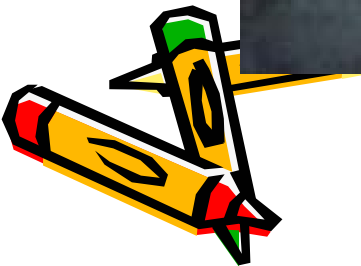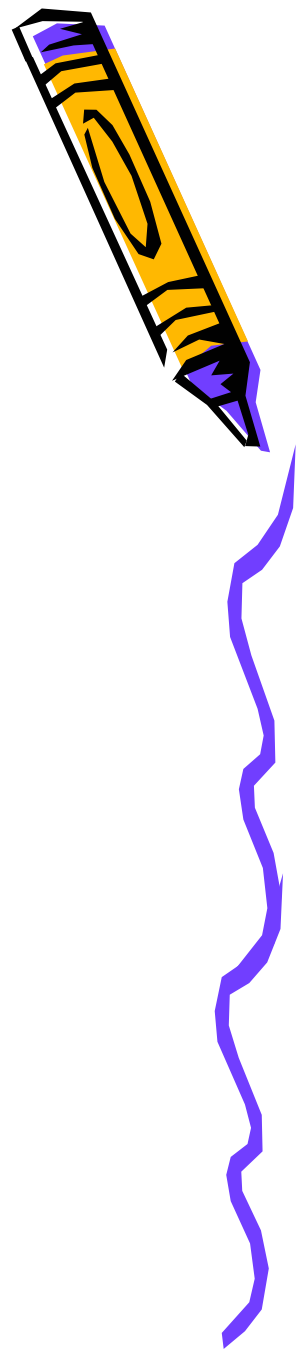# Lack of Electricity

Limited Coverage
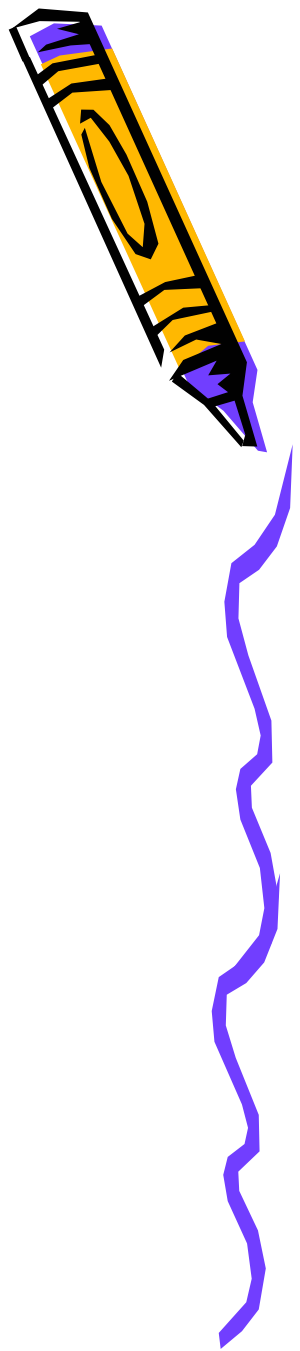
Rural Schools: Computer Literacy

Rural Schools:
Pride in Being Self-Contained
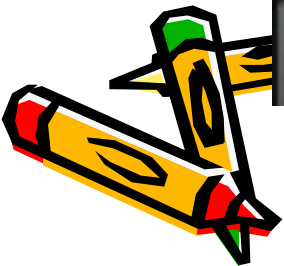
Rural Schools:
Pride in Being Self-Contained
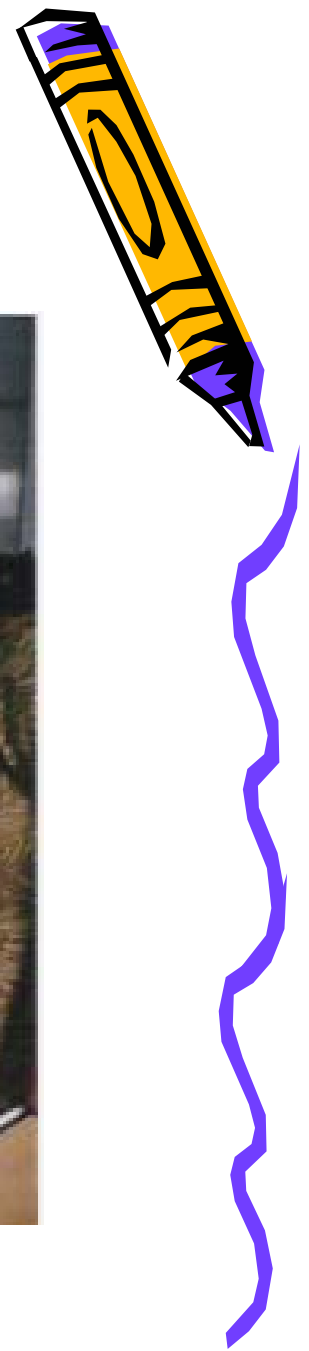
Newspapers

After-School Program: Classes
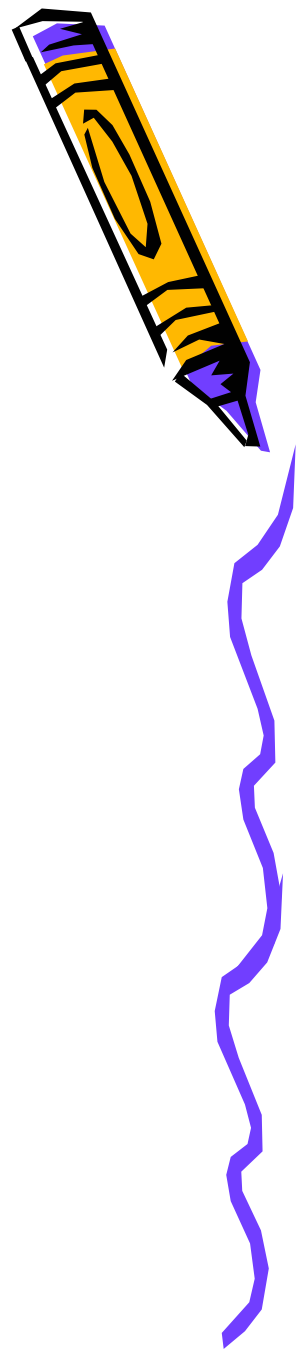
After-School Program: Computer Lab
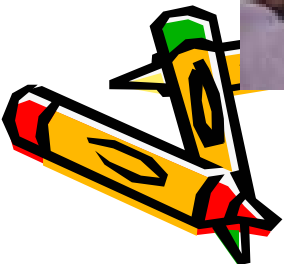
After-School Program: Computer Lab

Village Schools + After-School Program: Evidence of Learning

Village Schools + After-School Program: Evidence of Learning
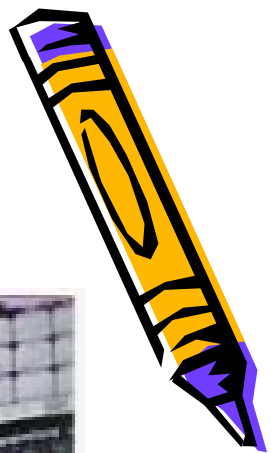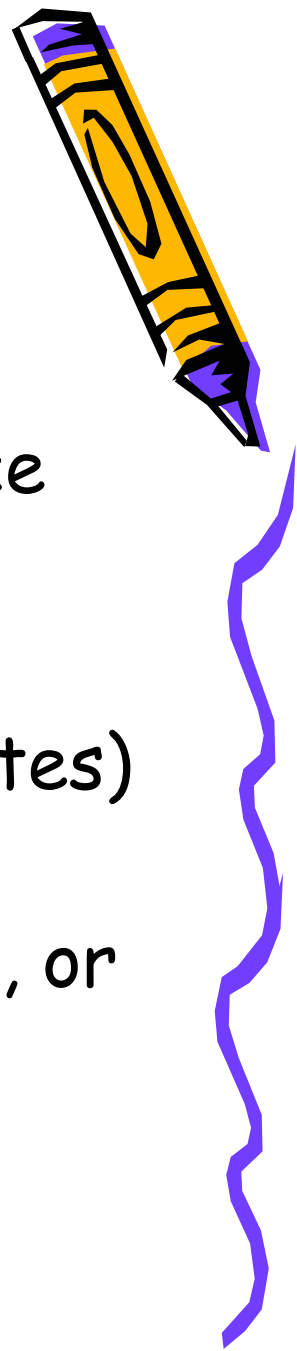
Other Forms of Literacy

After-School Program: Urban Slum

After-School Program: Urban Slum

Constraints

- Teacher shortage, qualifications
- Unsupportive parents, school attendance
- Unreliable electricity
- Keyboard usability
- Limited daily computer usage (~15 minutes)
- Limited building space
- Lack of Internet access (village school), or poor connectivity (Study Hall)

Enablers

- Conducive public policies
  - Rice and monetary incentives
  - Standardized state-wide syllabus
- Culture of peer tutoring, 2-way exchange
- Pride in personal accomplishments
- Availability of textbooks and stationery
- Child interest in graphical representations
- Ample open spaces
- Shared computer was a draw for parents

Hypothesis 1

- Learning through digital storytelling
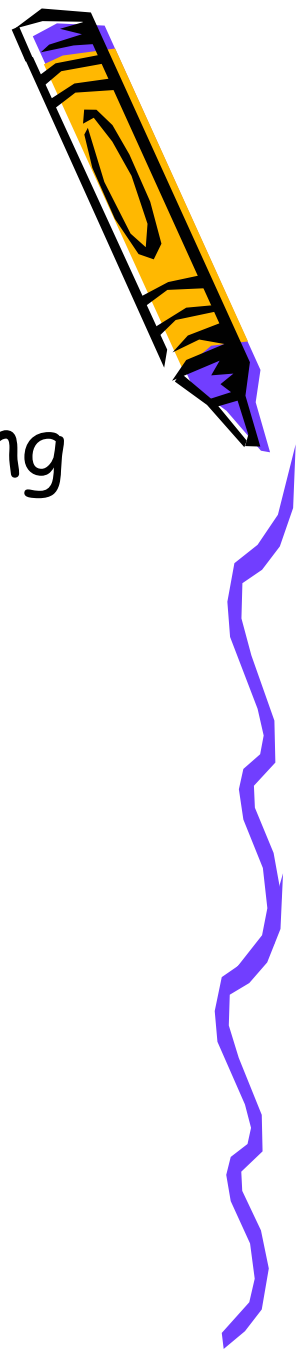
Digital Storytelling

- Motivation: existing authoring tools (Flash, PowerPoint, Adobe Premiere) too complicated for 8-10 year olds
- Simple tool for students to create digital stories and interactive exercises in small teams
- Pen-based user interface, sketching
- Low-cost digital camera, microphone
- Possibly also color printer and/or mobile computing

Expected Educational Value

- Explaining concepts is part of active learning
- Ability to communicate concepts to peers
- Team authoring process involves collaborative learning, develops teamwork skills
- Creation of digital content that could be shared with other schools
- Developing interactive exercises fosters metacognition
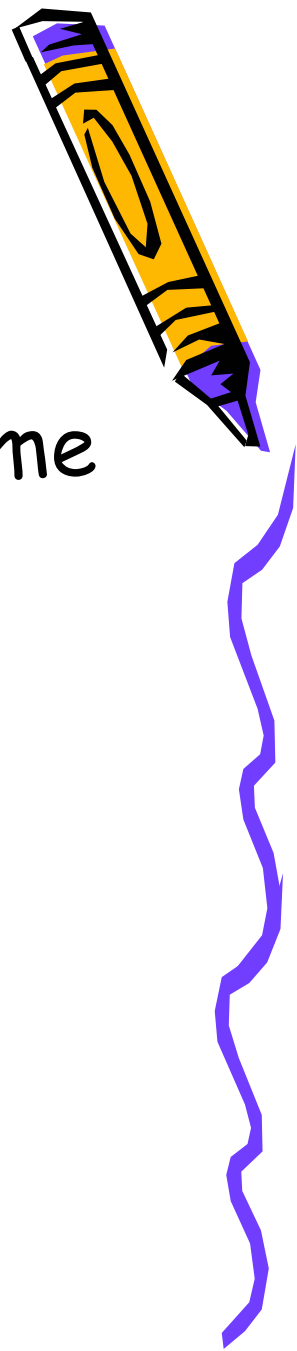- Additional means for teachers to assess student authors' understanding

Hypothesis 2

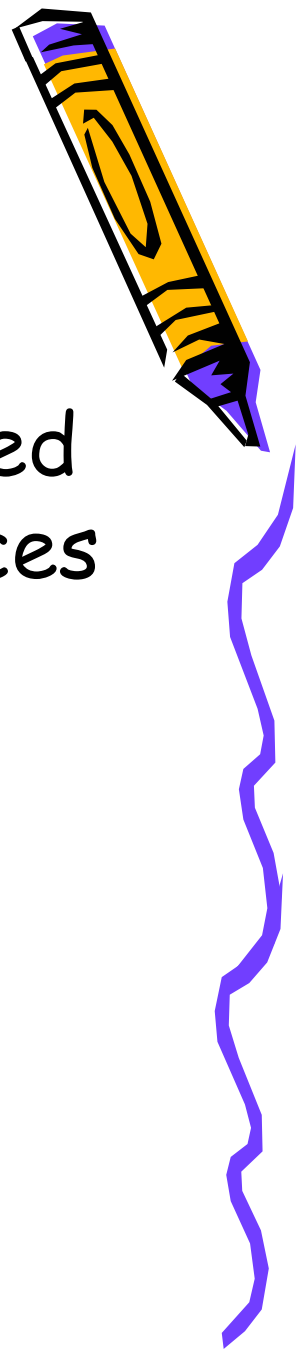- Usability engineering and pedagogy must go hand-in-hand
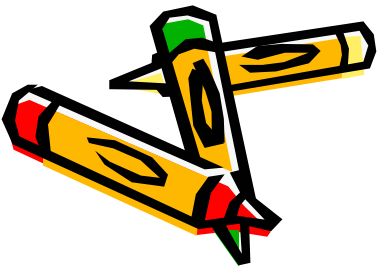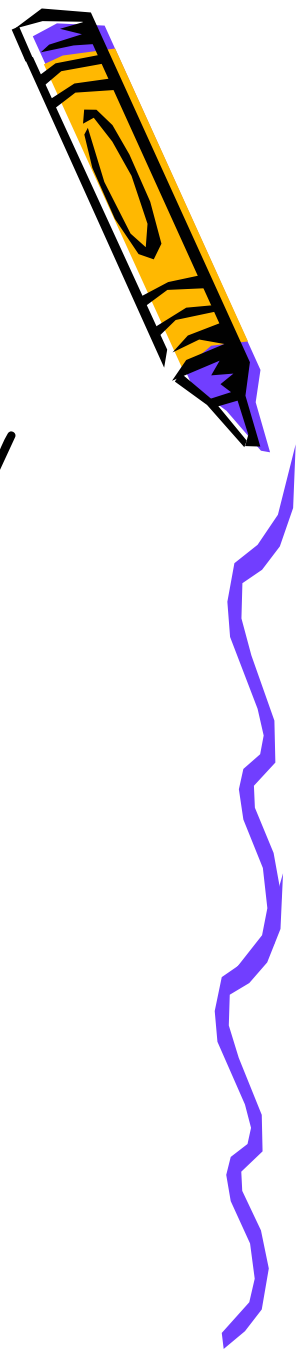
Hypothesis 3

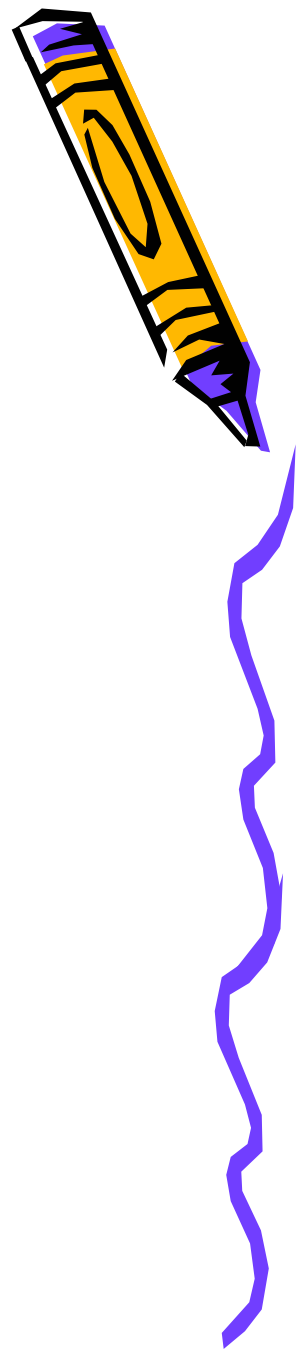- Mobile technology can help overcome constraints in access to education

Hypothesis 4

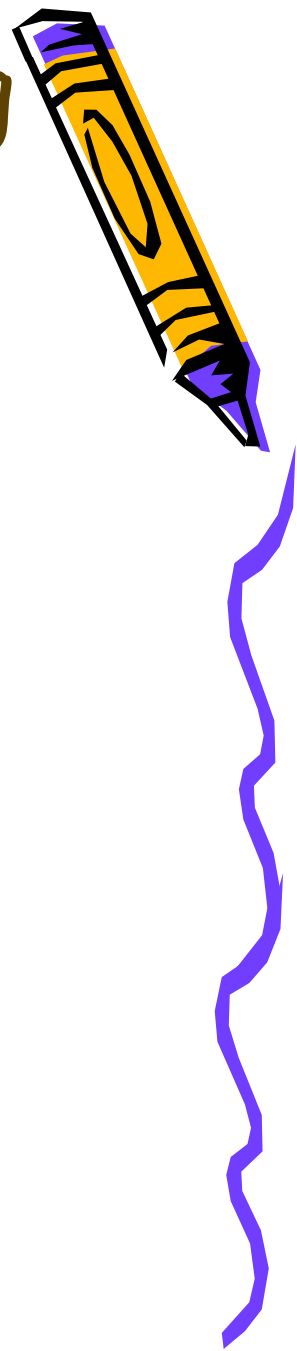- Shared computing can be augmented through paper-based user interfaces

Other Hypotheses

- (Audience participation)

Computers can improve teaching and learning in 6 ways (Rusten)

- Computer-assisted learning
- Simulation and exploration
- Research and analysis
- Computation and production
- Learning networks
- Artistic expression and creativity

A Dark Side of Education

- Disconnect between formal schooling and informal economies
- Disenchantment
- How do you create more formal sector jobs?
- How do you create more opportunities for people to realize their full potential?
- Population pressures of rural-urban migration?