In the rural developing world...
- Low-quality education
- Farmers have poor agricultural practices
- Poor health practices

Challenges
- Education, Agriculture, Health
  - Shortage of skilled educators
  - Educators overworked
  - Inefficient models

Information Dissemination
- Barriers to economic development seen as information dissemination problems
- How to improve information dissemination
  - In developing world?
  - Without access to high-quality educators?

Tutored Video Instruction (TVI)
- Video shown to students at another site by semi-skilled facilitator
- Excellent educator recorded at one site
- Technology to increase capabilities of facilitators

Tutored Video Instruction
- Deployments in rural India for
  - Education
  - Agricultural information
  - Health information
- Interaction is vital
- Quality of interaction matters

How can we ensure high quality and quantity of interaction?
My Goal:
- Build a system using technology in low-resource TVI to provide
  - structure to the interaction
  - support to the facilitator
- Considerations:
  - What kind of support and structure?
  - How can we provide this support and structure using technology?
  - What are the deployment issues?

Talk Outline
- Tutored Video Instruction (TVI) Background
  - TVI Deployments
  - Facilitator support for TVI
- Related Work Informing Design
- Thesis proposal

Tutored Video Instruction (TVI)
- Educational technique
  - class is recorded
  - video shown to students by semi-skilled facilitator
- Pioneered at Stanford
  - TVI group outperformed live group
  - Other deployments show at least equal achievement
- Facilitator’s role in creating interaction is vital

TVI in Rural India
- Digital StudyHall
  - Primary education
- Digital PolyClinic
  - Women’s health information
- Digital Green
  - Agricultural Extension

We will focus on Digital Green

Digital Green
- TVI for agricultural extension
  - Teaching farmers better farming practices
- Facilitators local-language literate
  - Not necessarily knowledgeable about practices
  - Compensated

Digital Green Processes
Supporting Materials for TVI

- TVI deployment between UW and Beihang, China
- Little interaction in Beihang classes
- Supporting materials
  - Active learning exercises
  - Advice for facilitators
    - Timing, questions

Problem Reduction Examples

Find the maximum of 8, 3, 2, 12, 1, 4.

Beihang Results

- Students spoke
  - 1 / week in traditional class
  - 3 / week in this class
- Positive student response to interaction

MSRI Internship with Digital Green

- Investigating useful support
- Supporting interaction
  - Subtitles prompting interaction
- Support outside shows
  - Step-by-step sheets
- Support for data collection

Facilitator support in TVI

- Early indicators show useful
  - Few studies
  - Preliminary results
- Look to other, related literature

Talk Outline

- Tutored Video Instruction (TVI) Background
- Related Work Informing Design
  - What kind of support and structure?
  - How can we provide this support and structure using technology?
  - What are the issues in deploying our solution?
- Thesis proposal

From TVI

- What kind of support?
  - Ensuring quality interaction
  - Data collection
  - Training facilitators
- These are broad goals
Anchored Instruction
- Video anchor
- Followed by high-level question
- Data embedded in video
- Differences from TVI
  - Narrative video
  - Specific goal: transferability
- Parallels to TVI
  - Use of video
  - Teacher facilitating rather than lecturing

Kinds of support
- Anchored Instruction
  - Advice for teachers
  - Computer activities
  - Organizational tools
  - Additional info
    - Necessary
    - Exploratory
  - Teacher training sessions
- TVI
  - Facilitation advice
  - Active learning exercises
  - Data presentation, info org
  - Training modules, reading
    - Required
    - Optional
  - Support for facilitator training sessions

Goals of Support
- Ensuring quality interaction
- Data collection
- Training facilitators

Kinds of support and Goals
- TVI
  - Facilitation advice
  - Active learning exercises
  - Data presentation, info org
  - Training modules, reading
    - Required
    - Optional
  - Support for facilitator training sessions

Kinds of support for TVI
- Ensuring quality interaction
- Facilitation advice
- Directions for activities
- Data Collection
  - Data organization
- Training the facilitator
  - Information organization
  - Information not in the video
    - Required training/reading
    - Supplementary training/reading
- Facilitator training sessions

Talk Outline
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Information and Communication Technology for Development (ICTD)

- Uses of technology in the developing world
- What we want to learn
  - How have other projects provided similar support
    - Ensuring quality interaction
    - Data collection
    - Training facilitators
    - Design criteria for low-resource environments

Goal 1: Ensuring high-quality interaction

- Namibian agricultural radio
  - Mediated radio
  - Trained group leader provided with flipcharts, group discussion questions
- e-IMCI
  - Diagnostic support for common childhood illnesses
  - Community health workers
  - Replaces paper flowcharts

Goal 2: Data Collection

- JavaRosa, AndriodRosa, RapidSMS, etc
  - Support for surveys and reporting on cell phones, smart phones
  - Very well-explored area
- CAM
  - Low-end cell phones
  - Data entry using phone’s camera to scan barcodes
- Numeric-only input paper forms
  - Automatic recognition of numeric input

Goal 3: Training the facilitator

- Individual information dissemination projects
- Computer Kiosks
  - Expensive, prone to failure, hard to use
- Cell phone games for English
  - Low-end cell phones
- Featherweight Multimedia
  - Paper + cheap audio

ICTD design criteria

- Low-cost
- Easy to use
- Good battery life
- High penetration rates
- Robust
- Portable
- Sufficient processing power

Other ICTD lessons

- Shared-device solutions
- Creative interaction mechanisms
- Data collection is important
  - To evaluate the intervention
  - For reporting
- Good partners and good processes are important
Talk Outline

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Diffusion of Innovations

- Innovation = Technology + Processes
- Often it is questions of use and process that derail ICTD projects
- Diffusion of Innovations
  - Factors that cause innovations to succeed or fail

Properties of innovations affecting adoption

- Relative Advantage
  - The perceived benefit of the adoption
- Compatibility
  - The perceived consistency with adopter’s values, beliefs, and needs
- Complexity
  - The perceived difficulty of adoption
- Trialability
- Observability
- Adaptability
- Uncertainty

Looking at facilitators

- Success in early deployments important
- Identify likely successful adopters
- Properties of early adopters
  - Experience with and positive attitudes toward technology
  - Higher education level and cosmopolite
- Adopter and technology “co-evolve” – so look to facilitators for ways to improve technology

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Perception is important
Why use technology?
- Easier data collection
- Easier data analysis
- Private channel to the facilitator
- Single point of communication
- Monitoring
- Updating materials

Talk Outline
- Tutored Video Instruction (TVI) Background
- Related Work Informing Design
- Thesis proposal
  - System components
  - Technology choices
  - Deployment plan
  - Conclusions

Software structure
- Look to functionality to determine structure
- Consider
  - How it will be used
  - When it will be used

Kinds of support
- Ensuring quality interaction
  - Facilitation advice
  - Active learning exercises
- Data Collection
  - Attendance-taking
  - Data about show
  - Data organization
- Training the facilitator
  - Information organization
  - Information not in the video
  - Facilitator training sessions

System Components
- Advice and activities during the shows
- Attendance-taking and other data collection during the shows
- Data collection and review outside the shows
- Facilitator enrichment and training outside the shows

Challenges
- During shows facilitator manages
  - Incoming data stream
    - Advice, activities
    - Timing dependent on video
  - Outgoing data stream
    - Attendance, video data
    - Timing facilitator-driven

Draw heavily on previous work
Challenges

Integrating synchronous and asynchronous functionality

- During shows facilitator manages
  - Incoming data stream
    - Advice, activities
    - Timing dependent on video
  - Outgoing data stream
    - Attendance, video data
    - Timing facilitator-driven

Talk Outline

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Hardware considerations

- Deploy a single device with the facilitator
  - Low-cost
  - High penetration rates
  - Easy to use
  - Good battery life
  - Robust
  - Portable
  - Processing power

Hardware choices

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<th>Penetration rates</th>
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</tbody>
</table>

Talk Outline

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What is Success?

- Diffusion of the system
  - Design for early adoption
  - Target likely adopters
  - Exploratory
  - Understanding “best practices”
  - More useful to Digital Green
- Rigorous evaluation of technology and deployment strategy
  - Randomized assignment
  - Rigid up-front design
  - More generalizable results
Deployment

- Surveys to determine good initial adopters
  - Characteristics of facilitators
  - Characteristics of environment
- Address issues of perception in training
  - Relative advantage, complexity
- Careful documentation
  - Iterations on technology
  - Interaction
  - Stakeholder attitudes
    - Facilitators, farmers, NGO officials

Evaluation

- Metrics
  - DG evaluation metric: $/adoption
  - Data reporting efficiency
  - Effect on interaction
  - Stakeholder attitudes toward innovation
- Deployment output
  - Evaluation of deployment and technology
  - Best practices for future deployments

Contributions

- The software system
- Deployment plan for system
- Evaluation
  - System
  - Deployment

Conclusions

- My Goal: Use technology in low-resource TVI to provide
  - Structure to the interaction
  - Support to the facilitator
- Literature: Preliminary answers
  - What kind of support and structure?
  - How can we provide this support and structure using technology?
  - What are the deployment issues?
- Outlined a system and deployment plan

Timeline

- Summer 2009
  - Finish prototype system
- Autumn 2009
  - Trials and pilots in India
  - Finalize system
- Winter 2010-Summer 2010
  - Ongoing deployments (hopefully)
  - Evaluation
  - Writing

Thanks!