Collaborative Technologies for International Education

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Center for Collaborative Technologies

- Microsoft funded center
- Investigate education and other collaborative scenarios
- Extend and maintain the ConferenceXP platform
- Build the community of users and developers

Research in Educational Technology

- How can computing technology enhance international education?
  - Focus on tools/techniques/technologies to allow faculty to take advantage of opportunities for collaboration and address specific needs
- Challenges:
  - Extending reach of education
  - Increasing interaction
  - Addressing problems of scale
  - Facilitating expression of ideas

Past and Current Research Projects

- Video conferencing for distance education
- UW PMP
- DISC
- ConferenceXP
- Center for Collaborative Technologies
- Classroom Presenter 2.0
- Classroom Presenter 3.0
- Classroom Feedback (CFS)
- CARTS for CS
- Structured Interactions (SIP)
- Student submissions with CP
- Current Video Instruction
- UW CC TVI Project
- Beijing TVI project
- Digital StudyHall

Research Approach

- Deployment driven
  - Classroom use
  - Technology development and promotion
- Goals and success criteria
  - Adoption of technology and methodology
  - Influence educational practice
- This is a model that has been working for us
  - Target specific deployments that are innovative
  - Work with partners
Today’s Talk

- Technology to support international education
- Video conferenced teaching
  - ConferenceXP
- Tutored Video Instruction
- Lessons learned and challenges
- Future projects

International Educational Experiences

- United States Perspective
  - For students
    - Critically important that some US students understand how to work in a global environment
    - Gain particular skills (language/culture)
    - Knowledge available in international classes
  - For faculty
    - Disseminate education on a global scale
    - Working with international groups
    - Strengthen and maintain ties
    - Gain international perspective on research and education
    - Understand emerging trends

Challenges in International Collaboration

- Distance
- Language and culture
- Time zones
- Schedules
- Institutional alignment

Where collaboration technologies can help

- Reduce costs
- Support innovations in communication

What is the role of a project such as ConferenceXP?

- Why not just use Skype?
  - Answer 1: Broader scenarios
  - Answer 2: Platform to support innovation
    - Low cost to enable entry
    - Extendable platform
    - Shared source

Video conferenced teaching

- ConferenceXP Project
  - Started at Microsoft Research in 2001
  - Transferred to University of Washington in 2007 with Center for Collaborative Technologies
- Initial project goal
  - Support multisite courses with high bandwidth, multicast, internet based audio-video conferencing
Video Conferenced Teaching

• Multi-site internet based audio-video conferencing
• UW PMP Program
  – Site-to-site courses between UW and Microsoft since Winter 1997
  – cs.washington.edu/education/dl/course_index.html
  – Master’s level courses
  – Goal: interaction across sites
  – Various technologies have been used since the program was introduced

Distance Classes in UW CSE Master’s Program

• Initial phase
  – Polycom + Netmeeting for PPT and SmartBoard
• MSR DISC Project
  – Target: UW, CMU, UCB, Brown graduate class
  – Spring 2002
• ConferenceXP
  – Since Spring 2003
  – UW, MSR, UCB, UCSD

ConferenceXP

• High quality, low latency video to support interactive classes
• High bandwidth internet video conferencing
  – Internet2
  – Multicast
• Single machine deployment
  – High end PC
  – Performance limit: handling multiple high resolutions video streams
• Innovative presentation tools

Initial Challenges (Spring 2002)

• What went wrong
  – Technology and systems failures
  – Multicast networking
  – High cost of interruptions
  – Audio
  – Loss of trust
  – Room configuration issues
  – Lack of control of lecture room
  – Production quality
• Meta lesson
  – Learn more from failures than from successes

• How to Fail at Video Conferenced Teaching
  – Microsoft Faculty Summit 2002
  – Anderson & Beavers
Success in distance classes

• Goals
  – Real time interaction between sites
  – High quality video

• Challenges
  – High bandwidth connections
  – Classroom Audio
  – Establishing a pattern of interaction

Dealing with multicast problems

• Reflector service
  – Plug in unicast to replace multicast
• Used as backup in our courses
• Solution when connecting to networks without multicast

Hardware Multicast

• Technology bet (2001)
  – Multicast networking to support multisite courses
  – Substantial bandwidth savings
  – Multicast not uniformly supported

Masters class, UW - Pakistan

• Masters class
  – University of Washington
  – Lahore University of Management Science
  – Microsoft

• Computing for the Developing world

Going International

• March 29, 2008, LACCIR Meeting
  – Latin American and Caribbean Collaboration for ICT Research
• Seattle and University of Chile, Santiago, Chile
• Seminar presentation
• CXP Unicast reflector

Technical Challenges

• Ensuring adequate bandwidth
  – Limited bandwidth to Pakistan
  – Reliability
  – Multicast

• Ensuring this did not compromise UW-MS class
  – Limited time to prepare
Fred's whiteboard

Basic PMP setup (2 sites)

3-way setup for UW, MS, LUMS

Use of Classroom Presenter
- Tablet PC based presentation and classroom interaction system
- Ink based presentation
- Classroom Activities

Classroom Presenter

Classroom Activities

What could go wrong?

- What are the potential difficulties with a large scale PMP-based course?
- How many students need to be in the same location?
- How will central information be shared amongst students?
Status as of six weeks

- Full connectivity
  - One lecture originated from Pakistan
- Improving audio (microphone issues)
- Participation of students from Pakistan
  - Student submissions
  - Questions and discussions
- Multiple rounds of audio communication

Key lessons

- Participants must have incentive for a distance course
- Instructor must make an effort to create multisite interaction
- Active participants at remote site help

Other opportunities

- Language instruction
- Music
- PhD Exams

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]

UW TVI Projects

- Introductory programming
  - Address community college articulation
  - Experiment with alternate approaches to introductory computing instruction
- UW – Beihang Algorithms course
  - Offering of CSE 421 in China
- Digital StudyHall
  - Primary education in rural India
UW-Beihang Algorithms class

- Offer course based on UW course in Beijing
- UW Instructor could not give the course in Beijing
- Scheduling prevented live course offering
  - 1:30 pm Seattle, 4:30 am Beijing
- Materials captured from live classes
- Tutored Video Instruction
  - Slides, talking head, digital ink
- Set up visit
  - Met with Teaching Assistants
  - Tested all technology
  - Trained Teaching Assistants in facilitation
  - Gave classes to students to demonstrate technology and TVI
- Midterm visit
  - Observed classes
  - Gave lecture without recorded video
- Regular communication with Teaching Assistants
- Data collection
- Applications displayed
  - Webviewer for video replay
  - Classroom Presenter
- Teaching Assistants would show video or show CP for inking on slides or classroom interaction

Involvement with Remote Site

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Course Delivery

- Applications displayed
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Summary of Project Results

- Offering successful
  - Technology, institutional relationship
  - Cross-cultural issues
    - English language materials were comprehensible
    - Classroom discussion primarily in Chinese
- Facilitation model
  - Significant support for facilitators
  - Classroom activities successful (and popular)
  - Facilities innovative and reproduced some of the instruction
  - Interactive and informal classroom atmosphere

Language Issues

- Lectures delivered in English
  - Language exposure consider to be a positive side effect of the course
- Teaching assistants facilitated in English
  - But discussions were generally in Chinese
- Students reported using lectures outside of class
- Instructor observations from site visit
  - Chinese students had substantially more English listening than speaking experience
  - Recorded lectures did contain some colloquial usage and cultural specific references which were lost

Facilitation

- Support provided for facilitators
  - Lecture notes
  - Activities
- Facilitators invested a larger effort in preparation
  - Studying videos
  - Planning how to cover content
- Active facilitation
  - Worked through lecture examples
  - Led activities
  - Asked questions to students

Example: facilitators working through example from lecture slides
**Classroom Activities**
- Tablet PC supported activities
  - Student submission model
  - Used for every lecture
- Technology generally successful
- Considered very positive by students
- Provided a structure for active learning

**Classroom Environment**
- Contrast to traditional large lecture class
- Highly interactive class
  - Interaction episodes measured by observation logs and videos of Beihang classes
  - Average of 13 interaction episodes per class, 10 with students speaking
  - UW class averaged about 20 interaction episodes per equivalent length of time
  - Beihang episodes averaged a greater number of rounds of communication
- Class atmosphere was informal

**Results**
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**What we’ve learned from all of this**
- Value of electronic materials in the process of classroom instruction
- Tools for teaching
  - Teacher and students drive the process
  - Flexible and unpredictable use
- Importance of high reliability
  - And attention to address issues
- Broader context – interplay of technology and other issues

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