Classroom Presenter and Tablet PCs in Higher Education

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Outline
- Classroom Presenter Project
  - Pen based presentation
  - Lecture archiving, ink use
  - Classroom interaction
  - Tutored Video Instruction

What will the University Classroom look like . . .
- If all students have computational devices
  - Laptops, Tablets, Ultra light tablets, PDAs, Smart Phones, Gameboys . . .
- If the devices are all connected
- If the devices are all integrated into classroom instruction

Wide range of potential classroom applications
- Presentation
- Demonstration
- Simulation
- Accessing external resources
- Note taking
- Feedback
- Active learning
- Peer communication

Classroom Presenter
- Distributed, Tablet PC Application
- Initial development, 2001-2002 at MSR
- Continuing development at UW
- Collaboration with Microsoft
  - Built on ConferenceXP Multicast networking
- Simple application
  - Ink Overlay on images
  - Export PPT to image
  - Real time ink broadcast
- UI Designed for use during presentation on tablet
- Presentation features
  - Instructor notes on slides
  - Slide minimization

Classroom Presenter as a distributed application
- Designed as distributed application for distance learning
- Enables many scenarios
  - Mobility
    - Walking and talking
    - Sharing materials with students
  - Note taking
  - Classroom interaction
  - Student submissions
Ink based presentation

- Tablet PC Inking on images
- Simple pen based controls
- Whiteboard, slide extension
- Multiple views – instructor/display
  - (dual monitor)
- Multiple slides decks with filmstrip navigation

10 reasons why Classroom Presenter is better than PowerPoint

1. Simple pen based UI
2. Instructor Notes
3. Film strip navigation
4. Slide previews
5. Lecture export to HTML
6. Extra writing space
7. Distributed Presentation
8. Full screen erase
9. Multideck model
10. Default Inking

“Typical ink usage”

Diagrammatic Ink

Distance Learning Classes
Ink Replay

- Static diagrams insufficient
  - Continuous and key frame replay
- Replay with or without audio

Diagram phasing

More phasing

Classroom Interaction

- Integrate student work into the public discussion

Classroom Presenter Deployments

- Build on the traditional slide based lecture
- Focus on classroom interaction
  - In class communication for activities
  - Ignore note taking, capture, student-student communication scenarios
  - Isolated network
- Look at a homogeneous deployment of devices
  - Tablet PCs

Study goals

- Are devices effective in achieving instructor specific classroom goals in the traditional lecture model
- What patterns of behavior arise when devices are deployed for classroom interaction
Classroom Presenter

Classroom goals (atmosphere)
- Encourage students to contribute in multiple ways
- Promote engagement in the class
  - Interest
  - Alertness
- Demonstrate that all students have important opinions
- Peer interaction

Classroom Goals (specific activities)
- Feedback – classroom assessment
- Collection of ideas
  - Collective brainstorm
- Student generation of examples
- Discovery of a pedagogical point
- Gain understanding of an example
- Show misconceptions

Submission Examples

Submission Examples
Submission examples

- Determine the LCS of the following strings:
  - BART COLLEWSKIPSON
  - KRISTEN TLOV

How good is this algorithm?
- Is it feasible to compute the LCS of two strings of length 100,000 on a standard desktop PC? Why or why not?

Classroom Usage

- UW Course usage
  - 16 courses
  - ~80 classes
  - ~300 activities

- Detailed measurements
  - Data from Undergraduate Algorithms course (Fall 2005)
  - 7 lectures, 26 activities
  - Logged data – timings of submissions

Participation rates

- Percentage of students present submitting work
  - Min 11%, Max 100%, Average 69%
  - Some students would answer without submitting
  - Resubmission common
  - No observed trends in submission rates
    - Position in course
    - Position in lecture

Display Behavior

- Average of 6.15 slides per activity displayed (minimum of 1, maximum of 18)
  - Common pattern – show one or two for most of the time, and quickly show the others

Collaboration

- One to three students per tablet
  - Interaction between students often encouraged
  - Instructors would survey and occasionally comment on student work during activity phase
  - Student work a key part of classroom discussion

Anonymity

- Work displayed on public display without any identification
  - Limited information about submission displayed on the instructor machine
  - Anonymous display valued by the students
  - Students often believe the instructor can identify their work
  - Tagging behavior observed
Achieving Instructor Goals for Activities

- Generally possible to identify individual goals for the activities
- It is possible to assess whether or not the activities achieve the instructor’s goals

Assessment Activities

Pedagogical Point

- What technology provides
  - Digital domain
  - Support for archiving, distribution, and analysis
  - Integration with lecture
  - Allows display with data projector
  - Efficiency
  - Reducing overhead of distribution and collection
  - Simultaneity
  - All students work at once to increase contribution rates
  - Additional communication channels
  - Easier to express certain ideas
  - Overcomes communication barriers

Classroom interaction summary

- Successful use has occurred when used for specific pedagogical purposes
- Technology is simple and in the background
  - Supporting role for instruction
- Focus is on the teaching, verbal interaction, understanding and discussion of student artifacts

Why I am in Beijing

- Offer undergraduate algorithms course at Beihang
  - Instructor is in Seattle
  - Time difference prevents a synchronous distance course
- Offer the course using Tutored Video Instruction
  - Incorporate Classroom Presenter
Tutored Video Instruction

- Base course on facilitated use of recorded materials
- Materials recorded from a live class
- Facilitator guides discussion around materials
- Gibbons, Science 1977

Tutored Video Instruction (TVI)

- Developed at Stanford University in the 1970’s
- On site: Stanford Master’s students
- Off site: HP Engineers
- Students watch pre-recorded class material with a tutor
- Tutor stops the material frequently for discussion and questions
- The key aspect of TVI is peer-learning
- At Stanford, off site students not only outperformed students who watched the videos only, but out performed the Stanford students.

Previous UW TVI Experience

- Introductory Programming Courses
  - Taught at University of Washington
  - Offered at Community Colleges
  - CC Instructors with limited experience
  - Need to align UW, CC courses
- Lessons learned
  - Importance of relationship between institutions
  - Facilitator support

Parallel Courses

- Course offered at University of Washington
  - Live lectures by Prof. Anderson
- Course offered at Beihang University
  - Lectures recorded at University of Washington
  - Tutored Video Instruction
    - Facilitators: Jie Luo, Ning Li, Jing Li

Making the course a success

- Overcoming the language and culture barriers
- Dual course offering
  - Materials are originating from University of Washington, but this is still a Beihang course
- Tutored Video Instruction
  - This will require students ask questions and participate in the discussions
- Classroom Interaction
  - Tablet PCs will support active learning

September visit

- Equipment setup and test
- Facilitator training
- Classroom Interaction Lecture
  - Introduce Technology
  - Assess background
- TVI Lecture
  - Demonstrate facilitation techniques
  - Establish peer instruction model
Course offering
- Approximately midway through
- Technology and methodology working well
  - With a few minor glitches
- Instructors are annotating lectures for use at Beihang
- UW Lectures are a mix of traditional and classroom interaction lectures

November visit

November 10
- Richard Anderson and Jane Prey observed three class sessions
- Three separate facilitators
- Topic – Fast Fourier Transform
  - Technical lecture
  - "Dry"
- Facilitators were brilliant
- Different techniques used to facilitate the lectures
- Students were engaged in lecture and activities
- All discussion was in Chinese

Observation notes
- Audio problems
  - Room acoustics poor
  - Record lectures
  - Colloquial usage
  - Background noise
  - Instructor pointing
  - Unsuccessful jokes
- Majority of interactions TA initiated
  - Took advantage of interactions in UW materials
- Engagement around Tablet PC
  - Significant student discussion on activities
- Facilitators investing considerable time in preparation
- Inking on slides is very important for facilitators

Reactions
- Beihang class is reproducing UW classroom interactions
  - As opposed to relying on peer interaction
  - Contrary to Stanford “theory” – but was expected
- Tablet PC is important for facilitator – but we need to improve the tools
- High level of effort by UW and Beihang

TVI Theory
- TVI Classes
  - Stanford - Gibbons
  - UW Intro Programming
  - Digital Study Hall
  - UW-Beihang
- Alignment of recorded materials with classroom usage
- Structural issues for course
CLASSROOM PRESENTER

www.cs.washington.edu/education/dl/presenter
www.cs.washington.edu/education/courses/cse421/06au

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