

Electronic Problem-Based Learning The Berkeley Nomadic Computing Experiment

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MSR Faculty Summit

July 18, 2000

A New Learning Paradigm is Needed

- ✓ Colleges experiencing significant growth
 - * 15% for UCB in the near future!
 - * EECS may grow by 30%

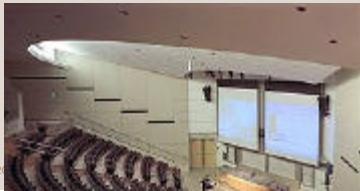


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A New Learning Paradigm is Needed

- ✓ Colleges experiencing significant growth
- ✓ Lecture-style learning doesn't scale well
 - * Loss of staff-student and student-student interaction
 - * Web-based lecture capture and replay is insufficient
 - * Unfortunately, scaling lectures is cost effective



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A New Learning Paradigm is Needed

- ✓ Colleges experiencing significant growth
- ✓ Lecture-style learning doesn't scale well
- ✓ Project-based learning can offer better educational outcomes
 - * Work in small groups for project & course work
 - * Lecturers as enablers or facilitators
 - * Involves lots of collaboration between students and between students and staff
 - * Even harder to scale than lecture-style learning

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Our Approach: Use Technology to Improve Team Collaboration

- ✓ Provide mobile platform for real-time communication & collaboration
 - * Mobile computers facilitate face to face team work
 - * Laptop video cameras & chat allow remote meetings & capture for later individual and group replay
 - * Technologies for better lecture interaction
- ✓ Coordination framework
 - * awareness of group's status, milestones, schedule
 - * self-assessment of work efforts

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Example of Laptop Coordination Tools



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Our Approach: Use Technology to Improve Teaching

- ✓ Diagnose problem groups earlier using tacit information
 - * groups w/ poor communication patterns
 - * groups w/ uneven work loads
- ✓ Alternative means of assessment
 - * short in class on-line quizzes (easier to grade)
 - * on-line portfolios (easier to examine)
 - * grade on process in addition to outcome

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Nomadic Classroom Platform

- ✓ Mobile computing
 - * IBM ThinkPad 570 running Windows 2000
 - + Pentium II, 128 MB RAM, 6GB disk
- ✓ Communications
 - * Wireless networking in the classroom & across campus
 - + 11 Mbit/s wireless network in Cory, Soda, and several classrooms (extend later to libraries, cafes, etc.)
 - * Leverage research infrastructure
- ✓ Multimedia information capture & access
 - * On-line web repository for portfolios & awareness support
 - * USB video/still cameras, videoconferencing support, HP CapShare scanners, chat, ink-based notes via CrossPad
 - * Proxy-based chat server (log chat metadata, not content)

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Research Questions

- ✓ What are the underlying problems with existing EPBL courses
 - * In the classroom?
 - * Outside the classroom?
- ✓ What techniques can we apply to maximize scalability?
- ✓ What are the right evaluation metrics?

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Why Nomadic Computing?

- ✓ Alternative: build larger computing labs
 - * Computing scarce (currently 12 students to 1 machine)
 - * Lab space is hard to find / expensive
- ✓ Alternative: rely on fixed home computing
 - * Most (all?) students have their own computers
 - + Many are more powerful, capable than lab computers
 - * Severely limits interaction
 - + Project team members can't work together
 - + Students can't interact with their classmates
 - * Doesn't improve staff-student interaction

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Metrics for Success

- ✓ Two types of comparisons
 - * Old versus new version of class
 - * Multiple sections of a class
 - + one with and one without laptops
- ✓ Metrics
 - * Ability to scale project-based learning to larger numbers of students (e.g., staff hours / student)
 - * Real-time surveys during lectures / presentations
 - * Changes in grades (between versions or sections)
 - * Quality of term projects
 - * Monitoring electronic communications

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Significant Deployment Issues

- ✓ Initial experiences from deployment of 40 laptops
 - * Very high start-up time – lots of software and hardware
 - * Configuring the first one is hard / takes time
 - * Support is hard (students have root access)
 - ✓ Our deployment will be 50 laptops
 - * Funding from Intel for equipment
 - * Dean is providing a staff programmer for 3 years
 - * Target is a single configuration across classes
 - * Windows 2000 OS platform to reduce management costs
 - ✓ Theft
 - * Major campus problem
 - * Grant will pay for theft insurance (\$75/yr)
 - * Students pay this back through a lab fee (\$32.50/term)
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Staggered Deployment Plan

- ✓ Summer 2000
 - * Acquire laptops, set-up lab
 - * Develop initial software infrastructure
 - ✓ Fall 2000
 - * CS 160 undergrad HCI / UI course (50 students)
 - ✓ Spring 2000
 - * CS 162 undergrad OS course (100-150 students)
 - ✓ Summer 2000
 - * Evaluation of initial results
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