Classroom Presentation and Interaction with Tablet PCs

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Educational Technology

...in the winter of 1813 & '14 ... I attended a mathematical school kept in Boston...On entering his room, we were struck at the appearance of an ample Black Board suspended on the wall, with lumps of chalk on a ledge below, and cloths hanging at either side. I had never heard of such a thing before. [Samuel J. May, 1855]

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Classroom Presenter

- Initial problem
  - Develop a distributed presentation space for use in a distance learning class
- Later
  - Many of the same issues / challenges in large lecture classroom

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Background studies

- Studied UW CSE PMP
  - Interviews, Surveys, Observations
- Greatest pain in distance course
  - Presentation environment
    - "PowerPoint is a pain for the same reason it's a pain in a non-distance course, the slides impose a rigid structure on the lecture and make it more difficult to adjust to the interactions that occur during it."
    - "PowerPoint sucks the life out of a class."

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Important features

- Wireless
- Integration of High Quality Ink and Slides
- Multiple views
- "Performance UI"

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Large lecture classes

- Challenges
  - Maintaining attention
  - Communication
  - Feedback from students
  - Flexibility in presentation materials
  - Conducting activities in class

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Classroom Deployments

- Since summer 2002, it has been used in about 35 CSE courses
- Intro programming courses to masters' courses
- Used at UVa and University of San Diego starting spring 2003.

Results

- Observation, instructor comments, some system logging
- Positive reception from instructors
  - Sustained use of writing through full term
  - Wide range of use
    - Highlighting / Attention
    - Derivations
    - Recording comments
    - Diagrams
- Positive reception from students and instructors
  - Positive comments and repeat use by instructors
  - Student surveys
    - Student comparison vs. PowerPoint

<table>
<thead>
<tr>
<th></th>
<th>less</th>
<th>no change</th>
<th>more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention to lecture</td>
<td>4%</td>
<td>36%</td>
<td>57%</td>
</tr>
<tr>
<td>Understanding of lecture</td>
<td>2%</td>
<td>52%</td>
<td>46%</td>
</tr>
</tbody>
</table>

Instructor innovations and suggestions

- Taking tablet to the audience
- Elaborate preparation of instructor notes on second deck of slides
- Improved navigation (flyout from thumbnails)
- Collective brainstorming

Inking Study

- In progress
  - Careful study of recorded lectures to look at instructors use of ink
  - Comparison of the class taught with and without ink
- Preliminary results
  - A substantial amount of inking is ephemeral
  - Simplicity of UI is critical
  - Unexpected usage patterns
Instructor Ink Examples

Classroom Feedback System
- Student feedback does not scale
- Encourage participation
- Ease of expression
- If the method does scale, how does the instructor make sense of it

Design choices
- Low attention requirements
- Embed in context of the slide
  - Slides are the mediating artifact
- Fixed feedback
  - Avoid having to compose questions
  - Instructor control of feedback
    - Example, More Information, Got It
    - Slow Down, Question, Explain, Cool Topic

Experiment
- Roughly 12 students given laptops to use in class
- 2 week deployment in CSE 142
  - 4 weeks no intervention
  - 2 weeks Tablet PC
  - 2 weeks Tablet PC + feedback system
- Extensive observations, logging, surveys, interviews

Results
- Mixed results
  - Classroom culture not what we had expected
  - Instructor goals different than expected
- Interactions did increase
  - Pre CFS
    - 2.4 (spoken) episodes per class
  - With CFS
    - 2.6 (spoken) episodes per class
    - 14.8 (feedback) episodes per class
    - 5.0 (feedback – “Got it”) episodes per class

import statement
- A class’ full name includes its package.
  - For example, java.util.ArrayList or java.lang.String
- Often it is more convenient to use the class name without the package, e.g., ArrayList, String
- The import statement tells the compiler where to find class definitions that don't have a complete package name and aren't in the current package
  - Classes can be imported individually, or all classes in a package can be imported
  - java.lang.* is imported automatically by the compiler in Java
  - #include solution not like include in C/C++
import java.util.HashSet

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Student inking support

- Instructor broadcast slide
- Student inks slide and submits to instructor
- Instructor selects slides for public display
- Classroom Exercise Scenario

Trace the path of Hurricane Isabel

Five day forecast (9-15)

Goals of class exercises

- Participation
- Discussion
- Active learning
- Student contribution and involvement
- Interaction
- Spontaneity

Structured Interaction Presentations

- Assume students have wireless devices
- Build interactive activities into lecture
- Computer support to overcome logistical barriers
Structured Interactions for Presentations: the Vision

Enable instructors to design presentations with interactive elements just as they currently design passive presentations:

by laying out simple objects on slides and collecting these into a presentation.

Multiple choice problems

- Students give collection of multiple choice problems
- Result slide shows votes and proposes an ink exercise
- Ink exercises returned to instructor for review
- Instructor has choice of answers to display

Silicon Downs: Pick your winners!

- Race I: \( n^2 + 2n^2 \)
- Race II: \( \log n \)
- Race III: \( 2n + 10 \log n \)

- Race IV: \( 5n^5 \)
- Race V: \( n^{12n/100} \)
- Race VI: \( 3n^2 + 7n \)

Race VII: \( \log n \)

SIP multiple-choice exercise.

Text based exercises

- Students submit textual answers
- Distributed answers to students for analysis
  - Distributed Human Computation
- Aggregate results for shared display
Describe one problem with the “horse race” analogy for comparing asymptotic runtimes.

Horses are physical. Algorithms aren’t.

Note: this is an anonymized, ungraded, untimed collective brainstorm.

Students evaluate each others’ ideas.

<table>
<thead>
<tr>
<th>Left choice</th>
<th>Are these distinct ideas?</th>
<th>Which is more interesting?</th>
<th>Right choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algorithms are faster than horses.</td>
<td>Same</td>
<td>Same</td>
<td>Horses run real distances while algorithms run on computers.</td>
</tr>
<tr>
<td>Horses are cooler.</td>
<td>Distinct</td>
<td>Left</td>
<td>You just can’t compare them.</td>
</tr>
<tr>
<td>The “faster” algorithm doesn’t necessarily win.</td>
<td>Same</td>
<td>Left</td>
<td>You just can’t compare them.</td>
</tr>
<tr>
<td>There’s no fixed target for algorithms like there is for horses.</td>
<td>Distinct</td>
<td>Left</td>
<td>Horses are cooler.</td>
</tr>
</tbody>
</table>

How algorithms and horses differ.

SIP aggregates the results.

SIP Summary

- Support for many types of exercises
- Integration of exercises into presentations
  - unifies design process
  - eases sharing of presentations
  - simplifies in-class execution of exercises
- Scales to large classes

For more information

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