Pros and Cons for Teaching Courses in the Classroom and Online Simultaneously

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Presentation Outline

- Introduction: what is *simulteaching*?
- Delivery modes: synchronous, asynchronous and hybrid
- Simulteaching pros and cons
- Experience with simulteaching
- Open source software for simulteaching
- Conclusions
Introduction
How Can We Best Help the Student to Learn?

ESTABLISHED PRINCIPLES

• *There is no significant difference in educational outcomes, based purely on mode of delivery*

• *Given technologies available today, the most effective way to present material in order to facilitate student learning is a hybrid or blended approach, combining options for*
  – classroom learning
  – online synchronous delivery
  – online asynchronous learning materials

This paper is written to explain the choices we have made in adopting the hybrid approach and to review their validity.
GMU CS Grades: No Significant Difference

Course Level

Grade Average

400 500 600 700

CLASSROOM
ONLINE
Synchronous and Asynchronous Delivery
Two Schools of Thought

• The majority of Internet-based distance education today is delivered **asynchronously**, via webpages
  – Natural progression from earlier “correspondence courses” and course library compilations
  – Web offers faster delivery, flexible linkage
• However, a growing amount is delivered **synchronously**, as it is being taught
  – Progression from TV and VTC teaching
  – We have found audigraphics, not video, most useful for CS teaching
  – Offers interaction, desktop delivery, high quality graphics, and replay
Which is Best?

• Research shows students learn about as well either way
  – “no significant difference”
• So, “best” would mean a system that
  – Minimizes student time to learn the same amount of material
  – Minimizes faculty time to present
  – Minimizes institutional cost to deliver
Hybridizing DE Technologies

• Ubiquitous Internet offers greater accessibility of education
  – Electronic delivery of course materials
  – Real time delivery of courses
  – GMU Volgenau School of IT&E has been a pioneer

• Combination of synchronous & asynchronous delivery
  – Live streaming of class accessed through Web interface
  – Playback of streaming delivery
  – Course materials accessed via webpages
  – Supporting Learning Management System
    • Accessed by Web
    • With links to Playback for review
Hybridizing Student Locations: *Simulteaching*

- Regional online course delivery
  - Avoids long travel time to attend class
- Students may attend in-person or online
  - or time-delayed via recording
- Classroom and online students have equal access to class and opportunity for interaction
- Low-cost approach
  - No new webpages to create; use existing slides
  - Teaching two groups at same time lowers costs
  - Video possible but benefit marginal
    - Major cost is Internet connection
    - Could provide if network is available
Pro Simulteaching
Simulteaching Pros 1

- Low barriers to participation
  - Easy extension of regular classroom
  - Use existing teaching materials
  - Online office hours made easy
- Good interaction with students
  - Good quality Internet synchronous teaching software enables spoken and typed interaction with students
  - As in the classroom, lack of interaction is a pedagogical problem, not a delivery problem
- Reduced faculty preparation/support time
  - Reduces requirement to spend large amounts of time preparing asynchronous materials
  - Most communication with students takes place in class and is heard by all – reduces need for email
Simulteaching Pros 2

• Faculty salary savings
  – Primarily for advanced courses with lower enrollment
  – Classroom and online groups combined require only a single presentation

• Enables more distance education courses
  – Students want full online degree program
  – Hard to justify small online sections in graduate courses
  – Much easier when combined with classroom

• Low support cost
  – Doing simulteaching well requires student monitor online
  – But the monitors are much less expensive than faculty
  – And can be shared among multiple simultaneous courses
Simulteaching Pros 3

• Enables flexible distance education delivery
  – Individual sections using recordings, mentored by presenter
  – Expands range of courses available in summer
  – Recordings also can support inverted or “flipped” classroom

• Enables expansion of local programs
  – Many programs do not seek global scope (ours included)
  – Local/regional simulteaching can serve time-challenged students while keeping benefits of nearby physical campus
Con Simulteaching
Simulteaching Cons

• Classroom equipment requirements
  – Need good, uninterrupted Internet service in teaching room
  – And some form of tablet (SmartBoard style favored by many)

• Administrative complexity
  – Somebody must keep track of linked groups
  – Schedule facilities (classroom and Internet)
  – Account for difference in tuition/fees (if any)

• Faculty technophobia
  – Faculty need to be confident of teaching tool so they can focus on effective presentation
  – Need simple and robust supporting software

• Technology problems can disrupt class
  – Need on-call help and software that deals with problems
Simulteaching Experience
CS Distance Education at GMU

• Northern Virginia (in Washington DC metro area) is known for extreme traffic congestion
  – Commuting to class can require as much time as the class itself!

• Many of our graduate students are employed in government or industry – must travel for work
  – Can connect to evening classes via Internet from hotel
  – Or keep up with class on weekly basis using recordings of classes

• Pullen was early adopter of online teaching
  – By 2004, convinced colleagues to offer MSCS online

• Approach has proved successful
  – Popular with students
  – Faculty find it easy and like providing expanded student access
  – Administration likes enrollment increase but would prefer to avoid support burden
## Online Courses in GMU MSCS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 540</td>
<td>Language Processors</td>
</tr>
<tr>
<td>CS 555</td>
<td>Computer Communications and Networking</td>
</tr>
<tr>
<td>CS 571</td>
<td>Operating Systems</td>
</tr>
<tr>
<td>CS 580</td>
<td>Introduction to Artificial Intelligence</td>
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<tr>
<td>CS 583</td>
<td>Analysis of Algorithms</td>
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<tr>
<td>SWE 619</td>
<td>Object-Oriented Software Specification and Construction</td>
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<tr>
<td>SWE 620</td>
<td>Software Requirements Analysis and Specification</td>
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<tr>
<td>SWE 621</td>
<td>Software Modeling and Architectural Design</td>
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<td>CS 640</td>
<td>Advanced Compilers</td>
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<td>CS 652</td>
<td>Computer Graphics</td>
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<td>CS 658</td>
<td>Networked Virtual Environments</td>
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<td>CS 672</td>
<td>Computer System Performance Evaluation</td>
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<tr>
<td>CS 706</td>
<td>Concurrent Software Systems</td>
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<tr>
<td>CS 755</td>
<td>Advanced Computer Networks</td>
</tr>
<tr>
<td>CS 756</td>
<td>Performance Analysis of Computer Networks</td>
</tr>
</tbody>
</table>
Moodle Integrated Synchronous Teaching/Conferencing (MIST/C)

Open Source Software for Simulteaching
Simulteaching System

Student Home/Office Locations

- Student Multimedia Computer

Server Facility

- Live Class Server
- Playback Server
- Webserver & Database

Classroom

- Video Camera
- Workstation Display/Tablet/SmartBoard
- Classroom Projector
- Instructor Multimedia Computer
- Wireless Microphone
- Keyboard & Mouse/Tablet Pen
- Recording of Class
- Prepared Slides

Student Multimedia Computer

Internet

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Purpose of MIST/C

• Provide a quality, easy to use, open-source tool for teaching and conferencing over the Internet, supporting student and instructor with:
  – Audio, graphics (slides and annotations), video, and text chat
  – Floor control, breakout rooms, and voting
  – Real-time interaction and recording of sessions
  – Simulteaching classroom and online students
Commercial Alternatives

• When we starting developing online teaching software the only commercial systems were very expensive and not Internet-capable

• Imitation is the sincerest form of flattery!
  – Commercial systems now available but not free:
    • Blackboard Collaborate (formerly Elluminate)
    • Adobe Connect (oriented toward conferencing)
    • Echo 360 “classroom capture” (video oriented)

• More expensive than MIST/C

• They are not designed for simulteaching
  – And user interfaces while elegant are more complex
Features of MIST/C

• Multiplatform (Windows, Linux, Macintosh)
  – Clients for download at http://netlab.gmu.edu
  – With presenter guide and extensive documentation
• Multimedia (Audio, Whiteboard, Video, Text)
• Integrated, adaptive control window
• Communicates via TCP for best access
  – Through Network Address Translators and Firewalls
  – Low data rate: dialup connection (without video)
• Server and client run on low-cost computers
• Free and open source (posted to SourceForge)
MIST/C Client Interface

MIST/C
Moodle Integrated Synchronous Teaching and Conferencing
Synchronous Internet Distributed Education

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MIST/C and Moodle

• Moodle provides access control and file management for MIST/C
  – MIST/C has access to Moodle database
• Instructor saves slide files and recordings in Moodle for student access
• This allows all course materials to be available through Moodle
  – Or MIST/C in Blackboard or Sakai via link to Moodle
• Easy-install package contains full server in VM
  – Moodle, MIST/C, Apache Webserver, MySQL, Linux
  – Instructors configure 24x7 MIST/C rooms
MIST/C Features supporting Simulteaching
(based on user suggestions)

- Auto-reconnect
  - Instructor can continue with classroom session in event of network outage; MIST/C reconnects to server if possible
  - Online student can recover using recordings
- Server-side backup recording
  - Classroom recording is better but instructor may forget to start
- Simple, intuitive interface
  - Includes bell + visual alert when online users need attention
- Whiteboard supports range of open media and imports desktop window contents
- Voting and breakout rooms improve online interaction
- Second full-screen whiteboard for projector
  - No other system we know of has this!
MIST/C Usage in GMU MSCS

CS Dept Enrollment in Simulteaching Sections

- **Online**
- **Classroom**

<table>
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<th>Semester</th>
<th>Enrollment</th>
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<tbody>
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<tr>
<td>S11</td>
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</tr>
<tr>
<td>F11</td>
<td>100</td>
</tr>
<tr>
<td>S12</td>
<td>250</td>
</tr>
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Conclusions/Future Directions

• Simulteaching with synchronous plus asynchronous delivery minimizes costs and additional faculty time
  – Pros far outweigh cons in our situation
• MIST/C supports it in free, easy-to-use software that is integrated with Moodle
  – Online delivery increases access for students
  – Best combined with Moodle asynchronous
• GMU has used simulteaching to extend its MSCS online to reach more regional students
• Results are highly promising
  – Enrollment, grades, student evaluations all good
  – We intend to continue expanding MIST/C capabilities
Backup Slides
GMU C4I Center
Networking and Simulation Laboratory

MIST/C

For more details, see:
http://netlab.gmu.edu/MISTC
Using MIST/C with Tablet PC
Using MIST/C with SmartBoard

NEW
Network EducationWare
Synchronous Internet Distributed Education

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