THE IMPACT OF TECHNOLOGY ON LEARNING ENVIRONMENTS
Introduction: What Architects do

The work of this session: to ask questions about the impact of web assisted technology on learning environments

Topic One:
Collaborative Learning Environment

Topic Two:
Customized Learning Environment

Topic Three:
Student-Centered Learning Environment
Program / Design / Curriculum

Architect’s Role

• Bring people together
• Help define goals & mission for project
• Present case studies that benchmark curriculum concepts
• Discover new approaches to design of learning space
• Encourage participants to lead similar explorations at their institutions
Program / Design / Curriculum
Program / Design / Curriculum

**PROGRAM CRITERIA**
(How to Use It)

**How Used**
- Pedagogical Goals
- Utilization Rate Goals
- Degree of Flexibility
  - (Ability to Reconfigure)
  - Open Use - Multi-Purpose
  - Curriculum Use - Departmental
  - Multi-Venue
    - (Group Learning / Task-Focused)

**Occupancy**
- Number of Students
- Types of Furnishings

**Level of Technology**
- Smart to Front
- Smart to Seat
- Distributed Learning
- Cutting Edge

**ROOM CRITERIA**
(How to Build It)

**Room Geometry**
- Rectangular
- Square
- Composite
- Fan

**Room Section**
- Stepped (degree of rake)
- Flat
- Sloped

**Room Performance**
- Acoustics
- Lighting
- Finishes
- HVAC

**Furniture**
- SF / Student Metric
- Connectivity
- Adaptability
Traditional Classroom Models

- Formally Organized
- Lecture Based
- High Room Utilization
- Low Room Adaptability
- High Student / Furnishings / Space Ratio

* Photo courtesy of “Lily’s Purple Plastic Purse”

- Choice in Learning Spaces
Program / Design / Curriculum

New Classroom Models

- Group Learning
- Multi-Venue
- Lecture and Discussion
- Lower Room Utilization
- Lower Student / Furnishings / Space Ratio
- Higher Room Adaptability

* Photo courtesy of “Lily’s Purple Plastic Purse”

- Choice in Learning Spaces
Program / Design / Curriculum - Learning Space Types

Classroom
- 25 - 75 seats
- Flat floor
- Tablet arm - 16sf / student
- Table / Chair - 21sf / student
- Open use

Seminar Room
- 15 - 25 seats
- Flat floor
- Nested Table / Chair - 20sf / student
- Conference Table / Chairs - 23sf / student
- Open use

Skills Classroom - Multi-Venue
- 15 - 25 seats
- Flat floor
- Perimeter Computer Workstations / Central Conference - 50sf / student
- Curriculum use
Program / Design / Curriculum - Learning Space Types

**Lecture Hall**
- 75 - 350 seats
- Stepped / sloped floor
- Tablet arm - 15sf / student
- Table / Chair - 20sf / student
- Open use

**Caseroom**
- 50 - 120 seats
- Table / Chair - 27sf / student
- Stepped floor
- Curriculum use

**Discussion Classroom**
- 35 - 75 seats
- Table / Chair - 25sf / student
- Stepped floor / sloped floor
- Curriculum use
<table>
<thead>
<tr>
<th>Technology Level</th>
<th>Room Implications</th>
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| Cutting Edge     | • Shell Space until Systems Identified.  
|                  | • Provide enhanced Power & HVAC.  
|                  | • Furniture: Expect limited flexibility. |
| Distributed      | • Significant Technology impact.  
| Local             | • Requires special lighting / room control.  
|                  | • Furniture: Fixed, minimum flexibility. |
| Connected        | • Technology impact throughout room.  
| Local             | • No special lighting / room control.  
|                  | • Furniture: Limited by outlet locations. |
| Wireless         | • Technology impact limited to Presenter.  
| Distributed      | • Requires special lighting / room control.  
| Local             | • Furniture: Flexible, except Presenter. |
|                  | • Minimal technology impact.  
|                  | • No special lighting / room control.  
|                  | • Furniture: Maximum Flexibility. |
Program / Design / Curriculum - Wireless Classroom
What is Collaborative Learning?

Peer Instruction

The teacher asks questions in the classroom, and gives students time to discuss possible answers. Students vote on the answers with the help of a handheld device. The students confer in small groups before voting on the answer, which has proved to be a valuable tool for learning.

“I consider myself a coach more than a teacher”
Eric Mazur, physicist, named ‘distinguished scholar’ by the National Science Foundation for his development of Peer Instruction
Collaborative Learning

Where does “peer instruction” take place?

Historical places
Lavoisier’s Laboratory - 1787
Liebig’s Teaching Laboratory - 1842
Edison’s Main Laboratory - 1879

Contemporary places
Classroom, Seminar, Lecture Hall
Research and Teaching Labs

New group learning places
Mixed Use Buildings
Technology Commons
The Media Center
Where did peer instruction take place in the past?

The Research Lab
Lavoisier’s Laboratory - 1787
Collaborative Learning Environment

Where did peer instruction take place in the past?

The Teaching Lab
Liebig’s Teaching Laboratory -1842
Collaborative Learning Environment

Where did peer instruction take place in the past?

The Research Lab
Edison’s Laboratory - 1879
Collaborative Learning Environment

Where does web assisted peer instruction take place today?

The Classroom
Design Considerations
- Flexible walls
- Movable furnishings
- Portable technologies

Agnes Scott College, Georgia
Where does web assisted peer instruction take place today?

The Classroom
Design Considerations
Movable furnishings
Portable technologies

Bates College, Maine
Collaborative Learning Environment

Where does web assisted peer instruction take place today?

The Seminar Room
Design Considerations
  Movable furnishings
  Portable technologies

Bates College, Maine
Collaborative Learning Environment

Where does web assisted peer instruction take place today?

The Lecture Hall
Design Considerations
  Movable furnishings
  Portable technologies

Bates College, Maine
Where does web assisted peer instruction take place today?

The Biology Teaching Lab
Design Considerations
  “Plug and Play”
  Portable technologies

Boston College, Massachusetts
New places for web assisted peer instruction?

The 24/7 Computer Commons;
a place where students can share their knowledge of technology, and can do projects together.

Bates College, Maine
Columbia University, New York
Collaborative Learning Environment

New places for web assisted peer instruction?

The University Library and Student Center: spontaneous group learning in mixed use facilities

George Mason University, Virginia
New places for web assisted peer instruction?

The Media Center:

where students use technology as peers, in multiple groups

Wellesley College, Massachusetts
Collaborative Learning - Classroom Trends

Teacher Focused

Fully Connected

Peer-to-Peer

Peer-to-Peer Collaboration
Collaborative Learning

Caseroom
Design Considerations
• 1350sf / 50 seats
• 4 rows / fixed tables / moveable chairs
• Stepped floor / integrated ramp
• Rear screen projection / presentation wall
• Emphasis on student / student and student / presenter interaction
• Capability for distributed learning
Collaborative Learning

Caseroom
Technology Considerations
• Lighting conflict between presenter & screen
• Noise from HVAC systems
• Provision of power and data cabling to students
• Rear versus front projection
Collaborative Learning

Drucker Graduate Management Center
Claremont Graduate University
Customized Learning Environment

How do people learn?

How is the “science of learning” affecting the design of spaces?

Design Considerations

• How technology can help students stay focused and pay attention
• The acoustic impact of “noisy” information technology
• The impact of real time interactive sessions in remote locations
• The building blocks for multiple learning groups.
Customized Learning Environment

Using Technology to help students stay focused and pay attention

Three Screen Teaching

Emory College, Georgia
Customized Learning Environment

Using technology to help students stay focused

Design Considerations

White noise
Customized Learning Environment

Seminar Room: The Living Wall
real time interactive sessions in remote locations
Customized Learning Environment

Using technology to help students stay focused

Design Considerations
    Building blocks for multiple learning groups

Wellesley College, Massachusetts
Customized Learning Environment

Using technology to help students stay focused

Design Considerations
Open work area: a building block for multiple learning groups

Wellesley College, Massachusetts
Customized Learning Environment

Using technology to help students stay focused

Design Considerations
The TV studio: a building block for multiple learning groups

Wellesley College, Massachusetts
Electronic Classroom Design Considerations

• 1250sf / 24 workstation & central conference
• Multi-venue - perimeter workstations / central conference
• Room adaptability & utilization requirements while maintaining high bandwidth connectivity
• Ability to adapt to evolving curriculum & research requirements

Texas Tech University
Customized Learning

Classroom - Furniture Layout 1

Texas Tech University
Customized Learning

Texas Tech University

Classroom - Furniture Layout 2
Customized Learning

Texas Tech University

Classroom - Furniture Layout 3
Caseroom Layers
Technology Considerations
*Layered Approach Offers:*
• Maximum flexibility
• Raised floor provision for power & signal flexibility
• Ability to upgrade systems with minimum disruption
• Support for multiple furniture configurations
• Efficiencies in energy costs
• Improved environment

Texas Tech University
Customized Learning

Immersive Learning Environments

* Photos courtesy of Silicon Graphics, Inc.
**Customized Learning**

**Design Considerations**
- 1500sf / 20 seats
- 'Immersion Area' / conference area / computer control area
- Degree of virtual immersion vs. collaboration
- Individual vs. group training
- Hybrids - flat screen to cave
- Establish research interests with software / hardware systems
- Rapid change of technology

**Texas Tech University**

**Virtual Reality Center - Curved**
Customized Learning

Technology Considerations

- Double-height shell space to extend ‘last possible moment’
- Raised floor provision for power & signal flexibility
- Equipment room adjacent for imaging processing capability
- Multiple viewing areas for differing uses

Texas Tech University

Virtual Reality Center - Shell
Customized Learning

Texas Tech University

Virtual Reality Center - Flat
Customized Learning

Texas Tech University

Virtual Reality Center - Curved
Customized Learning

Texas Tech University

Virtual Reality Center - Sphere
Bringing technology to the students

- Consider where student centered learning takes place.
- Consider how technology enhances individualized instruction.
Student Centered Learning Environment

The campus center:
“the social life of information”

Design Considerations
Using wireless throughout the facility
Mixing social experience with learning

Worcester Polytechnic Institute, Massachusetts
Agnes Scott, Georgia
Student Centered Learning Environment

The Library

Design Considerations
• Minimizing the presence of equipment within existing spaces
• Creating project based places for students

Yale University, Connecticut
Princeton University, New Jersey
Student Centered Learning Environment

The Laboratory

Design Considerations
• Minimizing the presence of equipment
• Creating project based places for students

Boston College, Massachusetts
Student Centered Learning Environment

The Classroom

Design Considerations
Strengthen the relationship between teacher and student

University of Rochester, New York
Emory College, Georgia
Bringing technology to the student?

Summary:
• Consider a variety of levels of technology, based on the cost to the student, and the kind of information/pedagogy requirements.
• Consider programming spaces to include wireless laptop technology, wired technology for some classrooms, and specialized computer and AV labs for complex teaching and research activities.
Student Centered Learning

Medical Education

- Fewer lectures, more small group experiences
- Integration of basic sciences with clinical
- Individualized instruction
- Training in how teams function in multi-disciplinary environments

University of New Mexico
Student Centered Learning

Simulator Patient Training

- Computerized mannequins
- Clinical skills procedure rooms
- Debriefing & feedback protocols

University of New Mexico
Student Centered Learning

Clinical Skills Environment

- Clinical teaching
- Research
- Assessment
- Video control & monitoring

University of New Mexico
Clinical Performance Center

Clinical Skills Lab
• Patient Examining
• In-Patient Beds
• Procedure Rooms
• Pharmacy Interview / Consultation

Simulator Patient Training Area
• Computerized Mannequins

Debriefing and Assessment Rooms
Monitoring & Video Technology

University of New Mexico
Student Centered Learning

Student Amenities

University of Iowa
THE IMPACT OF TECHNOLOGY ON LEARNING ENVIRONMENTS
Technology Design Timetable

- **Design**
  - Rooms, Routes, Risers

- **Approvals**

- **Bid**

- **Construction**
  - Common Cabling

- **Opening**
  - Systems

**Time**

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