LSC Webinar:
The University of Minnesota Experience with Active Learning Classrooms

Presenters:

Jeremy Todd, Director, Office of Classroom Management
J.D. Walker, Manager, Research and Evaluation, Office of Information Technology
Robin Wright, Associate Dean, Department of Genetics, Cell Biology and Development
Prototype Classroom Development

- What prompted the UMN to explore this specific alternative style of classroom?

Review of inventory

Feedback from faculty and students

Benchmarking: SCALE-UP, NCSU TEAL, MIT
Controlled studies have shown that new learning spaces:

• Help students to outperform final grade expectations.
• Affect teaching-learning activities, even when the instructor attempts to hold these activities constant.
• Do not conduce to a lecture-based approach; student performance improves when instructors move to active, student-centered teaching methods.
Active Learning Classroom
Pilot Initiative

- Student-centered, flexible, innovative design
- Observation, evaluation and research of space
Prototype Classroom Evaluation

- Academic & Administrative ALC coordination
- Instructor and student expectations in ALCs
- Faculty development and support services for pedagogical and technical support and technology needs
ALC physical space

• Room, furniture and group size
  – Room: 2800ASF, 126 students = 22-23ASF/student
  – Furniture shape and size?
STSS Acoustics

- Acoustical isolation maintained while using raised floors and operable partitions
- Provides enhanced:
  - Flexibility
  - Privacy
Teaching & Technology in ALC

• Physical classroom setting: ALC vs. traditional
• Student collaboration using technology to collect and analyze information on demand
• Audio/video to further the shared learning process
Questions?
The Impact of Space: New Empirical Research in Active Learning Classrooms

J.D. Walker, Ph.D.
Research Fellow
Office of Information Technology

UNIVERSITY OF MINNESOTA
Driven to Discover
Learning Spaces Research (LSR): Pilot Phase

• Began in fall 2007, OIT & OCM
• **Methods:** Interviews, surveys of instructors and students using Active Learning Classrooms (ALCs)
• \( N = 169 \)

*Active Learning Classroom at the U of M (BioSci 64)*
LSR: Comparison Studies

• Traditional classroom vs ALC
  • Post-Secondary Teaching & Learning 1131
  • Biology 1003

• ALC vs ALC: Adapting instruction
  • Family Social Science 3101

![Table 1. Learning Spaces Research: Quasi-Experimental Designs]

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Traditional Classroom</th>
<th>ALC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedagogical Approach</td>
<td>Lecture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Active Learning</td>
<td></td>
</tr>
</tbody>
</table>

- PSTL 1131
- BIOL 1003
- FSOS 3101
LSR Comparison Studies: Biol 1003

- N = 263
- Compared two sections (ALC & traditional), both in STSS
- Replication of 2008 study
Student Perceptions, Aggregated Survey Items

<table>
<thead>
<tr>
<th>Category</th>
<th>ALC Mean</th>
<th>Traditional Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engagement****</td>
<td>3.27</td>
<td>2.85</td>
</tr>
<tr>
<td>Enrichment</td>
<td>3.04</td>
<td>2.93</td>
</tr>
<tr>
<td>Flexibility***</td>
<td>3.41</td>
<td>3.13</td>
</tr>
<tr>
<td>Effective Use</td>
<td>3.63</td>
<td>3.69</td>
</tr>
<tr>
<td>Course/Room Fit**</td>
<td>3.52</td>
<td>3.30</td>
</tr>
</tbody>
</table>

NOTE: **p < .01; ***p < .001; ****p < .0001
Average Composite ACT Scores, by Section

Traditional Classroom: 26.36*
Active Learning Classroom: 25.32*

* Mean difference p < .05
**LSR Comparison Studies: Biol 1003**

**Expected vs. Actual Average Course Grades, Traditional vs. ALC**

- **Traditional**:
  - Expected: 78.52%
  - Actual: 77.77%

- **ALC**: 76.49%
  - Actual: 71.77%

**NOTE:** *p < .05; ****p < .0001
LSR Comparison Studies

Expected versus Actual Grades in Three ALC Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Expected</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSTL 1131***</td>
<td>75.76%</td>
<td>80.73%</td>
</tr>
<tr>
<td>BIOL 1003****</td>
<td>71.77%</td>
<td>76.49%</td>
</tr>
<tr>
<td>FSOS 3101****</td>
<td>80.96%</td>
<td>85.50%</td>
</tr>
</tbody>
</table>
Mechanisms: Classroom Activities and Instructor Behaviors

- Lecture: ALC - 69.3%, Traditional - 74.1%
- Discussion: ALC - 4.7%, Traditional - 2.1%
- Group Activity*: ALC - 32.6%, Traditional - 43.2%
- Q&A: ALC - 35.9%, Traditional - 40.4%
- At Podium**: ALC - 82.2%, Traditional - 91.1%
- Not at Podium***: ALC - 75.0%, Traditional - 89.0%
- Consulting**: ALC - 26.7%, Traditional - 14.6%
- Not Consulting: ALC - 95.8%, Traditional - 97.4%

NOTE: *p < .05; **p < .01; ***p < .001
Mechanisms: Social Context and Alliance

Alliance =

- Respect
- Responsibility
- Cooperation
- Communication
- Security

(Billson & Tiberius, 1991; Meyers, 2008)

- Alliance linked to engagement, improved outcomes.
Evidence of alliance:

• *Faculty focus groups and interviews:*
  • “they do ask questions that I don’t know the answer to and… it feels much more comfortable to say, that is a really good, probing question.”

• *Student focus groups and surveys:*
  • “It was awesome having a group of nine kids to whom I could always utilize in my time of need/to bounce ideas off of.”
Controlled studies have shown that new learning spaces:

- Help students to outperform final grade expectations.
- Affect teaching-learning activities, even when the instructor attempts to hold these activities constant.
- Do not conduce to a lecture-based approach; student performance improves when instructors move to active, student-centered teaching methods.
New research, fall 2012:

- **Innovative teaching in ALCs**: What are best practices in new learning spaces?
- **Hybrid learning in ALCs**: Can student-faculty contact hours be radically reduced, while maintaining good outcomes?
- **Room size analysis**: How large can ALCs become, while keeping good effects on student engagement?
Engagement

N = 27
N = 45
N = 54
N = 63
N = 90
N = 126
N = 135
N = 144
N = 153
N = 162
N = 171
N = 180
N = 189
N = 198
N = 207

ALC Research: New Directions
Questions?
how active learning classrooms create learning environments that APPLY THE BIOLOGY OF LEARNING
Leveraging an active learning class: an active learning course

Biology 2002 – Foundations of Biology

Teaching Goals:

• Apply the biology of learning
• Focus on higher order skills
• Represent authentic work of biologists
What is learning?
What is learning?

Information, ideas, & skills that a person can

- **Use** after a significant period of disuse
- **Apply** to a new problem

http://bjorklab.psych.ucla.edu/research.html
What is teaching?

**Architecture**
Creating conditions in which learning can happen

**Brain change!**
Biology 2002 applies basic principles of learning.

- Each brain is unique.
- What I pay attention to is what I learn.
- More senses = more learning.
- The person who does the work learns.
- Making memories requires repetition, elaboration, & sleep.
- The brain is social.
- Metacognition enhances learning.
After four years of college, what should you be able to do?
We try to focus on higher levels of Bloom’s taxonomy of cognition.
Leveraging an active learning class: an active learning course

Biology 2002 – Foundations of Biology for Majors

Goals:

- Apply the biology of learning
- Focus on higher order skills
- Represent authentic work of biologists
Learn biology by being a biologist...
What are the learning outcomes of the foundations courses?

You will…

- Learn foundational biology concepts in an evolutionary context
It is very important that you learn about traxoline. Traxoline is a new form of zionter. It is montilled in Ceristanna. The Ceristannians gristerlate large amounts of fevon and then brachter it to quasel traxoline. Traxoline may well be one of our most lukized snezlaus in the future because of our zionter lescelidge.

Directions: Answer the following questions in complete sentences.

1. What is traxoline?
2. Where is traxoline montilled?
3. How is traxoline quaselled?
4. Why is it important to know about traxoline?

--- Judy Lanier
What are the learning outcomes of the Foundations courses?

You will…

- Learn foundational biology concepts in an evolutionary context
- Develop foundational skills needed for success in science & future careers
  - Problem solving, critical thinking
  - Data analysis & interpretation
  - Laboratory skills & experimental design
  - Team work & Communication
  - Quantitative reasoning
What’s different about Foundations?

**Learning outcomes**
- Biology concepts
- Critical thinking, communication skills, team work, collaboration, skills for life after college, etc.

**Bloom’s taxonomy**
- Knowledge & understanding
- Application & analysis
- Synthesis & evaluation

**Class activities & Assessments**
- Text, self-tests, quizzes
- Concept lab activities; Exams
- Team projects; Exams
<table>
<thead>
<tr>
<th>DAY</th>
<th>TIME</th>
<th>ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>35 minutes</td>
<td>Learning readiness quizzes &amp; debrief</td>
</tr>
<tr>
<td>115 minutes</td>
<td>55 minutes</td>
<td>Application &amp; Analysis Activities</td>
</tr>
<tr>
<td></td>
<td>10 minutes</td>
<td>Metacognition</td>
</tr>
<tr>
<td>Wednesday</td>
<td>60 minutes</td>
<td>Application &amp; Analysis Activities</td>
</tr>
<tr>
<td>115 minutes</td>
<td>45 minutes</td>
<td>Team Project Work</td>
</tr>
<tr>
<td></td>
<td>10 minutes</td>
<td>Metacognition</td>
</tr>
<tr>
<td>Friday</td>
<td>100 minutes</td>
<td>Team Project Work</td>
</tr>
<tr>
<td>115 minutes</td>
<td></td>
<td>Office Hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exam discussion, etc.</td>
</tr>
<tr>
<td></td>
<td>10 minutes</td>
<td>Metacognition</td>
</tr>
</tbody>
</table>
Knowledge & Understanding

- Before class
  - Study guides
  - Text book
  - Self-tests
- In class
  - Quizzes
Application & Analysis

- Problems
- Simulations
- Videos
- Data Analysis
- Discussions
- Models
- etc.
Synthesis & Evaluation
Questions?
Comments & Feedback Welcome:

Jeremy Todd, toddx012@umn.edu
J.D. Walker, jdwalker@umn.edu
Robin Wright, wrightr@umn.edu

http://z.umn.edu/lsr
Upcoming LSC Activities

• LSC Webinar: The University of Illinois at Chicago Experience with Project Oasis, an Informal Learning Space Program
  ➢ December 11, 2012 / 4:00 p.m. EST

• LSC Workshop at Portland State University
  ➢ February 9, 2013

Contact Information

For more information: http://www.pkallsc.org/