Learning is not a spectator sport.

Why we need to get our students active and why space matters

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Burning questions about active learning?

• Take 2 minutes for a quick write

• Write down the top 3 burning questions you have about active learning.

• Share questions with your group and select the top burning question for your group

• Post your question on your team whiteboard
Goals for this session

• Examine and become familiar with the theoretical foundation of active and collaborative learning and evidence of its use in higher education.

• Explore why space matters when it comes to teaching and learning.
I learn best when...

• Shoutout
WHAT DO WE KNOW ABOUT LEARNING AND TEACHING?
What do we know about learning?

Learners create knowledge actively and uniquely; they learn best when they are able to...

- **connect** new knowledge to existing knowledge
- **focus** their attention on the learning experience
- stay **motivated** to learn
- receive appropriate **feedback** early and often
- work on **engaging, collaborative** experiences

(Angelo & Cross, 1993; Chickering & Reisser, 1993; Ewel, 1997; Felder & Brent, 2003; Ramsden, 1992; Weiman, 2005, 2007; Weimer, 2003)
What is active learning?
How would you define “Active Learning”?  

• Talk at your table (5 min)  
• Report (5 min)
Active Learning

Active learning means that the mind is actively engaged. Its defining characteristic is that students are dynamic participants in their learning and that they are reflecting on and monitoring both the processes and the results of their learning.

(Barkley, 2010)
Characteristics of Active Learning

• Students are involved in more than listening.

• Students are engaged in activities (e.g. reflecting, discussing, writing).

• Emphasis on higher order thinking (application, analysis, evaluation)

• Instructor facilitates and provides feedback

• Usually- but not always- involves student collaboration

Evidence of Active Learning

• Hakke (1998)
  – Students in courses with interactive engagement achieved a gain of 2 standard deviations higher than traditional courses

• Prince (2004)
  – “broad but uneven support for core elements of active, collaborative, cooperative and problem-based learning”

• Michael (2006)
  – “enormous wealth of research supporting the benefits of active learning in helping students master difficult subjects”

• Freeman et al (2014)
  – Students in a traditional lecture course are 1.5 times more likely to fail, compared to students in courses with active learning
  – Students in active learning classes outperform those in traditional lectures on identical exams (1/2 standard dev higher)
Evidence of Active Learning

• Improved student understanding (Kvam 1999; Crouch and Mazur, 2001; Handelsman et al. 2004)

• Improved student retention in general student population and in underrepresented minorities (George et al. 2001; Cortright et al. 2003; Lorenzo et al. 2006)

• Improved attitude, problem-solving skills, and conceptual learning (Beichner et al. 2007, Yehudit et al 2003)
Evidence of Active Learning

• Increased content knowledge, critical thinking and problem-solving abilities, and positive attitudes towards learning in comparison to traditional lecture-based delivery (Anderson et al, 2005)

• Increased enthusiasm for learning in both students and instructors (Thaman et al., 2013)

• Development of graduate capabilities such as critical and creative thinking, problem-solving, adaptability, communication and interpersonal skills (Kember & Leung, 2005)

• Improving students perceptions and attitudes towards information literacy (Deltor et al., 2012)
NSSE Engagement Indicators and High-Impact Practices

- Higher-Order Learning
- Reflective & Integrative Learning
- Learning Strategies
- Quantitative Reasoning
  
  *Theme: Academic Challenge*

- Collaborative Learning
- Discussions with Diverse Others
  
  *Theme: Learning with Peers*

- Quality of Interactions
- Supportive Environment
  
  *Theme: Campus Environment*

- Student-Faculty Interaction
- Effective Teaching Practices
  
  *Theme: Experiences with Faculty*

- High-Impact Practices
  - Learning Community
  - Service-Learning
  - Research with a Faculty Member
  - Internship or Field Experience
  - Study Abroad
  - Culminating Senior Experience
“The one who does the work, does the learning.” (Doyle, 2008)

Image source: https://flic.kr/p/mwxysz
Does that mean the lecture is dead?
“Active learning doesn’t just happen; it occurs in the classroom when the teacher creates a learning environment that makes it more likely to occur” (Michael, 2006)
Learning Outcomes

Strategies
What activities will support learning?

Context

Content
What is the content of the course?

Assessment
How do you know if students are learning?

Outcomes
What will students learn?
Why does space matter?

DESIGNING LEARNING SPACES TO SUPPORT LEARNING
Humans and the built environment
Space impacts perception
Space impacts perception
Space impacts perception
Impact of color
Impact of color
Space impacts interaction

- Intimate Space: 1.5 ft (45 cm)
- Social Space: 4 ft (1.2 m)
- Public Space: 12 ft (3.7 m)
- Personal Space: 25 ft (7.6 m)
Space impacts performance
Space impacts performance
“We shape our buildings, and afterwards our buildings shape us.”

Winston Churchill, 1943, Presentation to the House of Lords
What message does this space communicate about learning?
Space creates expectations of behavior, suggests how to act, and communicates what is valued.
Research-informed classroom design

NSSE Benchmarks → Principles for teaching and learning space design → Design features in classrooms
Principles for Designing Teaching and Learning Spaces

1. **Academic challenge**
   Learning spaces should be sufficiently varied for both individual and collaborative work, and include a range of technologies that support multiple modes of teaching and learning.

2. **Learning with peers**
   ... should provide features that allow students to actively engage with content and to collaborate with one another, with or without the support of technology.

3. **Experiences with faculty**
   ... should reduce physical distance and barriers, and facilitate exchanges between students and faculty in the classroom.

4. **Campus environment**
   ... should conform to university design standards, designed with future flexibility in mind and consistent with the university’s culture and priorities as reflected in the campus master plan.

5. **High Impact Practices**
   The campus is a pedagogical space where high-impact practices can be supported and grounded in credited experiences in the classroom/teaching lab.

<table>
<thead>
<tr>
<th>Principle</th>
<th>Layout</th>
<th>Furniture</th>
<th>Technologies</th>
<th>Acoustics</th>
<th>Lighting &amp; Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Challenge</td>
<td>[Promoting active engagement with content]</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Learning w/ Peers</td>
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<td>Experiences with Faculty</td>
<td>[Promoting interaction and communication]</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Campus Environment</td>
<td>Standards applied; flexible for future use; meet the needs for all; designed to integrate with surroundings; coherent with the master plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Impact Practices</td>
<td>Ensure ubiquitous availability of, and support for, all affordances (physical, virtual) to maximize HIPs for student learning</td>
<td></td>
<td></td>
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</tr>
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## Principles for Designing Teaching and Learning Spaces

http://www.mcgill.ca/tls/spaces/tlswg/principles

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<tr>
<td><strong>Academic Challenge</strong></td>
<td>- Work surfaces for notebooks, laptops, textbooks</td>
<td>- Comfortable furniture; Varied furniture to support different types of tasks and preferences</td>
<td>- Access to infrastructure</td>
<td>- Acoustic design to avoid distraction from outside and inside sources</td>
<td>- Appropriate lighting for individual work</td>
</tr>
<tr>
<td>[Promoting active engagement with content]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[Intentional use of colour to promote focus]</td>
</tr>
<tr>
<td><strong>Learning w/ Peers</strong></td>
<td>- Promote F2F communication Individuals can move about easily</td>
<td>- Flexible seating Intentional use of furniture of different heights and shapes</td>
<td>- Shared workspaces</td>
<td>- Sound zones support simultaneous conversations</td>
<td>- Different lighting patterns to support different activities</td>
</tr>
<tr>
<td>[Promoting active engagement with one another]</td>
<td>- Unobstructed sightlines</td>
<td></td>
<td></td>
<td>- Appropriate amplification</td>
<td>[Using colour to define groups’ use of space]</td>
</tr>
<tr>
<td><strong>Experiences with Faculty</strong></td>
<td>- Easy access to all students</td>
<td>- Podium doesn’t interfere with sightlines, movement and interaction Flexible furniture to support different teaching strategies</td>
<td>- Screen sharing Ability to control classroom technologies away from the podium</td>
<td>- Sound zones support multiple simultaneous conversations</td>
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<td>[Promoting interaction and comm.]</td>
<td></td>
<td></td>
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<td>- Appropriate amplification available</td>
<td>[Colours distinguish purposes]</td>
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</table>
McGill University – Leacock 219

184 seats – no arm seating, large writing surface, multi screen multi source AV
McGill University – Leacock 219
McGill University – Arts W120

104 seats – two rows tier, fixed table, movable chairs, writable walls, multi screen multi source, videoconferencing, wireless screen sharing, student microphones
McGill University – Arts W120

104 seats – writable surfaces
McGill University – Arts W120
104 seats – natural light, mural scenes
What if we designed a space from scratch to support collaboration and interaction?
What is an Active Learning Classroom?

• Discuss in your small groups (10 min)
• Report to large group
What are Active Learning Classrooms (ALCs)?

• Range of classrooms with different combinations of design features

• Designed with intent:
  – Promote active and collaborative learning
  – Increase student-faculty interaction
  – Enrich educational experiences with access to new technologies
  – Provide a supportive campus environment
MIT – TEAL Classroom
Bruininks Hall – University of Minnesota
Claude Moore Medical Education Building – University of Virginia
168 seats
McGill – Active Learning Classroom – 72 seats – 2009
Fixed round tables movable chairs, writable walls, multi-sources and screens, screen sharing, central podium, raised floor, natural light, daylighting, table colors to match writable glass
McGill – Active Learning Classroom – 24 seats – 2011

Fixed round tables movable chairs, writable walls, multi-sources and screens, central podium, natural light,
McGill – Active Learning Lab – 80 seats – 2010

Fixed Y-tables, counter height, movable chairs, writable walls, multi-sources, screen sharing, raised floor
McGill Undergraduate Chemistry Labs – 2011

Round table pods, interactive whiteboards, screen sharing across two floors
McGill CyberMed

3x80 seat Active Learning Classrooms, 7 x16 small group rooms, informal learning space
McGill – Active Learning Classroom – 80 seats – 2013

Fixed tables movable chairs, writable walls, multi-sources and screens, screen sharing, central podium
Evidence of impact

• Engagement
  – Students and instructors rate experience as highly positive

• Outcomes
  – Outperform expectations based on “expected”
  – Outperform peers in “traditional” classrooms
  – Decreased failure rates

• Active learning pedagogy
  – Instructors doing less lecture more interaction

(Dori and Belcher, 2004; Cotner, Loper, Walker and Brooks, 2013; Gierdowski, 2013; Whiteside, Brooks and Walker, 2010; Walker, Brooks, Baepler, 2011)
Evidence of Effectiveness: SCALE-UP and Active Learning Classrooms

MIT / Israel Institute of Technology: Technology-Enabled Active Learning (TEAL)

• Media-rich learning environment in a redesigned classroom intended to “facilitate group interaction”
• Failure rate decreased from 13% in control (non-TEAL) group to <5% in experimental (TEAL) group.
• Conceptual understanding scores for students identified as high-achievers improved for TEAL Group from 60% to 83% in Fall 2001 compared with an improvement for Traditional format group from 57% to 61% in Spring 2002.

University of Pittsburgh

• Physics – Brief Electricity and Magnetism Assessment (BEMA) – multiple choice test used to evaluate students’ comprehension of broad topics within the discipline.
• “Striking gains” between pre-assessment and post-assessment on the BEMA, for SCALE-UP 65% score compared to score of 34% for a representative traditional lecture).
• Student attendance in class was notably consistent.

University of Minnesota

• Active Learning Classrooms (ALC) for electrical engineering/computer science and biological sciences
• 98% of students surveyed reported that the ALC environment was student-oriented.
• 85%+ students recommended the ALC space for their other classes.
• ALCs were “very well received by both the instructors and students”

MCGILL EVIDENCE OF IMPACT: BREADTH
Documenting engagement of instructor/student experiences

• Interviews and focus groups
• Created video of ALC experience
  – Teaching and Learning Services
• Usage data
• End of term surveys
<table>
<thead>
<tr>
<th>Question</th>
<th>Score</th>
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<tbody>
<tr>
<td>1. This classroom has a positive impact on my learning</td>
<td>4.0</td>
</tr>
<tr>
<td>2. This classroom effectively accommodates different ways of learning</td>
<td>4.0</td>
</tr>
<tr>
<td>3. I like this classroom for this course</td>
<td>4.1</td>
</tr>
<tr>
<td>4. I would take more courses in this classroom</td>
<td>3.9</td>
</tr>
<tr>
<td>5. This classroom facilitates constructive interaction among students</td>
<td>4.1</td>
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<td>6. This classroom facilitates constructive interaction between students and instructors</td>
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<tr>
<td>7. This classroom offers technologies that enhance my learning</td>
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## End of term instructor survey (4 ALCs):
### Perceived Impact on engagement and learning

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<tr>
<th>Statement</th>
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<tr>
<td>1. This classroom has a positive impact on my learning</td>
<td>4.3</td>
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<td>4.2</td>
</tr>
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<td>3. I like this classroom for this course</td>
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<td>-------------------------------------------------------------------------</td>
<td>--------</td>
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<td>(b) Group tables for students</td>
<td>4.1</td>
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<tr>
<td>(d) Technologies available to students at the tables</td>
<td>4.0</td>
</tr>
<tr>
<td>(a) General layout of the room</td>
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</tr>
<tr>
<td>(g) Placement of the instructor’s podium</td>
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</tr>
<tr>
<td>(e) Screen sharing (among students, with entire class)</td>
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<td>(f) Writable walls</td>
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End of term *instructor* survey (4 ALCs):
Extent to which room features benefited learning

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What did students say about learning in an ALC?

• The value of the active learning we did in this course only really became clear when I started studying for the exam - I was really amazed by how much I understood and remembered, compared to my other courses!

• The classroom design makes it very interactive with our colleagues as well as with the teacher, which makes it a better learning environment than a traditional classroom.

• Open space for teacher to walk around engages students and also encourages students to participate. It also encourages teacher to ask questions to students.

• Writable walls are good to brainstorm and write where everyone can see.
What did students say about learning in an ALC?

• If this class[room] [is] used in a traditional lecture it wouldn't be suitable.

• This space is effective for classrooms with interactive aspects. The classroom however might be distracting if the class was not intended to be interactive.

• The room certainly has its advantages, but can also serve as a distraction. This type of room isn't suited to all classes, or all teachers.

• The space does not make us learn better but rather the teaching methods of the teacher is what really makes a difference.
MCGILL EVIDENCE OF IMPACT: DEPTH
How do instructors make meaning of an ALC?

- Instructor thinking & planning
- Instructor actions in the classroom
- Student learning experience
Participants

• Volunteer instructors
• New to Education 627
• 8 instructors w/8 courses
• Diverse level (from 200-600 level)
• Diverse size (20-72)
• Diverse discipline
  – Arts (3), Management (1), Education (2), Medicine (1), Science (1)
• ~ 45% response rate by students (n=320)
Observation Form

This observation form should be submitted every time a strategy changes in the class.

Class/Instructor

Observer

Start Time

Overall Objective of Class

Objective of Activity/Strategy

Strategy
- [ ] Lecture
- [ ] Question/Answer
- [ ] Demonstration
- [ ] Group Activity
- [ ] Individual Activity
Observations - Locations

DM  AR  GJ  LB  DR  TA  NA  RK

Walls
Podium+
Podium
Class

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Observations - Strategies

- DM
- GJ
- RK
- DR
- TA
- LB
- NA
- AR

Active Learning
Lecture

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Preliminary results

- Less learning focused
- Employ more lecture strategies
  - Move around the room less frequently
  - Spend more time at the podium
- Surface learning approach
- Less positive learning experiences

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Preliminary results

More learning focused

Employ active classroom strategies
Move around the room more frequently
Spend more time at tables than podium

Deep learning approach
More positive learning experiences
Active Learning Classrooms make a difference when you have instructors that can take advantage of them.
Good teaching can withstand poor spaces. Poor teaching can withstand good spaces.

Thank you!

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www.mcgill.ca/tls

www.mcgill.ca/teachingblog
Design well-aligned instruction that takes advantages of the affordances that new spaces provide.

Thank you!

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