

Learning is not a spectator sport.

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



McGill

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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

Bonnell and Eison (1991). Active Learning. ASHE-ERIC.



# 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)



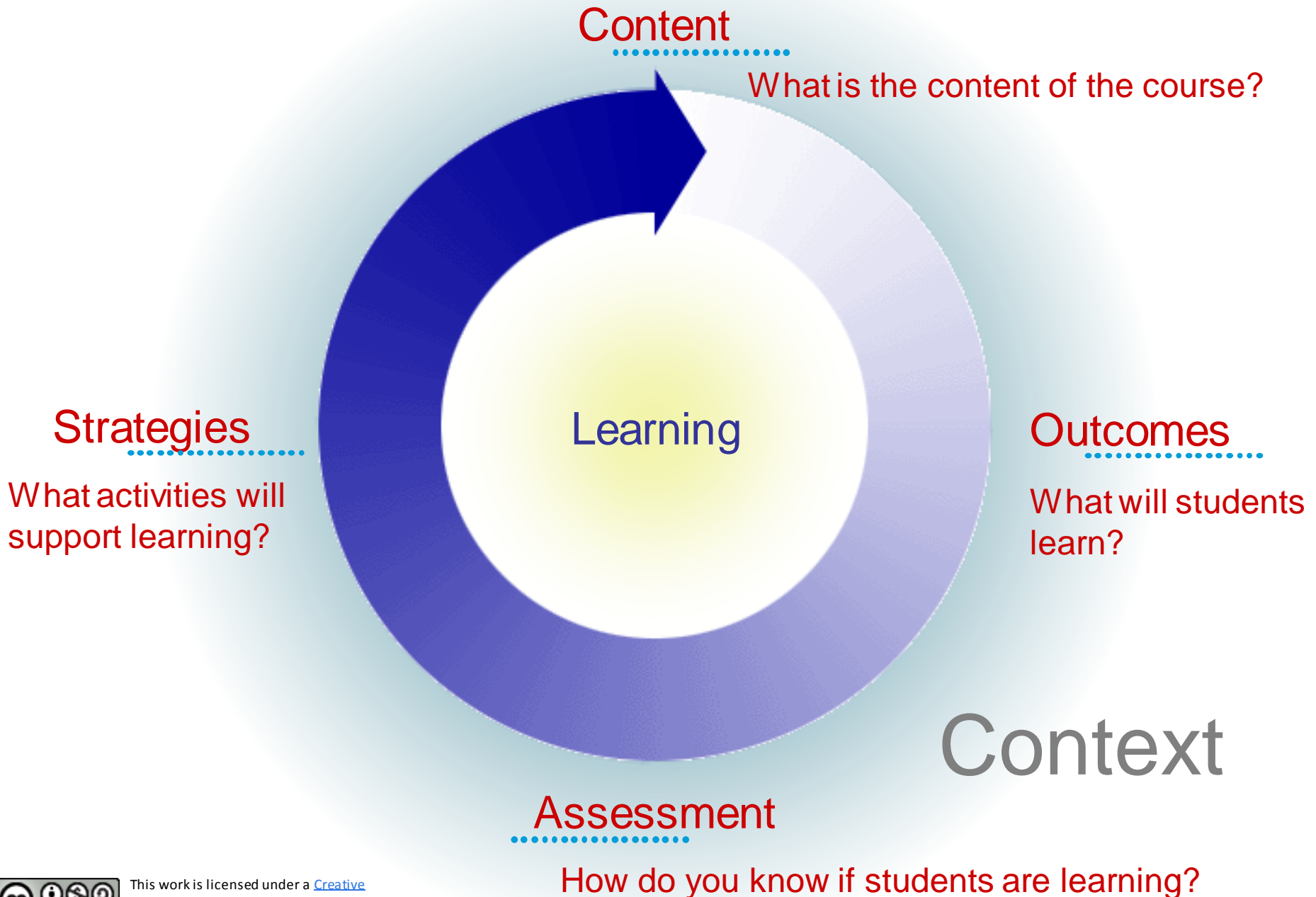
Image source: <https://flic.kr/p/mwxsyx>

# 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)

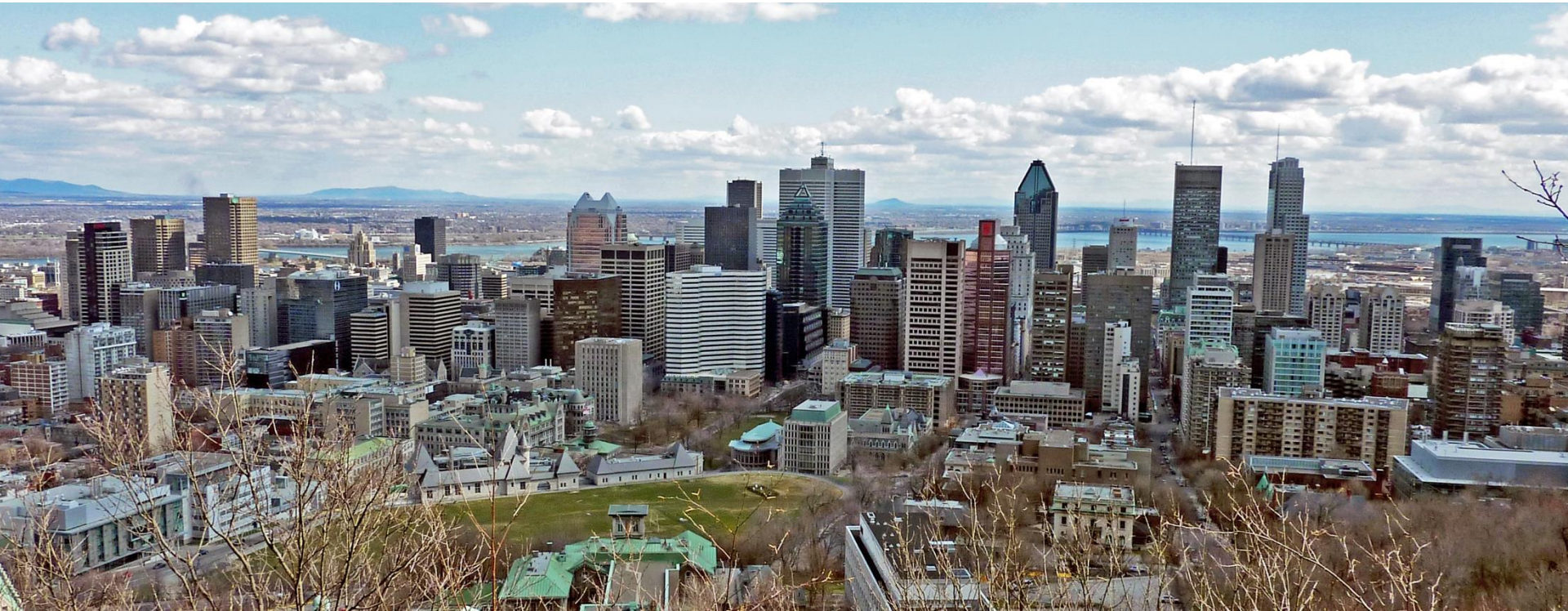




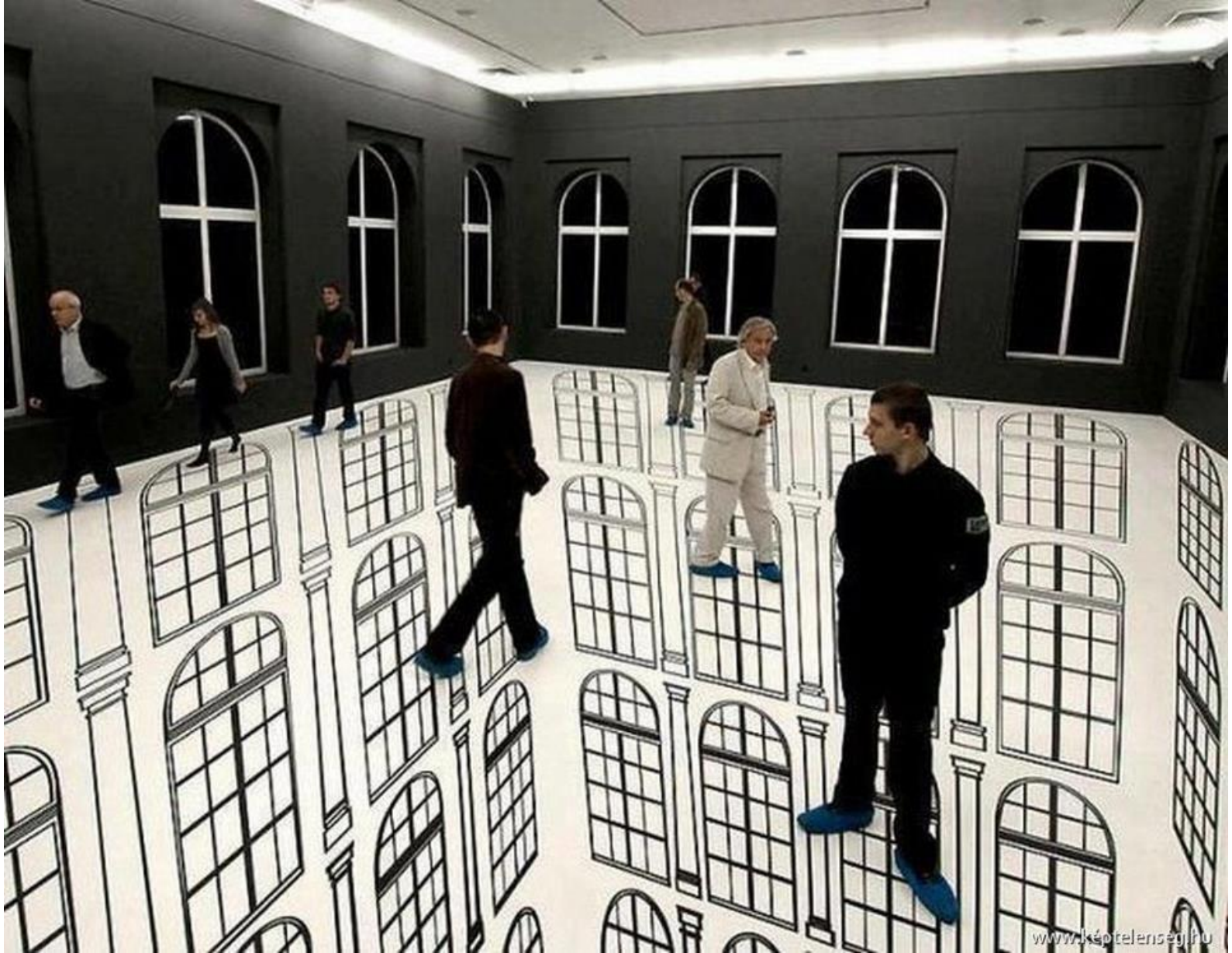
Why does space matter?

# **DESIGNING LEARNING SPACES TO SUPPORT LEARNING**

# Humans and the built environment







Space impacts perception



Space impacts perception



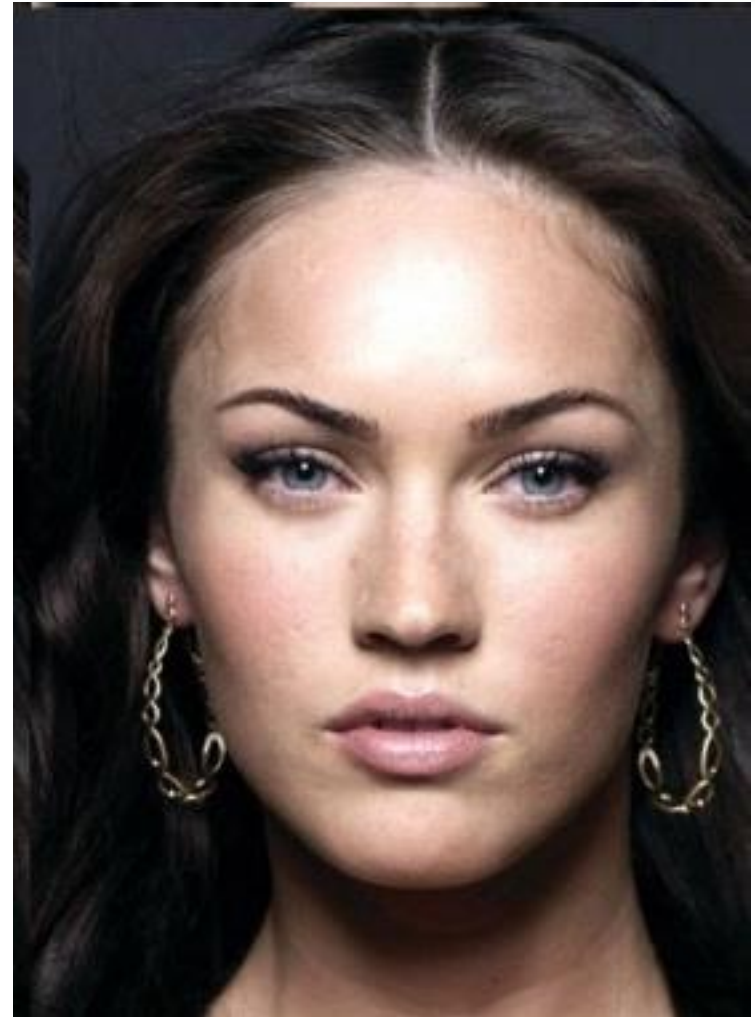
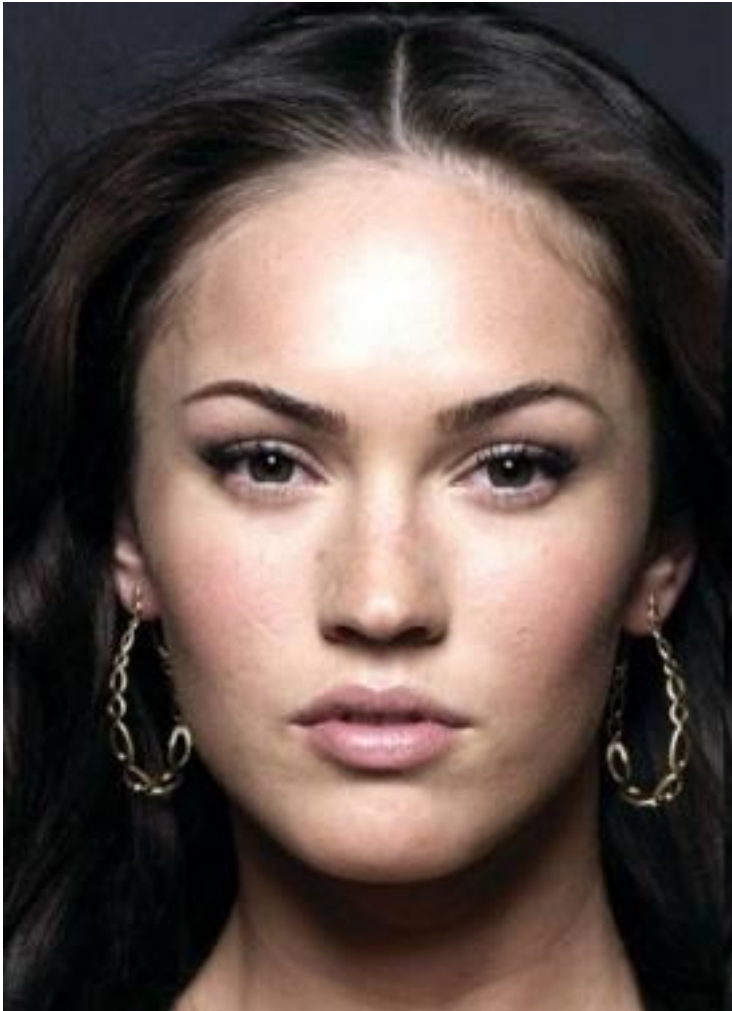


Space impacts perception

# Impact of color



# Impact of color



**Intimate  
Space**

**Personal  
Space**

**Social  
Space**

**Public  
Space**

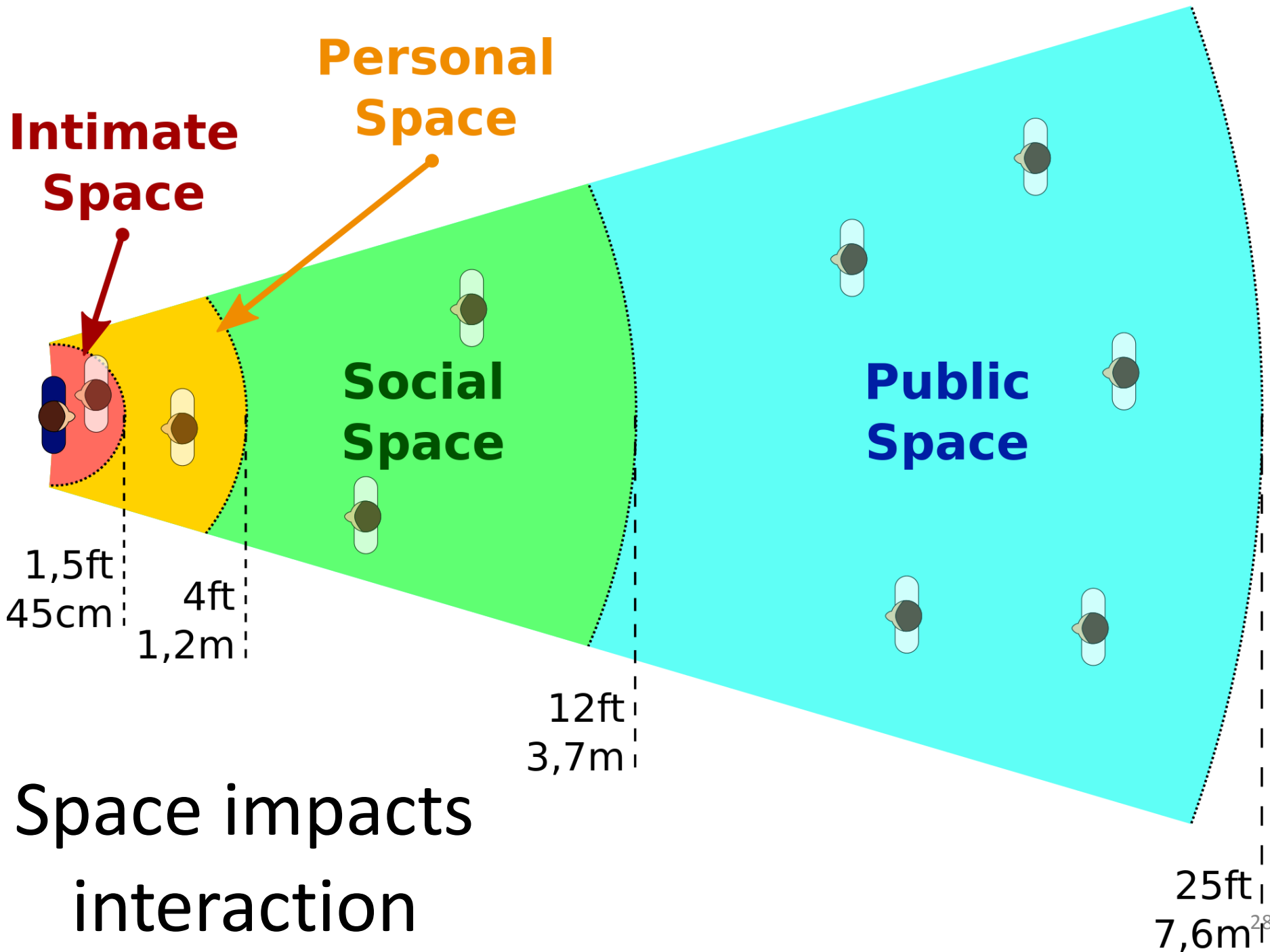
1,5ft  
45cm

4ft  
1,2m

12ft  
3,7m

25ft  
7,6m<sup>28</sup>

Space impacts  
interaction







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



# 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.

Adapted from: Benchmarks of effective educational practice. National Survey of Student Engagement.  
[http://nsse.iub.edu/pdf/nsse\\_benchmarks.pdf](http://nsse.iub.edu/pdf/nsse_benchmarks.pdf). Retrieved Sept 10, 2008.

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



# Principles for Designing Teaching and Learning Spaces

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



Principle	Layout	Furniture	Tech	Acoustics	Lighting & Colour
<b>Academic Challenge</b>  [Promoting active engagement with content]	<ul style="list-style-type: none"> <li>Work surfaces for notebooks, laptops, textbooks</li> </ul>	<ul style="list-style-type: none"> <li>Comfortable furniture;</li> <li>Varied furniture to support different types of tasks and preferences</li> </ul>	<ul style="list-style-type: none"> <li>Access to infrastructure</li> <li>Access to resources</li> <li>Multiple sources and screens</li> </ul>	<ul style="list-style-type: none"> <li>Acoustic design to avoid distraction from outside and inside sources</li> </ul>	<ul style="list-style-type: none"> <li>Appropriate lighting for individual work</li> <li>Intentional use of colour to promote focus</li> </ul>
<b>Learning w/ Peers</b>  [Promoting active engagement with one another]	<ul style="list-style-type: none"> <li>Promote F2F communication Individuals can move about easily</li> <li>Unobstructed sightlines</li> </ul>	<ul style="list-style-type: none"> <li>Flexible seating</li> <li>Intentional use of furniture of different heights and shapes</li> </ul>	<ul style="list-style-type: none"> <li>Shared workspaces</li> </ul>	<ul style="list-style-type: none"> <li>Sound zones support simultaneous conversations</li> <li>Appropriate amplification</li> </ul>	<ul style="list-style-type: none"> <li>Different lighting patterns to support different activities</li> <li>Using colour to define groups' use of space</li> </ul>
<b>Experiences with Faculty</b>  [Promoting interaction and comm.]	<ul style="list-style-type: none"> <li>Easy access to all students</li> </ul>	<ul style="list-style-type: none"> <li>Podium doesn't interfere with sightlines, movement and interaction</li> <li>Flexible furniture to support different teaching strategies</li> </ul>	<ul style="list-style-type: none"> <li>Screen sharing</li> <li>Ability to control classroom technologies away from the podium</li> </ul>	<ul style="list-style-type: none"> <li>Sound zones support multiple simultaneous conversations</li> <li>Appropriate amplification available</li> </ul>	<ul style="list-style-type: none"> <li>Different lighting patterns to support multiple types of teaching tasks</li> <li>Colours distinguish purposes</li> </ul>



## 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



## 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

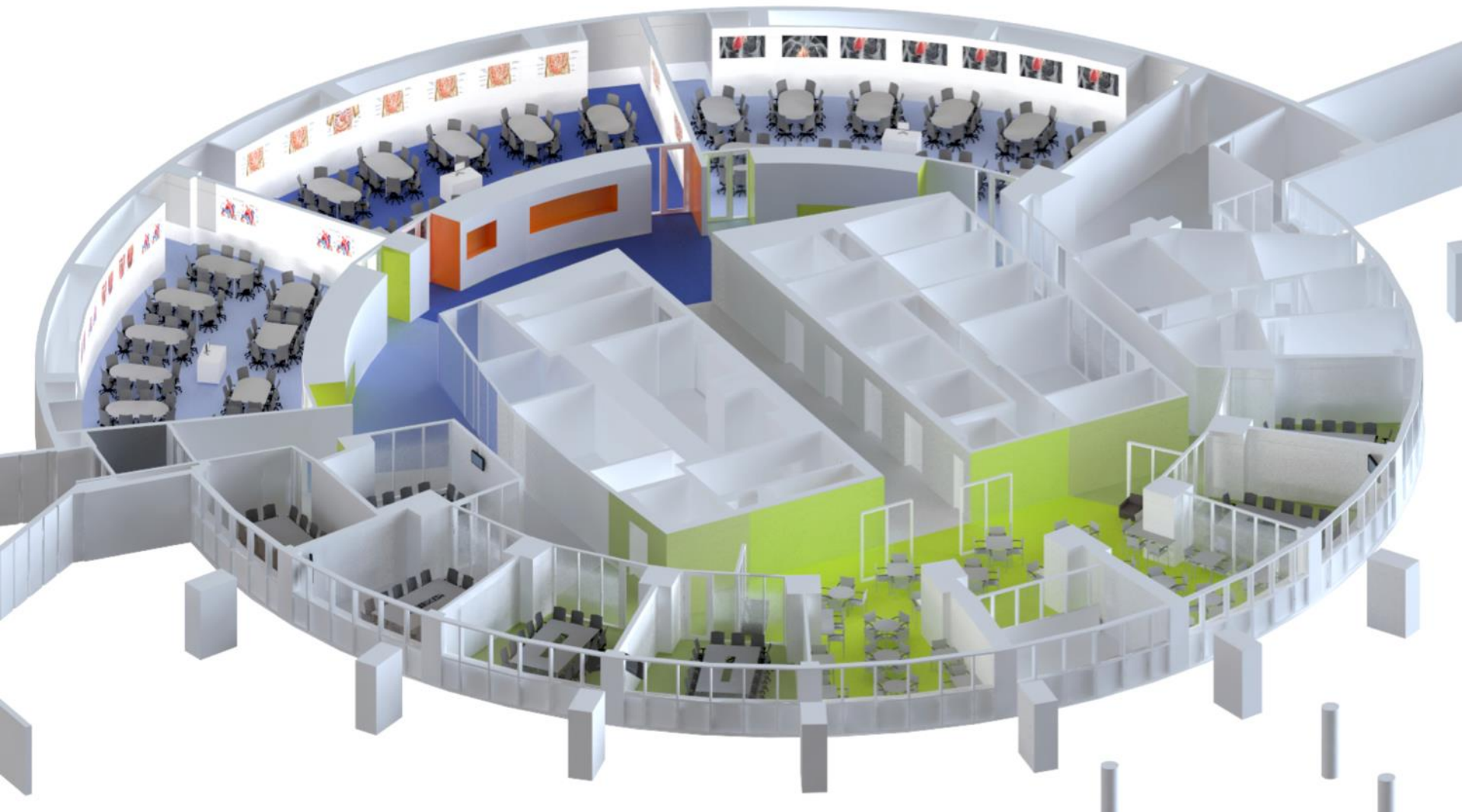




## McGill Undergraduate Chemistry Labs – 2011

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”

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Dori, Y.J. and Belcher, J. (2004).

How Does Technology-Enabled Active Learning Affect Undergraduate Students’ Understanding of Electromagnetism Concepts? *The Journal of the Learning Sciences* 14(2). Accessed 6 March 2009. p. 1 <<http://web.mit.edu/edtech/casestudies/pdf/teal1.pdf>>.

Pellathy, S. and Leibovich, A.K. (2008). Implementing proven introductory physics reforms. [draft]. Accessed 6 march 2009. p.2

<<http://scaleup.ncsu.edu/groups/adopters/wiki/15c1e/attachments/ca7e3/BemaStudy.pdf>>.

University of Minnesota. “Active Learning Classrooms Pilot Evaluation: Fall 2007 Findings and Recommendations”. p. 2. Accessed 12 March 2009.

<[http://www.classroom.umn.edu/ALC\\_Report\\_Final.pdf](http://www.classroom.umn.edu/ALC_Report_Final.pdf)>.

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# **MCGILL EVIDENCE OF IMPACT: BREADTH**

# Documenting engagement of instructor/student experiences



- Interviews and focus groups
- Created video of ALC experience
  - Teaching and Learning Services
  - <http://www.mcgill.ca/tls/spaces/alc>
- Usage data
- End of term surveys



# Teaching and Learning in Active Learning Classrooms



McGill

Teaching and Learning Services

<http://www.mcgill.ca/tls/spaces/alc>





**End of term student survey (4 ALCs):**  
**Perceived Impact on engagement and learning**

**1-Strongly Disagree  
5-Strongly Agree  
(n=1075/5329)**

1. This classroom has a positive impact on my learning	4.0
2. This classroom effectively accommodates different ways of learning	4.0
3. I like this classroom for this course	4.1
4. I would take more courses in this classroom	3.9
5. This classroom facilitates constructive interaction among students	4.1
6. This classroom facilitates constructive interaction between students and instructors	4.0
7. This classroom offers technologies that enhance my learning	4.1

**End of term *instructor* survey (4 ALCs):**  
**Perceived Impact on engagement and learning**

**1-Strongly Disagree  
5-Strongly Agree  
(n=60/108)**

1. This classroom has a positive impact on my learning

4.3

2. This classroom effectively accommodates different ways of learning

4.2

3. I like this classroom for this course

4.4

4. I would take more courses in this classroom

4.2

5. This classroom facilitates constructive interaction among students

4.5

6. This classroom facilitates constructive interaction between students and instructors

4.4

7. This classroom offers technologies that enhance my learning

4.4

<p>End of term <u>student</u> survey (4 ALCs):</p> <p>Extent to which room features benefited learning</p>	<p>1=very low 5=very high (n=980/5329)</p>
(c) Movable chairs for students	4.3
(b) Group tables for students	4.1
(h) Technologies available to instructors at the podium	4.1
(d) Technologies available to students at the tables	4.0
(a) General layout of the room	3.8
(g) Placement of the instructor's podium	3.6
(e) Screen sharing (among students, with entire class)	3.6
(f) Writable walls	3.5

End of term instructor survey (4 ALCs):  
Extent to which room features benefited learning

1=very low  
5=very high  
(n=57/108)

(c) Movable chairs for students

4.6

(b) Group tables for students

4.6

(h) Technologies available to instructors at the podium

4.4

(d) Technologies available to students at the tables

4.3

(a) General layout of the room

4.1

(f) Writable walls

3.7

(e) Screen sharing (among students, with entire class)

3.9

(g) Placement of the instructor's podium

3.2



# 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.

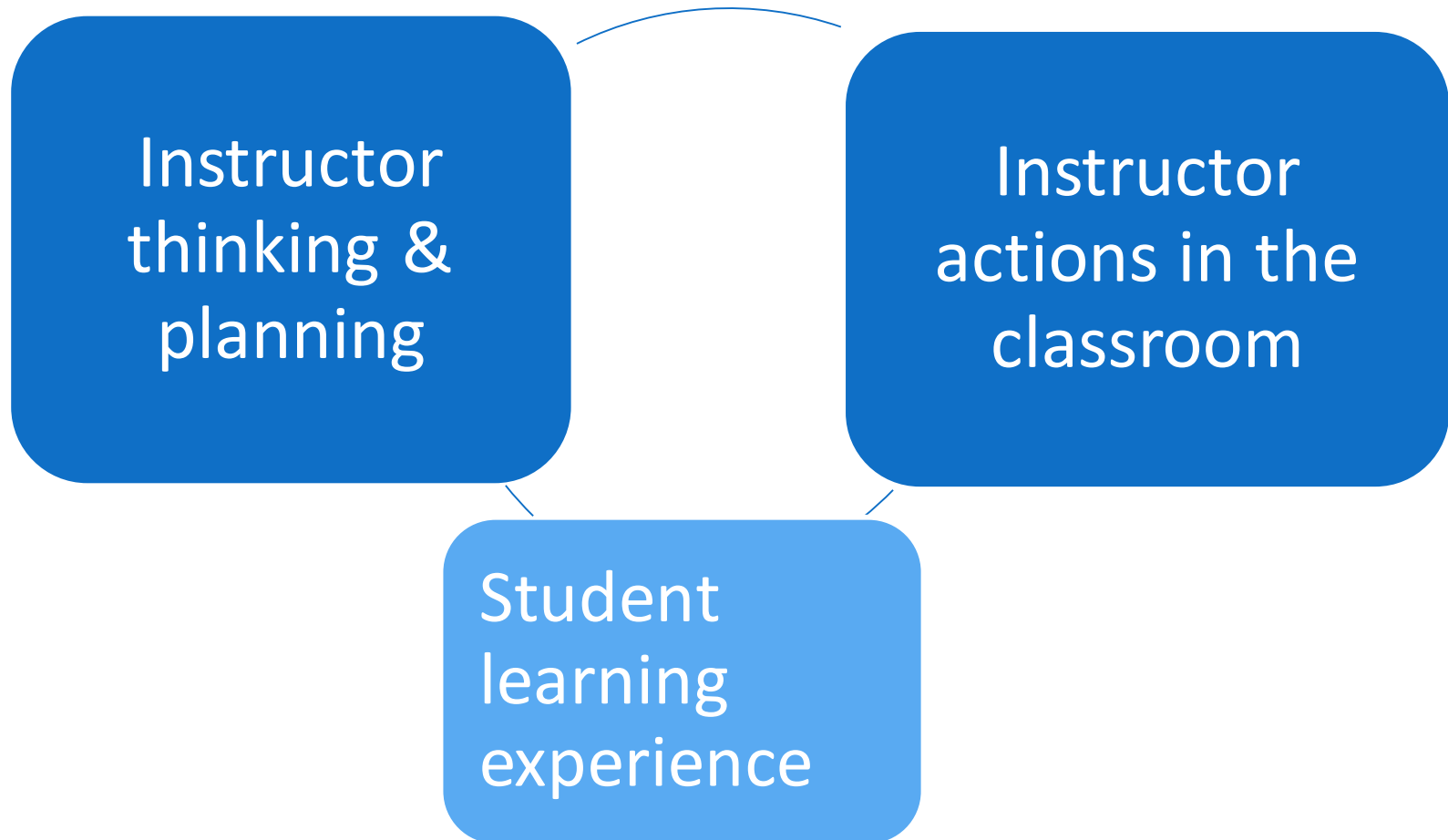
# What did students say about learning in an ALC?



- 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?







# 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

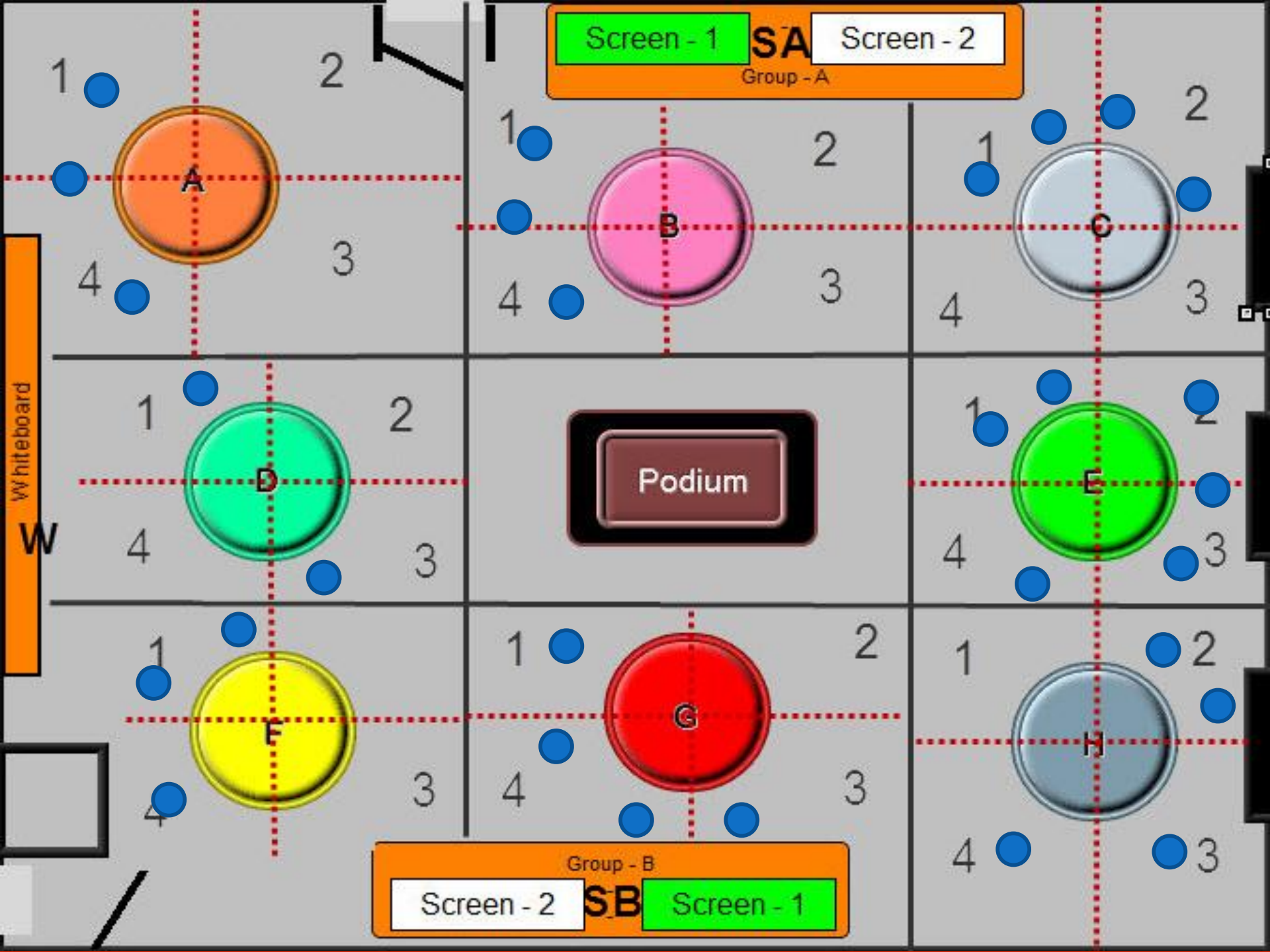
## Start Time

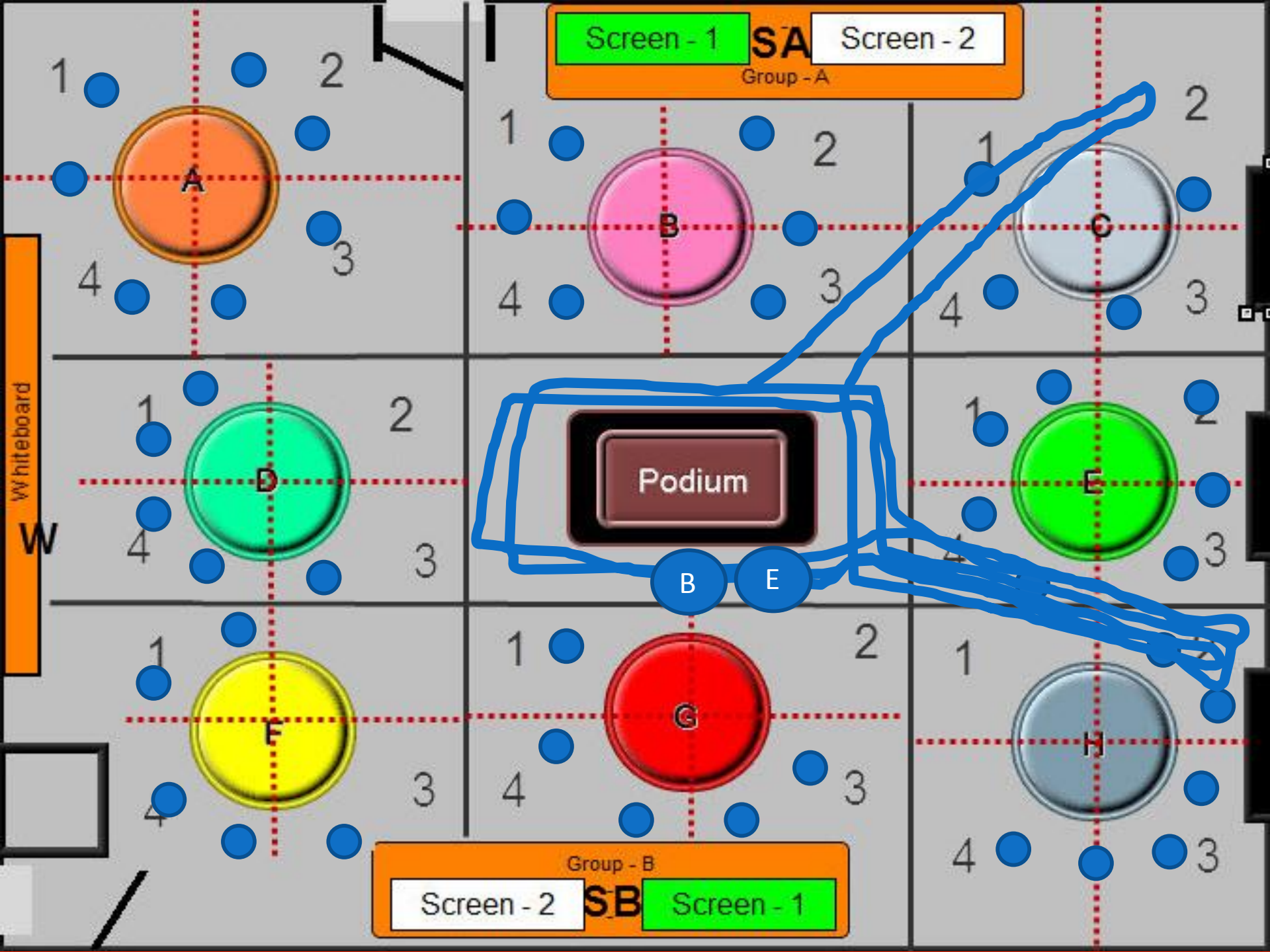
## Overall Objective of Class

## Objective of Activity/Strategy

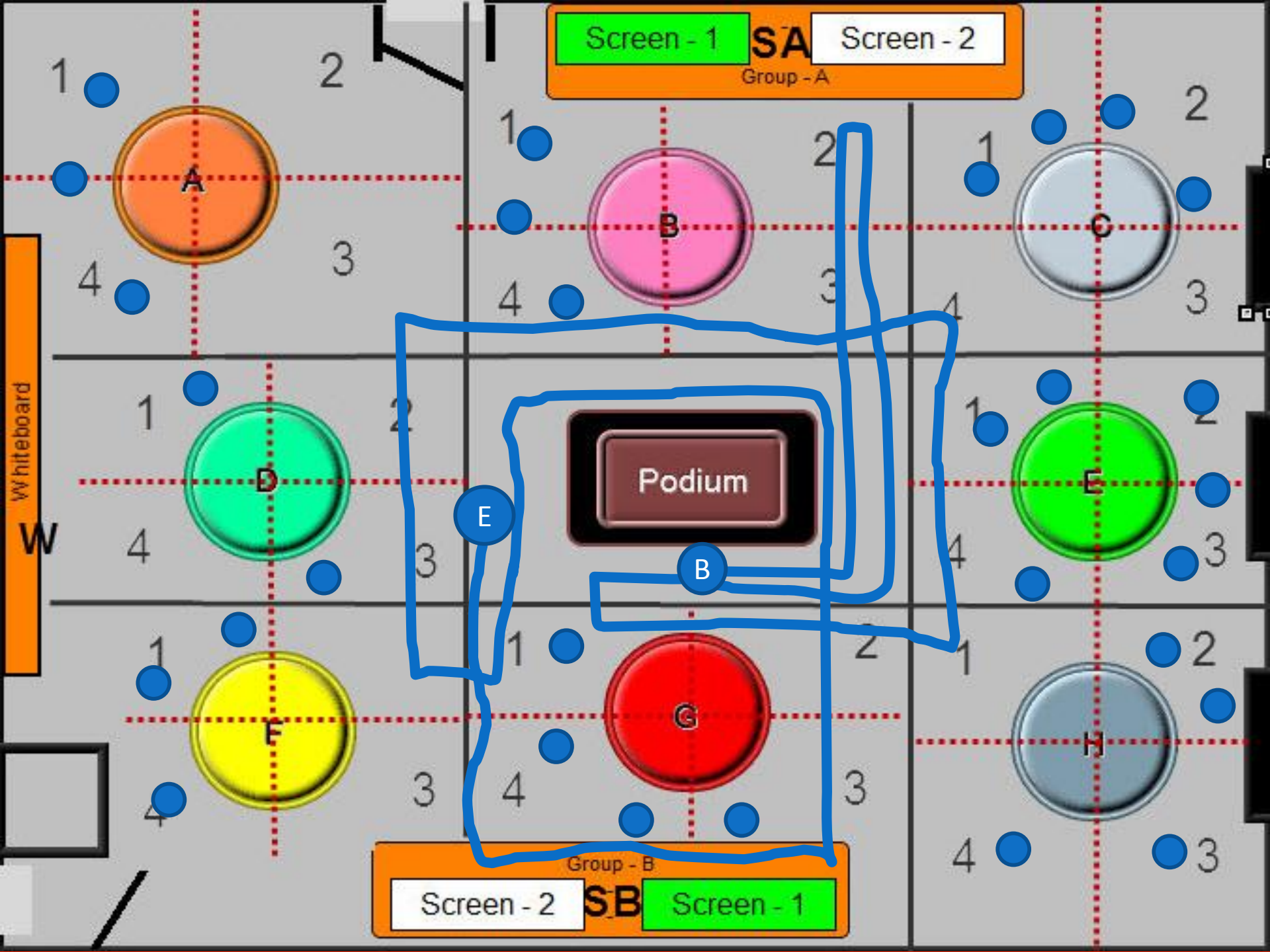
## Strategy

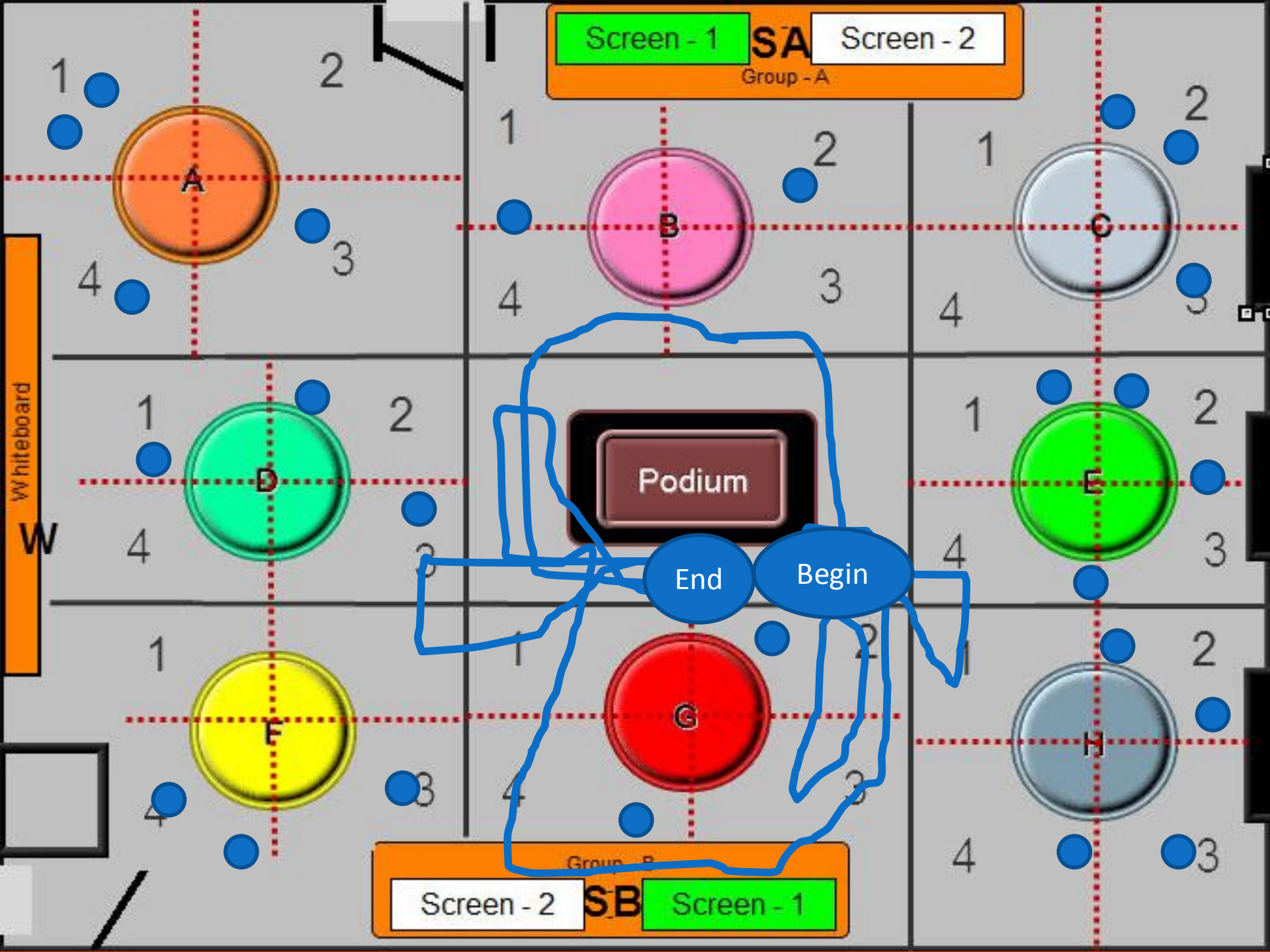
- ☐ Lecture
- ☐ Question/Answer
- ☐ Demonstration
- ☐ Group Activity
- ☐ Individual Activity



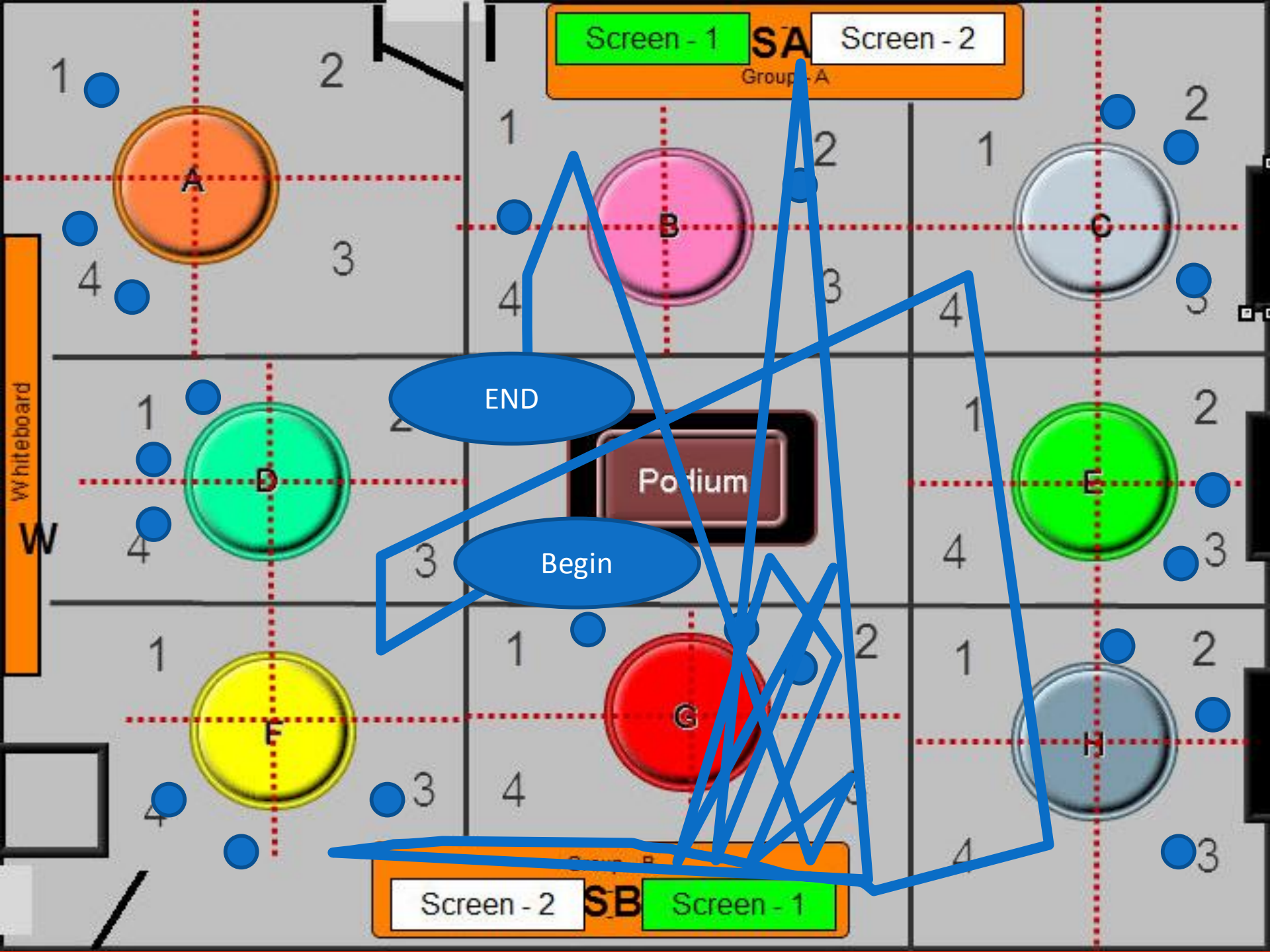




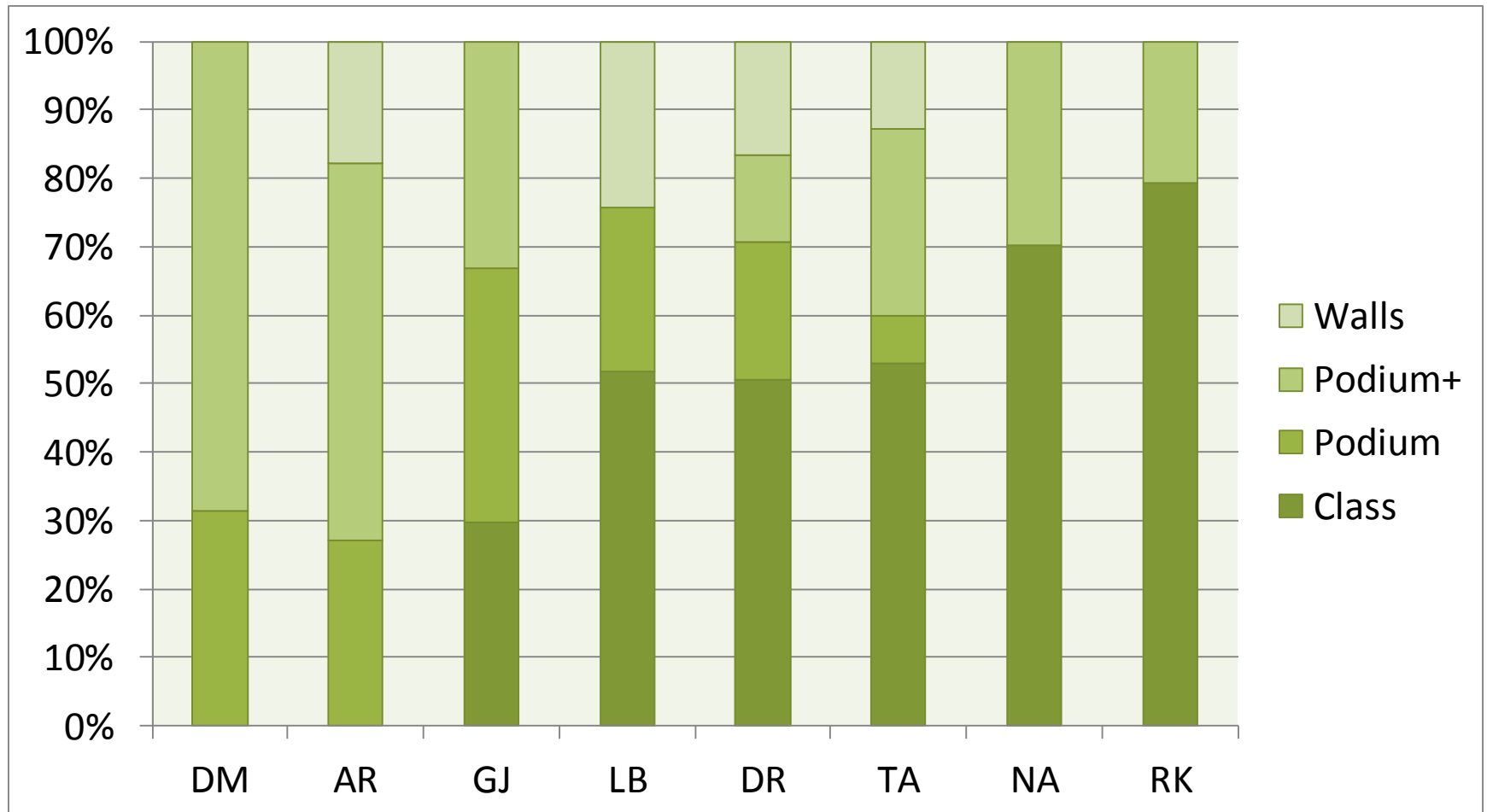






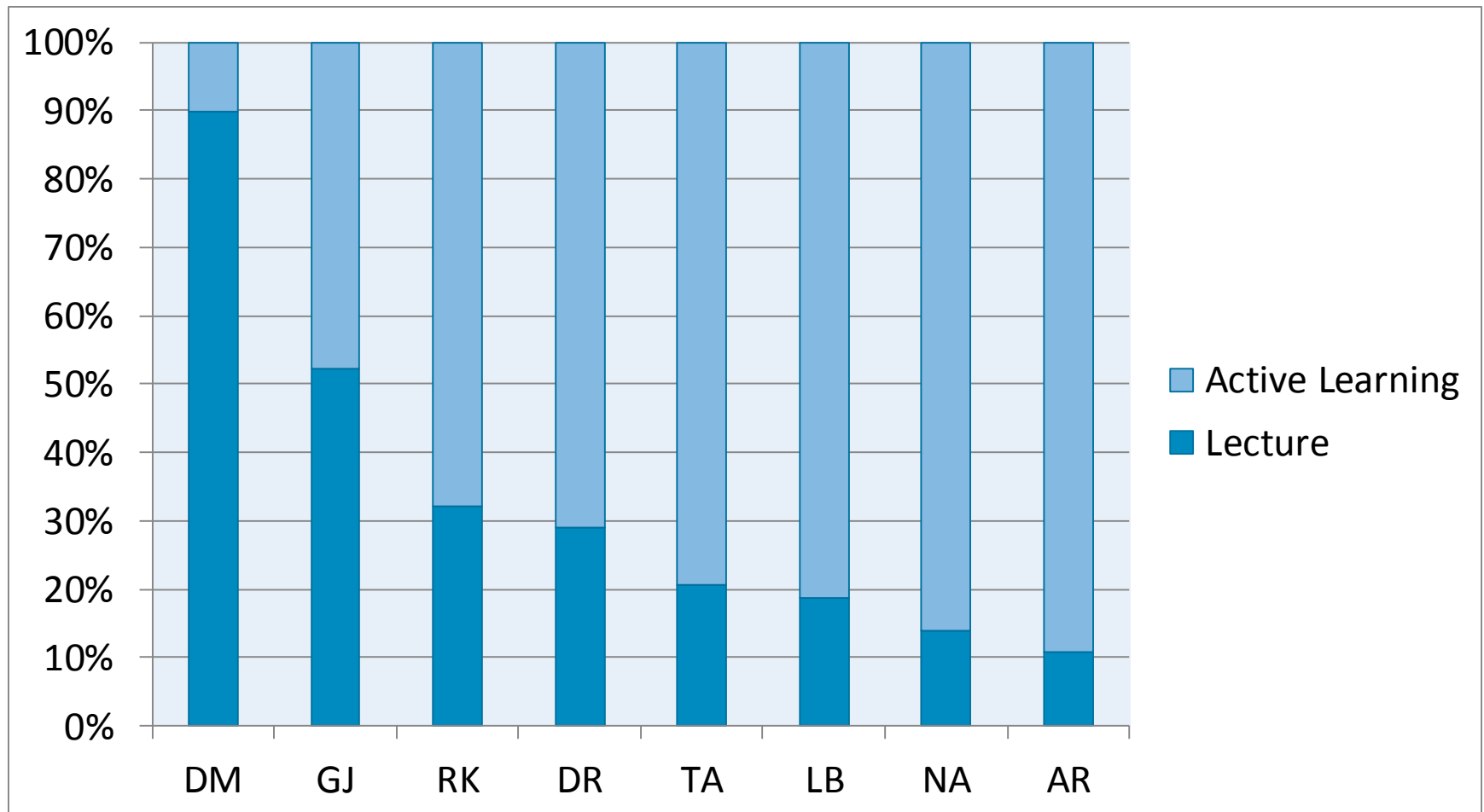


# Observations - Locations





# Observations - Strategies



# 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

# 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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**Design well-aligned instruction that takes advantages of the affordances that new spaces provide.**

**Thank you!**

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