Learning Spaces Collaboratory Webinar

Dissolving Disciplinary Boundaries & Embracing the Future: 21st century Spaces for Undergraduate STEM Learning Communities

January 28, 2015

http://www.pkallsc.org/

The central LSC strategy is to create and catalyze a feedback loop through which the broad community of stakeholders can:

- ask and respond to questions about all aspects of planning learning spaces
- collaborate in exploring lessons learned from the community of experienced practitioners
- come to understand what is known about how the quality and nature of learning spaces affects the quality and nature of learning in the undergraduate setting.

Learning Outcomes

- About transforming the experience of learners in undergraduate STEM courses when the focus is on integrative, interdisciplinary, innovative learning

- About re-imagining and repurposing new kinds of physical spaces to accommodate new kinds of integrated curricular initiatives, new kinds of pedagogical practices

- About what works in realizing interdisciplinary STEM learning environments.






Facilitators

- Dennis Cuddy
- Russ Ellis
- Carolyn H. Eyles
- William R. LaCourse
- David O. Ribble
- Sarah Symons

Moderator

- Jeanne L. Narum

McMaster University

Hamilton, Ontario, Canada

Honours Integrated Science Laboratory

Who are we?

Carolyn Eyles, Director

Russ Ellis, Lab Coordinator

Sarah Symons, Teaching Professor

Members of the Integrated Science (iSci) Instructional Team (about 17 in all)

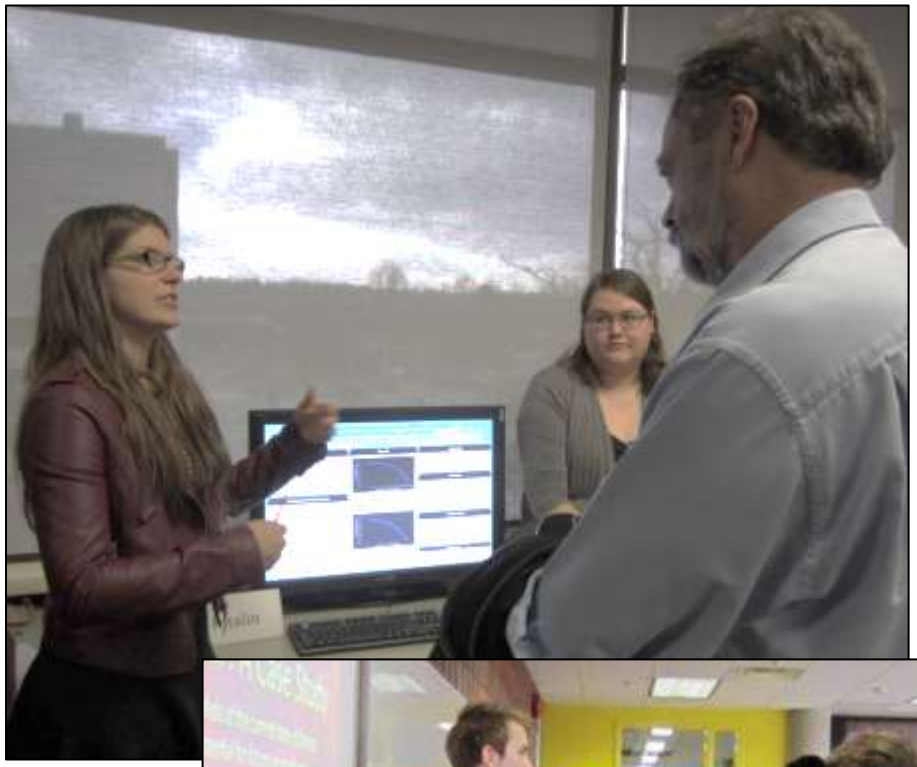
McMaster University SCIENCE

- 4-year Honours B.Sc., 60 students/year
- Interdisciplinary, research-based, collaborative, self-directed learning
- Appropriate learning spaces are essential
  - student study/collaboration, laboratory

iSci

Institutional Impact

- iSci program is viewed as a ‘petri dish’/sandbox for new and innovative pedagogies & approaches to learning
- Adopted/adapted to other (larger) programs
  - e.g. Life Science program – 1000 students/year
- Longitudinal pedagogical research project evaluating success



McMaster University SCIENCE

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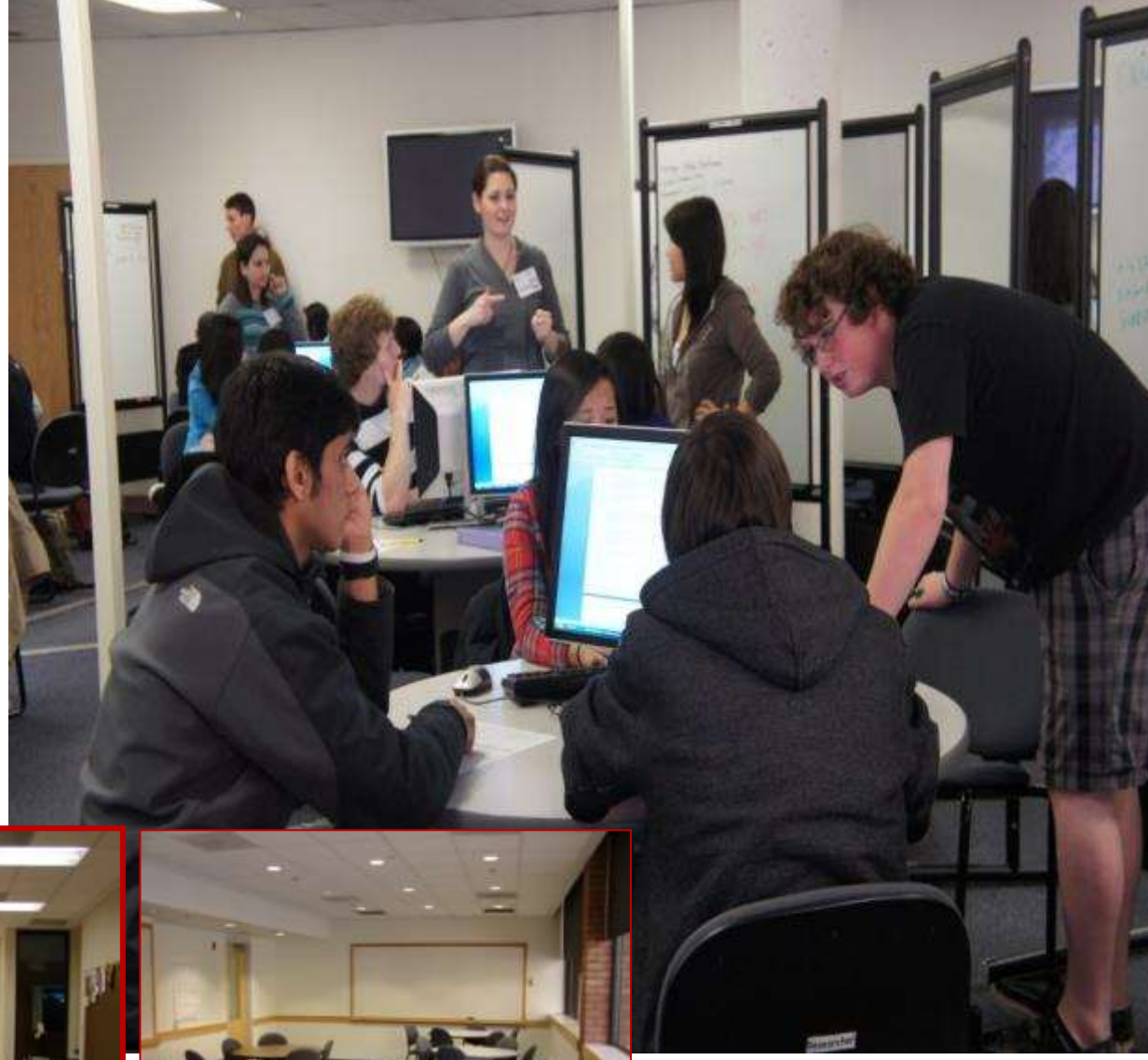
Dennis Cuddy, Manager of Administration and Facilities for the Dept of Chemistry and Biochemistry

William R. LaCourse, Dean, College of Natural and Mathematical Sciences



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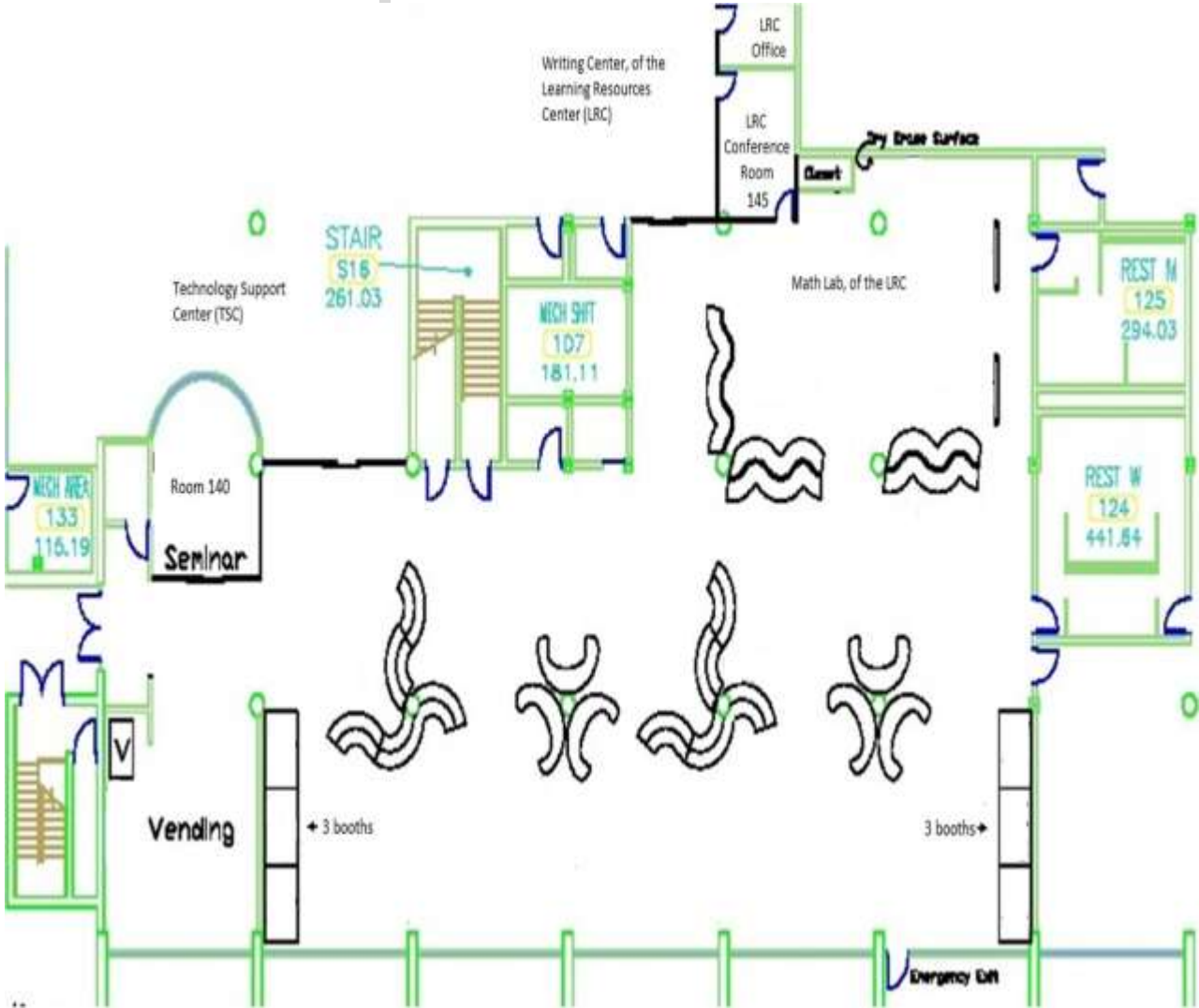
The Retriever Learning Center

- **Provide Distinctive Undergraduate Experience:** convivial social learning space – a socially connected learning environment - in proximity to co-located library services, tutoring, information resources and information technology.

- **Improve Student Retention and Graduation Rates:** encouragement of peer to peer learning, group learning, informal student/faculty interactions; tutoring, library research assistance, and tech support in convenient proximity and integrated with learning activities; environmental positive reinforcement of a sustained study regime.



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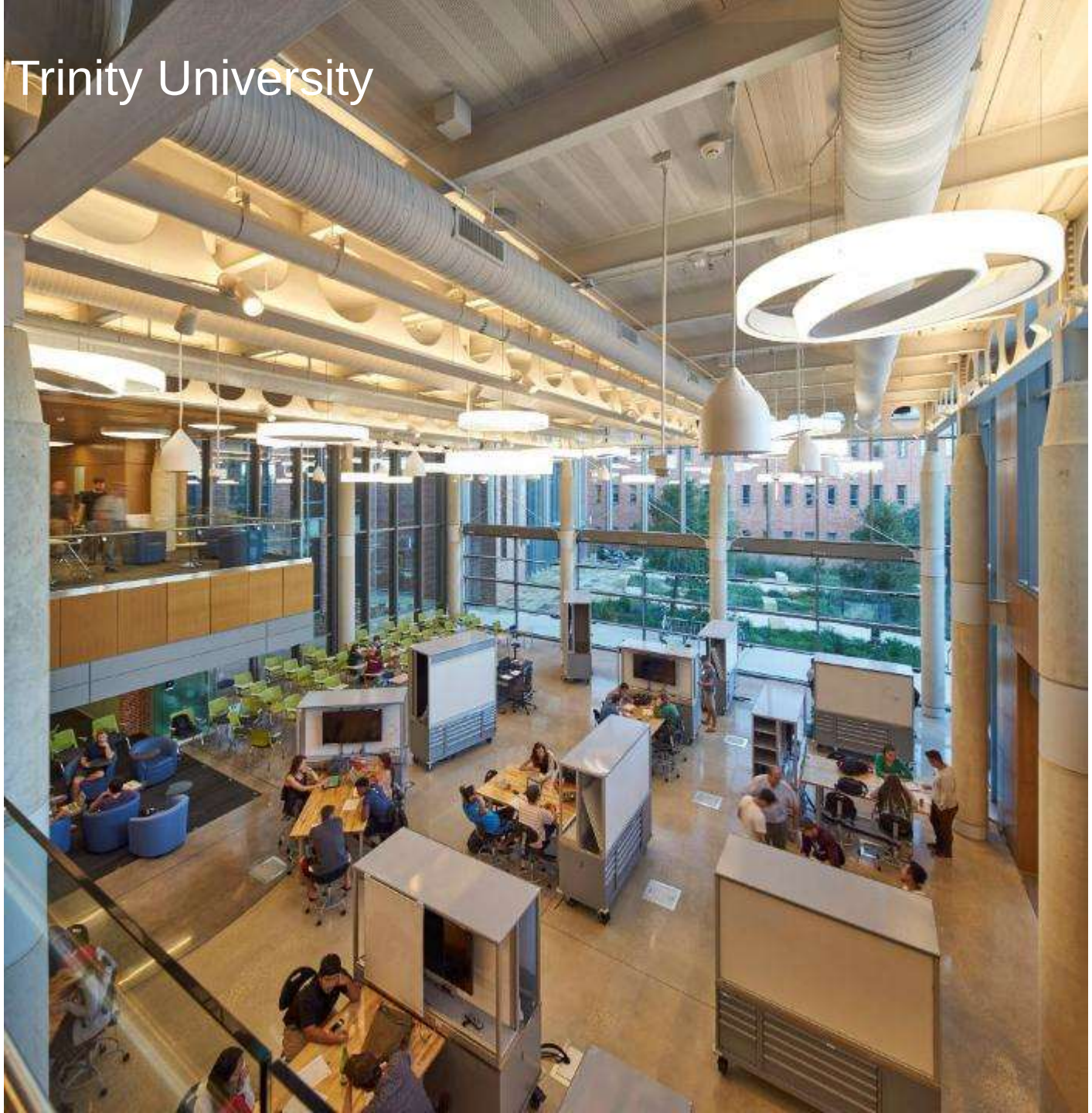
UMBC—ILSB
Interdisciplinary Life Sciences Building

Planned for 2016

- A suite of “active” learning spaces
- No departmental ownership
- A “collaboration requirement” for research space
- An incubator for innovation
- Design criteria: student interaction



David O. Ribble,
Murchison Term Professor and Chair of Biology

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Center for the Sciences and Innovation

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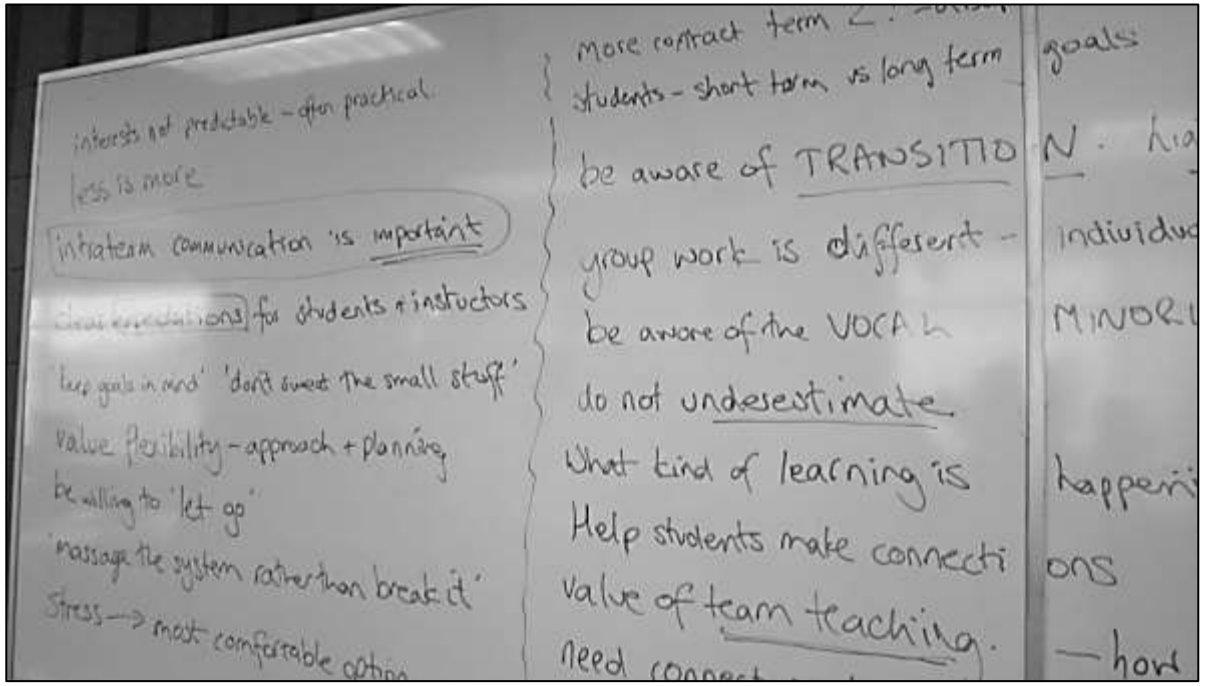
iSci@McMaster



Design & development of program – 2005-2009

- involved faculty reps (junior & senior) from each science discipline, Chief Librarian, lab coordinator, student

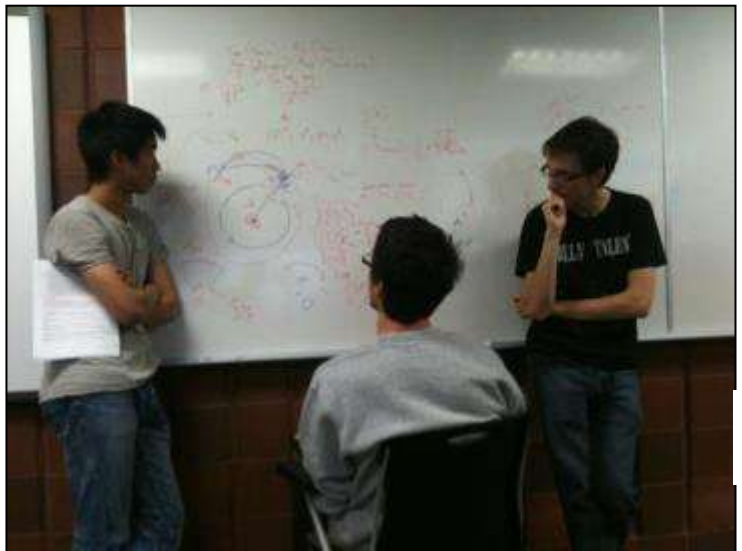
First intake September 2009

Design of laboratory – 2011 - 2013 (opened September 2013)

Space Design

Pedagogy

Space



Example: Level 1 Research Project: Planetary Exploration: Mars analogue component

Plan a mission to Mars
Outline scientific goals and mission objectives; design an undergraduate experiment

Mathematics
Use of mathematical software to simulate planetary motion

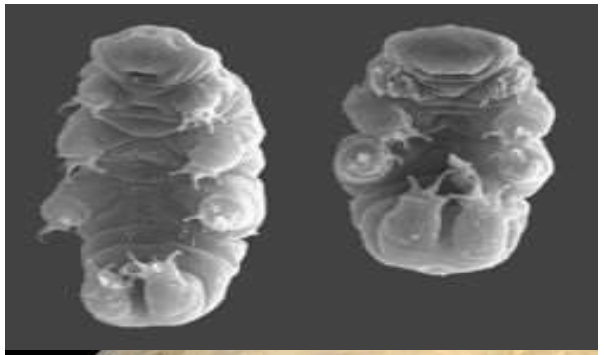
Physics
Kepler's laws, angular momentum, Newtonian gravity

Life Science
Extremophiles, biogeochemical cycles

Earth Science
Earth as an analogue: fluvial processes, tectonic activity, glacial movement

Chemistry
Combustion of rocket propellants

Psychology
Manned vs. unmanned missions, group dynamics



iSci Teaching Lab

Quick facts:

- opened September 2013
- 3000 square feet
- renovated office space

Laboratory space suitable for:

- wet labs requiring fume hoods (chemistry, biology)
- dry labs requiring various equipment & supplies (physics, earth science, biology, math)
- collaborative and active learning, different instructional styles
- student learning & exploration of science

McMaster University SCIENCE iSci

Flexibility in Design


Level 2 Neuroscience


Level 1 Physics


Level 1 Chemistry

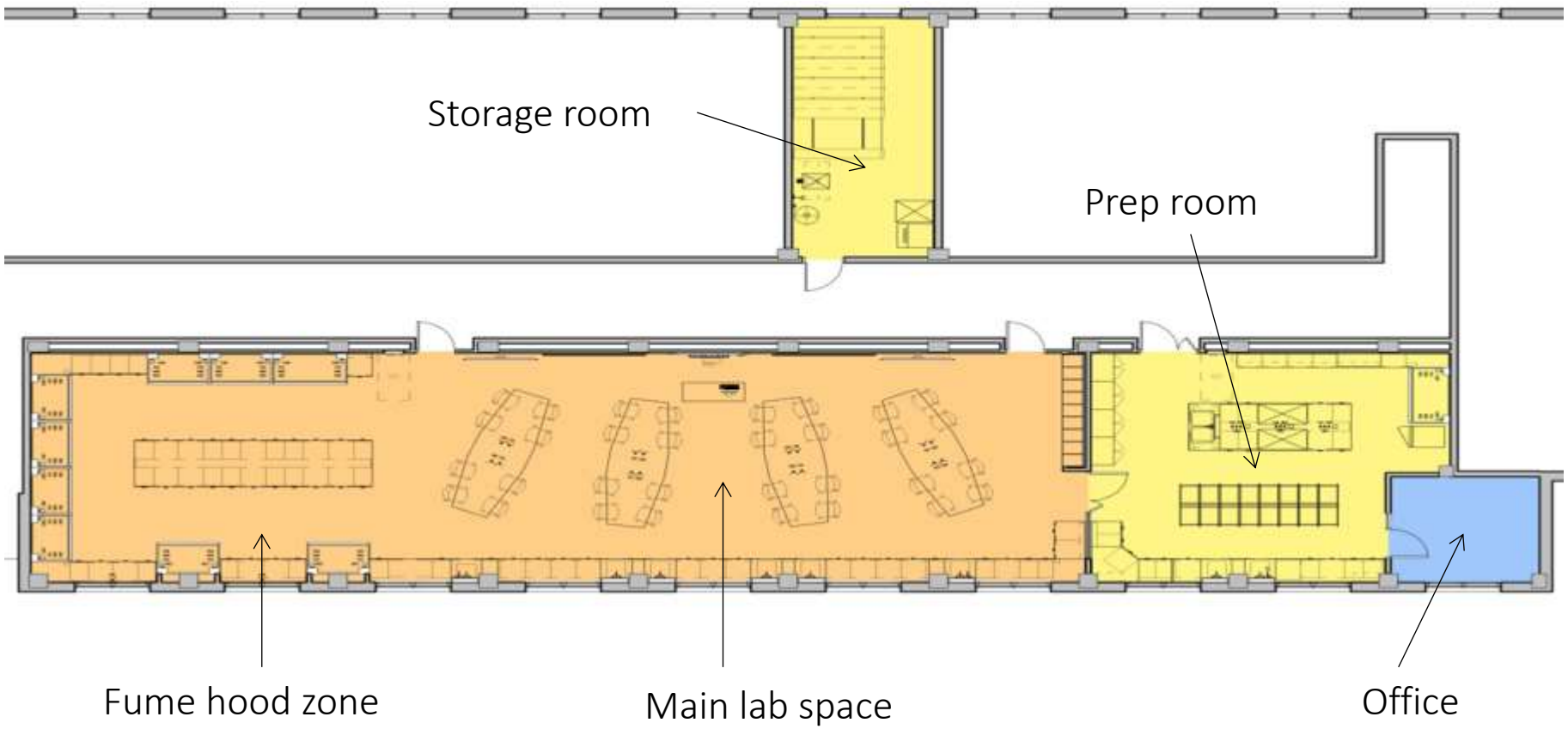

Level 2 Thermodynamics

McMaster University SCIENCE

Location

iSci

Architectural Layout



Going Green

Green ductless hood

Energy-efficient ductless Green hoods utilize the latest Neutrodine® technology

Initial cost is greater, but Green fume hoods cut energy costs by 96% and reduce operating costs by 70%

Accessibility & Safety

The iSci lab was designed to be fully accessible and meet the standards of the Accessibility for Ontarians with Disabilities Act

Connecting classroom learning…

…with hands-on applications

Level 1 Research Project 3: Sustainable Energy

Questions & Comments

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Where it all started

Steps Along the Way

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Then & Now

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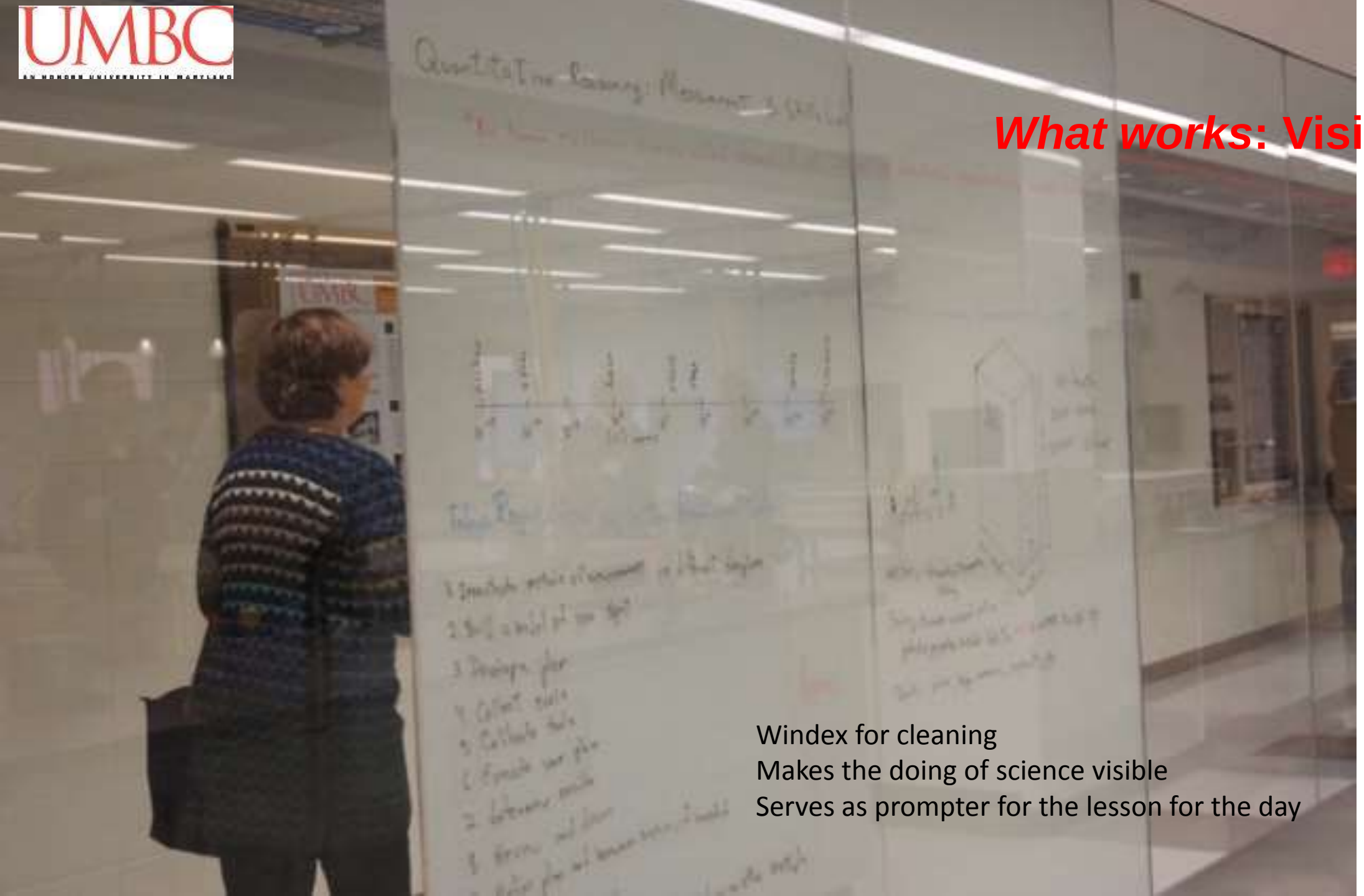
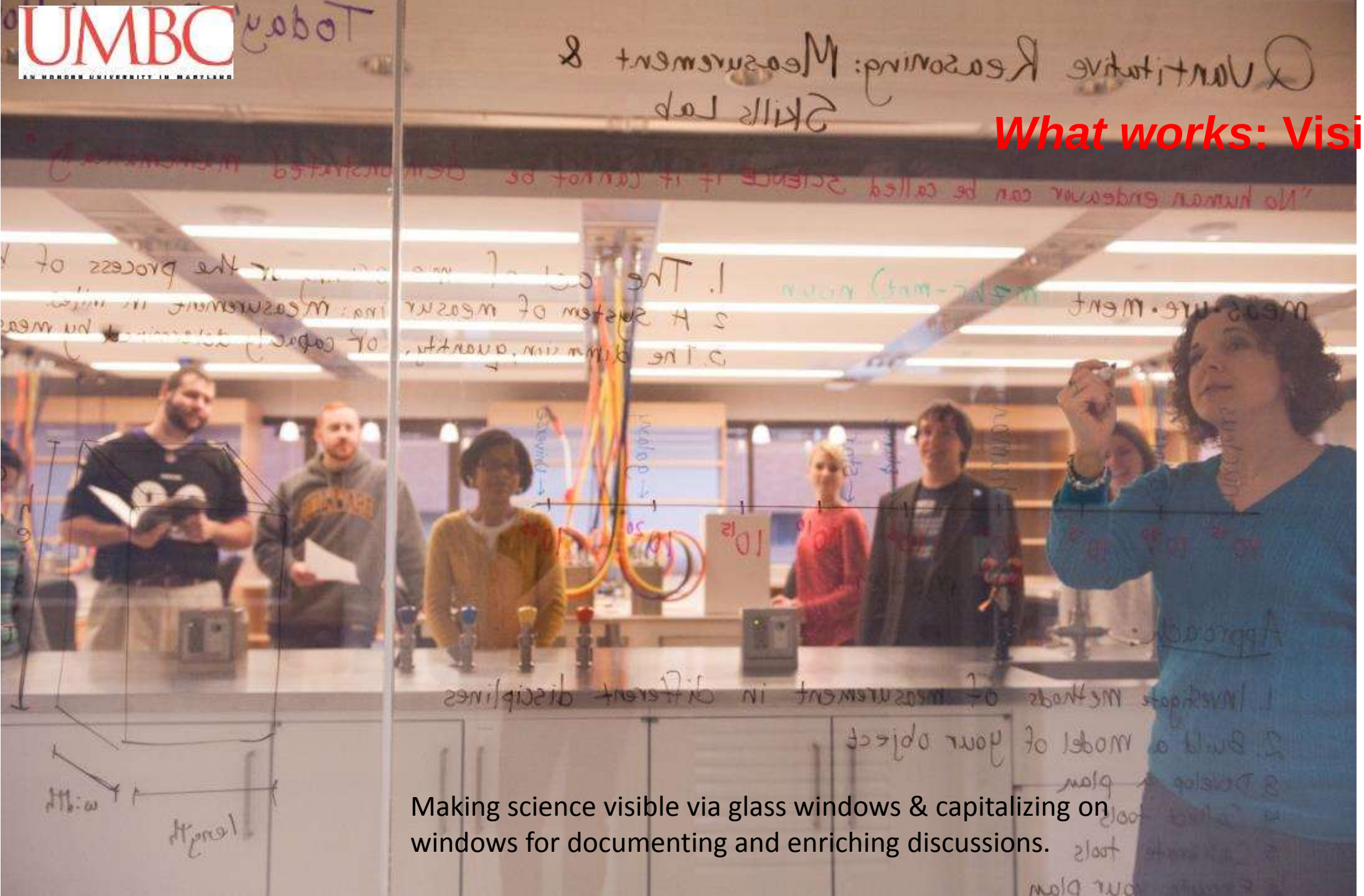
What works: Visibility

Making science visible via glass windows & capitalizing on windows for documenting and enriching discussions



What works: Visibility

Windex for cleaning
Makes the doing of science visible
Serves as prompter for the lesson for the day



What works: Visibility

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Then & Now

What works: Flexibility

The mantra—flexibility now and into the future (benches can be lowered for outreach and for accessibility).

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What works: Flexibility

What works: Integrated technologies

Camera can:

- ✓ capture demonstrations and team-work for sharing within the lab and to teaching labs on the 3rd floor

- ✓ capture what is happening in the SLC for purposes of assessing how the space is being used (preparatory for future planning)

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What works: Flexibility

What works: Flexibility

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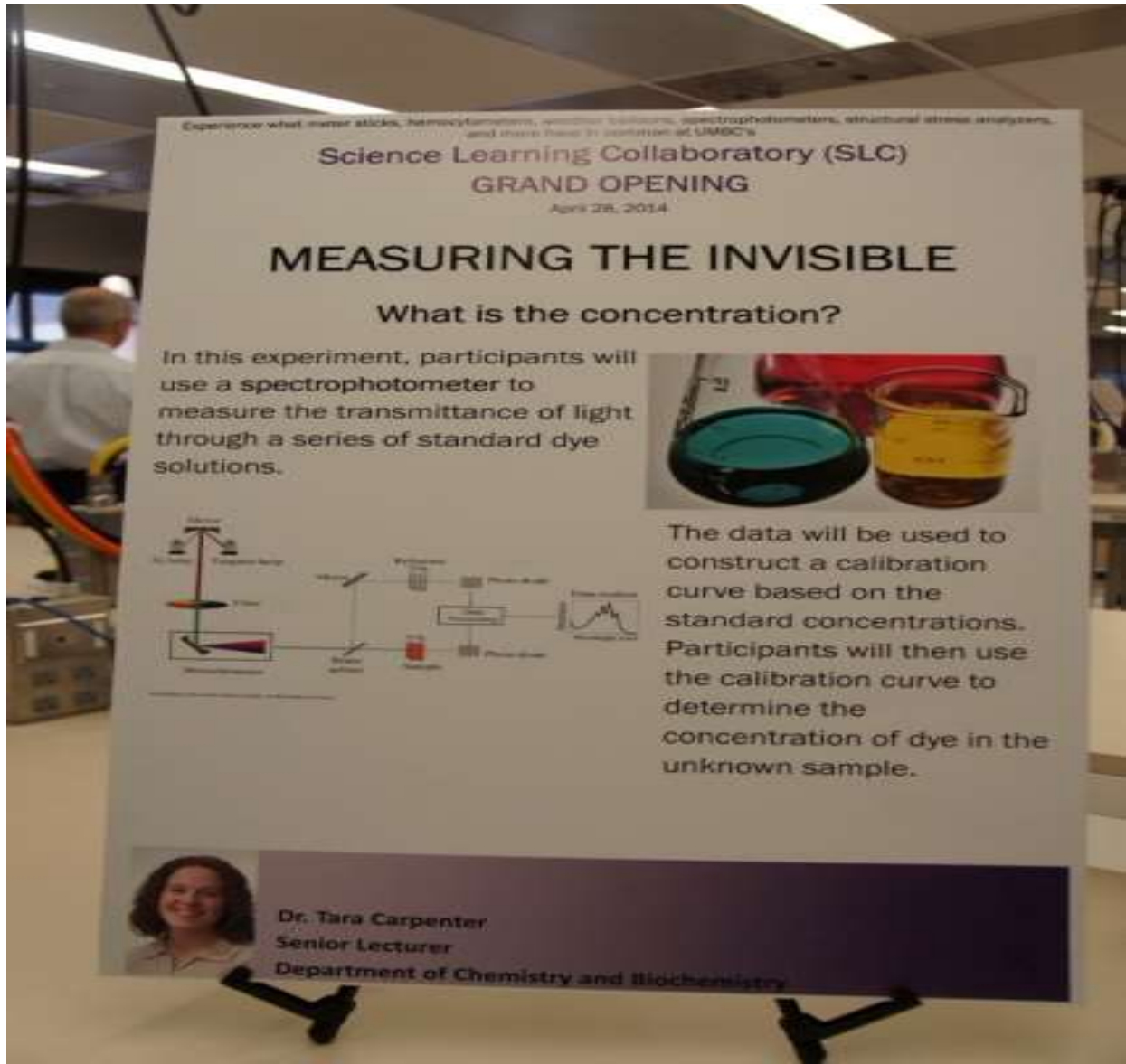
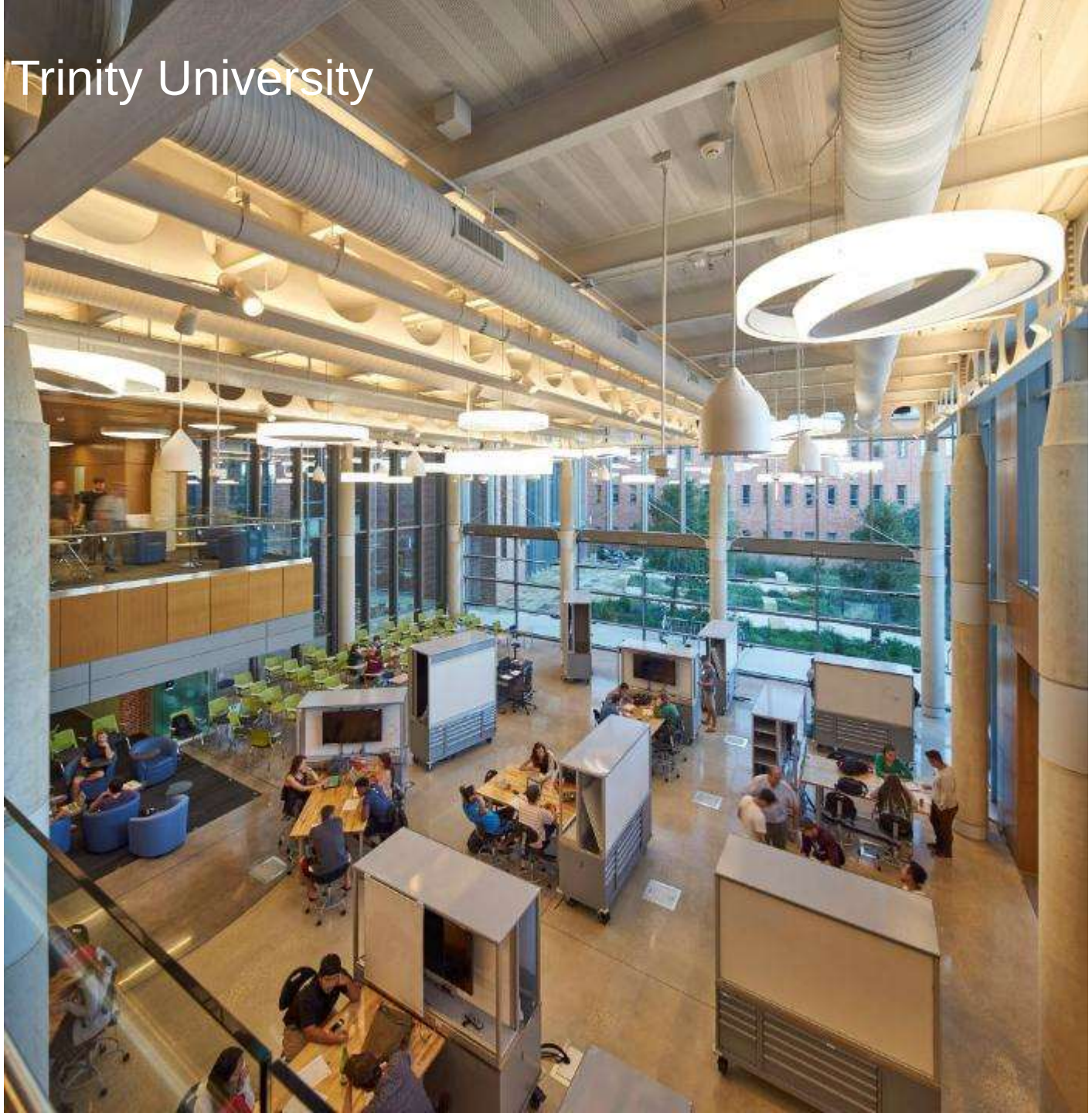
What works: Active collaborating teams



What works: Active collaborating teams

Questions & Comments



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Trinity University Points

- Innovation
- Integrated project grew from HHMI curricular integration
- Importance of planning committee
- Importance of metrics/impacts
- Maintenance/sustaining of integration

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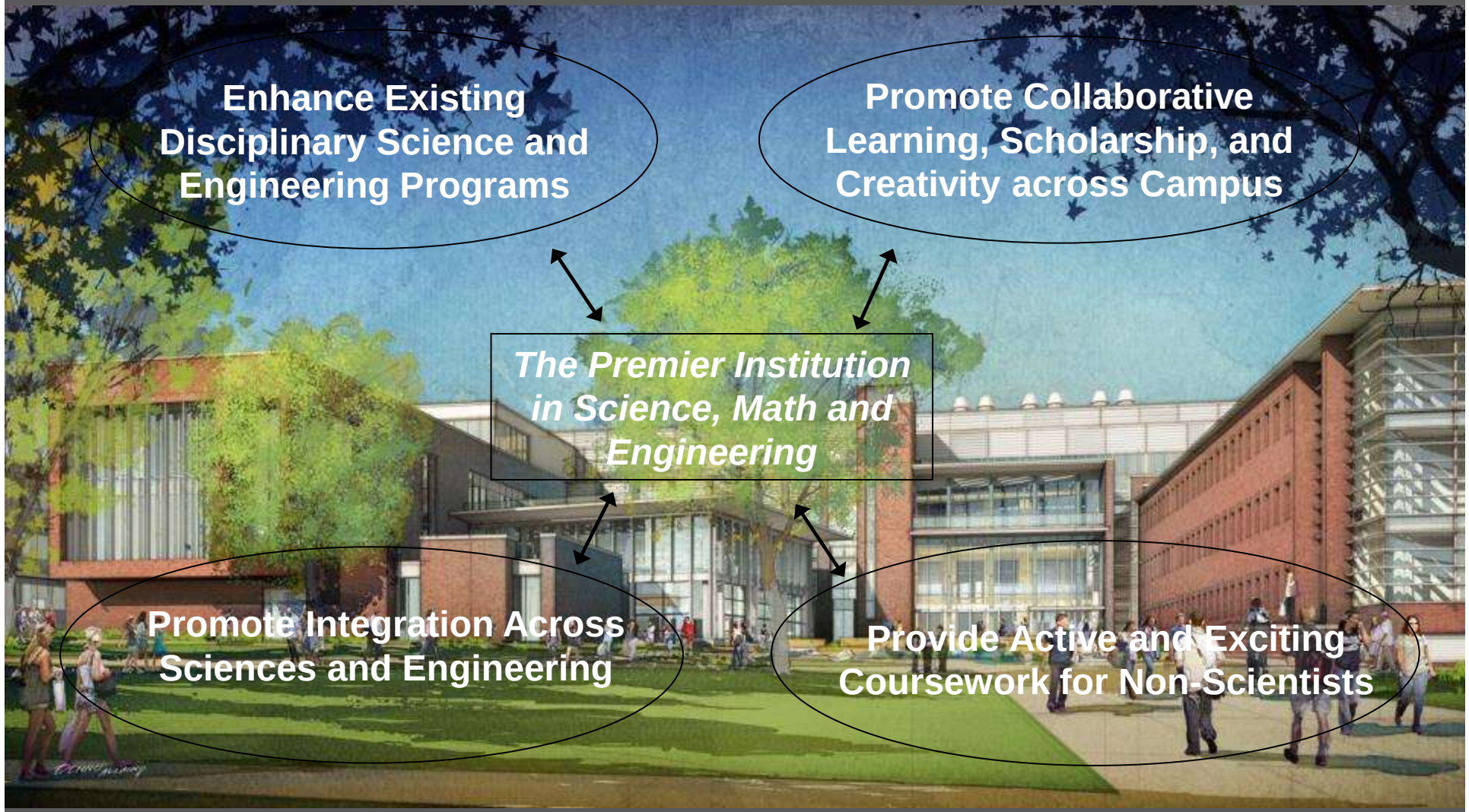

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Trinity University

CSI

- Biology
- Computer Science
- Chemistry
- Engineering
- Psychology

- Biochemistry
- Neuroscience

- Geology
- Mathematics
- Physics

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Atrium

- Biology
- Computer Science
- Chemistry
- Engineering
- Psychology

- Biochemistry
- Neuroscience

- Geology
- Mathematics
- Physics

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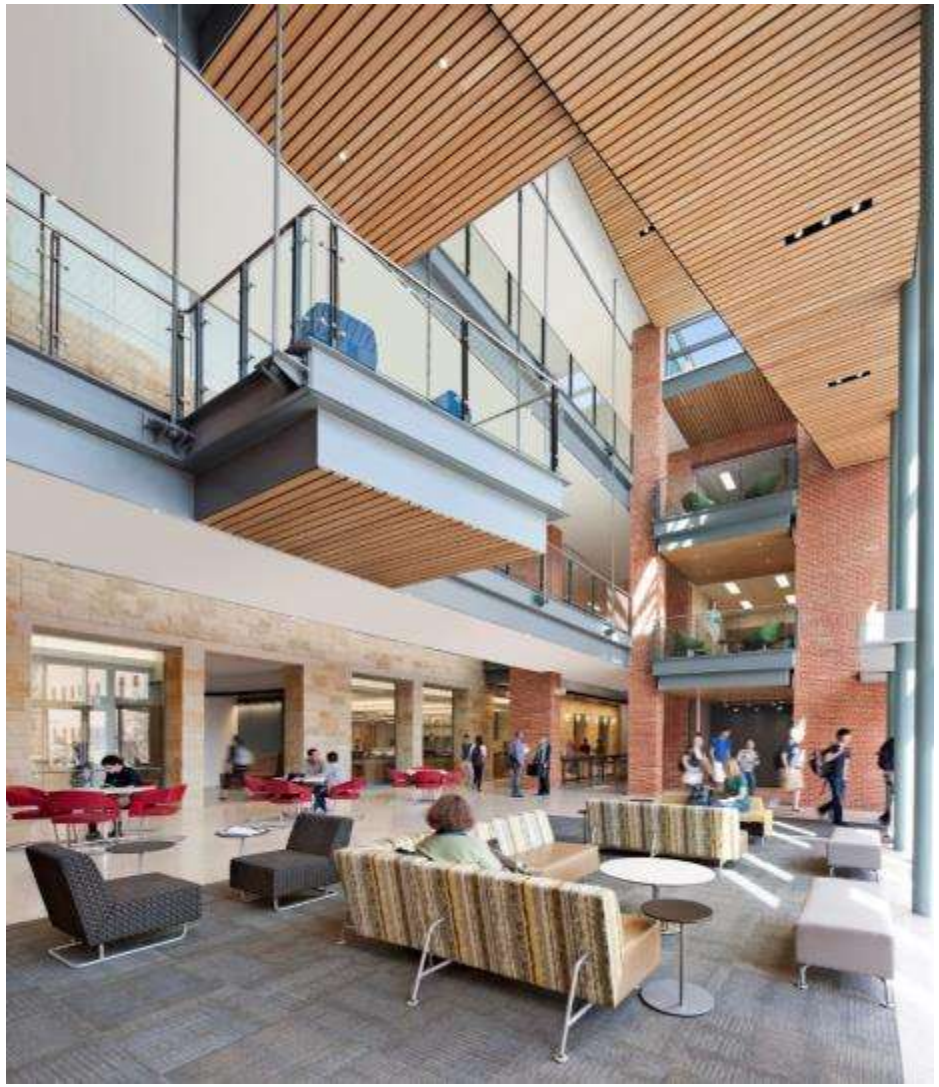
So how can a biology curriculum be organized to

"induce students to enjoy science from the first day"

of their academic experience in a biology course?

Project Kaleidoscope, 1991



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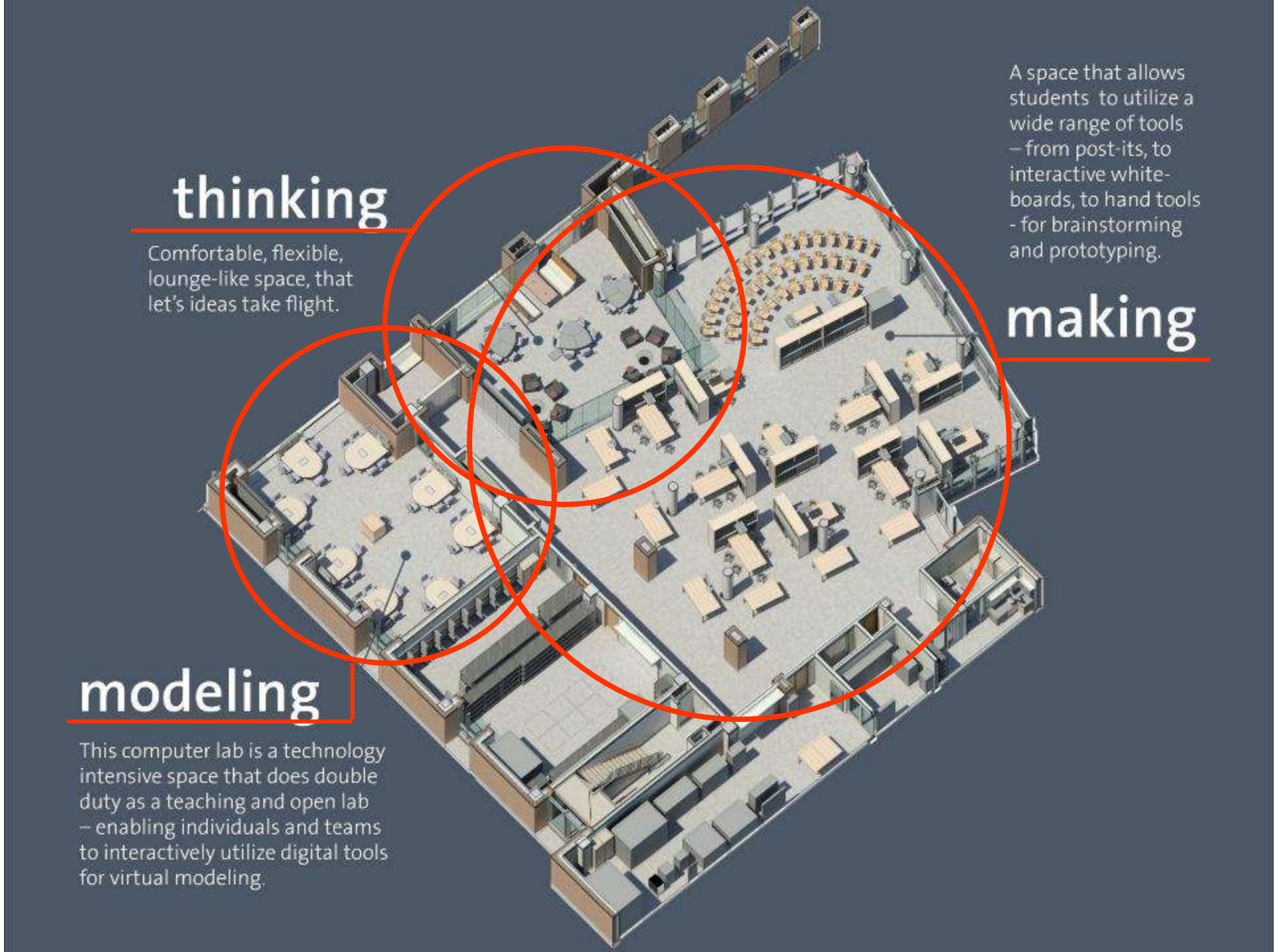

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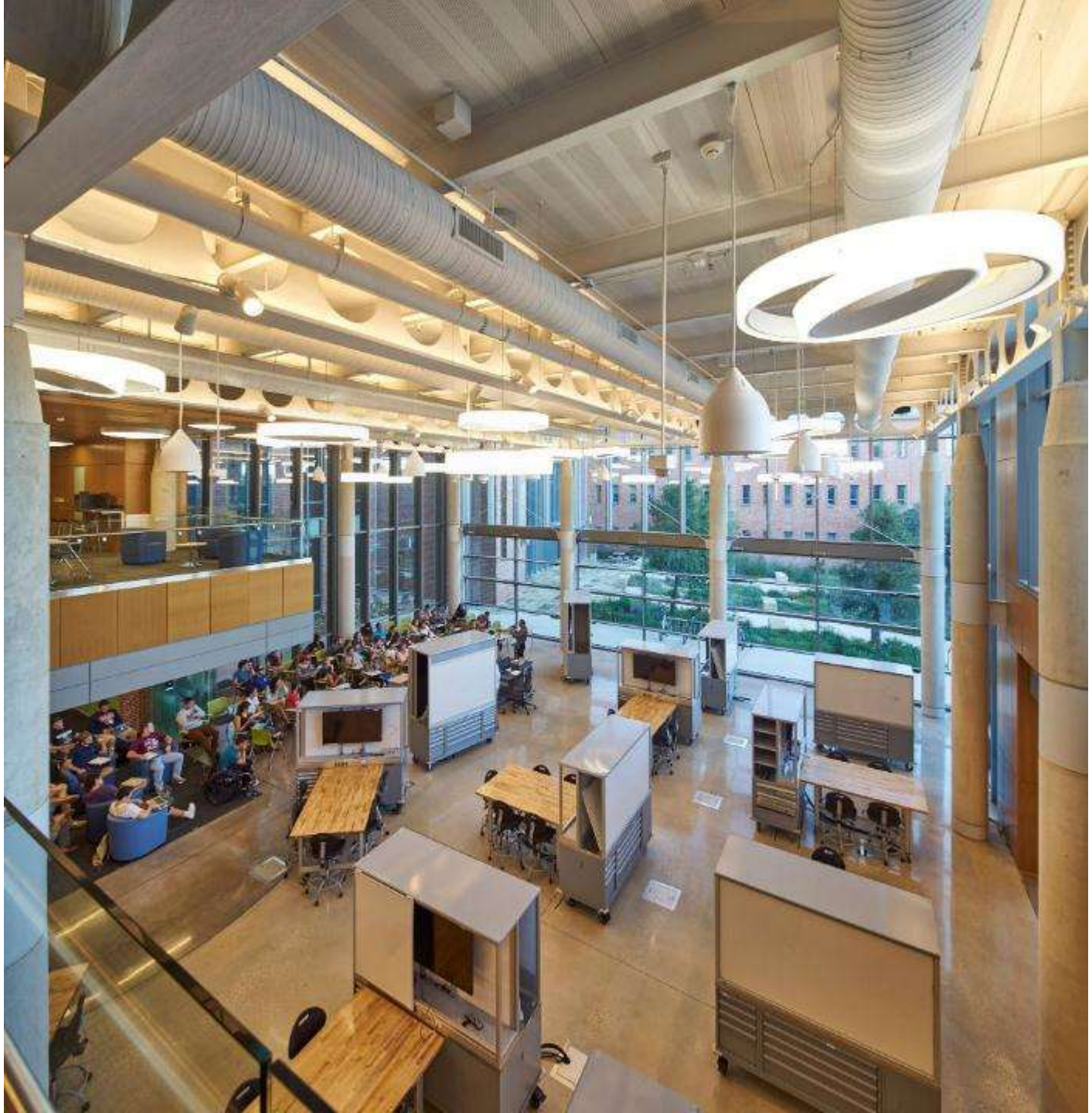
Project Lab



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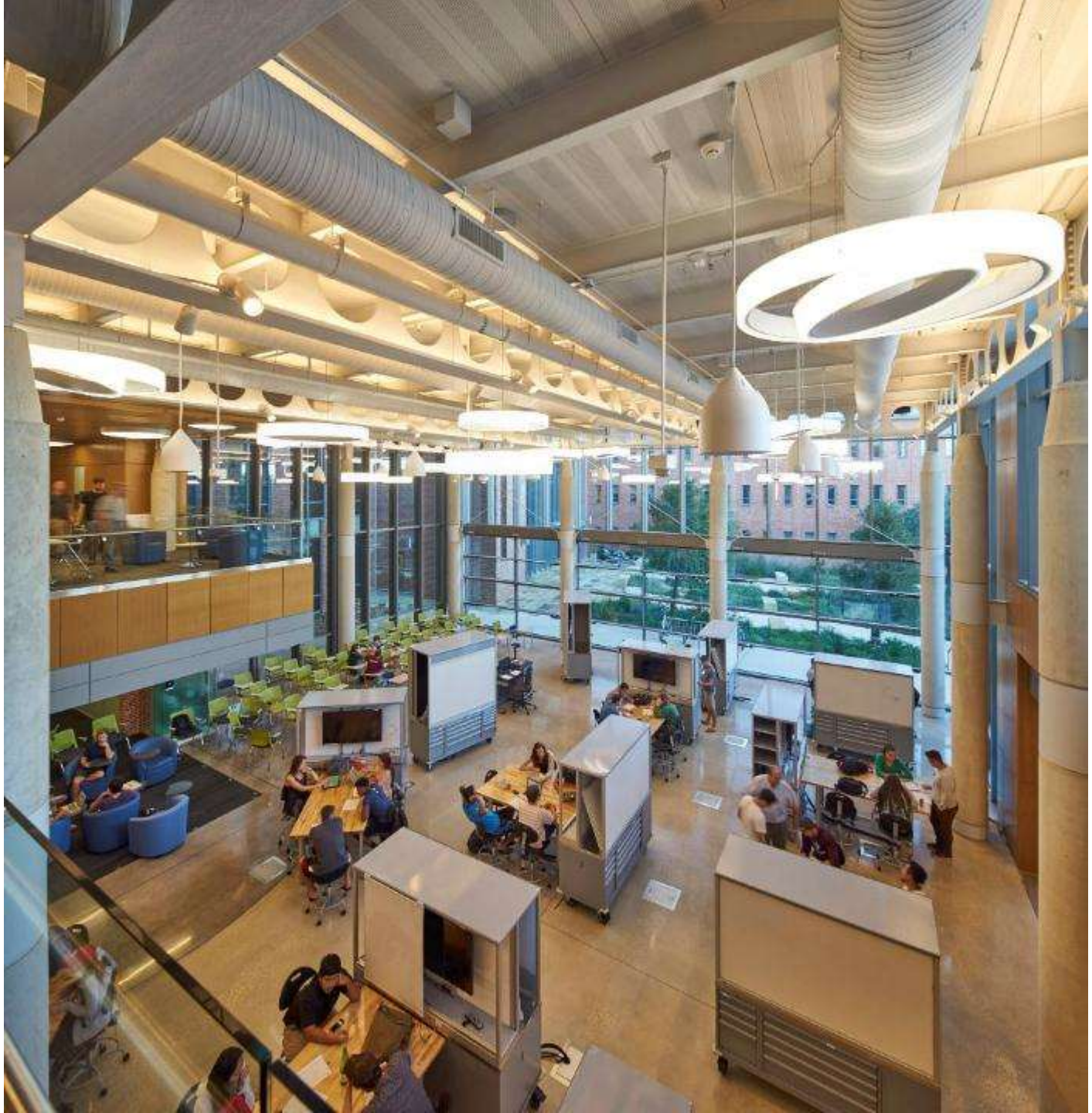

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PROJECT GOALS

1. Increase interest by prospective students in science, math, and engineering (STEM).
2. Increase interest in science and engineering as career among Trinity students.
3. Increase interest in science and engineering by non-science majors.
4. Improvement in productivity among faculty and students in science and engineering.
5. Facilitate and increase inter/multidisciplinarity among sciences.
6. Improve career opportunities for students in science, math, and engineering.

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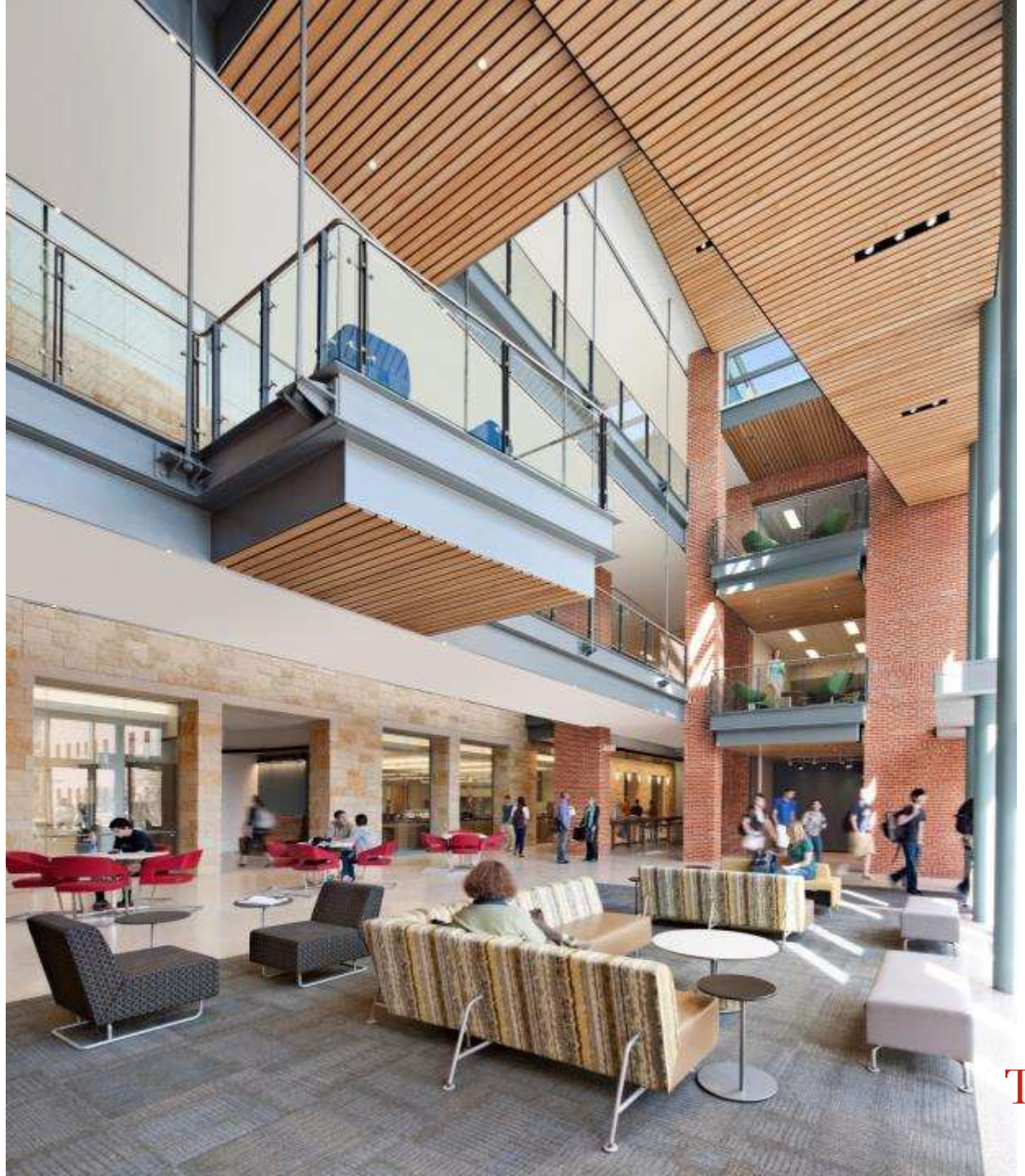

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Facilitator Conversation

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Auraria Library ♦ Berea College ♦ Bryn Mawr College ♦ Calvert Wright Architecture, PC ♦ Calvin College ♦ Carleton College ♦ Celli-Flynn Brennan ♦ Claremont Colleges Library ♦ CSO Architects ♦ Grimm + Parker Architects ♦ Harford Community College ♦ Harley Ellis Devereaux ♦ HOK ♦ Hord Coplan Macht ♦ James Madison University ♦ Linfield College ♦ Marshall Craft Associates ♦ McMaster University Library ♦ MIT Libraries ♦ Nebraska Wesleyan University ♦ Pacific Lutheran University ♦ Payette Associates Inc. ♦ SERA Architects ♦ SRG Partnership, Inc. ♦ Stantec Architecture Inc. ♦ SWBR Architects ♦ Syracuse University ♦ The Galloway School ♦ The S/L/A/M Collaborative ♦ UCLA ♦ Union College ♦ University at Albany ♦ University of Arizona ♦ University of Illinois/Center for Innovation in Teaching and Learning ♦ University of Richmond ♦ University of Wisconsin-La Crosse ♦ University of Wisconsin-Madison ♦ VMDO Architects ♦ Willamette University

Learning Spaces Collaboratory

Join the conversation – send us your ideas about questions to ask in shaping learning spaces

pkallsc@pkallsc.org

Spring LSC Webinars

- **Adapting Classrooms for Student-centered, Individualized, and Technologically-supported Pedagogies**
  March 5, 2015
- **Classrooms for Flipped or Blended Learning**
  April 15, 2015
- **Implementing an AAU STEM Initiative: Integrating Renewal of How and Where Learning Happens**
  May 5, 2015
- **Reframing the Concept of Maker Spaces: Maker Spaces Reinvented**
  June 10, 2015