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# Improving undergraduate education through active learning spaces

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# **Abstract for DBER Group Discussion on 2012-02-07**

**Presenter, Department(s):**

T. Jack Morris  
School of Biological Sciences

**Title:**

Improving undergraduate education through active learning spaces

**Abstract:**

I attended a meeting at U Minn from August 4-6 that was the first National Forum on improving undergraduate education through active learning spaces. The forum was held in the newly constructed and ultra modern "science teaching and student services building" on the U. Minnesota Twin Cities campus. The focus was on advancing practice and research on technology-enhanced learning spaces for undergraduate education with a focus on STEM disciplines. I will talk about the design of such interactive teaching spaces, some of affecting the use of these spaces and some successful practices that have been used to teach science to undergraduates in spaces specifically designed for active learning. We also had the opportunity to build networks with colleagues in order to advance their campus efforts. The presenters included Bob Beichner, an innovator of the Scale Up program; Larry Michaelsen, an expert on Team-based learning, and Robin Wright, host and developer of an interactive version of Introductory Biology at U Minn. I will try to summarize some of the enthusiasm and promise for this form of instruction and how this movement away from strictly lecture hall based instruction is having a national impact on science education at universities nation-wide. I will also introduce you to our local effort to embrace this form of instruction.

# National Forum on Improving Undergraduate Education through active learning spaces!

T Jack Morris - Biological Sciences

August 4-6, 2011, University of Minnesota, Twin Cities.

Focus - use of technology-enhanced learning spaces for undergraduate education with a focus on STEM disciplines.

Science  
teaching &  
student  
services  
building



## T Jack Morris - my career perspective

BS/MS McGill – Plant pathology, virology '68-70

PhD UNL – Plant pathology – virology '73

Assistant to Full Prof – UC Berkeley '76 – '90

Director of SBS at UNL – '90 – 2005; now professor

Research focus on plant viruses & virus diseases

- 15 PhDs & over 20 postdoctoral researchers
- 130+ research publications
- Continuous research funding – 30+ years
- Several research awards including AAAS fellow, APS fellow and charter member of ASV

Educational focus on how I can teach better

## My teaching philosophy

Desire to impart enthusiasm for learning science, teaching science and becoming engaged in scientific research at all levels of the university experience.

### **Career experiences that define my perspective:**

- Faculty mentoring as department chair – 15 yrs
- Graduate student & postdoctoral mentor - 30+ yrs
- Undergraduate research funding – 15 yrs
- Classroom instruction contributions
  - Graduate plant virology – 30+ yrs
  - Undergraduate virology – 20+ yrs
  - Introductory biology – 5 yrs
- Development & utilization of teaching pedagogy – 2 yrs

## **Recent lessons - where should we be going ?**

- HHMI/NAS Summer Institute on “Scientific Teaching” – Madison Wisconsin, June 21-26, 2010
- POGIL Great Lakes Regional Meeting, Franklin & Marshall College, 7/19-7/21/2011- Wksp on interactive education
- National Forum on Improving Undergraduate Education Through Active Learning Spaces, August 4-6 U. Minn.

## **Publications & seminars that have had an impact**

- Jo Handelsman, Sarah Miller, Christine Pfund. (2007). Scientific Teaching, W.H. Freeman, ST
- William B.Wood (2009). Innovations in Teaching Undergraduate Biology and Why We Need Them. Ann. Rev. Cell Dev. Biol. 25:93–112

# Learning Spaces Forum - Goals & Program

<http://z.umn.edu/alcforum>

- **examine common issues** affecting the effective use of these spaces and chart a path for their resolution;
- **share successful practices** that have enriched the undergraduate experience in active learning spaces;
- **build and deepen networks** with colleagues in order to advance their campus efforts.
  
- **Larry Michaelsen** – Team based learning
- **Bob Beichner** – Active learning spaces
- **Robin Wright** – Using ALS to enrich student learning & promote evidence based teaching

**Larry Michaelsen - University of Central Missouri**  
*Group Work: Keys to Getting Lemonade Instead of Lemons*  
[www.teambasedlearning.org](http://www.teambasedlearning.org)

*Team-Based Learning™ – a strategy for developing “concept mastery” – even in the large classroom*

Four components of TBL

- Student assigned to permanent teams (5-7)
- Readiness assurance
  - Students do reading, take individual & team tests followed by appeals & discussion
- Application activities
  - Significant problem, specific choice, same problem, simultaneous reporting
- Peer evaluation (mid-semester & end of semester)
  - Teams review each other – one thing they appreciate & one thing they request of each other



*Bob Beichner, North Carolina State University*  
*The Short Past and Long Future of Educating Students*  
*in Active Learning Spaces*

Active learning spaces permit students to engage in a manner more consistent with how they learn today!  
Students are digital natives – we are not!

- 75% >age 4 use computers
- Google since learned to read
- Internet is a form of external memory
- 69% say tablets will transform higher ed
- If you can be replaced by an Ipod – you will be!

Problem – college students are not learning in lectures

- 45% no improvement in critical thinking
- 36% show no significant learning over 4 years

Data to show that active learning spaces work better

## *Active Learning Spaces*

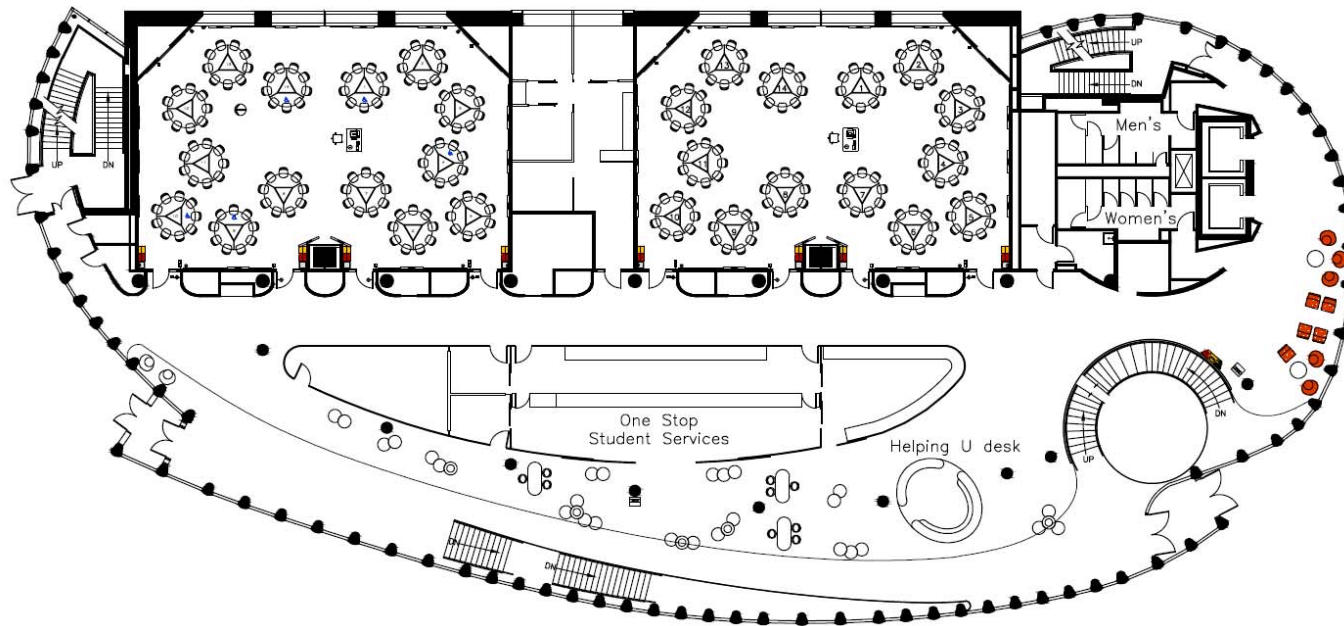
<http://scaleup.ncsu.edu>

Making learning more interactive

- Round tables to enhance student team interactions
- Computers & whiteboards for team activities
- Clickers, hands-on activities & virtual labs

Interactive classroom design - long list of sites

Univ Minnesota – 20 Scale-UP classrooms (10 larger ones)



*Robin Wright, University of Minnesota  
Using Active Learning Spaces to Enrich Undergraduate  
Learning and Promote Evidence-Based Teaching*

<http://www.cbs.umn.edu/bioprog/courses/interactiveclass/>

Teaching Intro Biology in an active learning classroom

Show video



## **Seminar by Bill Wood, U Col, Fall '11**

### **Why are we behind**

- Don't do a good job teaching undergraduates in introductory level science courses
- Too much factual emphasis
- Not enough conceptual understanding

### **Two problems are evident**

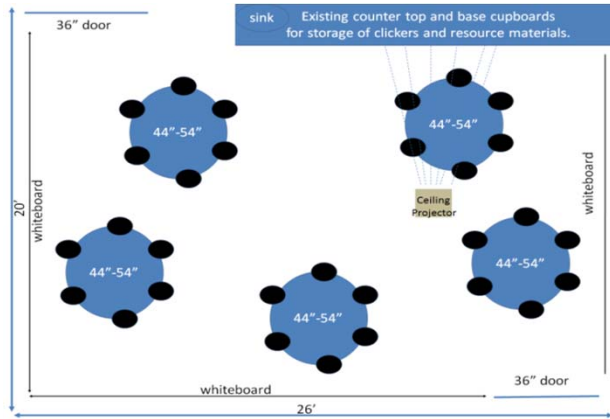
- What we teach - content not concepts
- How we teach it - non-interactive lectures

### **Toward a solution**

- Educational research - discipline-based educational research (DBER)

## Active Learning Space at UNL

- \$10K from Course impact project in 2011
- with help John Osterman, Cheryl Bailey & Jon Pedersen



- 480 sq ft room
- Ceiling & flooring
- Whiteboards
- Round tables & chairs
- Projector

## *Usage of SBS Active Learning Space in Manter Hall*

### **Bios 102 Cell Structure and Function**

- introductory cell biology for all life science majors
- 3 lectures & 1 hr recitation/ week
- Enrollment – 400 Fall '11 & 250 Spring '12

### **Recitation activities developed for new ALS**

- 14 weeks of recitation
- 7 new interactive learning activities
- 3 periods devoted to research paper analysis
- 2 periods to ethics with public policy center

### **Bios 326 Biology of Viruses**

- Fall sem – 26-28 students
- Challenged to develop interactive activities



*Alternative strategies I have incorporated as a supplement to lecturing*

- Clickers questions in large classroom
  - Daily “in class” think/pair/share
  - Weekly quizzes
  - Formative assessment with timely feedback
- Interactive classroom used for Recitation
  - Groups activities & problem solving
  - Research paper data analysis
  - Active learning rather than passive lectures