Improving Undergraduate Teaching and Learning: Lessons from the U.S.

STEVEN BRINT

Agenda for the Presentation

1. ANALYSIS OF THE PROBLEM
2. PROMISING CAMPUS INTERVENTIONS
3. LESSONS FROM THE SCIENCES OF LEARNING
4. CONCLUSIONS

I. Analysis of the Problem

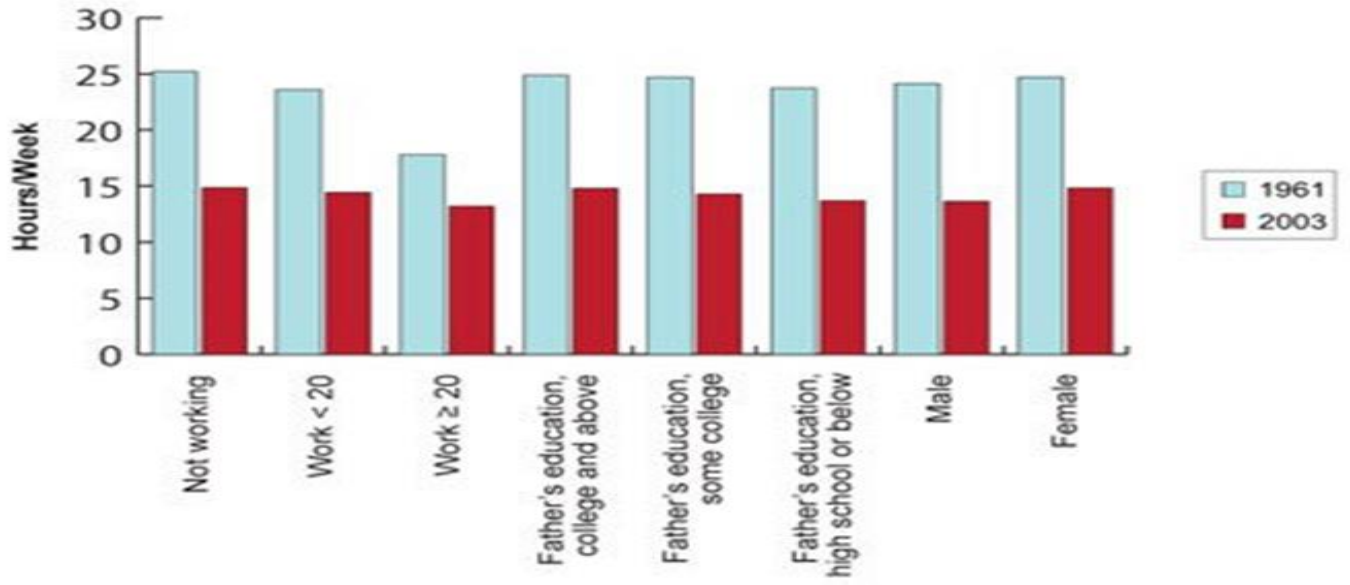
1. WEAK GAINS, LOW EXPECTATIONS
2. STUDENT UTILITARIANISM
3. SOCIAL RELATIONS OF THE CLASSROOM

Weak Gains, Low Expectations

- Richard Arum & Josipa Roksa *Academically Adrift* (2011):
  - More than one-third of university students made no statistically significant gains in analytical and critical thinking over four-years of university based on Collegiate Learning Assessment (CLA).
  - A majority of the 2,400 college students in the Arum and Roksa study said they had not taken a course during the previous term that required a total of twenty pages of written work, and 25 percent said they had not taken a course that required even forty pages of reading per week.

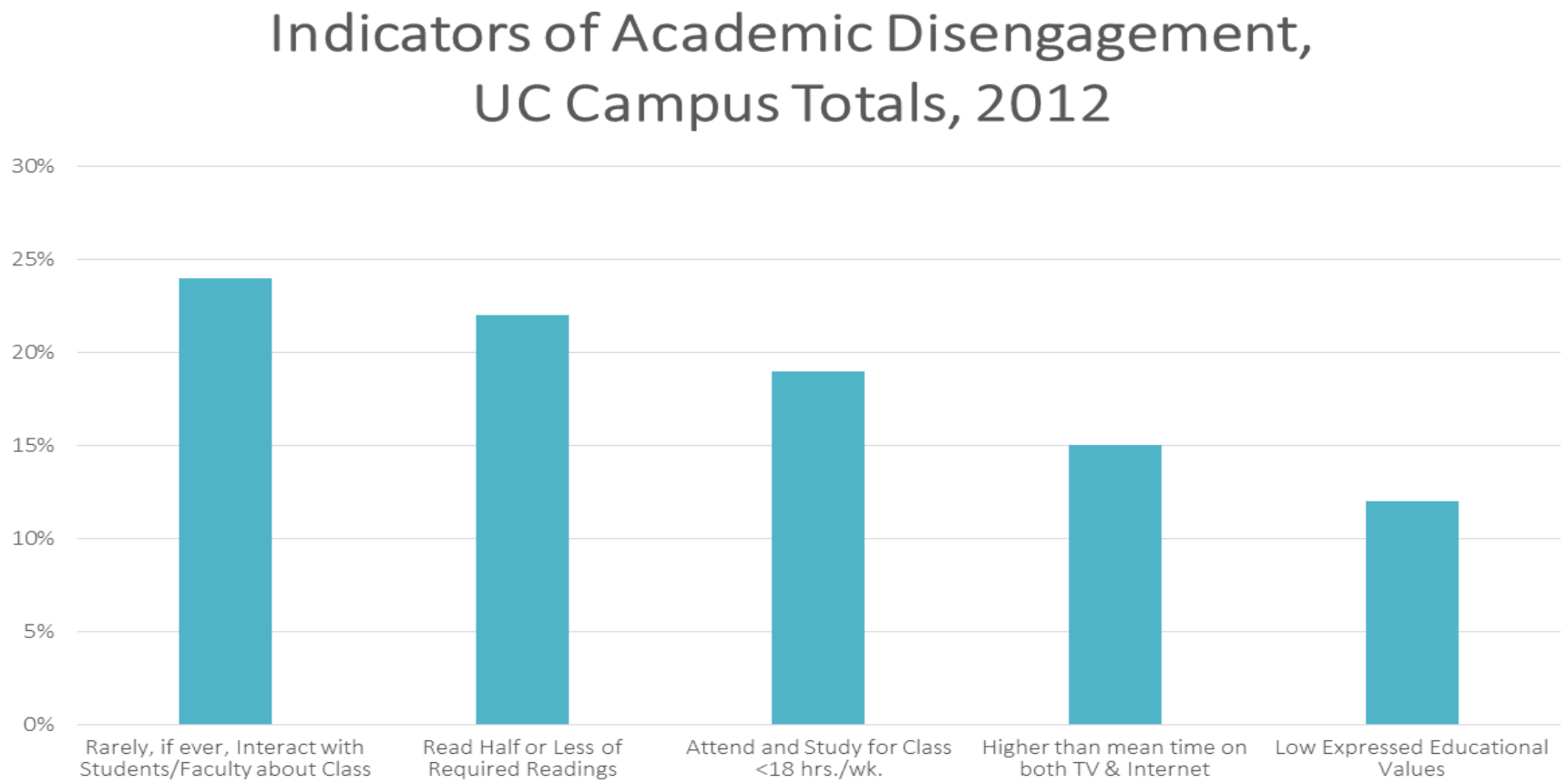
Declining Study Time

AVERAGE STUDY TIME FOR FULL-TIME STUDENTS AT FOUR-YEAR U.S. COLLEGES BY WORK STATUS, PARENTAL EDUCATION, AND GENDER, 1961 AND 2003



Source: Babcock & Marks 2011, Fig. 2

Student Utilitarianism: Academic Disengagement at UC



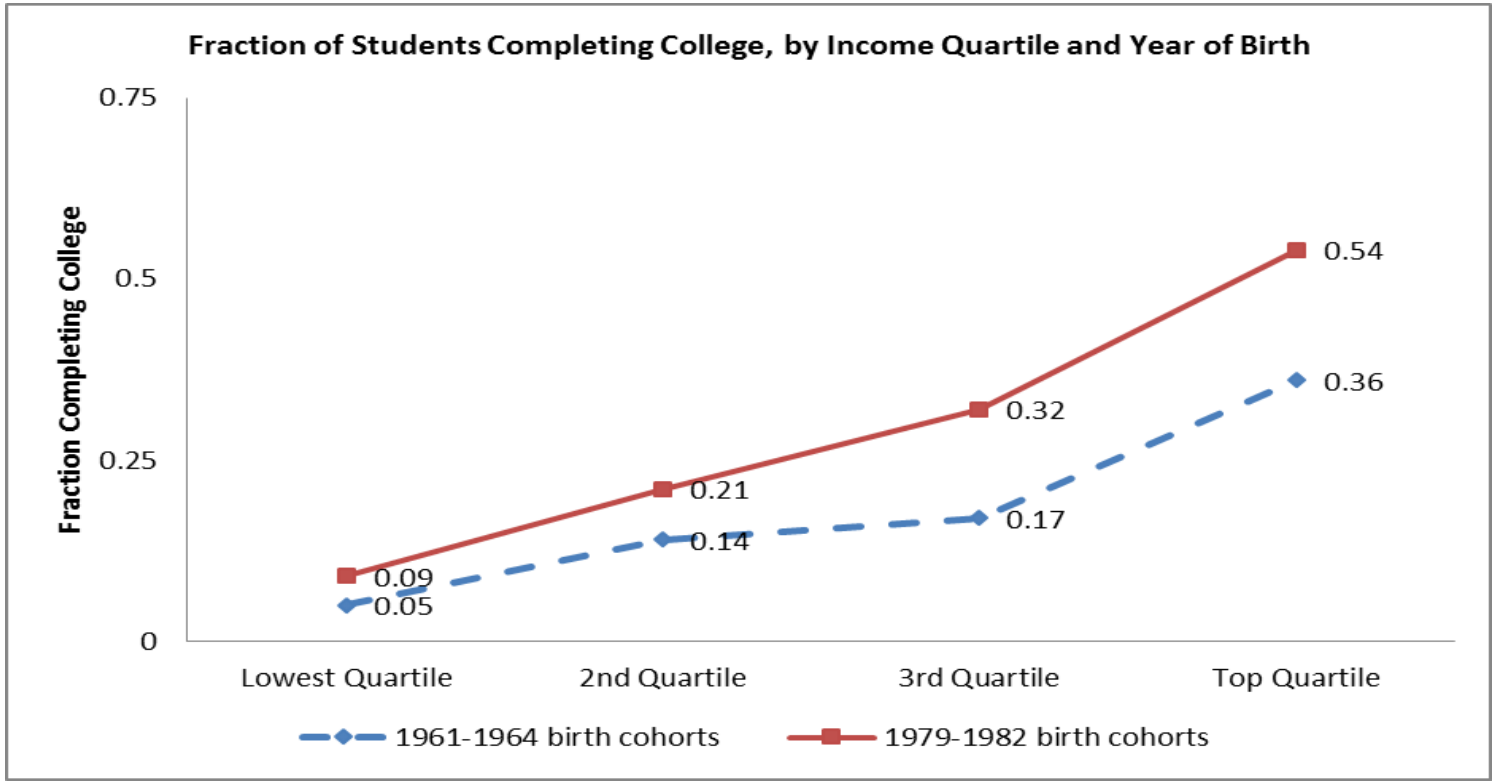
Source: **Brint & Cantwell (2014)**

Problematic Social Relations of the Classroom

- No major constituency in the research university has a central interest in undergraduate learning.
  - Student consumerism/utilitarianism
  - Faculty interest in research and professional responsibilities
  - Administrators interest in body counts, throughput, & revenues

- Empirical support: ethnographies, student time use studies, as well as research on learning gains.

College Graduation by Income Quartile, 1960s and 1980s Cohorts

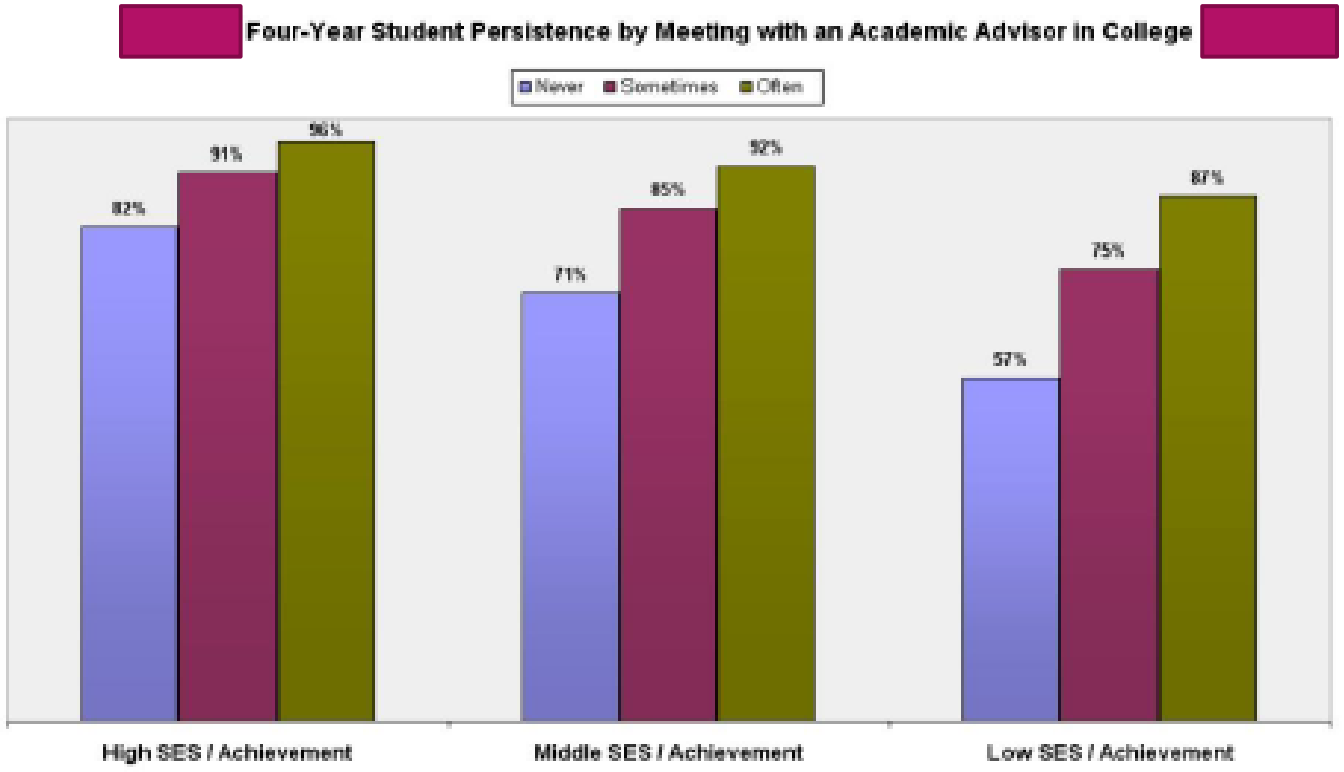


Source: **Bailey and Dynarski (2011)**

II. Promising Campus Interventions

1. INTENSIVE ADVISING
2. SUPPLEMENTAL INSTRUCTION
3. LEARNING COMMUNITIES
4. ADAPTIVE LEARNING SYSTEMS
5. TEACHING ACADEMIES
6. UNDERGRADUATE RESEARCH

Intensive Advising Matters, Especially for Less Well Prepared Students



Source: Klepfer and Hull (2012), Fig. 6

Degree Maps and Intrusive Advising

- Students who persist in programs in which they are very unlikely to succeed fail to make timely progress to degree and are less likely to graduate. The great majority of students who need transition advising are in STEM fields.

- The University of Texas starts transition advising after six weeks for science/engineering students, if their midterm grades in intro math and science are low.

- Many other campuses have moved from end-of-second year transition advising to end-of-first year transition advising.

Georgia State Univ.
Advising Stats

Supplemental Instruction (SI)

- Supplemental Instruction is an after-class review led by peer educators who have received high grades in the class.
- Usually offered in courses with high failure rates.
- Fairly consistent national results for Supplemental Instruction: If students attend frequently, higher likelihood of A/B grades and lower likelihood of D/F/W grades.
- Better results if strong communication with and acceptance by instructors, strong training for peer educators, and incentives for attendance.

SUPPLEMENTAL INSTRUCTION

Study Smart, not hard.

Learning Communities

- Students take several courses together (and sometimes live in same residence hall). Block scheduling creates a cohort of students who know each other and study together.
- Some learning communities are based on common majors, backgrounds, and/or interests.
- Design features that can matter:
  - Mandatory Supplemental Instruction
  - Intensive Advising
  - Early Research Experiences
  - Communication among instructors

University Leadership Networks

- The University of Texas-Austin created the University Leadership Network, a program to support at-risk, primarily minority students by:
  - Providing a four-year program of leadership training
  - Experiential learning opportunities
  - Community and university service opportunities
  - Scholarships for successful completion of full-load of credits
  - Prediction: Grad rates 18% lower. Result: Nearly equal grad rates.

Graduates of UT Leadership Network

Adaptive Learning Systems

- ALEKS (Assessment and Learning in Knowledge Spaces) is an Internet based tutoring and assessment program that includes course material in mathematics, chemistry, introductory statistics, and business.
- Rather than being based on numerical test scores, ALEKS uses the theory of knowledge spaces to develop a combinatorial understanding of the set of topics a student does or does not understand from the answers to its test questions.
- Based on this assessment, it determines the topics that the student is ready to learn and allows the student to choose from interactive learning modules for these topics.
- ALEKS is only one of many adaptive learning systems now available.

Examples of a Student's Algebra Knowledge Space in ALEKS

Academies of Distinguished Teachers

- Formed from winners of campus teaching awards
- Members receive compensation and title of Distinguished Teaching Professor
- Typical responsibilities:
  - First-year teaching excellence seminars
  - Mentoring faculty members who need it
  - Colloquia on elements of teaching excellence
  - Help in course redesigns

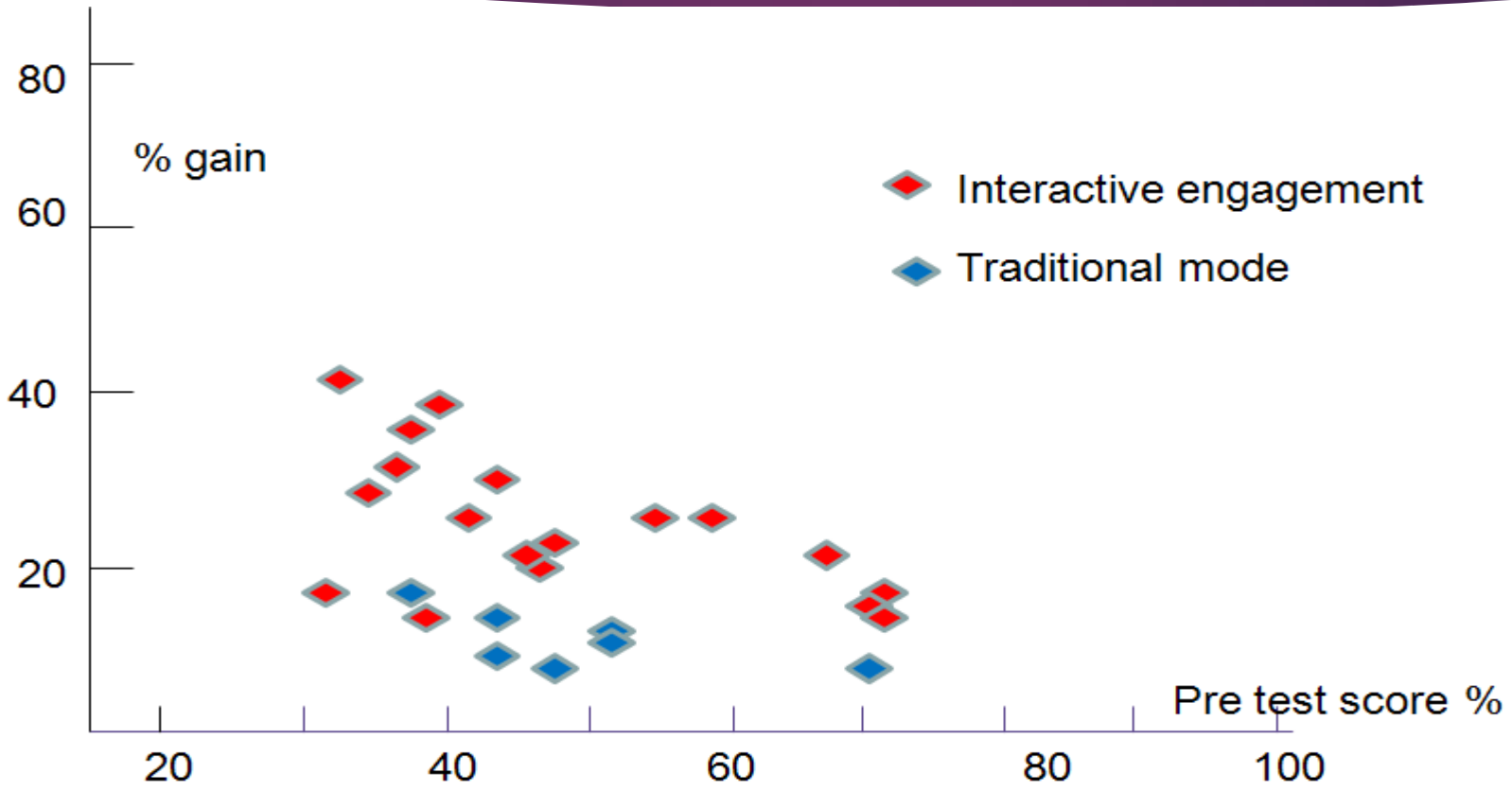
Expanded Undergraduate Research Opportunities

- Shift toward early involvement in undergraduate research as volunteer, for pay, or for course credit.
- Learning by doing more exciting for many undergraduate students
- Graduate students and faculty mentor undergraduates in labs and study teams
- Undergraduate Research Symposia (poster and oral sessions) held annually. 1200 participants at Univ. of Washington.
- Undergraduate Research Portals are used to connect students to faculty members.

III. Lessons from the Sciences of Learning

1. PARTICIPATION TOOLS
2. ACCOUNTABILITY TOOLS
3. TEACHING FOR UNDERSTANDING TOOLS

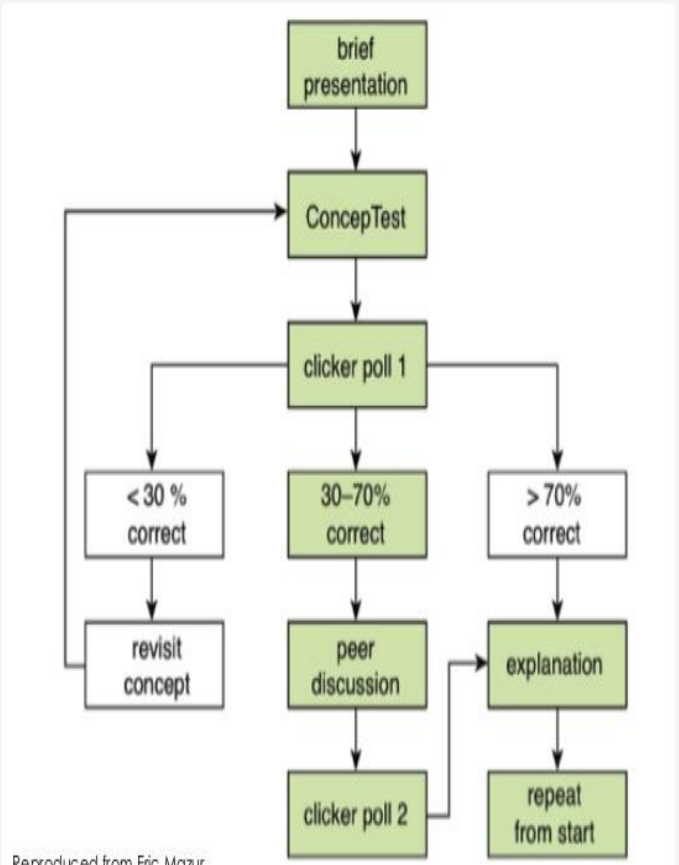
Participation Matters: Interactive Engagement Experiments



Source: R.R. Hake (1999)

Interactive Engagement Tools

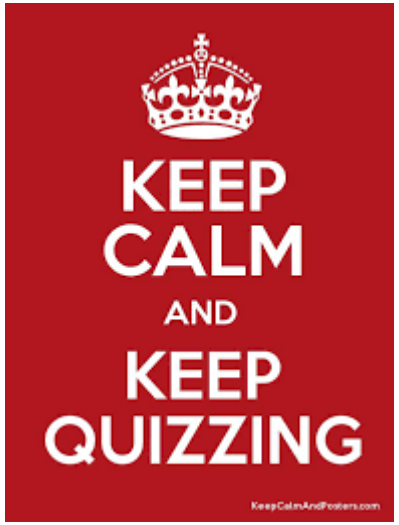
- Mini-lectures and small group breakouts
- Think-pair-share responses to comments
- Clickers
- Points to those who answer questions in the back of the room
- Fishbowl techniques
- Jigsaw techniques
- Traditional forms: Debates, Presentations, Group Projects



Reproduced from Eric Mazur
(search "Confessions of a converted lecturer" on YouTube)

Accountability Matters: Quizzing for Class Preparation

- To encourage student accountability, instructors are now making use of frequent sequential quizzing on required reading.
- A study by Pennebaker, Gosling & Ferrell (2013) found that exam performance improved by approx. one-half letter grade for treatment group as compared to control group experiencing no daily quizzes.
- The authors also found a 50% reduction in the achievement gap among students from different socio-economic backgrounds. Similar findings for other studies on pre-class quizzes or short response memos.



A More Controversial Approach: Banning Devices in Lecture Halls

- Students in the back rows of lectures use their computers and devices to text, shop, read Facebook, sporting news, etc.
- Banning laptops and devices can help to create the “sacred space” of the classroom by creating a common focus.
- However, students do not like it and can be resentful.

Teaching for Understanding Tools

- Use hooks to capture students' interest at beginning of class
- Find out first what students do and do not know
- Use illustrations that are meaningful to them based on their experiences and motivations
- Scaffold arguments so that they move step-by-step
- Use "uncoverage" methods to ask make accessible students' thinking processes. For example, "think alouds" in math class.
- Ownership of learning is linked to public presentation of what has been learned. Use public presentations.

Lee S. Shulman

The Weiman-Gilbert Teaching Practices Inventory

- Developed by Carl Weiman and Sarah Gilbert as supplement to student evaluations of teaching. Based on teachers' self-assessment following end of course.
- Points given for (among other items):
  - Specification of Learning Objectives
  - Specification of "Affective Goals"
  - Less than 60 percent of time in lecturing
  - Number of Interactive engagement activities
  - Students' explanations of reasoning that led them to conclusions
  - Use of pre- and post-class concept inventories to determine gain scores

Carl Weiman

IV. Conclusions

- **The weak state of undergraduate education can be considered the "Achilles heel" of an otherwise successful system of higher education in the United States.**

- **The problem has been recognized since the 1950s and seems to have become more severe over time as undergraduate student populations have grown and diversified.**

- **But significant improvement can be achieved by adoption of useful campus-level interventions and lessons from the sciences of learning.**

References

- Arum, Richard, and Josipa Roksa. 2011. *Academically Adrift: Limited Learning on College Campuses*. Chicago: University of Chicago Press.
- Babcock, Philip and Mindy Marks. 2011. "The Declining Time Cost of College: Evidence from a Half Century of Time Use Data." *Review of Economics and Statistics* 93: 468–78.
- Bailey, Martha, and Susan Dynarski. 2011. "Inequality in Postsecondary Attainment." In *Whither Opportunity? Rising Inequality, Schools, and Children's Life Chances*, ed. Greg Duncan and Richard Murnane, 117–32. New York: Russell Sage Foundation Press.
- Brint, Steven and Allison M. Cantwell. 2014. "Conceptualizing, Measuring and Analyzing the Characteristics of Disengaged Student Populations: Results from UCUES 2010." *Journal of College Student Development* 55: 808–23.
- Hake, Richard R. 1998. "Interactive-Engagement versus Traditional Methods: A Six-Thousand-Student Survey of Mechanics Test Data for Introductory Physics Courses." *American Journal of Physics* 66: 64–74.
- Klepfer, Kasey and Jim Hull. 2012. *High School Rigor and Good Advice: Setting Up Students to Succeed.* Washington, DC: Center for Public Education.
- Pennebaker, James W., Samuel D. Gosling, and Jason D. Ferrell. 2013. "Daily Online Testing in Large Classes: Boosting College Performance While Reducing Achievement Gaps." *PLOS One*. November. Retrieved from http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0079774.
- Wieman, Carl, and Sarah Gilbert. 2014. "The Teaching Practices Inventory: A New Tool for Characterizing College and University Teaching in Mathematics and Science." *CBE Life Sciences Education* 13: 552–69.