What the CAT Offers for Assessment: Engaging Faculty in Assessing & Improving Critical Thinking Skills

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Reinvention Center, 2012

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Workshop Goals

- Background Information on the CAT and Changing Nature of Education
- Advantages of Faculty Involvement in Scoring
- University of Wyoming Experience Using the CAT

Importance of Critical Thinking

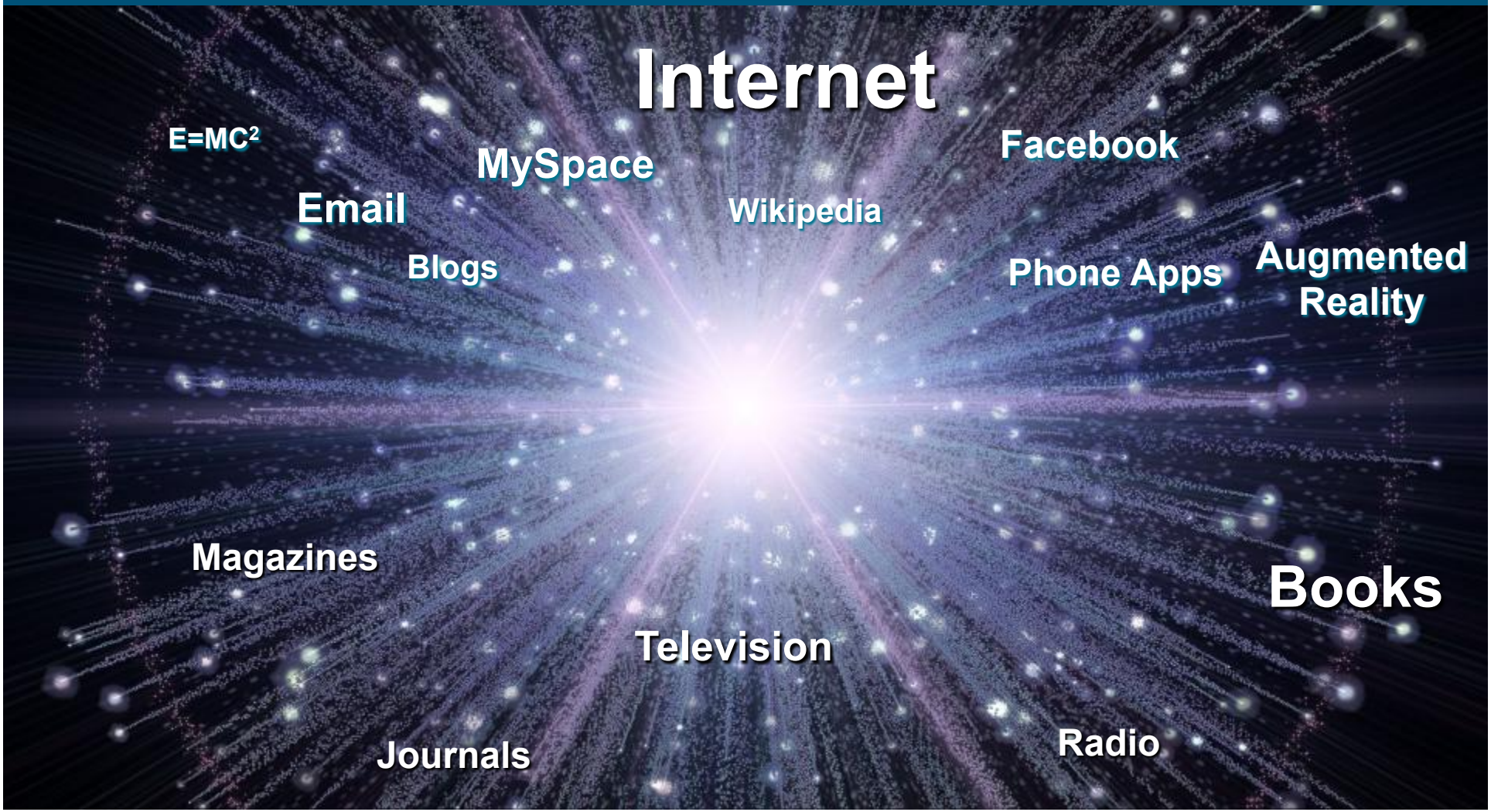
National polls indicate over 90% of the faculty in this country think critical thinking is the most important part of undergraduate education.

Derek Bok, 2005

President Emeritus of Harvard University

Importance of Critical Thinking

Explosion of Information



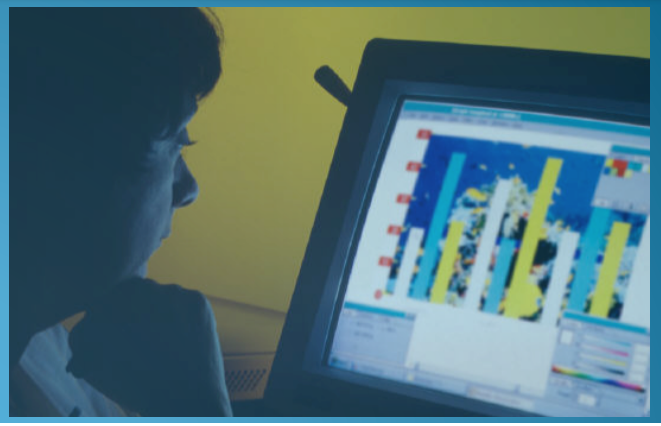
The Changing Nature of Education

Remembering Information

Finding Relevant Information

Understanding & Evaluating Information

Using Information Effectively



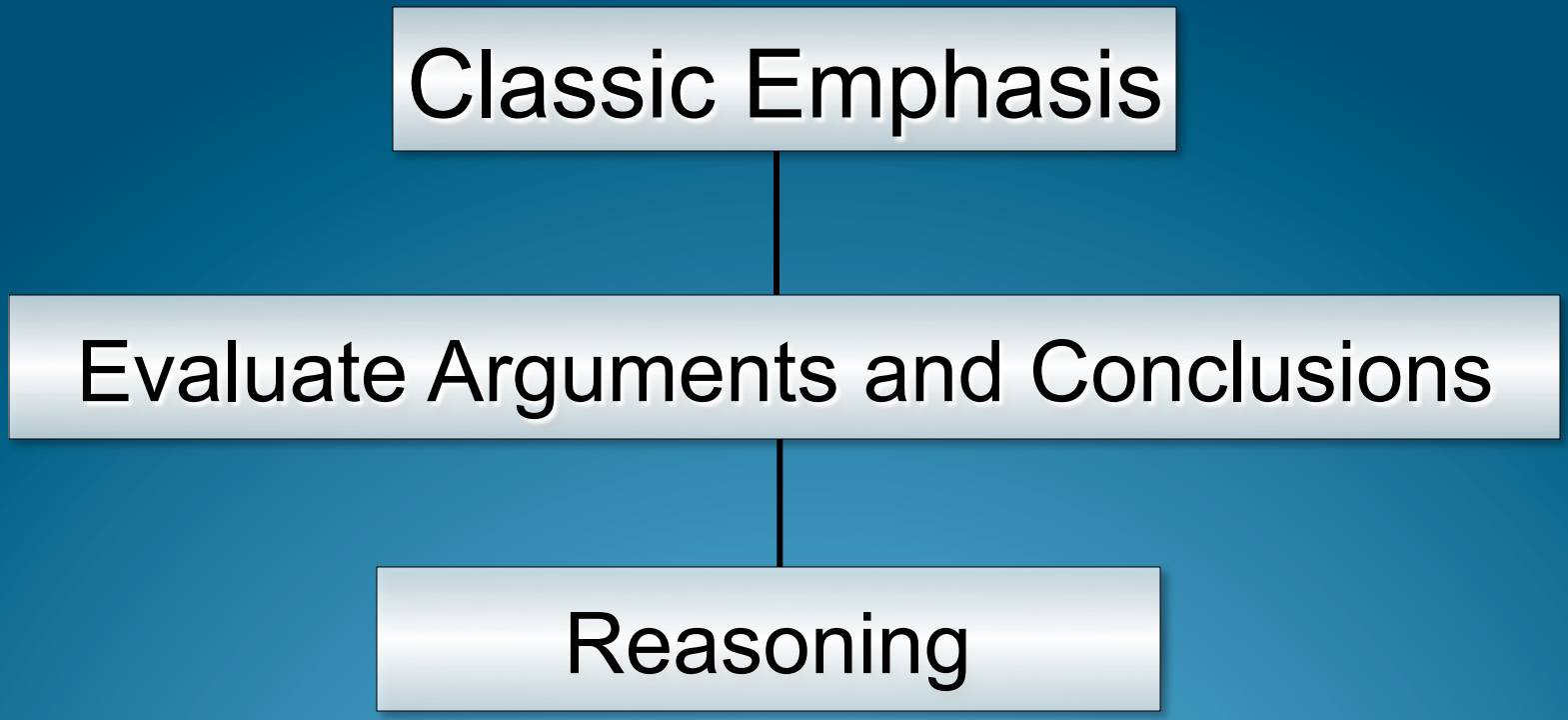
Where Do We Get Information

75% of College Students use the Internet as Primary Method of Searching for Information

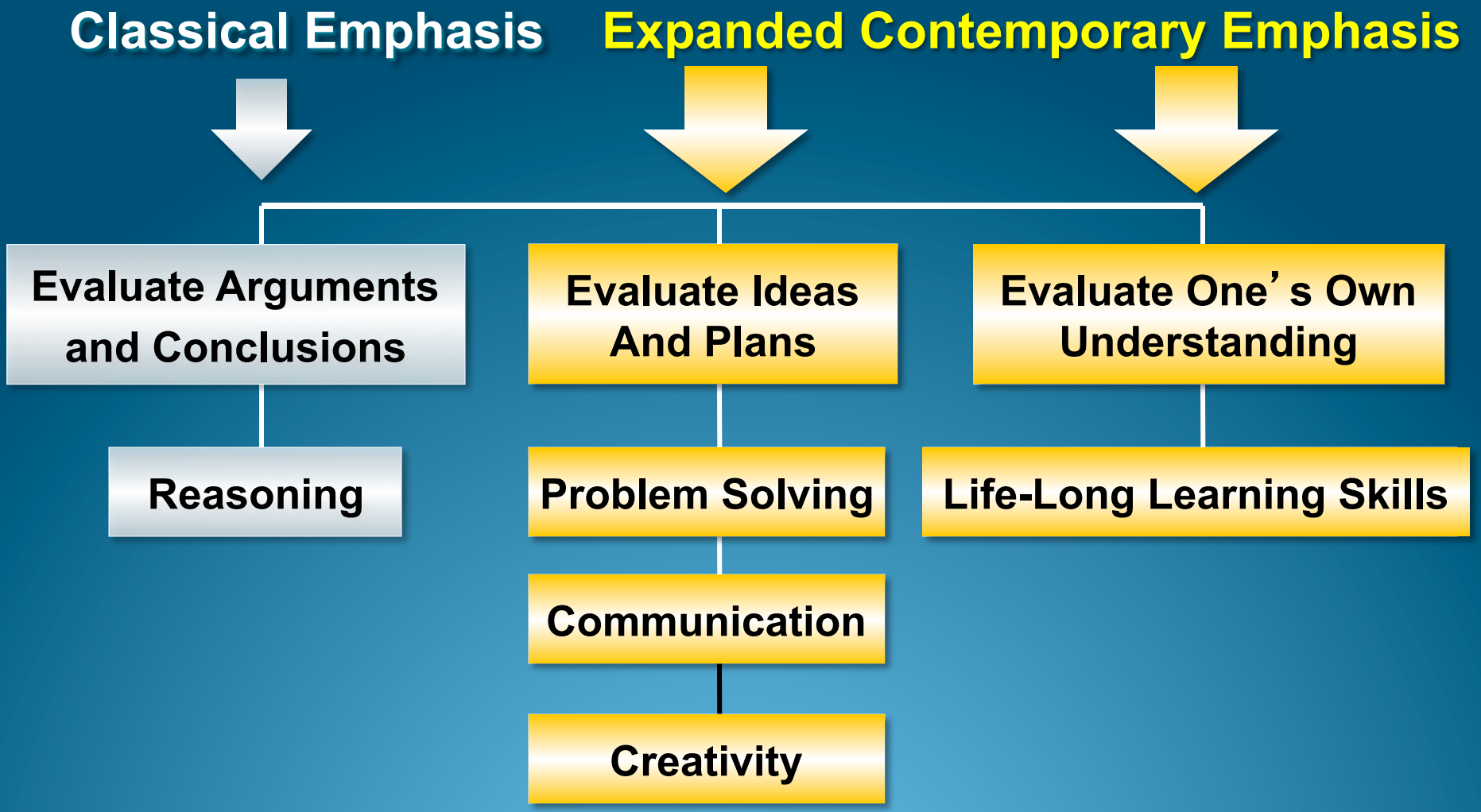
People are more likely to believe something on YouTube than from the CDC

59% of Adults Use the Internet for Healthcare Information

What is Critical Thinking?



What is Critical Thinking?



Bloom's Classic Taxonomy

Evaluation
Synthesis
Analysis
Application
Comprehension

Information (rote retention)

Critical Thinking

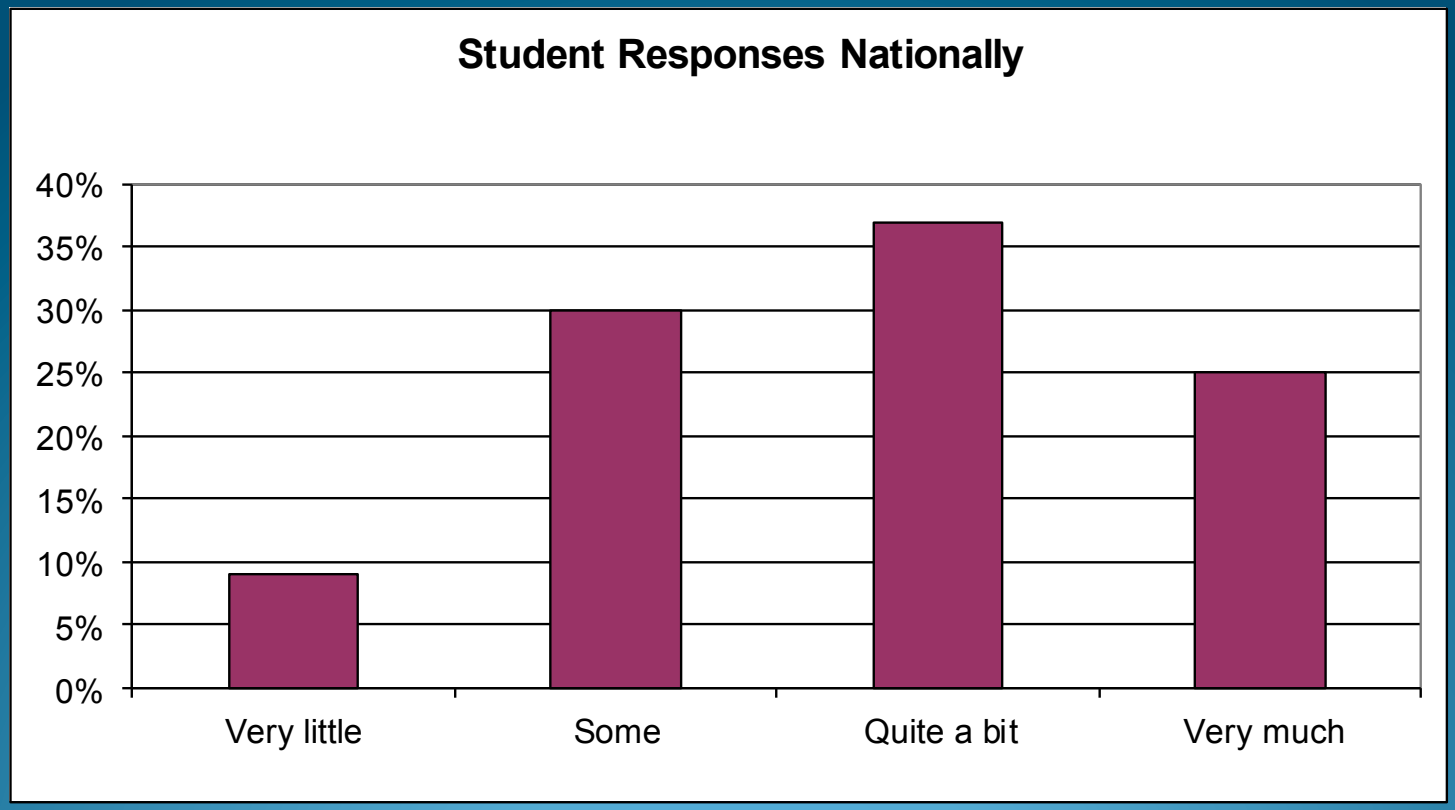
Agreement on what is not Critical Thinking

*NSSE Question
(2a) Memorizing facts, ideas, or methods from your courses and readings so you can repeat them in pretty much the same form.

Video

*National Survey of Student Engagement , Indiana University

NSSE: Coursework emphasizes: Memorizing facts, ideas, or methods from your courses and readings



Why Focus on Assessing Critical Thinking?

Need to Measure Success for Accountability

Assessment Drives Improvement Efforts

How We Assess - Determines What Students Learn

History of CAT Development

Preliminary Work
At TTU
2000 - 2004

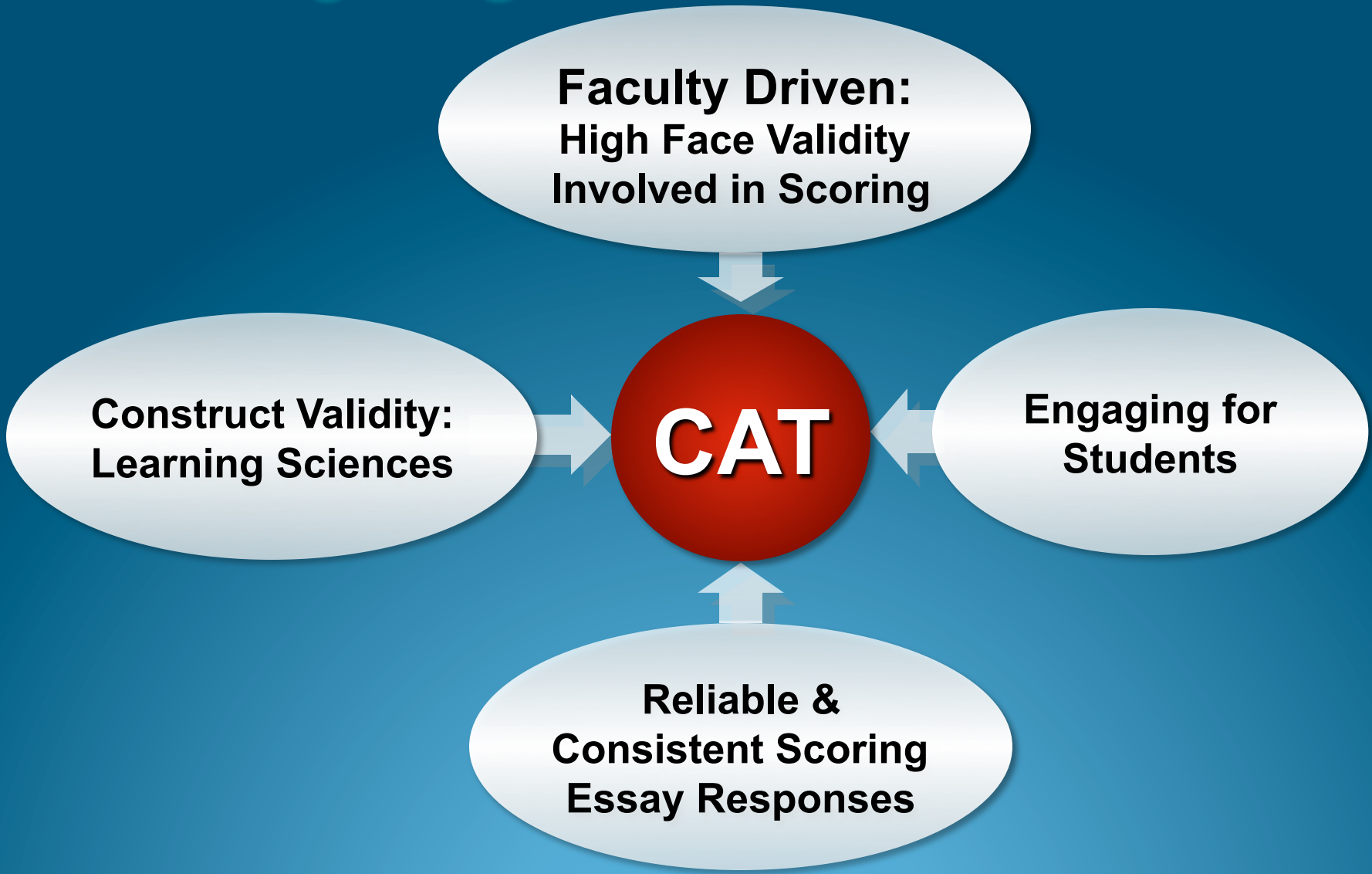
Collaborate With Other
Institutions To Refine CAT
2004 - 2007

Develop Training Methods for
National Dissemination & Collect Norms
2007 - 2010

Expand National Dissemination
& Support Assessment in NSF Projects
2010 - 2014

Over 150 Institutions Collaborating

Designing the CAT Instrument



Skills Evaluated by CAT Instrument

Evaluating Information

- Separate factual information from inferences.
- Interpret numerical relationships in graphs.
- Understand the limitations of correlational data.
- Evaluate evidence and identify inappropriate conclusions

Creative Thinking

- Identify alternative interpretations for data or observations.
- Identify new information that might support or contradict a hypothesis.
- Explain how new information can change a problem.

Learning & Problem Solving

- Separate relevant from irrelevant information.
- Integrate information to solve problems.
- Learn & apply new information.
- Use mathematical skills to solve real-world problems.

Communication

- Communicate ideas effectively.

Sample Disclosed Question

A scientist working at a government agency believes that an ingredient commonly used in bread causes criminal behavior. To support his theory the scientist notes the following evidence.

- 99.9% of the people who committed crimes consumed bread prior to committing crimes.
- Crime rates are extremely low in areas where bread is not consumed.

Do the data presented by the scientist strongly support their theory? Yes ___ No____

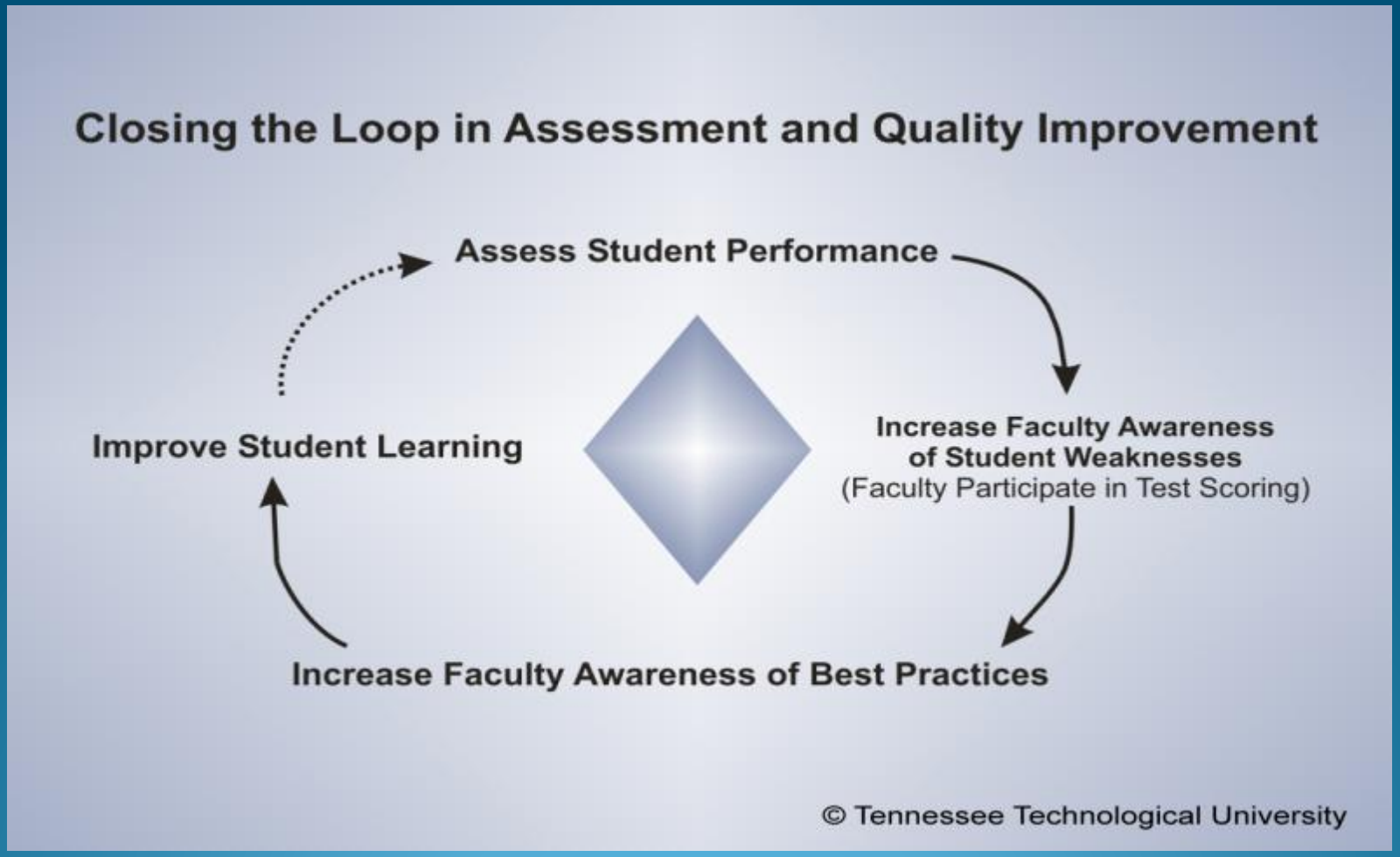
Are there other explanations for the data besides the scientist's theory? If so, describe.

_____

What kind of additional information or evidence would support the scientist's theory?

_____

Faculty Development Using the CAT



Examples of Effective Practices for Teaching Critical Thinking

Skill Set 1: Encouraging Effective Course Assessments

Provide alternative interpretations for information or observations that have several possible interpretations.

Identify additional information or evidence needed to evaluate the alternative interpretations.

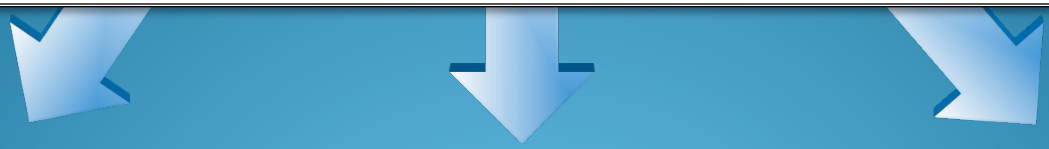
- **Patterns of Data**
- **Historical Events**
- **Literature**

Skill Set 2: Encouraging Effective Course Assessments

Separate relevant from irrelevant information when searching for information to solve a real-world problem.

Identify and explain the best solution for a real-world problem using relevant information.

Explain how changes to a real-world problem situation might alter the recommended solution.



Selecting New Lab Equipment

Solving a Community Problem – Feral Cats

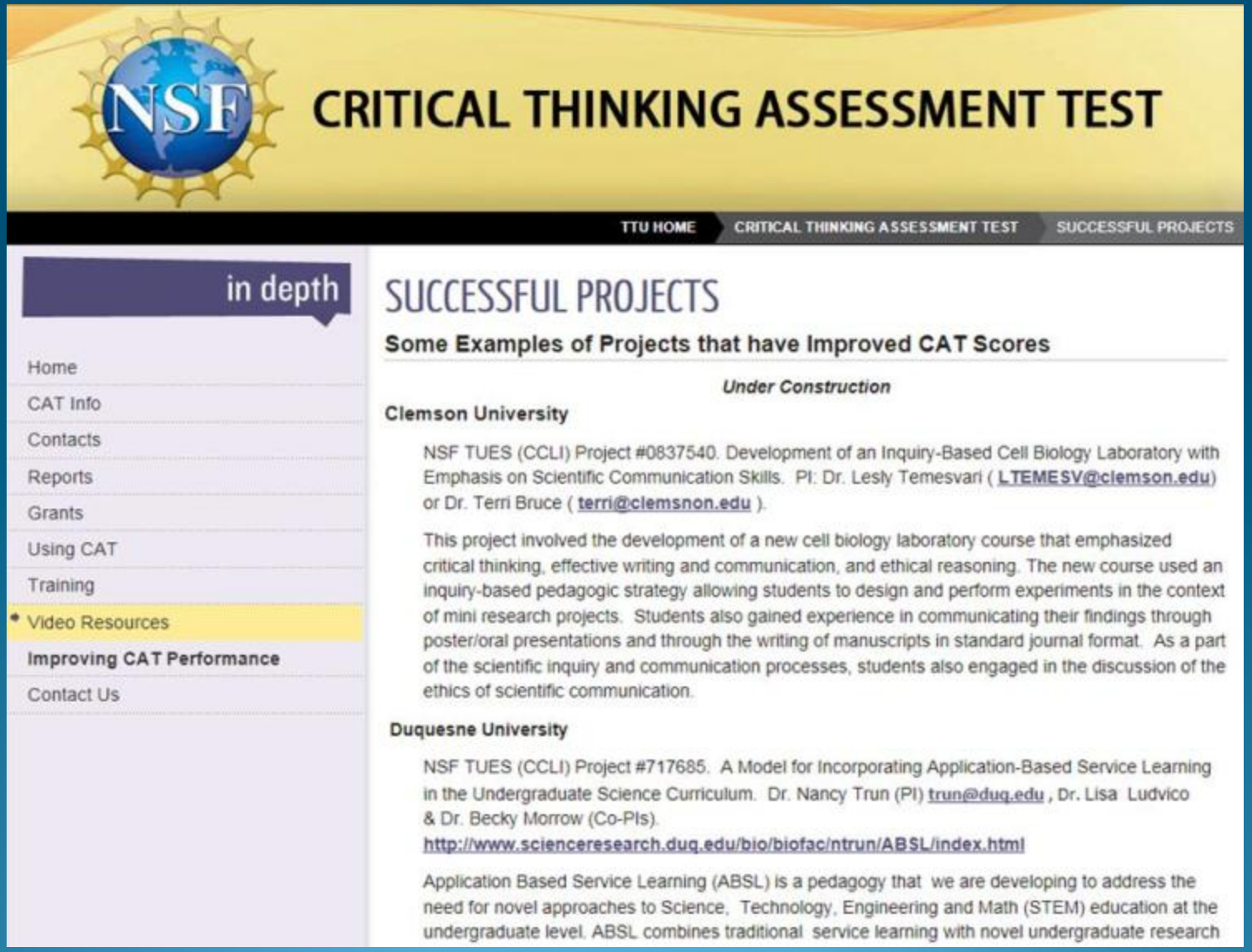
Designing a Set For a Play

What Are We Learning From National Use of the CAT

Faculty Involvement is Beneficial

Strategies for Improving Critical Thinking

Faculty Can Improve Course Assessments


CRITICAL THINKING ASSESSMENT TEST
TTU HOME
CRITICAL THINKING ASSESSMENT TEST
SUCCESSFUL PROJECTS
in depth
Home
CAT Info
Contacts
Reports
Grants
Using CAT
Training
Video Resources
Improving CAT Performance
Contact Us
SUCCESSFUL PROJECTS
Some Examples of Projects that have Improved CAT Scores
Under Construction
Clemson University
NSF TUES (CCLI) Project #0837540. Development of an Inquiry-Based Cell Biology Laboratory with Emphasis on Scientific Communication Skills. PI: Dr. Lesly Temesvari (LTEMESV@clemson.edu) or Dr. Terri Bruce (terri@clemsnon.edu).
This project involved the development of a new cell biology laboratory course that emphasized critical thinking, effective writing and communication, and ethical reasoning. The new course used an inquiry-based pedagogic strategy allowing students to design and perform experiments in the context of mini research projects. Students also gained experience in communicating their findings through poster/oral presentations and through the writing of manuscripts in standard journal format. As a part of the scientific inquiry and communication processes, students also engaged in the discussion of the ethics of scientific communication.
Duquesne University
NSF TUES (CCLI) Project #717685. A Model for Incorporating Application-Based Service Learning in the Undergraduate Science Curriculum. Dr. Nancy Trun (PI) trun@duq.edu , Dr. Lisa Ludvico & Dr. Becky Morrow (Co-PIs).
http://www.scienceresearch.duq.edu/bio/biofac/ntrun/ABSL/index.html
Application Based Service Learning (ABSL) is a pedagogy that we are developing to address the need for novel approaches to Science, Technology, Engineering and Math (STEM) education at the undergraduate level. ABSL combines traditional service learning with novel undergraduate research

University of Wyoming Experience Using the CAT

School of Pharmacy (2010)

- Looking for a tool to assess critical thinking, which is one of the program's identified student learning outcomes

Institutional Look at CAT

- 90% of UW depts/programs have a student learning outcome related to higher order thinking skills
  - Critical thinking, problem-solving, analytic reasoning
- Revision of UW's USP Program – Critical thinking skills are specifically identified
  - Critical and creative thinking
  - Inquiry and analysis
  - Problem-solving

What We Initially Liked About the CAT

- Developed by and scored by faculty
- A clear definition of critical and creative thinking
- Flexibility in its use (e.g. program assessment)
- Administered in one hour class
- Tennessee Tech's Center for Assessment & Improvement of Learning responsive to UW's needs
- Reasonable costs - keep our money in-house

UW's CAT Projects

- 4 departments/programs used CAT in 2011-12:
  - School of Pharmacy
  - Division of Social Work
  - Department of Veterinary Sciences
  - College of Business
- Additional programs using CAT in 2012-13:
  - Department of Geology and Science Math Teaching Center
  - UW Assessment Academy (Physiology, Kinesiology, Nursing)

School of Pharmacy

- 3 year plan (Aug 2011-May 2014)
- P1s (incoming students) tested in fall of each year
- P3s (entering clinicals) and P4s (graduating) tested in spring of each year
- Cross-sectional and longitudinal study
- Use CAT results to predict likelihood of success in program
  - Past performance (ACT/SAT and PCAT)
  - Academic performance at UW (GPA, grades in specific courses, etc.)

Division of Social Work

- BSW students
  - 2 cohorts of entering students - Laramie and UW/ Casper College (45 students)
  - Want to see if there is a difference in cohort performance
- MSW students
  - Skill level of new graduate students entering without BSW degree compared to performance after first year (16 students)
- CAT administered during class and discussed in context of skills needed to be a successful social worker

Veterinary Sciences

- Cross-sectional study (first-year students compared to upper- division students)
  - PATB 1001 (Freshman Interest Group)
  - PATB 4710 (Virology)
  - 64 students total
- Fall semester

College of Business

- Pilot project (spring 2012)
  - Assess critical thinking skills of graduating students
  - College of Business capstone course (MGMT 4800)
  - Administered outside class to volunteers (paid $25)
  - Goal was to test 100 of 200 students; 37 students tested
- Revised plan (2012-13)
  - Cross-sectional and longitudinal study (freshmen vs. senior performance)
  - Test 240 freshmen in ACCT 1010 in fall semester
  - Test 240 seniors in MGMT 4800 in spring semester
  - Follow freshmen through program

What We Learned So Far About Critical Thinking

- Wide range of results
  - By program/student major
  - By level of students
  - By CAT questions

Pharmacy

- Highest overall scores at UW
- Scored above national average
- P4s performed the best; P1s performed better than P3s
- Stat differences (positive) for 7/15 questions for P1s
- Stat differences (2 pos/1 neg) for 3/15 questions for P3s
- Stat differences (11 pos/1 neg) for 12/15 questions for P4s
- Negative difference for both cohorts - Using an applying relevant information to evaluate a problem (Q 11)

Social Work

- Graduate students scored higher, but both scored below national average
- No differences between Laramie and Casper cohorts
- Stat differences (pos) for 1/15 questions for grad students
- Stat differences (neg) for 4/15 questions for undergrads
- Still looking for patterns in data
  - High percentage could use basic mathematic skills to help solve a real world problem (Q 12)
  - Undergraduates scored below average and graduates above average - Providing alternative explanation for a pattern of results that has many possible causes (Q 3)

Veterinary Sciences

- Upper and lower division students scored well above the national average
- Stat differences (positive) for 5/15 questions for students in PATB 4710
- Stat differences (positive) for 3/15 questions for students in PATB 1001
- Both groups were above average for providing alternative explanations for spurious associations (Q 6)

Business

- Graduating seniors scored just above national average
- Stat difference (negative) for 1/15 questions
  - Using and applying relevant information to evaluate a problem (Q 11)

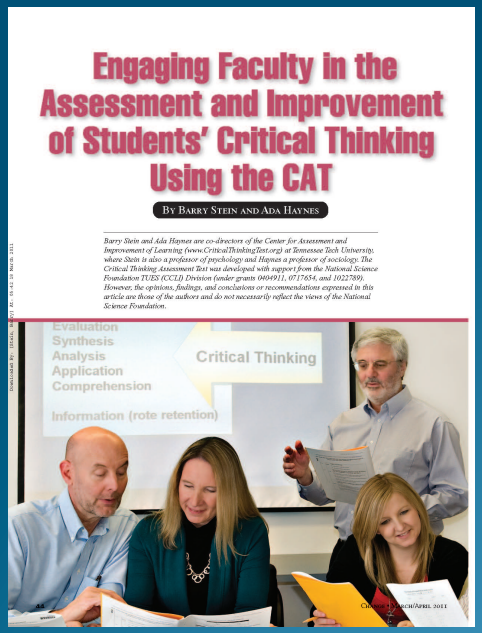
Faculty Reactions

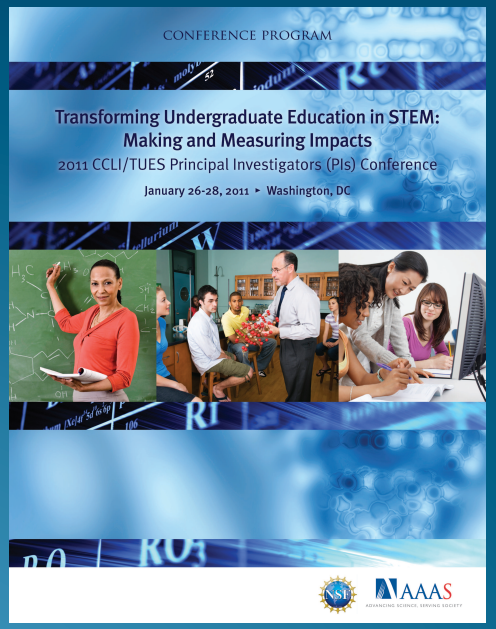
- CAT validated some suspicions regarding the lack of specific critical thinking skills
- Provided insight on how to deal with ambiguous student responses in class
- Increased validity of open book tests
- Challenged the way some faculty currently structure test questions (e.g. recall vs. critical thinking)
- Rethinking their own grading rubrics - simplifying them
- Assessment can actually be fun!

Perceived Benefits of Using the CAT

- Multiple and different opportunities to engage faculty
  - Groups/depts/program and individually
  - Reluctant faculty to the assessment table
- Faculty become your best advocates
- Provides anchor to institutional programming on critical thinking
- It is easier to administer and facilitate compared to other standardized assessments
  - Logistics
  - $

www.CriticalThinkingTest.org





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