



Getting Faculty Involved in Assessing and Improving Critical Thinking

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Importance of Critical Thinking

Explosion of Information

Internet

$E=MC^2$

MySpace

Facebook

Email

Wikipedia

Blogs

Phone Apps

Augmented Reality

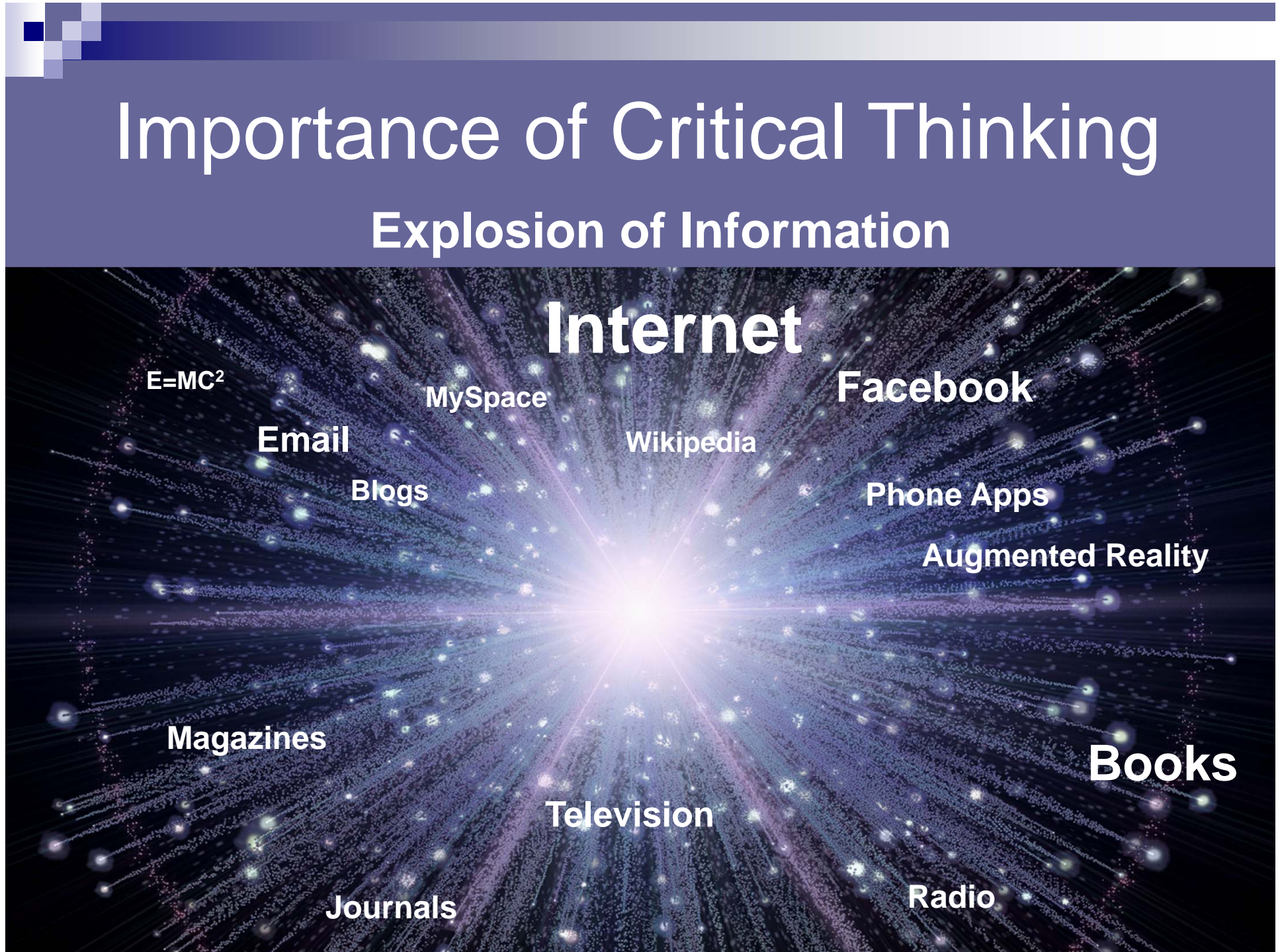
Magazines

Books

Television

Journals

Radio

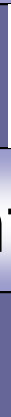


What is Critical Thinking?

Classic Emphasis

Evaluate Arguments and Conclusions

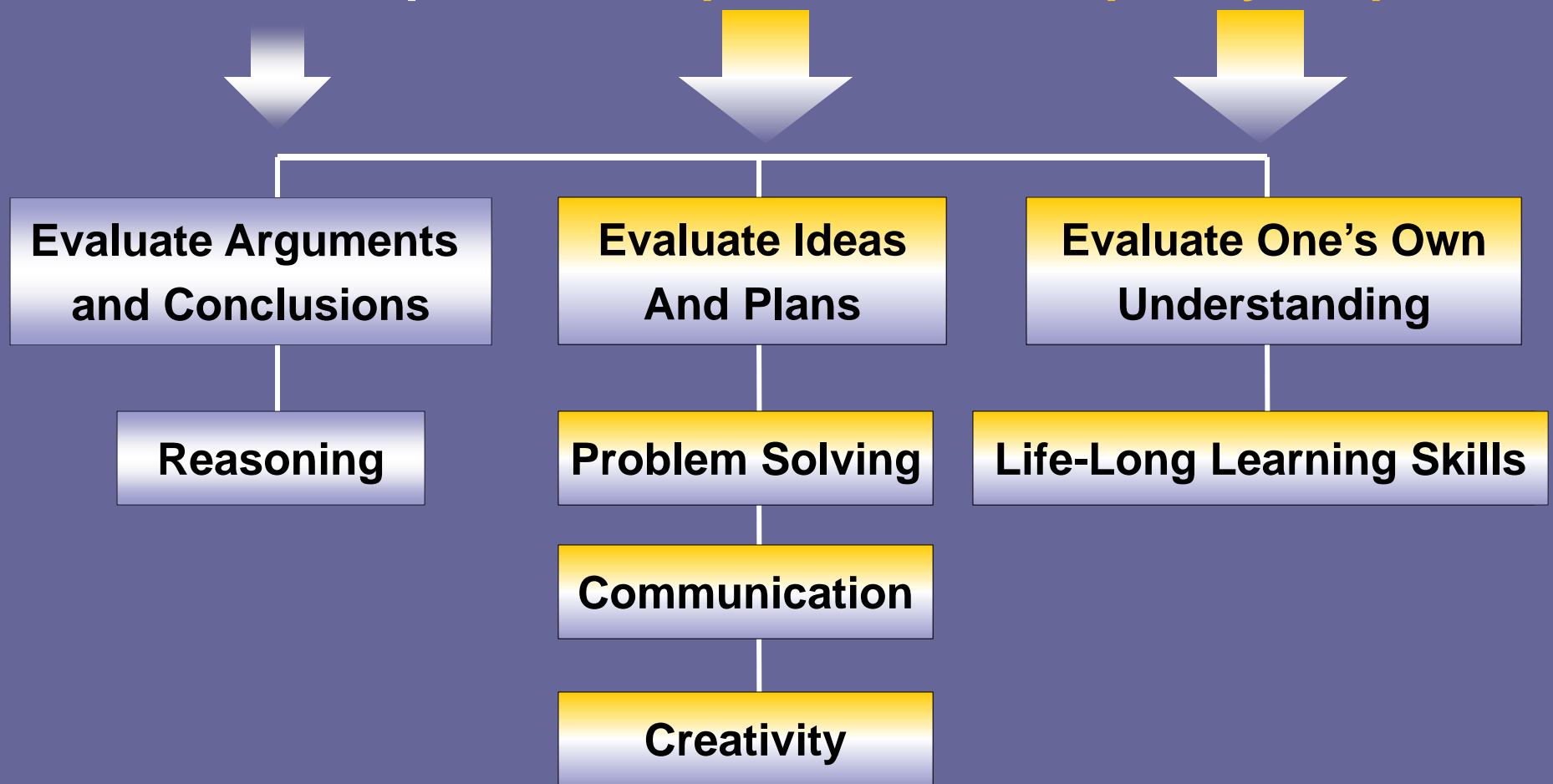
Reasoning



What is Critical Thinking?

Classical Emphasis

Expanded Contemporary Emphasis





Why Assess 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**

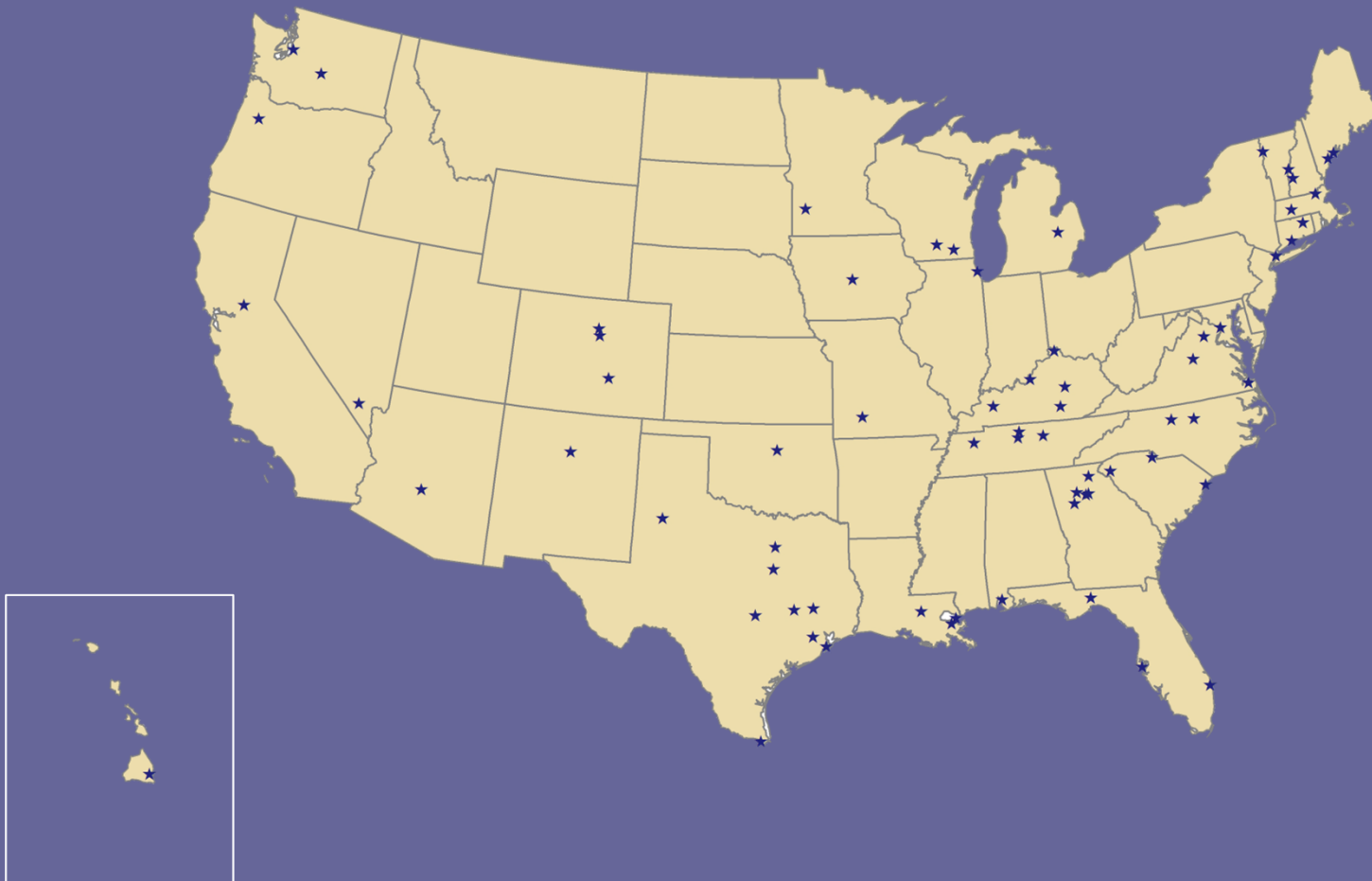


**Develop Training Methods for
National Dissemination & Collect Norms
2007 - 2010**

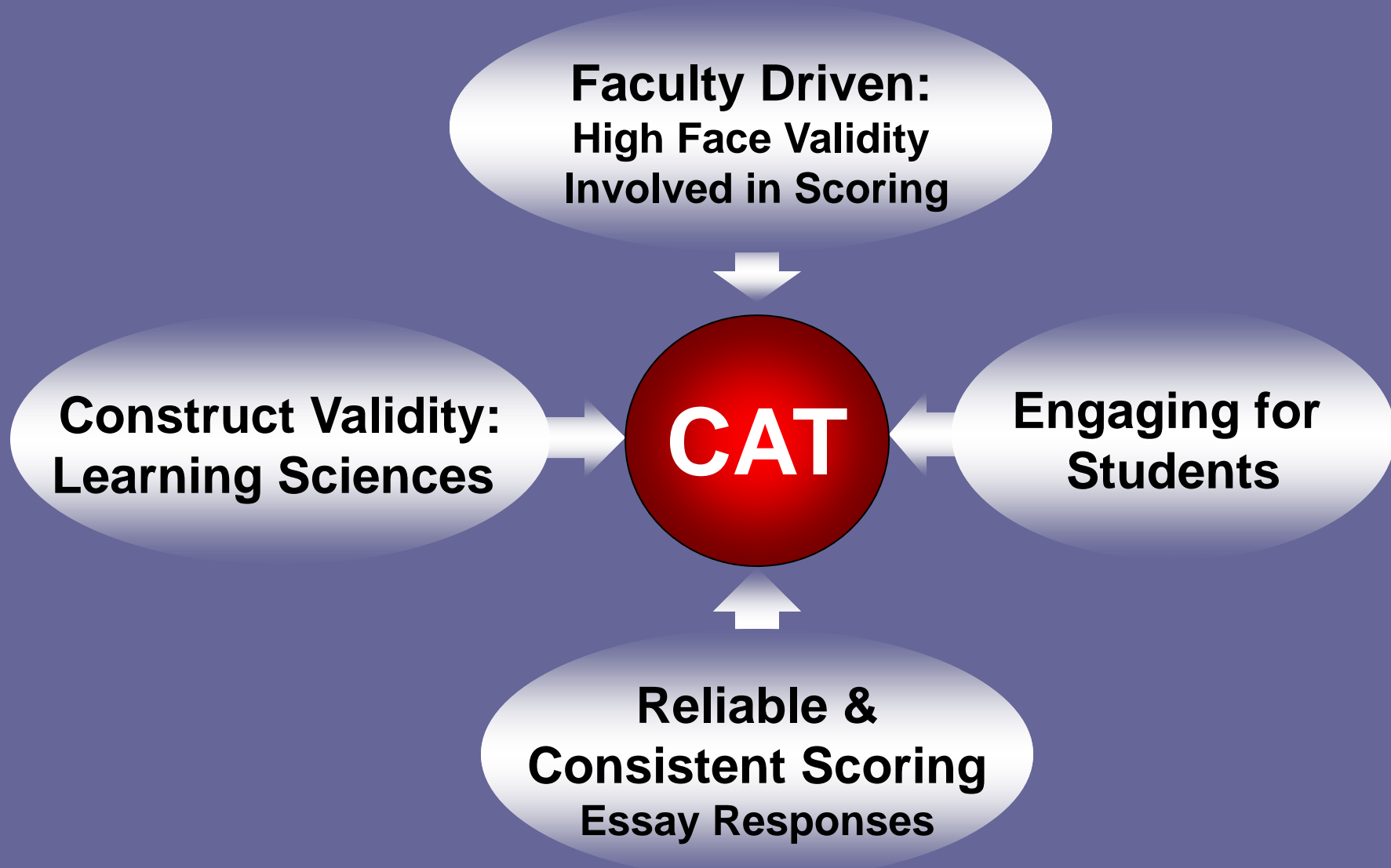


**Expand National Dissemination
& Support Assessment in NSF Projects
2010 - 2014**

Over 80 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

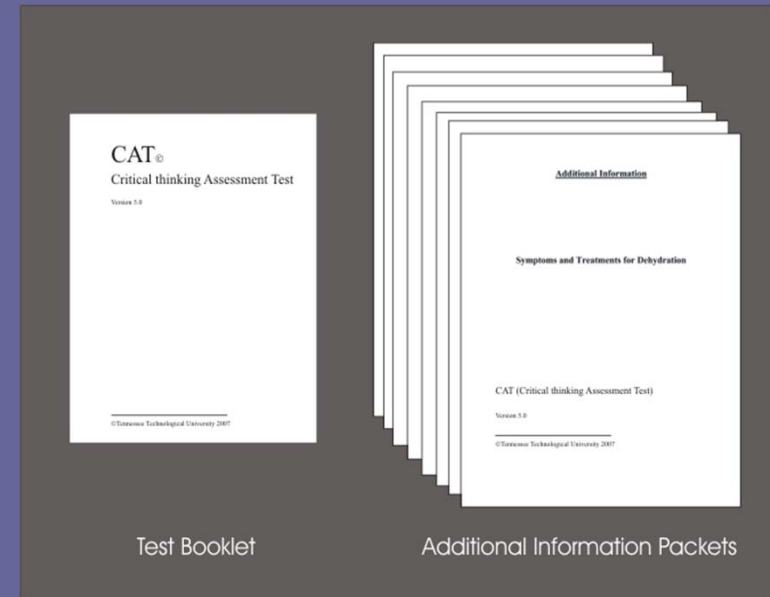
- Separate relevant from irrelevant information.
- Integrate information to solve problems.
- Learn & apply new information.
- Use mathematical skills to solve real-world problems.

Communication

- Communicate ideas effectively.

CAT features

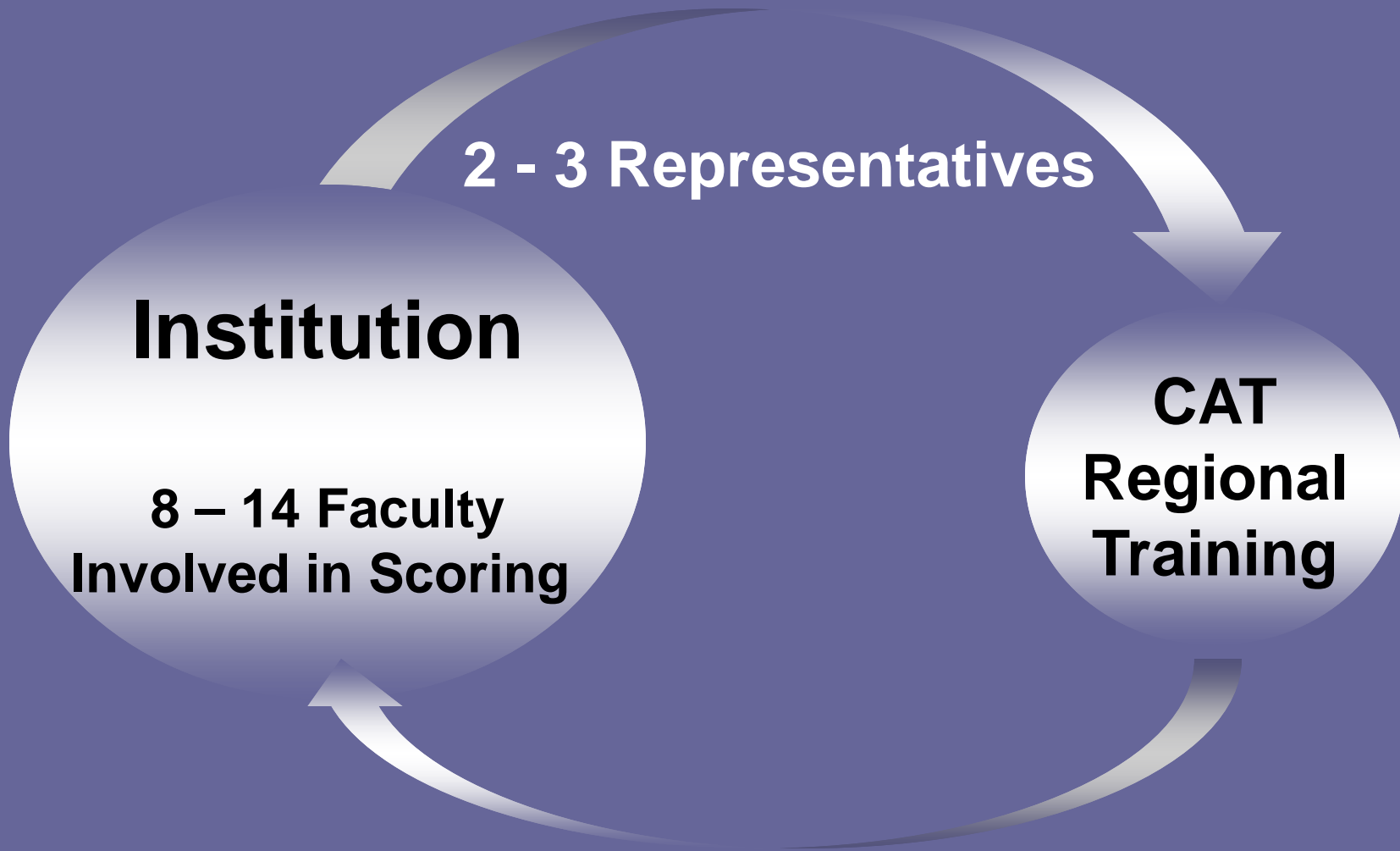
- One hour exam
- Mostly short answer essay
- Faculty scored in workshops
- Detailed scoring guide
- Reliable
- Valid



Cost

\$6 Test, \$200 Year Participation Fee

National Dissemination Model



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.

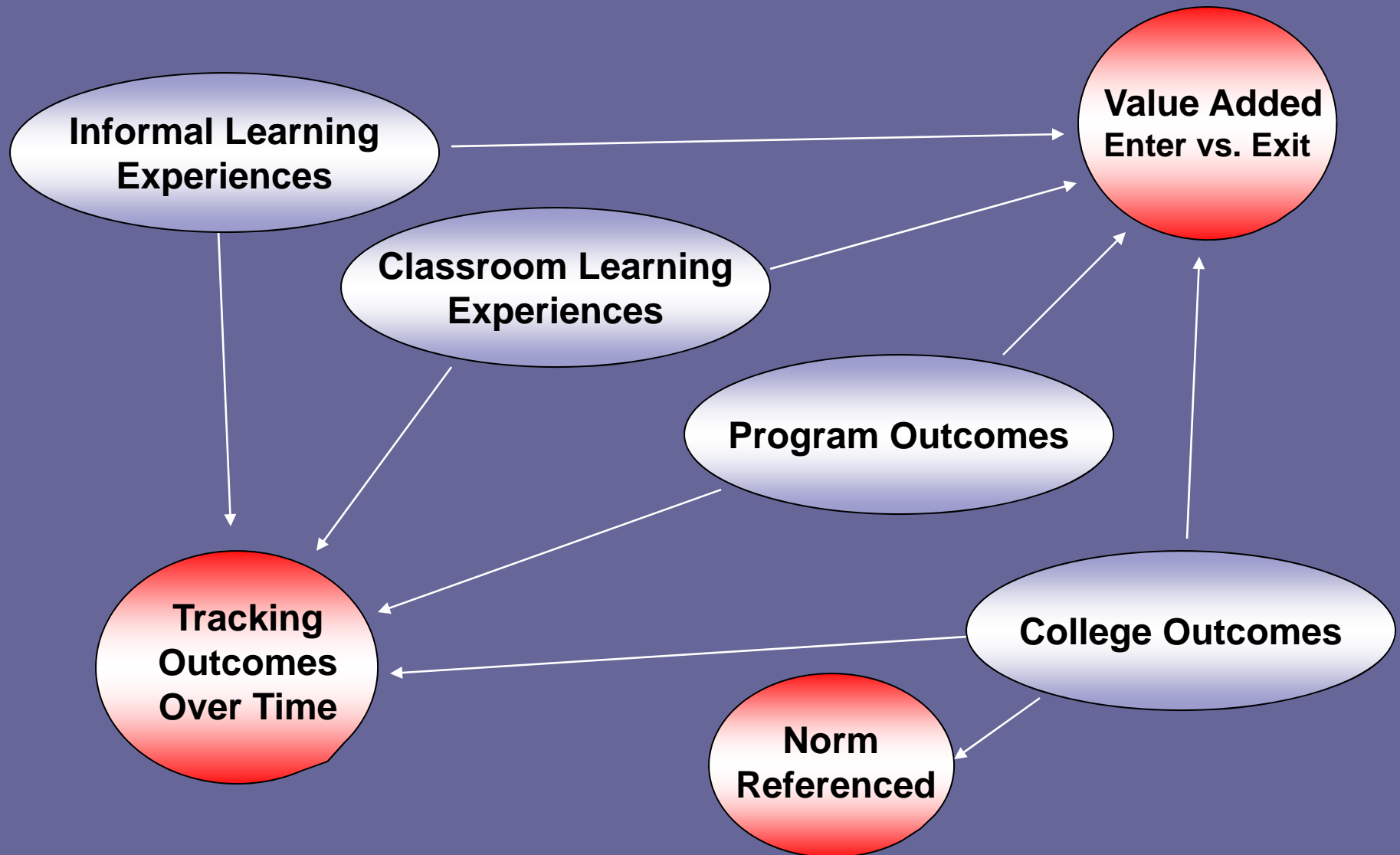
- 99.9% of the people who committed crimes consumed bread prior to committing crimes.
- Crime rates are extremely low in areas where bread is not consumed.

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.

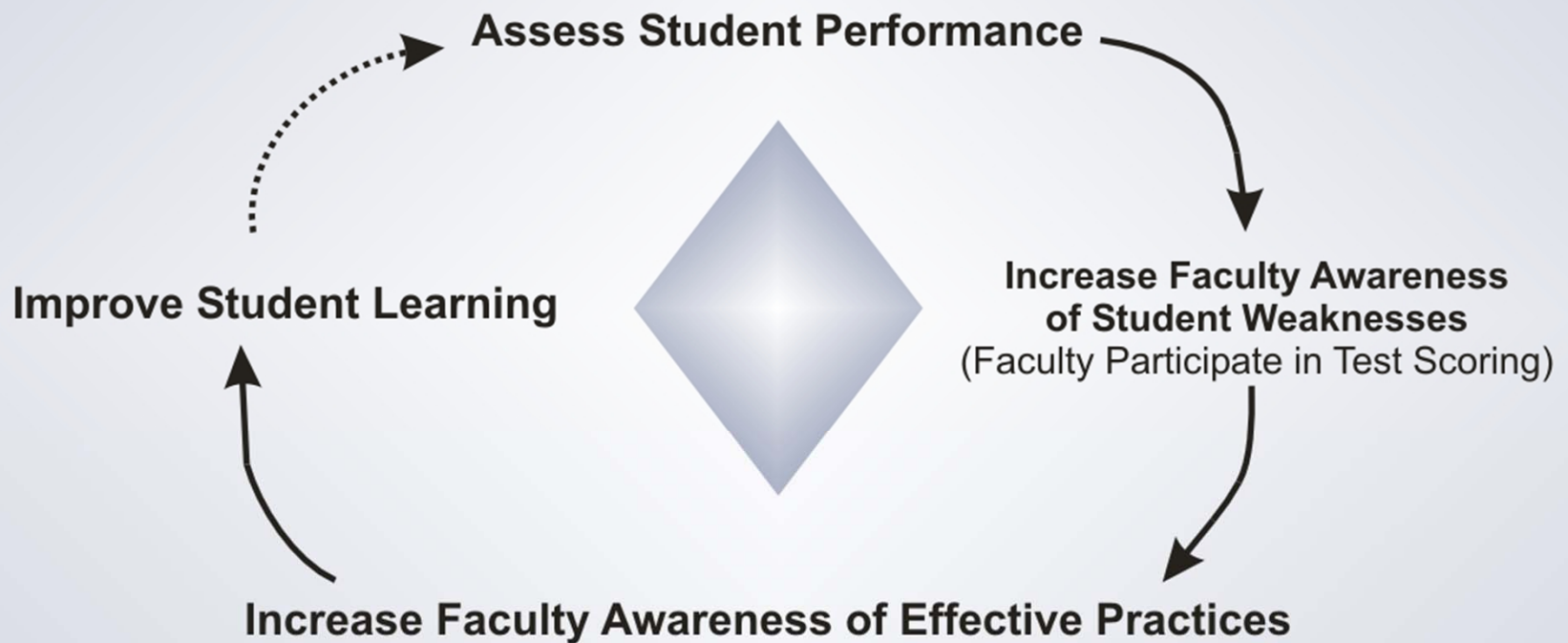
What kind of additional information or evidence would support the scientist's theory?

Assessment Uses of CAT



Closing the Loop in Assessment and Quality Improvement

Closing the Loop in Assessment and Quality Improvement





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 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@clemson.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.

Sam Houston State University

A multidisciplinary general education course, *Foundations of Science*, was developed to improve students' critical thinking and scientific literacy. The course is taught collaboratively by faculty in Geography/Geology and Biology. Marcus Gillespie [GEO_BMG@SHSU.EDU] ; Matthew Rowe [MPR002@SHSU.EDU]

In the course, students critically evaluate a diversity of extraordinary and engaging claims (sometimes controversial), ranging from astrology to alternative medicines to the lost continent of Atlantis to help them understand the relevance of science in their daily lives. Students work in groups to discuss various **Case Studies** (many designed specifically for this course). The course emphasizes the way scientists think critically about information and ideas more than the facts of science. The course also incorporates discussion of common logical fallacies, and other types of reasoning/perceptual biases that can mislead us. Students are introduced to the importance of sample size, double-blind clinical studies, and the placebo effect during our discussions of alternative medicines and alleged paranormal phenomena. Throughout the course, we try to help students understand that they can use what they learn about science and critical thinking to help them make better decisions for themselves, for their families, and for society.

University of Wisconsin - Madison

NSF-CCLI Project #0737352. Teaching nature of science and scientific inquiry in the context of scientific paradigms: Assessing student understanding. Basil Tikoff (PI) & Nancy Ruggeri. basil@geology.wisc.edu

Excerpt from Course Description: This course is about how scientists figure things out. To put it more formally, it is about how people make sense of the natural world in the past, understand the present, and make predictions for the future. An integral (and interesting) part of this process is the different methods scientists use to create their knowledge, communicate, and have that



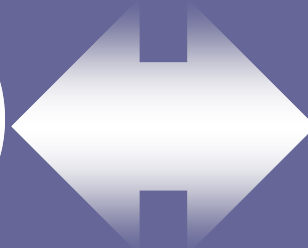
Northwestern NSF Project

**Faculty Development
Workshops
& Participation in
CAT Scoring**

**Impact on Teaching
Attitudes & Practices**

Institutional Involvement

**Northwestern
University**



**City Colleges
Of Chicago**



Goals

1. **Reflect critically on key issues in learning and teaching in higher education.**
2. **Develop their learning, teaching, and assessment practices to facilitate higher order student learning outcomes.**
3. **Redesign an existing course or develop a new course that implements these new learning and teaching practices.**
4. **Improve STEM students' higher order learning outcomes.**

Hypothesis

**Faculty Involvement
Scoring CAT & Course
Improvement**

Vs.

**Standard Faculty
Development
Workshops**

**Impact
on
Teaching**

Assessments

**Faculty Instructional &
Assessment Practices**

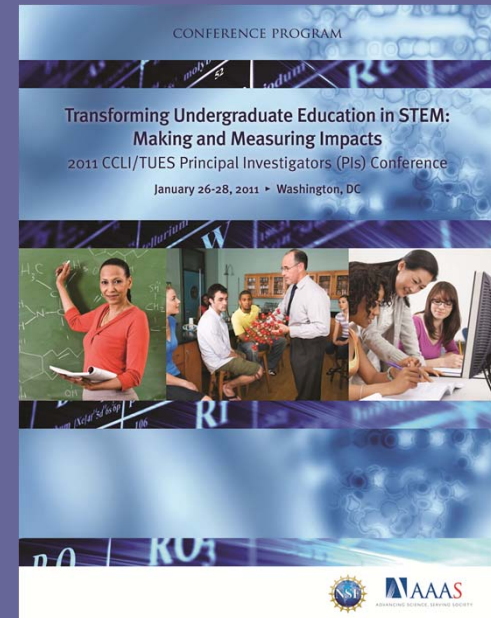
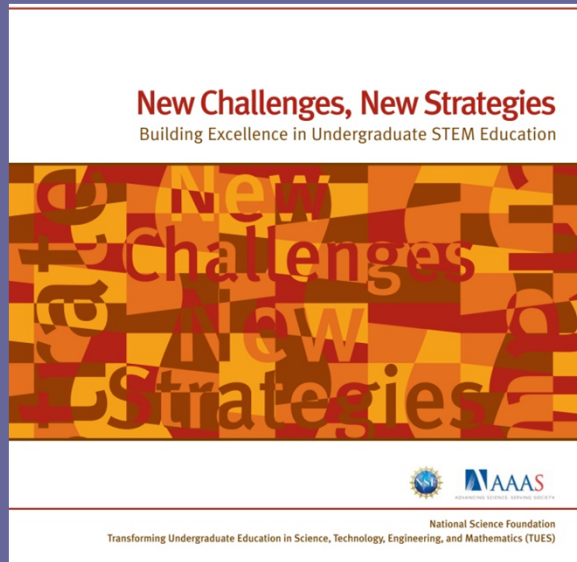
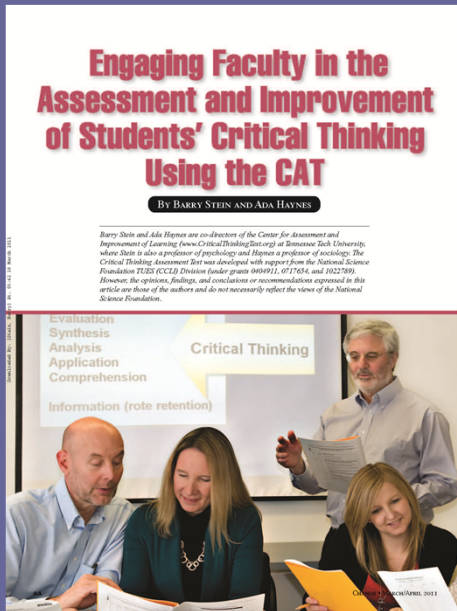


**Faculty approaches and
conceptions of teaching**



**Student Learning
Outcomes**





www.CriticalThinkingTest.org

&

www.northwestern.edu/searle/programs/facultyprograms/CTSI_program.html

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.