



Assessing Critical Thinking Using the CAT Instrument

Dr. Barry Stein, PI, Chairperson of Counseling & Psychology

Dr. Ada Haynes CoPI, Professor of Sociology, QEP Director

Center for Assessment and Improvement of Learning



American Association of Colleges & Universities, 2010

Partial support for this work was provided by the National Science Foundation's CCLI Program under grants 0404911, 0717654.

© Tennessee Tech University 2010



National Advisory Board

Dr. John Bransford

James W. Mifflin University Professor University of Washington

Dr. Donald Deeds

Professor of Biology Drury University

Dr. Peter Ewell

**Vice President The National Center for Higher Education
Management Systems**

Dr. Michael Grant

Associate Vice Chancellor University of Colorado



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

[Link](#)

Information and the Internet

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

Factual Error Found On Internet

LONGMONT, CO—The Information Age was dealt a stunning blow Monday, when a factual error was discovered on the Internet. The error was found on Ted's Ultimate Brady Bunch, a *Brady Bunch* fan site that incorrectly listed the show's debut year as 1968, not 1969.

Caryn Wisniewski, a Pueblo, CO, legal secretary and diehard *Brady Bunch* fan, came across the mistake while searching for information about the show's first-season cast.

"When I first saw 1968 on the web page, I thought, 'Wow, apparently, all those *Brady Bunch* books I've read listing 1969 as the show's first year were wrong.'" Wisniewski told reporters at a press conference. "But even though I obviously trusted the Internet, I was still kind of puzzled. So I checked other *Brady Bunch* fan sites, and all of them said 1969. After a while, it slowly began to sink in that the World

Wide Web might be tainted with unreliable information."

Following up on her suspicion, Wisniewski phoned her public library, the



Above: The shocking error.

ABC television network, and the office of *Brady Bunch* producer Sherwood Schwartz—all of whom confirmed that "Ted's Ultimate *Brady Bunch* Site" was in error.

Attempts to contact the webmaster of see INTERNET page 7

31% of Population Use the Internet as Primary Source of Healthcare Information

What is Critical Thinking?

Classic Emphasis

Evaluate Arguments and Conclusions

Reasoning



What is Critical Thinking?

Classical Emphasis

Expanded Contemporary Emphasis



**Evaluate Arguments
and Conclusions**

**Evaluate Ideas
And Plans**

**Evaluate One's Own
Understanding**

Reasoning

Problem Solving

Life-Long Learning Skills

Communication

Creativity

Bloom's Taxonomy

Evaluation

Synthesis

Analysis

Application

Comprehension

Information (rote retention)

Critical Thinking

Agreement on what is not Critical Thinking

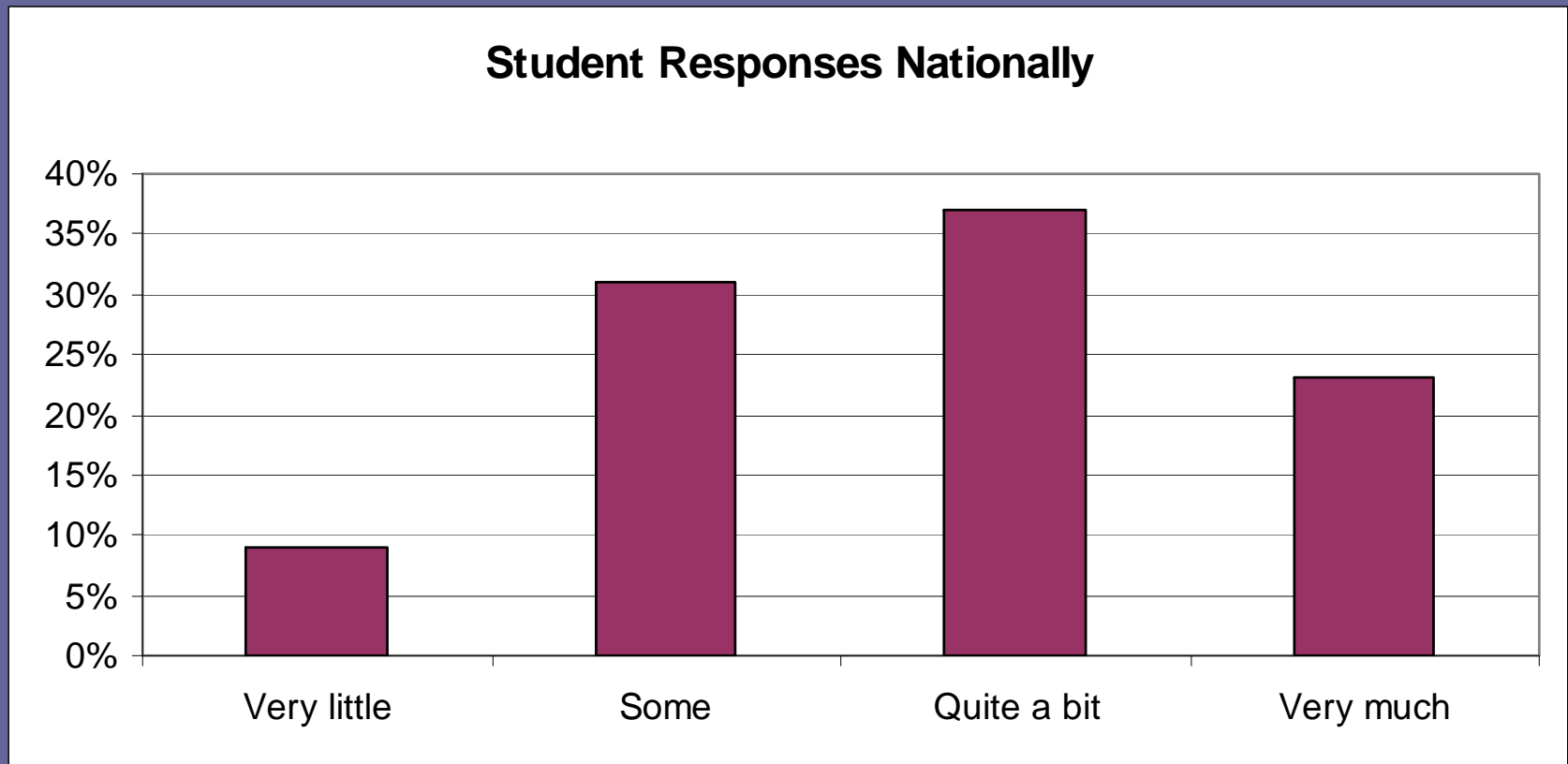
*NSSE Question

(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



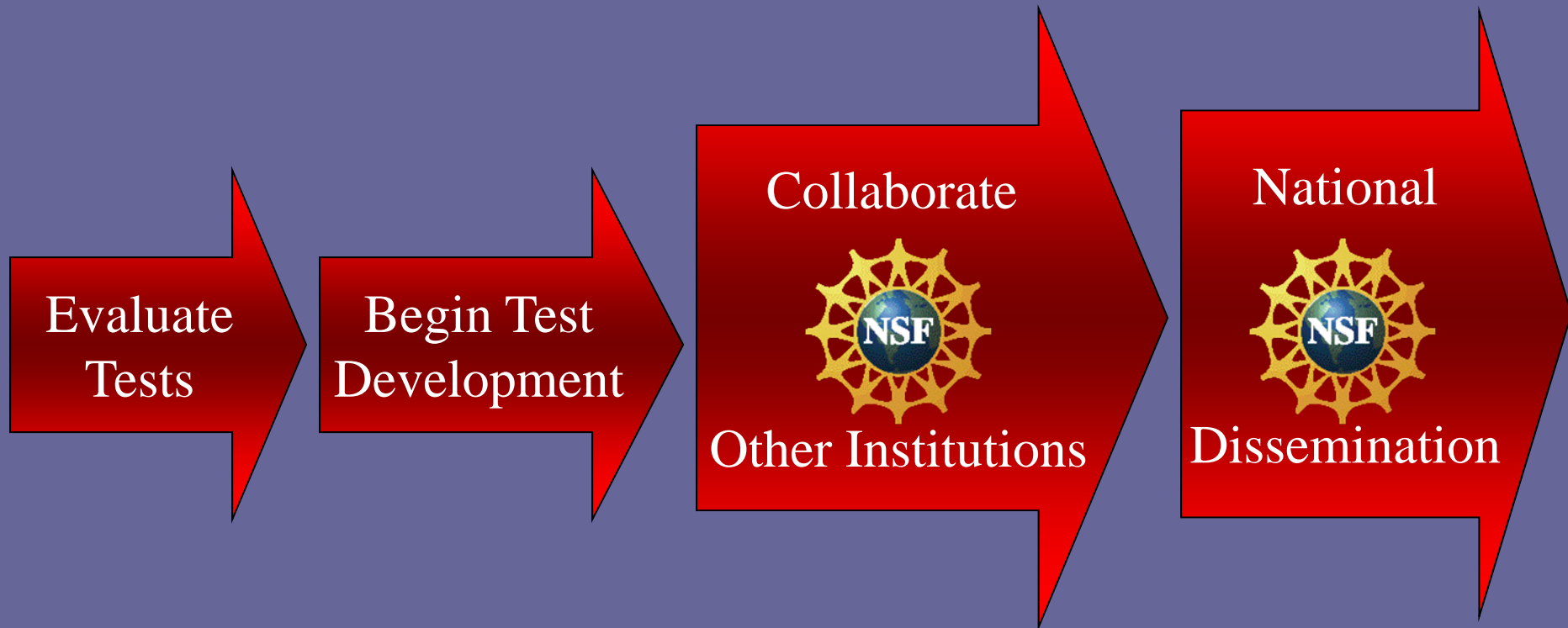


Why Assess Critical Thinking?

Need to Measure Success for Accountability

Assessment Drives Improvement Efforts

History of CAT Development



Developing the CAT Instrument

Faculty & Students

**Learning Sciences
Experts**

CAT

External Evaluators

**Statistical
Findings**

Institutions Participating in Test Development



Howard University
Madisonville Community College
The University of Colorado
The University of Hawaii
The University of Southern Maine
The University of Texas
The University of Washington

Over 40 Institutions Now Collaborating



Skills Evaluated by CAT Instrument

Evaluating Information

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

Creative Thinking

- Identify & evaluate evidence for a theory.
- Identify new information that might support or contradict a hypothesis.
- Explain how new information can change a problem.

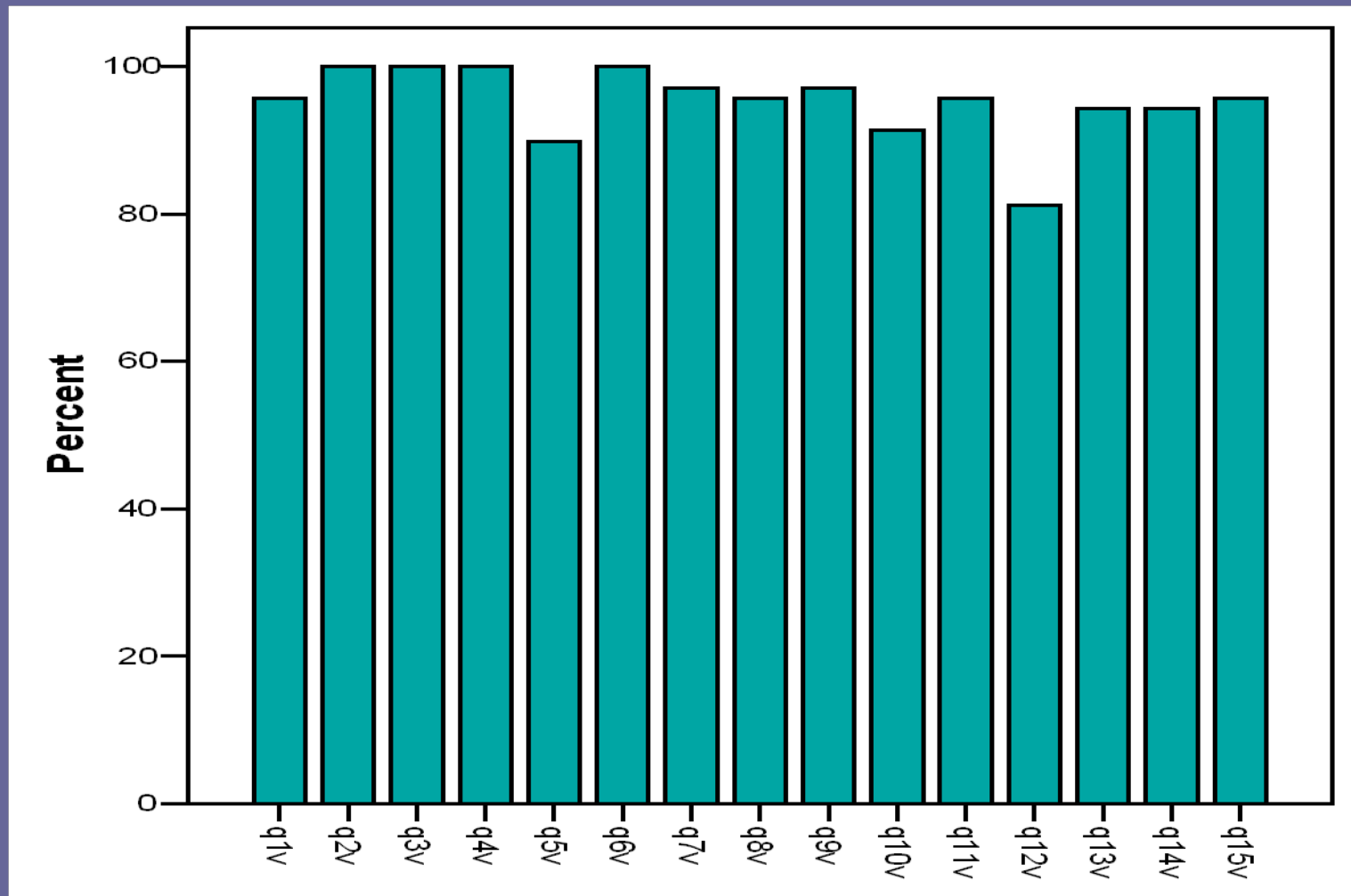
Learning & Problem Solving

- 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.

Faculty Evaluations of Question Validity



CAT Statistics

General Measures of Academic Performance

	ACT	SAT	Academic Profile	Grade Point Average
CAT	0.560*	0.528*	0.562*	0.295*

* correlations significant, $p < .01$

Other Measures of Critical Thinking

	CCTST (California Critical Thinking Skills Tests)	CAAP Critical Thinking Module
CAT	0.645*	0.691*

* correlations significant, $p < .01$

CAT Results with 2005 NSSE

(National Survey of Student Engagement)

Multiple R = .490
(explains 24% of variability in CAT)

NSSE Question	Beta Coefficient
(2a) Memorizing facts, ideas, or methods from your courses and readings so you can repeat them in pretty much the same form. <i>(negative relationship)</i>	-.341 **
(3b) Number of books read on your own (not assigned) for personal enjoyment or academic enrichment.	.277 **
(11e) Thinking critically and analytically & (11m) Solving complex real-world problems	.244 **
(7h) Culminating Senior Experience (thesis, capstone course, project, comprehensive exam, etc.)	.231 *

* Significant at .01 level

** Significant at .001 level

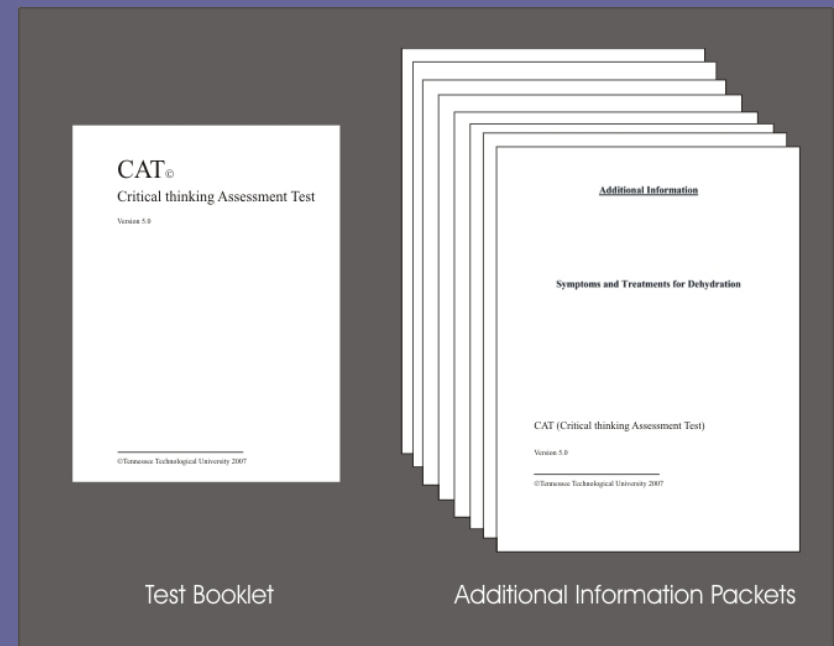
CAT vs. CCTST with NSSE

NSSE Question	CAT Coefficient	CCTST Coefficient
(2a) Memorizing facts, ideas, or methods from your courses and readings so you can repeat them in pretty much the same form. (<i>negative relationship</i>)	-.341 *	-.212*
(3b) Number of books read on your own (not assigned) for personal enjoyment or academic enrichment.	.277 *	-.124
(11e) Thinking critically and analytically & (11m) Solving complex real-world problems	.244 *	.144
(7h) Culminating Senior Experience (thesis, capstone course, project, comprehensive exam, etc.)	.231 *	.025

* Significant at .01 level

CAT features

- One hour exam
- Mostly short answer essay
- Faculty scored in workshops
- Detailed scoring guide
- Reliable (.82 - .85)
- Valid



Student Comments

- I thought the test wasn't too difficult, but it was challenging. You have to look at things deeply to truly understand.
- I thought the assessment was interesting and made me use real life scenarios and data to decide my results.
- I thought the test was thought provoking, but not too difficult.
- It was an easy test that tests the mind. I enjoyed the stories and the questions on the test. I think I did very well on the test.

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.

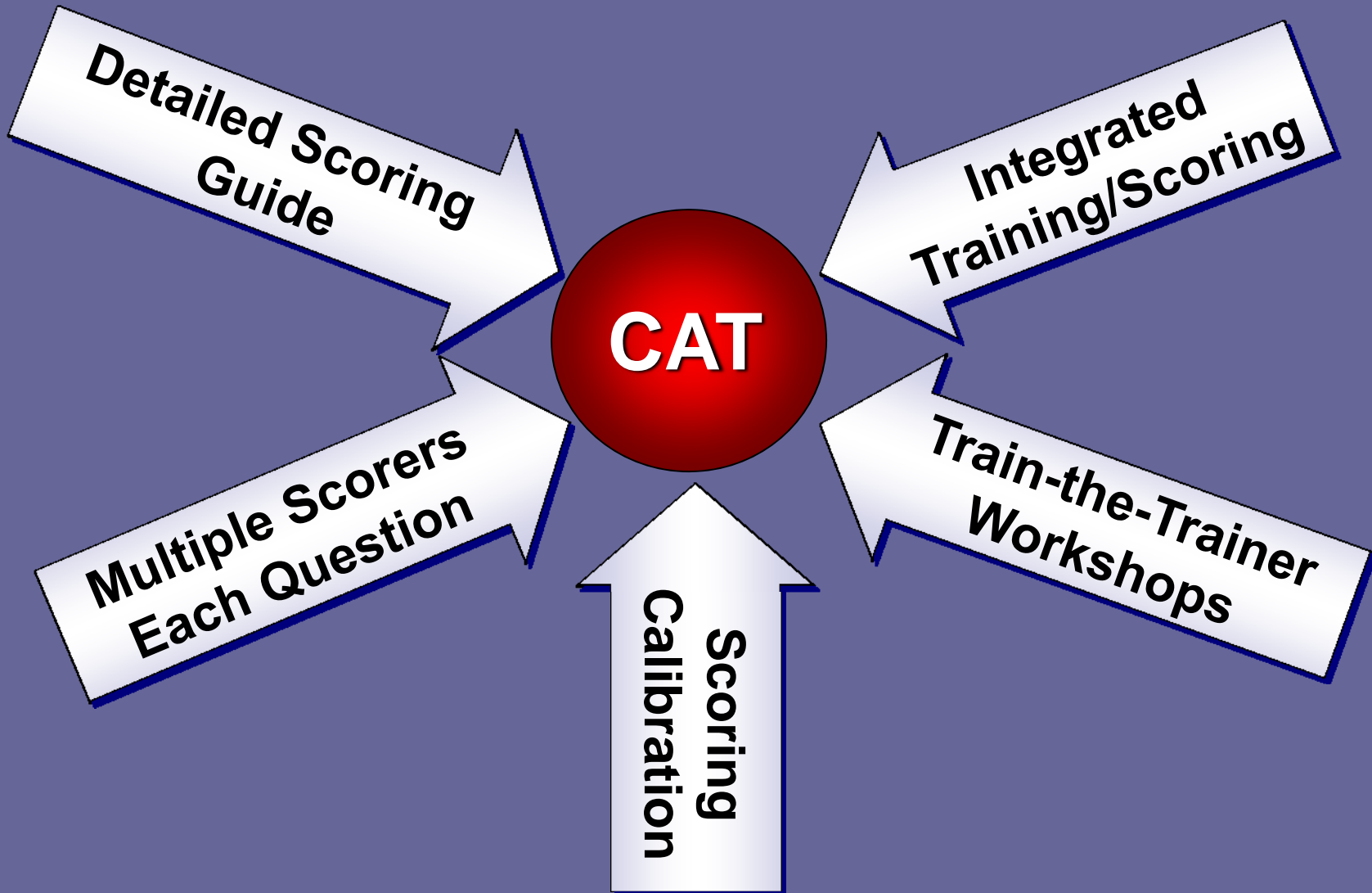
- 99.9% of the people who committed crimes consumed bread prior to committing crimes.
- Crime rates are extremely low in areas where bread is not consumed.

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?

Ensuring Reliability of Scoring



Various CT Assessments

CAT

**Portfolios & Other Tests
(CLA, CCTST, CAAP CT module)**

Student Performance

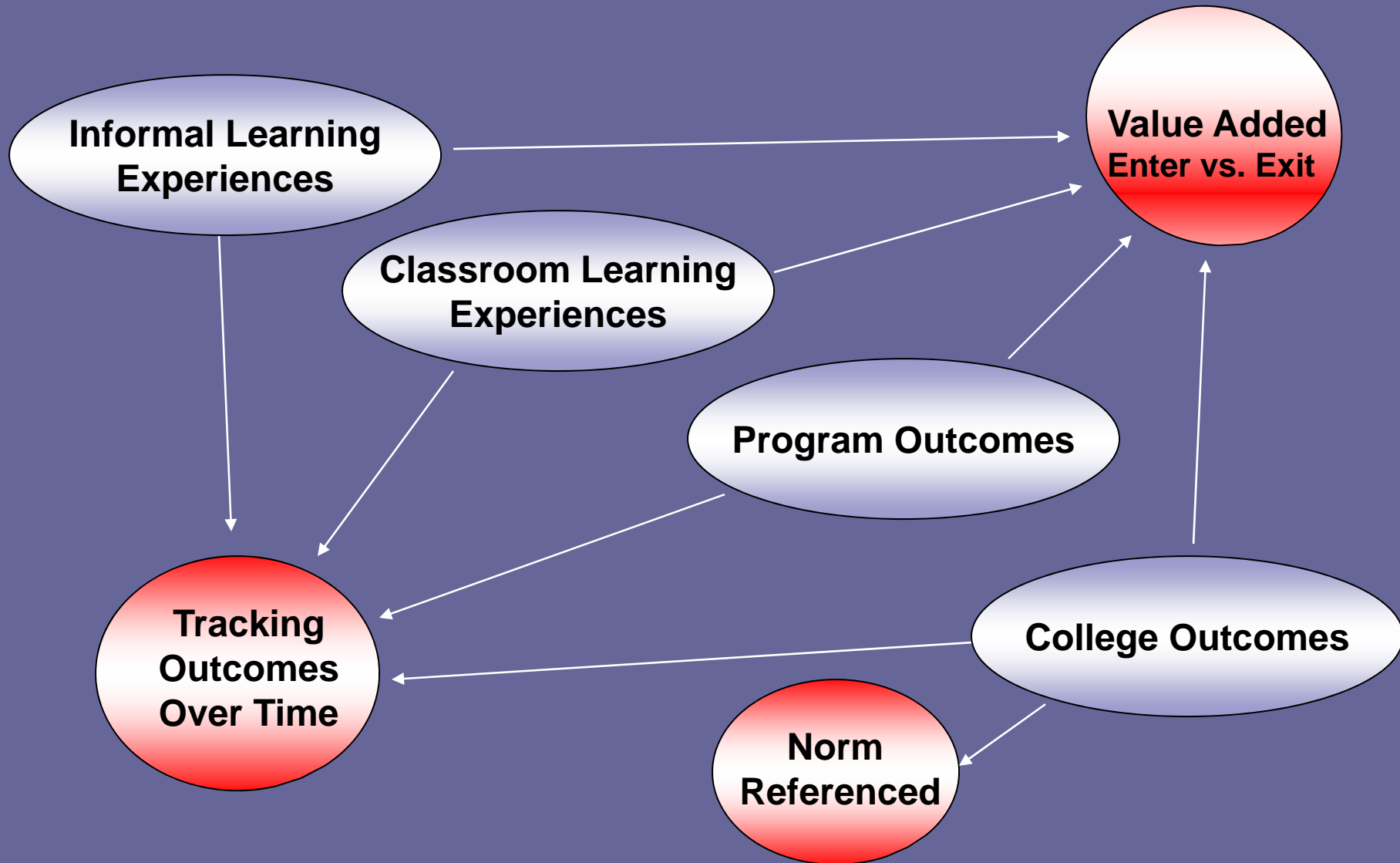
**IDEA Teaching Evaluations
NSSE/CSSE & other surveys**

Student Perceptions

Alumni & Employer surveys

**Alumni/Employer
Perceptions**

Assessment Uses of CAT

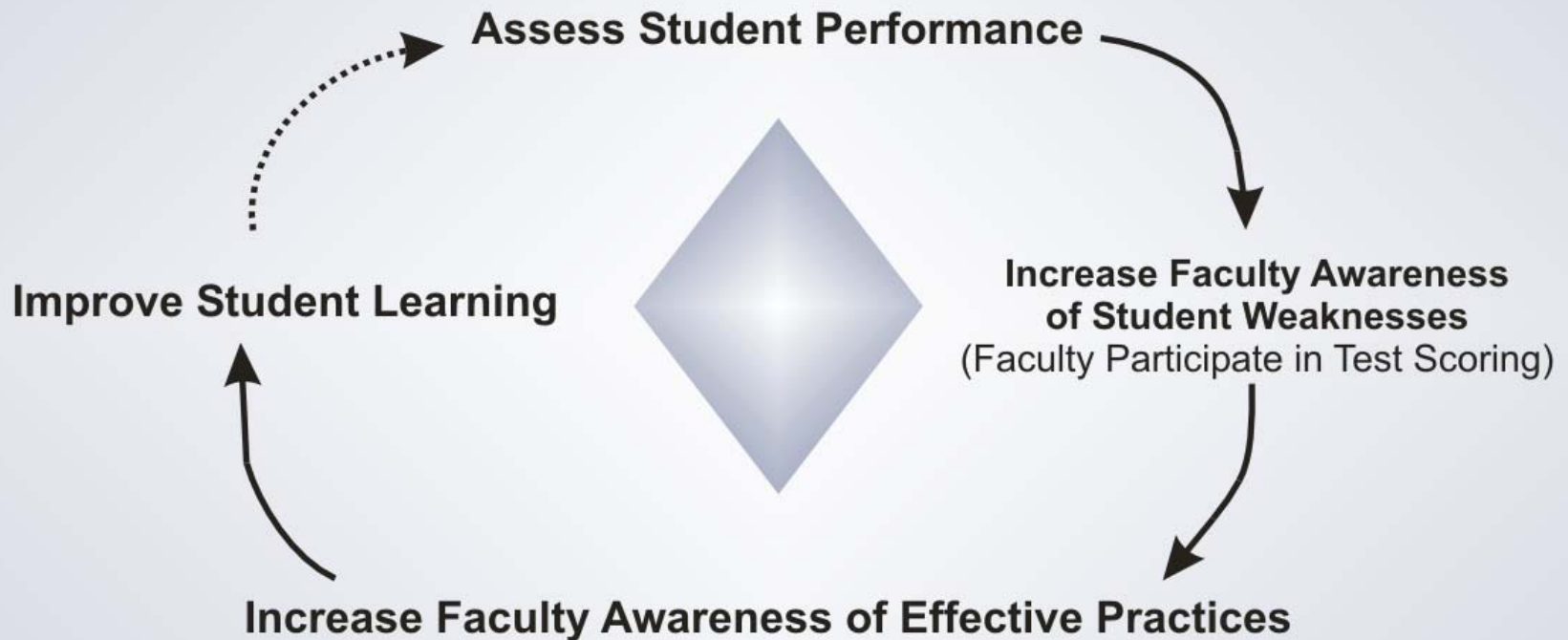


Effective Practices Are A Moving Target

[Video](#)

Closing the Loop in Assessment and Quality Improvement

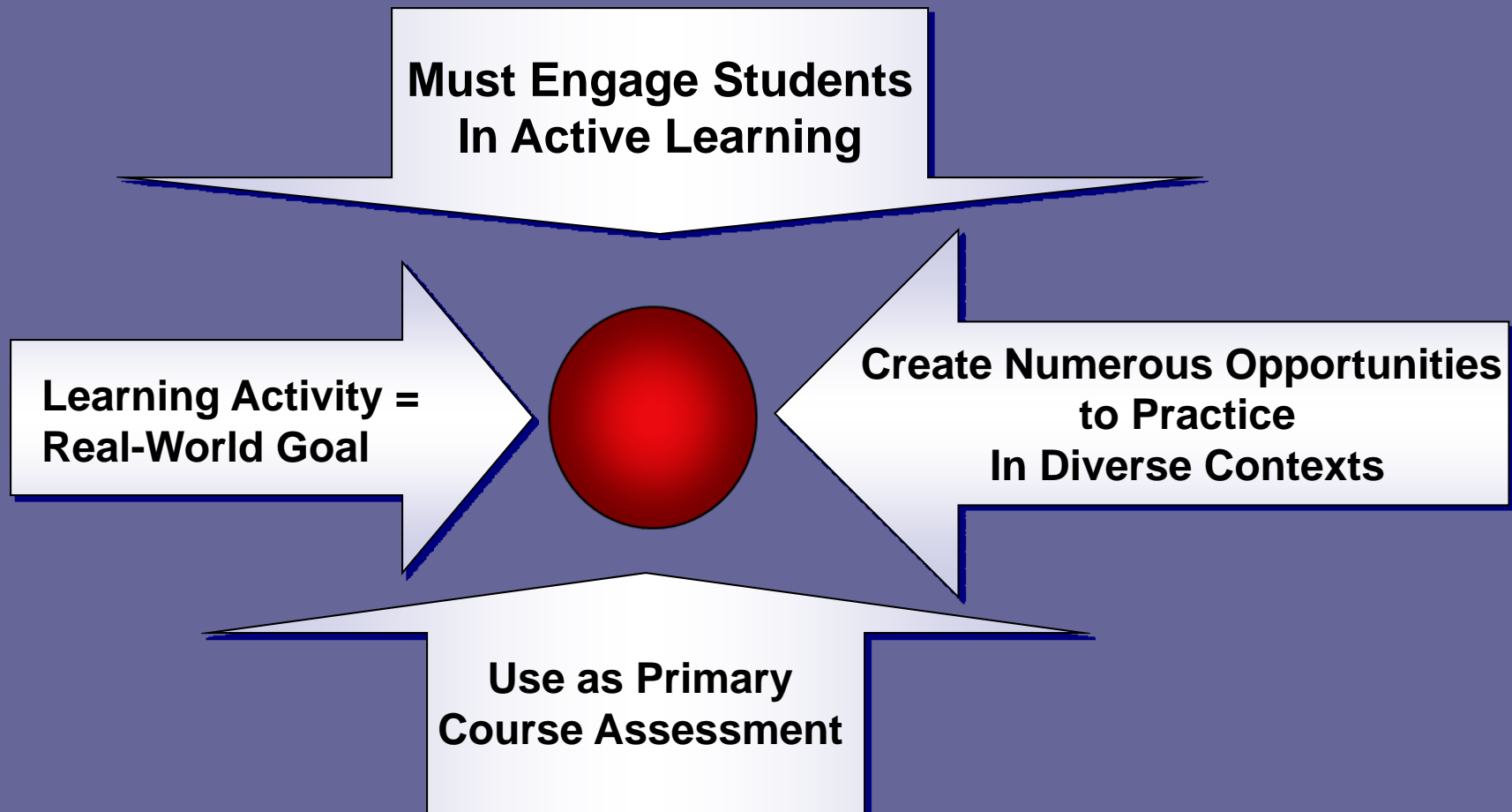
Closing the Loop in Assessment and Quality Improvement



Professional Development: Faculty Involvement in CAT Scoring



Design a task that resembles what we want students to do.





Evaluate Faculty Interest CAT Checklist



Upcoming Workshops

April 8 - 9 Boulder, CO



CAT National Dissemination Project

www.tntech.edu/CAT

or

www.CriticalThinkingTest.org

**Center for Assessment and Improvement of
Learning**

