Getting Faculty Involved in Assessing and Improving Students' Critical Thinking

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Importance of Critical Thinking

Explosion of Information

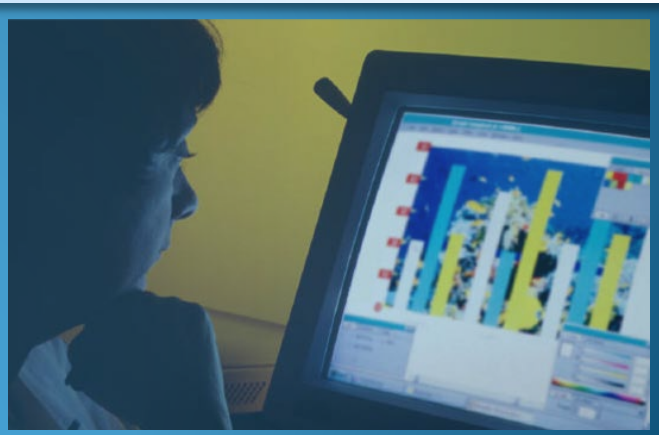
The Changing Nature of Education

Remembering Information

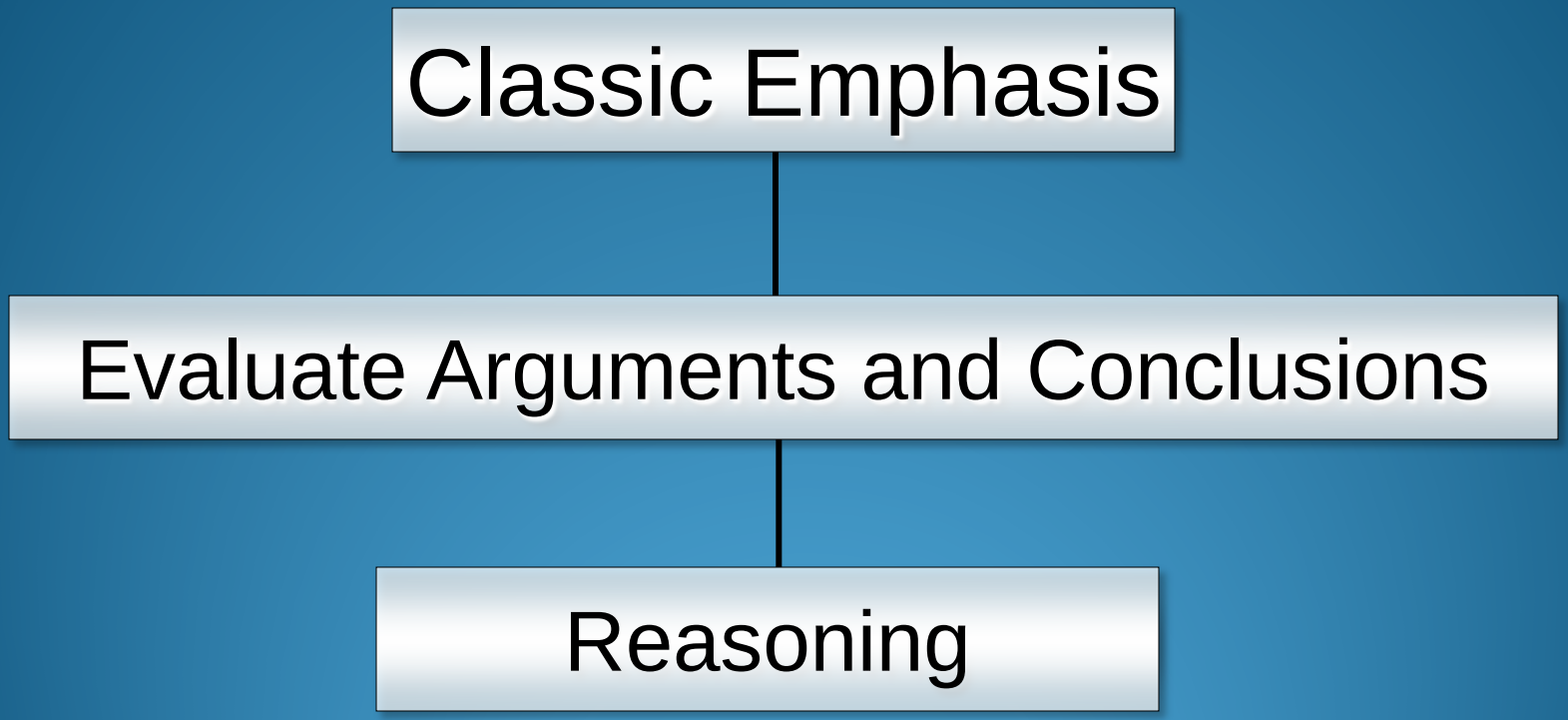
Finding Relevant Information

Understanding & Evaluating Information

Using Information Effectively



What is Critical Thinking?



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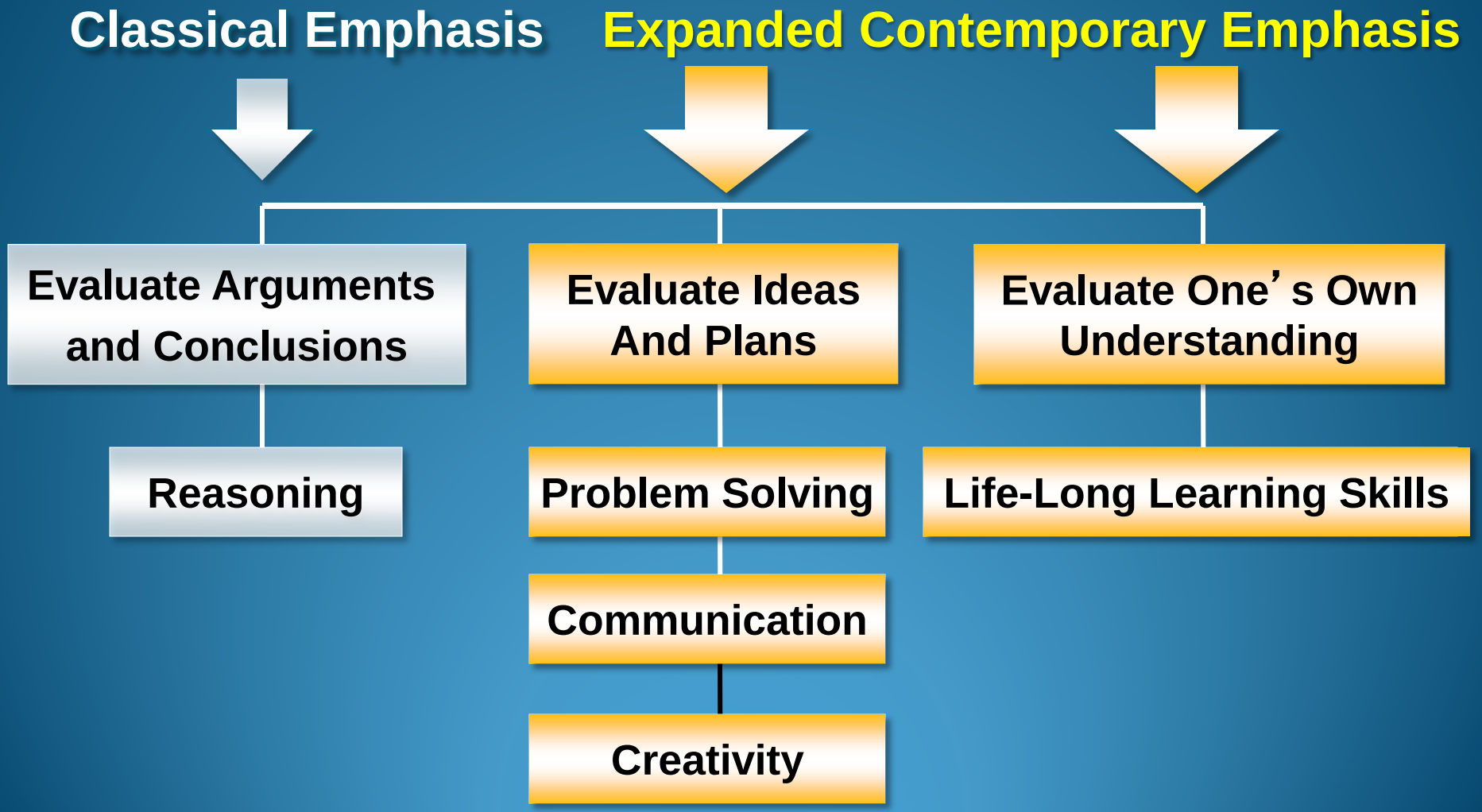


Why Assess Critical Thinking?

Need to Measure Success for Accountability

Assessment Drives Improvement Efforts

How We Assess - Determines What Students Learn

History of CAT Development

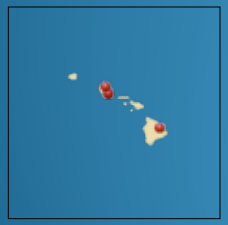
Preliminary Work
At TTU
2000 - 2004

Collaborate With Other
Institutions To Refine CAT
2004 - 2007

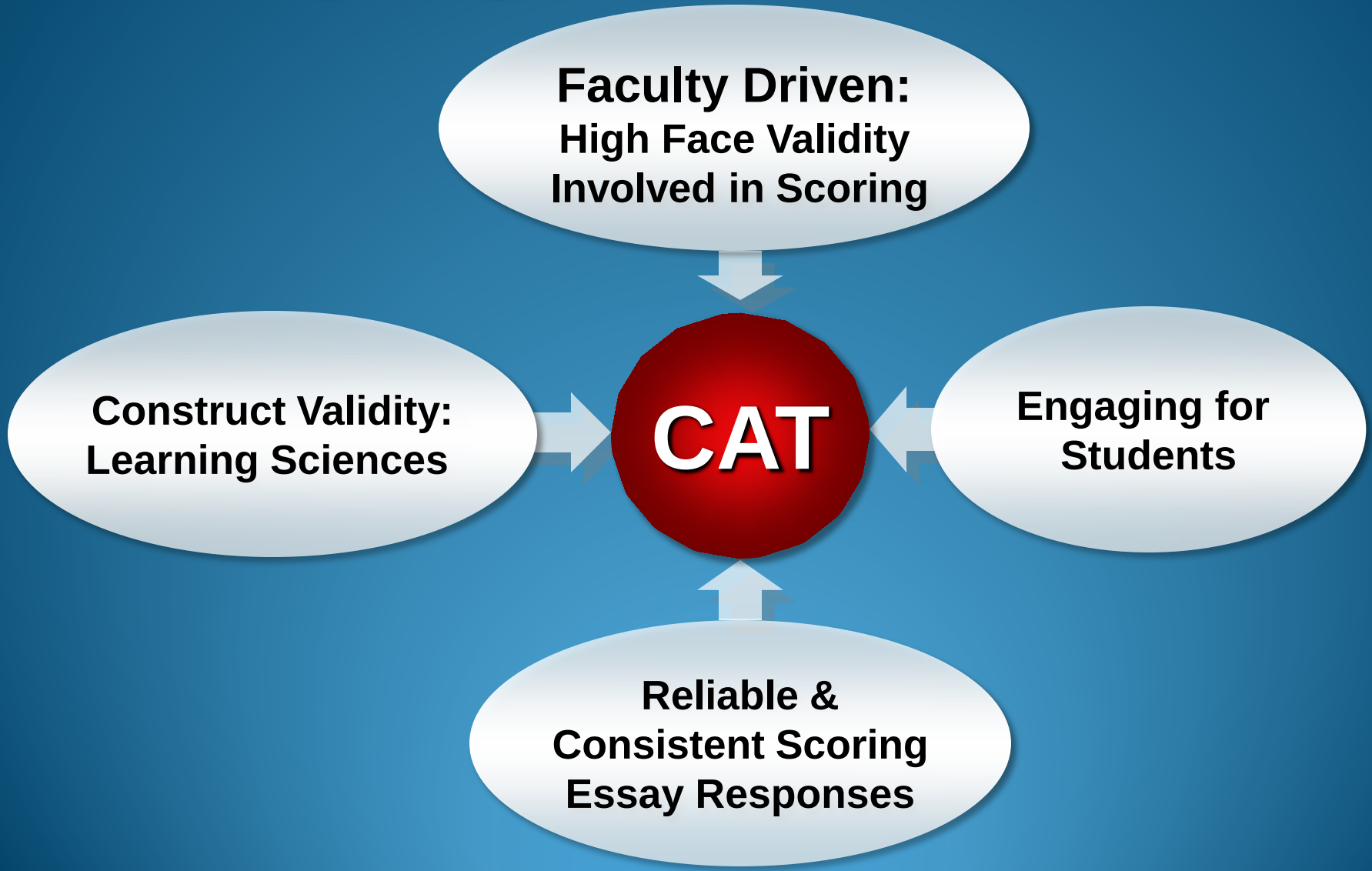
Develop Training Methods for
National Dissemination & Collect Norms
2007 - 2010

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

Over 100 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.

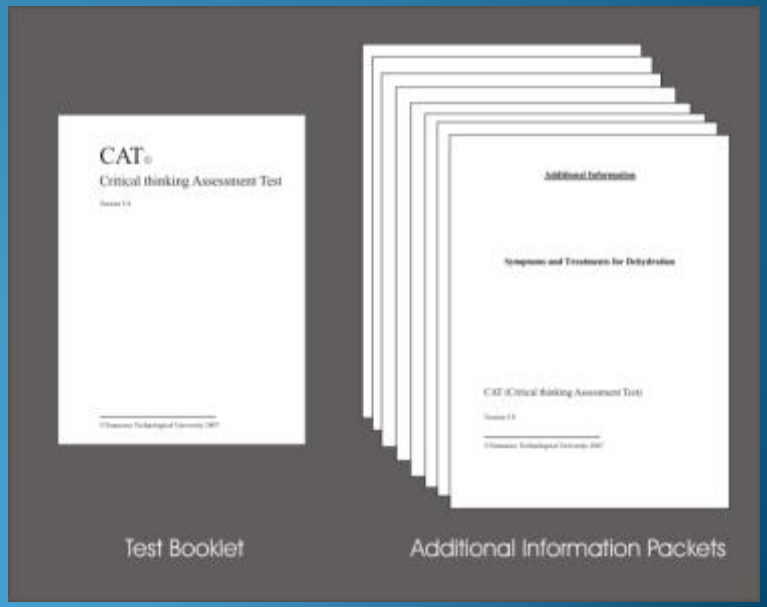
Use mathematical skills to solve real-world problems.

Communication

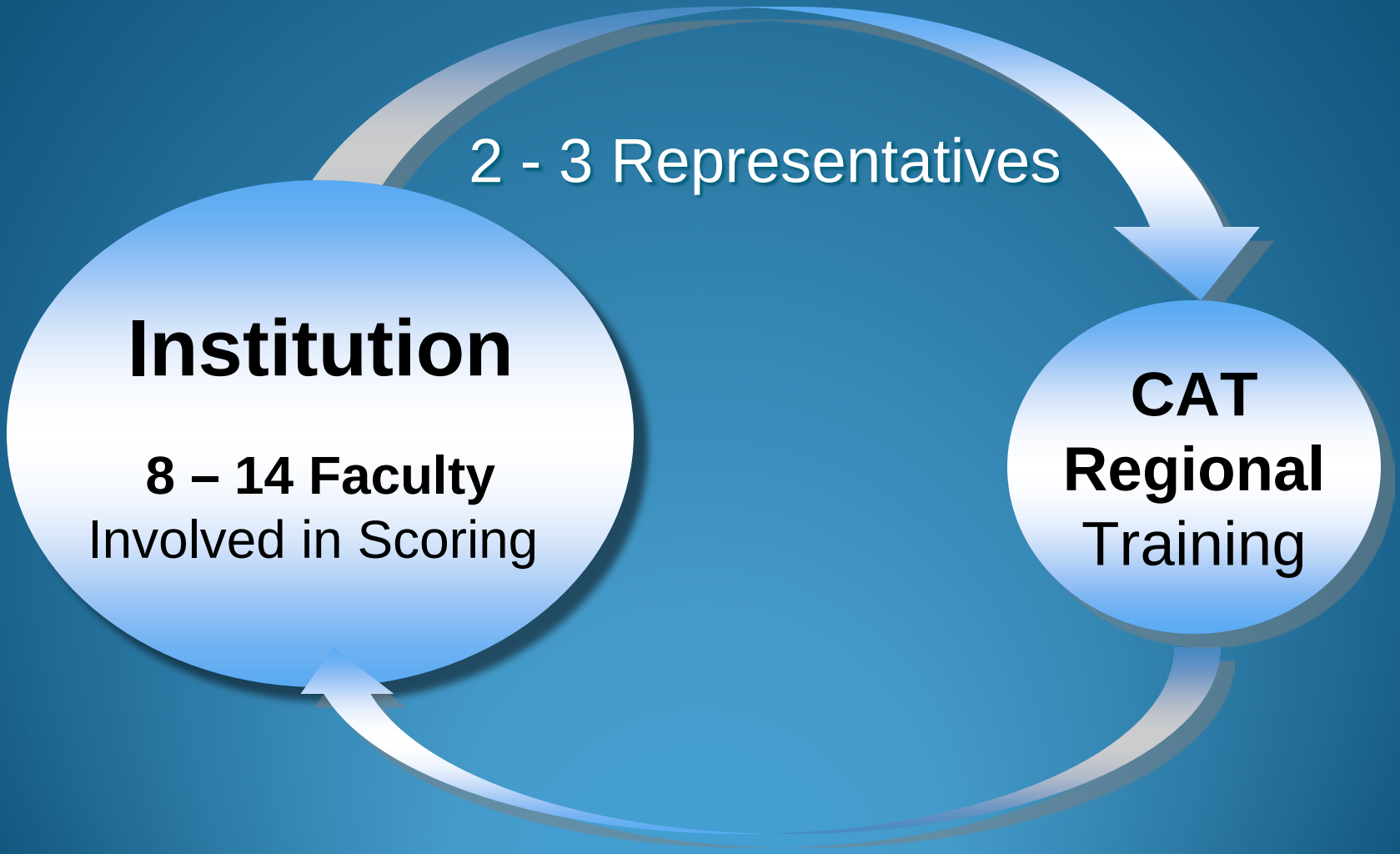
Communicate ideas effectively.

CAT Features

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



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____

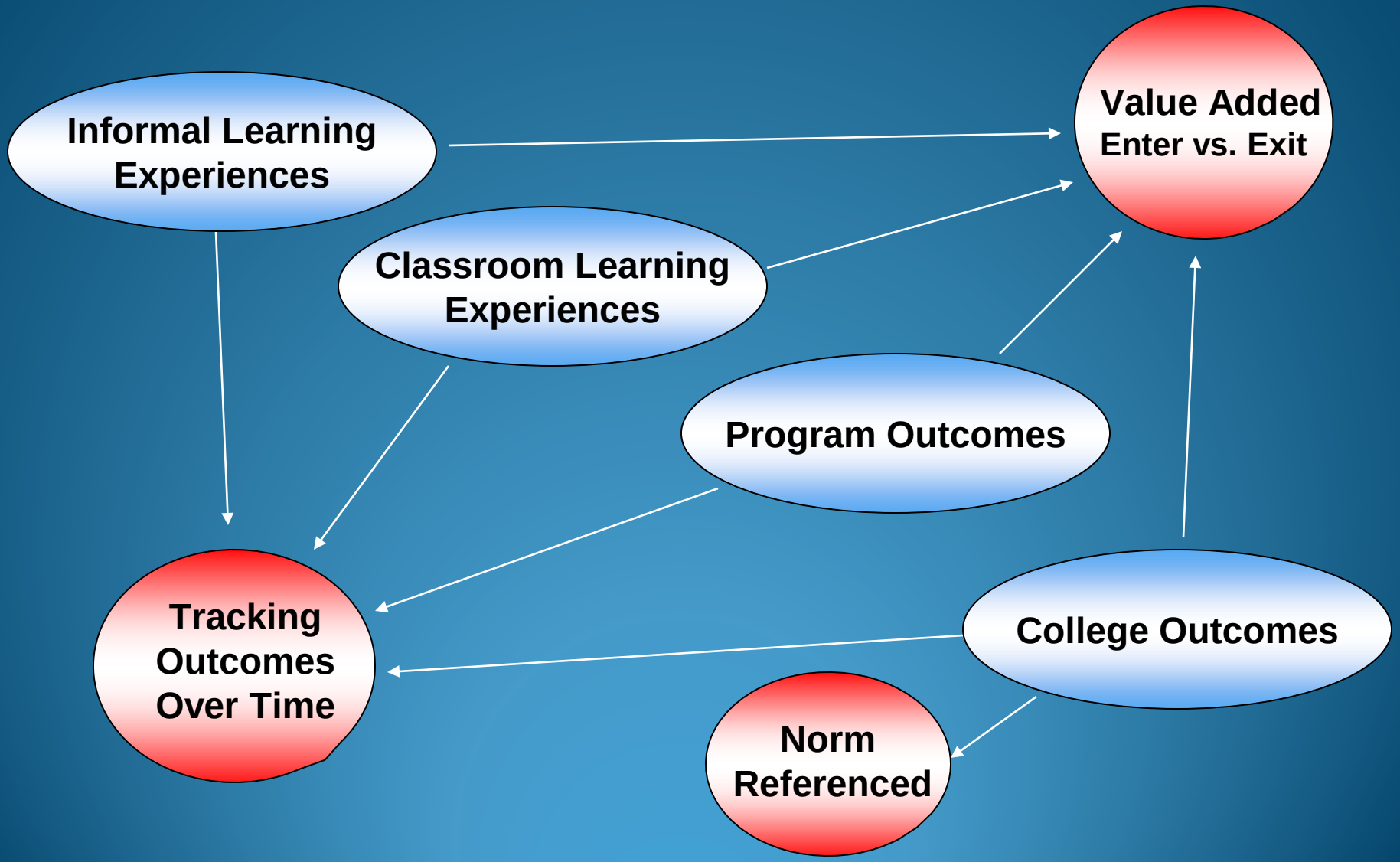
Are there other explanations for the data besides the scientist's theory? If so, describe.

_____

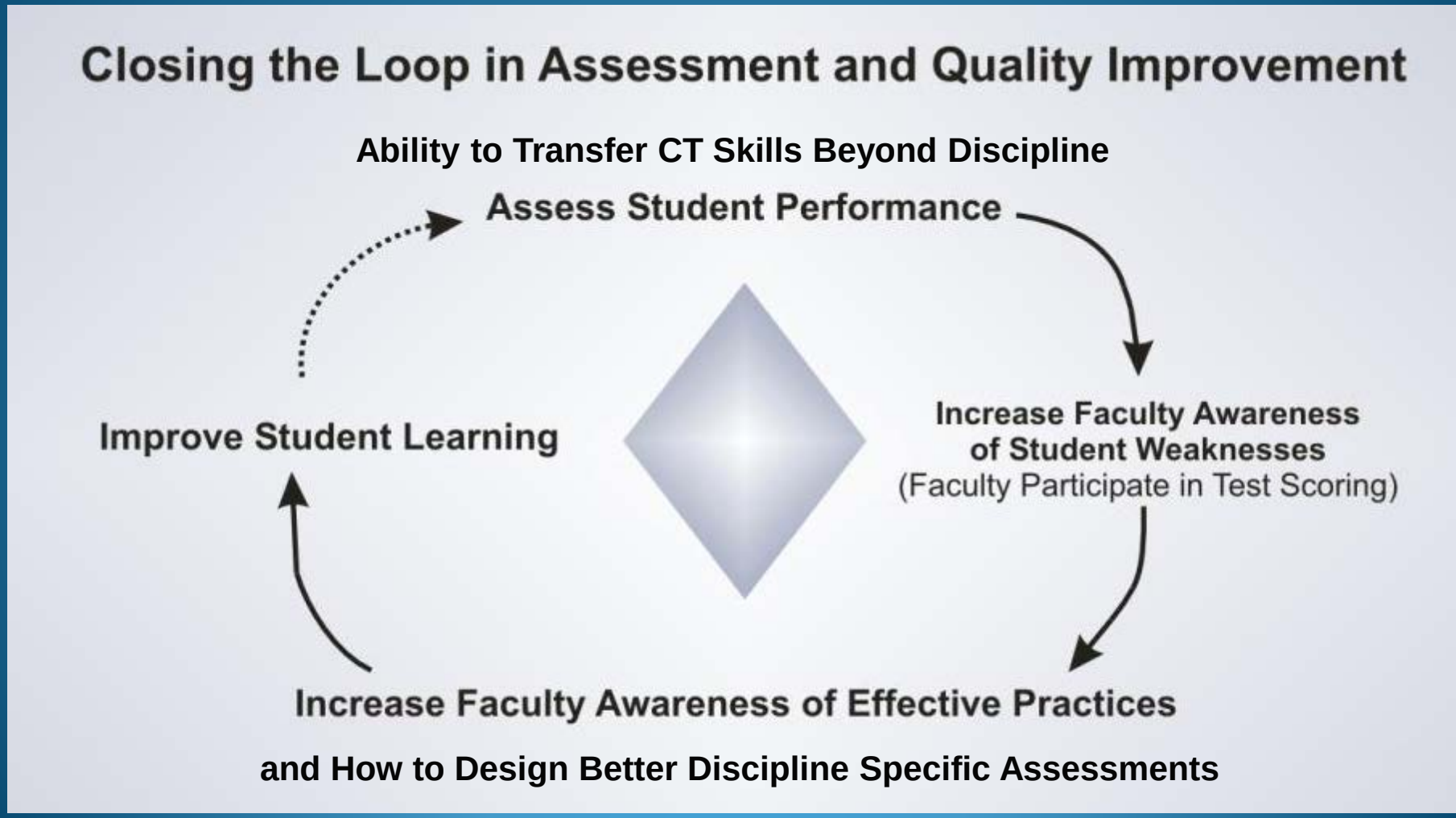
What kind of additional information or evidence would support the scientist's theory?

_____

Assessment Uses of CAT



Closing the Loop in Assessment and Quality Improvement



CRITICAL THINKING ASSESSMENT TEST

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 on a community problem. For the service-learning portion of the class, students spend a set number of hours throughout the semester in a specific community environment so that they learn about and understand the community problem. In class, the students conduct novel research, using the scientific method, on various parts of the community problem and investigate solutions to the problem.

Purdue University

Northwestern & City Colleges of Chicago NSF Project

Research Questions

Can we use the CAT to

1. **Improve how faculty teach critical thinking?**
2. **Increase the gains that students make in critical thinking?**

DUE-0942404

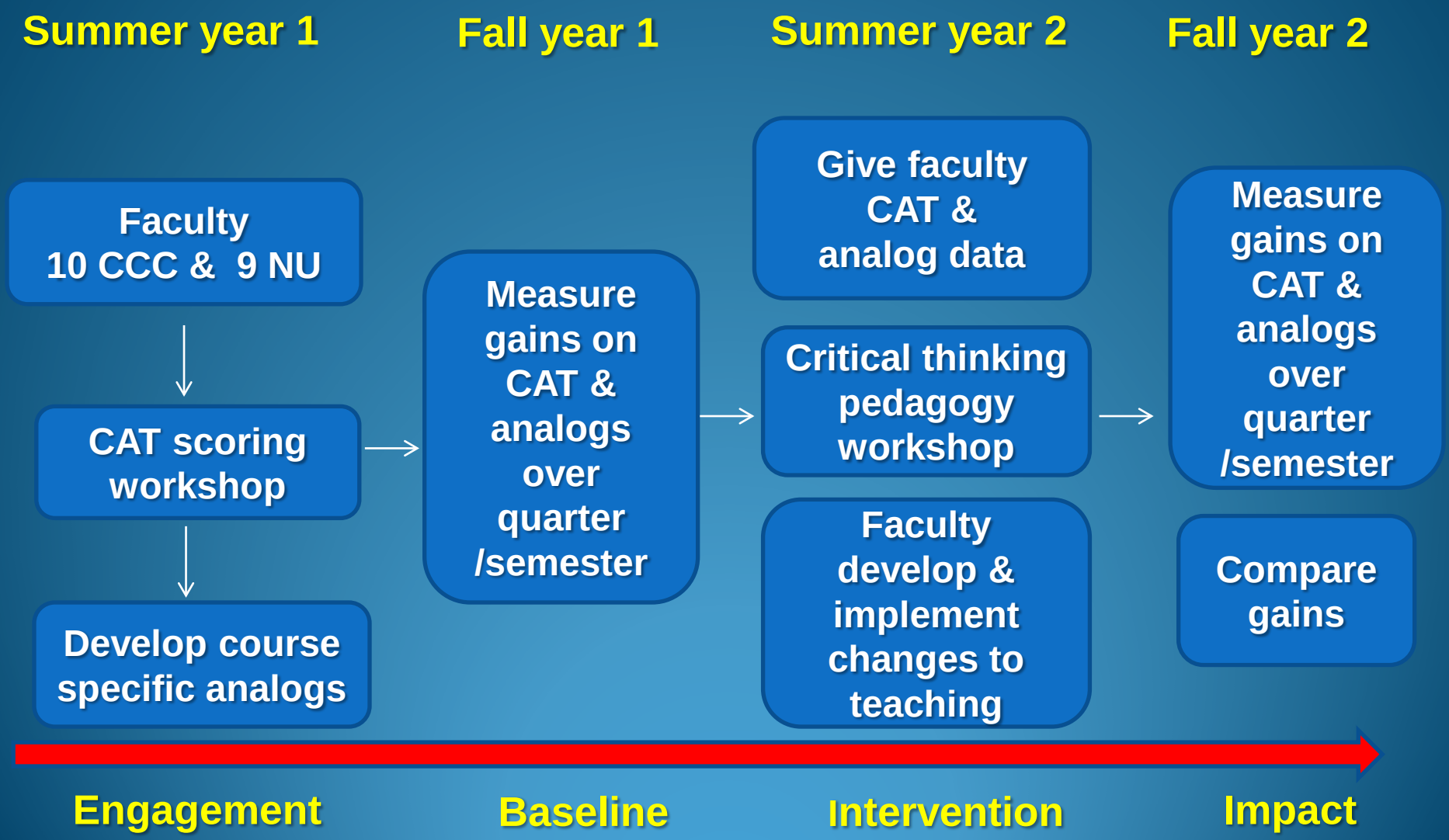
Northwestern & City Colleges of Chicago NSF Project

Present faculty with assessment data on student gains in critical thinking in their class

To inspire them to make changes to their teaching to enhance critical thinking

To see if changes in teaching result in greater gains in critical thinking

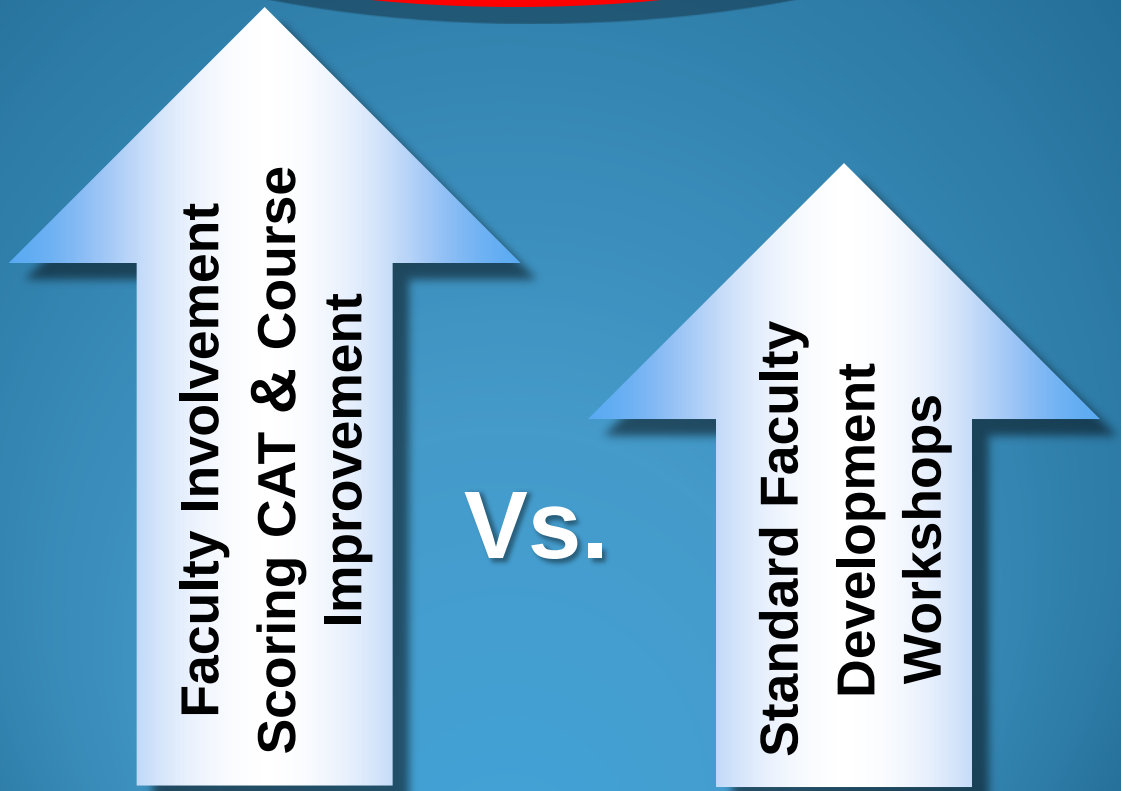
Critical Thinking Initiative in STEM: Study Design



Hypothesis

Impact on Teaching

- approaches to teaching
- approaches to assessment
- conceptions of critical thinking
- instruction



Critical Thinking Initiative in STEM: Progress

Summer Year 1 | **Fall Year 1** | Spring Year 1

Faculty
10 CCC & 9 NU

Anatomy
Astronomy
Biology
Calculus
Chemistry
Chemical Engineering
Electrical Engineering
Linguistics
Physics
Quantum Mechanics

Developed course specific analogs

Measured gains on CAT & analogs over quarter /semester

n=241 students with pre & post course CAT tests

Currently grading CAT tests & analogs

Observations & Faculty Reactions

CAT Instrument

Analog Development

Administering CAT in Courses

Developing Discipline Specific Analogs

Aligning Course Assessments with Critical Thinking Skills

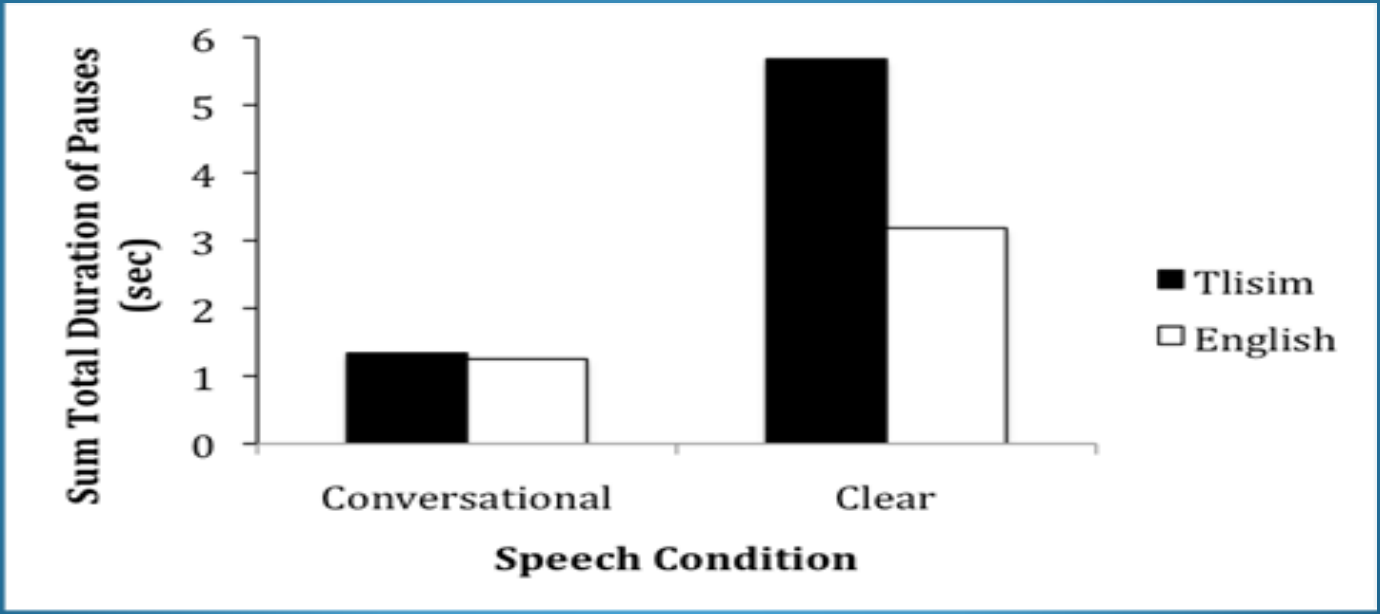
Identify Alternative Interpretations for Evidence

Identify New Information Needed to Support an Idea

Example Analog: Linguistics

Researchers at the University of Alberta conducted a study of cross-linguistic differences in the realization of clear speech.

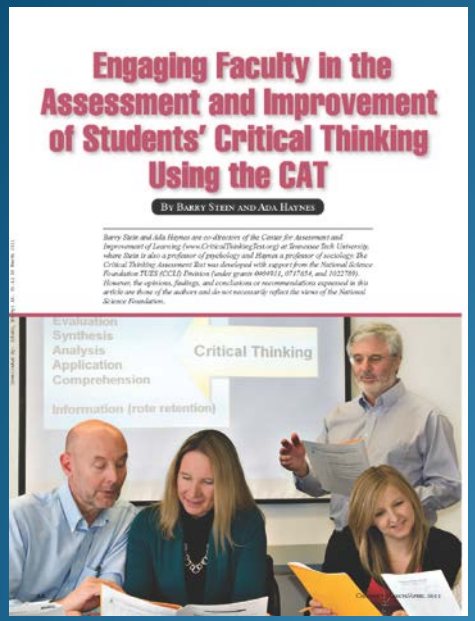
Figure 1. Total amount of time spent pausing (averaged across speakers) in clear and conversational speech in both speaker groups.

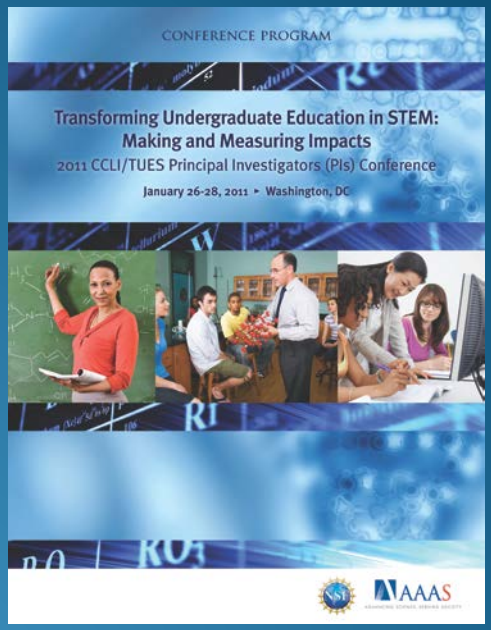


Analog Development: Discipline Specific Questions

1. **Are there other possible explanations for the data in Figure 1 that do not assume that in clear speech Tlisim speakers lengthen their pauses more than English speakers? If so, explain what they are. Try to provide two alternative accounts.**

2. What kind of additional information or evidence would help you evaluate the researchers' claim? Try to provide two types of additional information.





www.CriticalThinkingTest.org

&

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

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