



Getting Faculty Involved in Assessing and Improving Students' 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

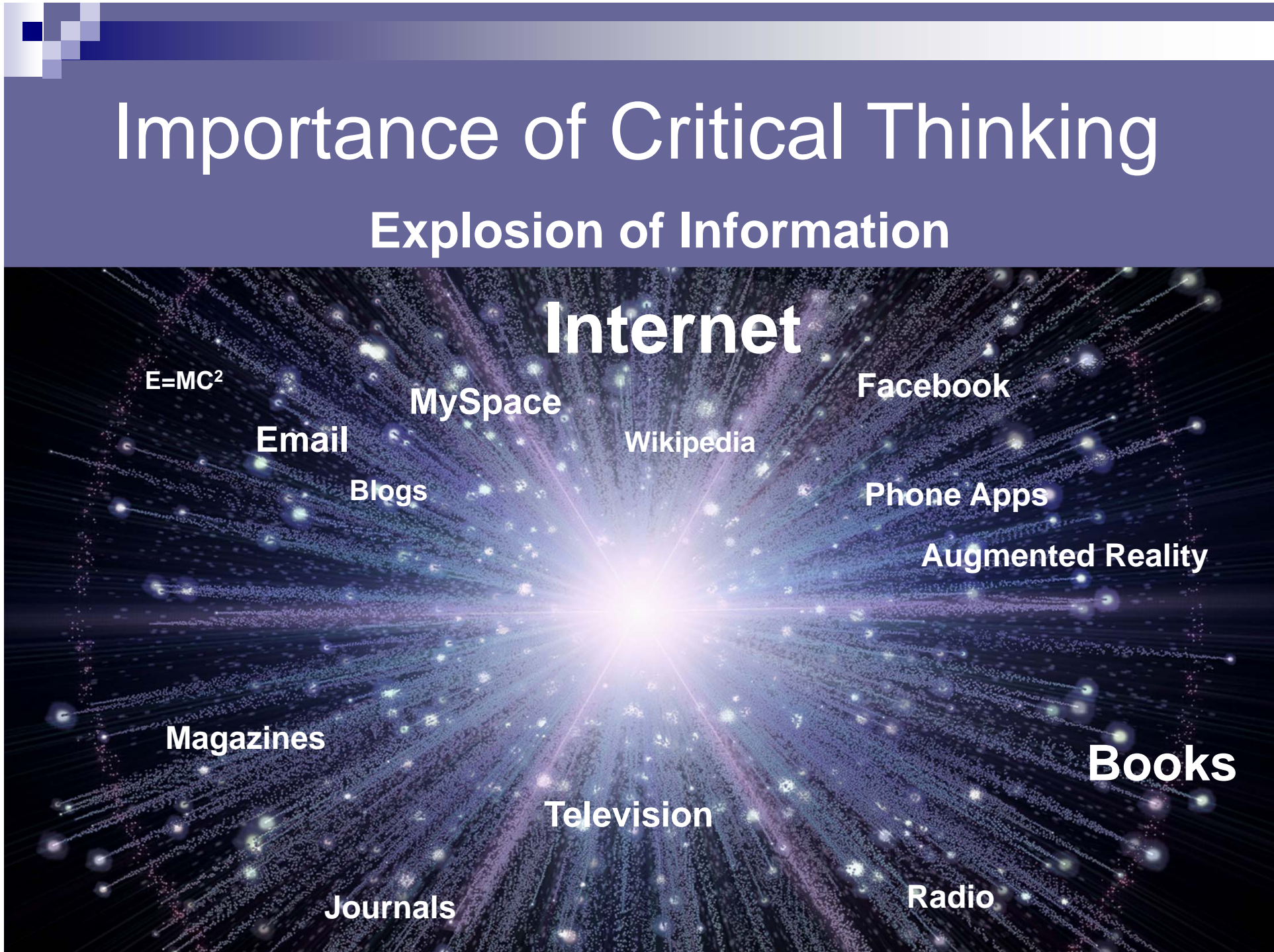
Magazines

Books

Television

Journals

Radio

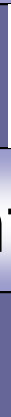


What is Critical Thinking?

Classic Emphasis

Evaluate Arguments and Conclusions

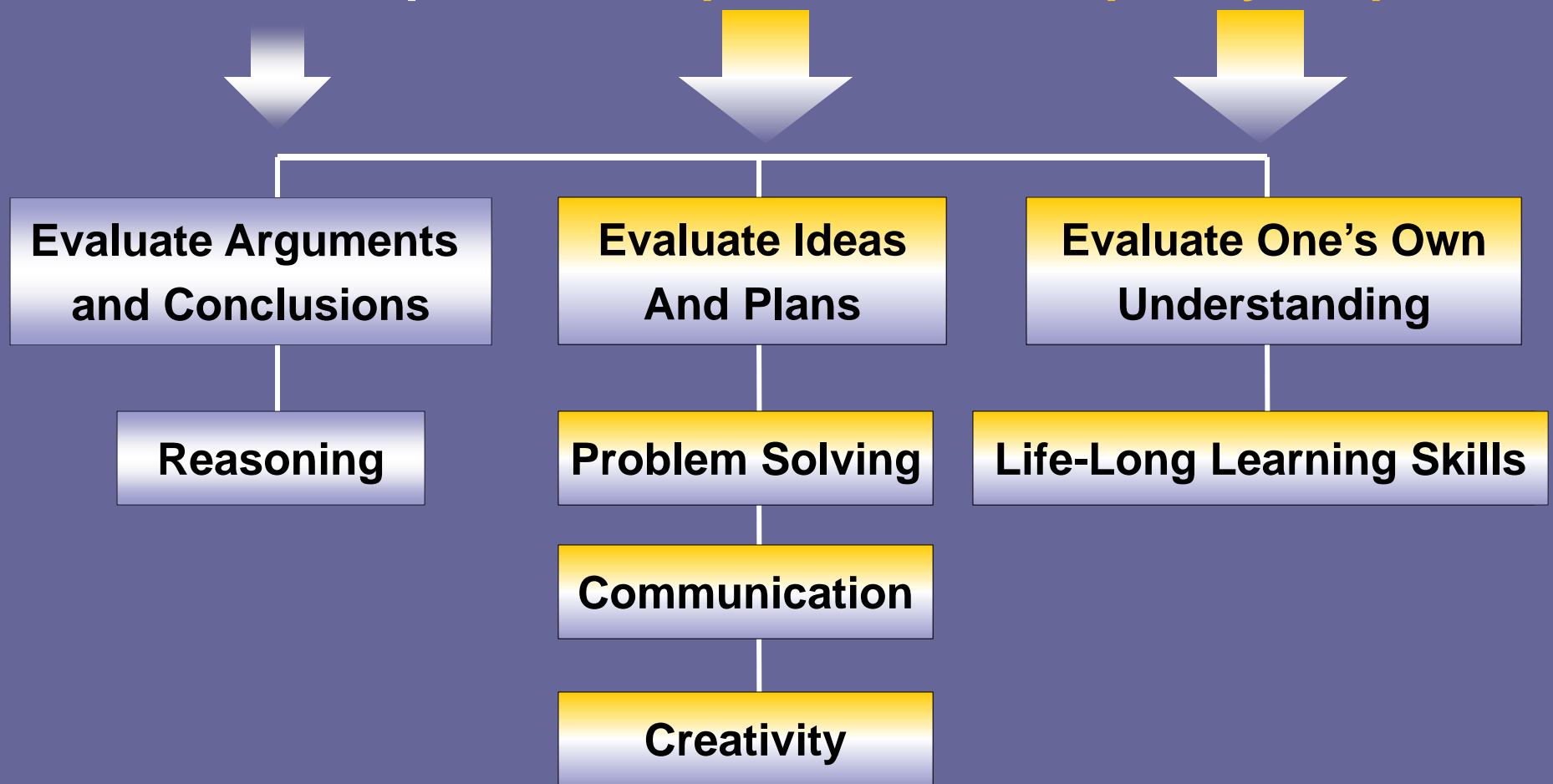
Reasoning



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**

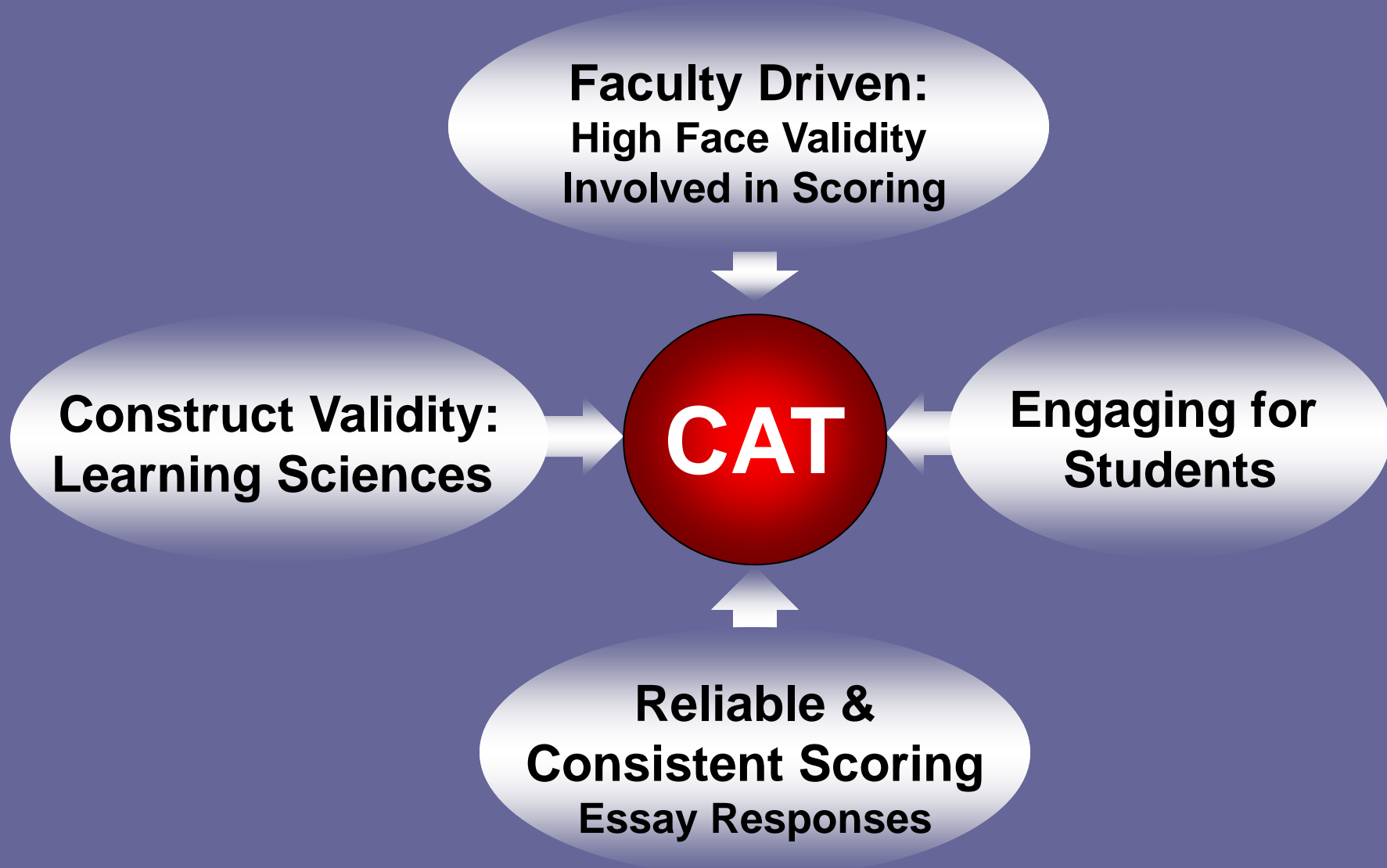


**Develop Training Methods for
National Dissemination & Collect Norms
2007 - 2010**



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

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.
- 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

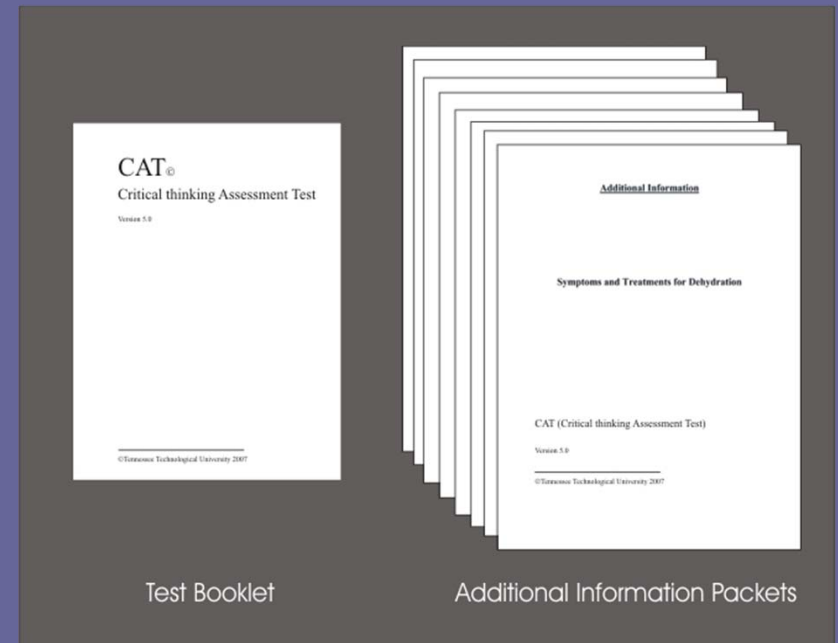
- Separate relevant from irrelevant information.
- Integrate information to solve problems.
- Learn & apply new information.
- Use mathematical skills to solve real-world problems.

Communication

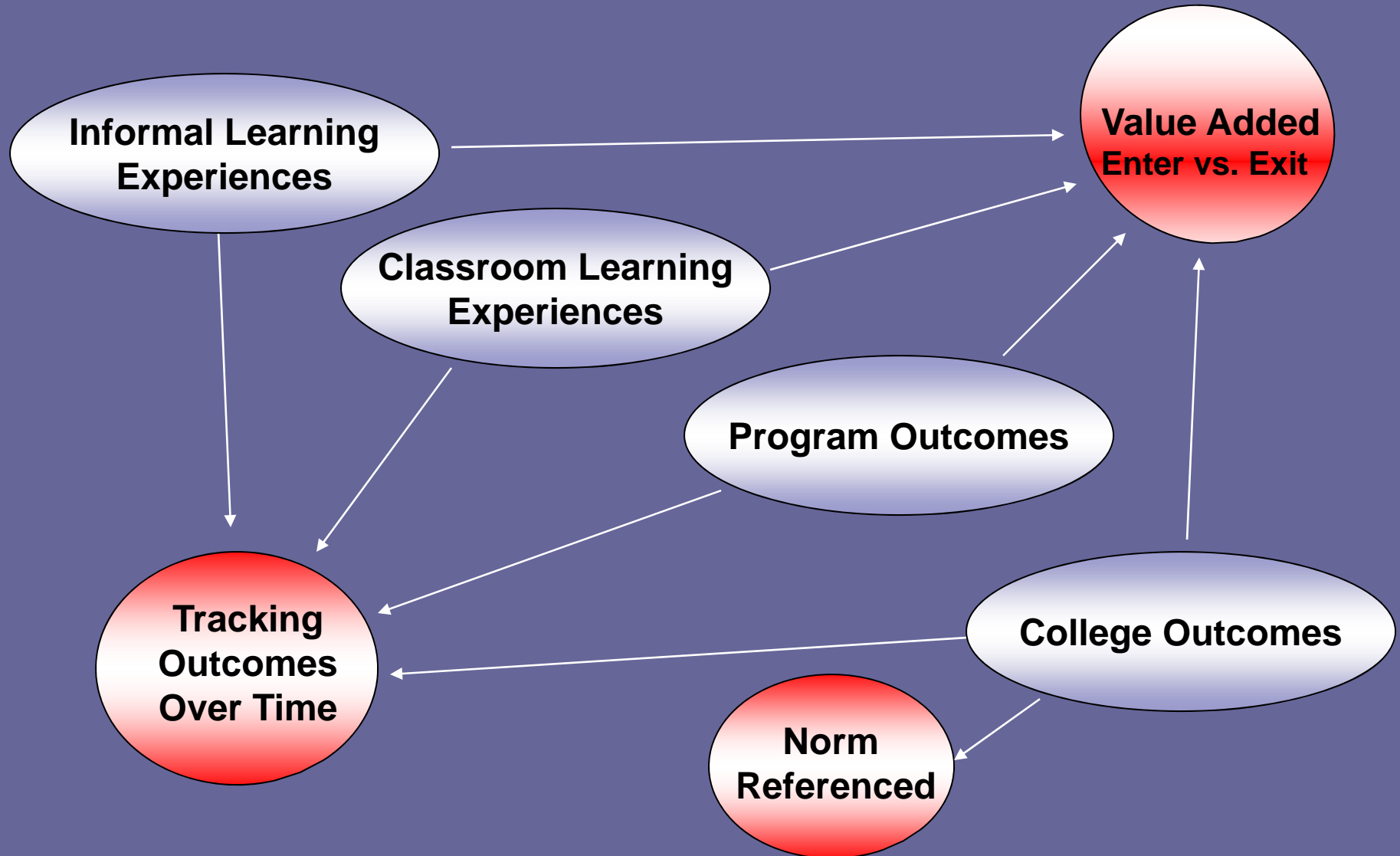
- Communicate ideas effectively.

CAT features

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

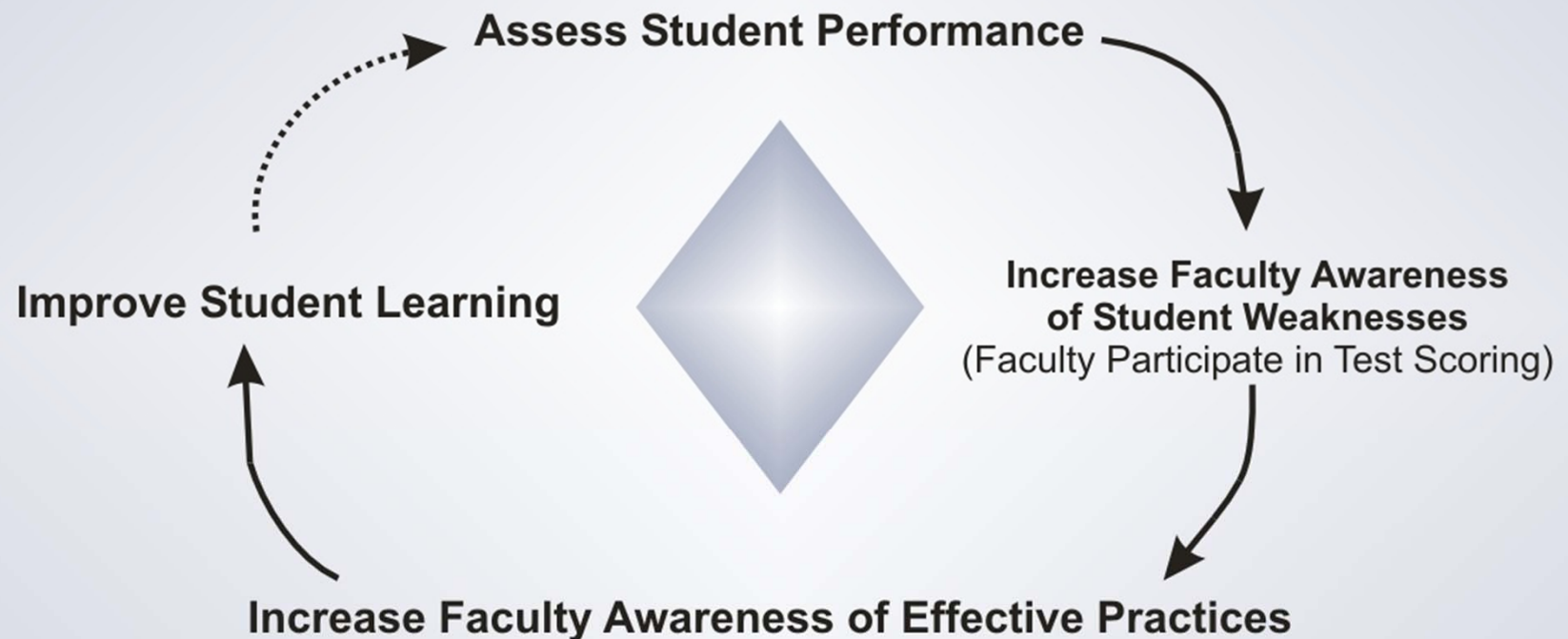


Assessment Uses of CAT



Closing the Loop in Assessment and Quality Improvement

Closing the Loop in Assessment and Quality Improvement



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.

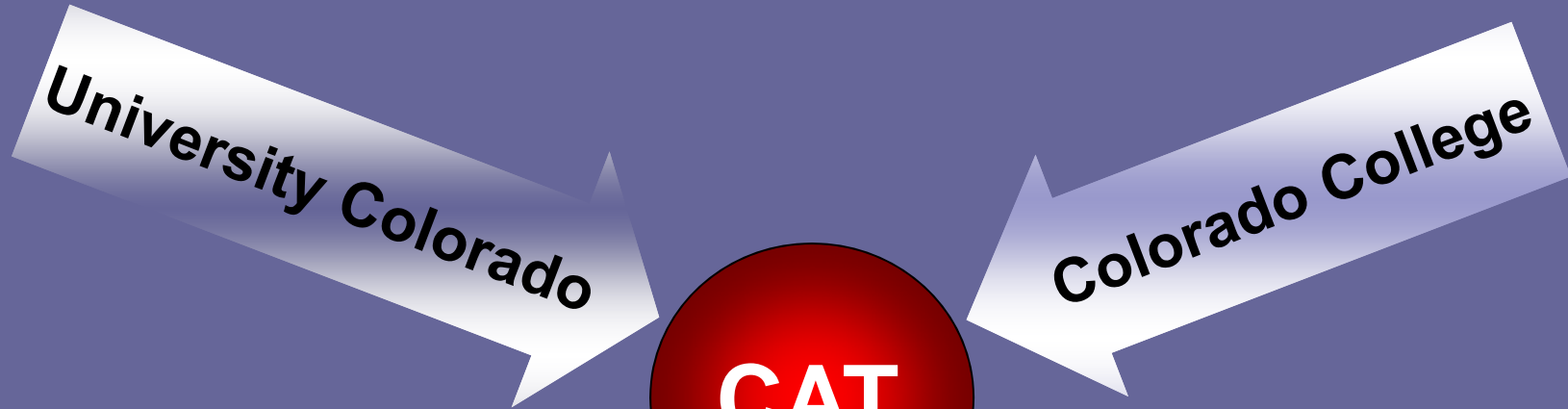
- 99.9% of the people who committed crimes consumed bread prior to committing crimes.
- Crime rates are extremely low in areas where bread is not consumed.

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.

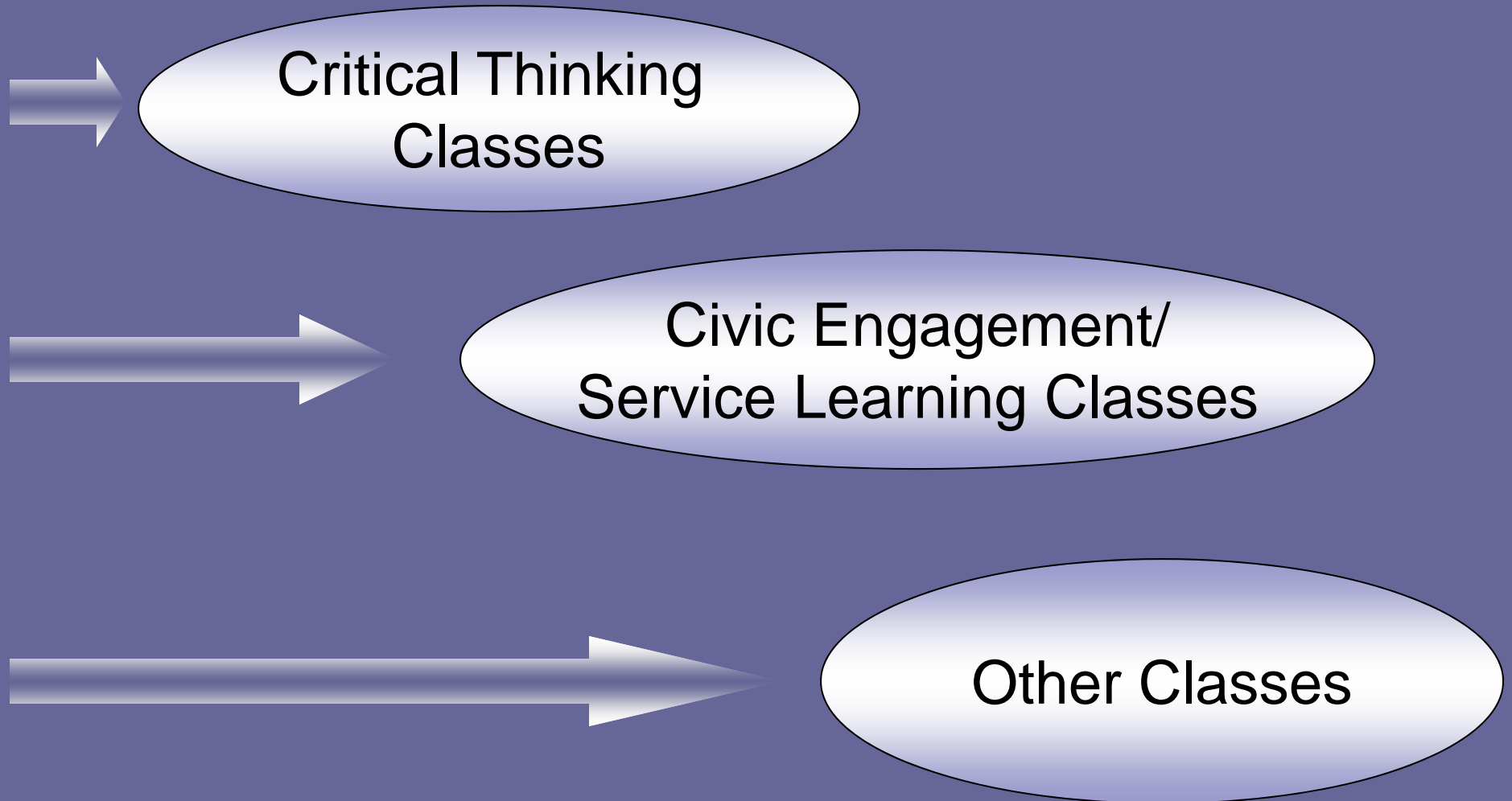
What kind of additional information or evidence would support the scientist's theory?

Teagle Foundation Grant



**Assessment
&
Faculty Development**

Target Groups





Goals

Exploring Effects of Different Classes

Faculty Development

Curriculum Strengthening

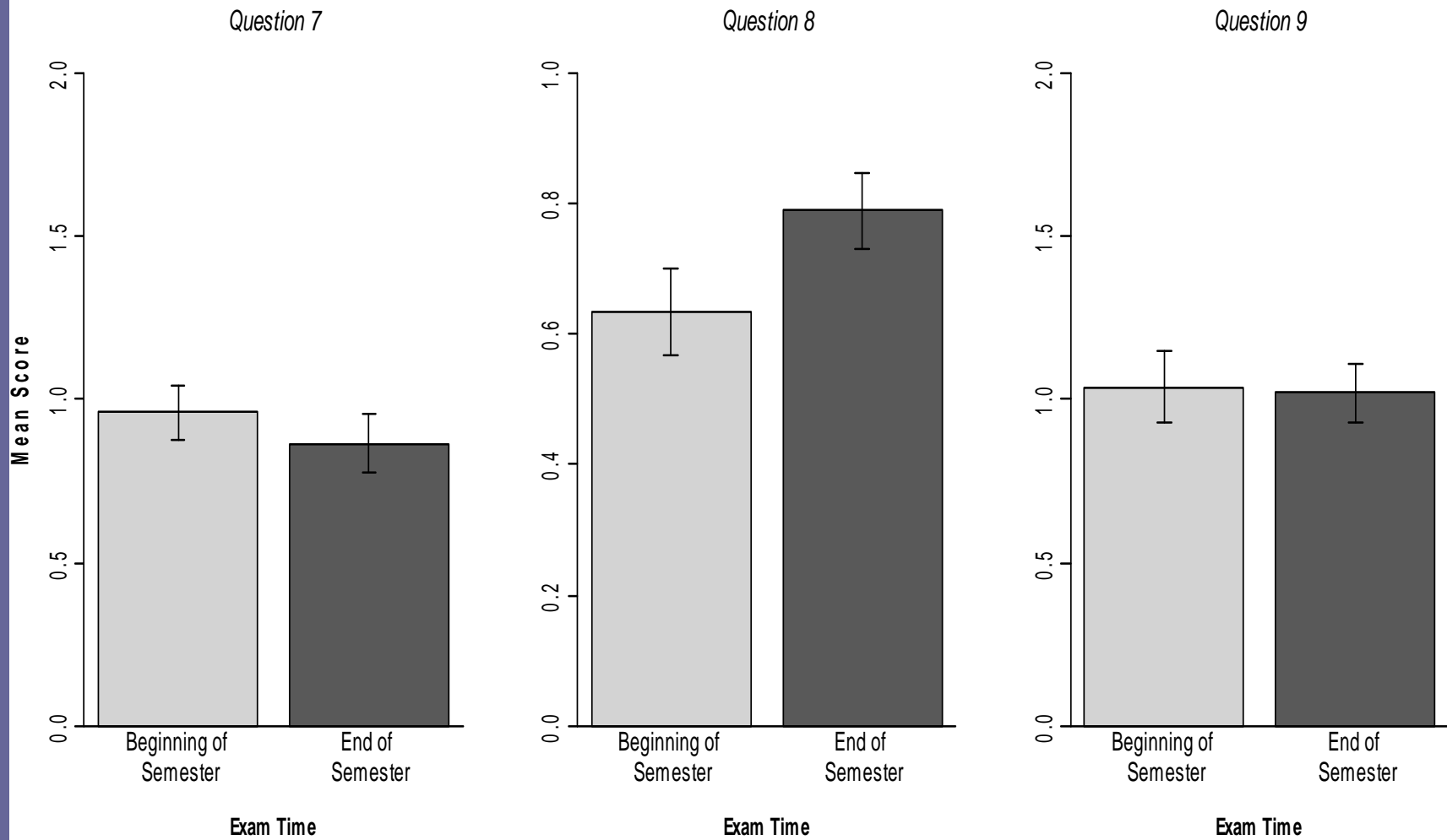


General Experimental Layout

- **Three Factor Design**
- **Two Schools: CC and CU**
- **Two Testing Periods**
- **Three Class Types**

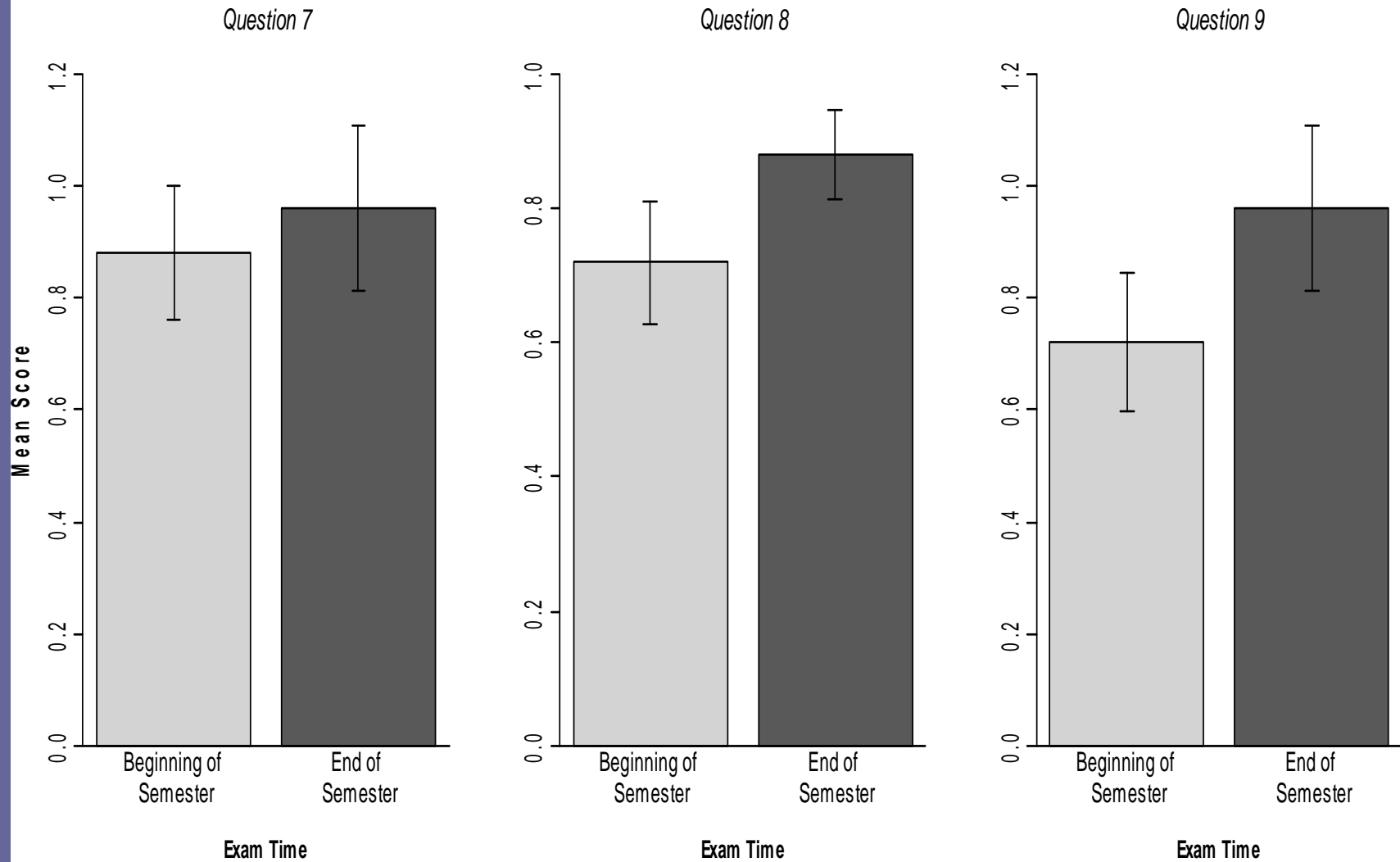
Preliminary Findings

Mean Score Relative to Exam Time for Control Group



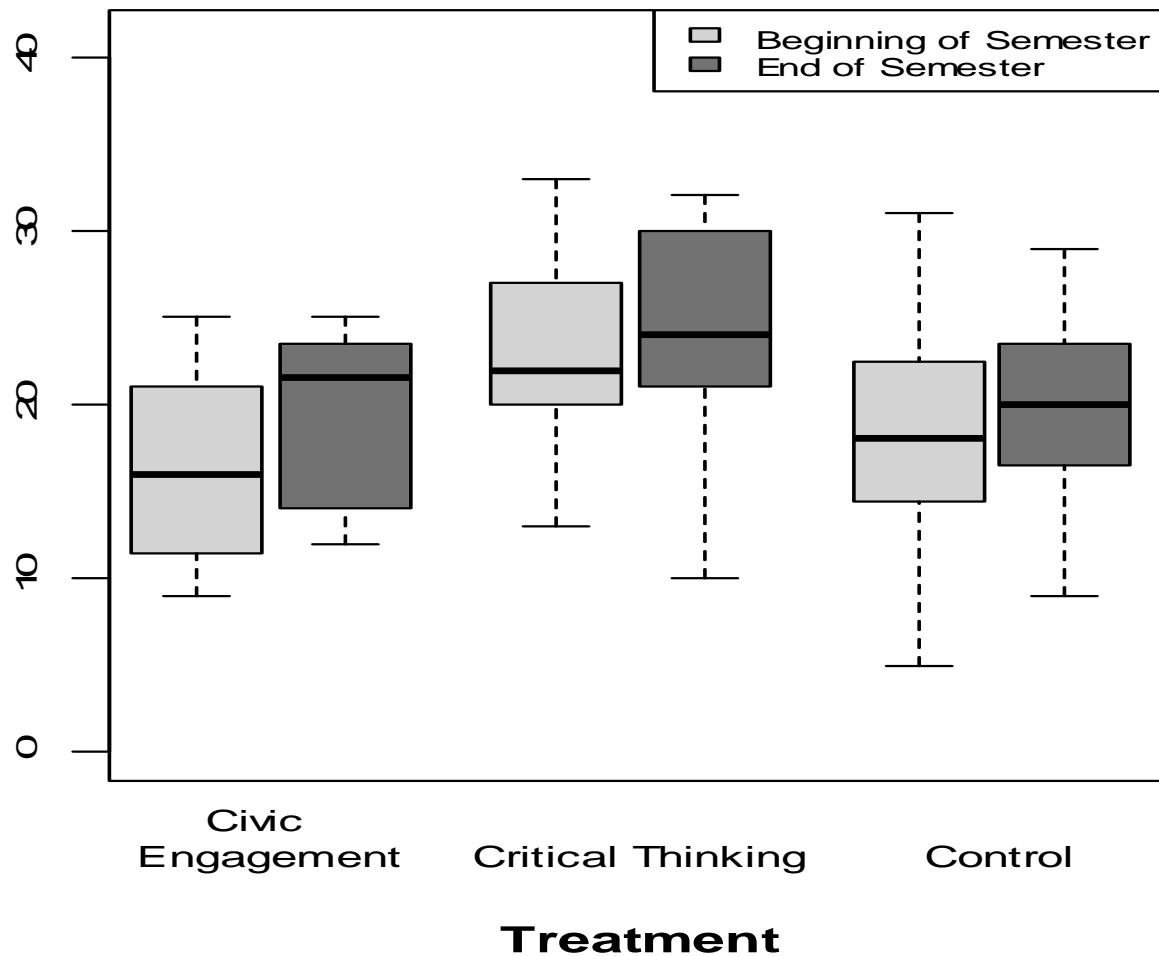
Preliminary Findings

Mean Score Relative to Exam Time for Civic Engagement Group



Preliminary Findings

U. of Colorado Exam Scores by Treatment and Exam Time



Using the CAT as a Diagnostic Tool

California Northstate Pharmacy

**Skills Needed in
Pharmacy**

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graph TD; A[Skills Needed in Pharmacy] --> B[Student Performance on CAT]; B --> A; B --> C[Implications for Training]; A --> C;
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**Student Performance
on CAT**

**Implications for
Training**



Pharmacy Practice Responsibilities that Require Good Critical Thinking Skills

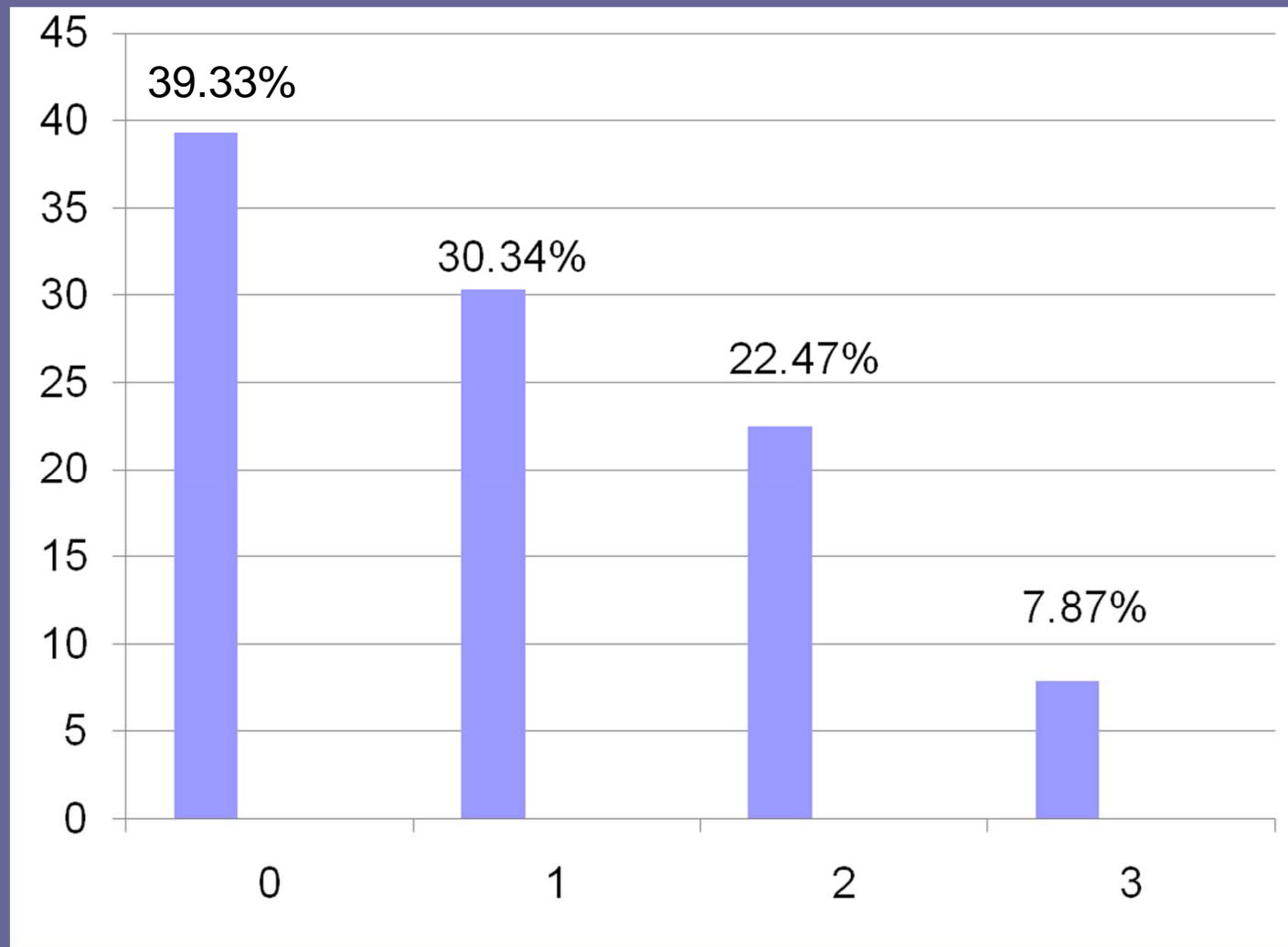
1. Differentiate the best treatment for the patient based on age, race, organ function, and concomitant conditions.
2. Define the desired therapeutic outcomes given the patient's underlying disease state and prognosis.
3. Determine the patient's clinical response to treatment and decide whether to maintain the same course of therapy or make appropriate adjustments.
4. Delineate the possible causes of a patient's signs, symptoms, abnormal lab results, or failure to achieve expected treatment results.



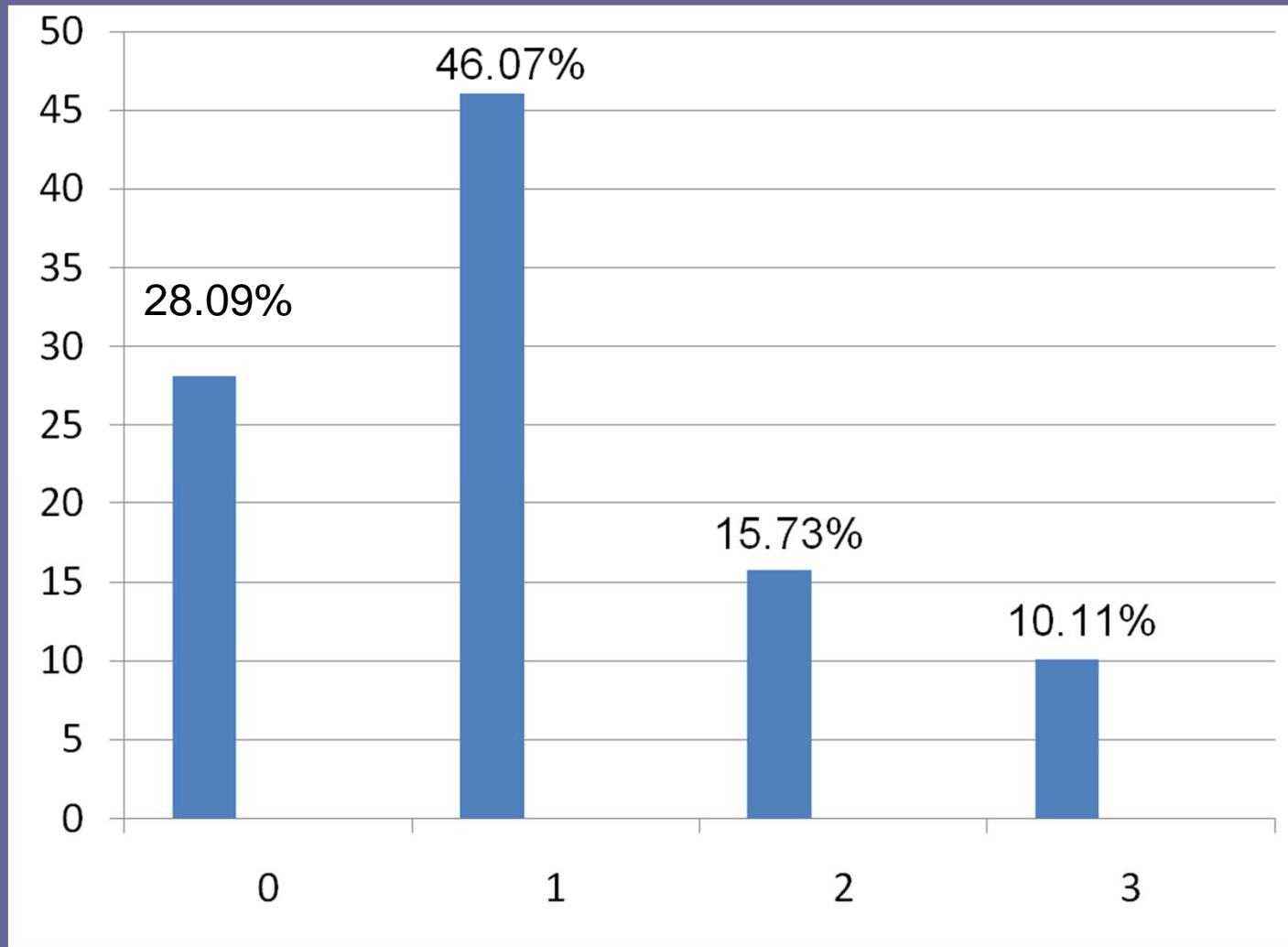
Critical Thinking Skills Assessed by the CAT

- Provide alternative explanations for a pattern of evidence that has many possible causes.
- Identify additional information needed to evaluate a hypothesis/interpretation
- Provide relevant alternative interpretations of information
- Separate relevant from irrelevant information when searching for information to solve a problem.
- Identify suitable solutions for a real-world problem.
- Identify and explain the best solution for a real-world problem using relevant information.

Alternative Explanations (0-3pts)



Alternative Solutions (0-3pts)






Diagnosis

- 92.2% of our students have difficulty generating alternative explanations for a pattern of results that has many possible causes.
- 89.9% of our students have difficulty identifying suitable solutions for real-world problems using relevant information


Treatment

- Design application exercises that challenge students to come up with alternative explanations for a patient's clinical response to pharmacotherapy.
- Design application exercises that challenge students to come up with rational alternative treatment strategies.



A 52 y/o male patient with a seizure disorder has been placed on 300mg of Dilantin daily. Despite this usual daily dose, the patient continues to have 1-2 seizures every 3-4 days.


What are three possible explanations for the lack of anticonvulsant effectiveness in this patient's Dilantin therapy?



Linda and Lance enter a tavern and are served identical vodka tonics. Lance gulped his drink down, walked out of the bar, and lived.

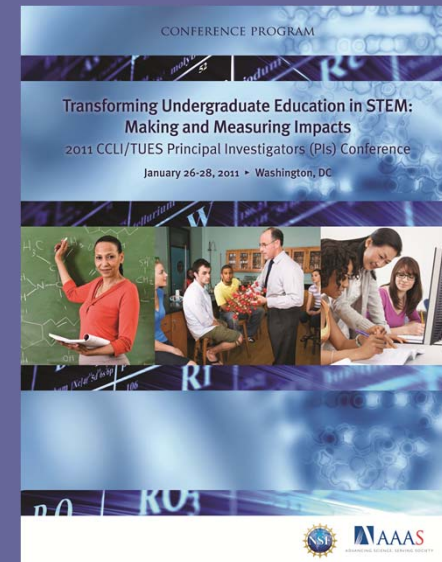
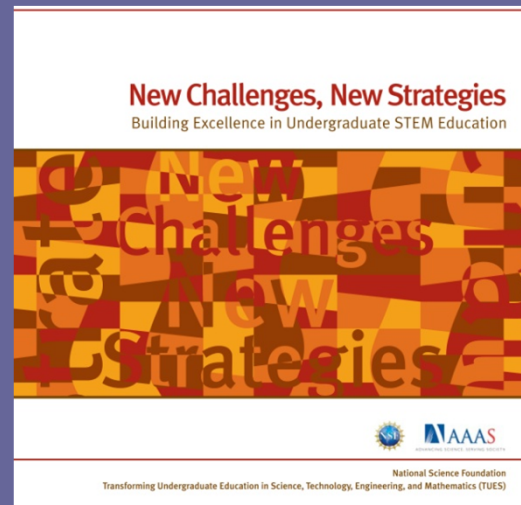
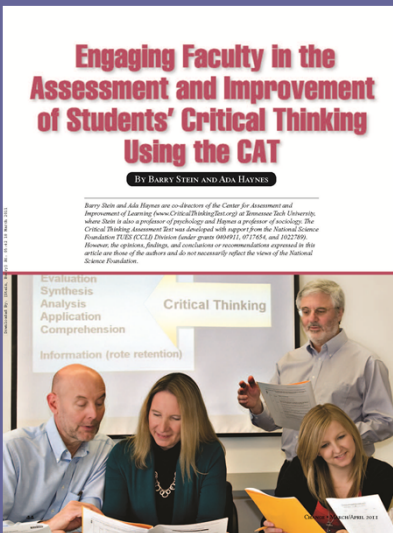
Linda nursed her drink and then died.

What was the cause of Linda's death?



A 62 y/o African American woman with newly diagnosed hypertension is being managed on 25 mg of Hydrochlorothiazide (HCTZ) daily. The patient has a history of acute gouty arthritis. She read on WebMD that HCTZ can precipitate an acute attack of gout.

What alternative medication can be used to manage her hypertension?



CAT National Dissemination Project

www.CriticalThinkingTest.org

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