

CRITICAL-THINKING ASSESSMENT: Connecting the Dots between Evidence and Practice

Georgia Gwinnett College – CTE Summer Institute

**Center for Assessment &
Improvement of Learning
Tennessee Tech University**



National Science Foundation's IUSE Program under grant 1022789.

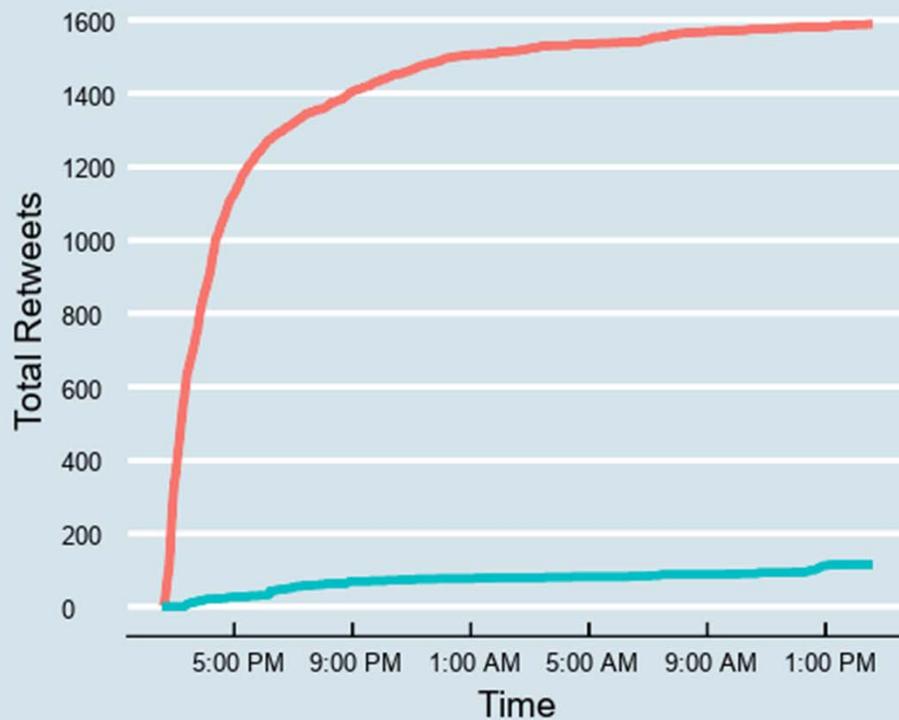
CAT App Workshop

- 1. Briefly discuss best practices in the teaching and assessment of critical thinking**
- 2. Introduce 1 of 2 Skill Sets associated with CAT Apps**
- 3. Discuss and Brainstorm potential discipline topics**
- 4. Begin development and provide feedback on individual CAT Apps**

Viral Nature of Misinformation

How Misinformation Spreads on Twitter

Total Retweets Over 24 Hours, Monday April 23 to Tuesday April 24



False Account



Accurate Account



@chrimeserole

Information and Society

“Only 16% of adults are confident in their ability to navigate and obtain trustworthy information from the current information landscape”

-Gallup Survey

“50% of adults believe made-up news and information is a very big problem and erodes trust in our democracy”

-Pew Research Center

The Changing Nature of Education



**Remembering
Information**

Finding Relevant Information

**Understanding & Evaluating
Information**

Using Information Effectively

Our Mission





ASSESS

Measure What Matters

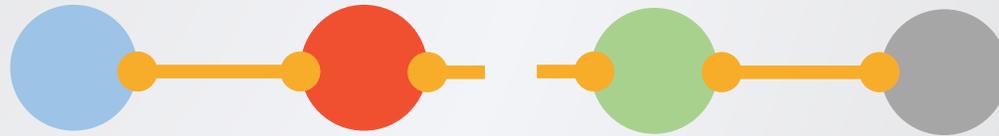
Skill Checklist for the CAT Instrument

| CAT QUESTIONS |
|--|
| Q1: Summarize a pattern of information without making inappropriate inferences. |
| Q2: Evaluate how strongly correlational-type data supports a hypothesis. |
| Q3: Provide alternative explanations for observations. |
| Q4: Identify additional information needed to evaluate a hypothesis or particular explanation of an observation. |
| Q5: Evaluate whether spurious relationships strongly support a claim. |
| Q6: Provide alternative explanations for spurious relationships. |
| Q7: Identify additional information needed to evaluate a hypothesis/interpretation. |
| Q8: Determine whether an invited inference in an advertisement is supported by information. |
| Q9: Provide relevant alternative interpretations of information. |
| Q10: Separate relevant from irrelevant information when solving a real-world problem. |
| Q11: Analyze and integrate information from separate sources to solve a real-world problem. |
| Q12: Use basic mathematical skills to help solve a real-world problem. |
| Q13: Identify suitable solutions for a real-world problem using relevant information. |
| Q14: Identify and explain the best solution for a real-world problem using relevant information. |
| Q15: Explain how changes in a real-world problem situation might affect the solution. |

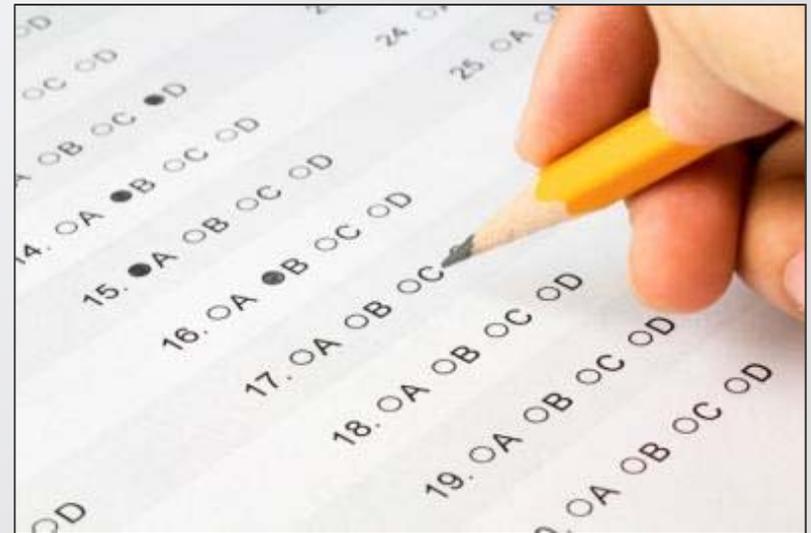
Teaching Critical Thinking



Understanding the Disconnect



Teaching Critical Thinking

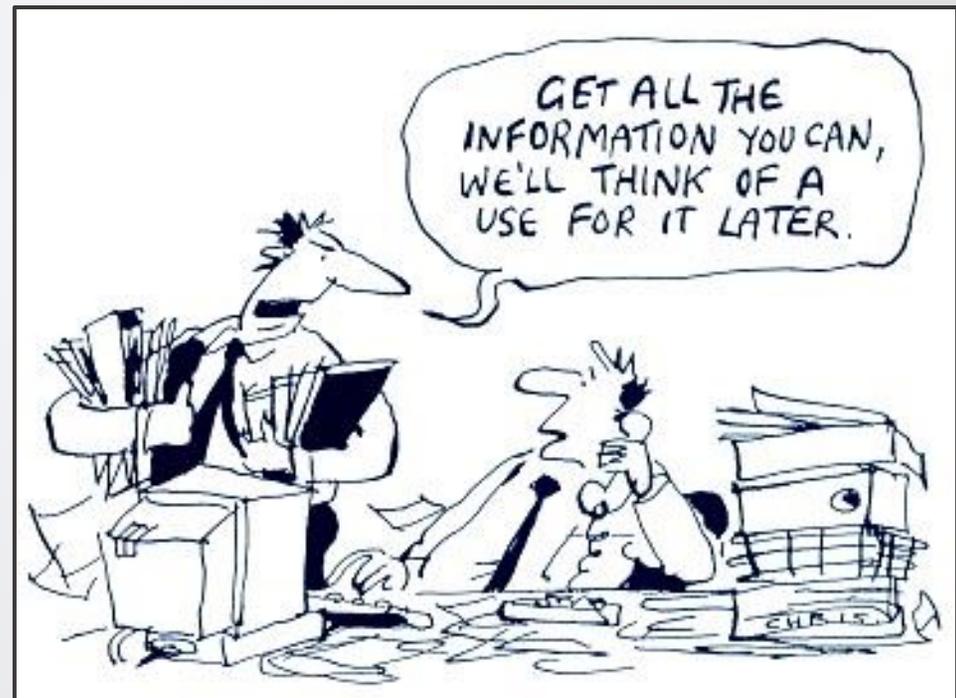


Assessing Factual Knowledge

Faculty Roadblocks

**Not trained in
assessment**

**View institutional
assessment as
removed or
antagonistic**



ENGAGE

More than just a Number



Sample Disclosed Question

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

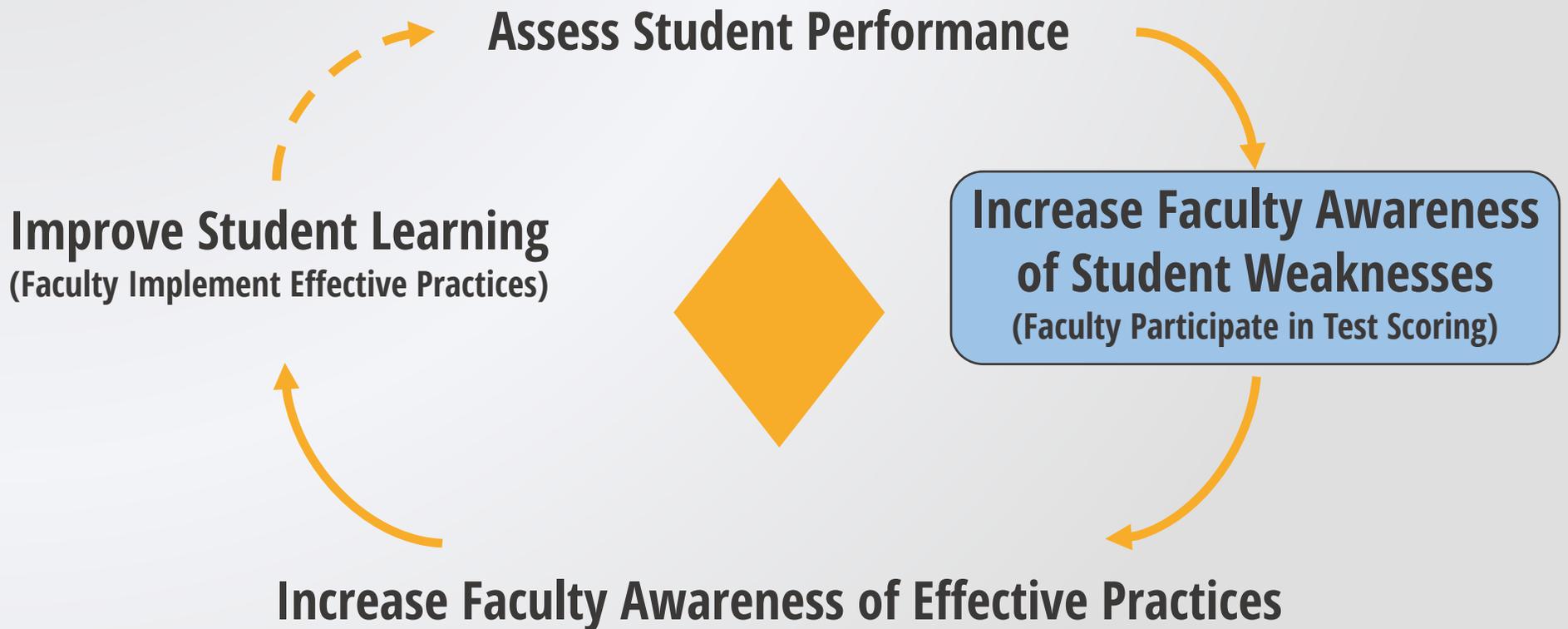
- 99.9% of the people who committed crimes consumed bread prior to committing crimes.
- Crimes rates are extremely low in areas where bread is not consumed.

Do the data described above strongly support the scientist's hypothesis? Yes____ No____

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

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

Closing the Loop in Assessment and Quality Improvement





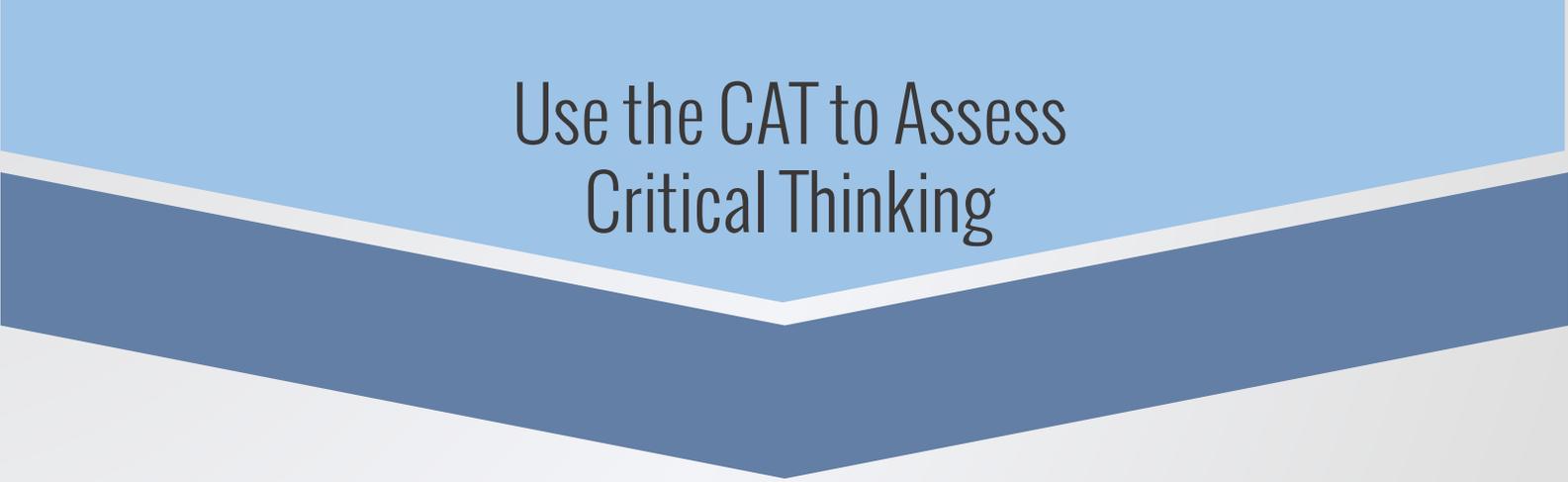
Using the Right Tools

Assessment Drives Improvement Efforts

How We Assess - Determines What Students Learn

Benefits of Course-Based CT Assessment

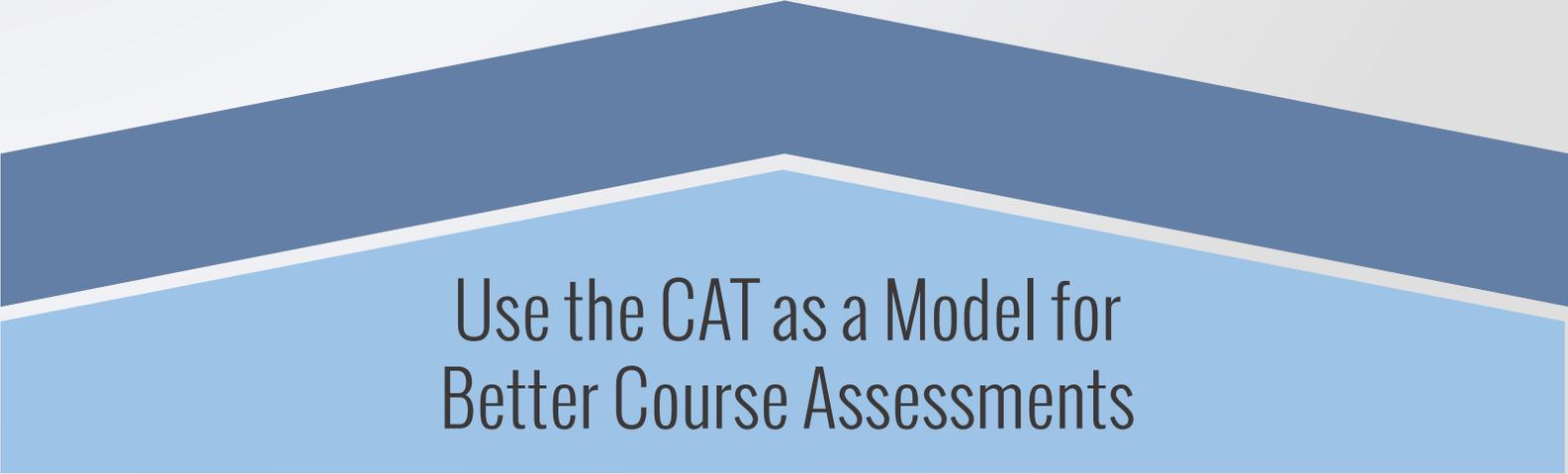




Use the CAT to Assess
Critical Thinking



ASSESSING & IMPROVING CRITICAL THINKING



Use the CAT as a Model for
Better Course Assessments



CAT App(lications)

Prioritizes skill development, alongside course content

Opportunities to practice skills across content areas

Provides actionable feedback on skill development

Critical Thinking Skill Set 1

How strongly does information support an idea.



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

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Patterns of Data

Historical Events

Literature



CAT App: Interdisciplinary

Courtney Cox believes that drinking alcohol keeps women skinny. She supports this argument with the following evidence.

- **In a medical study, doctors found that women who drank moderate amounts of alcohol were less likely to be overweight or obese in the future.**

Strength of Support

Courtney Cox believes that drinking alcohol keeps women skinny. She supports this argument with the following evidence.

- In a medical study, doctors found that women who drank moderate amounts of alcohol were less likely to be overweight or obese in the future.**

The evidence from the medical study *strongly supports* Courtney's argument. YES or NO

OR

How strongly does the evidence from the medical study support Courtney's argument?

Alternative Interpretations

Courtney Cox believes that drinking alcohol keeps women skinny. She supports this argument with the following evidence.

- **In a medical study, doctors found that women who drank moderate amounts of alcohol were less likely to be overweight or obese in the future.**

What are other interpretations for the results of the medical study aside from Courtney's interpretation?

Additional Information

Courtney Cox believes that drinking alcohol keeps women skinny. She supports this argument with the following evidence.

- **In a medical study, doctors found that women who drank moderate amounts of alcohol were less likely to be overweight or obese in the future.**

What additional information would we need to more fully evaluate the situation?

Using Headlines to Develop CAT Apps

Girls Who Play Soccer Have More Success in STEM Fields

Frequent Reliance on Social Services Yields Shorter Life Span

Eating Fast Food Leads to Depression

CAT App: History

Abraham Lincoln is commonly known by many Americans as the ‘Great Emancipator’. This nickname derives from Lincoln’s signing of the Emancipation Proclamation. The text of this document declared on September 22, 1862 that slaves were “forever free.” In signing this document, Abraham Lincoln single-handedly freed all slaves.

- 1. How strongly does the text of the Emancipation Proclamation support the conclusions that all slaves were freed?**
- 2. Are there alternative interpretations for the intent of the Emancipation Proclamation? Provide an alternative interpretation.**
- 3. Identify 3 types of additional information that would help you investigate the intent of the Emancipation Proclamation and explain why each source would be helpful.**

CAT App: Chemistry

Michelle recently moved to Milwaukee, WI from Tallahassee, FL. Before moving, she bought a brand new Toyota Camry. On her way to work, Michelle noticed her tire pressure sensor light had come on. Michelle mentioned her tire problem to her co-worker Joe, who suggested that Michelle probably has a tire puncture. Joe recommends that Michelle get her tires patched as soon as possible to address the issue.

- 1. How strongly does the information provided support Joe's idea that Michelle's tires have leaks due to punctures?**
- 2. List two alternative explanations.**
- 3. What additional information is needed to evaluate these explanations?**

M. Edington, Florida A&M University

Critical Thinking Skill Set 1

How strongly does information support an idea.



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

Critical Thinking Skill Set 2

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**

Designing a Set for a Play

Real-World Problem Solving Ideas

- **What Device should you buy or use for...**
- **What Treatment would be best for...**
- **Design an experiment to investigate...**
- **What is the best plan for...**
(marketing, communicating, educating, etc.)

CAT App: Pharmacy

AM is a 45 year old female admitted to the hospital with complaints of pain and swelling in her left shin after a fall down the stairs. The symptoms have gotten worse with increased redness and weeping of the wound in the past 2-3 days. She thinks she has been having fevers at home and reports decreased appetite with increased fatigue. AM's past medical history includes diabetes type 2, hypertension and hyperlipidemia. She is currently on disability and does not work due to problems with her health. Her current medications include Lisinopril 20 mg daily, metformin 500 mg twice daily and simvastatin 5 mg daily and she reports an allergic reaction of anaphylaxis to penicillin. The patient is seen by the physician and diagnosed with cellulitis caused presumably by methicillin sensitive *Staphylococcus aureus* (MSSA). The wound is cultured and sent to the lab for review.

L. Fox, University of Wyoming

CAT App: Business

Scenario: You are the chief ethics officer for a toy manufacturer. One of your toys includes magnets and, because of these, has recently been banned by the Consumer Product Safety Commission (CPSC) for sale in the U.S.

Your CEO has asked for your recommendation about what to do with the company's existing inventory. The CEO's goal is to minimize financial damage to the company while maintaining the company's reputation as one that values child welfare. Your cousin, Terry, who did business in Central America ten years ago, informed you that consumer protection laws are much more lenient in Central America and suggested that you sell your inventory to toy retail outlets there.

N. Frost, Texas A&M University

Selecting & Evaluating Information

Example Rubric for Students to Use When Searching For Information

Define Search Goal: _____

| Pre Search Rubric | | | Post Search Observations | | | |
|----------------------------|-------------|------------|--------------------------|--------------------------|--------------------------|------------|
| Type of Information Needed | Best Source | Why useful | Information available? | Meets quality standards? | Other Information Needed | Why Useful |
| | | | | | | |
| | | | | | | |

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| | | | | | | |

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| | | | | | | |
| | | | | | | |

Critical Thinking Skill Set 2

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**

Designing a Set for a Play

Why Use the CAT with CAT Apps

Establish Validity of CAT Apps

Demonstrate Transfer Beyond Discipline Content

Compare to Gains Over a 4-Year Education

Using CAT Apps with the CAT



Creating a Community

Identify
Student
Weaknesses

Recognize Faculty
Strength
and Weaknesses

Develop a
Teaching
Community

Implement
Effective
Practices

Use
Appropriate
Assessments