



# Creating a Critical Thinking Community in the Classroom: Techniques, Strategies, Questions, and Assessments

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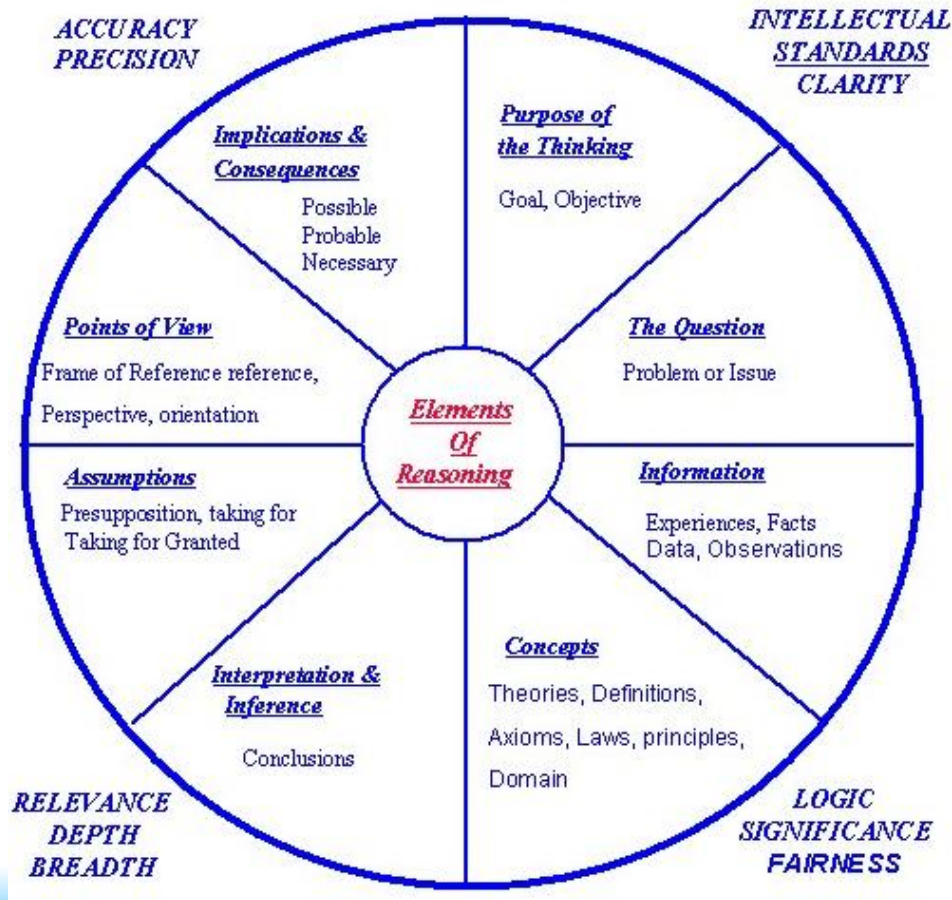
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# Elements of Reasoning (Paul & Elder, 1996)

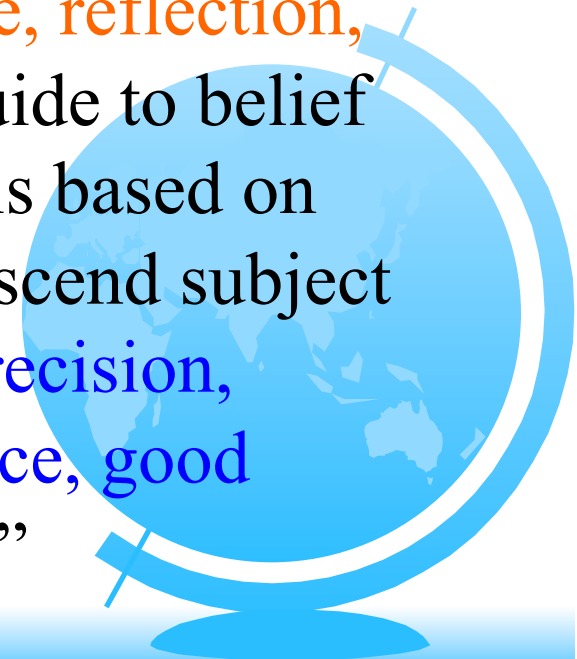
- ♦ <http://www.criticalthinking.org/pages/using-intellectual-standards-to-assess-student-reasoning/602>



# Defining Critical Thinking

(Scriven & Paul, 1987)

- ◆ “**Critical thinking** is the intellectually disciplined process of actively and skillfully **conceptualizing, applying, analyzing, synthesizing, and/or evaluating** information gathered from, or generated by, **observation, experience, reflection, reasoning, or communication**, as a guide to belief and action. In its exemplary form, it is based on universal intellectual values that transcend subject matter divisions: **clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness.**”



# Contrasting Thinking Skills

Part I (Reis, 1990)

- Creative thinking - brainstorming, flexibility, originality, elaboration
- Critical and logical thinking - comparing, contrasting, classifying (patterns and figural relationships)



# Examples – Creative Thinking

## **Brainstorm rules:**

### ◆ Brainstorming

- 1.one idea at a time**
- 2.encourage wild ideas**
- 3.go for quantity**
- 4.be visual**
- 5.headline!**
- 6.build on others' ideas "yes, and"**
- 7.defer judgement**
- 8.marking and sifting**

### ◆ Flexibility

- What are all the ways you can devise for weighing very light objects other than a balance or spring scale?

### ◆ Comparing

- How are trains and boats alike?



# Examples – Critical Thinking

- ◆ Tell all the ways you can think of that we use water. (science)
- ◆ What might have happened if Goldilocks hadn't run away? (language)
- ◆ What are the things that come in pairs? (math)
- ◆ List all the things a musical instrument could be saying? (music)
- ◆ Create a new kind of bird with scrap materials. (art)
- ◆ Name all the people who help us travel, keep us from getting sick, fix things, and build things for us. (social studies)



# Contrasting Thinking Skills

Part II (Reis, 1990)

- Creative problem solving and decision making - future problem solving
- Critical and logical thinking - deductive and syllogistic reasoning, analogical reasoning, learning to learn skills





# Future Problem Solving

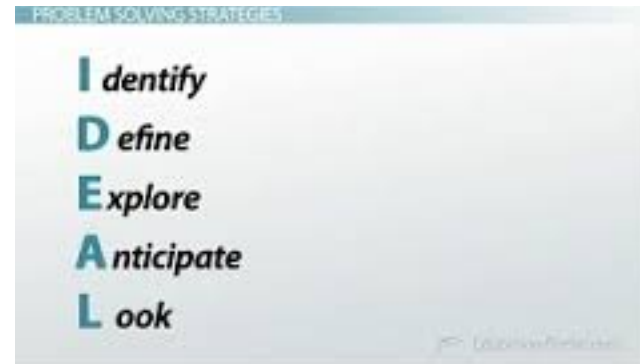
- ◆ In 1974, creativity pioneer, Dr. E. Paul Torrance founded the Future Problem Solving Program as a response to the need of gifted students who he felt needed highly engaging critical and creative thinking activities and an interest in their futures.
- ◆ <http://www.fpspi.org/index.html>





# Problem Solving (IDEAL)

- Identify a problem
- Define or clarify the problem
- Explore options to solving the problem
- Anticipate or act out the planned solution
- Look at the effects and evaluate the solution



# Examples - Problems

◆ J \_ M A M \_ J A S O N \_

◆ O T T F F S S E \_

◆ The nine dot problem:

—            •    •    •  
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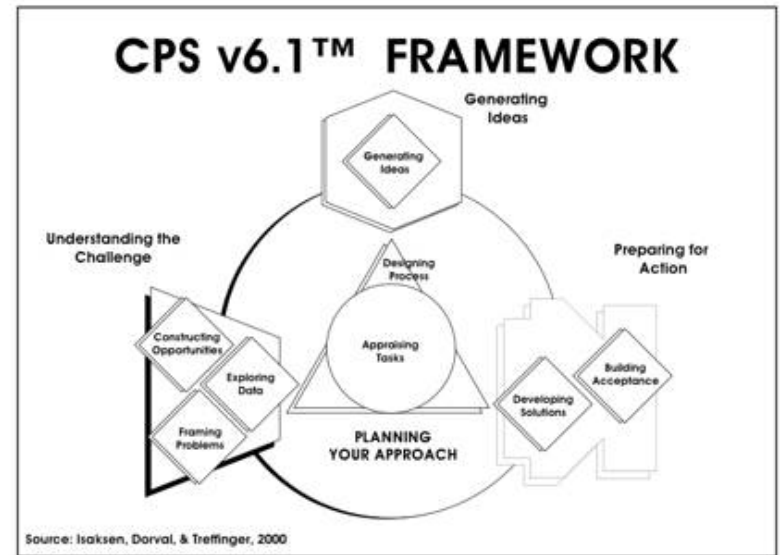


# Creative Problem Solving (CPS)

(Isaksen, Dorval, & Treffinger, 2000)

## ◆ Creative Problem Solving

- mess finding
- data finding
- problem finding
- idea finding
- solution finding
- acceptance finding



- ## ◆ Example - Identify major problems facing the homeless in U.S. cities. Select the most serious one. Design a solution to that problem.



# Examples

## ◆ Deductive Reasoning

- See Khan Academy website:
- <https://www.khanacademy.org/math/geometry/logical-reasoning/e/logical-arguments-deductive-reasoning>

## ◆ Analogical Reasoning

- speedometer : velocity
- thermometer : \_\_\_\_\_
  - ◆ (degree, light, temperature)



# Discovery Through Analogy

- ◆ Dunlop (1887) had an idea for air inflated tires from a garden hose.
- ◆ Morse (1860) used stagecoach relay points as a basis for building relay stations for telegraph signals.
- ◆ Whitney's (1795) idea for the cotton gin came from watching a cat catching a chicken through the fence. The cat missed the chicken, but came away with the feathers.



# Contrasting Thinking Skills

Part III (Reis, 1990)

- Critical and logical thinking - interpreting, inferring, hypothesizing, analyzing propaganda and bias
- Metacognitive skills - planning, monitoring, evaluating



# Examples

- ◆ A milkman has two empty jugs: a three gallon jug and a five gallon jug. How can he measure exactly one gallon without wasting any milk?
- ◆ How is it possible to cut a traditional circular cake into 8 equal size pieces, with only 3 cuts?





# Metacognition

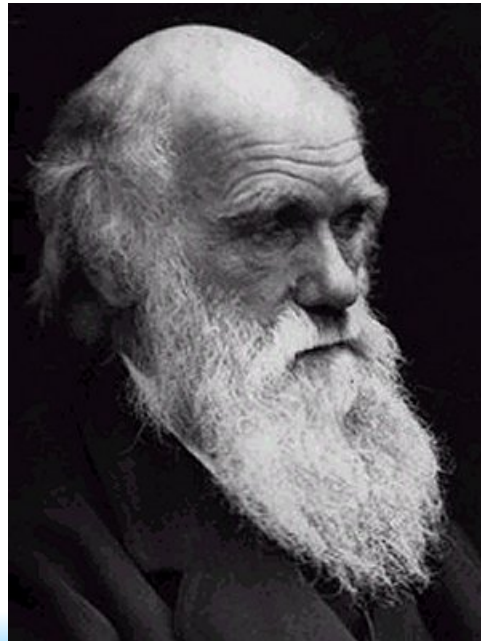
- ◆ Metacognition is thinking about thinking.
  - awareness and monitoring of attention
    - ◆ example: listening strategies
  - awareness, use, and control of various learning strategies
    - ◆ example: reading strategies



# Metacognition Applied

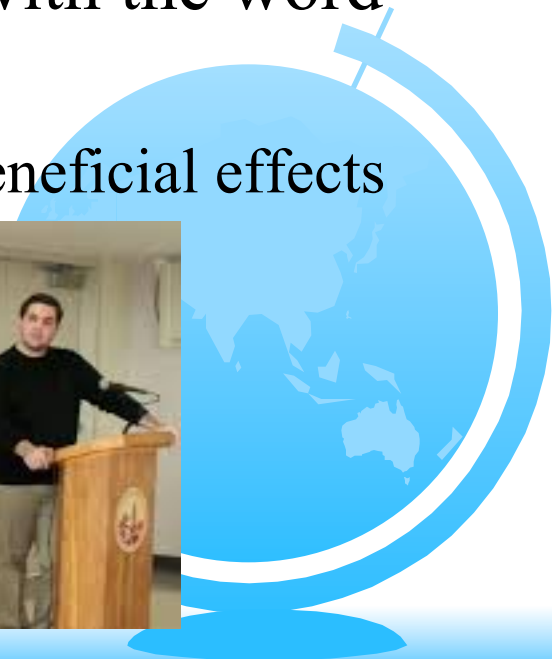
## ◆ Thinking Logs

- da Vinci and Darwin kept journals to capture ideas, new thoughts, and connections while they were still fresh



# Debate Format

- ◆ A debate is a series of formal spoken arguments for and against a definite proposal. The best solution is approved and adopted.
- ◆ Debates begin with a proposed solution to a problem. The proposal should begin with the word *resolved*.
  - Example: Resolved that television has beneficial effects on viewers.



# Bloom's Taxonomy

## Old Version

- ◆ **Knowledge**
- ◆ **Comprehension**
- ◆ **Application**
- ◆ **Analysis**
- ◆ **Synthesis**
- ◆ **Evaluation**

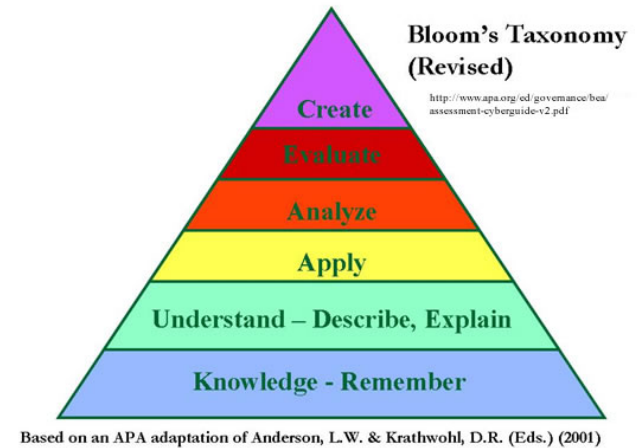
## Revised Version

- ◆ **Remember**
- ◆ **Understand**
- ◆ **Apply**
- ◆ **Analyze**
- ◆ **Evaluate**
- ◆ **Create**



# Bloom's Taxonomy

- knowledge/remember
  - the ability to recall or recognize.
- comprehension/understand
  - the ability to receive or use what is being communicated.
- application/apply
  - the ability to use abstractions, rules, principles, ideas, and methods in concrete situations.



# Bloom's Taxonomy (cont.)

## ■ analysis/analyze

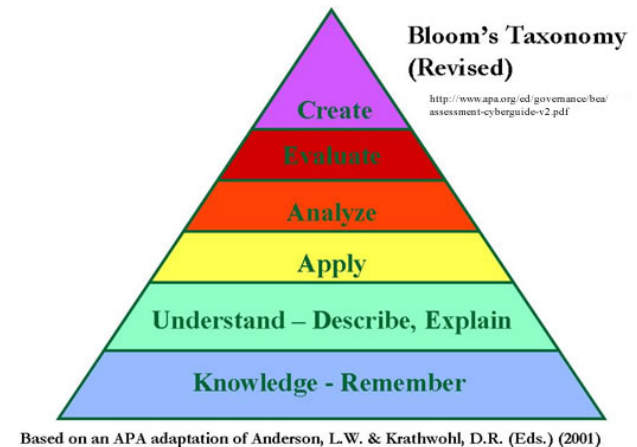
- the ability to break down information into usable parts.

## ■ evaluation/evaluate

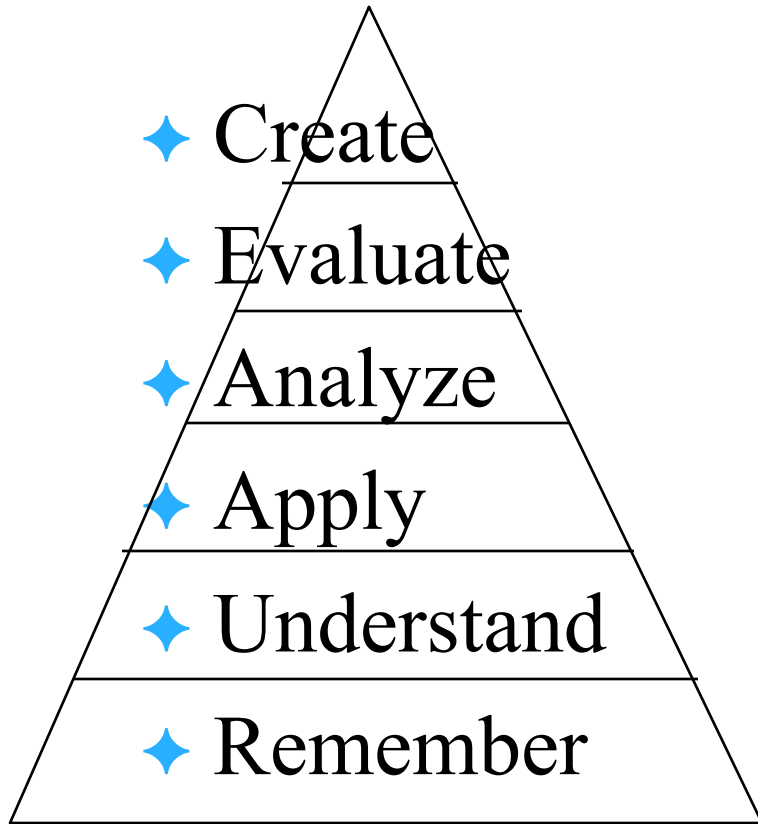
- the ability to make quantitative and qualitative judgments

## ■ synthesis/create

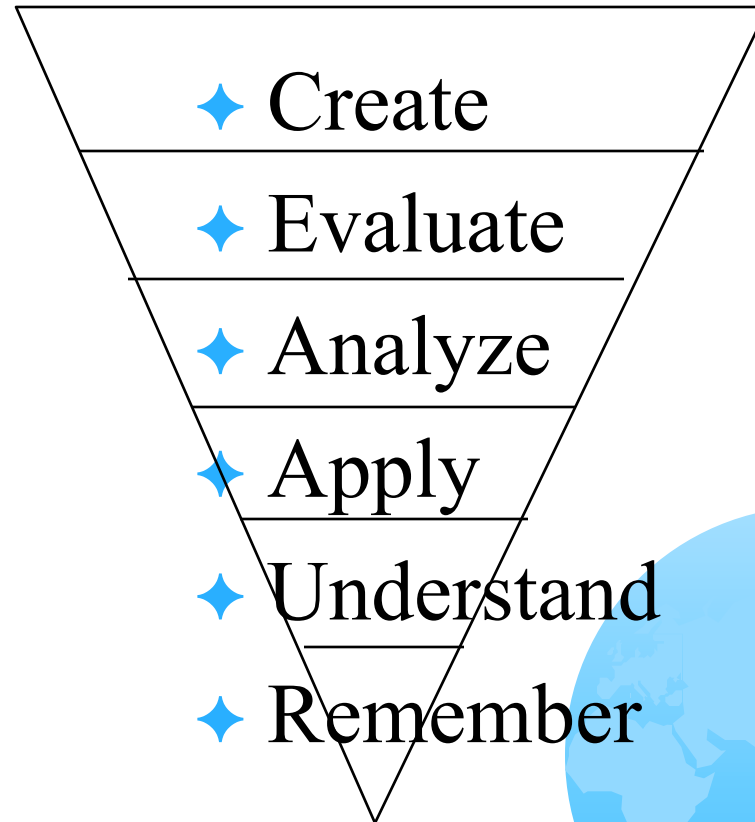
- the ability to combine pieces of information in a usable way.



# Regular



# Gifted





# Lateral Thinking (de Bono, 1985)

## ◆ Thinking hats

### The Six Hats:



**The White Hat:**  
calls for information known or needed.  
"The facts, just the facts."



**The Yellow Hat:**  
symbolizes brightness and optimism. You can explore the positives and probe for value and benefit



**The Black Hat:**  
signifies caution and critical thinking - do not overuse! Why something may not work



**The Green Hat:**  
focuses on creativity, possibilities, alternatives and new ideas. It is an opportunity to express new concepts and new perceptions - lateral thinking could be used here



**The Blue Hat:**  
is used to manage the thinking process. It ensures that the 'Six Thinking Hats' guidelines are observed.



**The Red Hat:**  
signifies feelings, hunches and intuition - the place where emotions are placed without explanation

### Six Thinking Hats®



**Blue Hat** - Process



**White Hat** - Facts



**Red Hat** - Feelings



**Green Hat** - Creativity

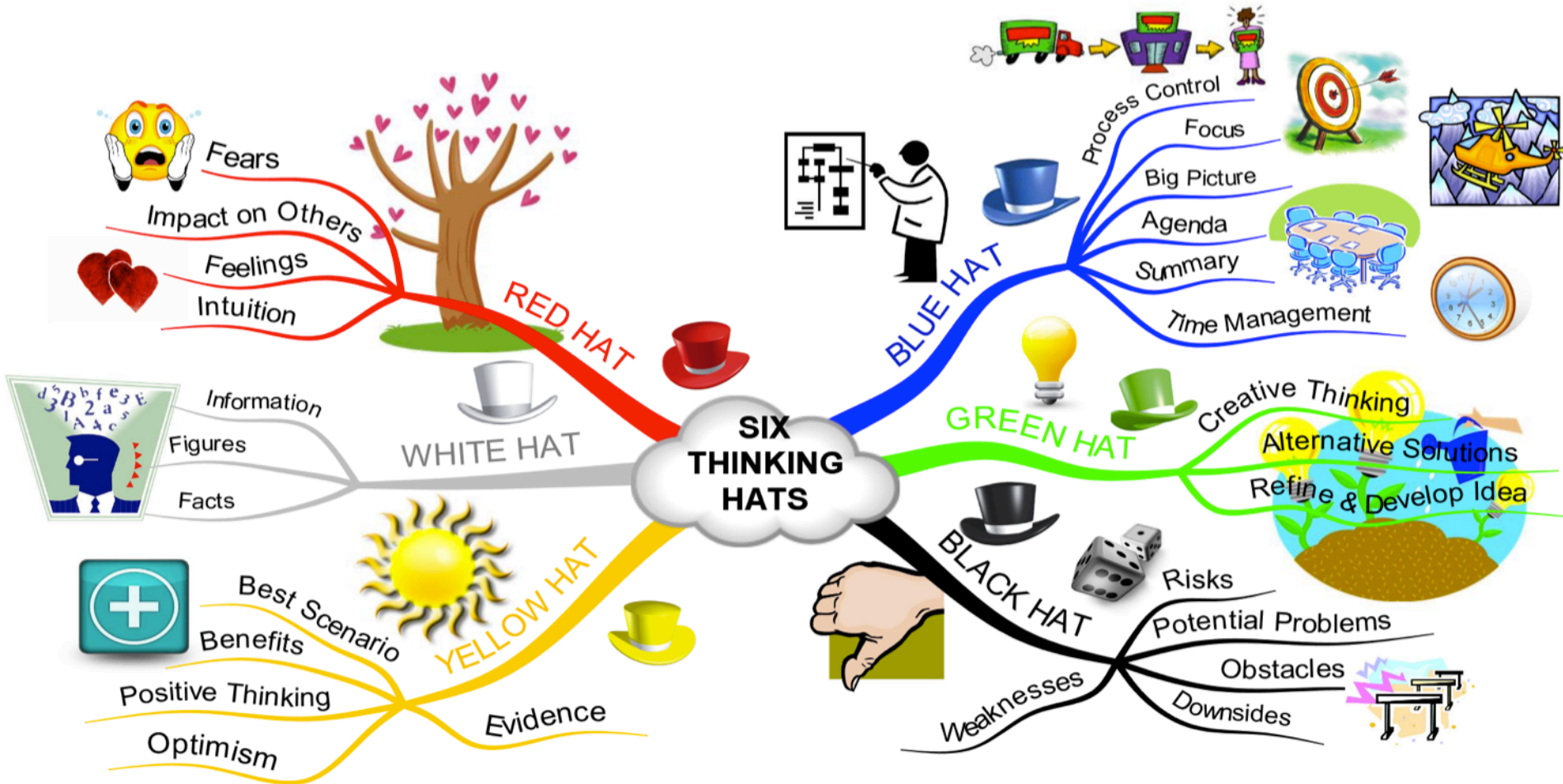


**Yellow Hat** - Benefits



**Black Hat** - Cautions

# Six Thinking Hats



# Socratic Questioning (Paul, 1995)

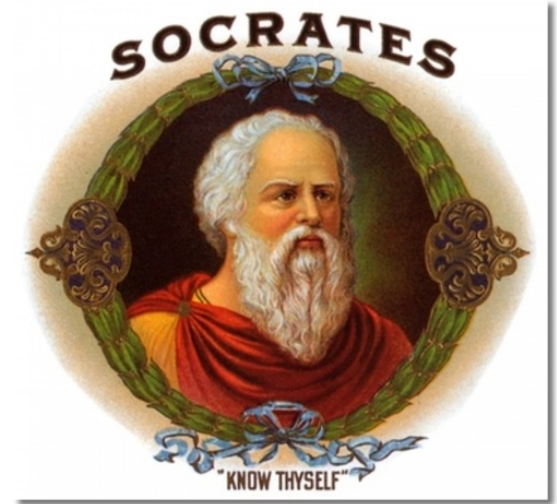
- ◆ Conflicts with Other Thoughts and Answers to Objections
  - How would you answer someone who said...?
- ◆ Origin or Source
  - How did you come to believe that?
- ◆ Implications & Consequences
  - Are you implying that...?
- ◆ Support, Reasons, Evidence, & Assumptions
  - How do you know?



# Taxonomy of Socratic Question

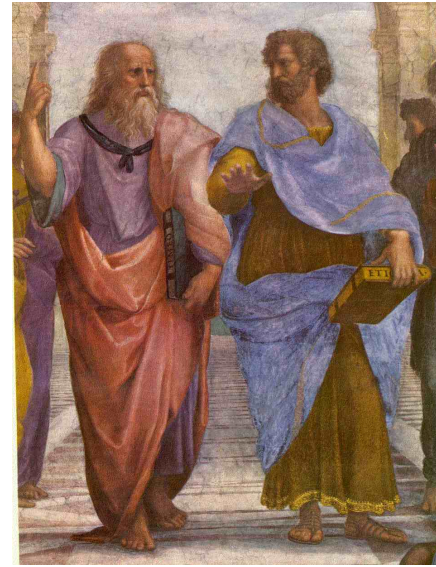
(Paul, 1995)

- ◆ Questions of Clarification
  - What is your main point?
  - Could you give me an example?
- ◆ Questions that Probe Assumptions
  - What are you assuming?
  - What could we assume instead?



# Taxonomy of Socratic Question

(Paul, 1995), continued



- ◆ Questions that Probe Reasons and Evidence
  - What would be an example?
  - How do you know?
  - Do you have any evidence for that?
- ◆ Questions About Viewpoints or Perspectives
  - How would other groups / types of people respond? Why? What would influence them?



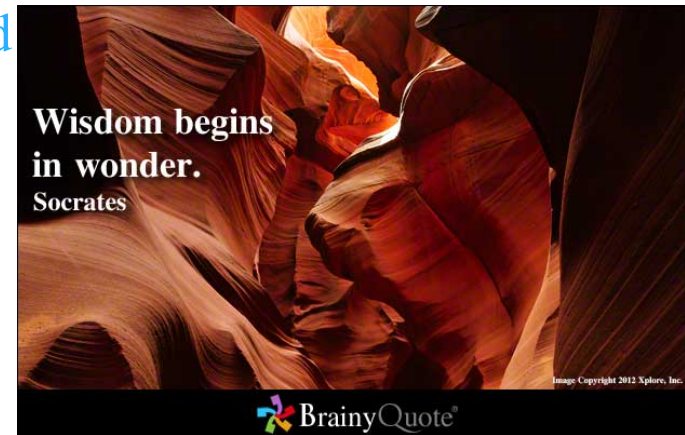


# Taxonomy of Socratic Question

(Paul, 1995), continued

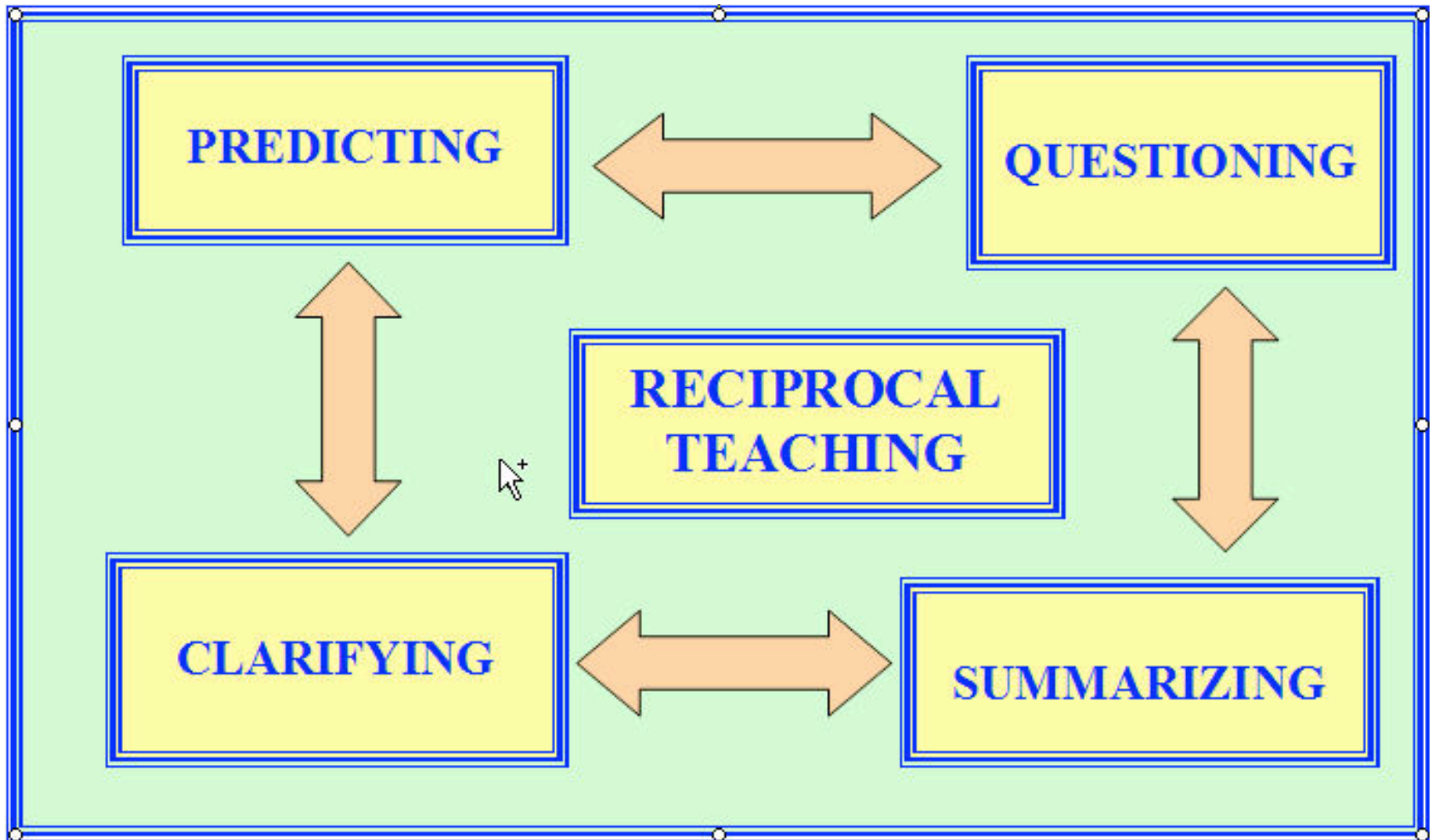
## ◆ Questions that Probe Implications and Consequences

- What are you implying by that?
- What effect would that have?
- Would that necessarily happen or only probably happen?
- What is an alternative?



# Reciprocal Teaching

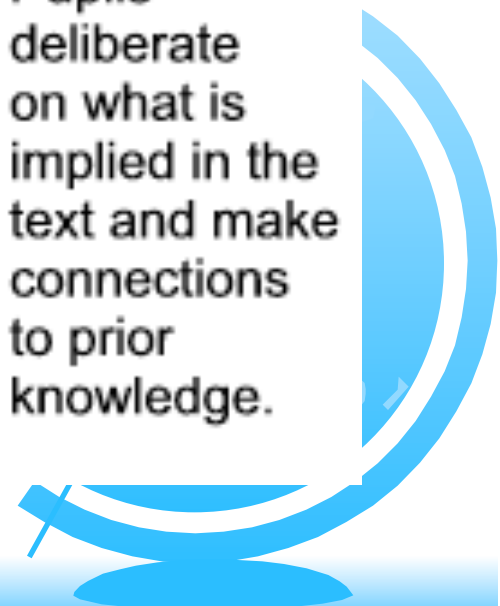
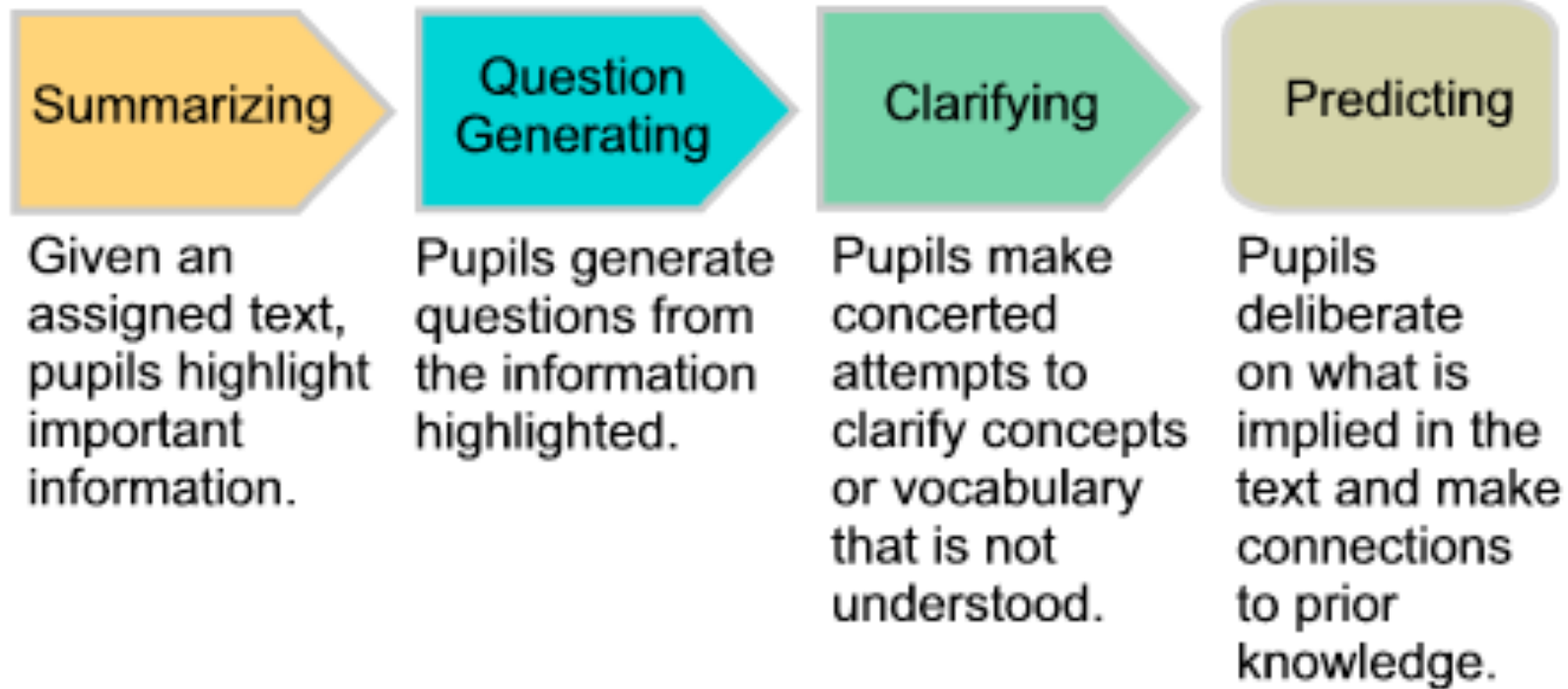
(Palinscar & Brown, 1984)





# Reciprocal Teaching

## Reciprocal Teaching Strategy



# Assessment Rubric

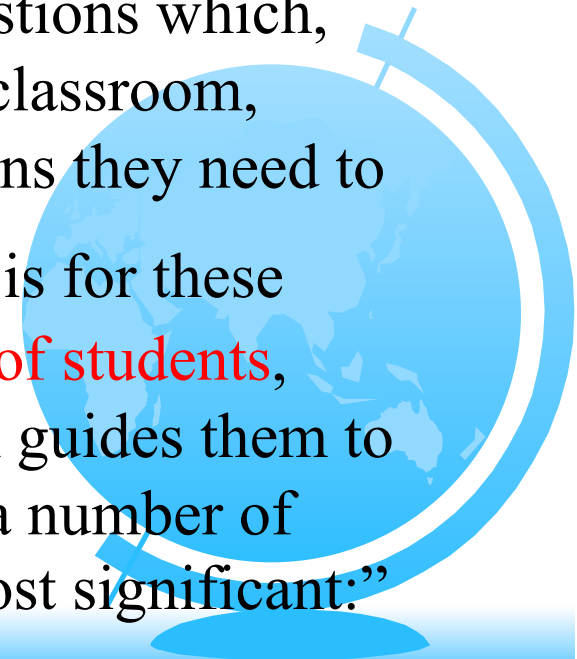
## ◆ Universal Intellectual Standards

- Based on the work of Richard Paul & Linda Elder
- <http://www.criticalthinking.org/pages/universal-intellectual-standards/527>



# Universal Intellectual Standards

- ◆ “Universal intellectual standards are standards which must be applied to **thinking** whenever one is interested in checking the **quality of reasoning** about a problem, issue, or situation. To think critically entails having command of these standards. To help students learn them, teachers should pose questions which probe student thinking, questions which hold students **accountable** for their thinking, questions which, through consistent use by the teacher in the classroom, become internalized by students as questions they need to ask themselves. The **ultimate goal**, then, is for these **questions to become infused in the thinking of students**, forming part of their inner voice, which then guides them to better and better reasoning. While there are a number of universal standards, the following are the most significant:”



# Universal Intellectual Standards

(Paul & Elder, 2010)

## ◆ Clarity

Could you elaborate further?

Could you illustrate what you mean?

Could you give me an example?



## ◆ Accuracy

How could we check on that?

How could we find out if that is true?

How could we verify or test that?



# Universal Intellectual Standards

(Paul & Elder, 2010)

## ◆ Precision

Could you be more specific?

Could you give me more details?

Could you be more exact?

## ◆ Relevance

How does that relate to the problem?

How does that bear on the question?

How does that help us with the issue?





# Universal Intellectual Standards

(Paul & Elder, 2010)

## ◆ Depth

**What factors make this a difficult problem?**

**What are some of the complexities of this question?**

**What are some of the difficulties we need to address?**

## ◆ Breadth

**Do we need to look at this from another perspective?**

**Do we need to consider another point of view?**

**Do we need to look at this in other ways?**



# Universal Intellectual Standards

(Paul & Elder, 2010)

## ◆ Logic

**Does all of this make sense together?**

**Does your first paragraph fit with your last?**

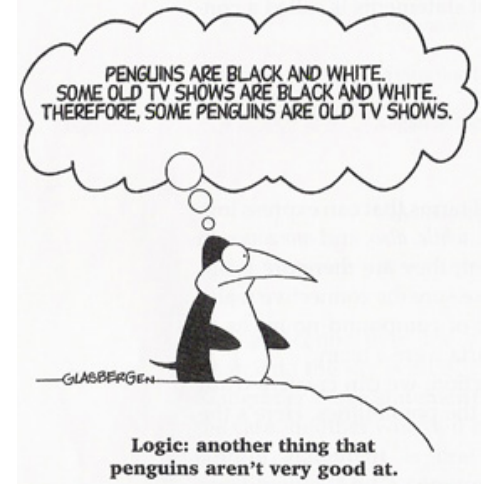
**Does what you say follow from the evidence?**

## ◆ Significance

**Is this the most important problem to consider?**

**Is this the central idea to focus on?**

**Which of these facts are most important?**





# Universal Intellectual Standards

(Paul & Elder, 2010)

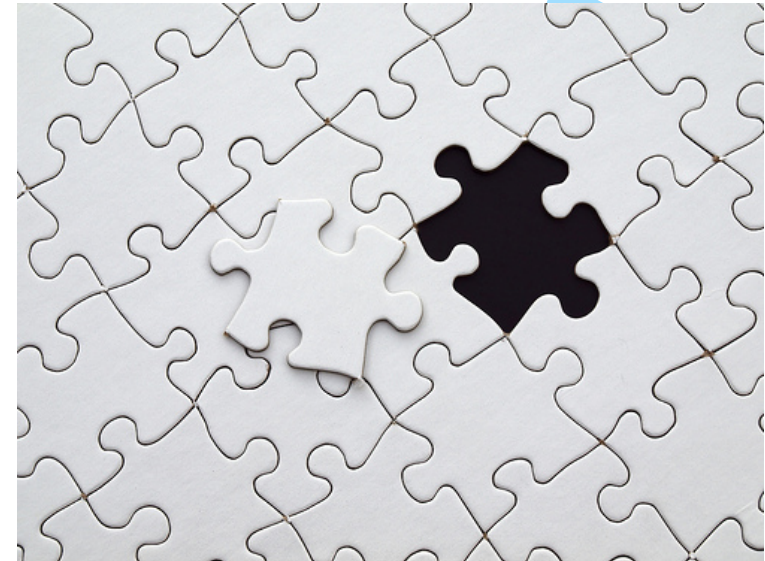
## ◆ **Fairness**

**Do I have any vested interest in this issue?**

**Am I sympathetically representing the viewpoints of others?**

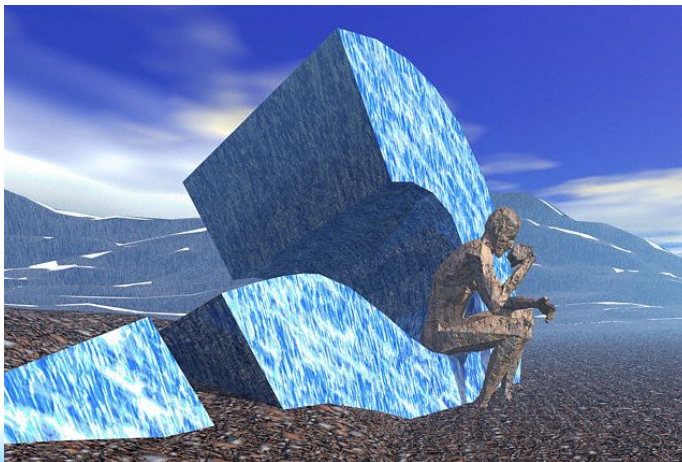
## ◆ **Completeness**

**Are the written responses complete?**  
**Is there anything else that could be added?**



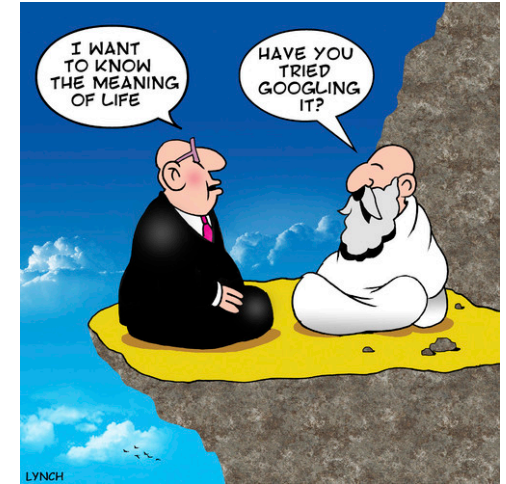
# Critical Thinking (Gerald Nosich, 1993)

- ◆ Getting students to evaluate what they read and hear by asking these four questions:
  - What does it mean?
  - Is it true?
  - Even if it is true, so what?
  - What alternatives are there?



# What does it mean?

- ◆ Students might read (biology text) that human beings are the most dominant species on earth. What does it mean? Does dominant mean more intelligent? Does dominant mean that human beings can get other species to do what they want? Does dominant mean more powerful? Should we also consider insects and bacteria?



# Is it true? How do you know it is true?

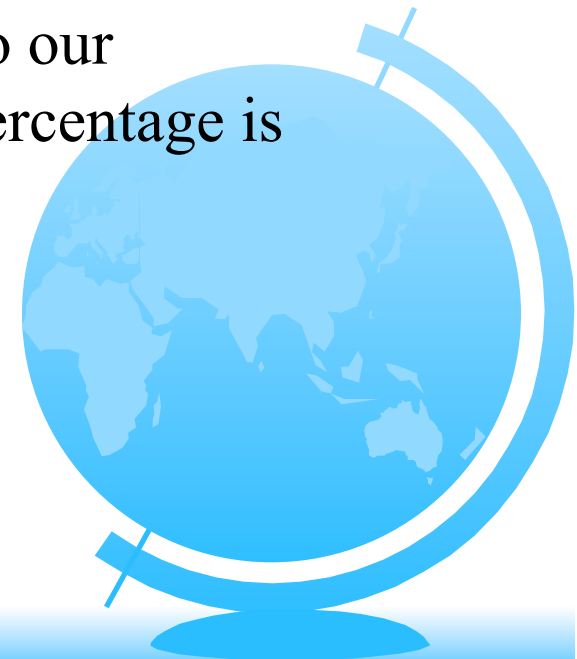
- ◆ The human being is a wanting animal and rarely reaches a state of complete satisfaction except for a short time. As one desire is satisfied, another pops up to take its place (Maslow, 1970). Is it true? One way to test if it is true is by using counter-examples. What about the Gandhi, The Pope, Mother Teresa?



# Even if it is true, so what?

- ◆ Students might read (biology text) that the cranial capacity of women is smaller than that of men. So what? It doesn't say anything about ability or intelligence.
- ◆ Some psychologists have stated that 60% of our intelligence is due to nature and 40% is due to nurture. So what? Both nature and nurture contribute to our intelligence, does it matter if a particular percentage is assigned to one or the other.

**SO WHAT?**



# What alternatives are there?

- ◆ Behaviorists state that our behavior is modified by reinforcing stimuli. Why is it that some people will choose a lower paying job over a higher paying one? Why do some people volunteer or donate their money to some cause? What alternatives are there?



# Rush Cosgrove



- ◆ “Many people think of creativity and innovation as something that is spontaneous. But what we find when we actually look at “geniuses” and people who have produced masterpieces, we find that they’re not just “doing it.” They have become **skilled** through the **performance and continual critique.**”





# Rush Cosgrove



- ◆ “This is a central insight of critical thinking: wherever human skill is relevant, wherever it’s important that there is a difference between skilled performance and unskilled performance, we can look at the qualities that make that performance skilled.”





# Rush Cosgrove



- ◆ “One of the possible ways of viewing education is just **slowing things down**. And many people can’t react quick enough, so they fail. In education we want to take these situations and slow them down to **take our time** and think about them, think about exactly how we are reacting. We can give students the **pacing** that allows them to understand each aspect of a complex process before they have to put it all together later.”



# Center for Critical Thinking

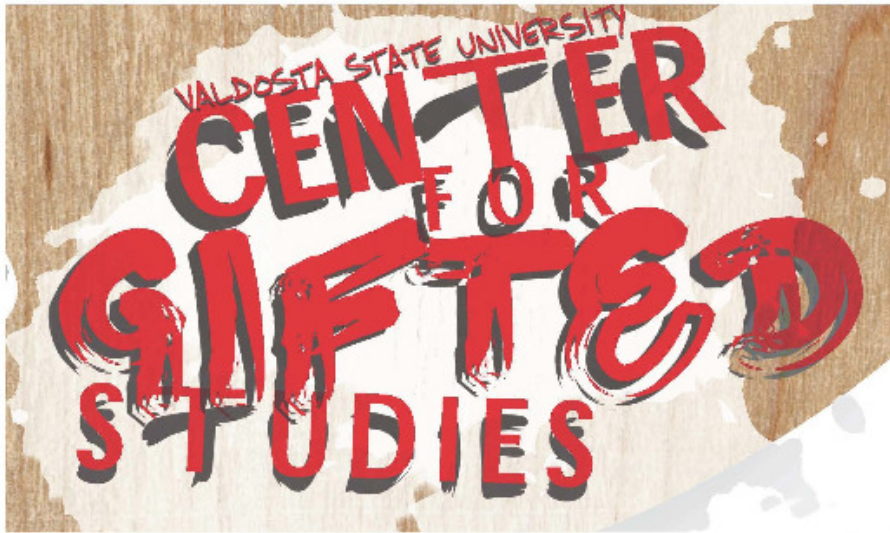


- ◆ Homepage:
- ◆ <http://www.criticalthinking.org//>
- ◆ Critical Thinking Channel on YouTube:
- ◆ <http://www.criticalthinking.org/pages/critical-thinking-channel-on-youtube/787/>



# Center for Gifted Studies

- ◆ <http://www.valdosta.edu/colleges/education/psychology-and-counseling/center-for-gifted-studies/>



# Reference

- ◆ Reffel, J. A. (2013, November). *Creating a critical thinking community in the classroom: Techniques, strategies, questions, and assessments*. Paper presented at the Innovations in Teaching and Learning Conference, Valdosta, GA.

