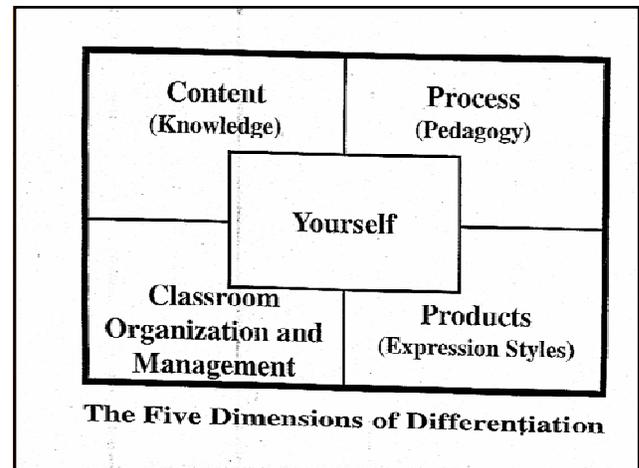
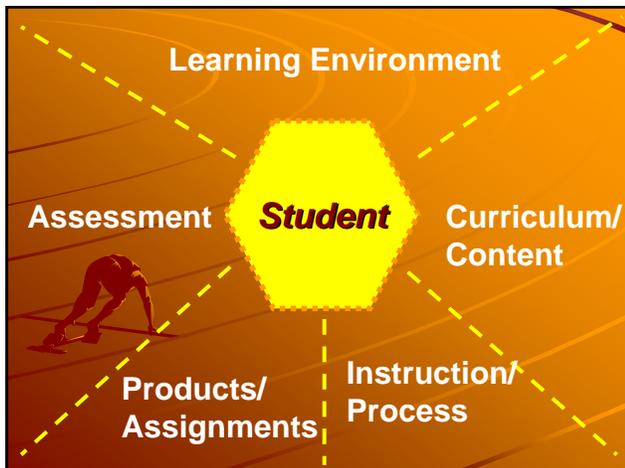


## Developing Critical Thinking in Students

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## Topics and Questions to Consider

- ✦ *What is critical thinking?*
- ✦ *How does CT raise student achievement?*
- ✦ *Low and high expectations*
- ✦ *Two Models of CT*
  - Benjamin Bloom (6 levels)
  - Richard Paul (35 dimensions)
- ✦ *Sample resources (CT Press)*
- ✦ *CT video*



## Self-Reflection

- ↗ What does 'critical thinking' mean to you?
- ↗ Which of these question and tasks require critical thinking?
  - Who is the main character in the story/book?
  - What is the setting?
  - What is the main idea of the chapter/book/story?
  - What do you think/predict will happen next?
  - Convert  $2x+3$  into a word problem.
  - In your opinion, which character displayed the most integrity?
  - Explain how physics and/or geometry apply to playing pool or golf.
  - Explain how algebra is used to plan a budget.
  - In your opinion, which character displayed the most integrity? Support your response.

## Questions frequently raised by Black students...

- ↗ Why do we have to read this stupid book?
- ↗ When are we gonna use this stuff?

## Philosophy

Teach children what to think,  
and you limit them to your  
ideas...

Teach children how to think,  
and their ideas are unlimited.

-- Thinking Works Press

## African American and Latino 17 Year Olds Have Been Taught to Read to the Same Levels as White 13 Year Olds



Source: Source: NAEP 1999 Long Term Trends Summary Tables (online)

### African American and Latino 17 Year Olds Have Been Taught Math to the Same Levels as White 13 Year Olds



Source: NAEP 1999 Long Term Trends Summary Tables (online)

### Too Few 17 Year-Olds Demonstrate Strong Reading Skills

	African American	Latino	White
Learn from Specialized Materials	1%	2%	8%
Understand Complicated Information	17	24	46
Partial Skills	66	68	87
Make Generalizations	95	97	98

Source: USDOE, NCES, 1999 NAEP Summary Data Tables

### Too Few 17 Year-Olds Demonstrate Strong Math Skills

	African American	Latino	White
Multi-Step Problem Solving	1%	3%	10%
Moderately Complex Procedures	27	38	70
Numerical Operations	89	94	99

Source: USDOE, NCES, 1999 NAEP Summary Data Tables

### What is Critical Thinking?

William Graham Sumner (1906)

- [Critical thinking is]...the examination and test of propositions of any kind which are offered for acceptance, in order to find out whether they correspond to reality or not. The critical faculty is a product of education and training. **It is a mental habit and power.** It is a prime condition of human welfare that men and women should be trained in it. It is our only guarantee against delusion, deception, superstition, and misapprehension of ourselves and our earthly circumstances.
- Education is good just so far as it produces well-developed critical faculty....**A teacher of any subject who insists on accuracy and a rational control of all processes and methods, and who holds everything open to unlimited verification and revision is cultivating that method as a habit in the pupils. Men educated in it cannot be stampeded...They are slow to believe. They can hold things as possible or probable in all degrees, without certainty and without pain. They can wait for evidence and weigh evidence...They can resist appeals to their dearest prejudices. **Education in the critical faculty is the only education of which it can be truly said that it makes good citizens.**

{Sumner, W. G. (1940). Folkways: A Study of the Sociological Importance of Usages, Manners, Customs, Mores, and Morals, New York: Ginn and Co., pp. 632, 633. }

## Paul's Definition

- ✦ 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.

## Features of CT

- ✦ It entails the examination of those structures or elements of thought implicit in all reasoning: purpose, problem, or question-at-issue; assumptions; concepts; empirical grounding; reasoning leading to conclusions; implications and consequences; objections from alternative viewpoints; and frame of reference.
- ✦ Critical thinking - in being responsive to variable subject matter, issues, and purposes - is incorporated in a family of interwoven modes of thinking, among them: scientific thinking, mathematical thinking, historical thinking, economic thinking, moral thinking, and philosophical thinking.

## Two Components of CT

- ✦ (1) a **set of skills**
- ✦ (2) a **habit**, based on intellectual commitment, of using those skills to guide behavior.

## CT is Not...

- (a) the mere acquisition and retention of information alone, because it involves a particular way in which information is sought and treated;
- (b) the mere possession of a set of skills, because it involves the continual use of them; and
- (c) the mere use of those skills ("as an exercise") without acceptance of their results.

## Motivation and CT

- ✦ Critical thinking varies according to the motivation underlying it. When grounded in selfish motives, it is often manifested in the skillful manipulation of ideas in service of one's own, or one's groups', vested interest. As such, it is typically intellectually flawed, however pragmatically successful it might be. When grounded in *fair-mindedness and intellectual integrity*, it is typically of a higher order intellectually, though subject to the charge of "idealism" by those habituated to its selfish use.

## *CT is a lifelong endeavor...*

- ✦ Critical thinking of any kind is never universal in any individual; everyone is subject to episodes of undisciplined or irrational thought. Its quality is therefore typically a matter of degree and dependent on , among other things, the quality and depth of experience in a given domain of thinking or with respect to a particular class of questions. **No one is a critical thinker through-and-through, but only to such-and-such a degree, with such-and-such insights and blind spots, subject to such-and-such tendencies towards self-delusion.** For this reason, the development of critical thinking skills and dispositions is a life-long endeavor.

## Summary

- ✦ Critical thinking is, in short, self-directed, self-disciplined, self-monitored, and self-corrective thinking. It presupposes assent to rigorous standards of excellence and mindful command of their use. It entails effective communication and problem-solving abilities and a commitment to overcome our native egocentrism and sociocentrism.

## A well cultivated critical thinker:

- ✦ raises vital questions and problems, formulating them clearly and precisely;
- ✦ gathers and assesses relevant information, using abstract ideas to interpret it effectively comes to well-reasoned conclusions and solutions, testing them against relevant criteria and standards;
- ✦ thinks open-mindedly within alternative systems of thought, recognizing and assessing, as need be, their assumptions, implications, and practical consequences; and
- ✦ communicates effectively with others in figuring out solutions to complex problems.





<b>Deficit Thinking</b>	<b>Dynamic Thinking</b>
He can't do it.	He can do it. He will do it.
That's good enough for her. That's all I expected.	She can do better. I expect and want her to do better.
He's not smart/gifted.	He doesn't know how to work. He needs to work on improving his effort and work ethic.
They are so lazy.	They've learned poor work habits.
She doesn't want to learn.	She has learned to dislike school (reading, etc.). How I can motivate and interest her?
Why should I waste my time on him?	If I don't try to help him, I am wasting his life and time.
If she fails, that's her fault; that's her problem.	If she fails, it's our fault. How can we improve?
I can't make a difference for those students.	I will make a difference. That's what teaching is about.

**A Culture of Thinking:  
Language of a Thinking Vocabulary**

Analyze	Contradict	Dispute	Guess	Presume	Resolve
Ascertain	Convince	Dissect	Hypothesize	Probe	Review
Assess	Criticize	Doubt	Infer	Propose	Ruminate
Assume	Deduce	Elucidate	Inquire	Prove	Scrutinize
Conclude	Demonstrate	Entertain	Interpret	Question	Solve
Cogitate	Derive	Estimate	Judge	Reason	Study
Conjecture	Detect	Evidence	Justify	Rebut	Suggest
Consider	Determine	Examine	Ponder	Recognize	Suppose
Contemplate	Discern	Explain	Posit	Reflect	Theorize
Contend	Discover	Explore	Postulate	Research	Think

*Teach children what to think, and you limit them to your ideas. Teach children how to think, and their ideas are unlimited.*  
Thinking Works Press

**Infusing the Teaching of  
Critical and Creative Thinking  
Into Content Instruction**



**R.J. Swartz and S. Parks (1994)  
Critical Thinking Books & Software**

INFUSING THINKING INTO INSTRUCTION—ELEMENTARY      Decision Making

**SAMPLE STUDENT RESPONSES • HORTON AND THE HUNTERS**

**CHOOSING**

OPTIONS  
What can Horton do?

Run away without the egg.	Fight the hunters.
Run away with the egg.	Give the hunters something nice in exchange for not hurting him.
Ignore the hunters.	Make himself look like a tree.
Talk to the hunters. Tell them what he's doing and ask them to go away.	Hide from the hunters.

**YOUR OPTION**  
Run away without the egg

**RESULTS**  
What will happen?

PRO	CON
Horton may escape.	Horton will feel bad because he broke his promise to Mayzie.
Horton won't be afraid anymore.	If Horton falls down, the hunters would get him.
Horton won't have to get cold anymore sitting on the egg.	The egg will die.
	Mayzie will get upset when she returns and finds her egg dead.

**CHOICE**  
Is this a good thing to do?

No.

Why?

Because it's very important to keep the egg alive and Horton made a promise to Mayzie to take care of the egg.

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INFUSING THINKING INTO INSTRUCTION—ELEMENTARY DECISION MAKING

SAMPLE STUDENT RESPONSES • HORTON AND THE HUNTERS

**CHOOSING**

OPTIONS

What can Horton do?

Run away without the egg.	Fight the hunters.
Run away with the egg.	Give the hunters something nice in exchange for not hurting him.
Stay and faces the hunters.	Make himself look like a tree.
Talk to the hunters. Tell them what he's doing and ask them to go away.	Hide from the hunters.

YOUR OPTION  
Stay and face the hunters

RESULTS

What will happen?

<b>PRO</b> The hunters might not shoot because Horton is brave.	<b>CON</b> The hunters might shoot Horton and take him away from the egg.
Horton keeps his word to Mayzie.	The hunters might steal the egg and sell it.
The hunters might miss.	

CHOICE

Is this a good thing to do? Why?

Maybe if the hunters are nice and don't hurt Horton. Because Horton made a promise to Mayzie to take care of the egg and that's important.

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INFUSING THINKING INTO INSTRUCTION—ELEMENTARY COMPARING AND CONTRASTING

Sample Student Responses • Triangles and Pyramids

**OPEN COMPARE AND CONTRAST**

<b>TRIANGLE</b>	<b>PYRAMID</b>						
<b>HOW ALIKE?</b>							
Both have faces, edges, and angles.							
Both take up and enclose a space.							
The angles in both are the same.							
Both are triangular shapes.							
You can flip and turn both without changing their shape.							
<b>HOW DIFFERENT?</b>							
<b>WITH REGARD TO</b>							
One face	←	→		←	→		Four faces
Three angles							Twelve angles
Three edges							Six edges
Encloses a flat space							Encloses a space that has height, width, and depth
<b>CONCLUSION OR INTERPRETATION</b>							
Triangles and pyramids can have the same angles and edges of the same length, but triangles are made of three lines that enclose a space with height and width, and pyramids are made of many triangles to enclose a space that has depth as well.							

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INFUSING THINKING INTO INSTRUCTION—ELEMENTARY COMPARING AND CONTRASTING

Sample Student Responses • Lincoln and Douglass

**OPEN COMPARE AND CONTRAST**

<b>ABRAHAM LINCOLN</b>	<b>FREDERICK DOUGLASS</b>
<b>HOW ALIKE?</b>	
Both were born into very poor families.	
Both were self-educated.	
Both used language to persuade others.	
Both contributed to ending slavery in the United States.	
<b>HOW DIFFERENT?</b>	
<b>WITH REGARD TO</b>	
<b>CIVIL RIGHTS</b> He was born a free citizen with all the rights guaranteed to Americans.	<b>CIVIL RIGHTS</b> He was born a slave with none of the rights guaranteed to Americans.
<b>EFFECTS OF RACE</b> His opportunities were not limited by his race.	<b>EFFECTS OF RACE</b> Even as a free black man, his opportunities were limited.
<b>ABOLITION</b> He was opposed to slavery but was not an abolitionist.	<b>ABOLITION</b> He was an abolitionist who believed that one person could not own another.
<b>INFLUENCE</b> He used the War Powers Act to free slaves and establish military service for blacks.	<b>INFLUENCE</b> He used his newspaper to inspire both blacks and whites to respect the rights of blacks.
<b>PATTERNS OF SIGNIFICANT SIMILARITIES AND DIFFERENCES:</b> Family background, leadership, effect on ending slavery.	
<b>CONCLUSION OR INTERPRETATION:</b> Both men showed determination to better themselves and, through this achievement, used its advantages to better the lives of countless others in this country.	

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INFUSING THINKING INTO INSTRUCTION—ELEMENTARY COMPARING AND CONTRASTING

Sample Student Responses • Lincoln and Douglass • Focused Compare and Contrast

**FOCUSED COMPARE AND CONTRAST**

<b>LINCOLN</b>	<b>DOUGLASS</b>
<b>GOALS:</b> To clarify how Lincoln and Douglass contributed to ending slavery in the United States.	
<b>FACTORS TO CONSIDER:</b> Goals, priorities, attitudes towards slavery, methods, accomplishments, effectiveness	
<b>HOW ALIKE?</b>	
They opposed slavery.	
They both used language persuasively.	
Both influenced a great many people to oppose slavery.	
<b>HOW DIFFERENT?</b>	
<b>Goals</b> To save the Union and uphold the Constitution while opposing slavery.	<b>Abolition of slavery</b> Believed that no person could own another.
<b>Attitudes towards slavery</b> Believed slavery was unacceptable, (though it was legal.)	<b>Oratory and writings; any means acceptable</b> Newspaper and his own writings.
<b>Methods</b> Legal means: the power of the presidency.	<b>Increased public awareness of the plight of slaves</b> The Emancipation Proclamation.
<b>Accomplishments</b> The Emancipation Proclamation.	
<b>Effectiveness</b> Legally freed slaves in southern states.	
<b>CONCLUSION OR INTERPRETATION:</b> While both Lincoln and Douglass worked towards the goal of ending slavery, Lincoln was constrained by legal considerations, regarding slaves as property, that Douglass did not accept, but ultimately, Lincoln used the power of the presidency to work within the law to free slaves.	

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INFUSING THINKING INTO INSTRUCTION—ELEMENTARY REASONS AND CONCLUSIONS

Sample Student Responses • Garbage and Trash

**REASONS AND CONCLUSIONS**

**CONCLUSION**

Using again what we've already used (recycling) is better than burying garbage in a landfill.

<p style="text-align: center;"><b>REASON</b></p> <p>There are more and more people and less land for landfills.</p>	<p style="text-align: center;"><b>REASON</b></p> <p>If we keep using and burying cans, we'll use up all the metal, and then there will be none left.</p>	<p style="text-align: center;"><b>REASON</b></p> <p>If we keep using and burying paper, we'll use up all the trees and there will be no trees left for making paper.</p>
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INFUSING THINKING INTO INSTRUCTION—ELEMENTARY CREATING METAPHORS

**UNDERSTANDING METAPHORS**

<p style="text-align: center;">CAT</p> <p>ALCOOF, IMPERSONAL, DISINTERESTED, WATCHFUL</p>	<p>HOW ALIKE?</p> <p>WITH REGARD TO ATTITUDE</p>	<p style="text-align: center;">FOG</p> <p>IMPERSONAL, RELENTLESS</p>
<p>STEALTHY, PADDED, CALM, NOISELESS, SOUNDLESS</p>	<p>WITH REGARD TO SOUND</p>	<p>MUTED, HUSHED, MUFFLED, SOUNDLESS, DAMPENING</p>
<p>SLINKING, GLIDING, STALKING, CREEPING</p>	<p>WITH REGARD TO MOTION</p>	<p>ROLLING, CURLING, BLANKETING, WRAPPING, SPREADING, CREEPING</p>
<p>SLEEK, SOFT, SILKY, FLUFFY</p>	<p>WITH REGARD TO TEXTURE</p>	<p>THICK, DENSE, HEAVY, DAMP, MISTY</p>
<p>GLISTENING, SHINING, FLUID</p>	<p>WITH REGARD TO APPEARANCE</p>	<p>GRAY, HAZY, FOAMING, GLISTENING, SOOPY</p>
<p>CROUCHING, LOW-LYING, SPRAWLING</p>	<p>WITH REGARD TO POSITION</p>	<p>LOW-LYING, OVER-HANGING, SPRAWLING</p>
<p>WATCHFUL, INDEPENDENT</p>	<p>WITH REGARD TO INTENTION</p>	<p>HIDING, SHUFFLING, HUSHING, CALMING</p>

What does the metaphor of the cat say about fog?  
**THAT THE FOG IS INDIFFERENT AND CREEPS IN SILENTLY.**

Sample student responses as they appear in *Organizing Thinking II*, Howard and Sandra Black, Critical Thinking Press and Software, 1990

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INFUSING THINKING INTO INSTRUCTION—ELEMENTARY REASONING BY ANALOGY

Sample Student Responses • Farming the Ocean

**REASONING BY ANALOGY**

<p>A: Clams</p>	<p>HOW ALIKE?</p>	<p>B: Potatoes</p>
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<p><b>ATTRIBUTE</b></p> <p>Habitat: Live underground</p> <p>Feeding Patterns: Always nourishment from immediate environment</p> <p>Value to Humans: Eaten as food all over the world</p> <p>Size: Can hold them in your hand</p>	<p><b>SIMILARITY</b></p> <p>Similar harvesting needs</p> <p>Similar feeding patterns</p> <p>Valuable to humans</p> <p>Same harvesting needs</p>	<p><b>WHY SIGNIFICANT?</b></p> <p>Similar harvesting needs</p> <p>Similar feeding patterns</p> <p>Valuable to humans</p> <p>Same harvesting needs</p>
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**THINGS KNOWN ABOUT B (Potatoes) THAT MIGHT ALSO BE TRUE OF A (Clams):**  
You can plant a lot of them in a small space. You can harvest them easily by digging them up. You can feed them to make them grow and be healthy.

<p><b>WITH REGARD TO</b></p> <p>Living animals: Clam move on their own. Beagulls eat them. Hard outer shell. Sand in which clams live is exposed only part of the time.</p>	<p><b>WITH REGARD TO</b></p> <p>Biological Status: Tubers (underground plant stem containing starch stored food energy).</p> <p>Locomotion: Cannot move on their own.</p> <p>Reproduction: Grow from the "eyes" of live potatoes.</p> <p>Predators: Birds don't eat them.</p> <p>Physical Properties: Soft skin.</p> <p>Accessibility: The ground potatoes live in is always exposed.</p>	<p><b>CONCLUSION ABOUT A (Clams):</b> Clams may be cultivated in sand that is (partially) exposed at low tide. A lot of them can be planted in the sand. They can be fed at low tide. A wire enclosure can keep the gulls away. They can be dug up with rakes and shovels.</p>
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INFUSING THINKING INTO INSTRUCTION—ELEMENTARY CONDITIONAL REASONING

Sample Student Responses • Growth and Digestion

**CONDITIONAL REASONING**

**TOPIC:** The pituitary gland.

**ARGUMENT**

**CONDITIONAL STATEMENT**

If your pituitary gland doesn't function properly, then there's a danger you won't grow.

**NEW INFORMATION**

A child down the street has a pituitary gland that doesn't function properly.

**CONCLUSION**

There is a danger that the child down the street won't grow.

**ARGUMENT EVALUATION CHECKLIST**

1. Are there circumstances in which the premises could be true while the conclusion is false? YES  NO

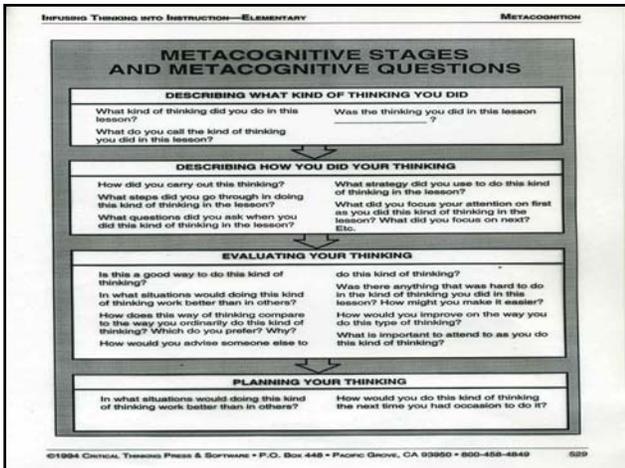
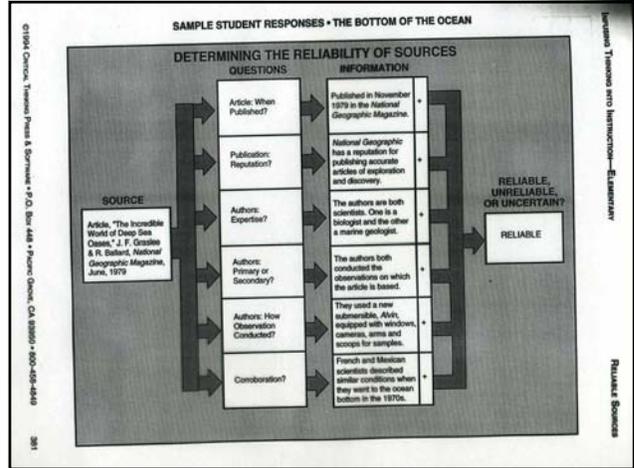
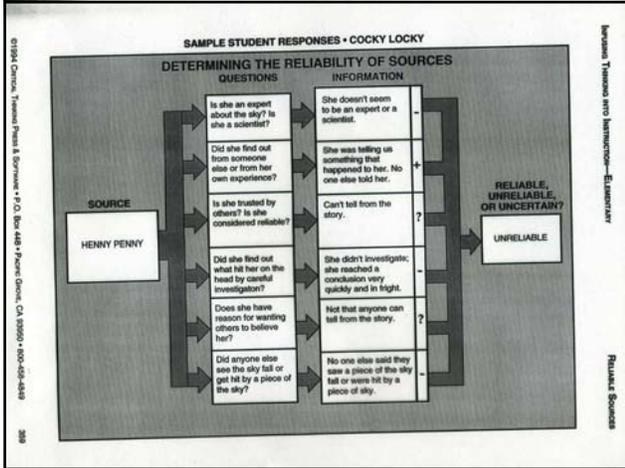
2. Explain.

It is true that he has a problem with his pituitary and it is also true that if someone has a problem with their pituitary, there is a danger he won't grow.

A deductive argument is valid only if there are no circumstances in which the premises are true and the conclusion false. YES  NO

Indicate validity and invalidity in the following ways:

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## Food for thought...

- ✦ *The immature mind is not merely ignorant or unskilled but unreflective.*  
-- Wiggins and McTighe (1998)
- ✦ *A good guiding question is the fundamental query that directs the search for understanding.*  
--Traver (1998)
- ✦ *The most important instructional strategy may be that of questioning.*

## Types of Qs

- 1 Closed-ended vs. open-ended  
(convergent vs. divergent)  
(skinny vs. fat)

*what to think...*

- 2 MultiLayered/complex/sophisticated  
*how to think...*

## Essential Questions & Examples

*... how to think...*

- ✦ Target big ideas
- ✦ Promote depth/deep understanding
- ✦ Focus learning
- ✦ Clarify
- ✦ Engage students/provoke interest
- ✦ Make the abstract become more concrete
- ✦ Scaffold/build/connect
- ✦ Assess depth of understanding
- ✦ Lead to more questions
- ✦ What is waste?
- ✦ What is courage?
- ✦ Who is a great person?
- ✦ What is a friend?
- ✦ When are laws fair/unfair?
- ✦ What is worth fighting for?
- ✦ Was Jefferson a hypocrite? Did he really think of slaves as subhuman while writing the Declaration of Independence?
- ✦ In what ways can a fairy tale be true?
- ✦ Is honesty the best policy or just the right thing to do?

## What is a good guiding question?

Rob Traver (1998). Educational Leadership.  
*Characteristics of a Good Guiding Question*

- ✦ Open-ended, yet focus inquiry  
– (Encourage thinking, further query/questioning)
- ✦ Contain emotive force and intellectual bite  
– (When are laws unfair?)
- ✦ Succinct  
– (contain a few words, but demand a lot)

At the end of each lecture/chapter/unit, students should be asked to answer two questions:

- ✦ What is the major idea/point/lesson that you learned in class today?
- ✦ What is the main unanswered question you leave class with today?

## Knowledge Words & Questions

- ✦ Key Words
- ✦ Five Ws and How
- ✦ Choose
- ✦ Find
- ✦ Define
- ✦ Label list
- ✦ Spell
- ✦ Match
- ✦ Name
- ✦ Recall, retell
- ✦ Select
- ✦ Tell
- ✦ What is...? Where is...? When did...?
- ✦ How did... happen?
- ✦ What happened when...?
- ✦ Who were the main...?
- ✦ Where did the story take place?

## Comprehension Words & Questions

- ✦ Demonstrate, Show
- ✦ Explain
- ✦ Illustrate
- ✦ Outline
- ✦ Rephrase
- ✦ Summarize
- ✦ How would you ...?
- ✦ What is another word for...?
- ✦ What is the main idea...?
- ✦ Explain what is meant by...?
- ✦ How would you summarize...?

## Application Words & Questions

- ✦ Apply
- ✦ Build
- ✦ Construct
- ✦ Do
- ✦ Experiment
- ✦ Model, Make use of
- ✦ Organize
- ✦ Plan
- ✦ Select
- ✦ Use
- ✦ How would you use/apply ...?
- ✦ What examples can you find...?
- ✦ How would you organize...?
- ✦ How would you make...?

## Analysis Words & Questions

- ✦ Analyze, Assume
  - ✦ Compare & Contrast
  - ✦ Dissect, divide
  - ✦ Examine
  - ✦ Inspect, infer
  - ✦ Predict
  - ✦ Survey
  - ✦ Take apart
- ✦ How is ... related to...?
  - ✦ What inference can you make about...?
  - ✦ How are ... alike and different?
  - ✦ What would happen if...?

## Synthesis Words & Questions

- ✦ Adapt
  - ✦ Build
  - ✦ Combine, construct, compose, create, change
  - ✦ Design, develop
  - ✦ Imagine, invent, improve
- ✦ How would you change... to get a new product?
  - ✦ How could you make something new out of...?
  - ✦ What is a different way of doing this?

## Evaluation Words & Questions

- ✦ Criticize
  - ✦ Defend, dispute
  - ✦ Evaluate
  - ✦ Interpret
  - ✦ Judge, justify
  - ✦ Prove
  - ✦ Recommend
  - ✦ Support
- ✦ What is your opinion of...? Why?
  - ✦ What do you recommend? Why?
  - ✦ What would you choose? Why?
  - ✦ What does research say about...?
  - ✦ How did you arrive at that answer? What evidence did you use to draw that conclusion?

## Activity...

- ✦ In your group, think of a lesson that you have recently taught or a book that your class has read. Agree on one topic to discuss as a group. Write two questions at each level of Bloom's Taxonomy.
- ✦ Or analyze the questions in [To Kill a Mockingbird Unit](#). Indicate where each question is on Bloom's Taxonomy.

## *Final Words...*

- ✦ Speak less so your students will speak more.
- ✦ Question your students often.
- ✦ Ask big/essential questions (open-ended, divergent).
- ✦ Focus on big ideas and concepts.
  - Fairness, equality, power, peace, justice, systems, change...
- ✦ Ask students to support/defend their ideas/statements.
- ✦ Concrete → abstract; abstract → concrete.
- ✦ Model thinking... think aloud in front of your students.
- ✦ Compliment students when they raise critical questions.