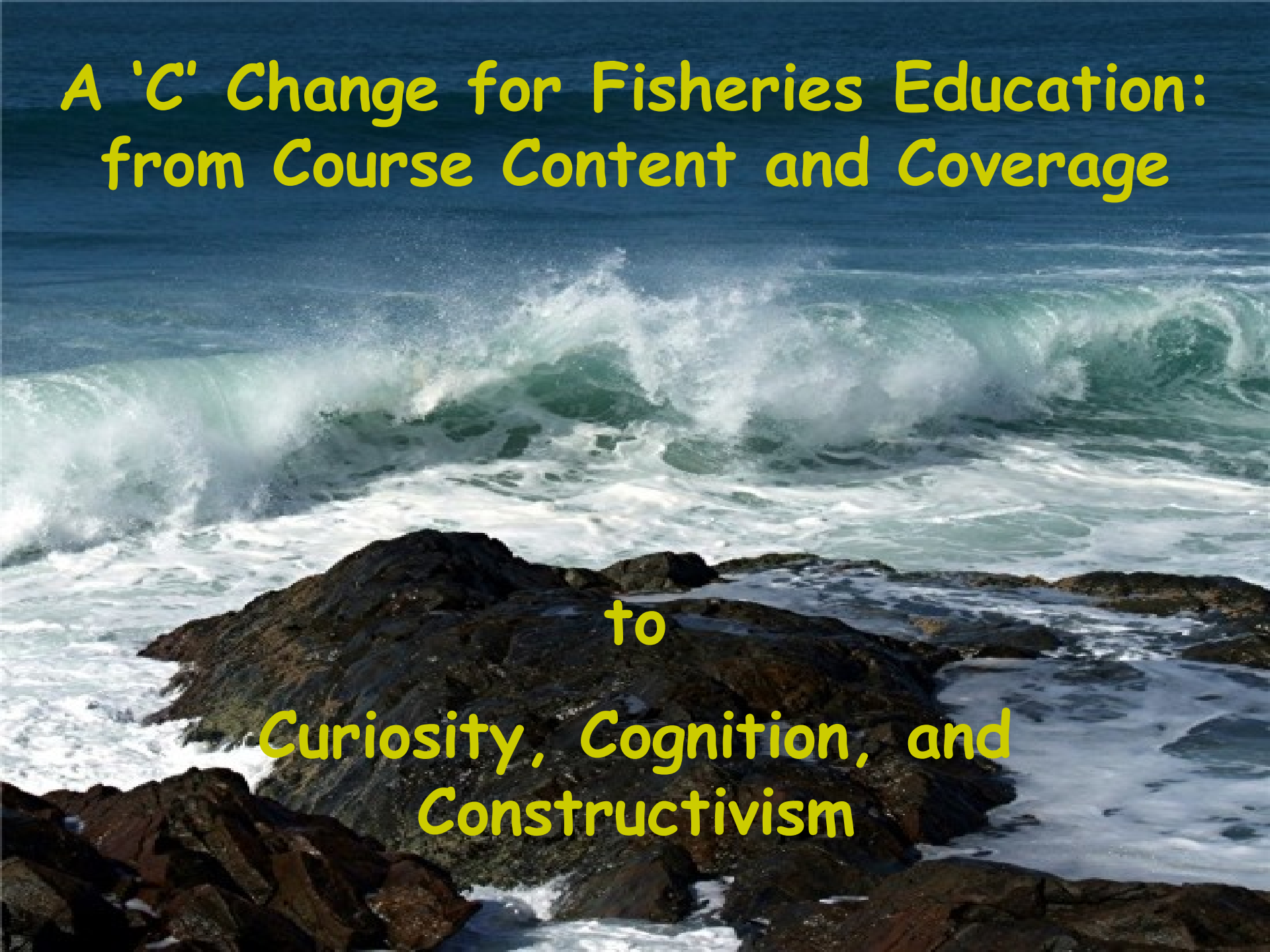

A 'C' Change for Fisheries Education:
from Course Content and Coverage
to
Curiosity, Cognition, and
Constructivism

'C' Change
Sea change (noun) -1) a striking change, often for the better;
2) any major transformation

A 'C' Change for Fisheries Education:

from

Course Content and Coverage

to

Curiosity, Cognition, and Constructivism

Brian R. Murphy, Virginia Tech

Find this PPT and all references at my Virginia Tech homepage:

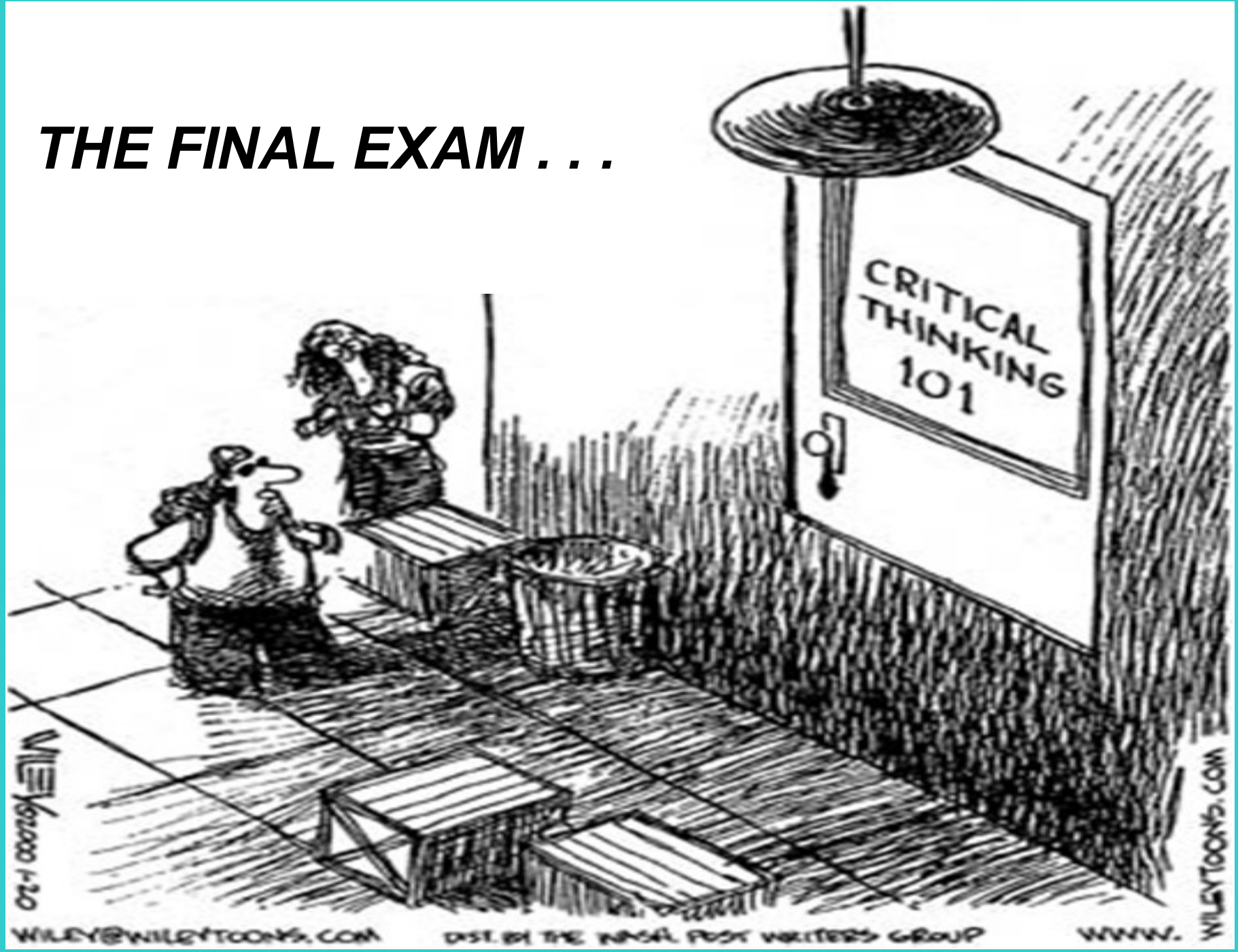
www.fishwild.vt.edu/

- *Faculty*
- *Murphy*

Abstract

Faculty often decry students' poor critical thinking skills, but have we designed our teaching to develop such skills?

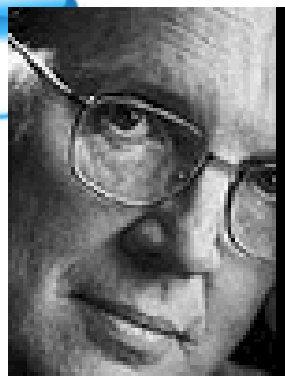
THE FINAL EXAM . . .



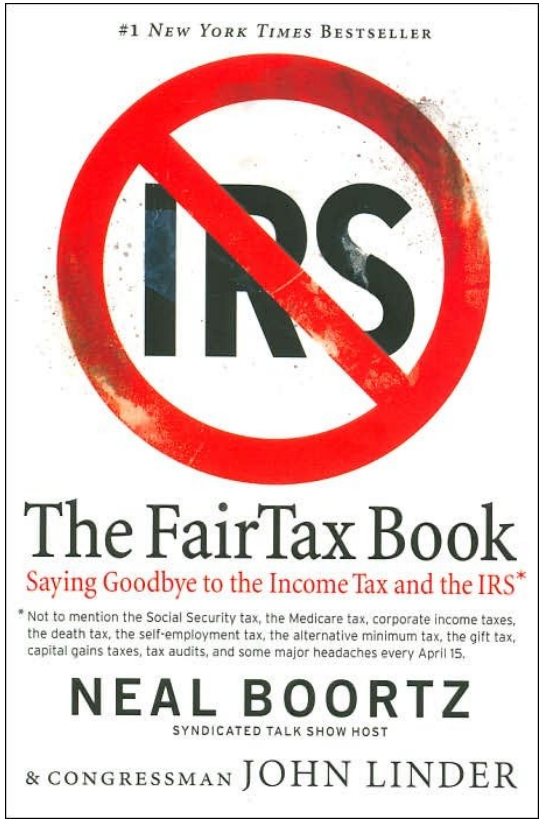
What are the consequences of poor critical thinking?

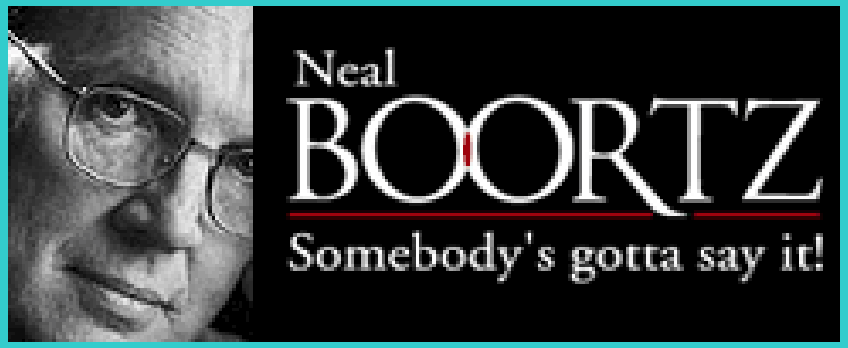
Poor thinking skills affect people all over the world !

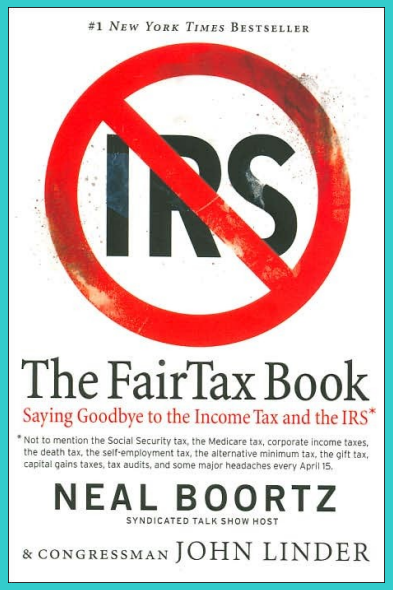
Are college students any better thinkers than the general populace ?



Neal
BOORTZ
Somebody's gotta say it!







Student caller:

“I am writing a paper on the Fair Tax for an economics course. I’ve read your book, but I can’t tell what are the main points supporting the idea of the Fair Tax. Please tell me the main points in your book, so that I can put them in my paper . . .”

WHY ???

The 'Coverage' model:

Course Content: It is my responsibility to 'cover' all the important material; it is the students' responsibility to learn it

Fr. Guido Sarducci, Educational Philosopher

Fr. Guido Sarducci, Educational Philosopher

The "Coverage" Model

('transferring' or 'imparting' information)

'Knowledge Transfer' ca. 1200 AD

'Knowledge Transfer' ca. 1200 AD

lektor (Latin): one who reads

'Knowledge Transfer' ca. 1200 AD

auditorium (from L.) "lecture room," literally "place where something is heard"

"Modern" lecture: conducted in an auditorium, where 'lecktor' reads and students transcribe

The "Coverage" Model: 900 years of tradition can't be wrong !

EXAMINER
UNIVERSITIES NO
LONGER THE KEEPERS
OF KNOWLEDGE!
NEWS UPDATE
GOSSIP

The Nashvi

Thursday, September 3, 2009

Universities no longer the ke

Today the United Nations declared that "universities should no longer be considered the keepers of knowledege for all of human society."

Said Secretary-General Ban Ki-moon, "That is an antiquated idea that should have died out long ago. Sure that was true in the Middle Ages, and before the invention of the printing press, but the Information Age is here and that old idea has outlived its usefulness."

Any school child can now find more information in five minutes on Wikipedia than faculty teach in an entire college course.

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Universities are no longer the 'keepers of knowledge'

Lecture: Where (old) information is transferred from the notebook of the professor to the notebook of the student, without passing through the brain of either.

Students are not “empty vessels” that we fill with knowledge

Neither knowledge nor wisdom can be "transferred" from the teacher or mentor

'Information transfer' is not 'learning'!

The 'old' 'C' model:

(We do) Content Coverage

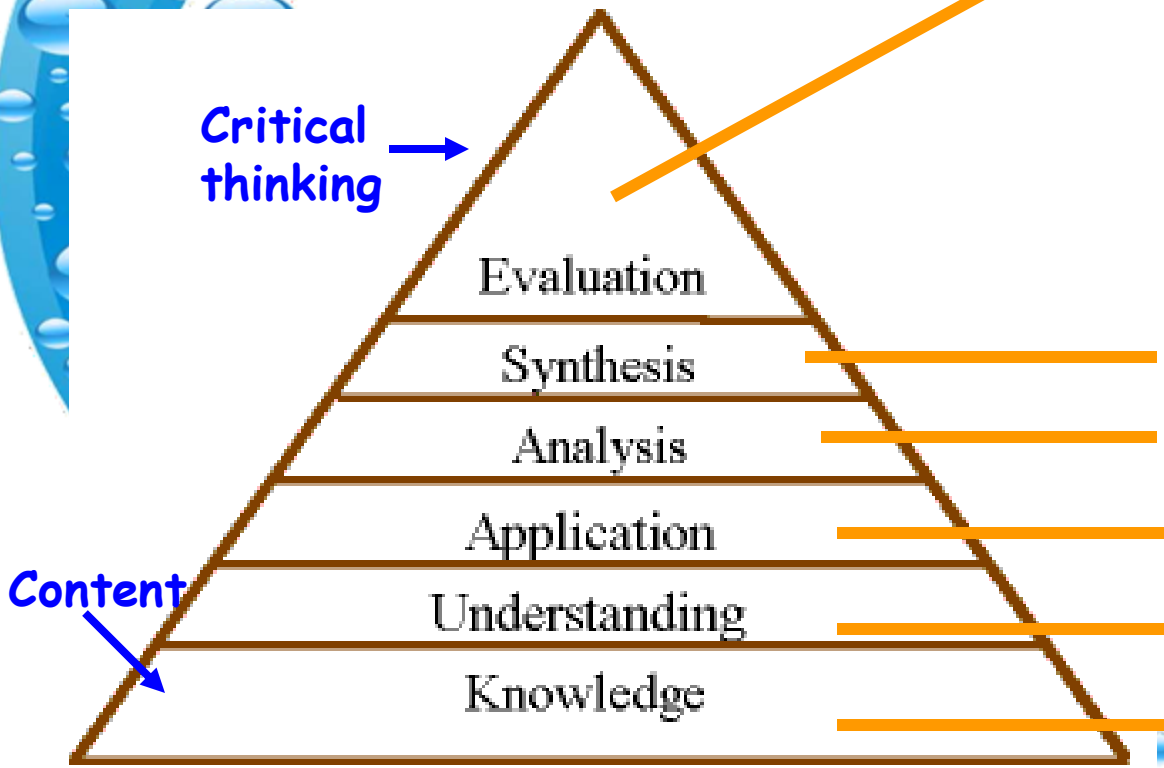
? | ?

(We say we want) Critical Thinking

Failure of Behaviorist Teaching and Learning

MIT *engineering graduates* cannot answer basic questions from middle-school physical science

Bloom's Taxonomy of Learning (Cognitive Domains; 1984)



judge, evaluate, debate, recommend

compose, invent

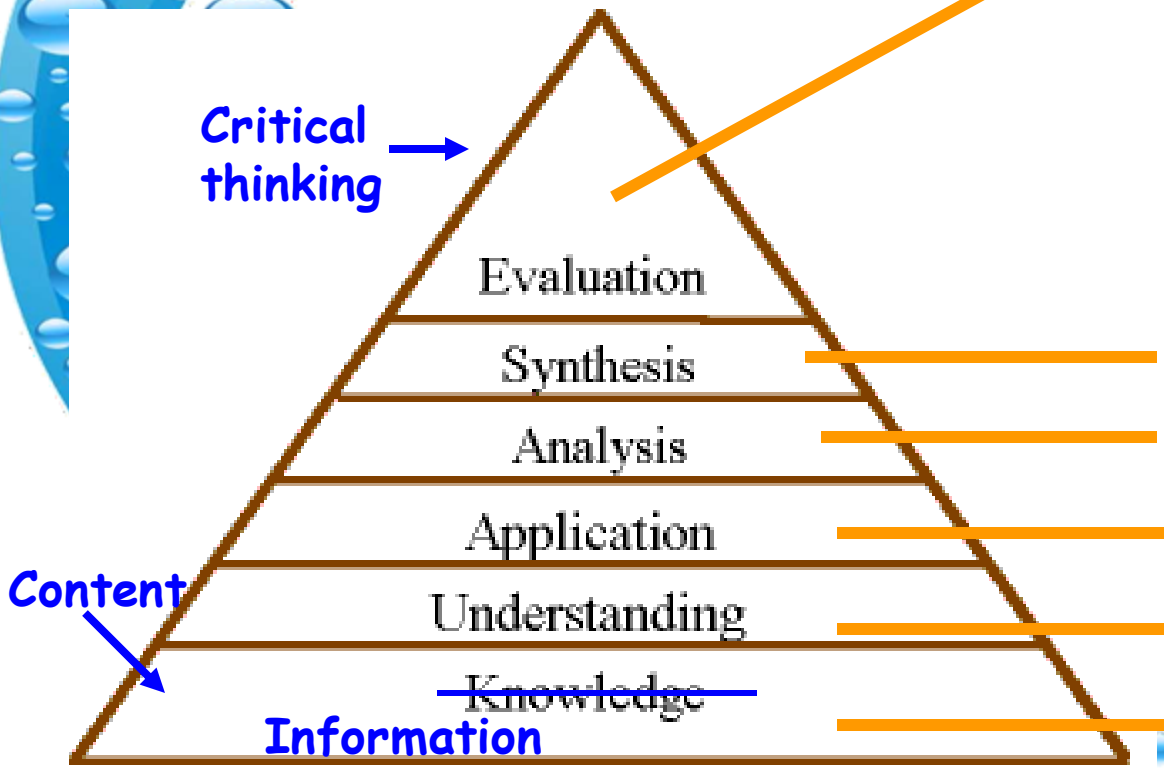
outline, relate

solve, manipulate

compare, interpret

define, describe

Bloom's Taxonomy of Learning (Cognitive Domains; 1984)



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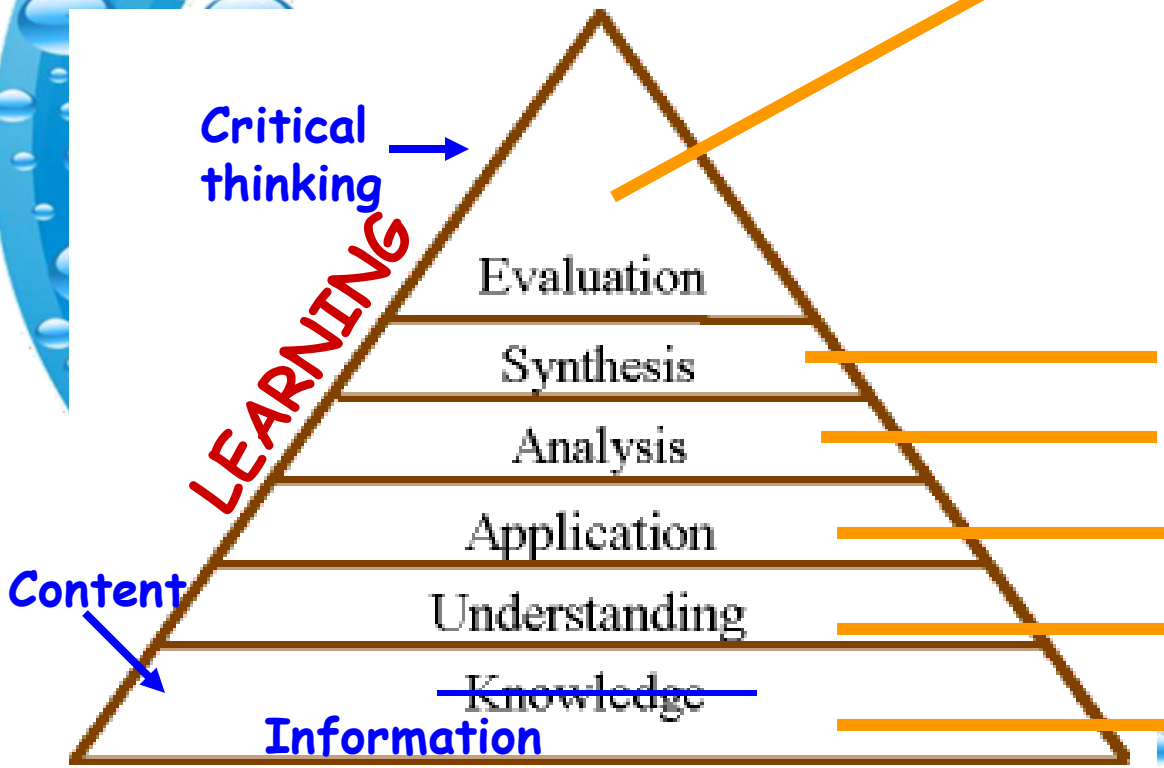

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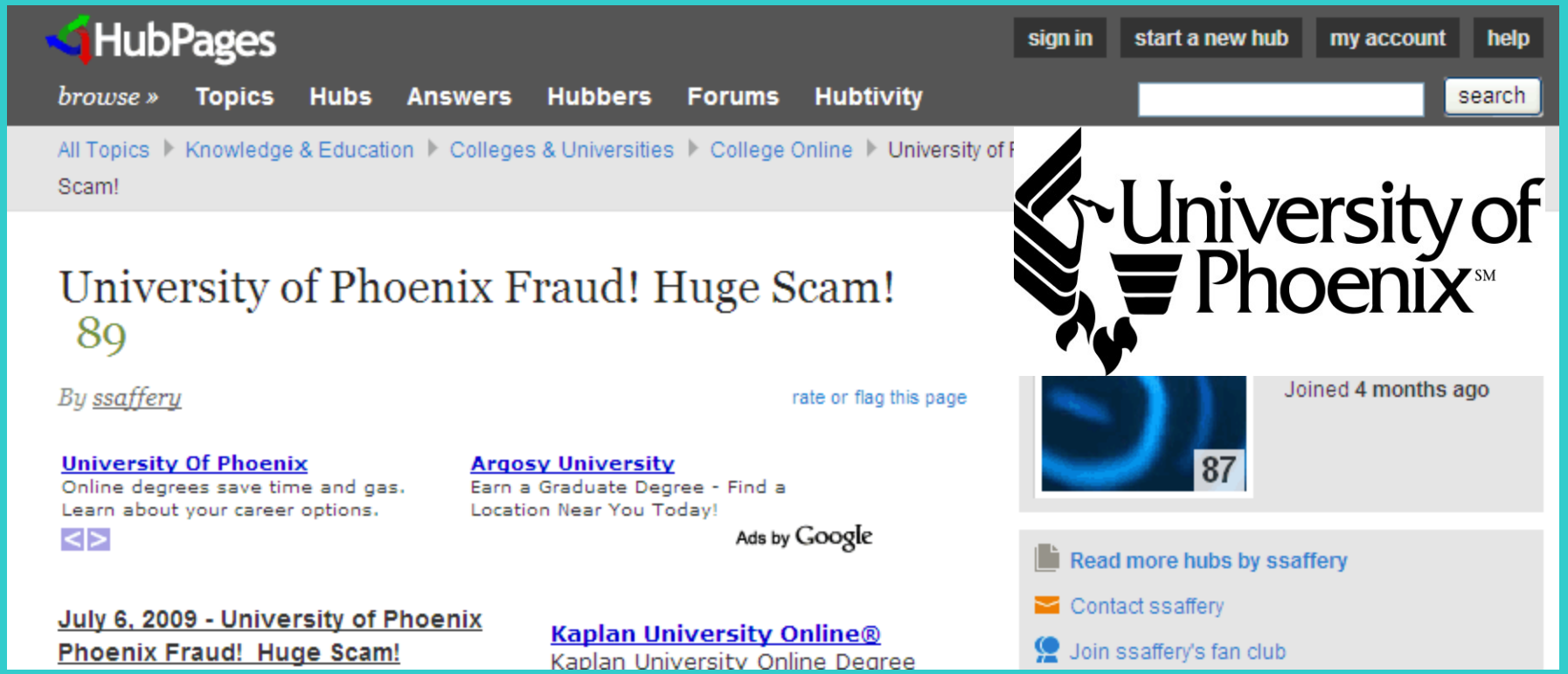
DISCONNECTS IN TEACHING & LEARNING

Too many courses concentrate on 'coverage'.

1. We've trained students to expect such.
2. "All they have to do is parrot it back on the test, and then they forget it." (Sarducci)
3. So, if you ask for different 'learning', they are lost or angry.

REALIST BACKLASH



"They don't teach you anything. They just give you stuff to read and lots of questions, and you have to teach yourself."

DISCONNECTS IN TEACHING & LEARNING

Knowledge Theories (epistemology):

Realist – knowledge "exists" external to the learner

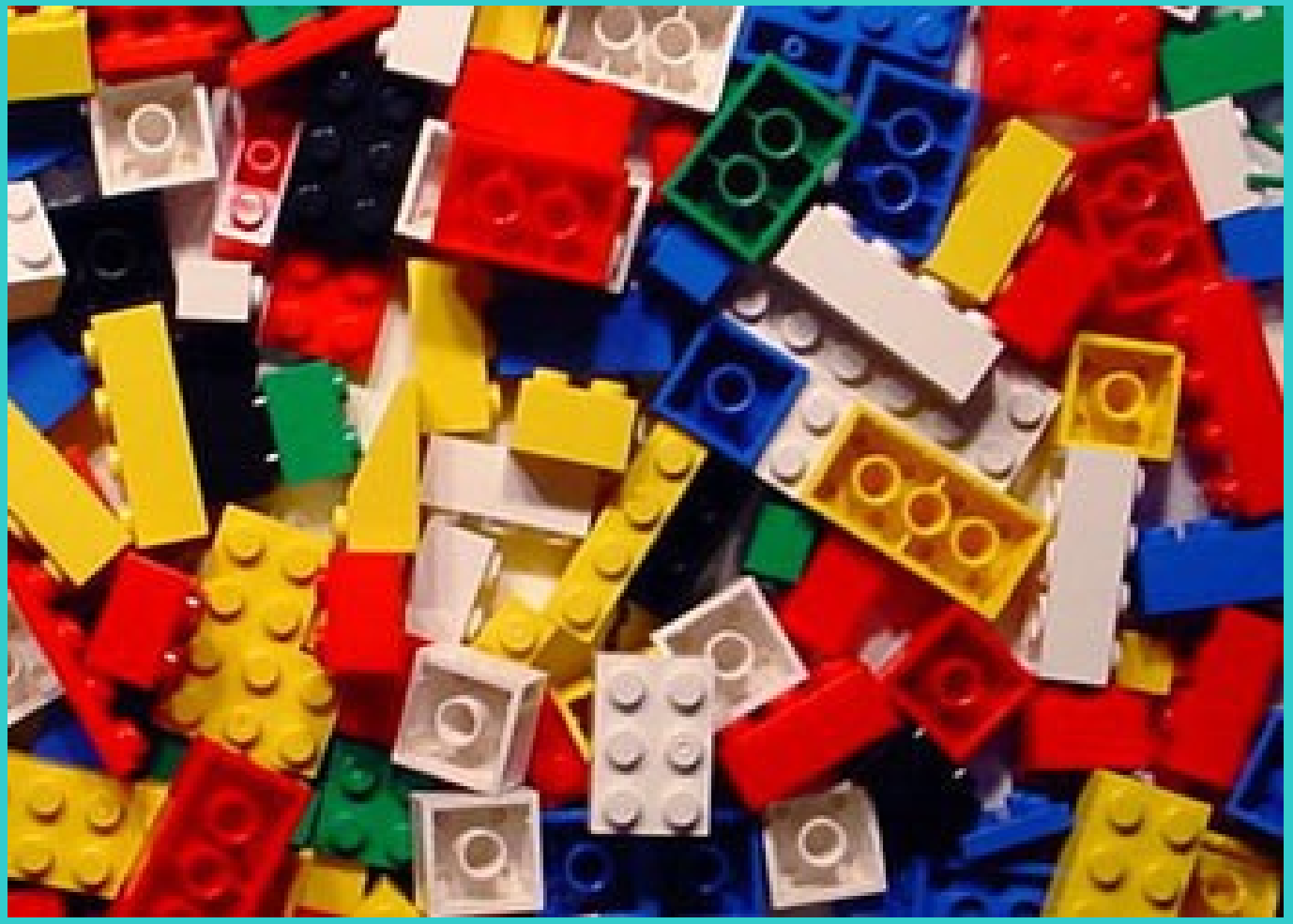
Constructive – knowledge is developed by the learner through experience

Learning Theories

Behaviorist – teachers possess and impart knowledge

Constructivist – knowledge is assembled by the learner through selection and organization of relevant data

'Knowledge' is constructed by students, not external to them (constructivism)



Working with students at Bloom's 'Knowledge' level (actually, 'information' level) level does not help them 'construct' knowledge.

They are simply stenographers who don't know where to file things.

Our job as teachers? Not to "impart knowledge", but to help students learn to judge and use information to create meaningful constructs of knowledge.

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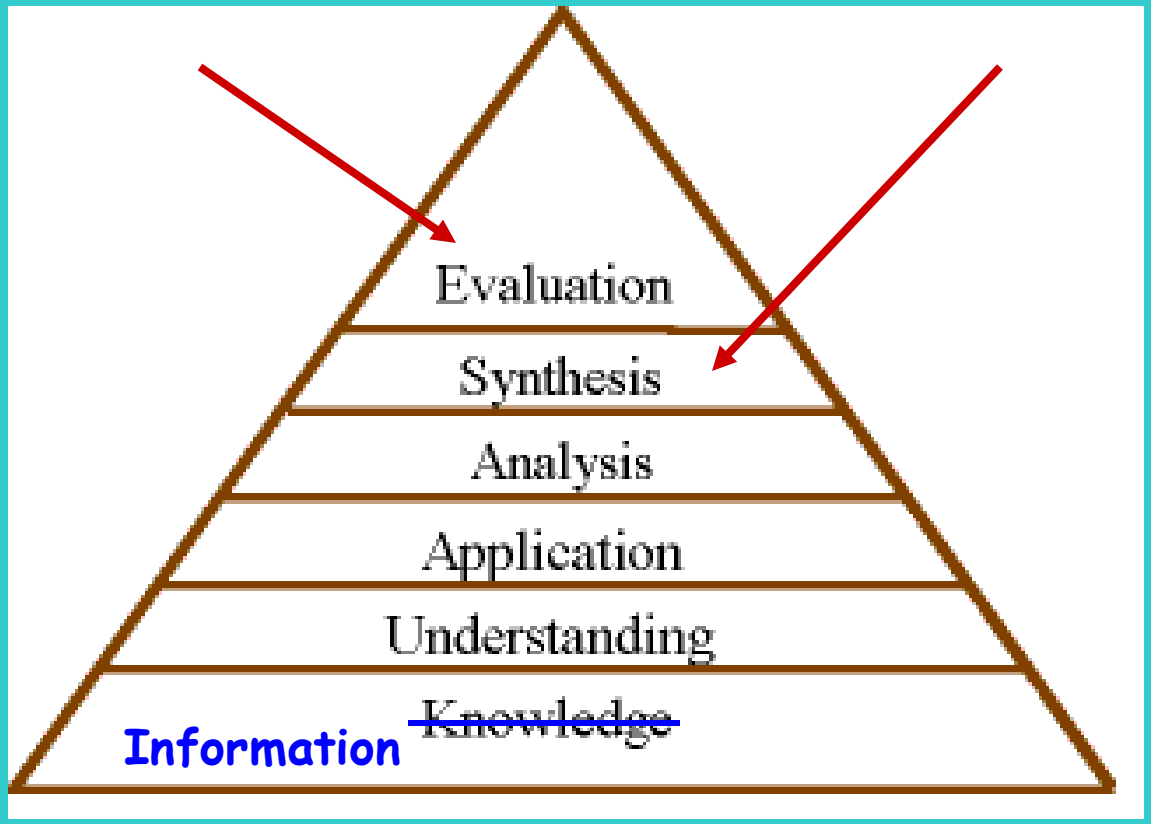
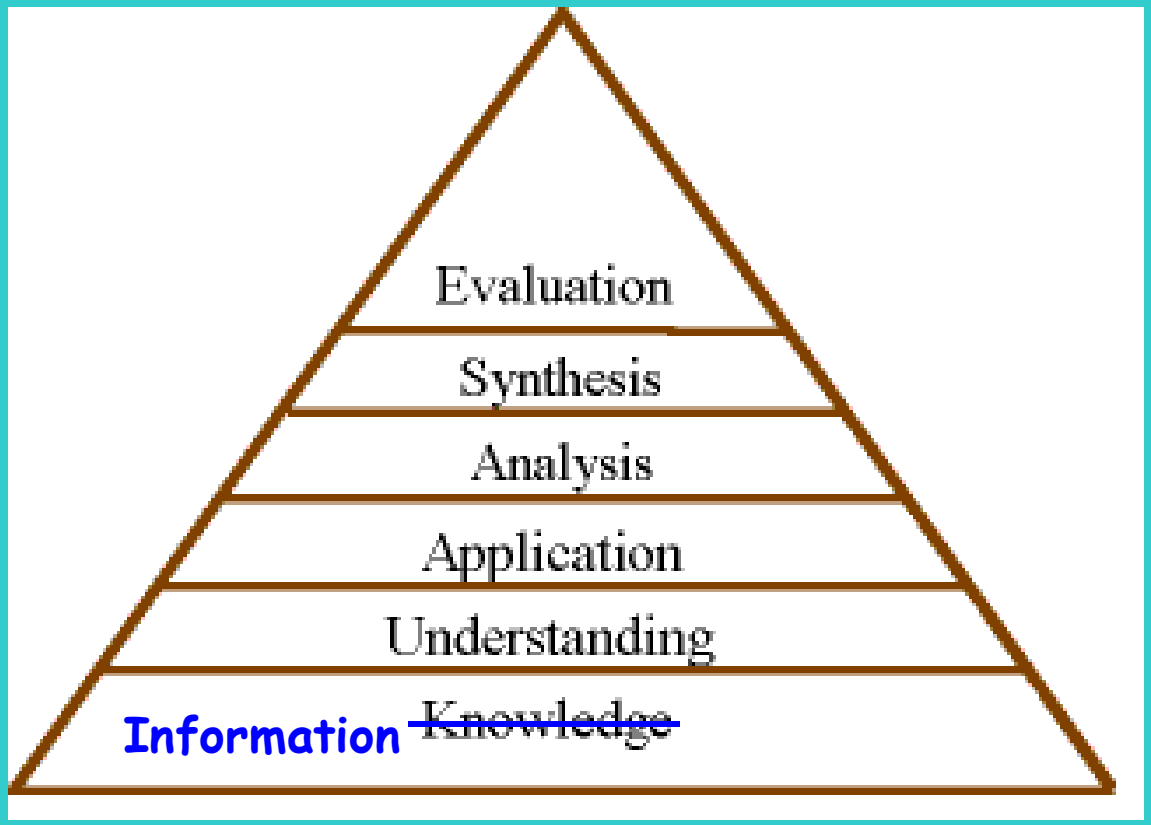


'Learning' is the construction process, not the construction product. Learning the process makes the student a 'life-long learner' able to tackle any future challenge.



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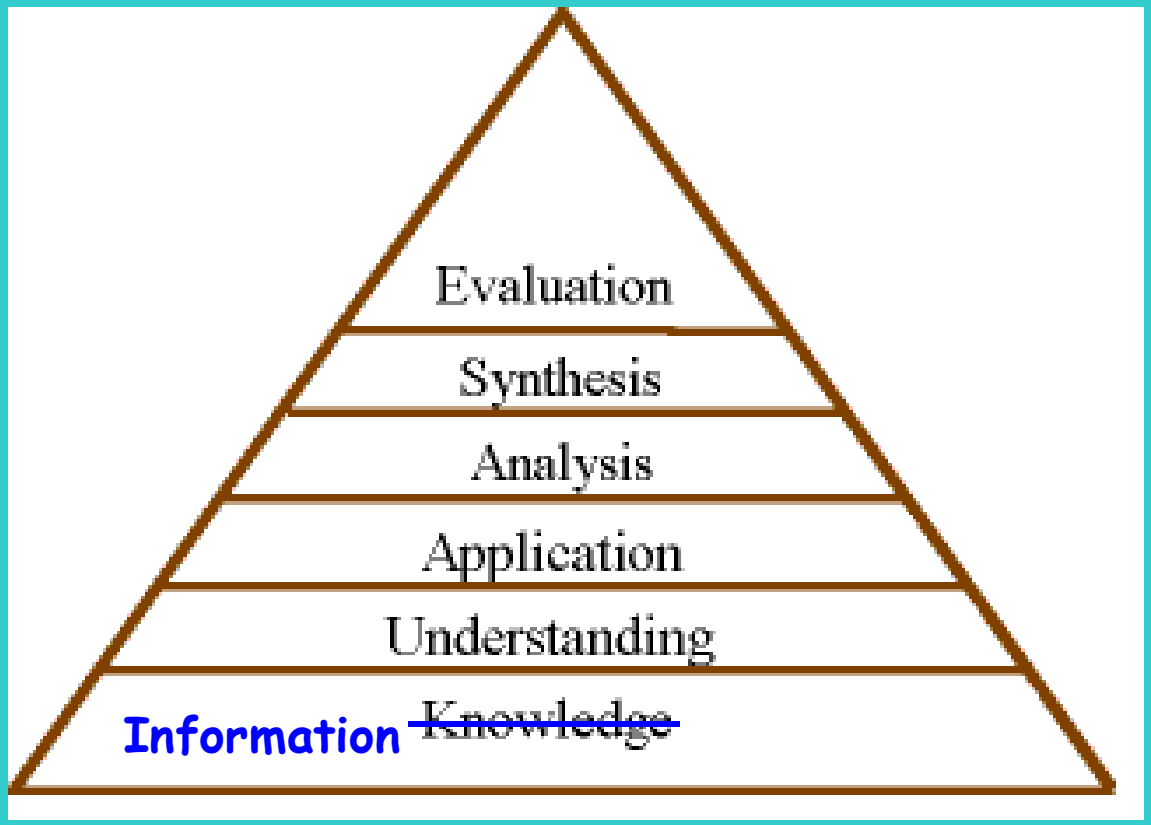
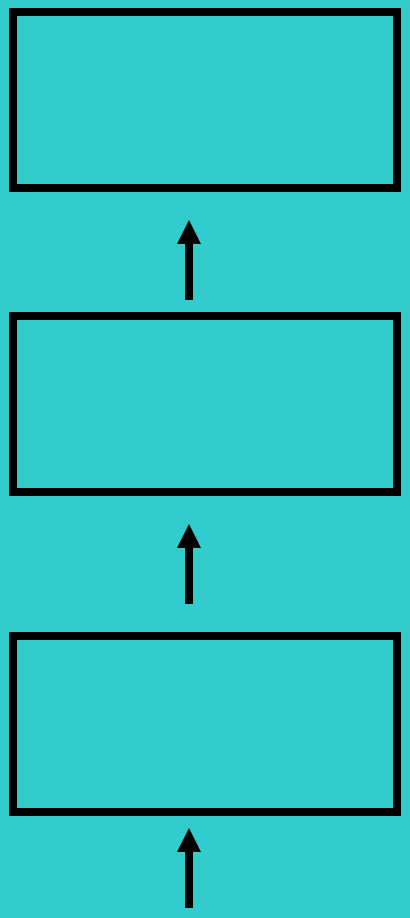


BUT, you must consider . . .

Nature of students . . .

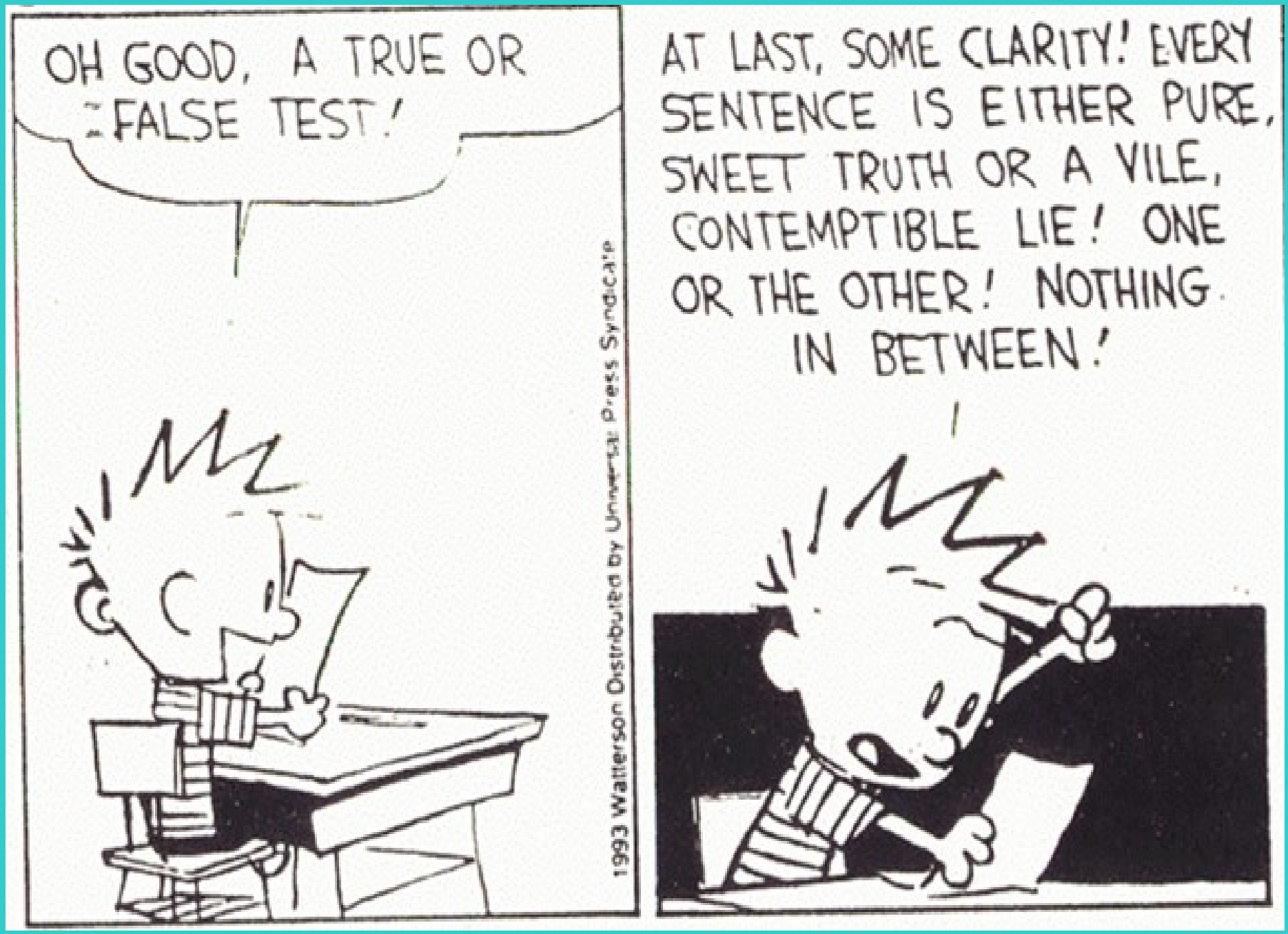
Levels of Intellectual Development (Perry 1970)

Levels of Intellectual Development



Dualistic
(Perry)

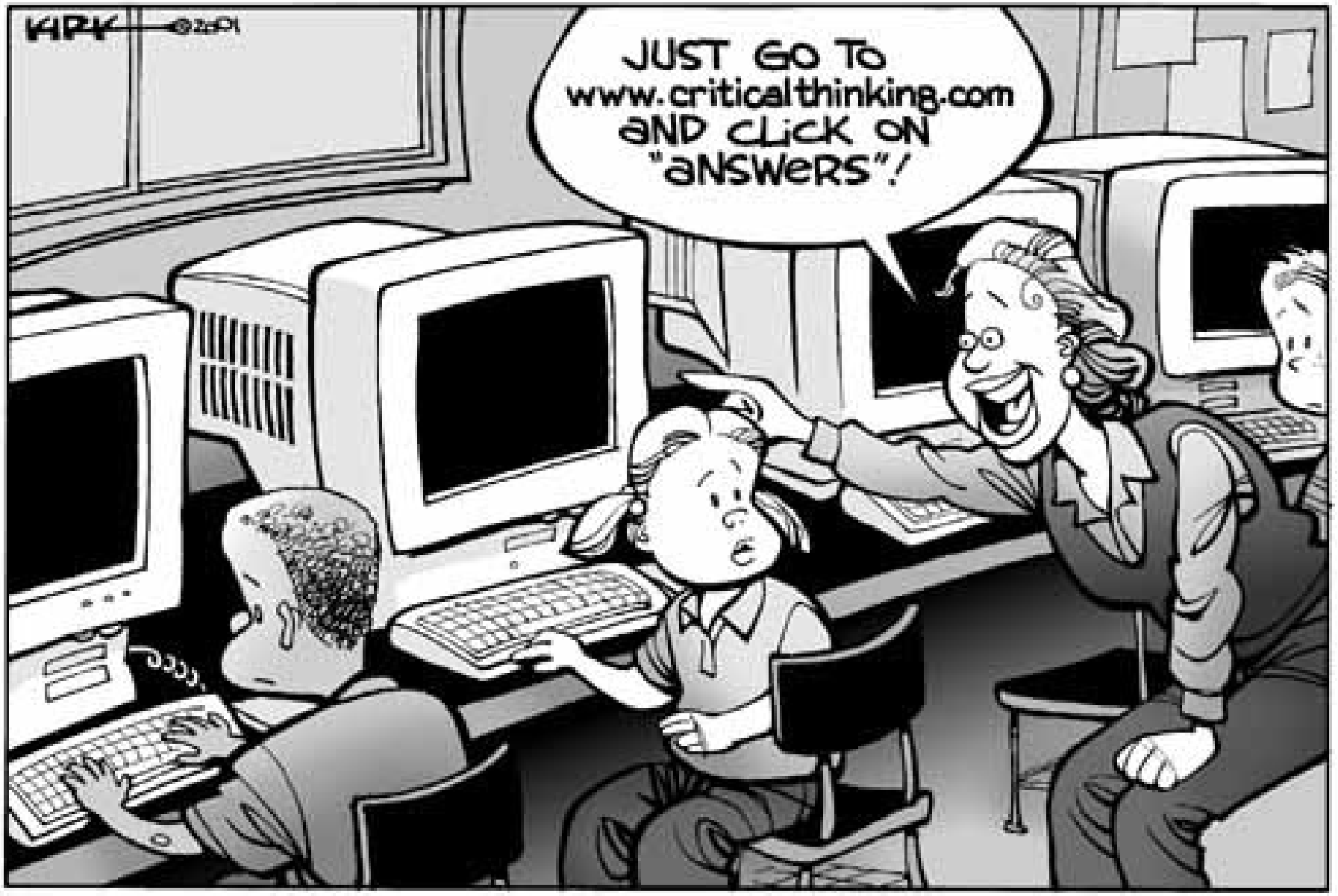
B&W world; experts hold eternal truths *(Received Knowledge)*


OH GOOD, A TRUE OR FALSE TEST!
1993 Watterson Distributed By Universal Press Syndicate
AT LAST, SOME CLARITY! EVERY SENTENCE IS EITHER PURE, SWEET TRUTH OR A VILE, CONTEMPTIBLE LIE! ONE OR THE OTHER! NOTHING IN BETWEEN!

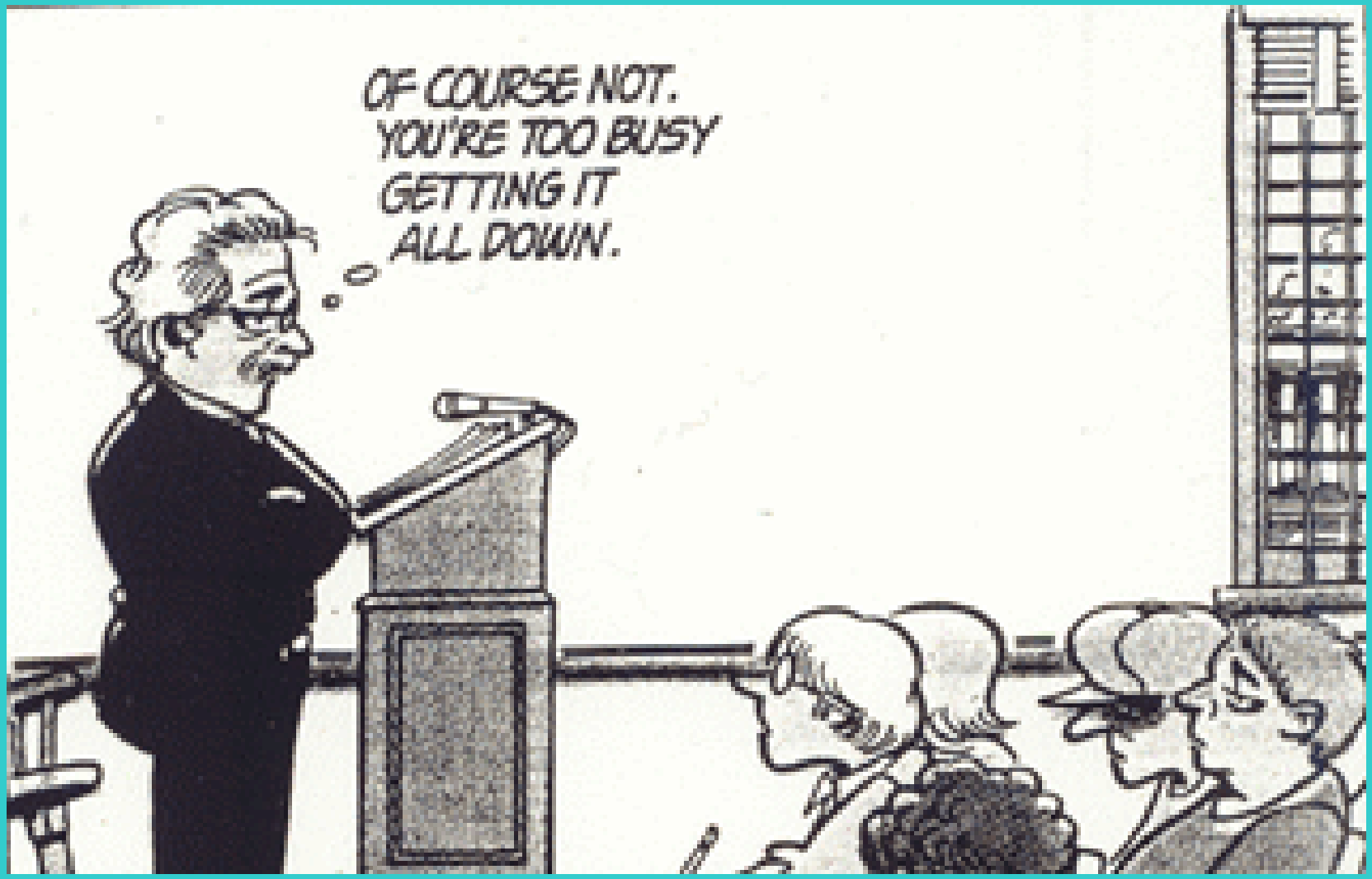
FAMILY CIRCUS

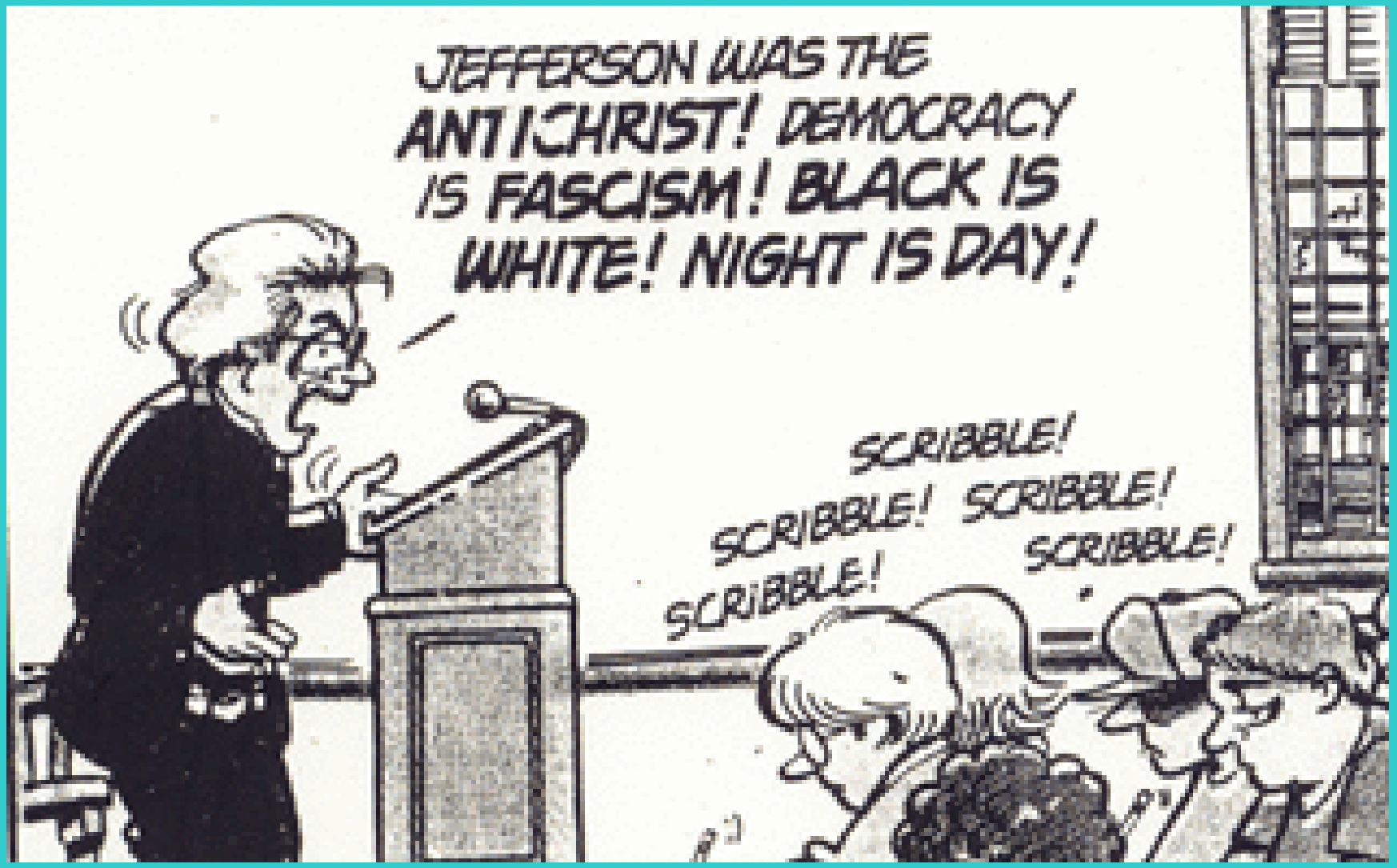
"I can't wait till I'm in the eighth grade and know all there is to know."

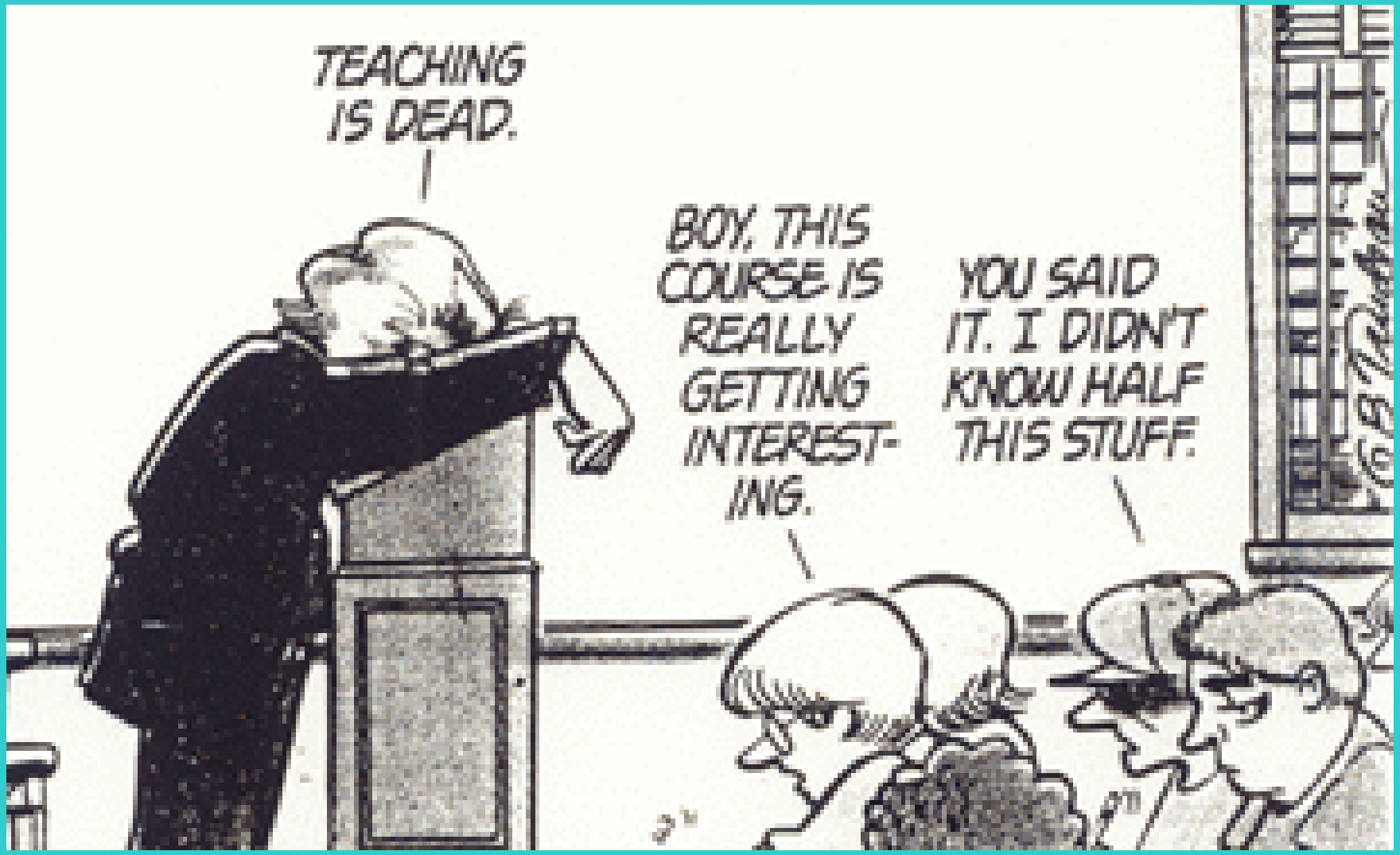
"I expect you all to be independent, innovative, critical thinkers who will do exactly as I say!"


JUST GO TO
www.criticalthinking.com
AND CLICK ON
"ANSWERS"!

...AND IN MY VIEW, JEFFERSON'S DEFENSE OF THESE BASIC RIGHTS LACKED CONVICTION. OKAY, ANY DISCUSSION OF WHAT I'VE COVERED SO FAR?
SCRIBBLE!
SCRIBBLE!
SCRIBBLE!
SCRIBBLE!


OF COURSE NOT.
YOU'RE TOO BUSY
GETTING IT
ALL DOWN.


JEFFERSON WAS THE ANTICHRIST! DEMOCRACY IS FASCISM! BLACK IS WHITE! NIGHT IS DAY!
SCRIBBLE!
SCRIBBLE!
SCRIBBLE!
SCRIBBLE!
SCRIBBLE!



'Doonesbury's Disease'

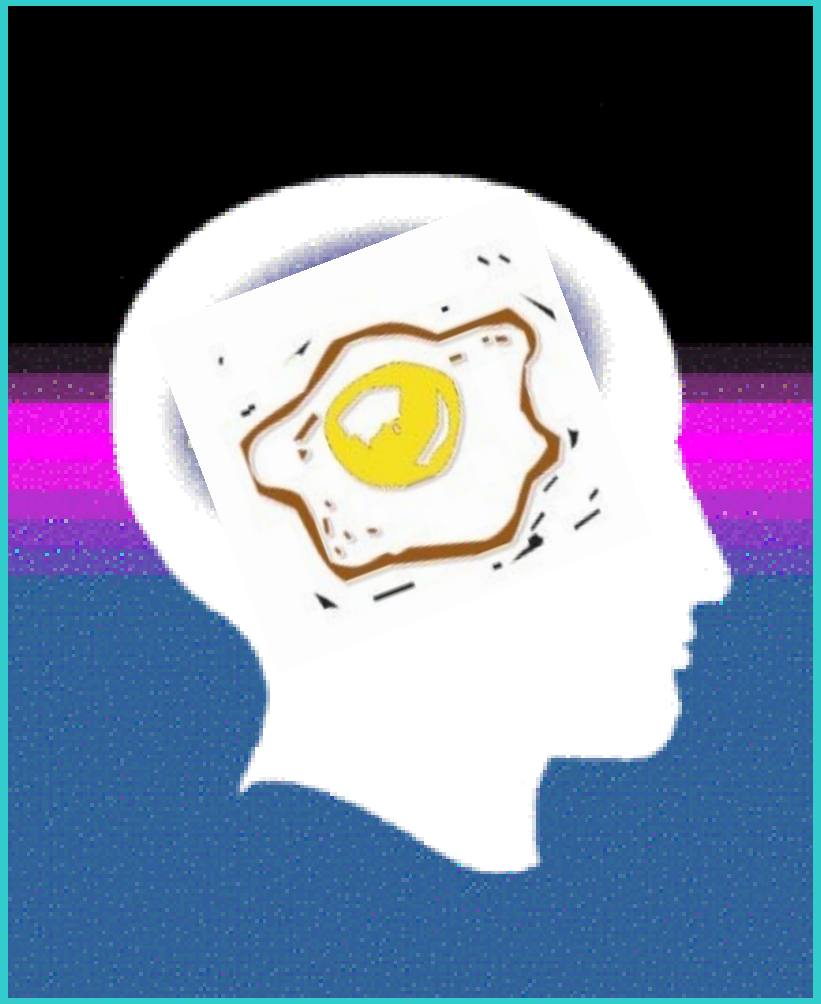
SILENCE IN THE CLASSROOM: SOME THOUGHTS ABOUT TEACHING IN THE 1980s*

MARTHA E. GIMENEZ
University of Colorado—Boulder

Teaching Sociology, 1989, Vol. 17 (April:184–191)

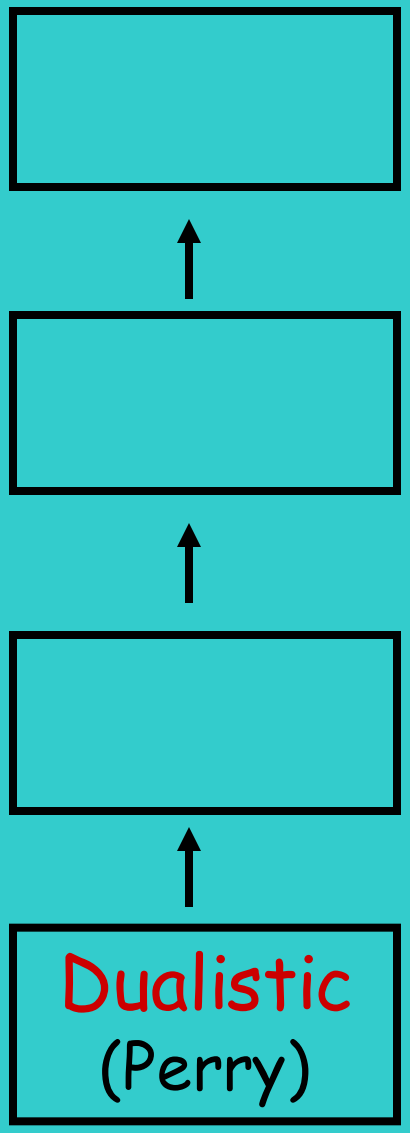
> [M]y own classroom experience suggests that there are profound deficiencies in the ability of many undergraduates to think logically and to employ analogical reasoning. This condition is closely associated with a dis-inclination and/or lack of ability to engage in critical thinking. Text is accepted without reflection, and authoritative status is granted without reservation. The provisional nature of *opinion* and of *truth claims* is not understood. If it is written down or presented by authority figure there is little disposition to entertain doubt (Gollin 1987, p. 3; emphasis in the text).

Advanced students can also be dualist . . .

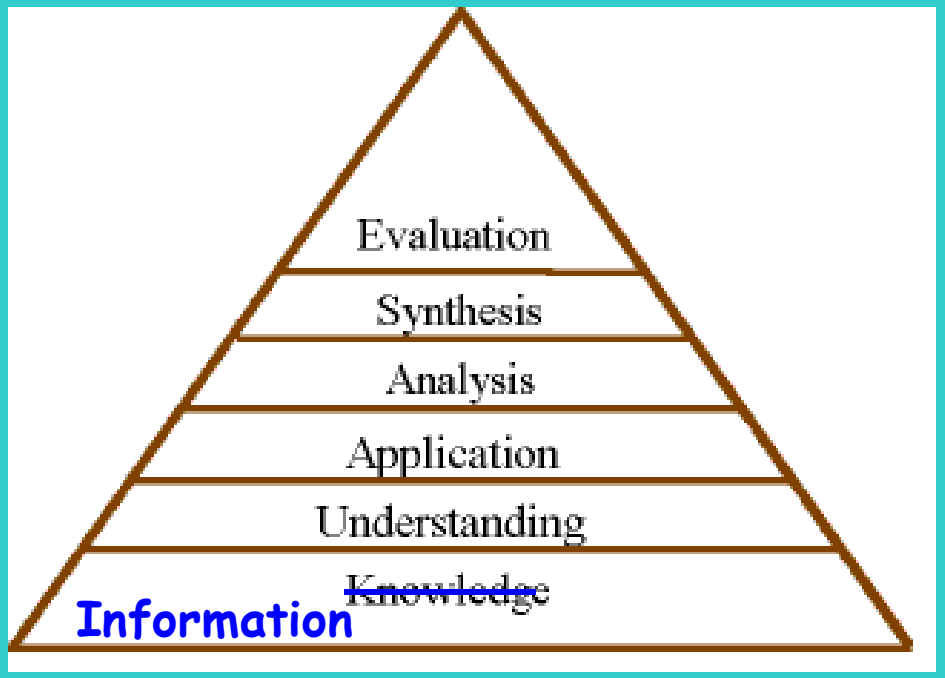


The Challenge of Teaching

Levels of Intellectual Development

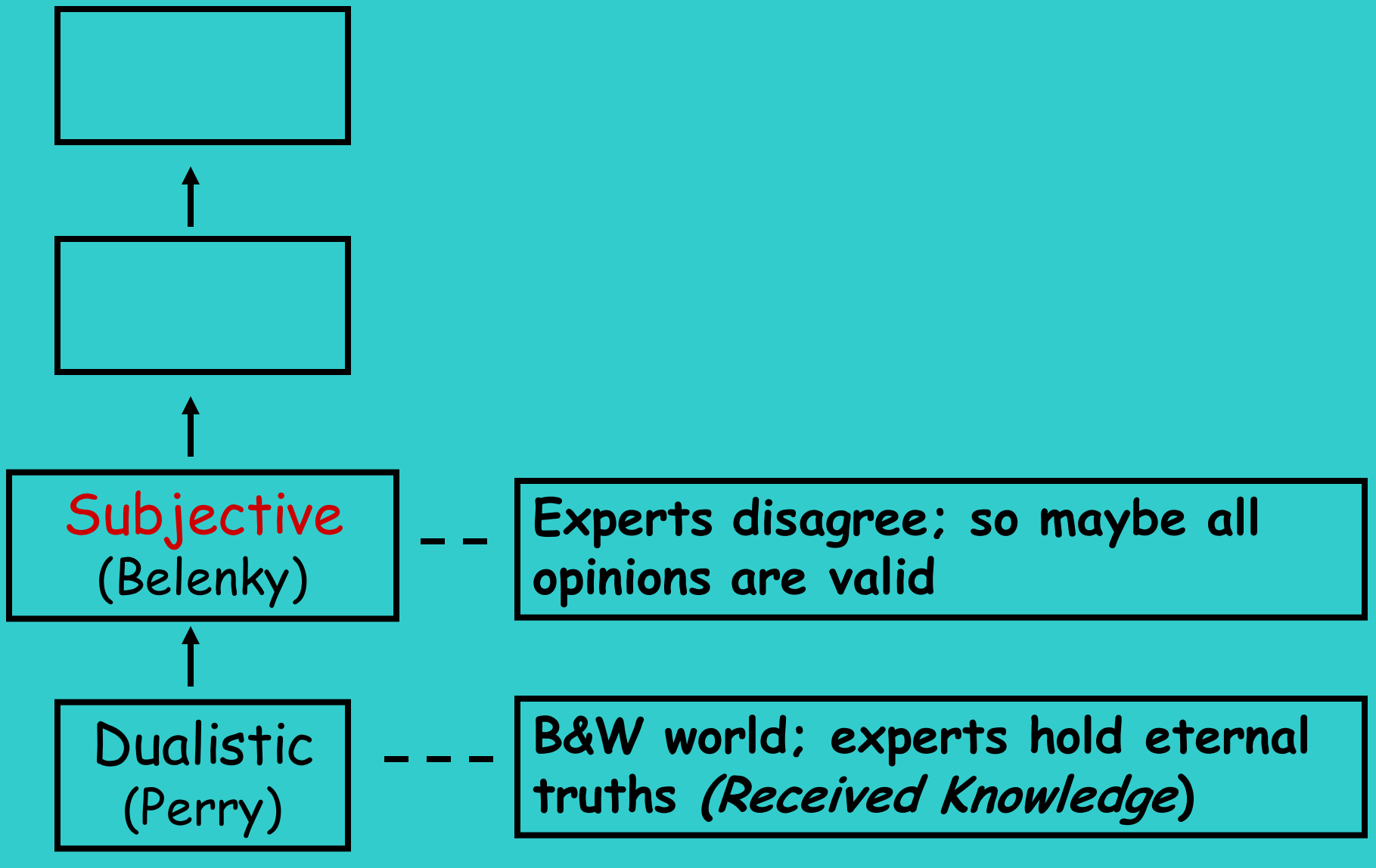


Dualistic
(Perry)



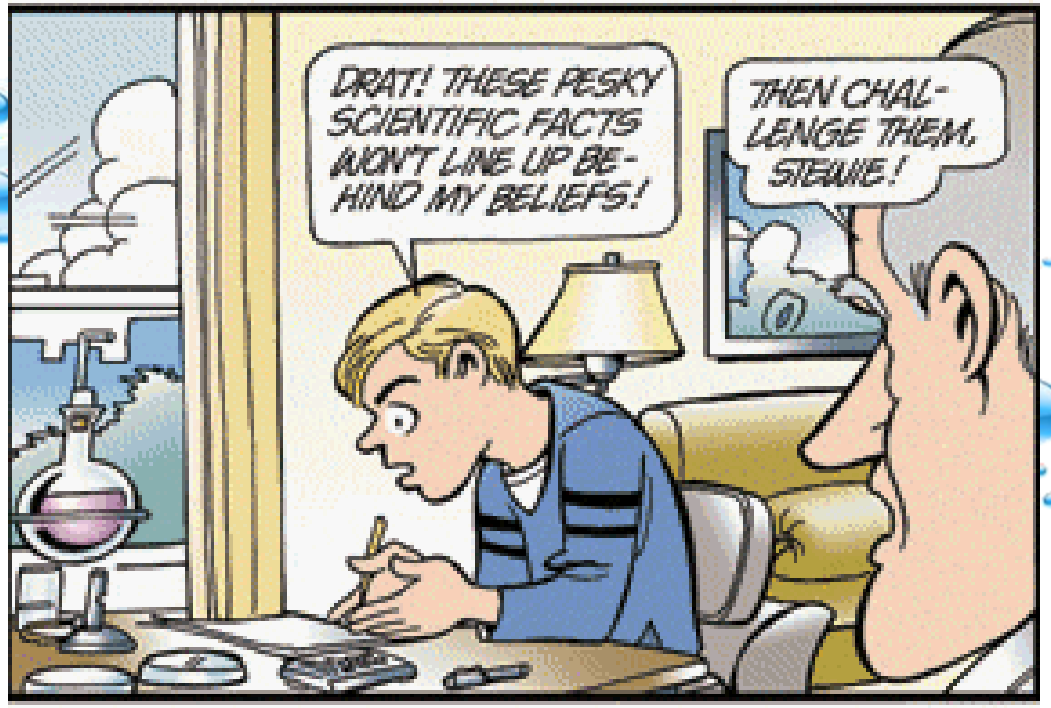
B&W world; experts hold eternal truths *(Received Knowledge)*

Levels of Intellectual Development

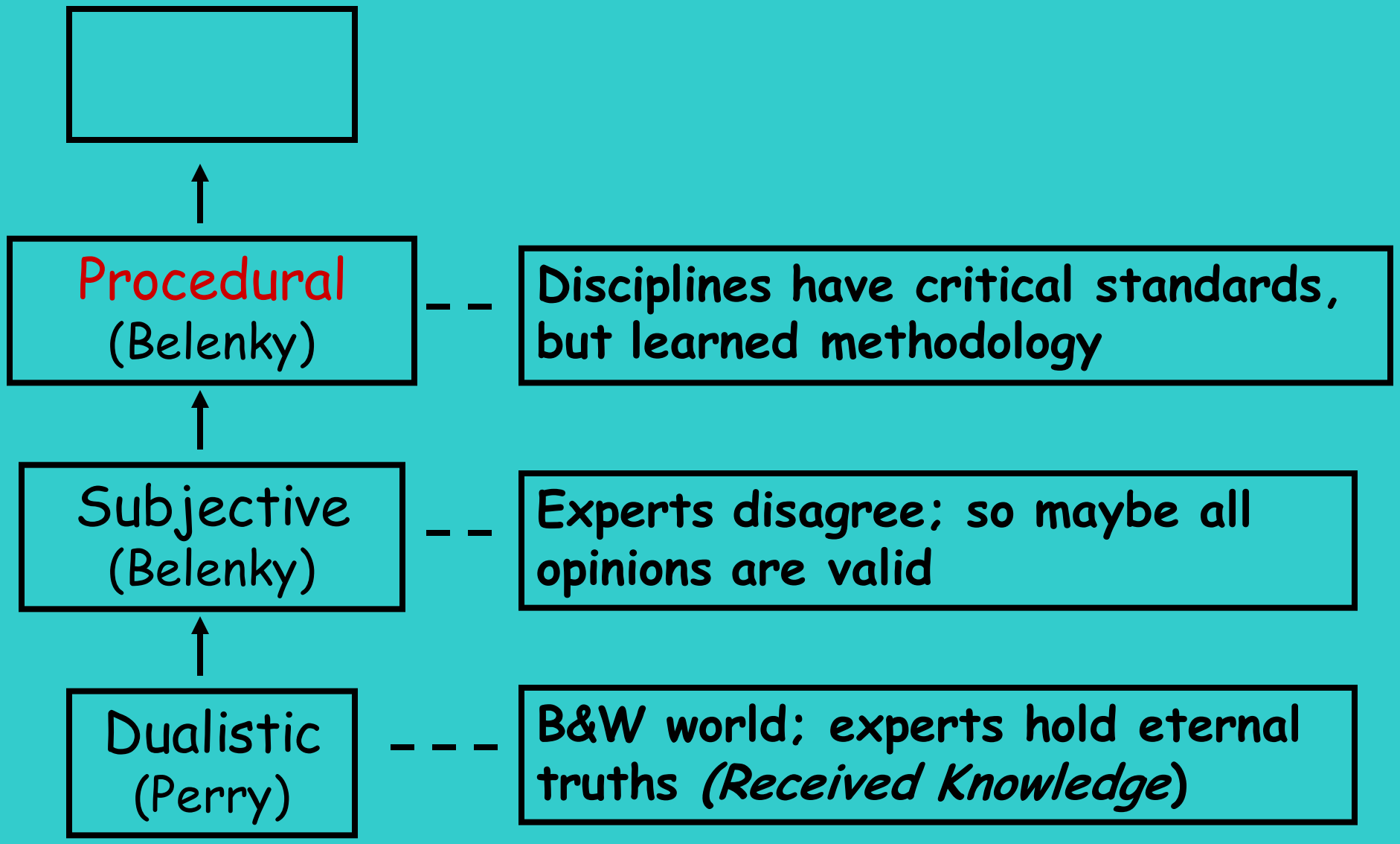


"Maybe it's not a wrong answer—maybe it's just a different answer."

Don't let facts interfere with your beliefs . . .



Levels of Intellectual Development

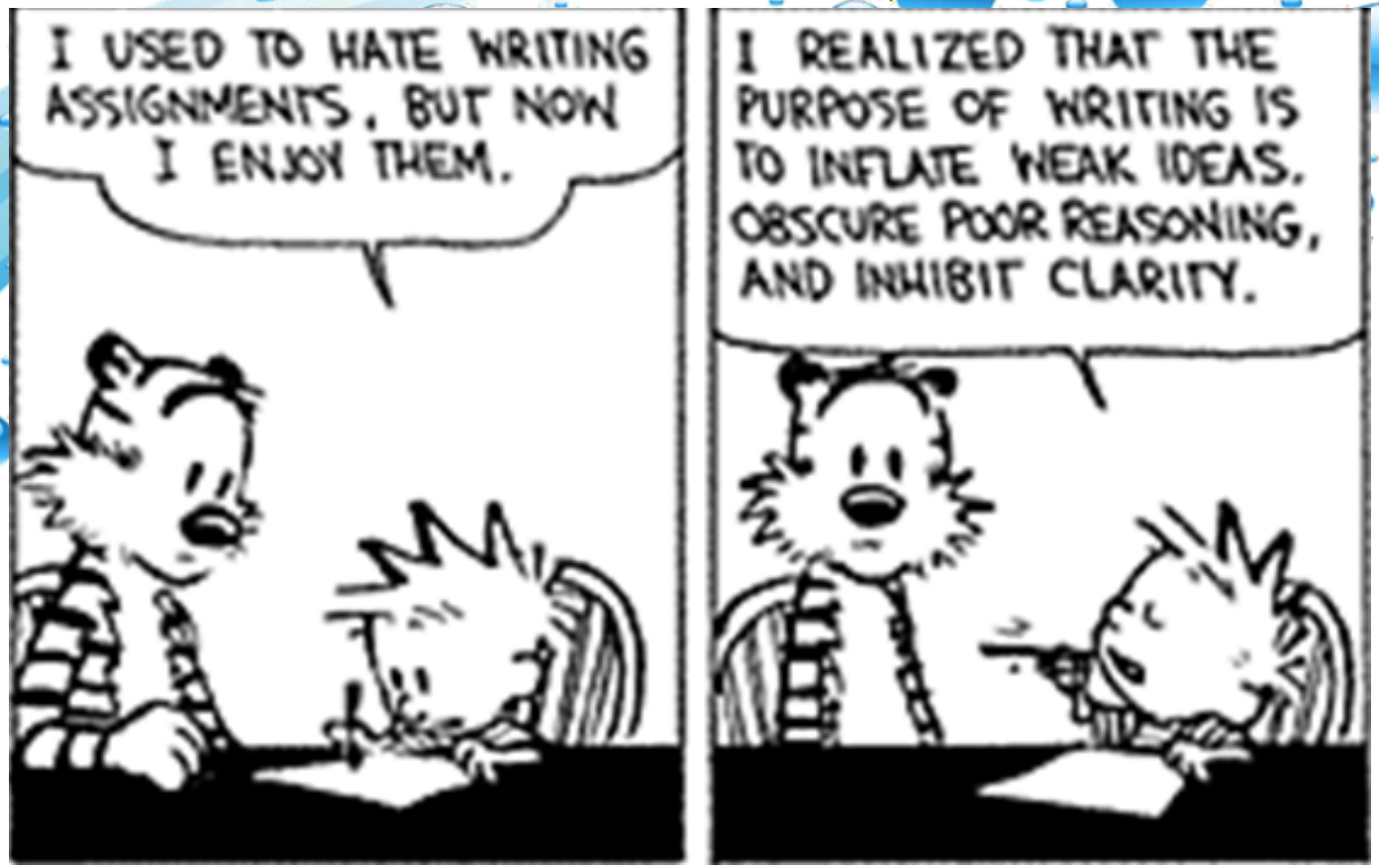


"I'll be happy to give you innovative thinking. What are the guidelines?"

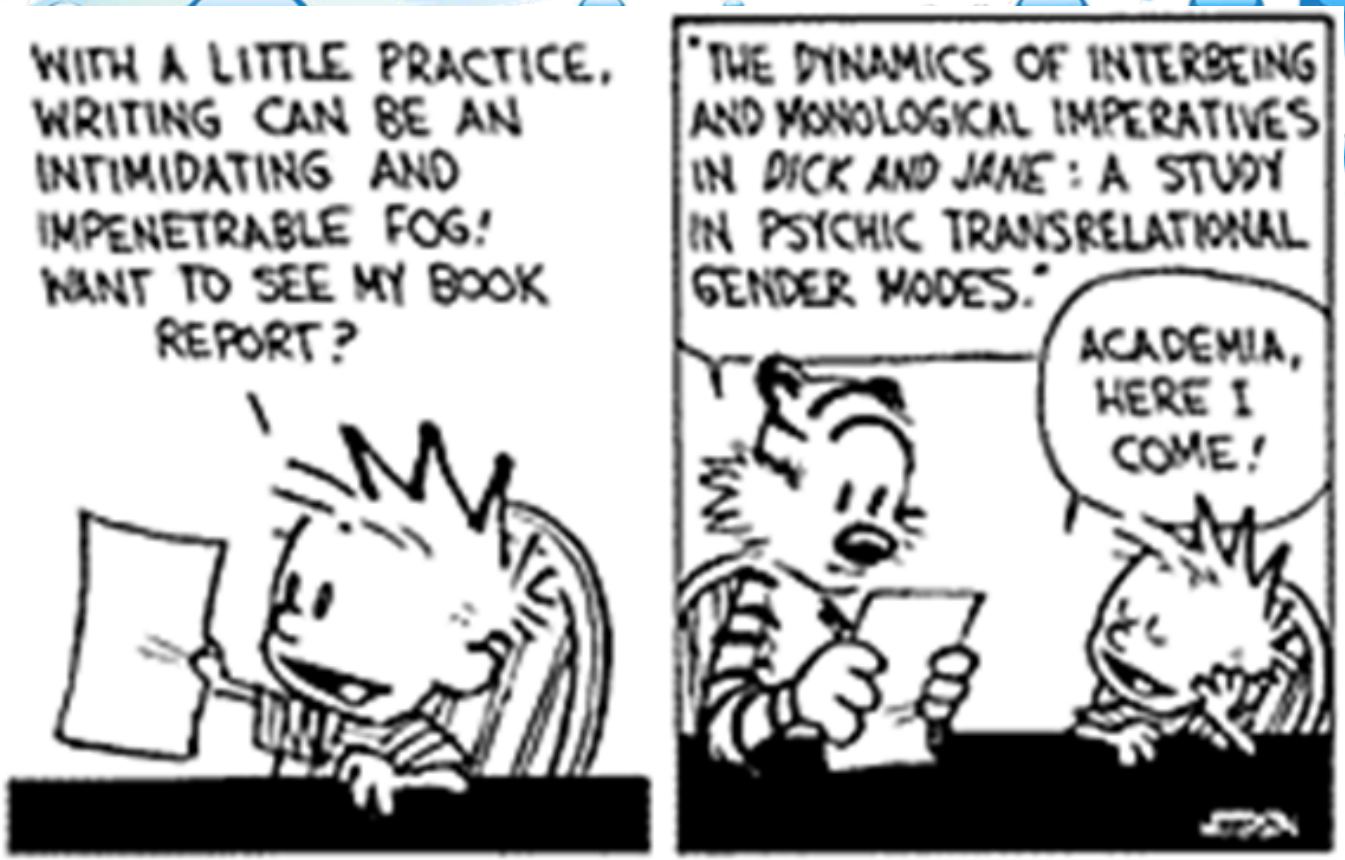
Procedural knowledge

Copyright 2006
by Randy Glasbergen.
www.glasbergen.com

Procedural knowledge



Students can use procedural knowledge to manipulate the system . . .



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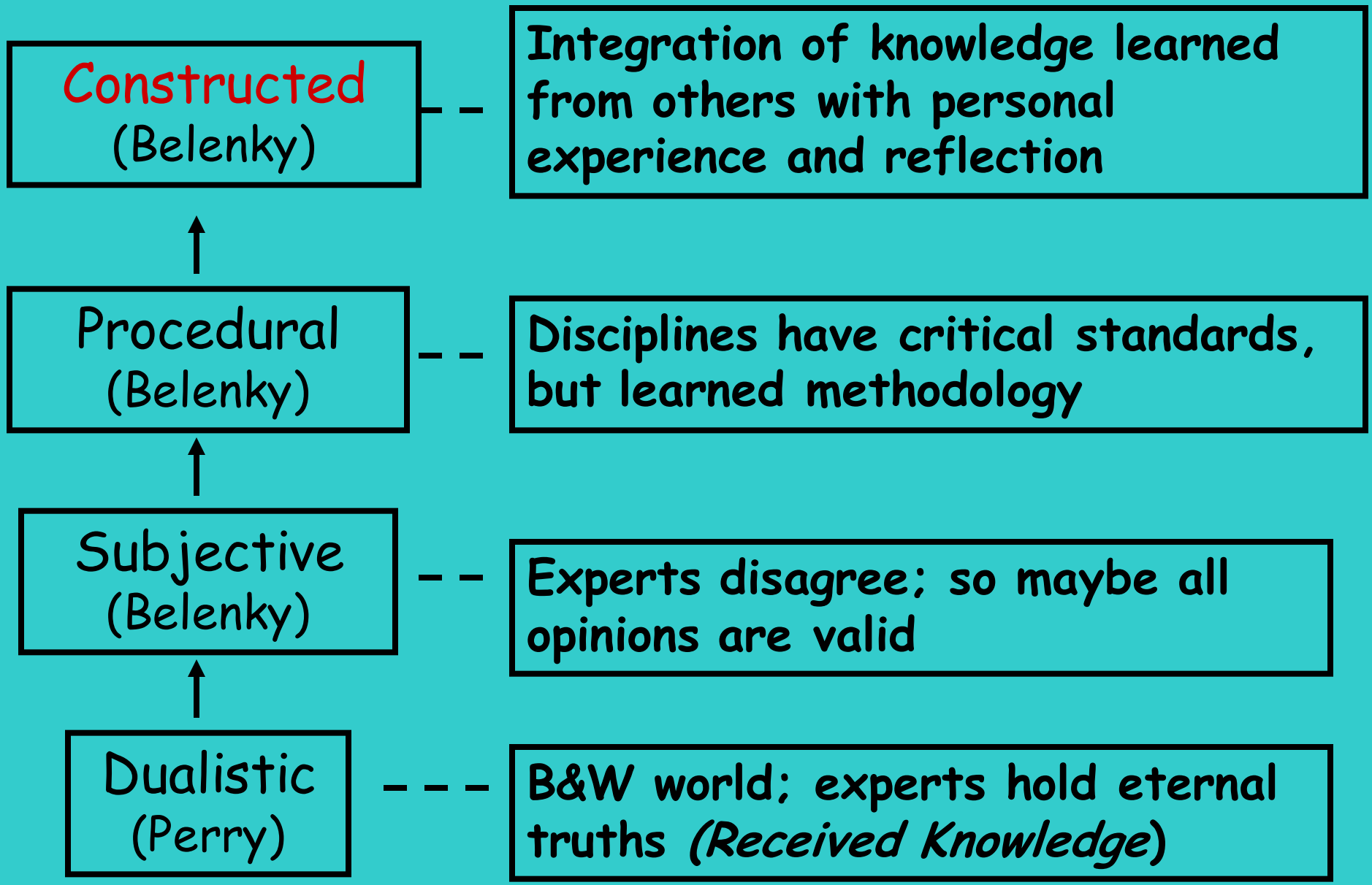
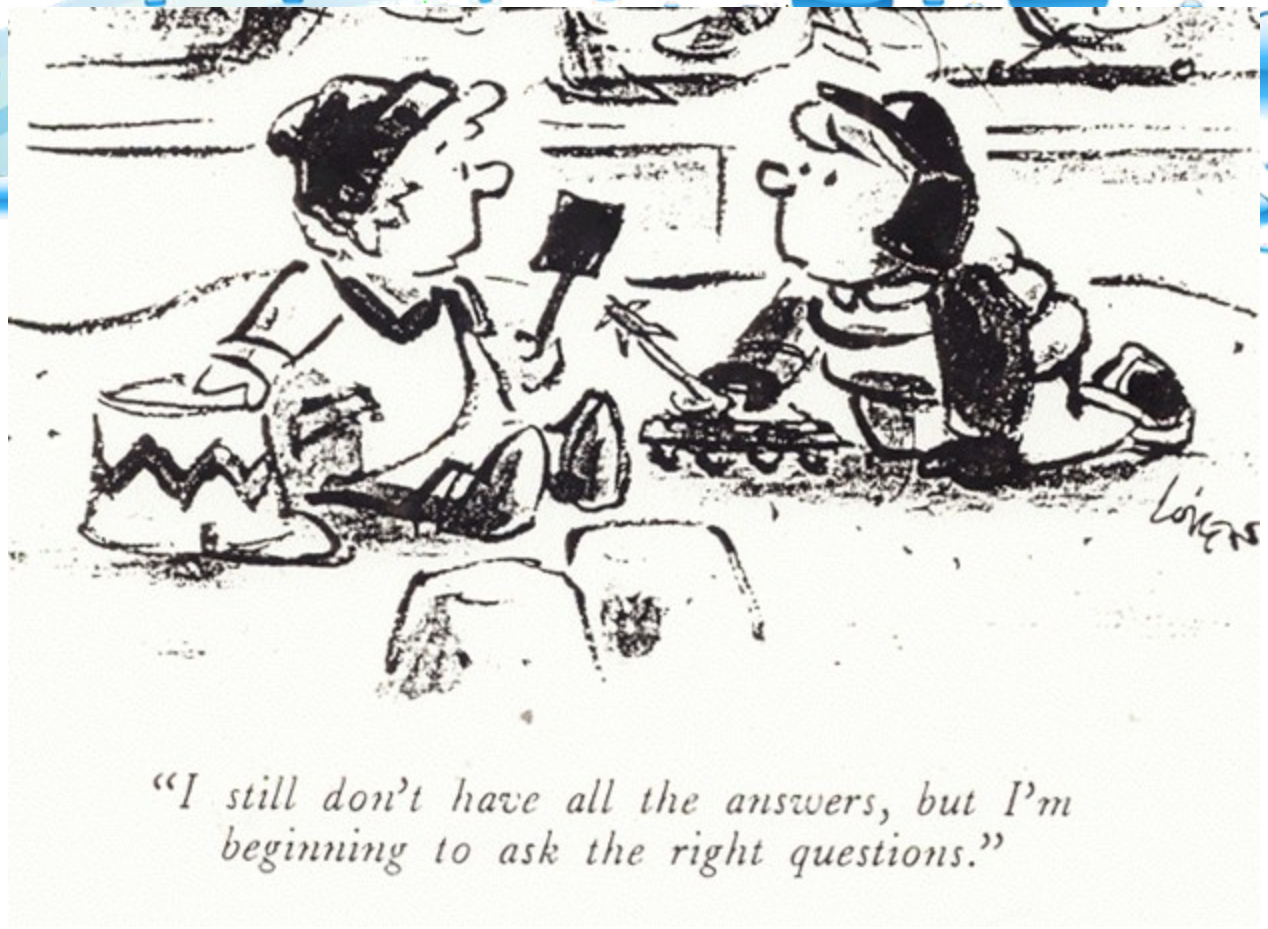
Levels of Intellectual Development

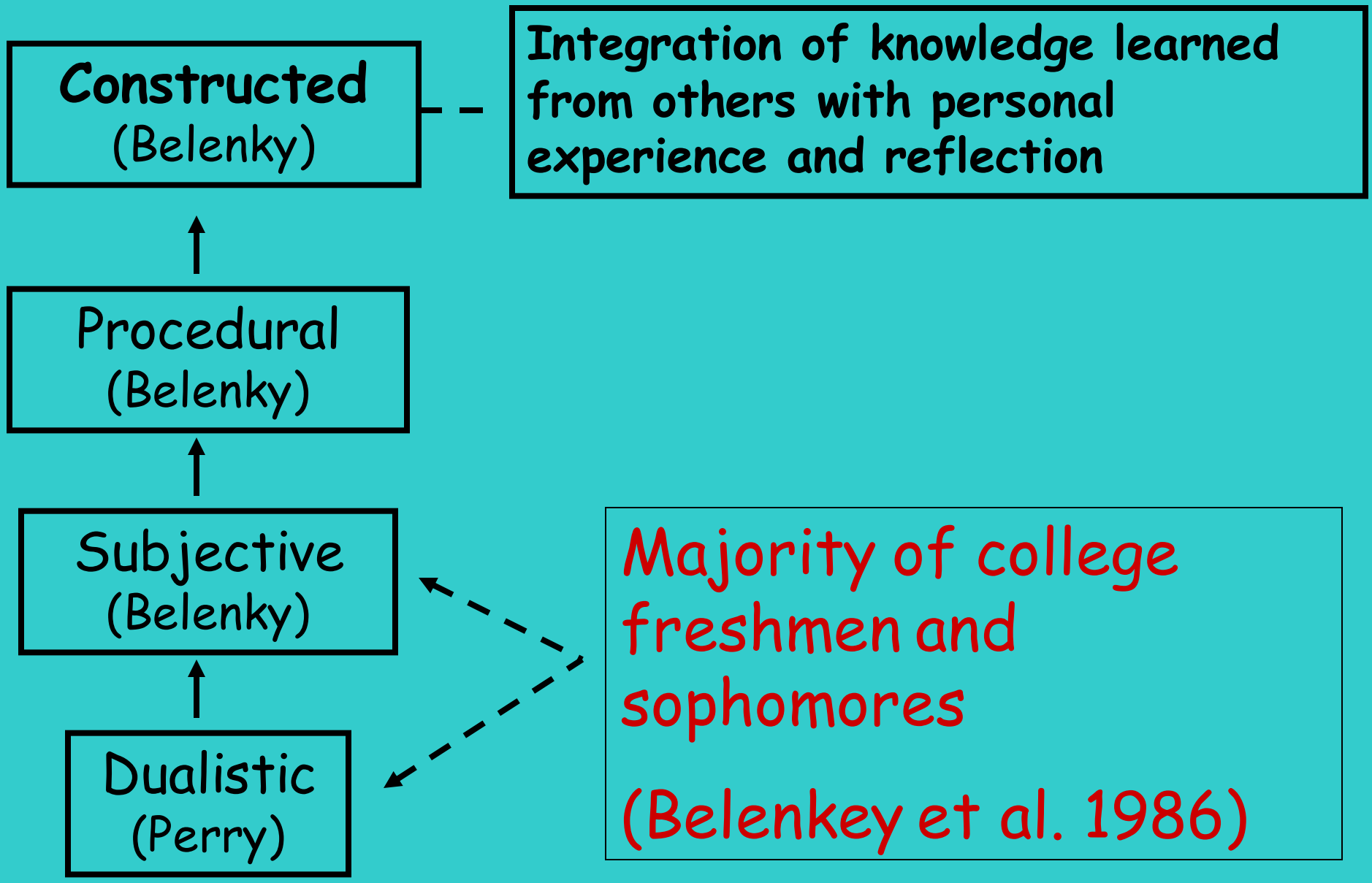


Constructed knowledge



Constructed knowledge

Levels of Intellectual Development



Student Development, and Moving Students from Stage to Stage

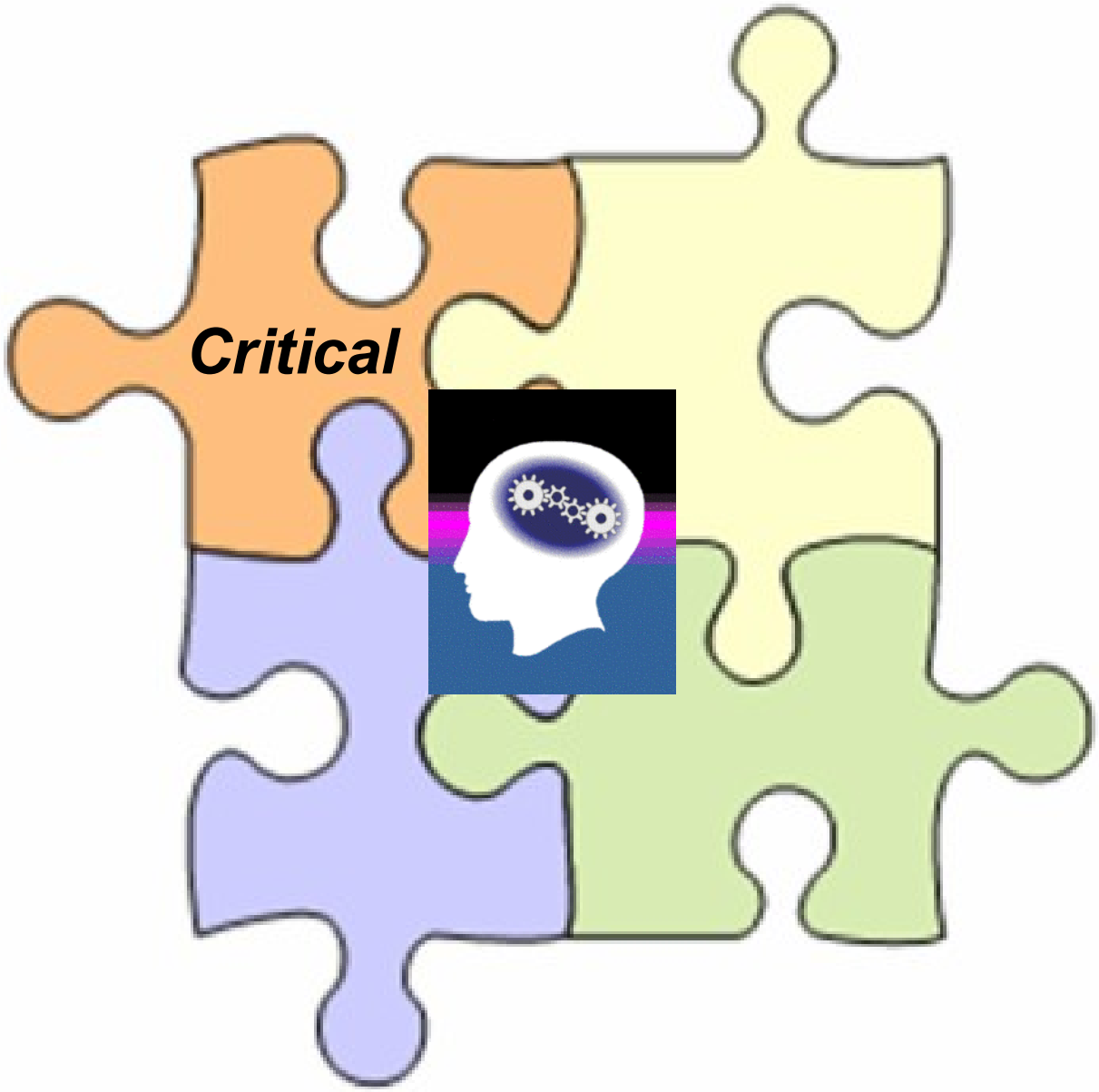
West, E.J. 2004. Perry's legacy: models of epistemological development. Journal of Adult Development 11:61-70.

Nelson, C.E. 1994. Critical thinking and collaborative learning. New Directions for Teaching & Learning 59:45-58.

Nelson, C.E. 1999. Skewered on the unicorn's horn: the illusion of a tragic tradeoff between content and critical thinking in the teaching of science. Pages 17-27 *in* L. Crowe, editor. Teaching critical thinking in the sciences. NSTA, Washington.

Wood. B.S. 2005. Lecture-free teaching in 7 steps. American Biology Teacher 67:334-342.

The 'Good Thinking' Puzzle

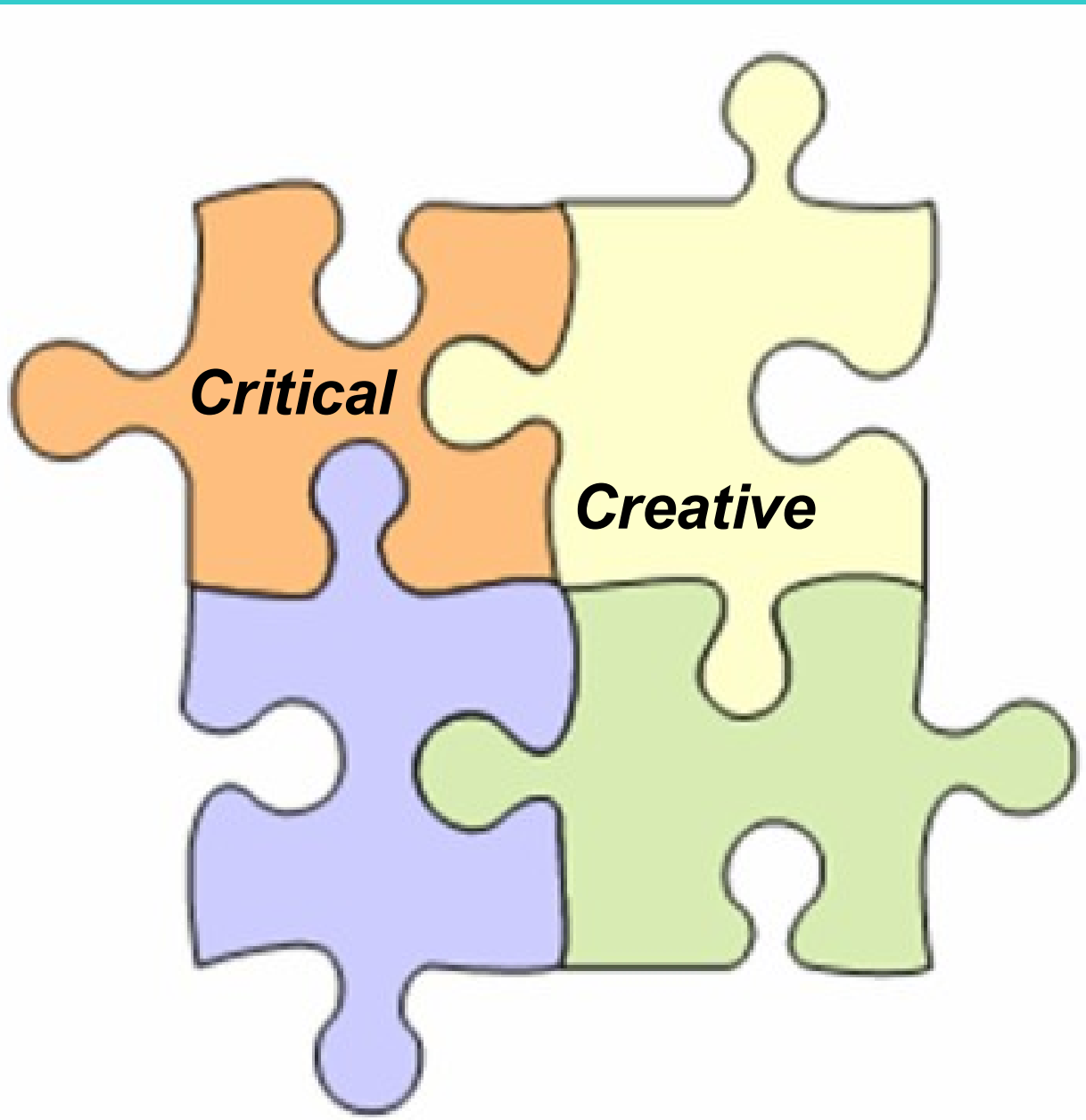


DEFINITION

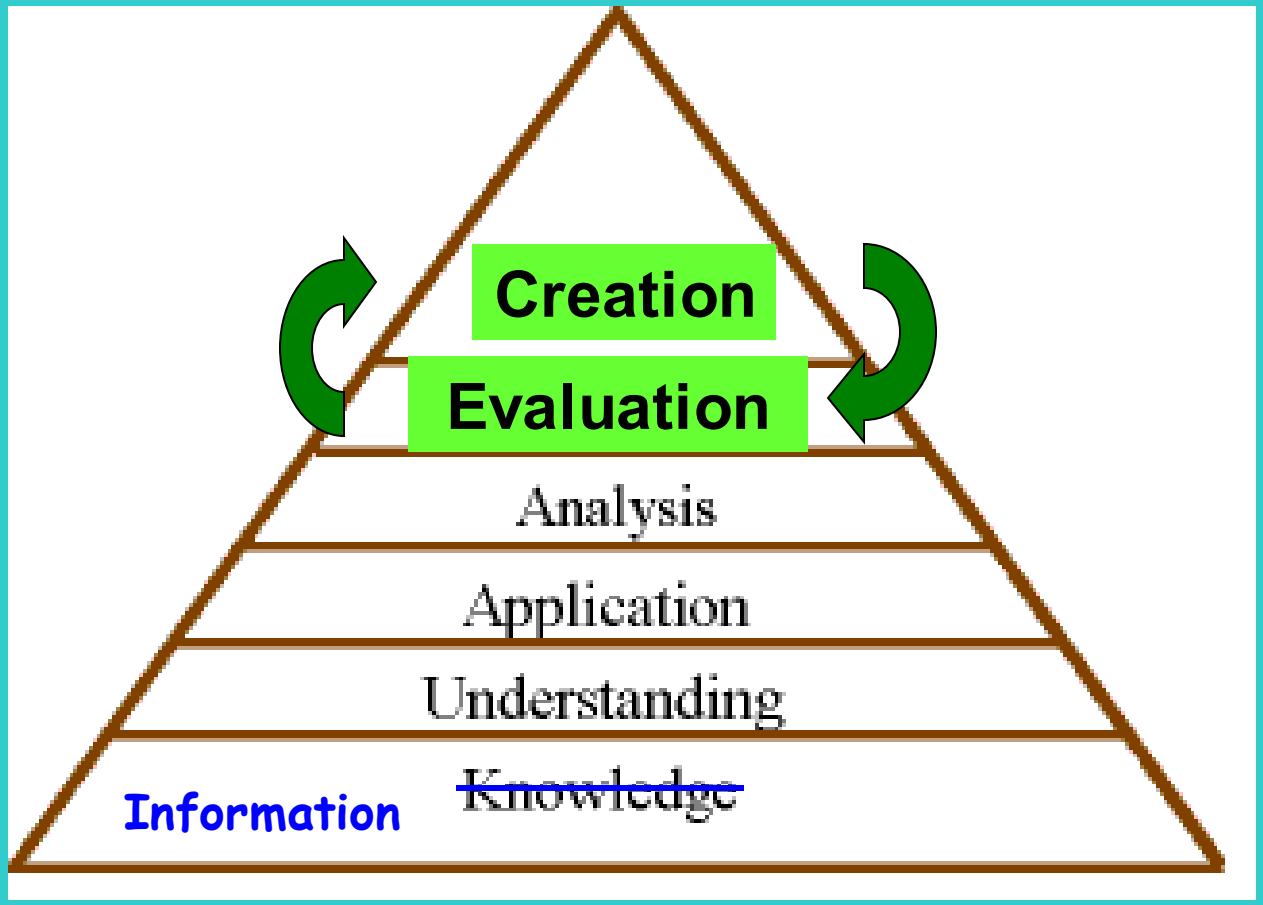
(Paul and Elder 2005)

Critical thinking is the disciplined mental activity of evaluating arguments or propositions and making judgments that can guide development of beliefs and taking action.

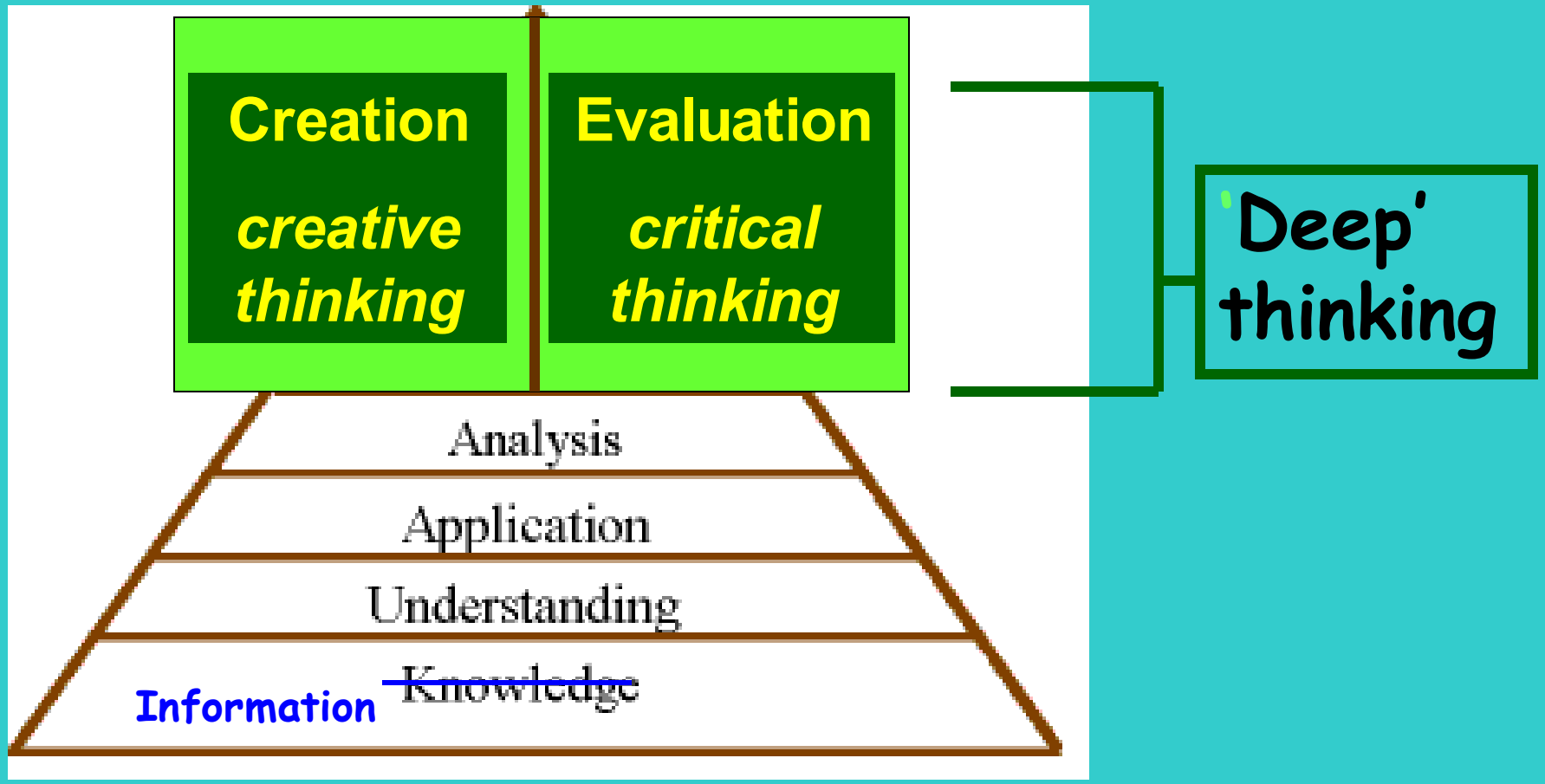
The 'Good Thinking' Puzzle



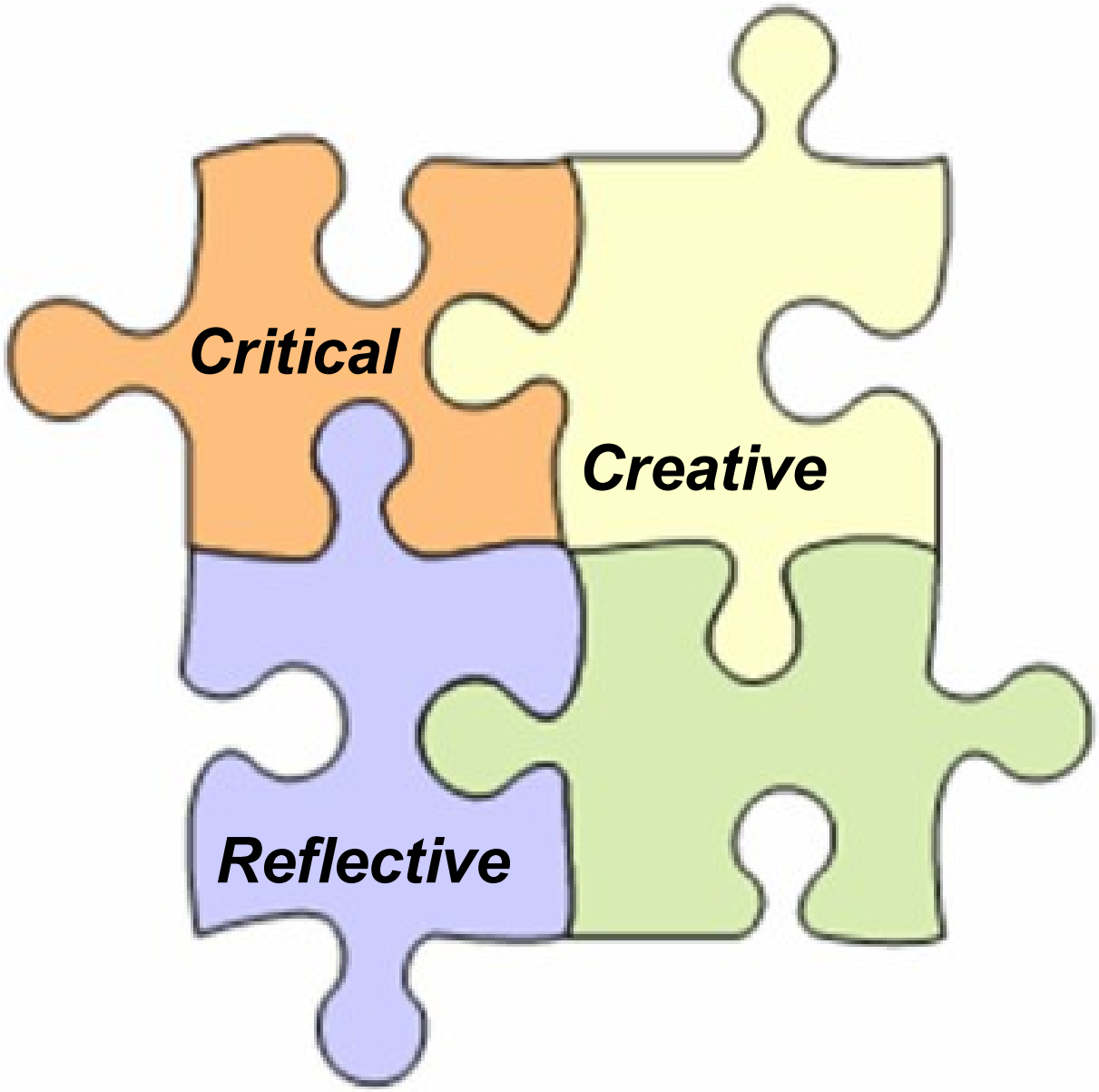
Bloom's Taxonomy – Revised (Krathwohl 2002)



Bloom's Taxonomy – Re-revised (Murphy – 2009)

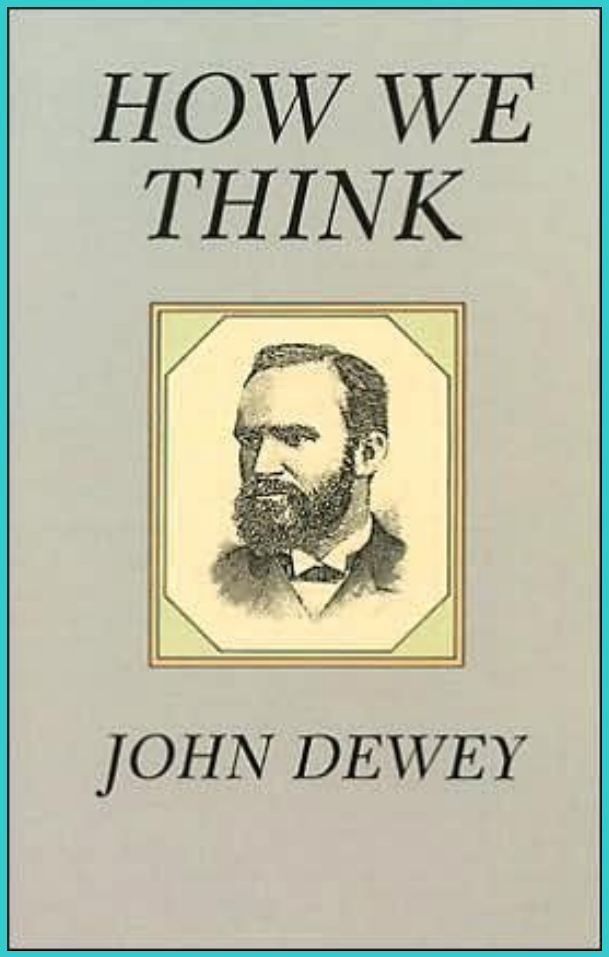


The 'Good Thinking' Puzzle



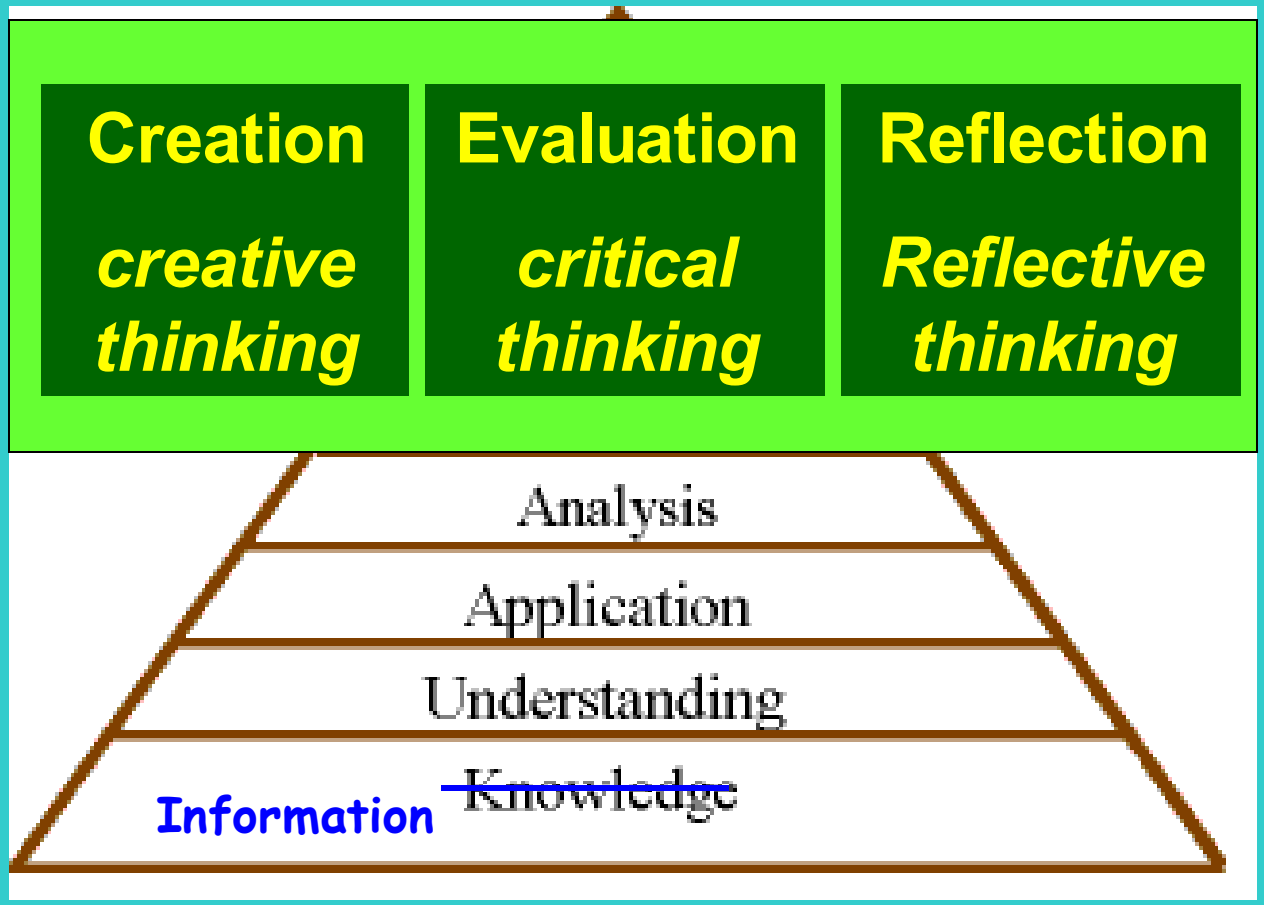
Reflective Thinking

1. Links present to past experience
2. 'Knowledge' is constructed by, not external to, thinkers (constructivism)
3. Gives opportunity to modify knowledge base
4. Creates 'thread' of continuous learning



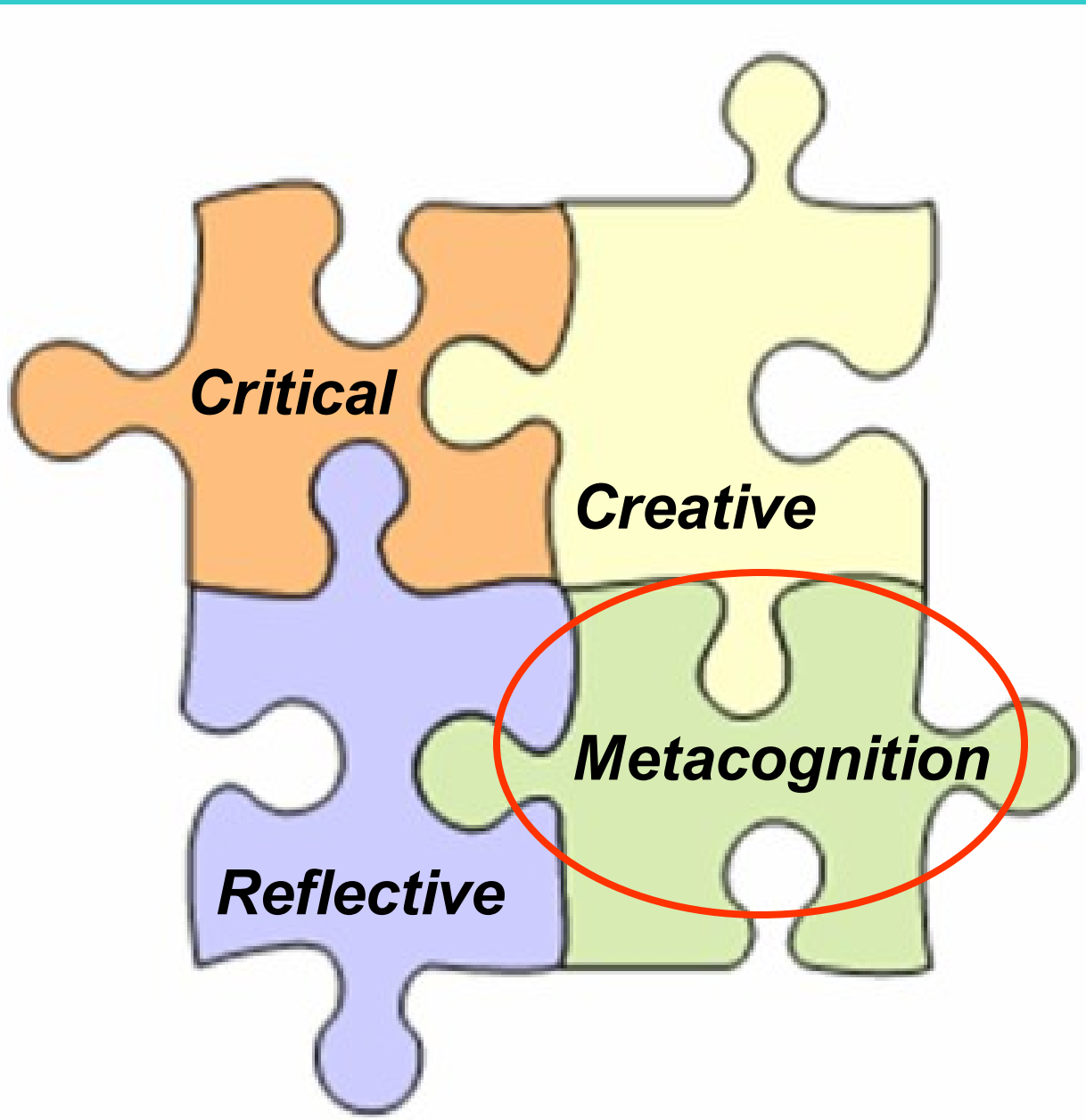
1910

Meaningful 'construction' happens when students are challenged at higher levels of Bloom's.



'Deep' thinking

The 'Good Thinking' Puzzle



Metacognition

'Thinking about thinking'

Share goals (and underlying theory) with students

- Perry's scheme
- Critical, creative, and reflective thinking (Bloom's)
- Problem-solving skills

Constructed

↑

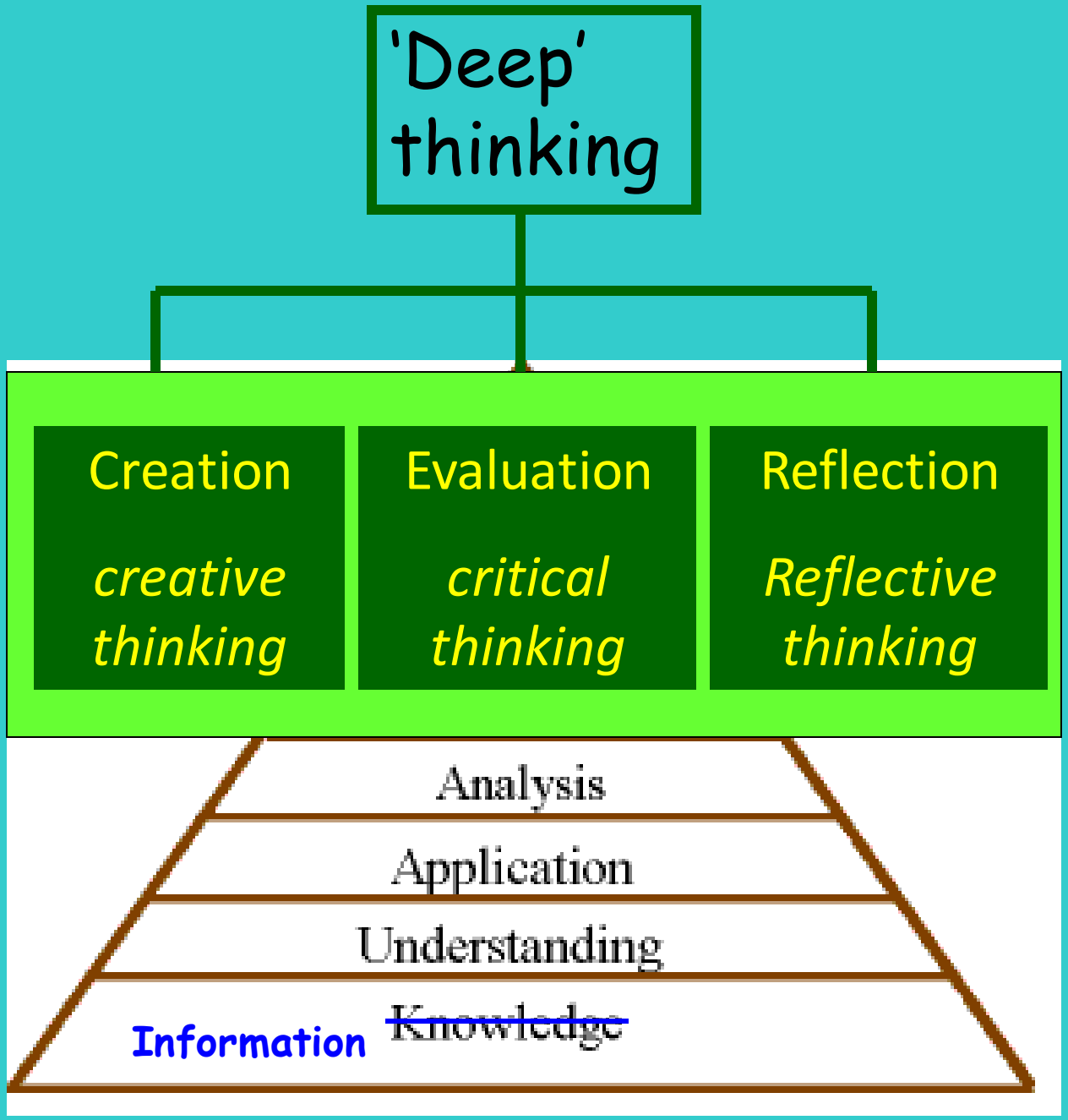
Procedural

↑

Subjective

↑

Dualistic



An essential teaching component: *Questions* rather than answers

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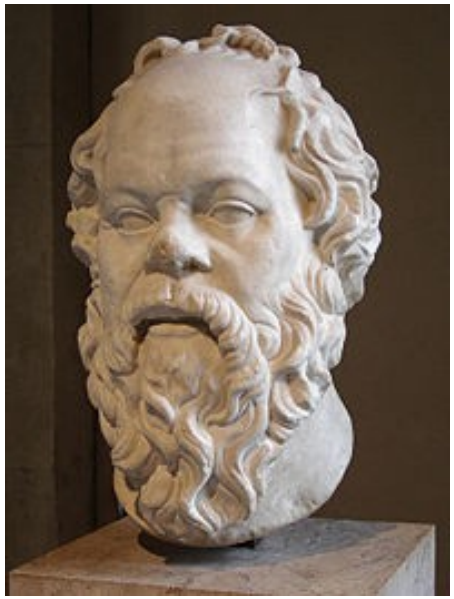


Socrates

"When *curiosity* is absent, so is thinking."

(Hill and McGinnis 2007)

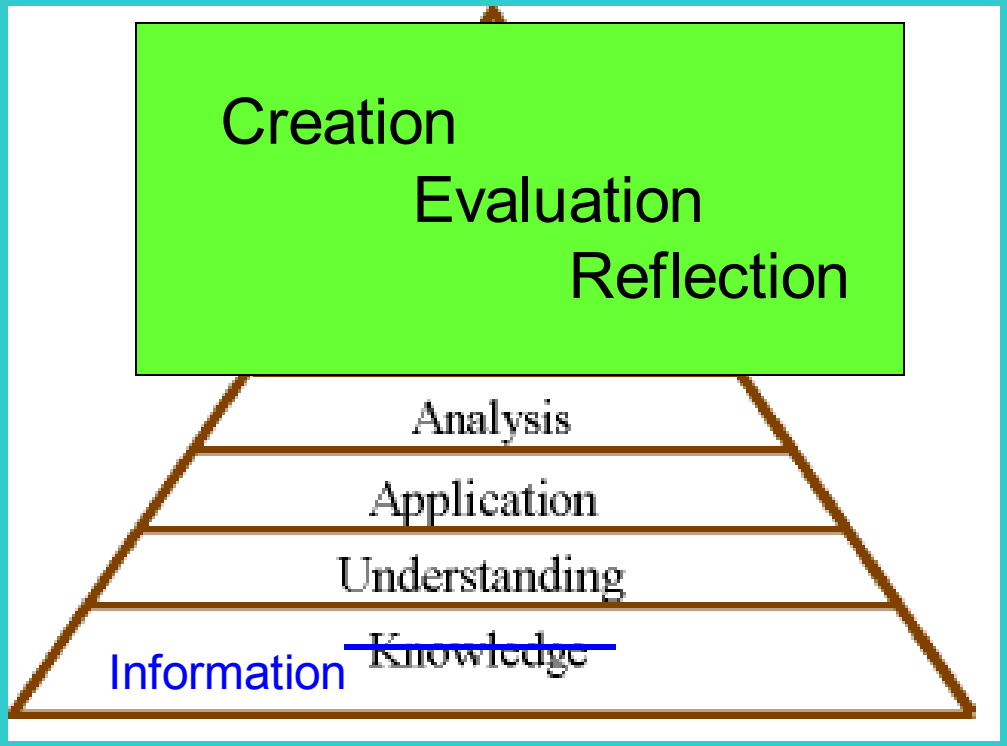
Case Study Teaching and Learning

Case Studies: Real-life stories written with an educational mission (Garvin 2003)

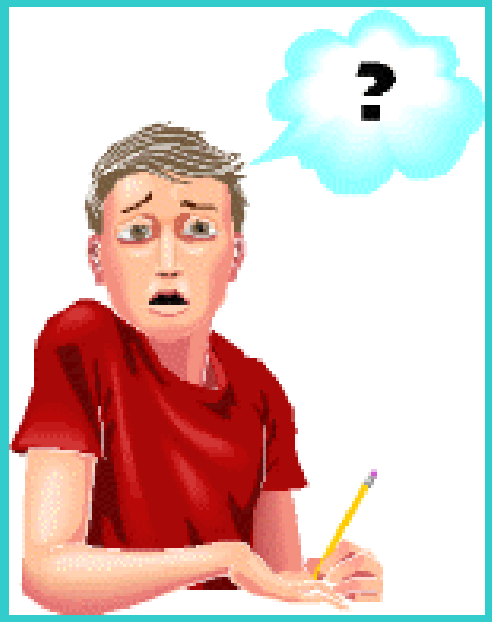
'Reality' is constructed through narrative (Bruner 1991)

(Well-written) narrative (e.g., case) stimulates curiosity

Cases teach by asking students to analyze problematic situations. ***Cases do not give information as much as they ask students to evaluate actions and options, thus leading students to deeper thinking.***



Case study learning is not easy for students --



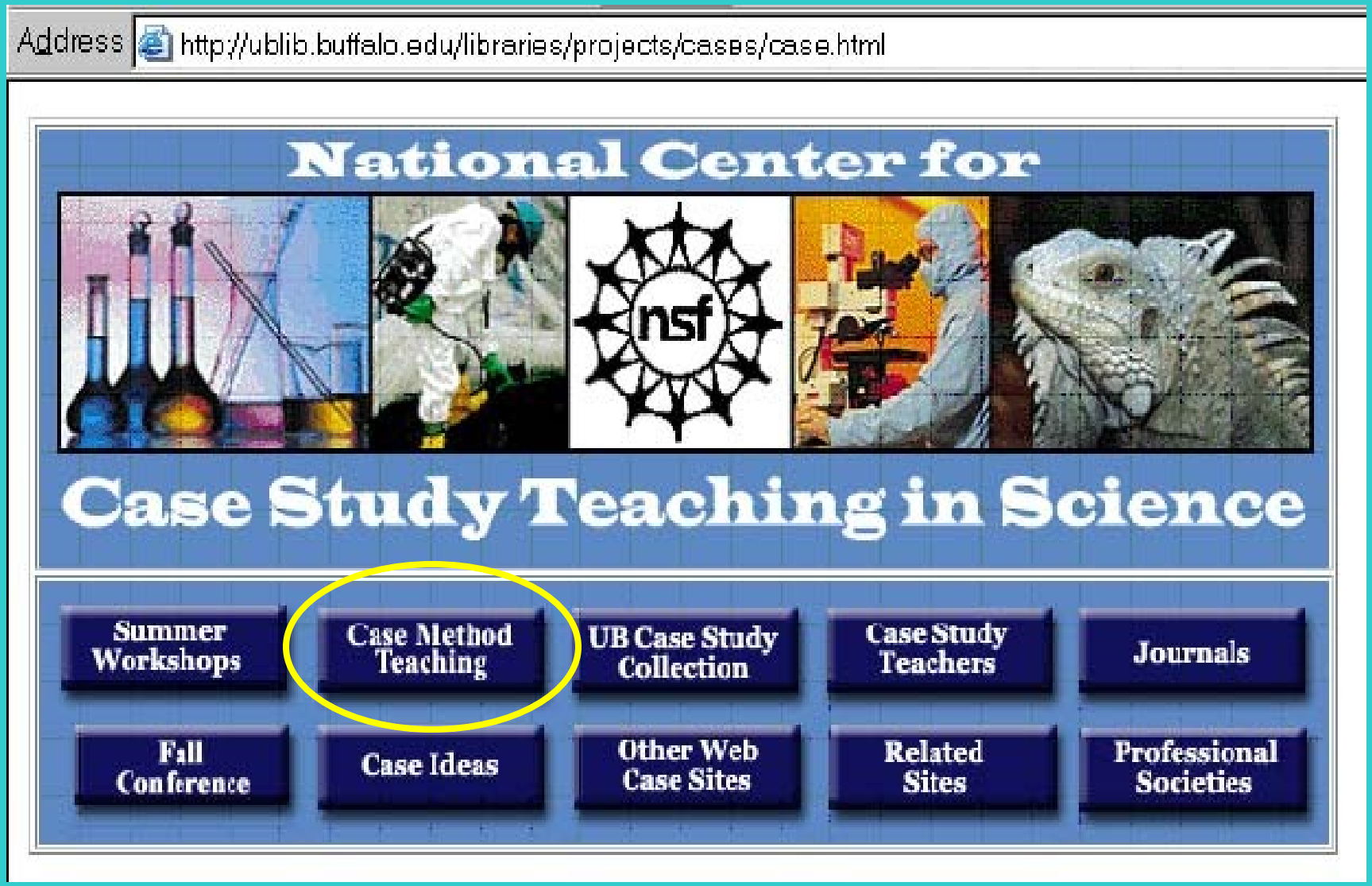
"Sometimes frustrating because you won't give us the answer."

"More like real-life problems."

"Showed there is no single right answer to complex problems."

"More fun than lectures."

Resources for the case-study teacher



Assessment of Case-Study Teaching and Learning USDA Higher Education Challenge Grant

(At Virginia Tech)

4 courses, lecture model

Pre- and post-testing

- Watson-Glaser CT test
- Content analysis (essays)

Result = 'normal'

Same courses, case model

Same testing

Result:

- *15-25% increases in 'CT'*
- *No 'knowledge' difference*
- *Level of case model adoption affects results*

Rekindle the dormant curiosity in your students, and they will surprise you !