



A 'C' Change for Fisheries Education: from Course Content and Coverage

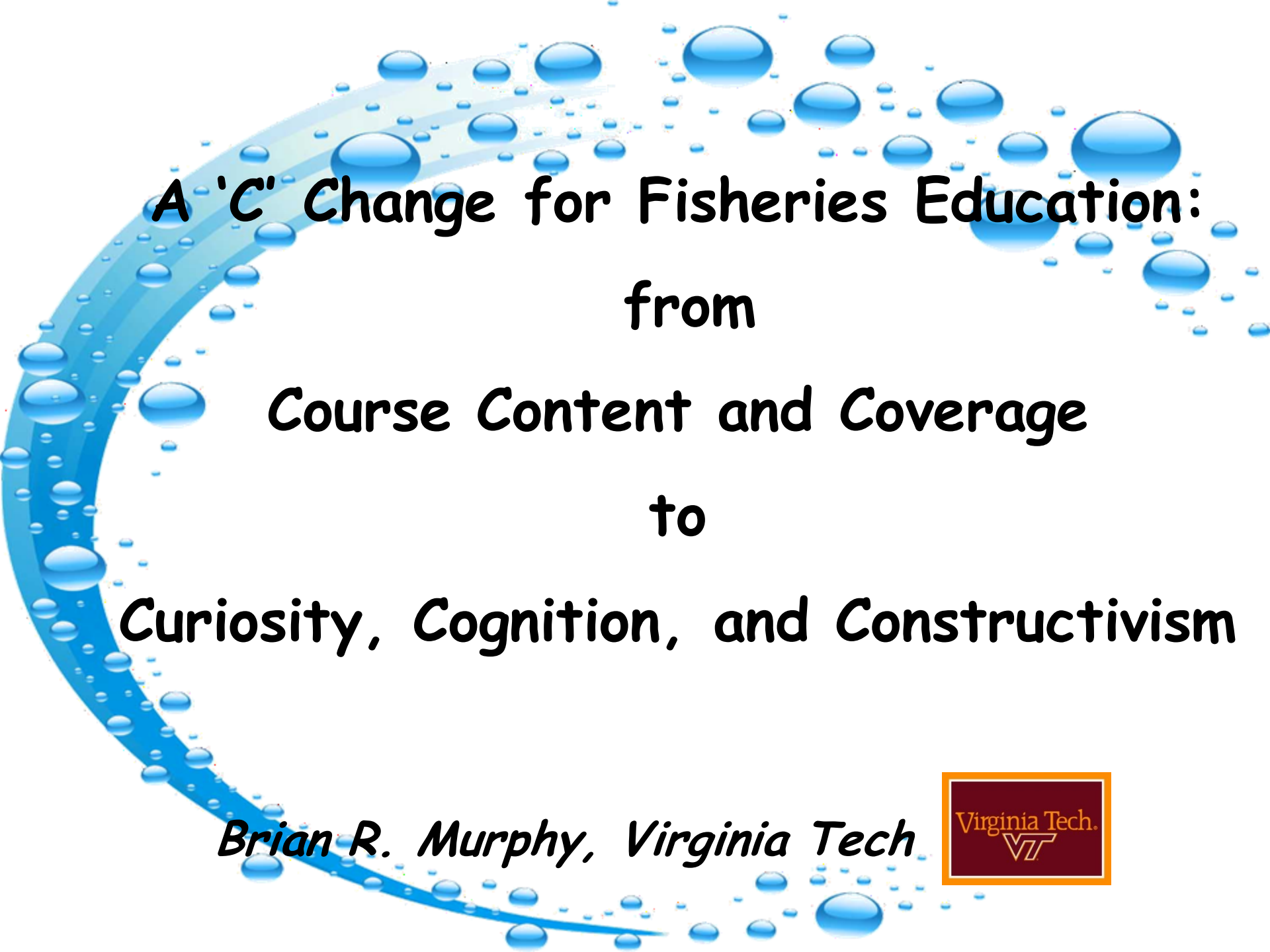
to

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



A decorative graphic featuring a thick, curved blue line that starts from the left and arcs towards the top right. The line is surrounded by numerous blue water droplets of various sizes, some with highlights, giving a fresh and aquatic feel.

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

www.fishwild.vt.edu/

- *Faculty*

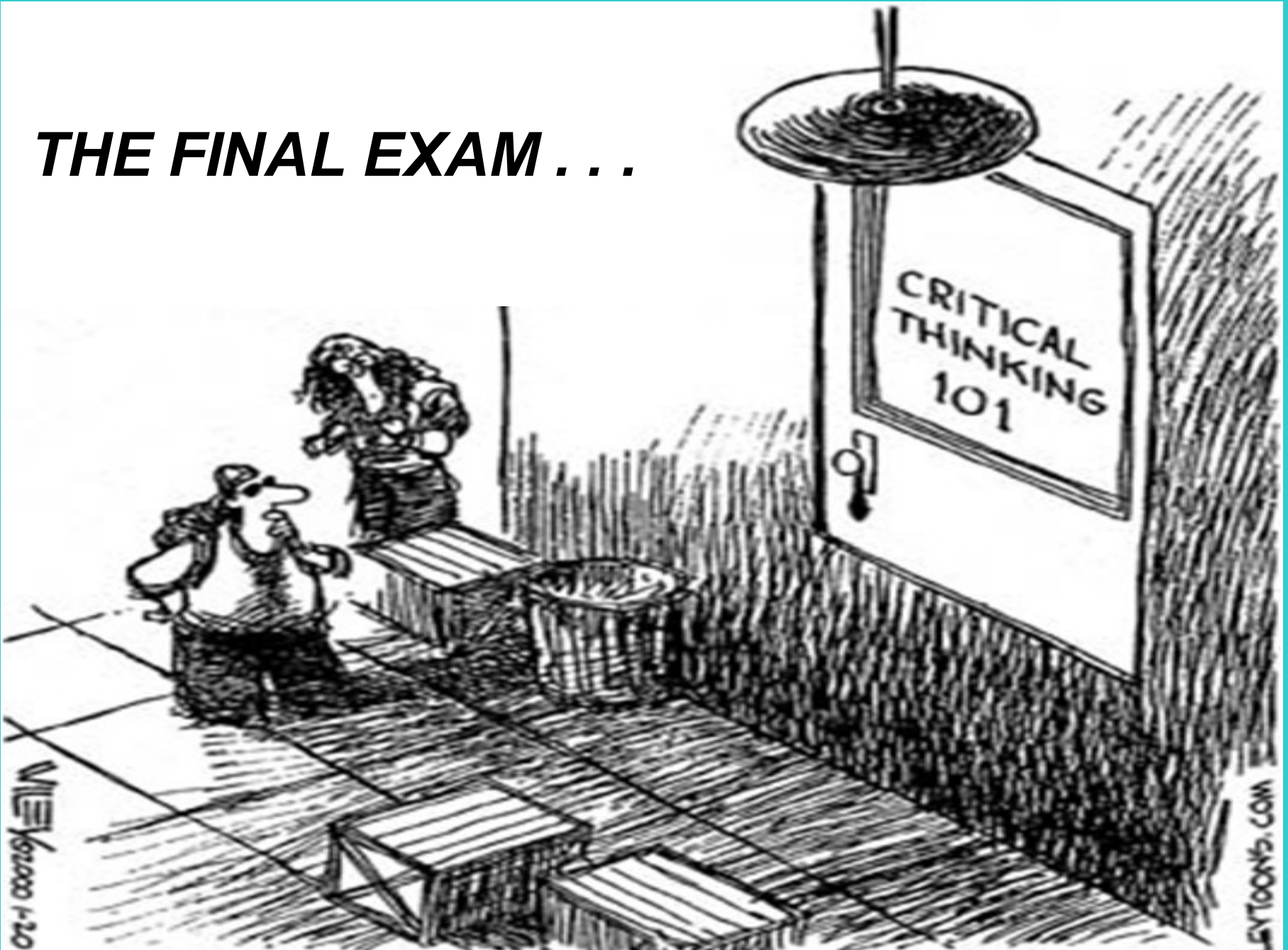
- *Murphy*

The background features a decorative design of blue water droplets of various sizes scattered across the page. A prominent, thick, curved blue line starts from the left side and arcs towards the top right, framing the text. The droplets are rendered with highlights and shadows, giving them a three-dimensional appearance.

Abstract

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

THE FINAL EXAM . . .



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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!

#1 NEW YORK TIMES BESTSELLER



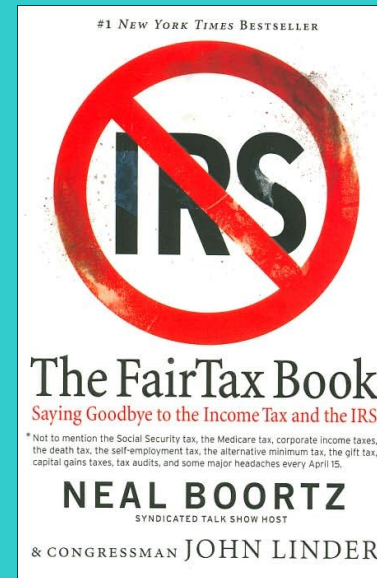
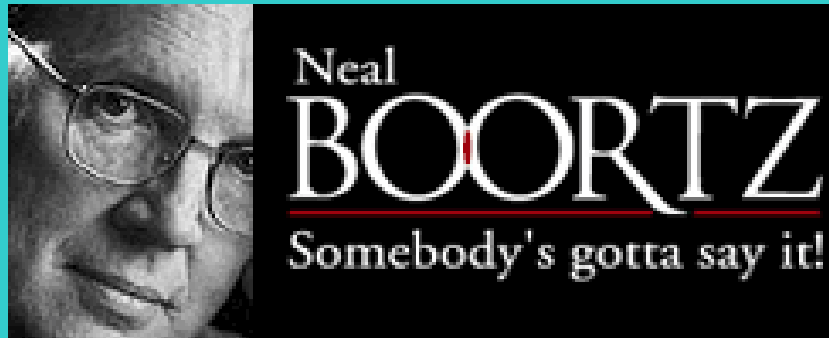
The FairTax Book

Saying Goodbye to the Income Tax and the IRS*

* Not to mention the Social Security tax, the Medicare tax, corporate income taxes, the death tax, the self-employment tax, the alternative minimum tax, the gift tax, capital gains taxes, tax audits, and some major headaches every April 15.

NEAL BOORTZ
SYNDICATED TALK SHOW HOST

& CONGRESSMAN JOHN LINDER



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 ???

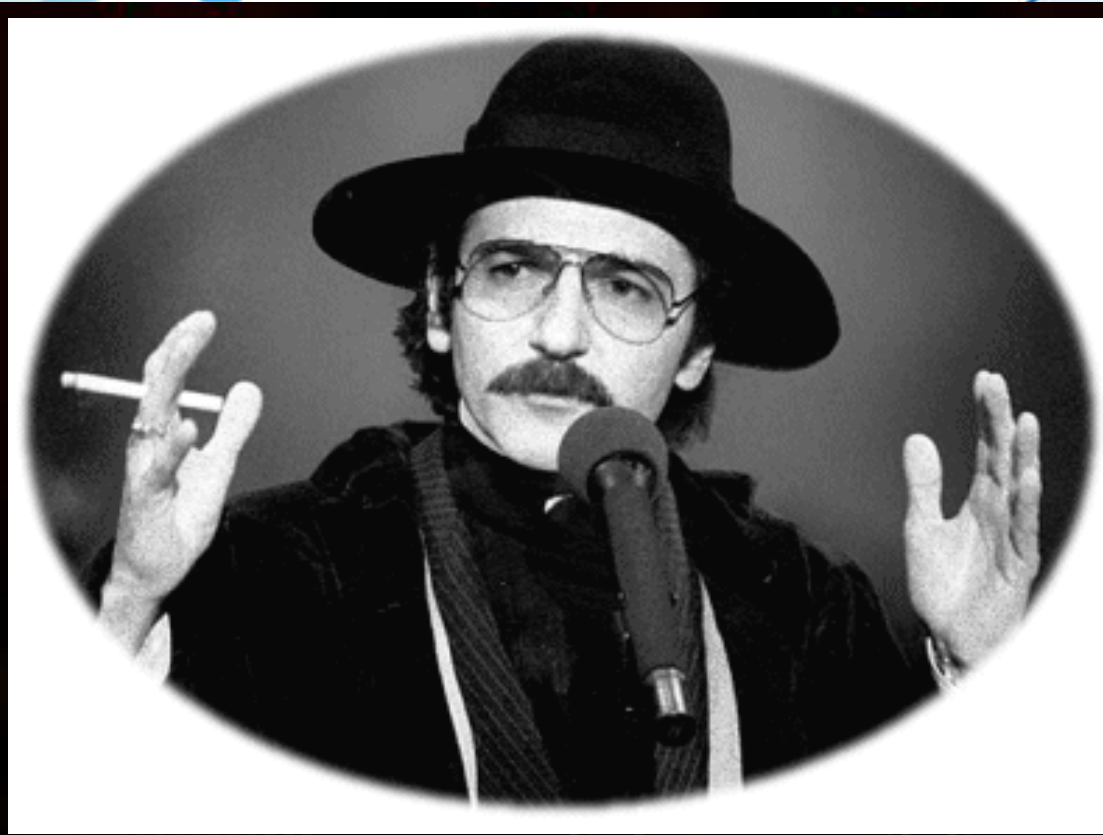
The '**Coverage**' model:

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 'lecturer' reads and students transcribe



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





ImageChef.com



The Nashua

Thursday, September 3, 2009

Universities no longer the keepers of knowledge

Today the United Nations declared that "universities should no longer be considered the keepers of knowledge 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.

Ren
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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.



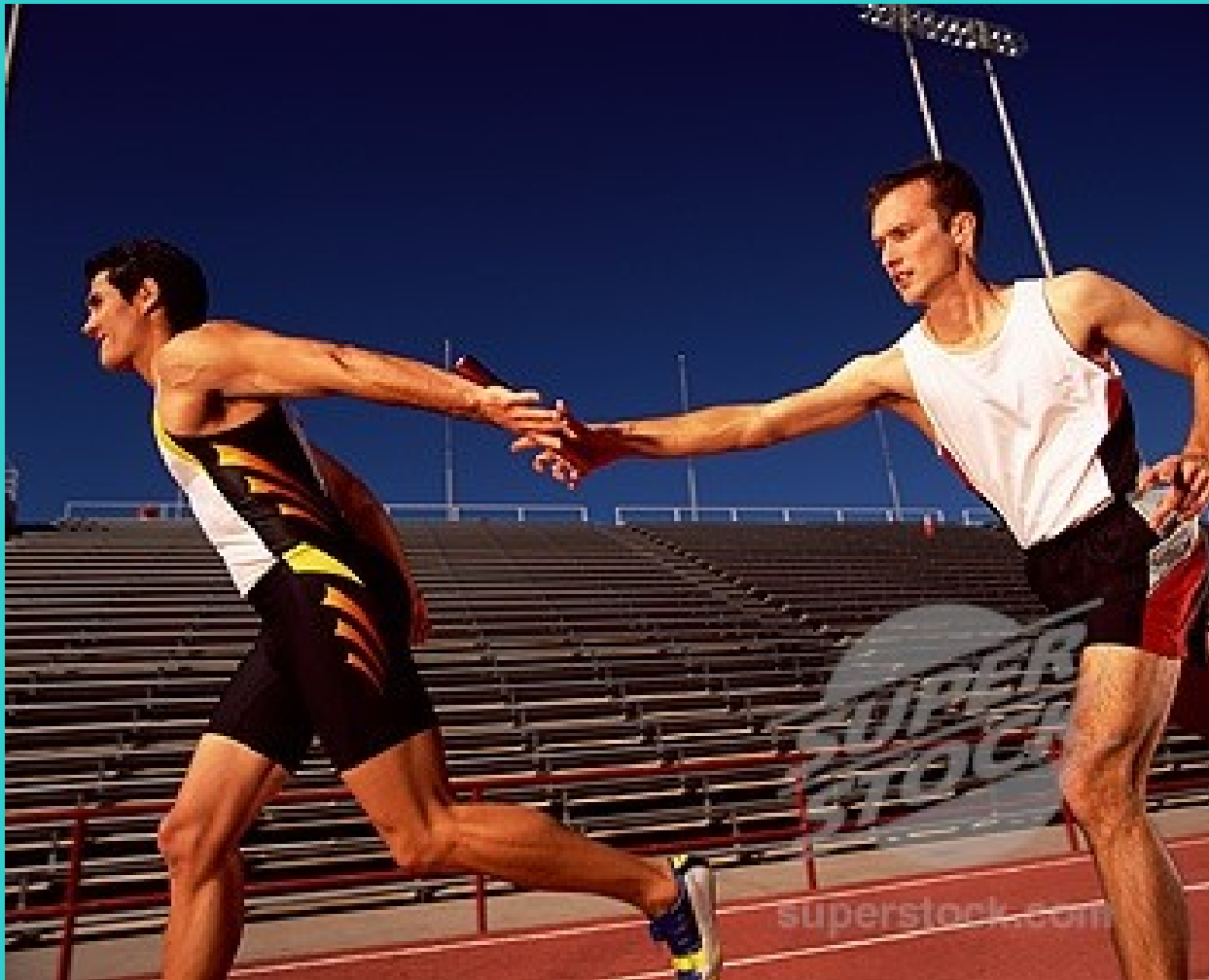
**Students are not “empty vessels”
that we fill with knowledge**



**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

Critical
thinking →

Evaluation

Synthesis

Analysis

Application

Understanding

Knowledge

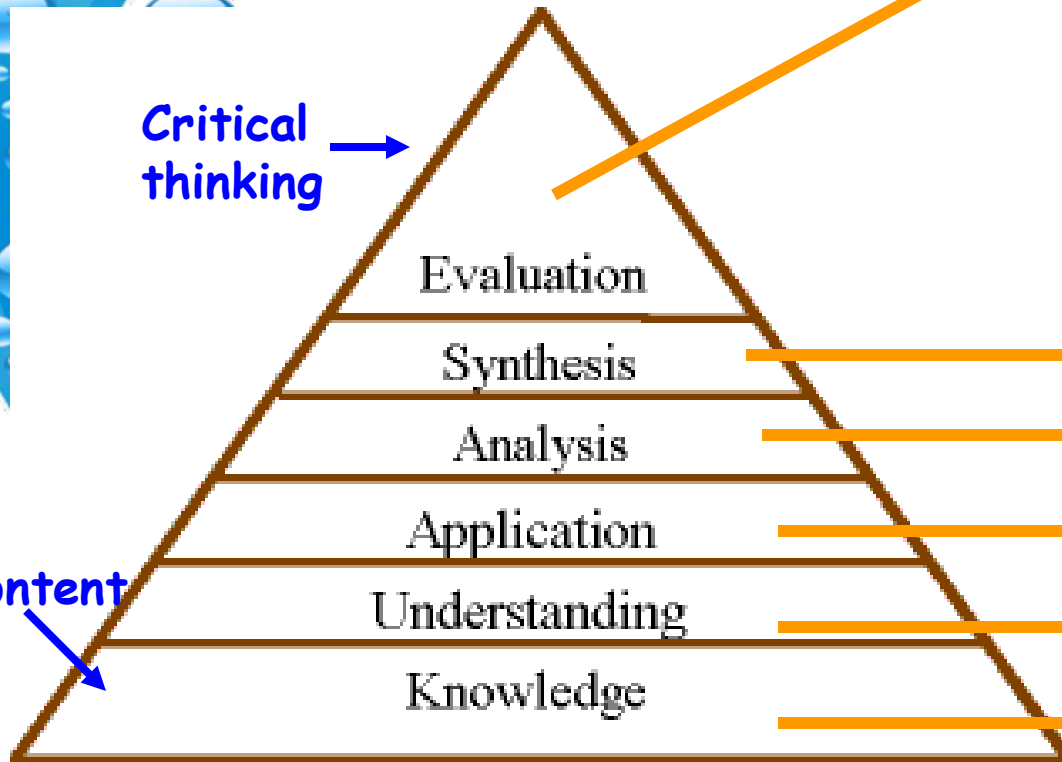
compose, invent
outline, relate

solve, manipulate

compare, interpret

define, describe

Content ↓



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

judge, evaluate,
debate,
recommend

Critical
thinking →

Evaluation

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Understanding

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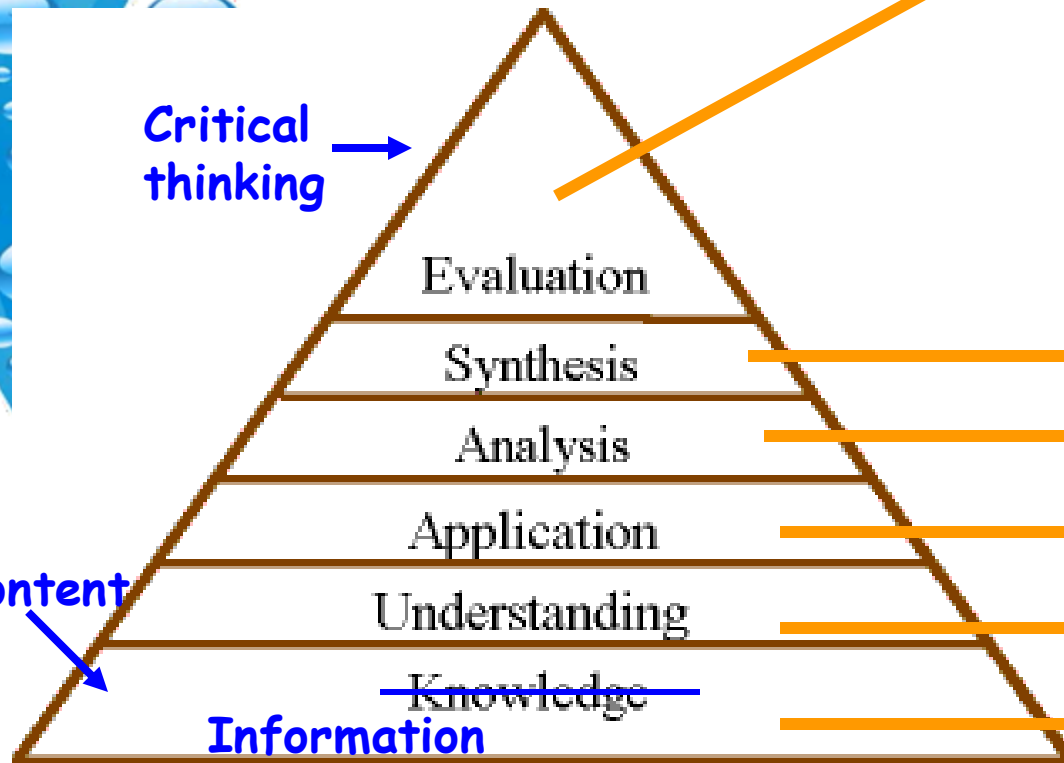
solve, manipulate

compare, interpret

define, describe

Content ↓

Information



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

judge, evaluate,
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Critical
thinking →

LEARNING

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Understanding

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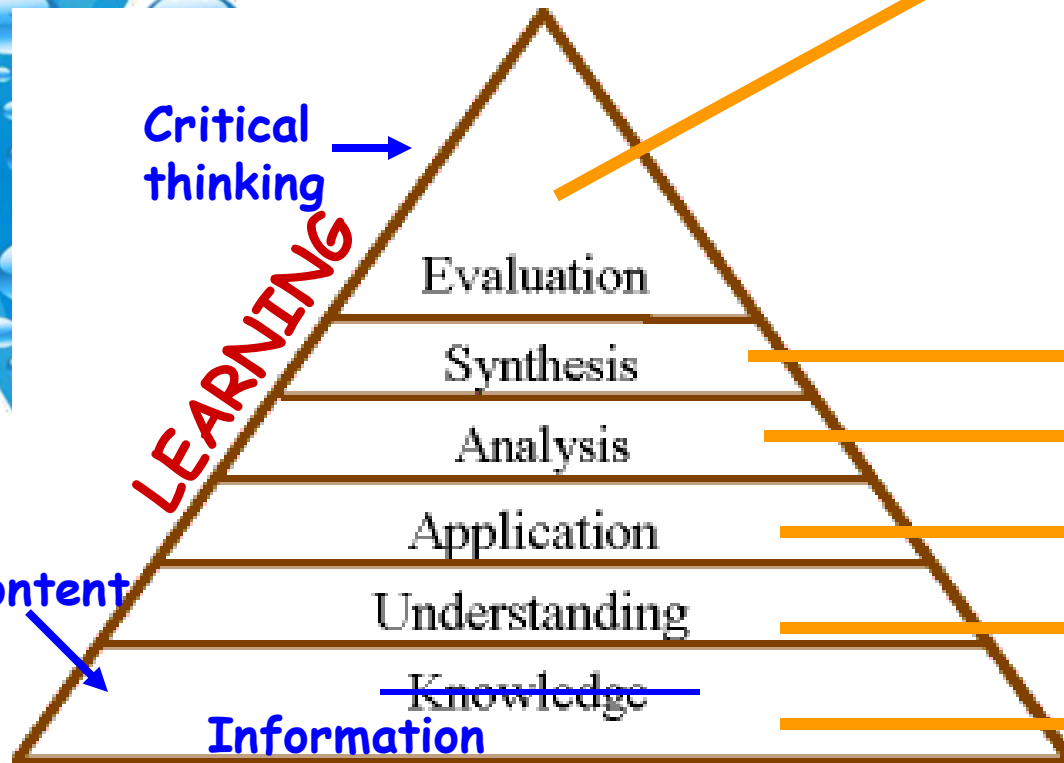
solve, manipulate

compare, interpret

define, describe

Content ↓

Information



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.



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University of Phoenix Fraud! Huge Scam!

89

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“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.

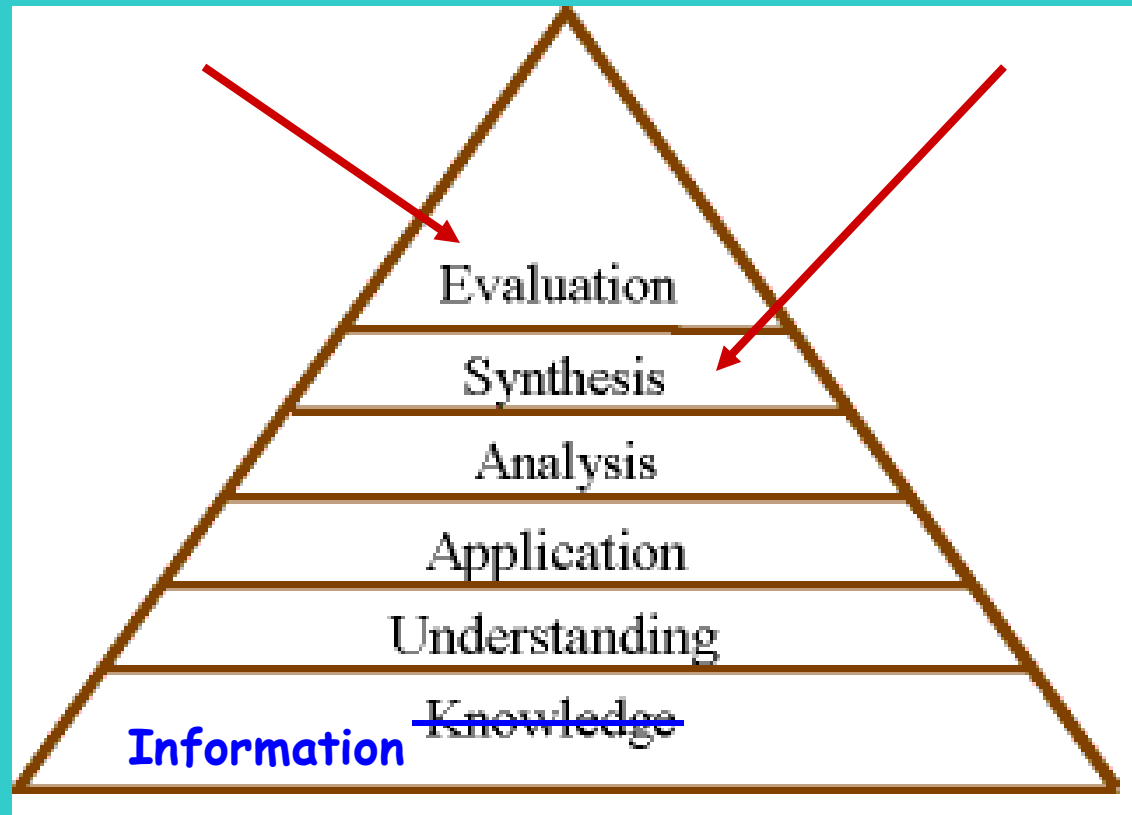
They are simply stenographers who don't know where to file things.



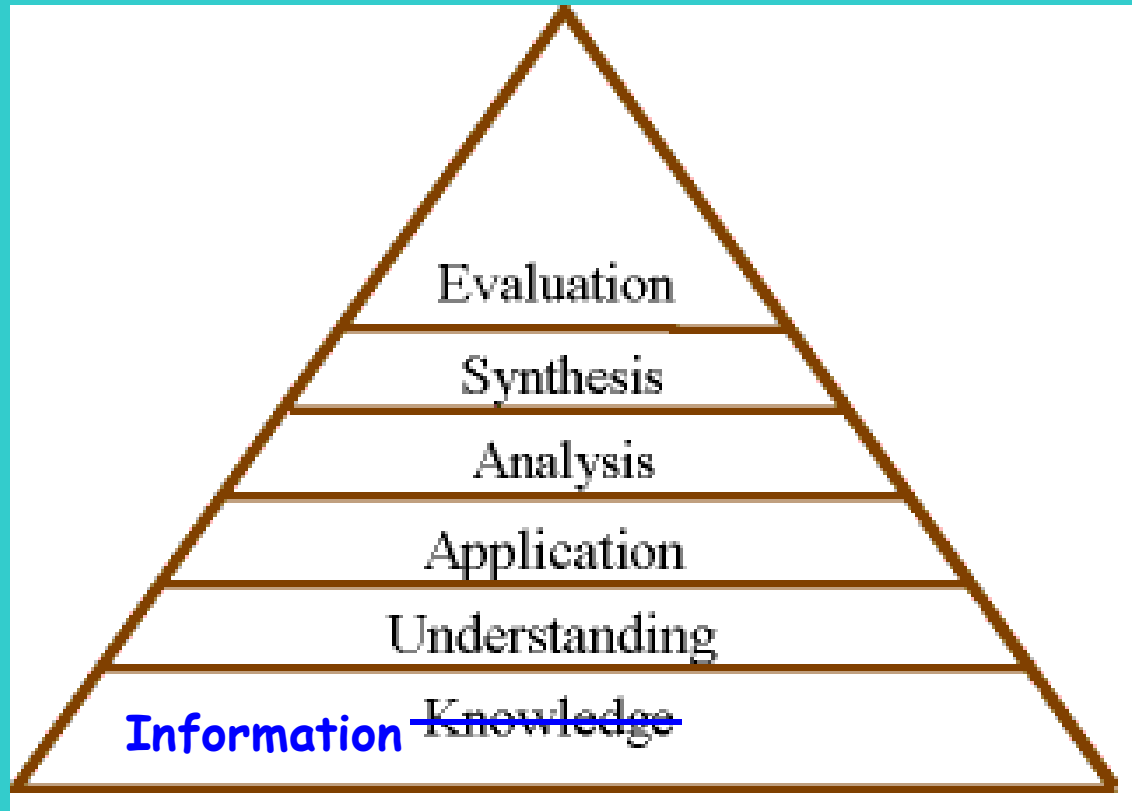
Our job as teachers? Not to “impart knowledge”, but to help students learn to **judge** and use information to **create** meaningful constructs of knowledge.



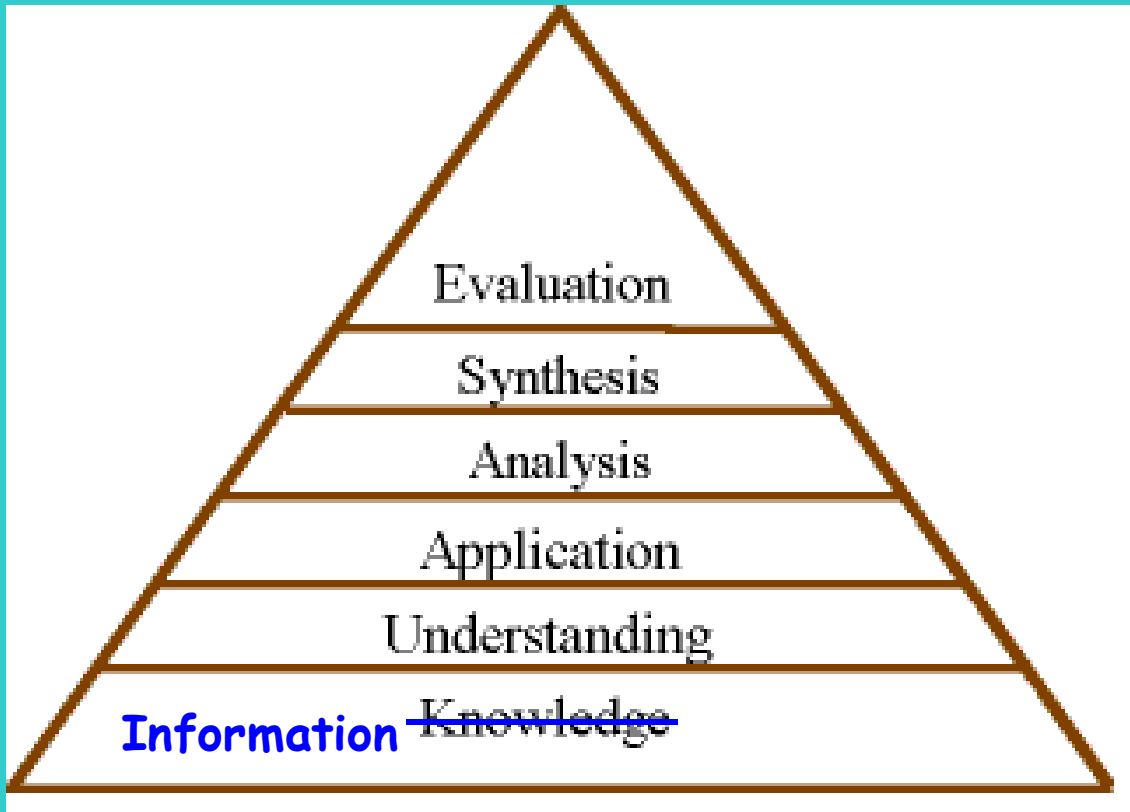
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'Learning' is the construction **process**, not the construction product. Learning the process makes the student a 'life-long learner' able to tackle any future challenge.



'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.



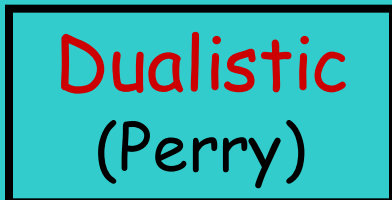
BUT, you must consider . . .

Nature of students



Levels of Intellectual Development
(Perry 1970)

Levels of Intellectual Development



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!



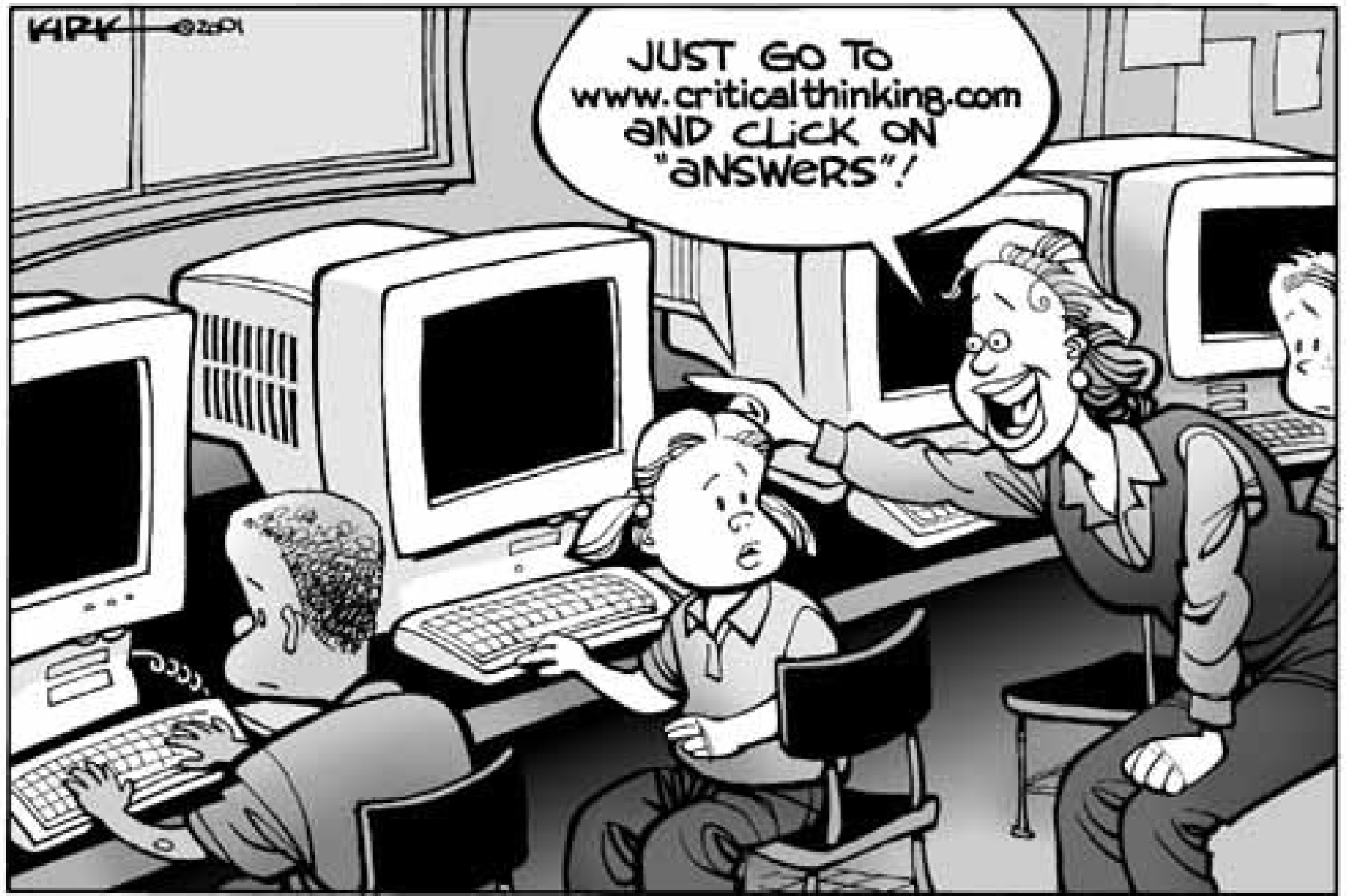
FAMILY CIRCUS



"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!”

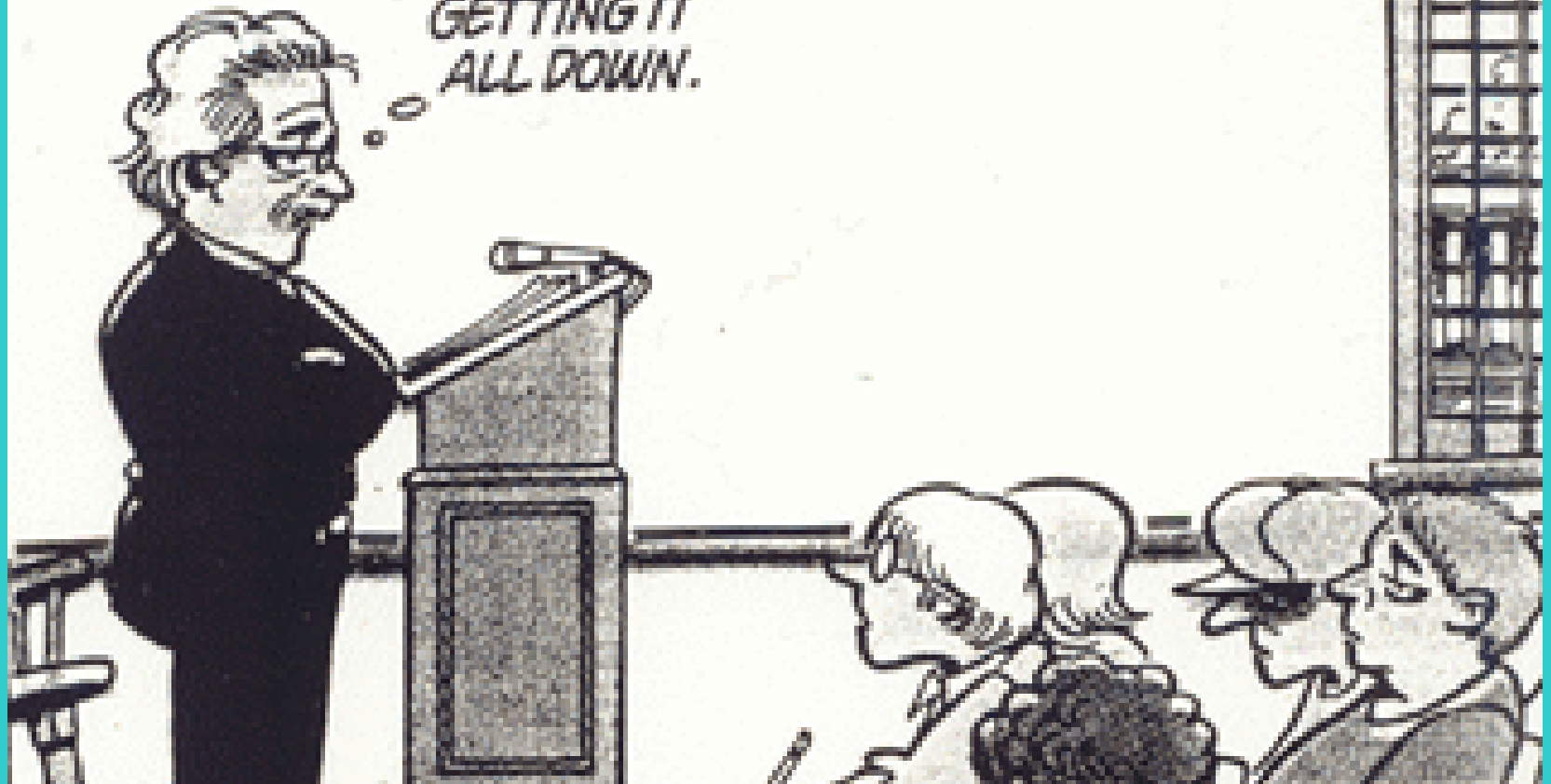


...AND IN MY VIEW, JEFFERSON'S
DEFENSE OF THESE BASIC RIGHTS
LACKED CONVICTION. OKAY, ANY
DISCUSSION OF WHAT I'VE
COVERED SO FAR?

SCRIBBLE!
SCRIBBLE!
SCRIBBLE!
SCRIBBLE!



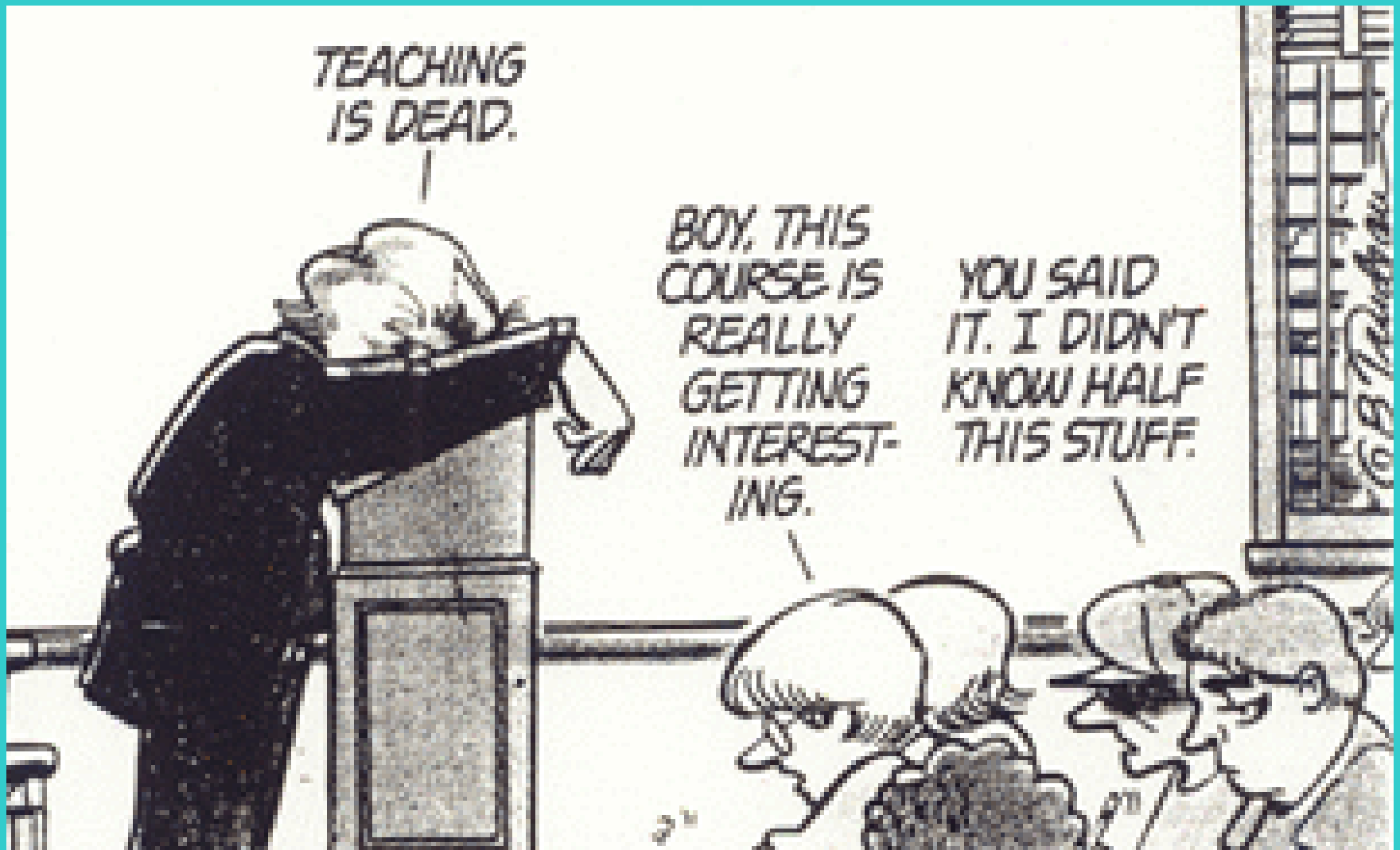
OF COURSE NOT.
YOU'RE TOO BUSY
GETTING IT
ALL DOWN.



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

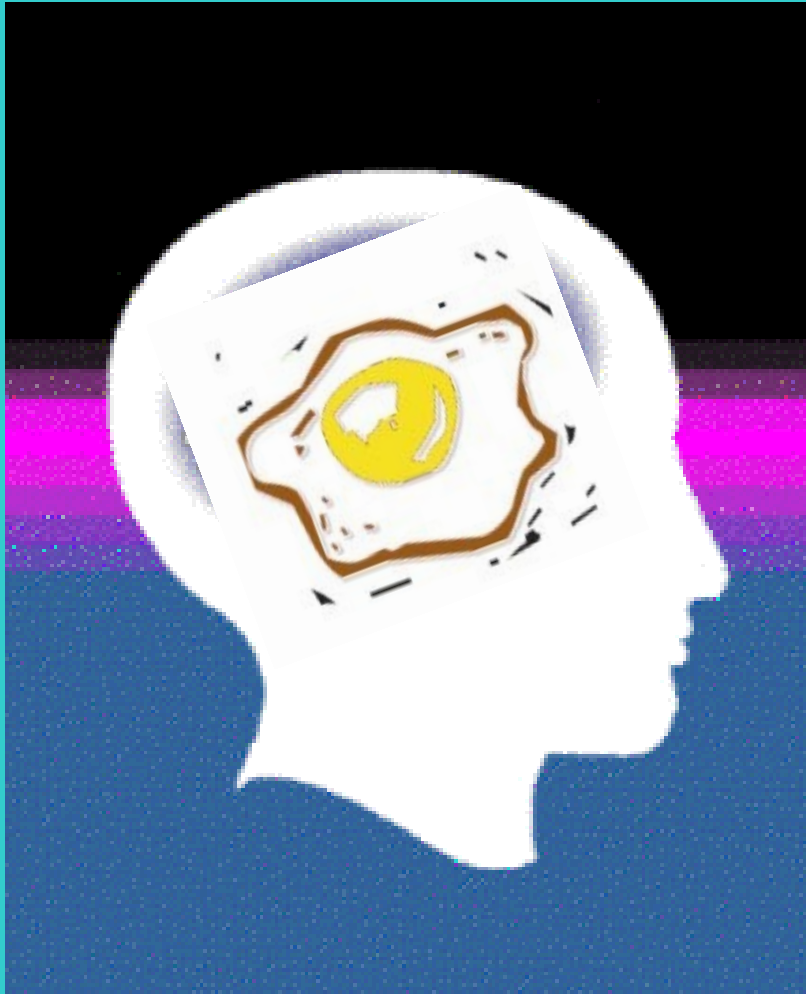
184

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).

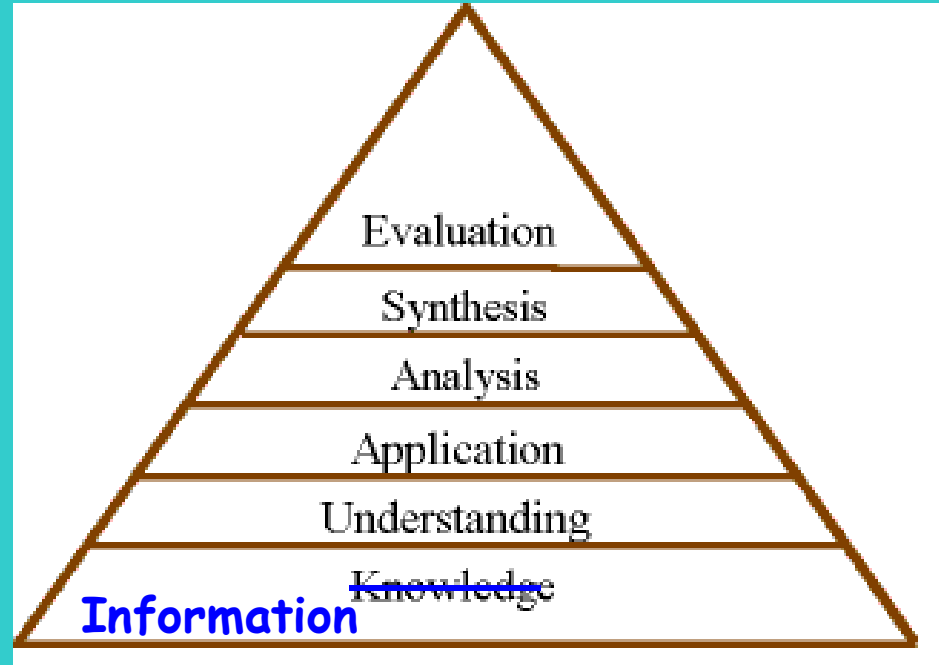
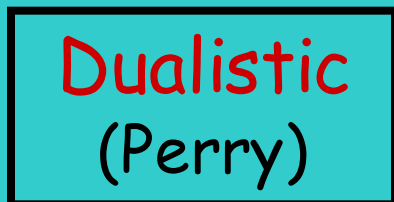


Advanced students can also be dualist . . .



The Challenge of Teaching

Levels of Intellectual Development



Levels of Intellectual Development



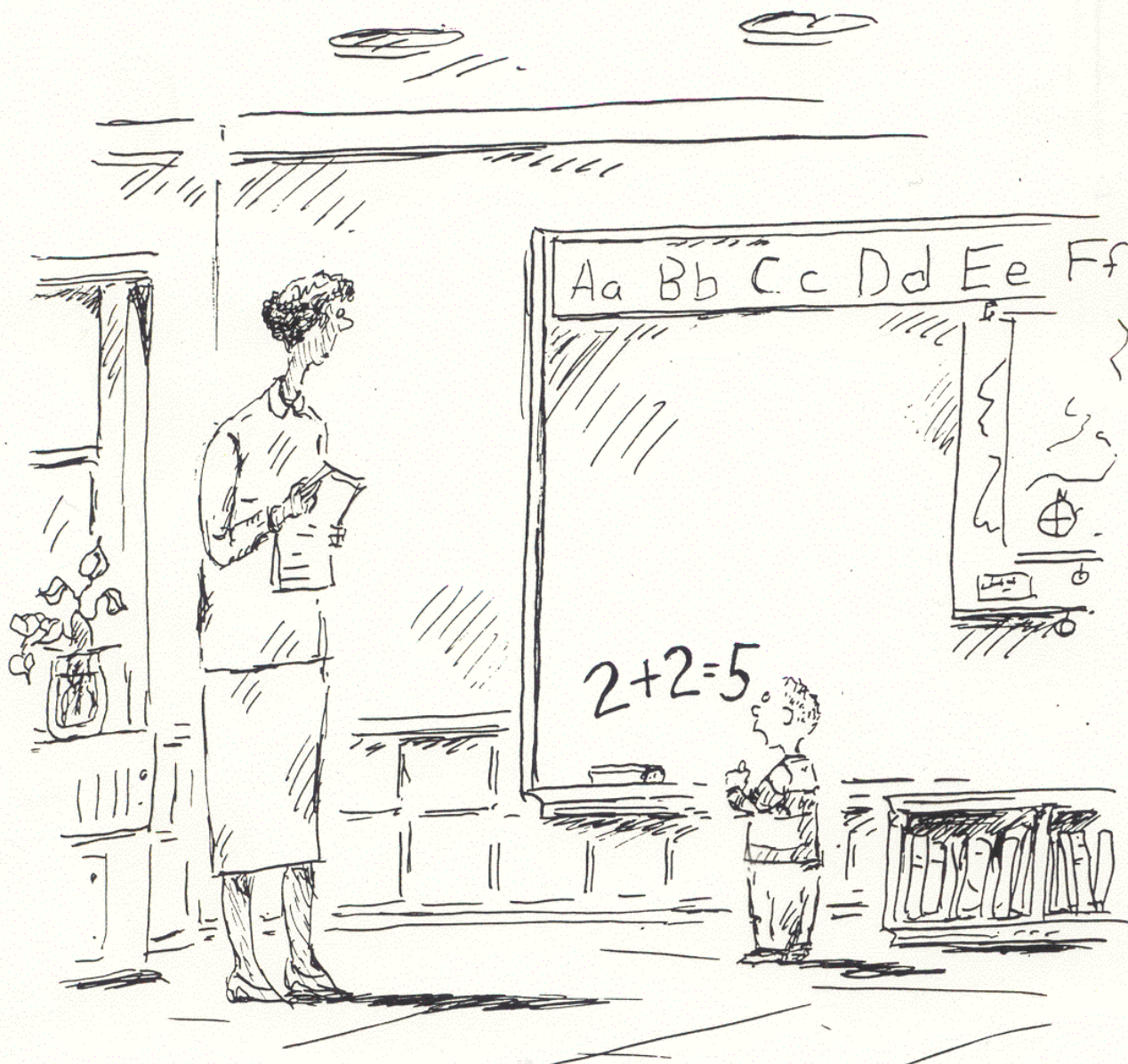
Subjective
(Belenky)

Experts disagree; so maybe all opinions are valid



Dualistic
(Perry)

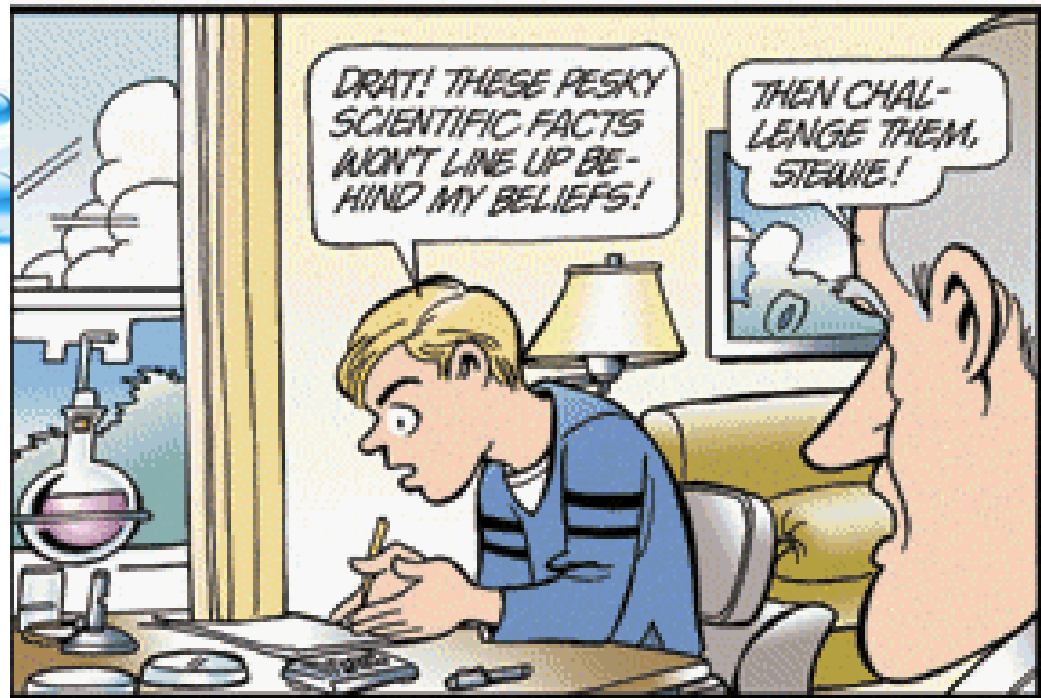
B&W world; experts hold eternal truths (*Received Knowledge*)



B. Smaller

"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



Procedural
(Belenky)

Disciplines have critical standards,
but learned methodology



Subjective
(Belenky)

Experts disagree; so maybe all
opinions are valid




Dualistic
(Perry)

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



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

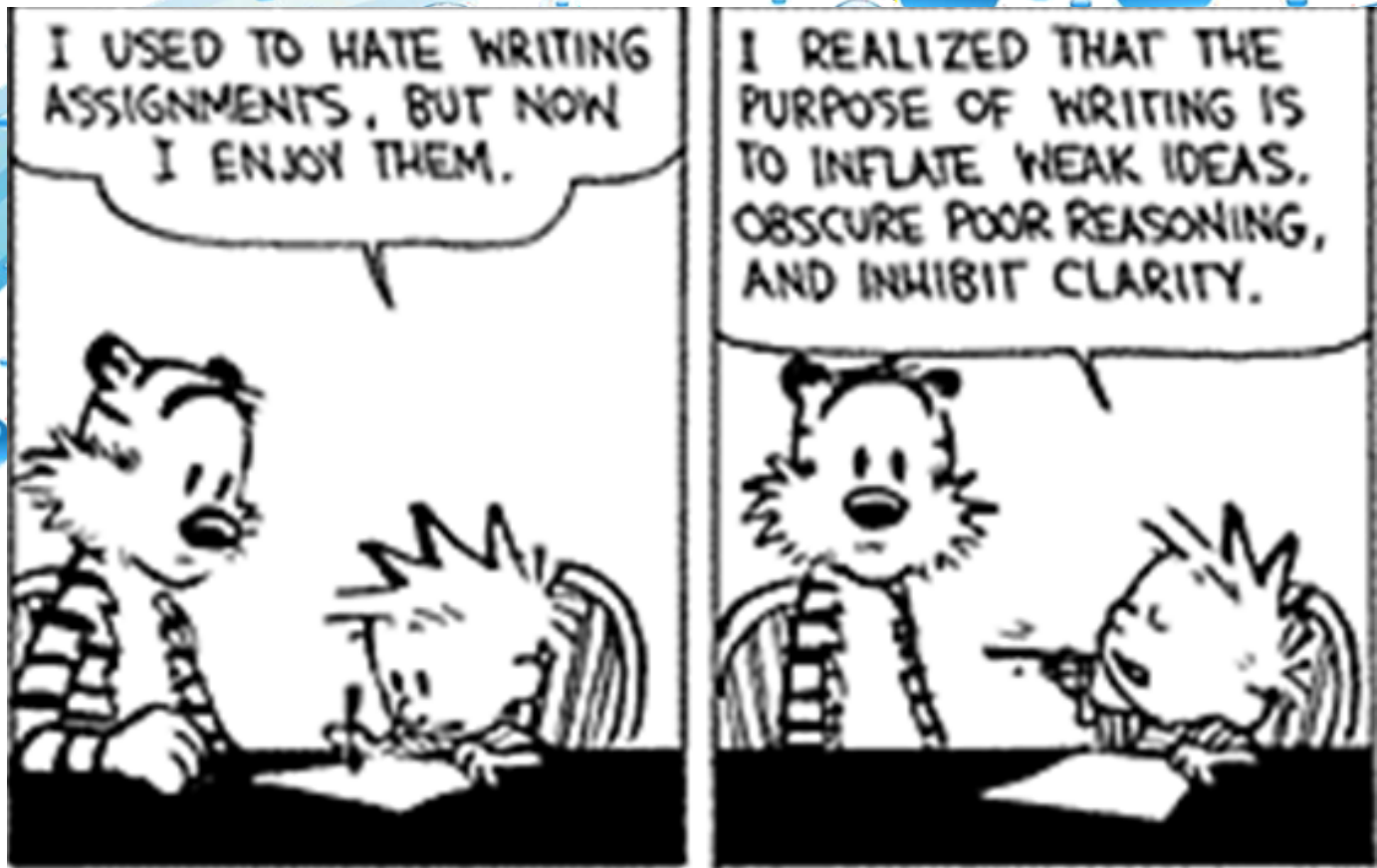
Procedural knowledge



THEY ONLY
TAUGHT ME HOW
TO THINK OUTSIDE
OF THE BOX. I'M NOT
TRAINED FOR CIRCLES!!!

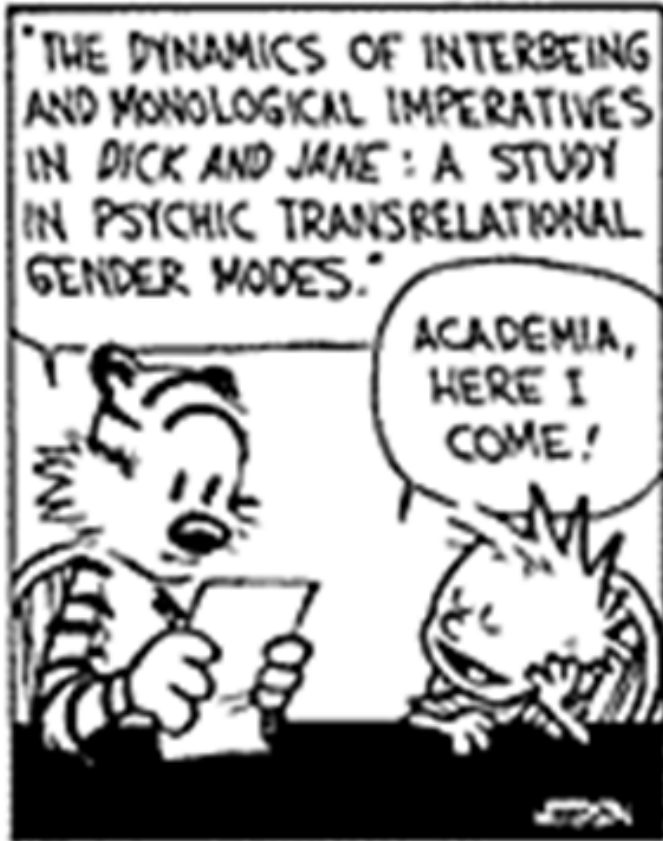
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Procedural knowledge



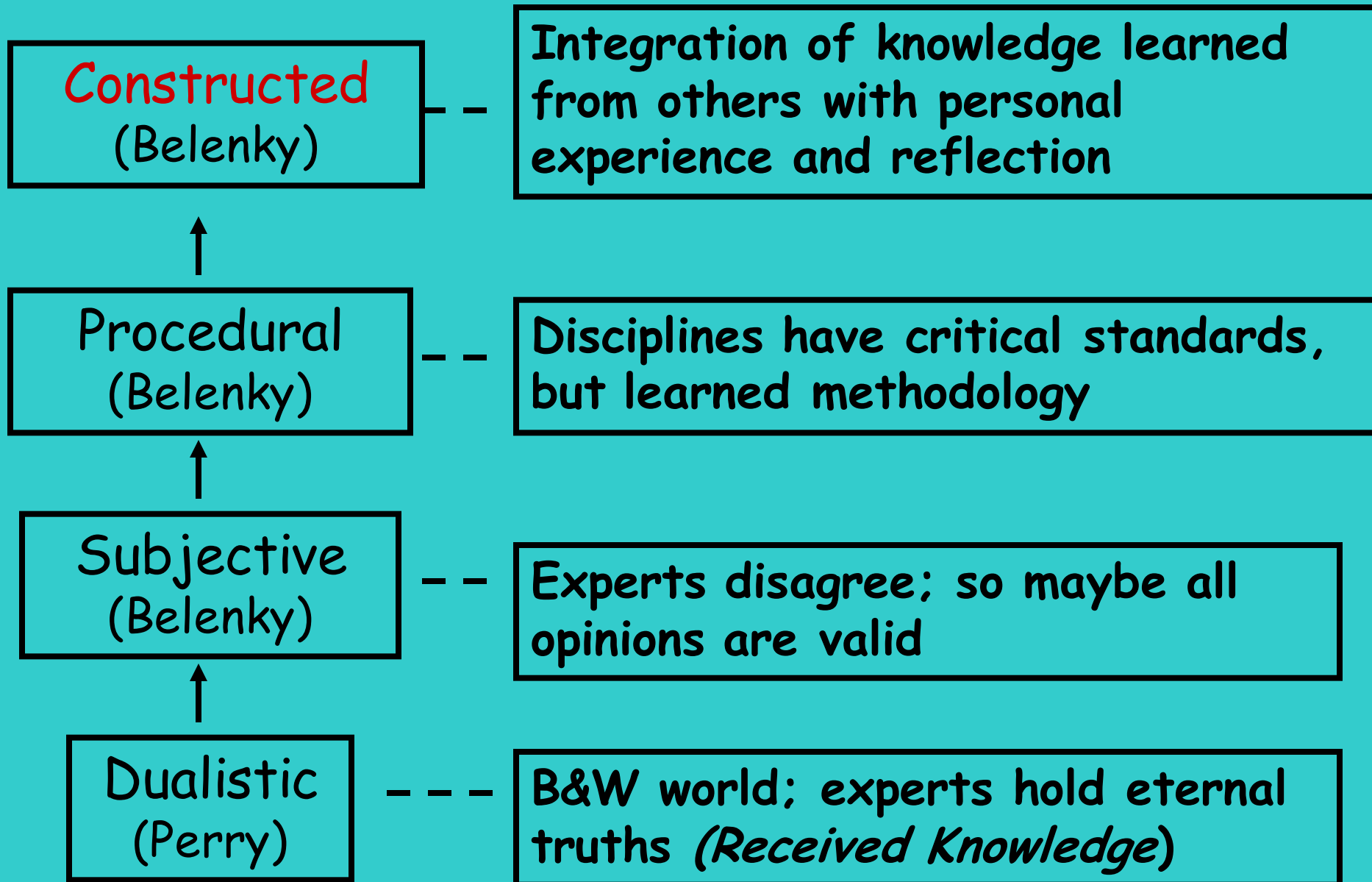
Students can use procedural knowledge to manipulate the system . . .

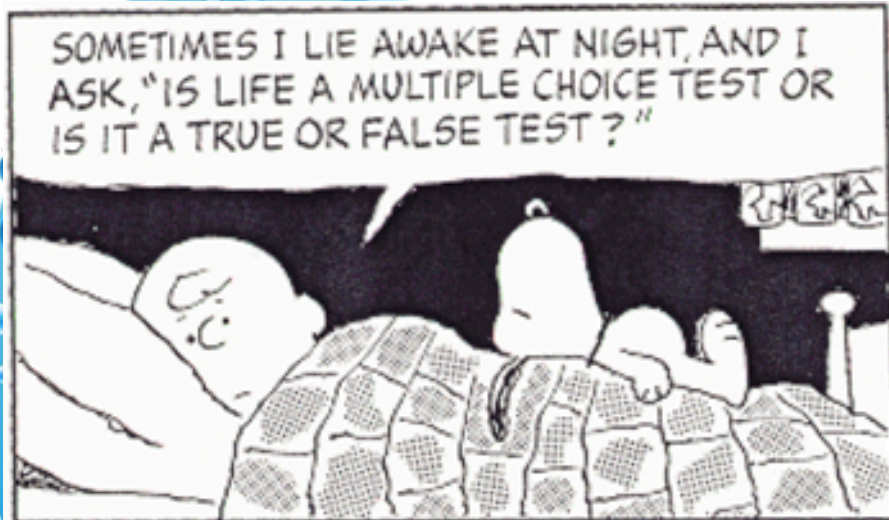
WITH A LITTLE PRACTICE,
WRITING CAN BE AN
INTIMIDATING AND
IMPENETRABLE FOG!
WANT TO SEE MY BOOK
REPORT?



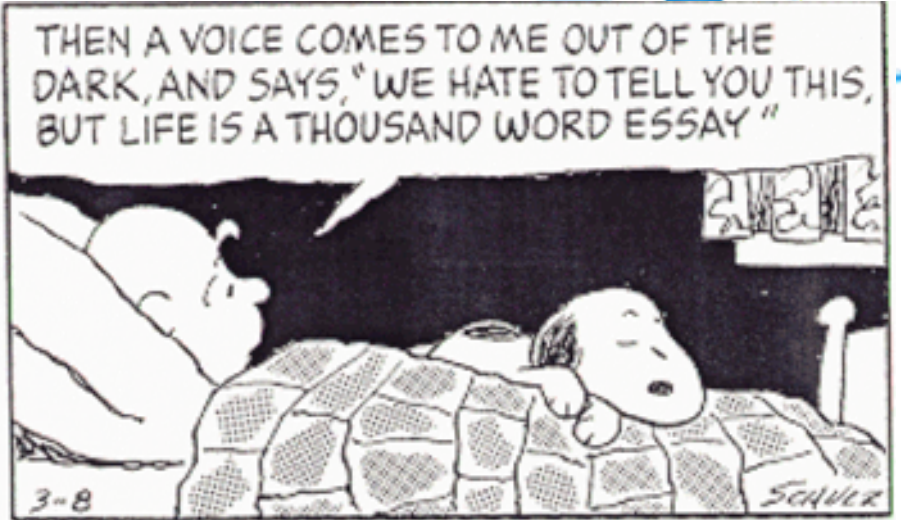
Students can use procedural knowledge
to manipulate the system . . .

Levels of Intellectual Development





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Constructed knowledge



"I still don't have all the answers, but I'm beginning to ask the right questions."

Constructed knowledge

Levels of Intellectual Development

Constructed
(Belenky)

Integration of knowledge learned from others with personal experience and reflection



Procedural
(Belenky)

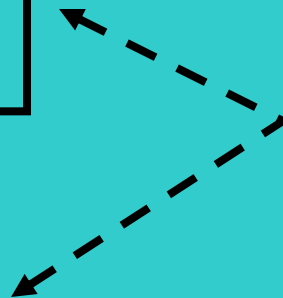


Subjective
(Belenky)



Dualistic
(Perry)

Majority of college freshmen and sophomores
(Belenkey et al. 1986)



Student Development, and Moving Students from Stage to Stage

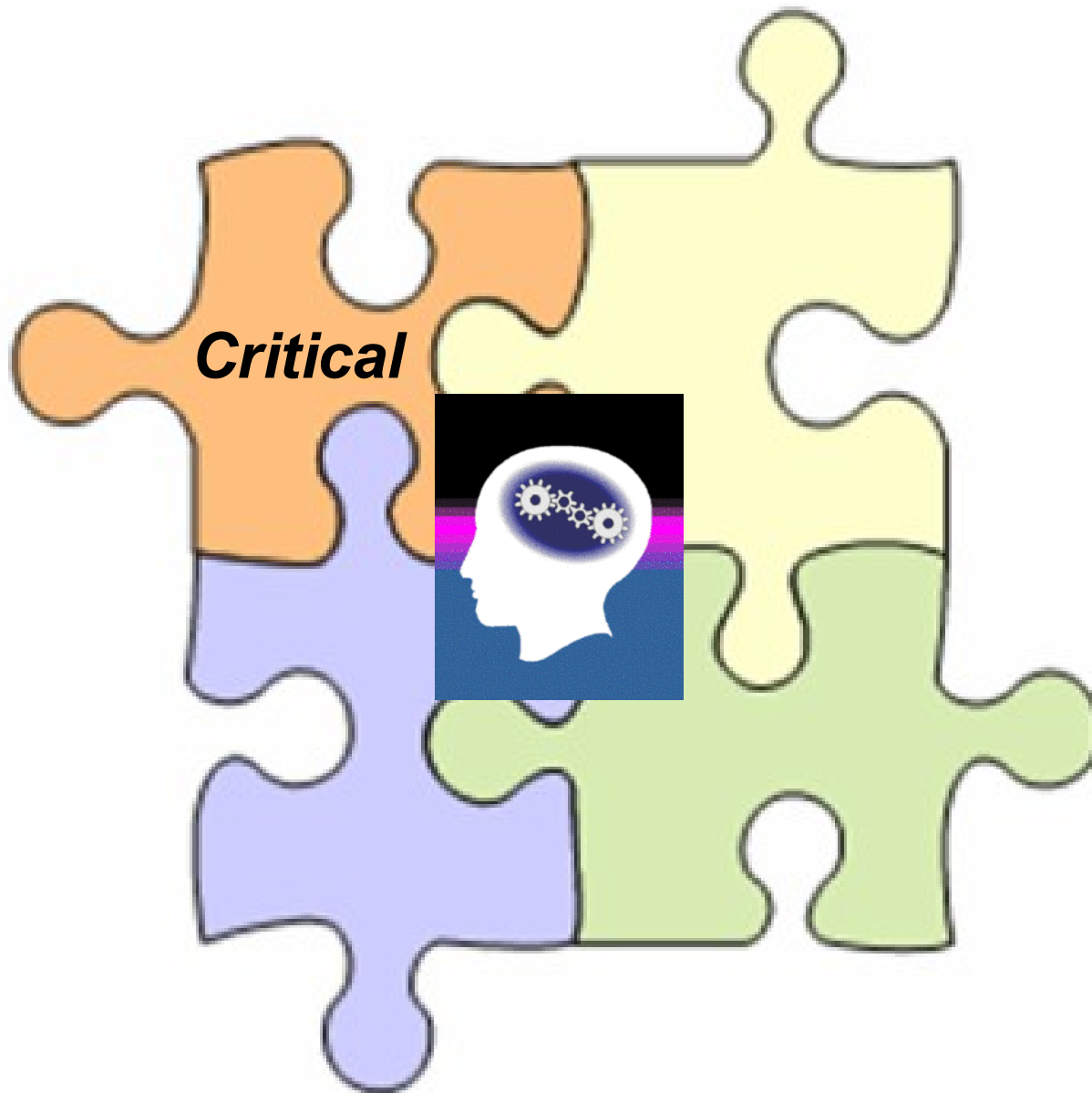
West, E.J. 2004. Perry's legacy: models of epistemological development. *Journal of Adult Development* 11:61-70.

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



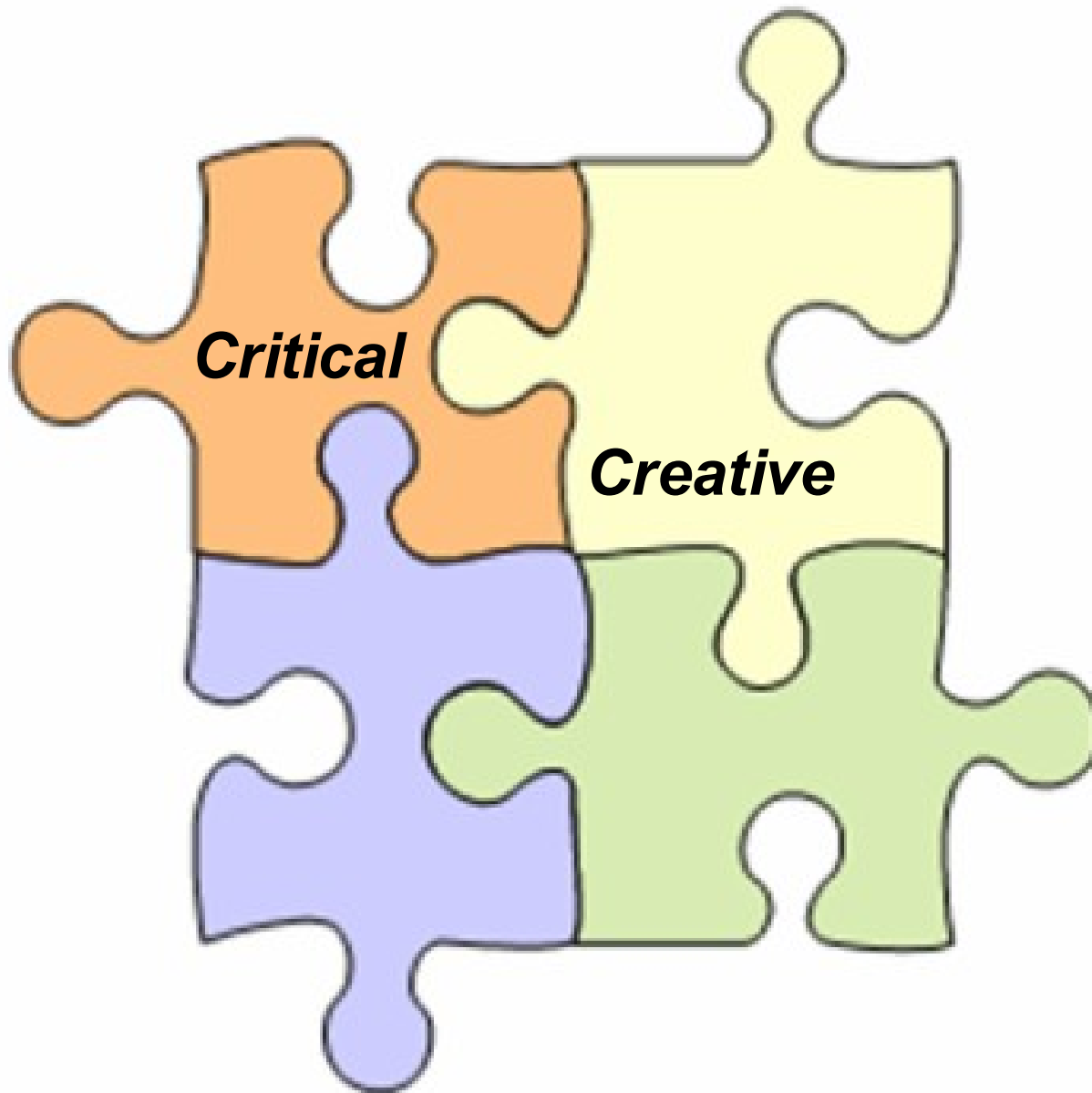


DEFINITION

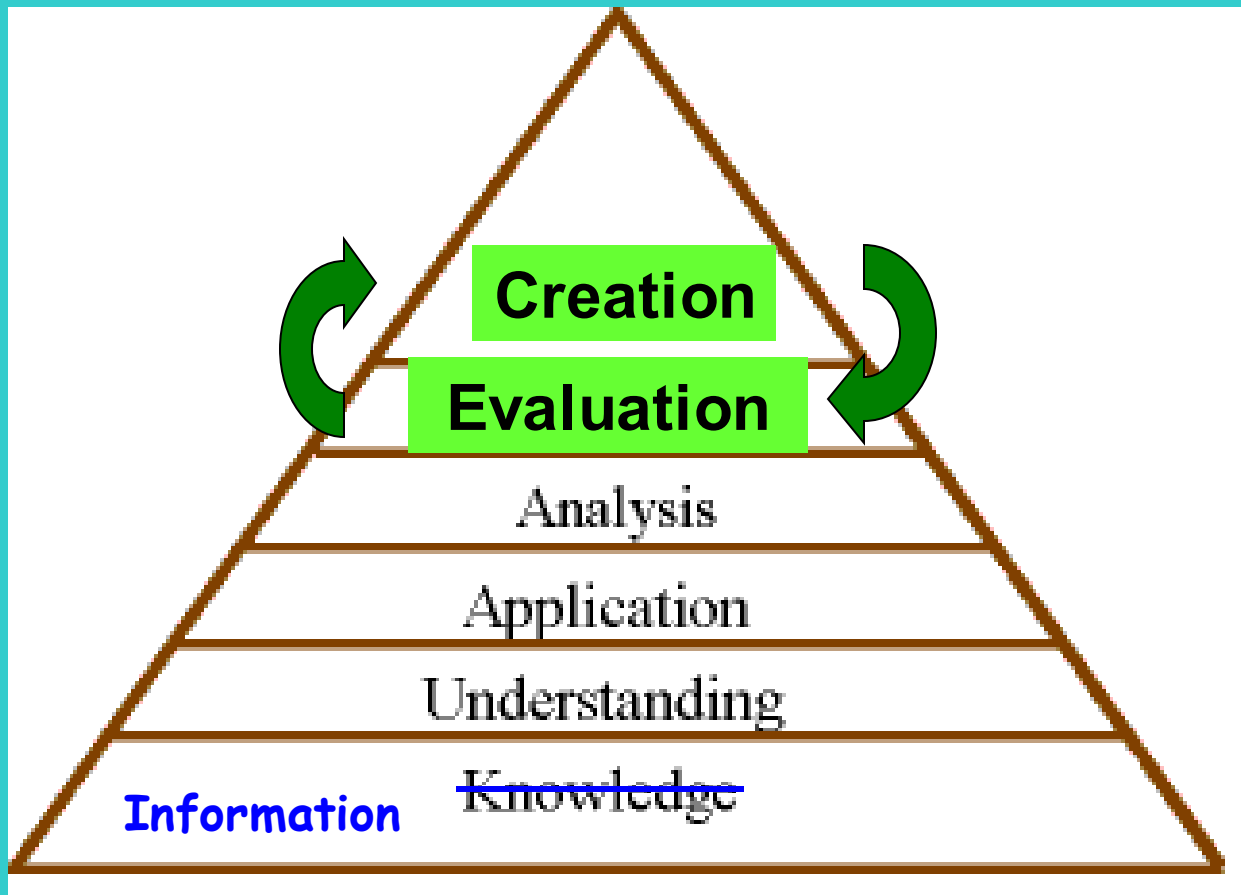
(Paul and Elder 2005)

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

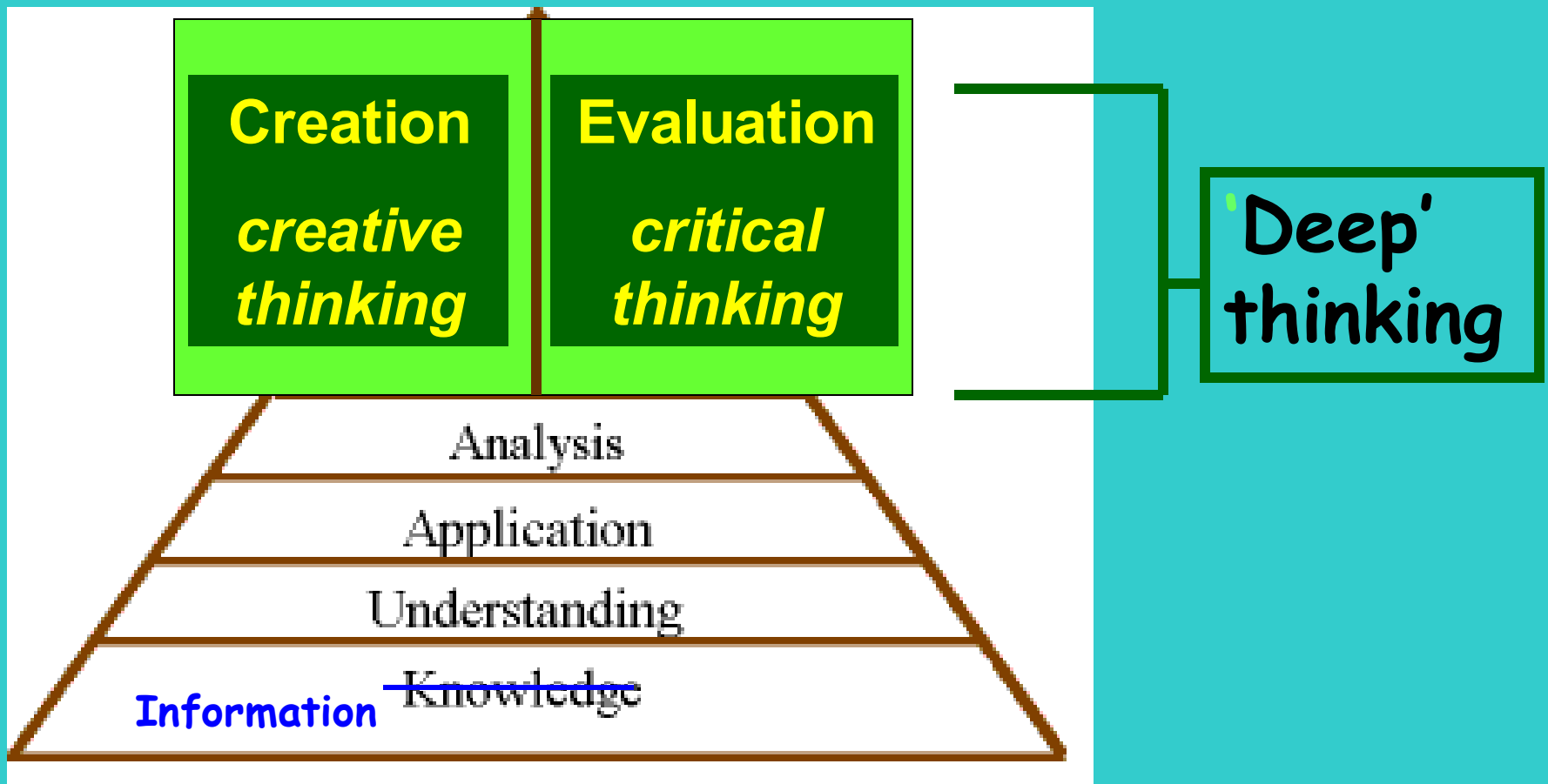
The 'Good Thinking' Puzzle



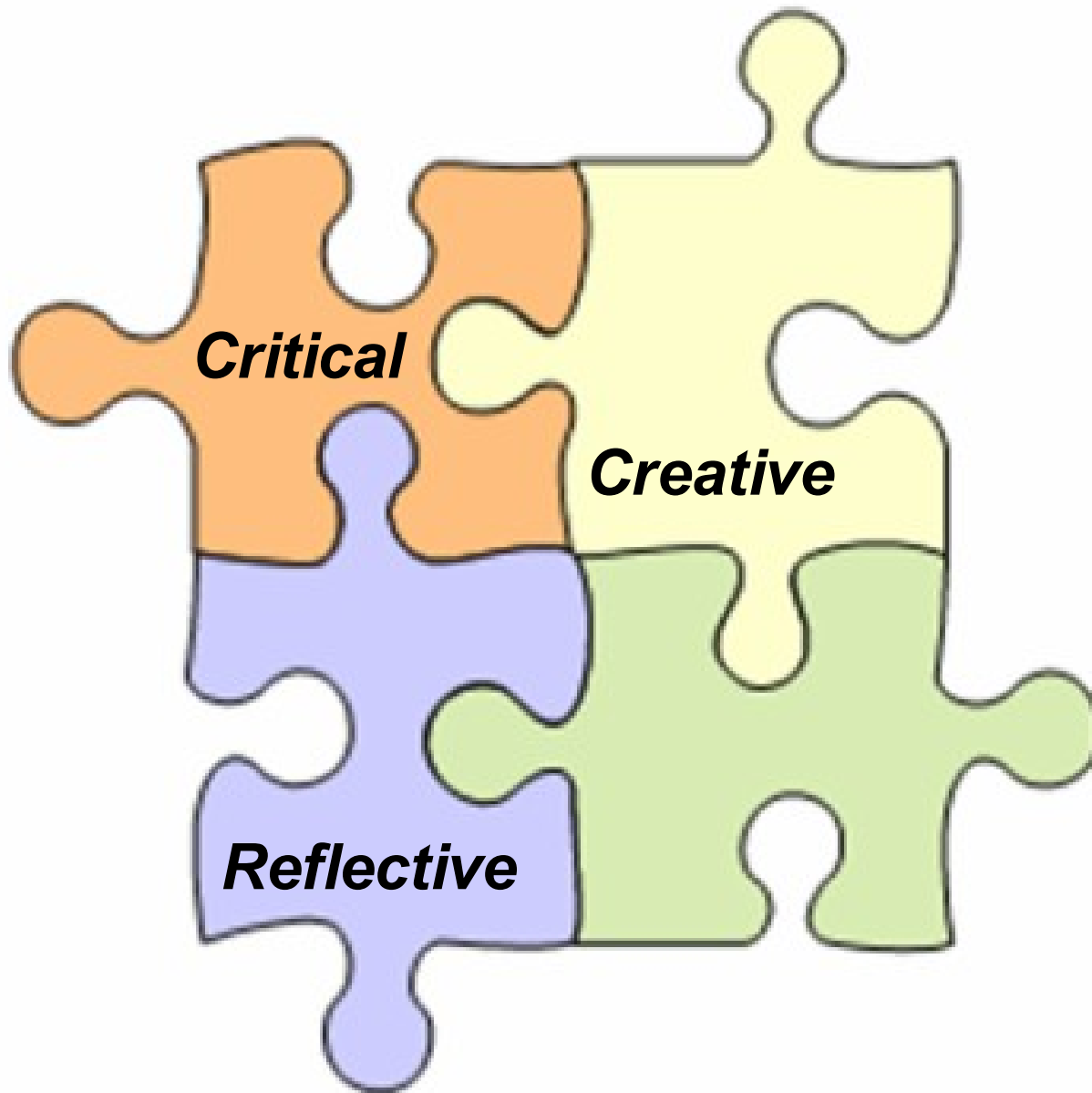
Bloom's Taxonomy - Revised (Krathwohl 2002)



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

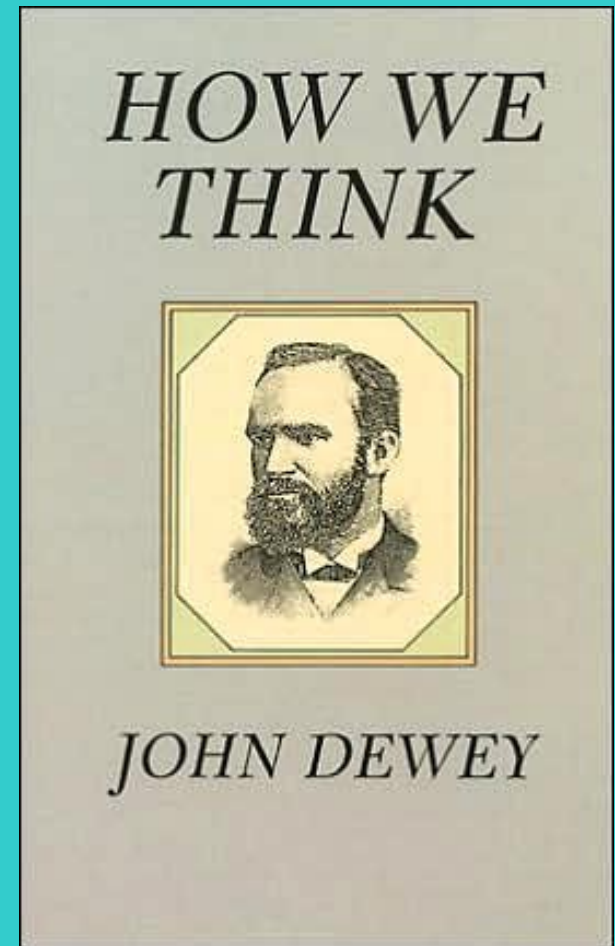


The 'Good Thinking' Puzzle



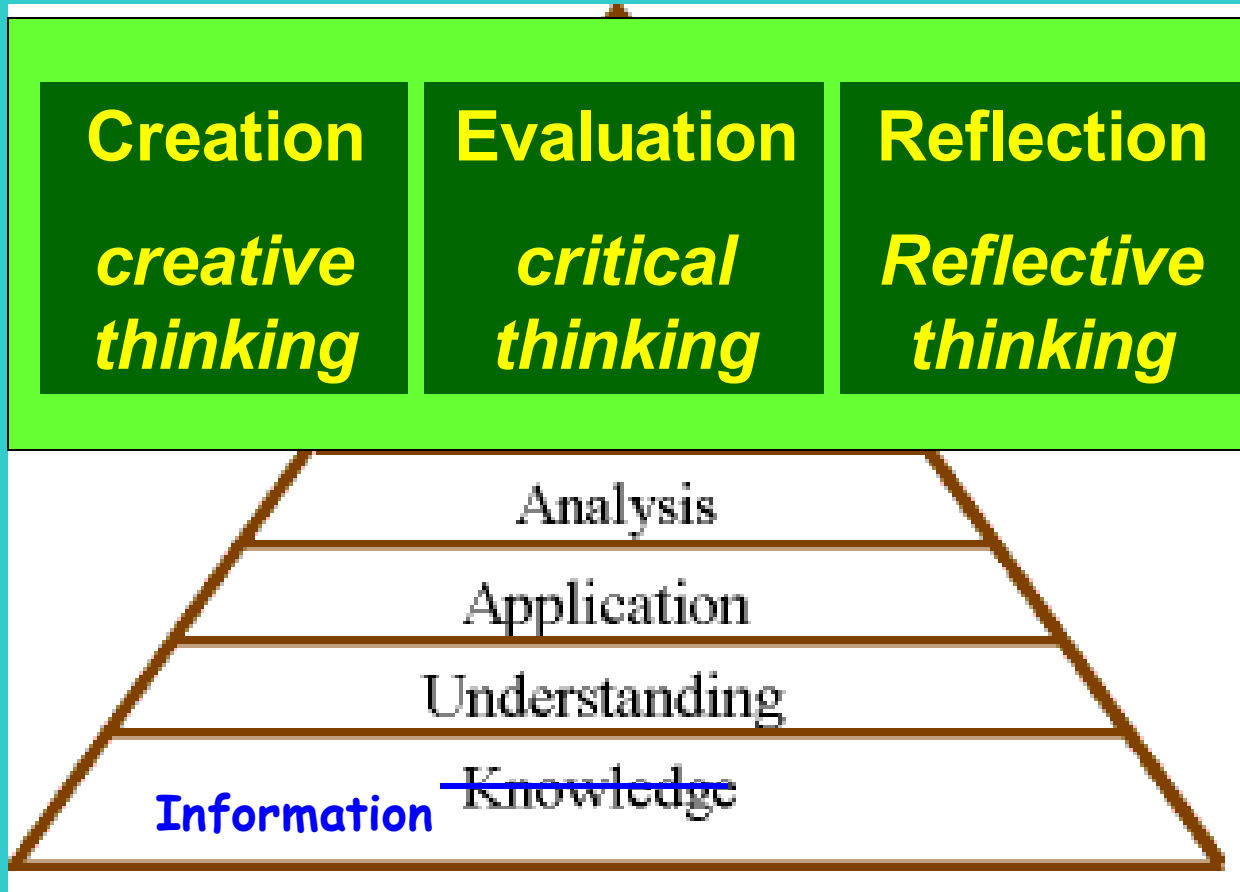
Reflective Thinking

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



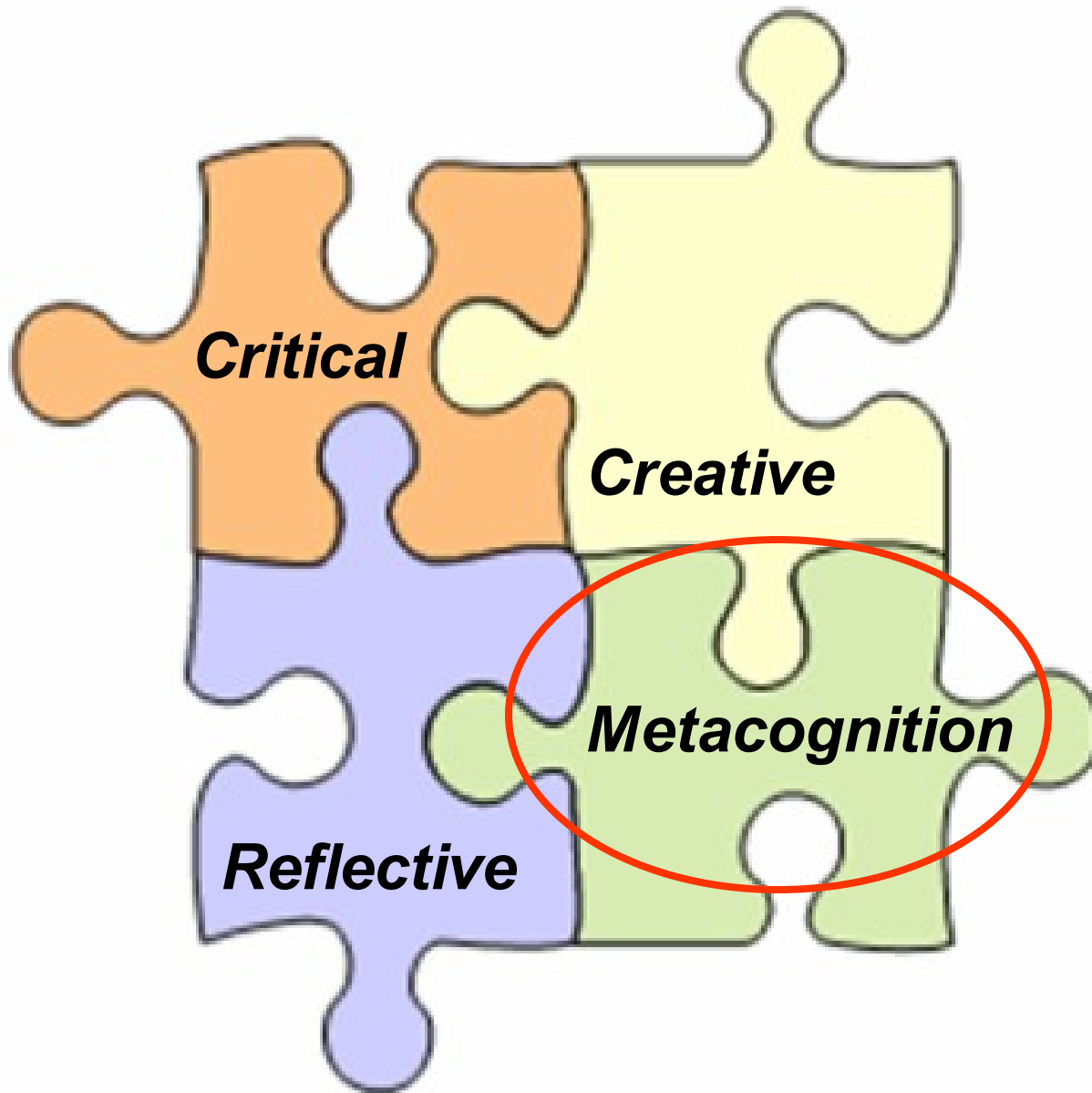
1910

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

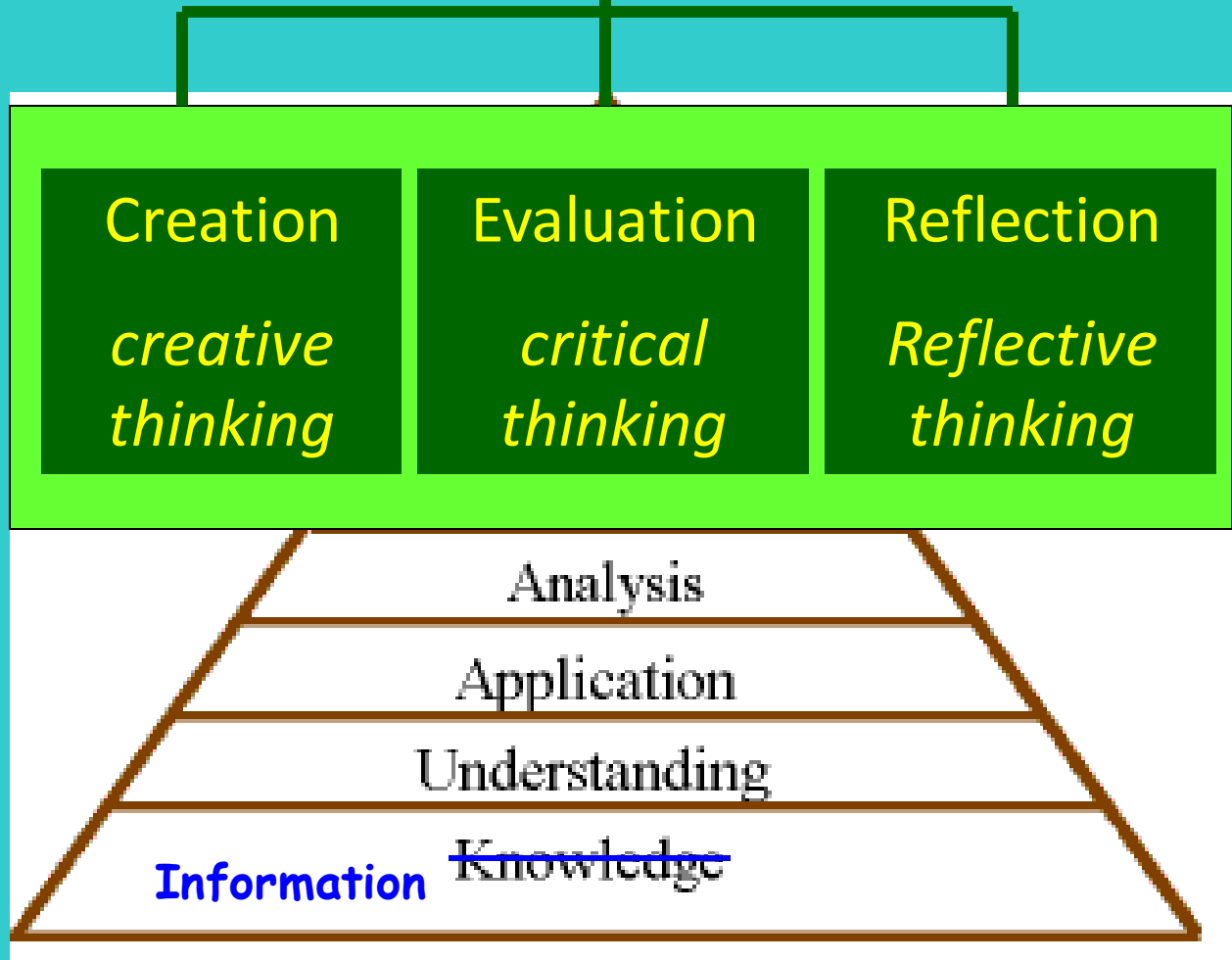


Subjective

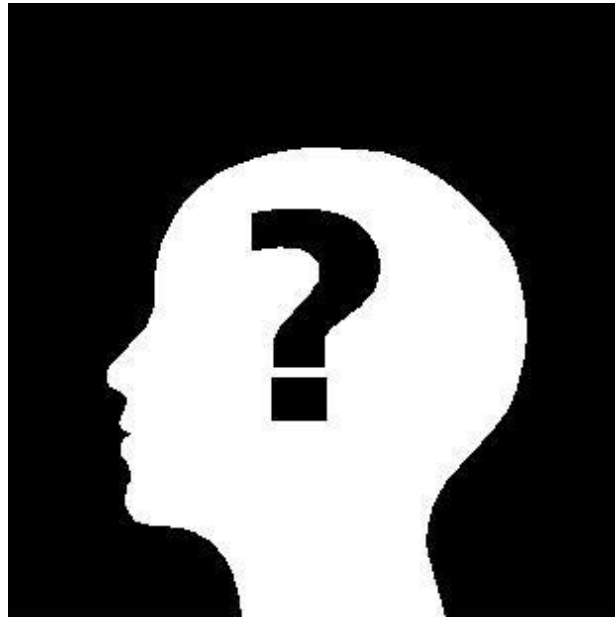


Dualistic

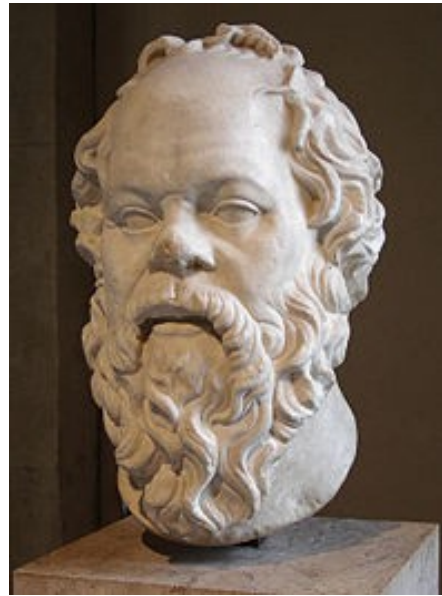
'Deep' thinking



An essential teaching component:
Questions rather than answers



An essential teaching component:
Questions rather than answers



Socrates

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

(Hill and McGinnis 2007)



Case Study Teaching and Learning



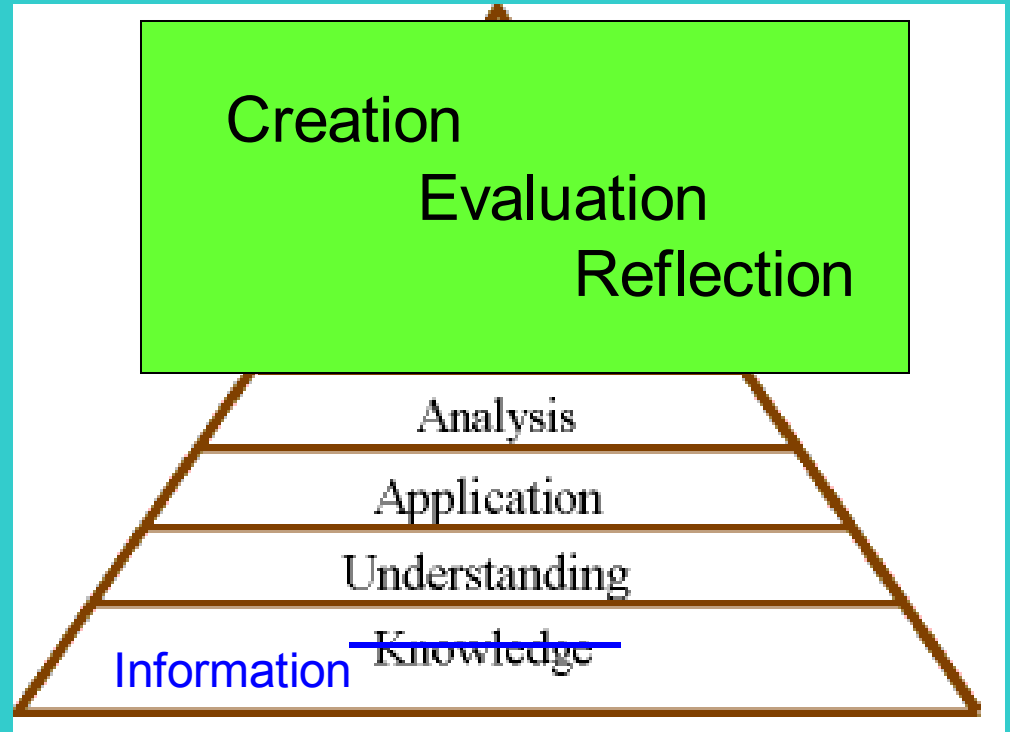
Case Studies: Real-life stories written with an educational mission (Garvin 2003)

'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.



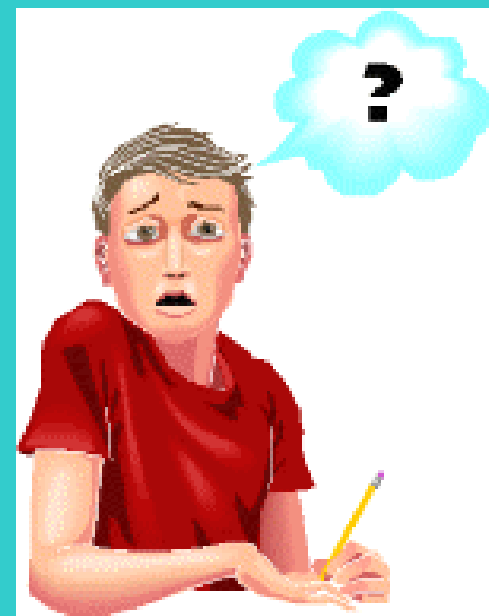
Case study learning is not easy for students --

"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

Address  <http://ublib.buffalo.edu/libraries/projects/cases/case.html>

National Center for



Case Study Teaching in Science

Summer
Workshops

Case Method
Teaching

UB Case Study
Collection

Case Study
Teachers

Journals

Fall
Conference

Case Ideas

Other Web
Case Sites

Related
Sites

Professional
Societies



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 !