Texas Success Center
Guided Pathways Institute #6: Critical Thinking

April 24-26, 2019

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Learning Outcomes

By the end of this session, I hope you comprehend:

- Reflective Judgment as a type of Critical Thinking
- Deductive Reasoning as a type of Critical Thinking
- Design Thinking as a type of Critical Thinking

To comprehend means that you can:

- Describe key features
- Create diagrams showing important relationships
- Explain the ways that components fulfill their function

Learning

Learning is mostly limited to those situations in which the brain is in the mood for it. Putting yourself into a learning mode: alert, focused, engaged, motivated, and ready for action turns the “brain plasticity switch” on and the brain releases the chemicals that enable the brain to change, i.e., to learn.

If you are disengaged, inattentive, distracted, sleeping, doing something without really thinking about it, or performing an action that requires no real effort, **your switch is off**.

Ten fundamentals of brain plasticity, Dr. Michael Merzenich

Agenda

- Introduction and Learning Outcomes
- Trends in Higher Education
- The purpose of today's workshop
- Perry's model of intellectual development
- King & Kitchener's model of reflective judgment
- Belenky et al. Women's Ways of Knowing
- Developing, assessing & describing reflective judgment
- Critical thinking that is not reflective judgment
- Marzano's taxonomy
- Why are we doing this, again?
- ACGM/WECM Learning Outcomes

List of Handouts

- Critical Thinking Assessments
- Critical Thinking Fables
- Reflective Judgment Model
- The New Taxonomy

Trends in Higher Education

Trends in Higher Education

- Faltering confidence in higher education as a whole
  - The top trend cited by the CEO of Achieving the Dream is "Confidence in the value of higher education is eroding and skepticism is increasing.”
  - Gallup polls reveal that…
  - 80% of US adults agree or strongly agree that “colleges and universities need to change to better meet the needs of today’s students”
  - 58% of US adults believe “US higher education is the same or worse than it’s been in the past.”
  - 97% of US adults say it is very important to somewhat important to have a certificate or degree beyond high school
  - 41% of US adults, in the last 12 months, have thought about going back to get a certificate or degree

Career Pathways Report – Georgetown CEW

- **No one really knows what a postsecondary credential represents.**

  Today's ecosystem of postsecondary credentials is complex, fragmented, and multilayered, and presents significant challenges to learners, employers, and policymakers. We don't know enough about the learning and competencies required to receive specific credentials. Employers traditionally have used specific credentials as signals of workers' competencies. But today they are unable to assess the value of different credentials and want to know how their underlying competencies match job requirements. Without clear, comprehensive, and actionable information, mediocrity prevails, and reputation rather than quality (captured by earnings returns) is rewarded.

- Career Pathways Report

The Future of the Degree - Chronicle

- The credential market has been stable for a long time with easily recognizable names, such as bachelor's and master's, and an academic taxonomy understood by those responsible for hiring. But the recent explosion in credentials has caused chaos in recruiting and academic circles. What do these new credentials mean? How do they prove that students have learned something? And most of all, who gets to decide?

Employment Tests - Chronicle

- When it comes to hiring, many employers still lean toward graduates from name-brand institutions. Yet those employers don't entirely trust what a college degree represents. Does it really mean you can get the job done? More and more, their answer is no.
- That's a problem, and some education groups and companies think they have a way to fix it. Their idea: simple tests that employers can use to measure whether college graduates and others are really ready for the jobs they apply for.

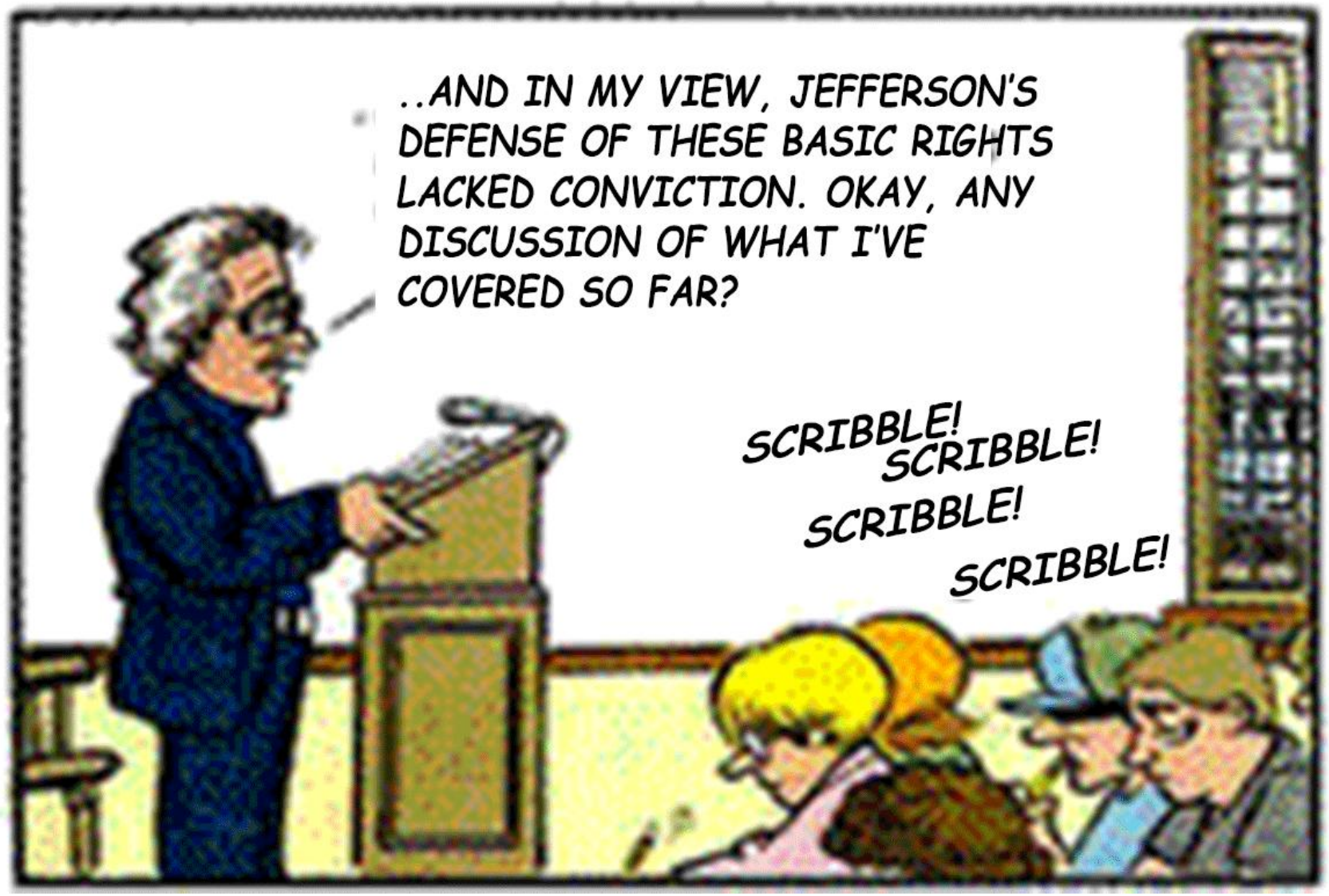
In Summary…

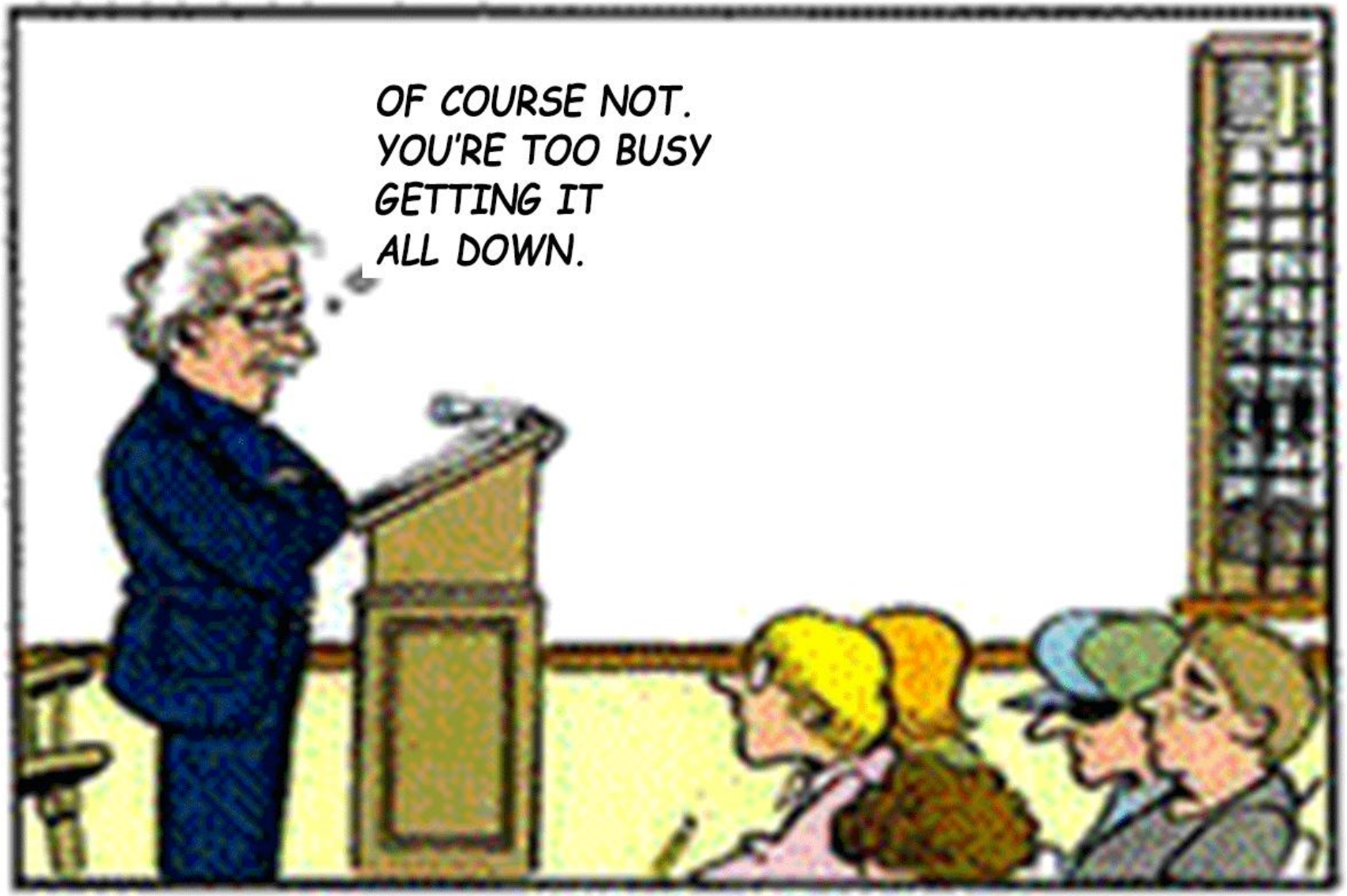
- The meaning of a degree or certificate is being questioned at all levels of American society
  - Students
  - Parents
  - Employers
  - Colleges and Universities
  - Non-college Providers of Higher Education
  - Think Tanks and Foundations
  - Policy Makers at the Local, State and National Level

Our Work Today

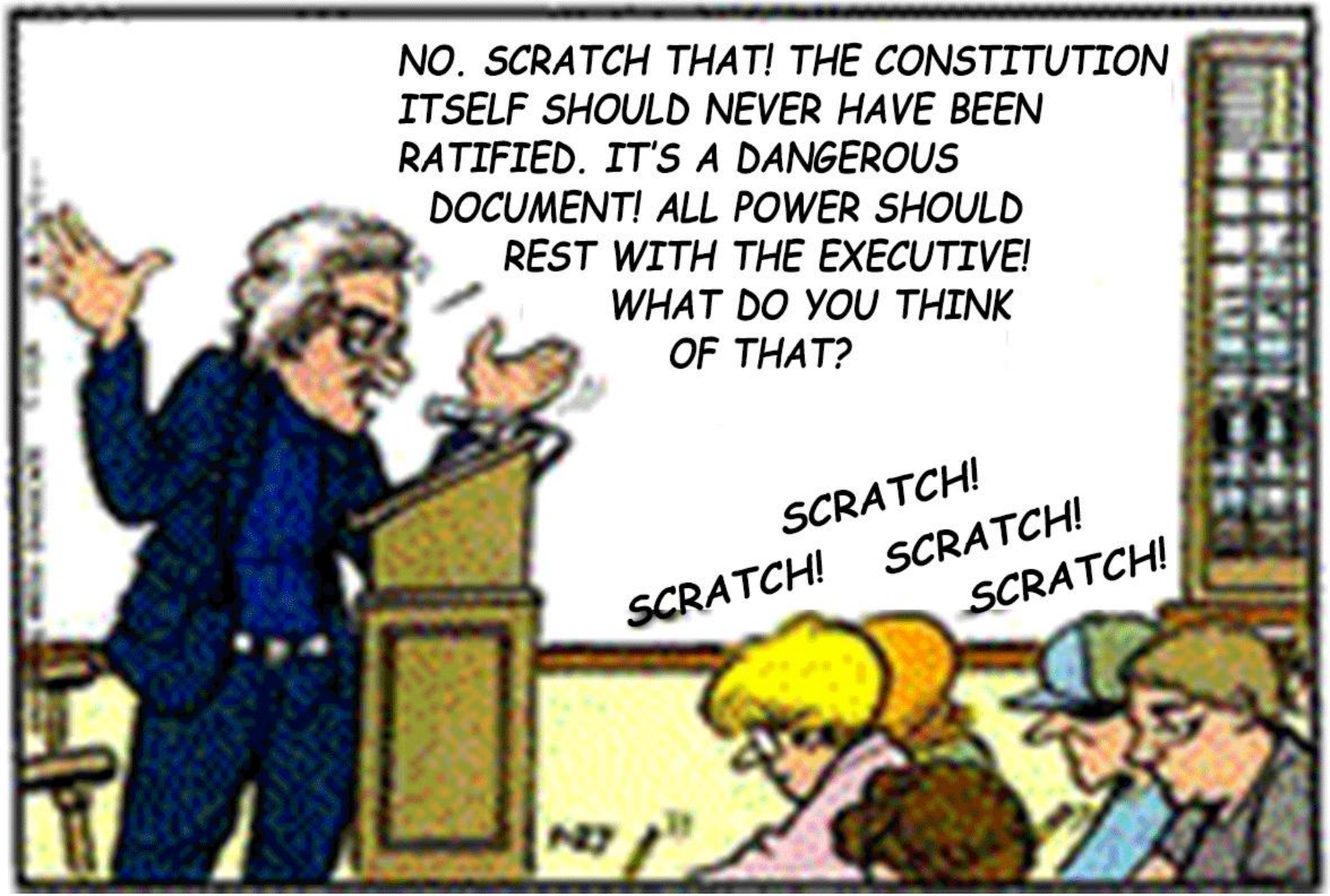
- Take a deep look at “critical thinking,” which is often cited as the most important learning outcome in higher education.
- Look at a taxonomy of learning outcomes.
- Look at some of the course goals in the ACGM/WECM.

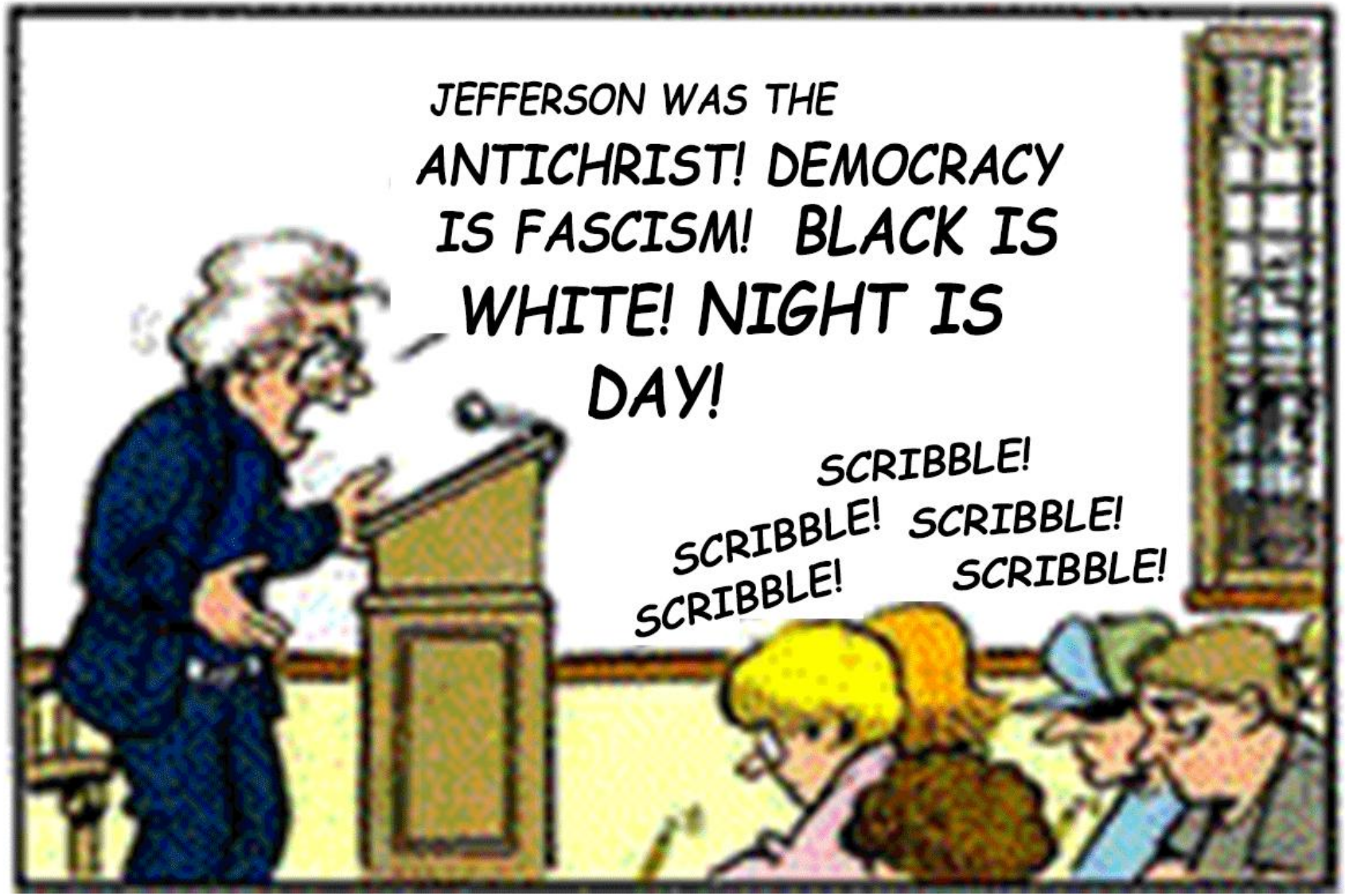

Doonesbury
BY
G. B. TRUDEAU

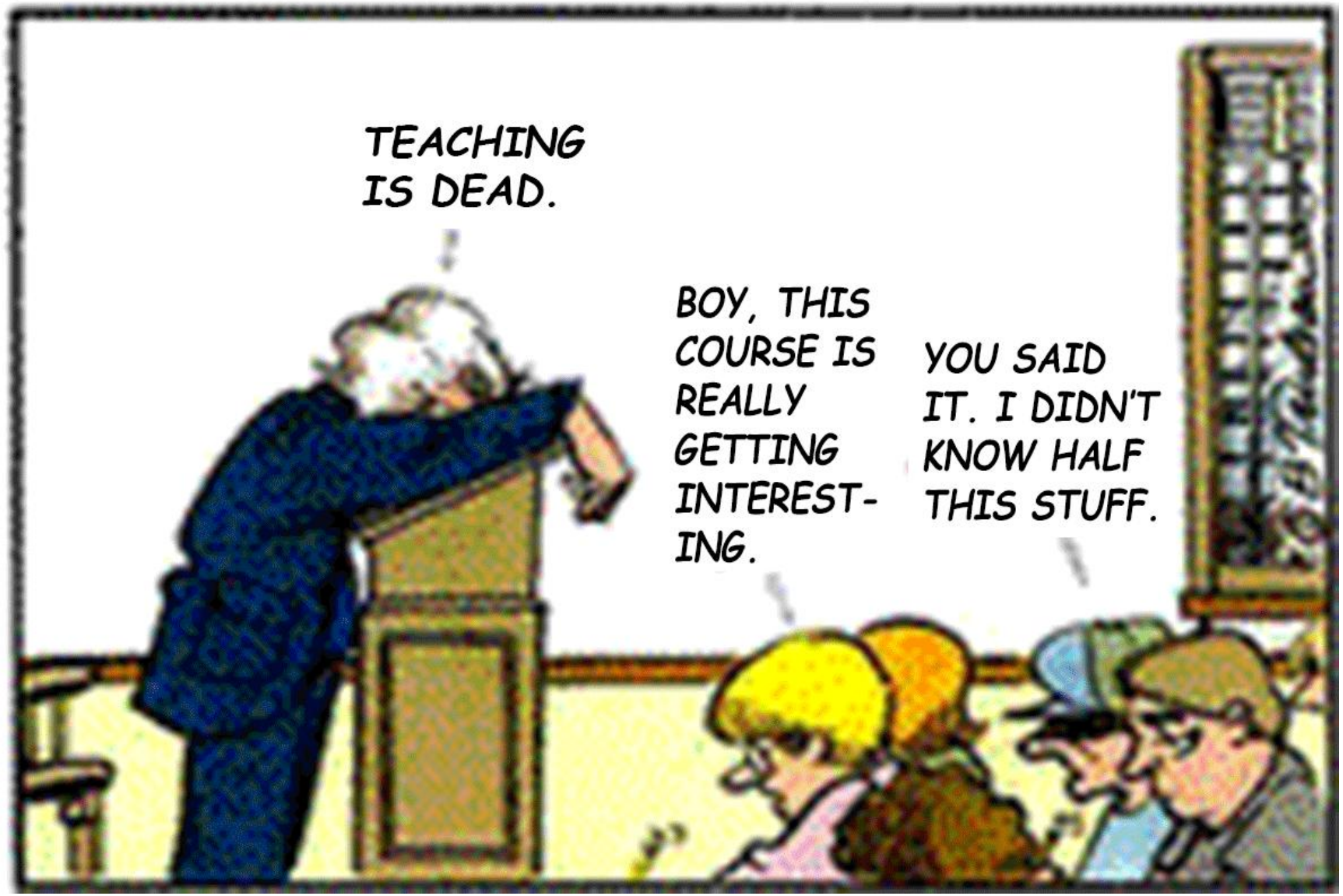

..AND IN MY VIEW, JEFFERSON'S DEFENSE OF THESE BASIC RIGHTS LACKED CONVICTION. OKAY, ANY DISCUSSION OF WHAT I'VE COVERED SO FAR?
SCRIBBLE!
SCRIBBLE!
SCRIBBLE!
SCRIBBLE!


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

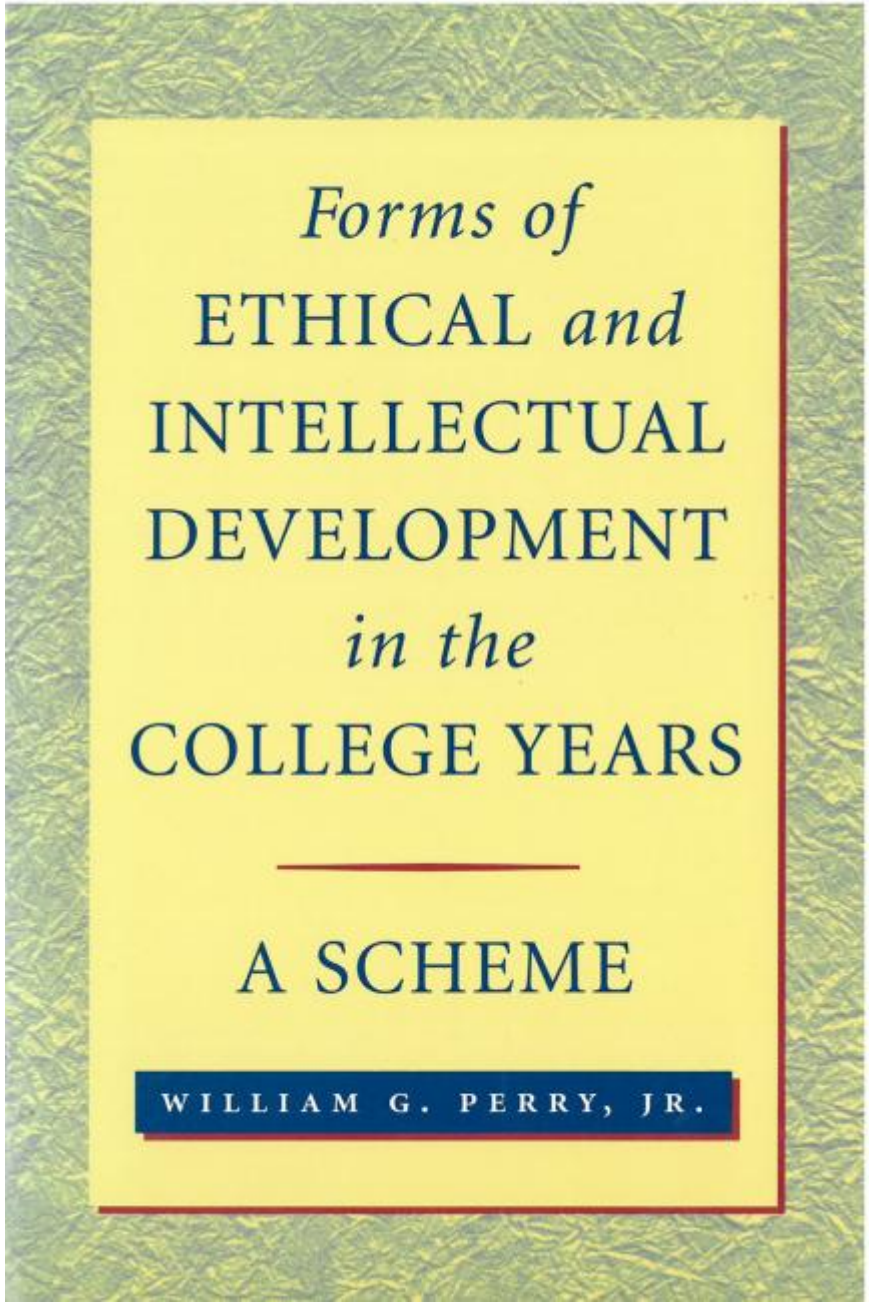

LET ME JUST ADD THAT PERSONALLY I BELIEVE THE BILL OF RIGHTS TO BE A SILLY, INCONSEQUENTIAL RECAPITULATION OF TRUTHS ALREADY FOUND IN THE CONSTITUTION. ANY COMMENT?
SCRIBBLE!
SCRIBBLE!
SCRIBBLE!


NO. SCRATCH THAT! THE CONSTITUTION ITSELF SHOULD NEVER HAVE BEEN RATIFIED. IT'S A DANGEROUS DOCUMENT! ALL POWER SHOULD REST WITH THE EXECUTIVE! WHAT DO YOU THINK OF THAT?
SCRATCH!
SCRATCH!
SCRATCH!
SCRATCH!


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


TEACHING IS DEAD.
BOY, THIS COURSE IS REALLY GETTING INTEREST-ING.
YOU SAID IT. I DIDN'T KNOW HALF THIS STUFF.

Perry's Model of Intellectual Development (1968)



Dualism (most common in high school)

- All knowledge is known. All problems are solvable.
- The people with the Answers are the Authorities.
- Education works like this: on Sunday, God gives lecture notes to the professor, then from Monday to Thursday the professor transmits this knowledge to students, and on Friday the students take a test to show they have received this knowledge.

Dualism (continued)

- The job of a student is to learn the Right Answer. Students who are dualists get frustrated when professors ask them:
  - to offer their own opinion
  - to defend an opinion
  - to critique ideas presented by other students or the professor
  - worst of all: to figure out an answer themselves (THAT'S THE PROFESSOR'S JOB!)

Multiplicity (most freshmen are at this stage)

- Some problems have not been solved or will never be solved, and for these problems there are different opinions, including my own opinion.
- Until The Answer is found, all opinions are equal; experts do not have better opinions than novices.
- If I develop my “inner voice” or “gut instinct,” I can have opinions that are just as good as my professors’.
- The job of a student is to make stuff up that sounds good, or, in the vernacular, bullshit.

Multiplicity (continued)

- Multiplicity only becomes evident when we ask students to address questions without Right Answers.
- Students who are multiplicitists get frustrated when professors ask them:
  - to defend their opinions
  - to value the professor's opinion above their own
  - to do research (What's the point if The Answer is not known! Duh!)
  - to evaluate their own opinion (What is there to evaluate? It's an opinion!)

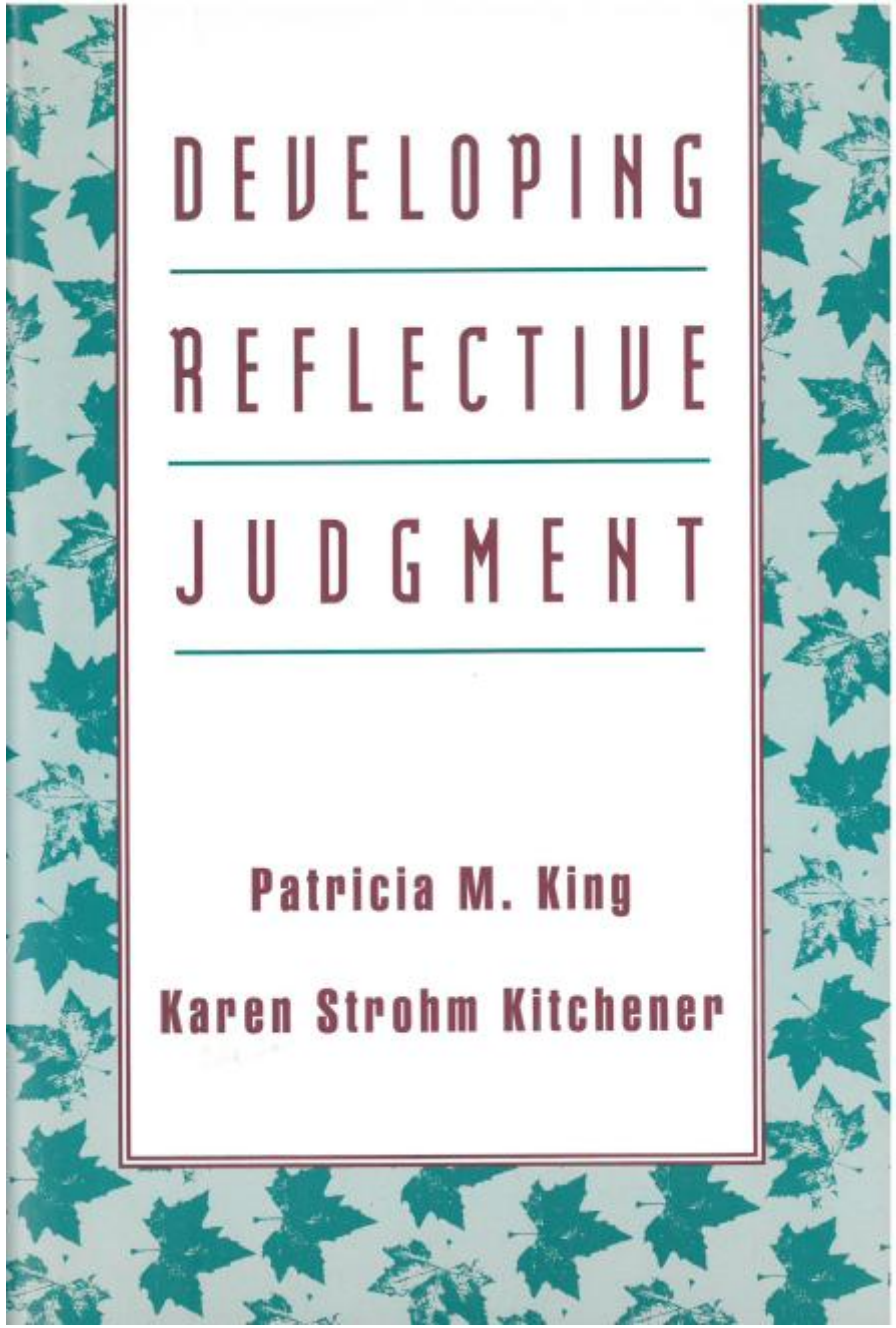
Relativism (seniors may reach this stage)

- Some questions have no right or wrong answers, but not all answers are the same because each discipline has rules and procedures, and answers that follow those rules and procedures are better than answers that don’t.
- I need to understand and apply the rules and procedures of my discipline. The job of a student is to have a good explanation, i.e., an explanation that obeys the rules and follows the procedures of the discipline for each step on the path to an answer.
- Students at the relativism stage get frustrated when:
  - the other students in their classes are in lower stages
  - professors are teaching to students in lower stages

Commitment

- A characteristic of academic inquiry is that while we do have rules and procedures, there are still a lot of choices to be made.
- The choices reflect underlying beliefs from a “school of thought.” Are you a behaviorist or a cognitivist or a structuralist? Capitalist or socialist or anarchist? Free market or regulated markets? Calvinist or Lutheran or Arminian or …?
- The job of a student is to integrate personal experience and the beliefs formed from that experience with knowledge learned from others.

King & Kitchener's Reflective Judgment (1994)



The Study of Critical Thinking

- Perry's model was based on observations of Harvard students from the 1950's and 1960's: white, male, academically gifted, wealthy, traditional age, unmarried, studying full time, and living on campus.
- King & Kitchner reevaluated Perry's model using evidence from a representative sample of students, and developed a model with many similarities but also some key differences.
- They limit their investigation to how students respond to unstructured problems: how to address poverty and hunger, how to make up for historical injustices against blacks, how to confront the drug addiction crisis, etc.

Pre-reflective (high school students)

- I know what I have seen and experienced directly.
- I know what Authorities have told me.
- Knowledge is absolute and I don’t question it.
- This is similar to Perry’s Dualism.

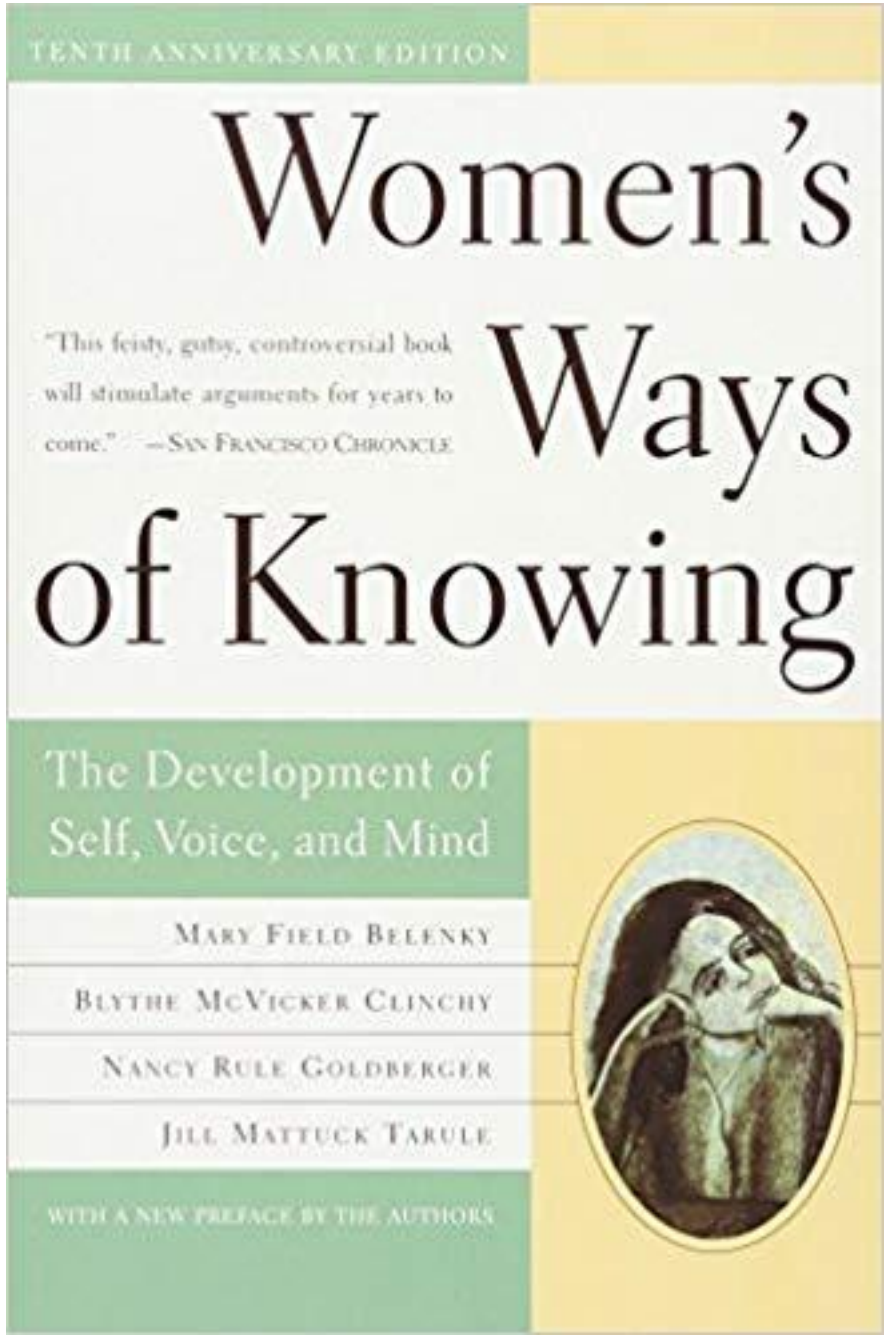
Quasi-Reflective (undergraduates)

- Knowledge is not certain because people make mistakes, information can be inaccurate or lost, and people can interpret information differently.
- Students use evidence but use it inconsistently or in a one-sided way, and if they provide conflicting evidence they do not deal with the conflict but just use “intuition” or “gut feel” to draw a conclusion.
- Students view judgments as idosyncratic.
- Similar to Perry’s multiplicity stage: “everyone has their own opinion.”

Reflective (advanced graduate students)

- Knowledge is actively constructed through a process of investigation and evaluation.
- Claims cannot be made with absolute certainty, but we can make reasonable judgments by evaluating data, and claims should be reevaluated as new data or methods become available.
- Similar to Perry's Relativist stage where solutions are found by following rules and procedures of the discipline.

Belenky, Clinchy, Goldberger, and Tarule Women's Ways of Knowing (1986)



The Study of Critical Thinking

- At about the same time as King and Kitchner were developing their Reflective Judgment model, a group of four researchers, Belenky, Clinchy, Goldberger, and Tarule, were observing the cognitive development of women.
- The researchers believed that issues and experiences that are gender specific have a significant impact on cognitive development.
- The researchers studied a population of women who were diverse in age, class, education, and race/ethnicity, and included women who had never been to college.

Silence

- This describes women who feel isolated, fearful of authority, and disconnected from knowledge.
- These women could not imagine declaring anything with certainty, even to themselves.
- Words were experienced as weapons or a means of control more than containers of information.
- There is no analog for this stage in Perry's or King and Kitcheners' models.

Received Knowledge: Listening to the voices of others

- Women in this stage view knowledge as absolute truth that comes from The Authorities.
- Learning involves repeating what authorities have told you.
- This is similar to Perry's dualists.

Subjective Knowledge: The inner voice

- Women in this stage have discovered their "infallible gut" as a source of truth and knowledge.
- While this is similar to Perry's Multiplicity (everyone has their own opinion), the researchers describe the intensity of belief in the power of intuition or "gut feel" and the rejection of external Authority in much stronger terms than other researchers.

Procedural Knowledge: Separate and connected knowing

- Women in this stage recognize multiple sources of knowledge: authorities, gut feel, and procedural knowledge, which comes from following a set of prescribed steps, e.g., the scientific method.
- Procedural knowledge allows students to use knowledge from outside of personal experience and enables them to accept authority without absolute obedience to it.
- This is roughly parallel to Perry's Relativism (answers are found by following the rules and procedures of your discipline).

Constructed Knowledge: Integrating the voices

- Women discern the difference between knowledge, knowing and the knower, and understand that knowledge is constructed, changes over time and depends on each person's experience and context.
- Constructed knowledge involves a capacity to feel connected with another person despite enormous differences while retaining the authority of their own voice.
- This is somewhat similar to Perry's Commitment stage, where personal beliefs (the importance of "the knower") are an essential ingredient in the construction of knowledge.

Developing, Assessing and Describing Reflective Judgment

Guided Pathways Workshop #6

April 25-26, 2019

How do we Develop Reflective Judgment?*

- Discuss controversial, ill-structured issues with students throughout their educational activities.
- Show respect for students' assumptions, regardless of the developmental stage(s) they exhibit.
- Create many opportunities for students to analyze others' points of view and develop and defend their own points of view about controversial issues.

*From Patricia M. King’s Reflective Judgment web site at U Michigan

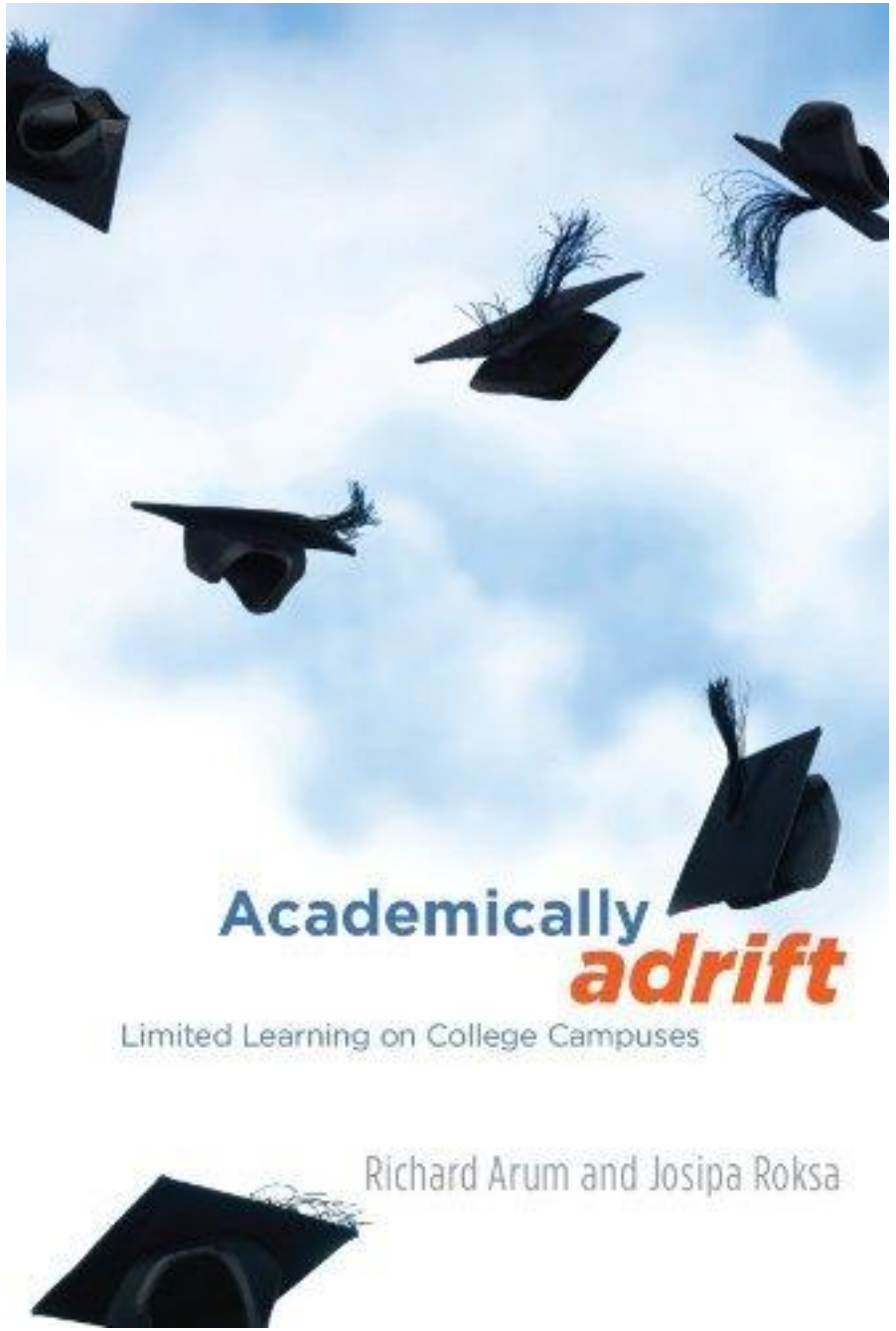
How do we Develop Reflective Judgment?

- Teach students strategies for data, assessing relevance, evaluating sources, and making judgments based on data.
- Give students frequent feedback, and provide both cognitive and emotional support for their efforts.
- Help students explicitly address issues of uncertainty in judgment-making.
- Encourage students to practice their reasoning skills in many settings, from their other classes to their practicum sites, student organizations, and elsewhere.

Assessing Reflective Judgment

- The **Collegiate Learning Assessment** (CLA) is designed to assess critical thinking, analytic reasoning, problem solving, and written communication skills.
- Harvard Case Studies are known for developing critical thinking.
- MyDigitalText developed textbooks emphasizing critical thinking.
- Take five minutes to read the examples, and discuss this question with your neighbors:
  - How important is it for your students to be able to do tasks like the ones described in the assessments?
  - How confident are you that your students would do well on these assessments?

Arum and Roksa Academically Adrift (2011)



How are “we” doing? Not great.

- Academically Adrift is a study of more than 2,300 undergraduates at twenty-four colleges that used the Collegiate Learning Assessment to assess students in their first semester of college and two years later.
- Only a third of students made any progress in critical thinking skills.
- Three factors correlated with critical thinking & communication gains:
  - The perception of high expectations from the professor
  - Students had a class that required 20+ pages of reading per week AND a class (could be the same class) that required 20+ pages of writing during the semester
  - Students spent 15+ hours per week studying *by themselves*.
- The presence of those factors was highly dependent on college selectivity

What Should We Do?

- Don’t shoot the messenger
- Recognize that if we were asked how much our students’ critical thinking skills increased in our degree and certificate programs, we could not answer the question
- Do the work of proving that the learning takes place

Reflective Judgment Course Goals

- Assignments must involve open-ended/ill-defined problems AND you must evaluate reflective judgment skills.
  - the ability to defend a thesis with evidence and reasoning
  - the ability to evaluate conflicting evidence
  - the ability to compare the credibility of different pieces of information
  - the ability to generate multiple possible responses to a controversial situations
  - the ability to acknowledge the worth of opinions different from your own
  - the ability to apply the research methods (procedures) of this discipline to collect evidence and draw conclusions
  - the ability to summarize evidence and identify conflicting data
  - the ability to integrate research findings from other sources into a coherent review

Critical Thinking that is not Reflective Judgment

Guided Pathways Workshop #6

April 25-26, 2019

Critical Thinking Fables

- The Old Engineer and The Hammer (engineering folk tale)
- The Party Hat (Dear Abby 1977)

THECB description of critical thinking: “creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information.”

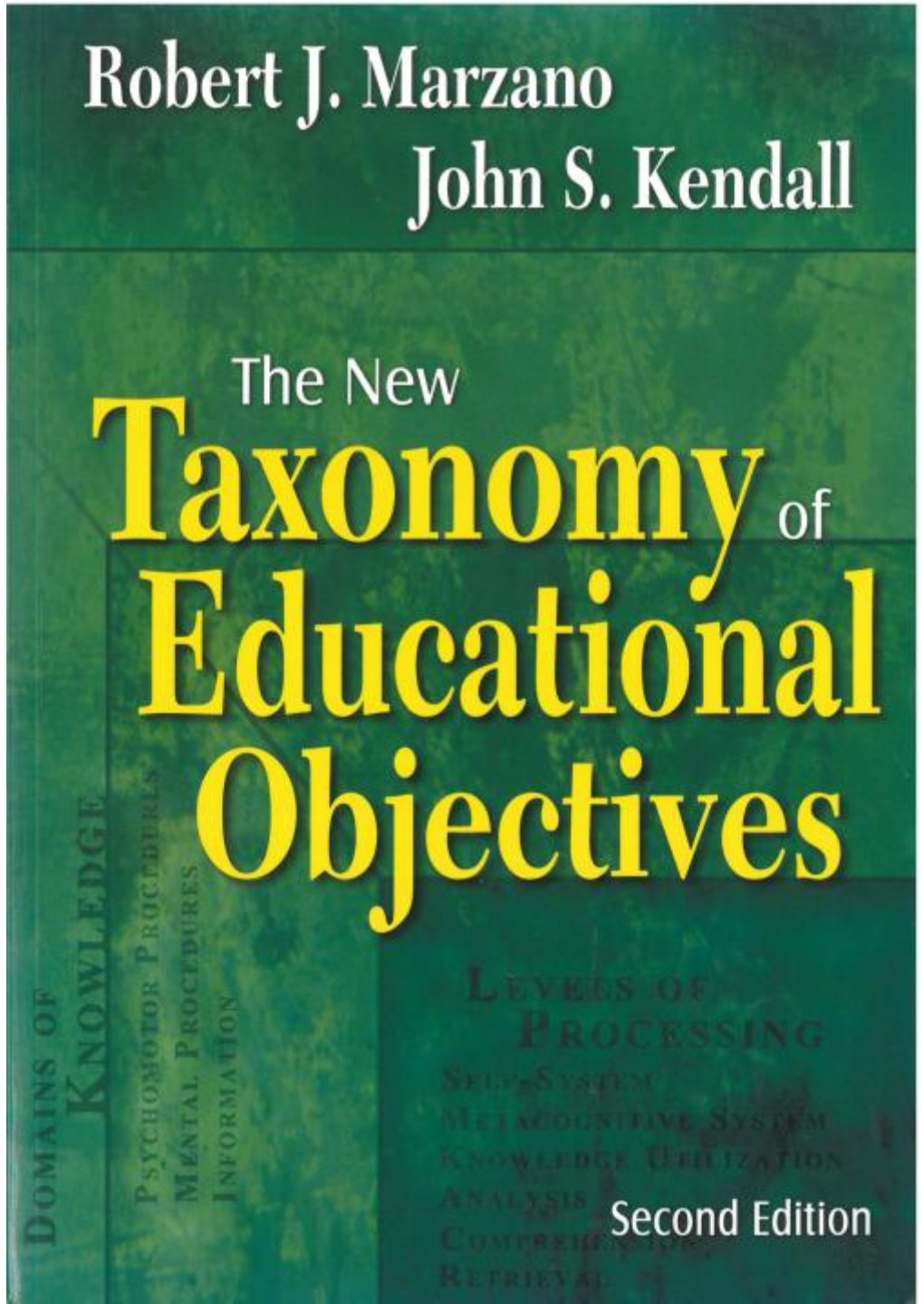
Logic and Deductive Reasoning Examples

- Automotive Technology: Why does this car lose power at 50 mph?
- Criminal Justice: Who committed this crime?
- Engineering: What caused this bridge to fail?
- Network Technology: Why did the system crash?
- Computer Science: Why did the program crash?
- Business: What is the optimal price for this product to maximize profit?
- Health Care: How serious is the condition of this new patient?
- Chemistry: What toxins are in this soil sample?

Creative Design and Evaluation Examples

- Mechanical Engineering: Design a mechanism to transfer traffic cones from a moving truck to the pavement
- Computer Science: Write a program that allows victims of natural disasters to request and receive help via their mobile device
- Pipefitting: Design a piping system to support a small distillation column
- Business: Design an employee performance review process for a small virtual company with a lot of contract employees.
- Criminal Justice: Evaluate the impact of this anti-crime policy on this community.
- Welding: Evaluate the quality of these welds
- Music and Fine Arts: Almost everything they do

Marzano's Taxonomy (2007)



Marzano's Taxonomy

- Marzano's Taxonomy has two dimensions:
  - What type of knowledge is being learned
  - What cognitive process is being applied to the knowledge
- Marzano uses a model of cognitive processes to classify educational outcomes, and does not assume that lower-level processes are less difficult or less important or less valued than higher-level processes.

The Knowledge Domain: Information

- Details
  - Vocabulary Terms
  - Facts about specific people, places, events, and specific things (but not about concepts, principles and generalizations)
  - Time Sequences describing a chronological series of events
- Organizing Ideas
  - Generalizations: statements for which specific examples can be provided. This often involves describing the characteristics of classes of people, places, etc.
  - Cause-and-Effect Principles, which includes understanding the sequence of events, the elements involved, and relationships between elements.
  - Correlational Principles, which includes understanding the general pattern of the relationship and details about the elements.

The Knowledge Domain: Mental Procedures

- Skills: procedures that, with practice, can be executed automatically
  - Single Rules: If X then Y, e.g., rules for capitalization
  - Algorithms: Very specific sets of steps that must be executed in order to produce very specific outcomes, e.g., the procedure for multi-column subtraction
  - Tactics: General rules that work together but do not have to be executed in order, e.g., the rules for reading a histogram
- Processes: procedures that involve many sub-procedures and always require active cognitive control to reach a successful outcome, e.g., the design process, the scientific method, or the writing process. Also known as macroprocedures. **Essential to critical thinking**

Cognitive Processes: Retrieval

- Recognizing: determining whether information that is presented is accurate, inaccurate, or unknown based on comparison to what was presented in lecture or in a textbook
- Recalling: producing accurate reproductions of information that was presented in lecture or in a textbook.
- Executing: accurately carrying out a mental or physical procedure. This can be a low-level task if the procedure is a simple skill, or a high-level task if it is a macroprocedure.

Cognitive Processes: Comprehension

- Integrating: identifying the essential elements of the knowledge and separate them from the non-essential elements.
- Symbolizing: depicting the essential or critical aspects of knowledge in nonlinguistic form using diagrams, graphs, pictures, charts, etc.

Cognitive Processes: Analysis

Analysis can be a skill or a process

- Matching: identifying similarities and differences, e.g., compare and contrast
- Classifying: identifying super- and subordinate categories
- Error Analysis: identifying factual and logical errors in information or processing errors in procedures
- Generalizing: creating new principles or generalizations
- Specifying: predicting what will happen

Cognitive Processes: Knowledge Utilization

- Decision Making: selecting among alternatives that initially appear to be equal or similar
- Problem Solving: accomplishing a goal when obstacles or limiting conditions are present
- Experimenting: generating and testing hypotheses using data collected by (or given to) the student
- Investigating: generating and testing hypotheses about a past, present or future situation based on assertions and opinions of others

Fluency, Working Memory & Critical Thinking

- Fluency is a prerequisite to high-level cognitive processes.
- Many college courses develop fluency, not critical thinking: math, physics, chemistry, biology, accounting, foreign languages, most workforce courses, etc.
- Students who do not achieve fluency will not be able to think critically in their discipline.

Critical Thinking

Critical thinking learning outcomes…

- describe the ability to execute a macroprocedure that is
- controlled by comprehension of organizing ideas and detailed information and
- requires analysis and/or knowledge utilization

Testing Your Critical Thinking Outcome

- Could students demonstrate this outcome…
  - Without comprehending the underlying concepts? (Perhaps they memorized the steps without understanding them.)
  - Without performing the tasks/skills the outcome is supposed to demonstrate? (Perhaps they have an app on their smartphone.)
  - Without demonstrating analysis or knowledge utilization? (Perhaps the outcome only requires retrieval and comprehension.)
  - (For reflective judgment-based outcomes): Without encountering and engaging with one or more of the “difficult tasks for students” at their stage? (Perhaps they are on a team and assign that task to another team member.)

Why Are We Doing This, Again?

12%

Only 12% of presidents strongly agree or agree that most Americans have an accurate view of the purpose of higher education.

Is Higher Education Preparing Students for Work?

99%

of **Chief Academic Officers** rate their institution as very/somewhat effective at **preparing students** for the world of work

13%

of **Americans** strongly agree that **college graduates** in this country are well-prepared for **success in the workplace**

11%

of **business leaders** strongly agree that **graduating students** have the skills and competencies their businesses need

Sources: Lumina Foundation/Gallup Poll 2013, The 2013 Inside Higher Ed Survey of College & University Chief Academic Officers Report