

WHY IS CRITICAL THINKING SO HARD FOR STUDENTS TO LEARN? HOW WE CAN HELP?
Fostering Critical, More Effective Communication, Better Decision Making and More

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Especially pertinent today:

Focuses directly on Higher-Order C.T. Literature review is now dated.

• Nelson, C. E. 1999. On the persistence of unicorns: The tradeoff between content and critical thinking revisited. In B. A. Pescosolido & R. Aminzade, Editors. *The Social Worlds of Higher Education: Handbook for Teaching in a New Century*. Pp. 168-184. Thousand Oaks, CA: Pine Forge Press. http://mypage.iu.edu/~nelson1/99_PersistenceUnic.pdf

More up to date: Active Learning, Misconceptions, Basic Reasoning, Complex Reasoning & Controversial Issues.

Broadly applicable, not just about evolution.

• Nelson, C. E. 2012. Why Don't Undergraduates Really 'Get' Evolution? What Can Faculty Do? Chapter 14 (pp 311-347) in K. S. Rosengren, E. M. Evans, S. Brem, & G. Sinatra (Editors.) *Evolution challenges: Integrating research and practice in teaching and learning about evolution*. Oxford University Press. http://mypage.iu.edu/~nelson1/12_Why_Don't_UGs_Get_Evol.pdf

TODAY: Sophistication in thinking is prerequisite to many of the goals of liberal and professional education including critical thinking, mature valuing, effective oral and written communication and much more. The basic question is: Why are sophisticated ways of thinking so difficult for students to acquire? We will examine two major frameworks for fostering critical thinking and related skills. However, help with cognitive frameworks is only half of our challenges as teachers. For most students, critical thinking is a deeply social enterprise. The most dramatic gains by far come changes that also *carefully structured* discussion and other aspects of social dynamics. An underlying theme will be that critical thinking can often be fostered best by increasing the ratio of support offered for a given level of challenge. This approach applies to ALL students but is even more important for those from non-dominant backgrounds. Mini-lectures will alternate with writing and small- and whole-group discussions of examples and implementation. Participants will be asked to consider and discuss how these approaches might apply in their own teaching, perhaps as soon as Monday morning.

OPENING EXERCISES

- Harvard students, pre-selected re ability & effort.

What do you think would be two important causes when they get into academic difficulty?

- Your Department or Program: ***Faculty's ideas of 2-4 main reasons that more students don't excel at CT?***

MULTIPLE FACTORS AFFECT STUDENTS' ABILITY TO MASTER C.T. +

[Review in Nelson 2012, above]

- *Active v passive methods* p 309 & Tomorrow
- *Readiness for formal and post-formal reasoning* p. 311
- *Misconceptions require conceptual change approaches* p. 313
- *Explicit v Tacit Presentation of Disciplinary Discourse* – Tomorrow, some today
- *Adult cognitive development as reflected in complex thinking* p. 317 Main focus today
- *Understanding is not sufficient for acceptance. & Acceptance is not sufficient for Action.* P 322 & Tonight.

EXERCISE: CHOOSING YOUR HIGHER-ORDER OUTCOMES

→Circle Three Outcomes That Are Very Important For Your Courses. [1-15 From AACU]

→Star (asterisk) Three Outcomes That Are Very Important For New SCC Graduates

→Explain for at least two why that outcome is so important (2 or 3 sentences).

1-15 are from: *VALUE: Valid Assessment of Learning in Undergraduate Education*. Association of American Colleges and Universities. <http://www.aacu.org/value/index.cfm> & http://www.aacu.org/peerreview/pr-wi09/pr-wi09_index.cfm Value Rubrics are available online as PDFs: <http://www.aacu.org/value/rubrics/index.cfm>.

• **Intellectual and Practical Skills:**

1. *Inquiry and analysis.*
2. *Critical thinking.*
3. *Creative thinking.*
4. *Written communication.*
5. *Oral communication.*
6. *Reading.*
7. *Quantitative literacy.*
8. *Information literacy*
9. *Teamwork.*
10. *Problem solving.*

• **Personal and Social Responsibility:**

- 11 & 12. *Civic knowledge and engagement—local and global,*
13. *Intercultural knowledge and competence*
14. *Ethical reasoning*

• **Foundations and skills for lifelong learning:**

15. *Integrative and Applied Learning*

• **I would add:**

16. *Complex decision-making,*
17. *A responsible self*
18. *Collaborative interpersonal interaction.*

• **You may wish to add one or two:**

19. _____
20. _____

KEY RESULTS FROM THE SCHOLARSHIP OF TEACHING & LEARNING

1. Most Seniors graduate from all four-year college programs UNABLE to do such outcomes.
75-80% don't use them spontaneously within courses, over 95% don't use them outside courses
 2. Higher level outcomes **can** be taught effectively in college programs but only if individual courses make outcomes their design focus (v “content”) using **“backwards” course design**
Outcomes → Assessment Focus → Assessment Exercises (using *just* the appropriate content)
 3. The most effective curricula **link sequential courses with increasingly challenging outcomes**
Alverno College: 8 outcomes, 5 levels for each, all 8 taught within each major.
University of Central Arkansas: Honors, One outcomes-focused seminar each semester
- Marcia Mentkowski and Associates 1999. *Learning that Lasts*. Jossey-Bass. (Alverno and beyond)
 - Marcia Baxter Magolda. 2001. *Making Their Own Way: Narratives for Transforming Higher Education to Promote Self-Development*. Stylus. [Fundamental liberal education including critical thinking, mature valuing, & self-authorship]
 - John Bean. 1996. *Engaging Ideas: The professor's Guide to Integrating Writing, Critical Thinking, and Active Learning in the Classroom*. Jossey-Bass.
 - L. Dee Fink. 2003. *Creating Significant Learning Experiences: An Integrated Approach to Designing College Courses*. Jossey-Bass.]
4. SO FAR, Faculty seem to be essential to developing higher order outcomes, if we would just DO IT.
 5. There is VERY extensive research on the development (or not) towards higher order outcomes

First major work:

- W. G. Perry, Jr. 1970 [1999]. *Forms of Intellectual and Ethical Development in the College Years, A Scheme*. (1999 edition with new introduction by Lee Knefelkamp, Jossey-Bass.)

From Perry's SOTL study to a Major Research Program [Perhaps 1000 papers and some 20 books!]

- M. F. Belenky et al. 1986. *Women's Ways of Knowing*. Basic Books.
 - P. M. King & K. S. Kitchner. 1994. *Developing Reflexive Judgment: Understanding and Promoting Intellectual Growth and Critical Thinking in Adolescents and Adults*. Jossey-Bass.
 - B. K. Hofer & P. R. Pintrich (Eds.). *Personal epistemology: The psychology of beliefs about knowledge and knowing* Lawrence Erlbaum Associates. [Several good review chapters on alternative approaches.]
 - M. B. Baxter Magolda. 2000. *Creating Contexts for Learning and Self-Authorship: Constructive Developmental Pedagogy*. Vanderbilt.
 - M. B. Baxter Magolda. 2001. *Making Their Own Way: Narratives for Transforming Higher Education to Promote Self-Development*. Stylus.
 - M. B. Baxter Magolda. and Patricia M. King, Editors. 2004. *Learning Partnerships: Theory and Models of Practice to Educate for Self-Authorship*. Stylus
 - M. B. Baxter Magolda. 2009. *Authoring Your Life: Developing an Internal Voice to Navigate Life's Challenges*. Stylus.
- [For use by students and mentors]

Several Key Perspectives Require Similar Development

- Religious (Fowler) & Multicultural (Bennett) Functioning.
- Professional Ethics, Managing, Working In Organizations, Parenting & Partnering (Kegan)
- Fowler, J. W. 1995. *Stages of Faith: The Psychology of Human Development*. Harper.
- Bennett, M. J. 1986. Towards Ethnorelativism: A Developmental Model of **Intercultural Sensitivity**. Pp. 27-69 in Michael Paige (Ed.) *Cross-Cultural Orientation*. University Press of America.
- King, P. M. and B. C. Shuford. 1996. A **Multicultural View** Is A More Cognitively Complex View. *American Behavioral Scientist*. 40(2):153-164
- Kegan, R. 1994. *In Over Our Heads: The Mental Demands of Modern Life*. Harvard [High-school to 80]

I have tried to summarize how to apply these results to course design

- C. E. Nelson. 1999. On the persistence of unicorns: The tradeoff between content and critical thinking revisited. In B. A. Pescosolido & R. Aminzade, Editors. *The Social Worlds of Higher Education: Handbook for Teaching in a New Century*. Pp. 168-184. Pine Forge.
- C. E. Nelson. 2012. Why Don't Undergraduates Really 'Get' Evolution? What Can Faculty Do? Chapter 14 (pp 311-347) in K. S. Rosengren, E. M. Evans, S. Brem, & G. Sinatra (Editors.) *Evolution challenges: Integrating research and practice in teaching and learning about evolution*. Oxford Univ. Press. [Lit review applies broadly, not just to evolution]

“BACKWARDS” COURSE DESIGN

(Putting the horse before the cart)

Outcomes → Assessment Focus → Assessment Practice Exercises (*just* the appropriate content)

Select most important Higher Level Outcomes (5 or fewer?).

Decide how you want to students to demonstrate each: How you will assess each outcome.

Practice exercises for doing the outcome fully in ways that practice the assessment.

Use the *only* the content that will best allow you to do this until master outcomes.

Content itself is now available on web and is relatively easy to learn. 50% is the new 100%.

Contrast: Course design that starts with content and adds outcomes as an afterthought

TAKE HOME: Fine Example of how to move from content centered to outcomes centered courses and curriculum:

- Robert Kegan & Lisa Laskow Lahey. 2009. *Immunity to Change: How to Overcome It and Unlock the Potential in Yourself and Your Organization*. Harvard Business Press. Pages 109-123: The Medical School: Summary of Bowe et al. (2003 a & b); includes many of the key tables. “*We agree what and how it would be best to teach future doctors—but we aren’t doing either.*” Faculty were *already convinced* that reformed teaching was ideal and desirable, but ...

- Constance M Bowe, Lisa Lahey, Elizabeth Armstrong & Robert Kegan. 2003a. *Questioning the ‘big assumptions.’* Part I: Addressing **personal contradictions that impede professional development**. *Medical Education* 37:715–722. *Done simultaneously* with Bowe et al. 2003b using the same approach to refocus individual commitments.

- Constance M Bowe, Lisa Lahey, Robert Kegan & Elizabeth Armstrong. 2003b. *Questioning the ‘big assumptions.’* Part II: Recognizing **organizational contradictions that impede institutional change**. *Medical Education* 37:723-732.

KEY TOOL FOR HIGHER LEVEL OUTCOMES: EFFECTIVE USE OF RUBRICS

- Rubric task must match and demonstrate desired outcome.

- ***Give rubric and give practice sets to rate with feedback before doing assignments.***

This does *not* mean *explain* the rubrics. Instead, you have to provide ***meaningful, guided practice.***

- Barbara Walvoord & Virginia Anderson. 1998. *Effective Grading: A Tool for Learning and Assessment*. Jossey-Bass.

EXERCISE: ASSESSING YOUR HIGHER-ORDER OUTCOMES

→Start with one of the outcomes you selected on page 2.

How do you, or might you do, a final assessment of how well the students can do it?

How do or might actively provide meaningful, guided practice in doing this assessment task?

Note: Guided practice, NOT just tell them how to do it! NOT just hope they will get it somehow

Should you look at related VALUE Rubrics and see if you can adapt and then teach them?

→Depending on how rapidly you answer for one outcome, you may want to go on to others.

ANOTHER FRAMEWORK FOR FOSTERING CRITICAL THINKING: ACTIVELY TEACH CORE ACADEMIC TASKS

Key Problem 1: *Many students don’t understand how to do core academic tasks.* [Perry. Harvard]

Key Problem 2: *Different courses and disciplines have very different tacit expectations for these.*

Key Problem 3: *Most students who are well prepared had several related advanced courses in HS.*

When I didn’t teach these skills I handicapped students from under-powered backgrounds.

Key Response: **Teach students how to do your core academic tasks including critical thinking.**

= *Get most or all students do what successful (often privileged) students learned to do earlier.*

EXAMPLE: 1. Outcome: Reading for understanding v reading for “what it is about.”

2. Assessment: Summarize an argument (critique it comes later). **3. Guided practice** [NEXT PG]

→ *How does the study question affect the depth to which the students are likely to understand?*

→ *How does the CONTENT of the example help contribute to the development of critical thinking?*

EXAMPLE: Reality Isn't What It Used To Be: Theatrical Politics, Ready-To-Wear Religion, Global Myths, And Other Wonders Of The Postmodern World. Walter T. Anderson. 1990. Harper & Row.

[Study Guide] The first task here is to understand clearly what Anderson says. Then, the task becomes evaluating and applying his ideas. Evaluating does not mean saying whether or not you feel Anderson is right. Rather it means explicitly explaining on what criteria Anderson's argument is strong and on what criteria it is weak. A part of doing this is sometimes to compare his argument with your own experience and knowledge.

STUDY QUESTION FOR P 4-5.

** 2. "The conservative indictment is correct, and yet the strategy that follows from it,..., is doomed to fail." Summarize (i) the indictment, (ii) the strategy, and (iii) the reasons Anderson offers for its inevitable failure. So what, according to Anderson? [Comments in brackets will NOT be on the quiz.] [Include, in your discussion of the reasons for failure, both diversity and the ultimately self-defeating aspects of the strategy.]

TEXT p 4-5 (part):

In small towns all across America, modern and postmodern culture do battle: neighbor turns against neighbor in bitter disputes about whether children should be taught skills of "moral reasoning"--a very postmodern concept--or should instead be taught to accept unquestioningly some rock-solid American values and beliefs. In the circles of higher education, the case is stated by books such as Bloom's *The Closing of the American Mind*, which hammer at the postmodern relativism that (Professor Bloom says) abandons fundamental political principles in favor of a wishy-washy flexibility and recognizes "no enemy other than the man who is not open to everything." Bloom recognizes- and is alarmed by-the extent to which the old view of reality has eroded: "Almost every student entering the university believes, or says he believes, that truth is relative."

Bloom's indictment is quite correct, in a way: most people in Western society today do hold a much more relativistic view of reality. And he is also justified in charging that few of them understand the full implications of this profoundly radical epistemology and instead wander around in a muddled good-guy liberalism that has no clear concept of truth and think all the world's problems would melt away if we just had a tad more tolerance. A postmodern worldview is present among us, yet unformed: it knows neither its own strengths, nor its own weaknesses. We do not know how to live in a world of socially constructed realities, yet we find it increasingly difficult to live in anything else.

The conservative indictment is correct, and yet the strategy that logically follows from it--to rebuild consensus, to get a core of standard values and beliefs in place in every American mind-- is doomed to fail. To see that, you only need to look at the variety of things being offered by people who are in favor of some such consensus building: Professor Bloom offers a restoration of classical Western civilization, and his idea of culture leans strongly to the right. Frances Moore Lappe in her book *Rediscovering Americas' Values* pleads for a similar return to cultural roots, but her version leans equally to the left. Robert Bellah and his coauthors of *Habits of the Heart* want Americans to become less individualistic, more settled and community based, to stop wandering around. James Fallows in *More Like Us* argues for restoring the old American "sense of possibility and openness," our tradition of mobility, our willingness to head for a new job or a new town and start all over. E. D. Hirsch, Jr., in *Cultural Literacy* proposed a list of things we all ought to know about, from Hank Aaron to Zurich, in order to be "culturally literate." Other writers criticize Hirsch's list for being too white-and European-oriented and propose other lists of items from non-European traditions. Still others counsel us to create and unite around new values based on feminism or ecology. All of these proposals make sense, in a way. Each of them looks good to certain groups of people, particularly those whose values and beliefs are the ones being proposed for the national culture. And I am sure the great majority of Americans have never heard of any of these people, or their books.

Humpty-Dumpty is not going to be put back together again. Efforts to do so are ultimately self-defeating, because campaigns to make people choose any particular system of value and belief tend to have the subversive effect of informing people that they are free to choose systems of value and belief. All too often, indoctrinations--even indoctrinations into traditional principles--turn out to be de facto courses in postmodernism.

The metaconflict about beliefs has become a central theme in American politics, and it also echoes around the globe: we can see it in the travails of the Catholic church as it struggles to hold the line against radically new ways of looking at revealed truth, in the reluctant and explosive deflation of doctrine of Marxist nations, in the worldwide proliferation of spiritual and psychological cults that offer new certainties to people

FOSTERING CRITICAL THINKING: ALTERNATIVES, CRITERIA & CATS

[CATs = *Classroom Assessment Techniques*]

1. SET UP ALTERNATIVES TO COMPARE [Critical thinking is usually about comparisons.]

Example: Age of Earth / Universe (Alternatives From Darwin's Time):

1. Then Popular: **A Few Thousand Years**--From Biblical Extrapolation and gravel on Alps.
2. Geologists: **Several Hundred Million Years**--From Rates Of Geological Processes

→ **APPLY: 1-3 Examples of alternatives you want students to compare using critical thinking.**

2. INTRODUCE & TEACH ONE (ONLY) CRITERION: A KEY WAY TO COMPARE.

Example: Fair Tests [Concept]

1. New Kind of Evidence: Not based on same kind of evidence as any alternative being compared
2. Not Biased: Could have supported any of the alternatives

3. USE SIMPLE CATs TO ENCOURAGE & CHECK UNDERSTANDING

Example: Fair Tests [CAT]

[FOR EXAMS: *Be prepared to explain your answers to any of the multiple-choice questions.*]

1. Scientists think that a **fair test** is one that:
 - a) could have shown any of the alternatives to be either probably correct or probably wrong.
 - b) is based on a line of data or reasoning independent of those on which each alternative is based.
 - c) yields a lot of data
 - d) contradicts popular ideas
 - e) supports their own preferred answers
 - f) none of the above, all of the above, or only two of the above

4. DEVELOP SEVERAL EXAMPLES APPLYING THE CRITERION.

Use Simple CATs to Encourage & Check Understanding Of Each Example

5. THEN INTRODUCE ADDITIONAL CRITERIA, GIVE EXAMPLES & DO CATs

The Set Of Criteria I Used: A Scientific Theory Is Better Science [7 Basic Criteria]:

1. If It **Better Matches** The Data From A **Fair Test**
2. If It Is Confirmed By **Multiple Independent Fair Tests**
Age: Cosmic Yardsticks, Radioactive Clocks & Many More
3. If Initially Conflicting Data Can Be Shown To Agree
= **Explanation of Anomalies:** Age: Radioactivity & Kelvin's Estimates
4. If There Are **No Conflicting Lines** Of Scientific Evidence
5. If The Fair Test That Supports It Is **Particularly Strong**
Age: Radioactive Clocks: Internal Checks Agree & Larger Causal Framework Predicts
6. If The Alternatives Are Seriously Defective Conceptually
Ad Hoc: No Data Suggests It
Untestable: When Have To Give It Up Or Modify It? Note That *Many Ad Hoc CAN be Tested!!*
7. If The **Overall Weight of Evidence** Is Greatly In Its Favor
Suppose We Had One Or Two Contrary Lines Of Evidence on Age
Would We Treat Them As Puzzles Or As Disproof?

Key point is NOT these particular criteria. Rather, one needs EXPLICIT CRITERIA that one can USE REPEATEDLY to make several important comparisons within and, ideally, among courses. Experimental design and critique could serve many of the same purposes if it focuses on controls.

KEY TAKE-HOME POINTS

→ *What would you say if asked about the importance of these examples?*

→ *List 2-4 CATs that you use or could use in teaching criteria.* [Muddiest. Write pair ..., M-C questions..]

→ *List 2-4 criteria students can use in your class to distinguish better ideas (etc.) from worse?*

6. EXERCISES FOR PROLONGED [WHOLE PERIOD] DISCUSSION

Example: RECAPITULATION & SYNTHESIS ACROSS TOPICS.

Worksheet For Learning Groups

[Context: Senior course/ Much prior practice using these criteria re better ideas.

Class met three times per week. Two lecture-discussions

One “learning group” each week, used small group discussion based on *structured worksheets*.]

[**Evaluation: Quick, minimal marking.** “Red Pen” approach. All comments in class in red-pen. Prep NOT red.

[*This Was Done For EACH Criterion*]

Explain the Criterion: *Explanation of anomalies* (i.e. initially conflicting data can be shown to agree) in science. Explain how it applies to one example for EACH of the following:

- a) The ages of the earth and universe
- b) The fossil sequence [Darwin’s problem: Most things in oldest known rocks]
- c) Non-adaptive (senseless) “signs of history” v Pure adaptation [Organs of “extreme perfection,” eyes, wings etc.]
- d) Fossil and living structural intermediates (“links”)
- e) Biogeography and Paleobiogeography
- f) Flood v Normal geology

Criteria for the answer to each topic (a through f) [*Note the Scaffolding Here*]:

- Explain the criterion: Explanation of anomalies. Why is this criterion important?
- Explain an important anomaly once faced by the now dominant answer
- Explain how the anomaly was resolved and state the conclusion.

[NOTE: This criterion is not illustrated just by showing that data are an anomaly for some one hypothesis (design or etc.), rather *the anomaly must have been a problem for the now dominant hypothesis.*]

7. ASK STUDENTS TO APPLY THE CRITERIA TO EXAMPLES OUTSIDE YOUR COURSE

Example: CRITERIA AS FUN [Worksheet For Learning Groups]

Before class:

- Write out answers to all questions.
- Examples can be from any non-scientific area including incidents that might causes jealousy, sports, consumer goods, mechanics, business decisions, crimes, mystery novels, issues for/with parents, etc.
- Standards for better answers:
 1. The examples accurately illustrate the criteria.
 2. The examples are interesting (non-trivial, help one understand).
 3. And the examples are fascinating or funny.

In Class: Discuss in Assigned Groups--Modify Worksheet With Red Pen

1. Explain the two criteria: **Fair Tests** and **Multiple Independent Tests**.
 - State what basic task each criterion could be used for outside of science.
 - State a specific non-scientific question to which these two criteria could be or has been applied.
 - Explain at least two alternative possible answers to the question.
 - Explain at least two potential fair tests and indicate which conclusion would be supported by what results from each fair test.
2. Explain the Criterion: **Explanation of anomalies**.
 - State what basic task this criterion could be used for outside of science.
 - State a non-scientific anomaly to which this criterion could be, or has been, applied.
 - Explain how the anomaly was resolved OR a way in which one could try to resolve the anomaly.
3. ... [Did for all basic criteria I used.]

TAKE HOME EXERCISE:

- *Answer the questions above for at least one of my criteria.*
- *Advanced students: Answer for as many of the seven as you you like*

KEY TAKE-HOME POINTS

- *What would you say if asked about the importance of points 6 (Recapitulation and synthesis) and 7 (Apply to own examples)?*

Note that this explains why it takes so much, much work to teach comparisons and criteria!

**ADULT COGNITIVE (HOLISTIC) DEVELOPMENT: PERRY +
Four Modes Of Thinking Relevant To Undergraduates**

After Perry (1970), Belenky et al. (1986), King & Kitchner (1994) & Baxter Magolda (several)
Nuclear Power as an Example

Baxter Magolda:

2/3 1st yr, ~ 1/2 of 2nd

SGT. FRIDAY [DUALISM]

Nuclear Power Either a) Is Really Safe or b) Should Be Totally Banned

One Authority has the Truth: Get the answer from THAT Authority—Teacher, NOT peers

Do not expect to understand WHY an authority supports a particular answer: Just tell me what to learn (memorize)!

I

Transitional (Mix of D & M)

I <----- **UNCERTAINTY**

~ 1/3 1st Yr., ~ 80% Seniors

I

BASKIN ROBBINS [MULTIPLICITY]

Opinions—All Are Equal & Deserve Equal Time

Nuclear Power: Why Argue? Just Respect Each Other!

Each Person's Views are Right For Her: Any view is valid if someone likes it (ice-cream style like).

I

I <----- **COMPARISONS & CRITERIA**

I

Students: TEACHERS' GAMES [CONTEXTUAL RELATIVISM]

~ 1/6 of Seniors

Faculty: Disciplinary Thinking

Making Arguments: Let's Really Understand Everyone's Arguments & Frameworks

Nuclear Power: Environmentalists argue that Whereas economists ...

Within a Game [Framework]: Many opinions are terrible; Some may be strongly supported.

BUT: All internally-coherent games SEEM equally good: Economics, Environmental ...

I

I <----- **CONSEQUENCES & VALUES FRAME**

I

ARGUMENTS

I

OWNED GAMES

~ 2% of Seniors

Contextual Decisions

Some Frameworks / Combinations Are More Appropriate For Particular Contexts

How We Choose Better v Weaker Among Internally-Coherent Games

Nuclear Power: *Safe Enough* for some uses (Submarines)

But *not safe enough* for others (Power-plants in urban areas) *Because ...*

EXERCISE

→On What Parts Of This Spectrum Do The Demands Of Your Courses Currently Fall? Explain.

→Will That Advance Students To Where You Want Them When They Graduate? Explain.

HOW CAN THIS FRAMEWORK HELP US UNDERSTAND STUDENT DIFFICULTIES & TEACH BETTER?

- RECOGNIZE THAT ***DEVELOPMENTAL TASKS TAKE TIME***
- LEARN TO ***BUILD IN SCAFFOLDING*** TO MAXIMIZE PROGRESS

• Ingram, E. L. & C. E. Nelson. 2009. Applications of intellectual development theory to science and engineering education. Pp 1-30 in G. F. Ollington (Ed.), *Teachers and Teaching: Strategies, Innovations and Problem Solving*. Nova Science Publishers.

- LEARN TO ***HEAR STUDENTS' VOICES***

Example: LCQ: Learning Context Questionnaire.

• John Griffith and David Chapman (Davidson College). 1982. *Learning Context Questionnaire*.

- CONCENTRATE ON SUPPORT AND CHALLENGE AT TRANSITIONS:

FIRST PROBLEM:

Students typically start as naïve ***objectivists***. *Faculty* typically are ***constructivists***.

RESPONSES TO FIRST PROBLEM: Foster an Understanding of Uncertainty

Tactics that **Challenge Dualism** (“Sargent Friday”) & **Support Multiplicity** (“Baskin Robbins”)

Tactic 1: Elicit and use “naked” (unsupported) student opinion.

Tactic 2: Use Story-Like Examples.

- Note: I was forced to math and physics examples when students said, interesting but ...
- Read Perry. Sophomoric. What do I know that is really true, besides direct facts? **2+2 = 4?**
- Brilliance of Flat Earth Model: Parallels in Validity Newton and All of Science.

Tactic 3: Explicitly address the scope of uncertainty. Key books and articles include:

• Anderson, W T. 1990. *Reality Isn't What It Used to Be: Theatrical Politics, Ready-to-Wear Religion, Global Myths, Primitive Chic, and Other Wonders of the Postmodern World*. Harper & Row. [Needs study guide.]

• Kline, M. 1980. *Mathematics: The Loss of Certainty*. Oxford University Press. [Use preface with guide]

• John Ioannidis (2005) *Why Most Published Research Findings Are False*. PLoS Medicine August; 2(8): e124.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1182327/> (the most downloaded article in the history of PLoS Medicine.) [Too technical for first-year students. Look at Freeman.]

• David Freedman (2010) *Lies, Damned Lies, and Medical Science*. Atlantic.

http://www.theatlantic.com/magazine/archive/2010/11/lies-damned-lies-and-medical-science/308269/?single_page=true (or <http://bit.ly/11aAmt0>). Summarizes and expands on Ioannidis. Claims that *meta-research experts have confirmed that similar issues distort research in all fields of science, from physics to economics*. [Give a list of possible exam questions as a study guide.]

Tactic 4: Use exercise(s) to get students to choose between literalism and constructivism.

A key issue in literary interpretation, legal and constitutional interpretation, and reading generally:

What is the force of the “original meaning” of a text, such as the Constitution?

Can we recognize the original meaning for sure? Can we just rely on its authority?

NOTE: In teaching critical thinking: *We can only use examples where we value the students' well-argued positions more than we value having the students agree with us*. You will need to find such examples, ones that *make sense in the context of your course*.

• Levinson, S. 1985. On interpretation: The adultery clause of the Ten Commandments. *Southern California Law Review* 58:719-725.

• Nelson, C. E. 2001. Why Should You Publish Your Best Teaching Ideas? *National Teaching and Learning Forum* 10(2):10-11. http://mypage.iu.edu/~nelson1/01_4_WhyPublish.pdf Comments on using Levinson with undergraduates.

→ **APPLY:** What tactics might you use to foster an understanding of uncertainty?

SECOND PROBLEM:

Students typically shift from naïve objectivism into a mix with multiplicity and stay there.

RESPONSES TO SECOND PROBLEM

Tactics that **Challenge Multiplicity** (“Baskin Robbins”)
 & **Support Contextual Relativism** (“Teachers’ Games”)

Tactic 1: Focus on comparisons and on how to use disciplinary criteria to address them.

Tactic 2: Focus on broader aspects of disciplinary thinking.

Use study guides etc. to teach students how to think about the readings in the way an expert in the field would think.

Right Question Institute: Advances a strategy for teaching all people to ask better questions and participate more effectively in decisions. How do we engage students and encourage them to take ownership over their learning? What can we do to help students learn more, produce new ideas and generate creative solutions? <http://rightquestion.org/education/>

APPLY:

→ *How can you explicitly teach students how to think about the readings etc. in the way an expert in the field would think. How can you teach them to think like a historian, or a physicist or ...?*

THIRD PROBLEM:

Even when students understand and use contextual relativism in class, they don’t apply it in the real world, they don’t “own” the approach. Nor do they understand how to articulate it with consequences, tradeoffs and values.

RESPONSE TO THIRD PROBLEM

Tactics that **Challenge Contextual Relativism** (“Teachers’ Games”)
 and **Support Commitment** (“Owned Games”)

*Tactic 1: Explicitly compare frameworks **after** having mastered each one separately*

Example: Interpret Short Story In 2 Paradigms (e.g. New Criticism & Marxist-Feminist) and Justify: Which Preferable for ...

Tactic 2: Focus on contexts, consequences, tradeoffs and situations that call for complex values

More Tactics: Scan chapter 322 on. Or come tonight.

FOR TOTAL WORKSHOP

→ Which Key Ideas Today Are You Using Or Ready To Implement?

→ What Evidence Or Arguments Might Help You Adopt Some Others?

WHY IS CRITICAL THINKING SO HARD FOR STUDENTS TO MASTER?

1. Faculty members usually are not focusing effectively on fostering higher-order outcomes. Requires “Backwards Design.” Select outcomes. Then how assess them. Only then pick content.
2. Thinking more effectively is only partly about thinking. **“You can never go home again.”**
 - *Adopting new culture easier if feel personal connection to your guide, as in graduate school.*
 - Note: This applies to all students but is even more important for those from non-dominant backgrounds. *“From the middle of my first semester they called me their little coconut.”*
 - Further: You **can** go home better as you master more advanced stages of thinking and being. **Context-appropriate code-switching** (v I just *have* to be me).

A DYSTOPIAN VISION FOR THE FUTURE OF COLLEGE EDUCATION

“Fifteen years from now more than half of the universities will be in bankruptcy, including the state schools. In the end, I am excited to see that happen.” Harvard business professor Clayton Christensen

A UTOPIAN VISION FOR THE FUTURE OF COLLEGE EDUCATION

- Pedagogy & Curricula: **Evidence based and theory framed. Current best-practices!**
- Systematic ongoing improvement: **Formative Classroom and Curricular Assessment**
- Take fostering **higher-level outcomes** seriously: **“Backwards” Course Design**
- **Personal connections** to faculty become as core for undergraduates as they now are for many graduate students. *Required by most students for cognitive and personal growth.*
- **Isn’t it worth a real try?**

ASSESSING HIGHER-ORDER CRITICAL THINKING SKILLS

TESTS OF PIAGET'S STAGES

Piaget's formal operations is a prerequisite for most of what faculty think of as critical thinking but only about 25% of traditional age freshman have reached this stage. I have seen several very similar instruments that ask students to solve about a dozen problems. These instruments provide an indication of the extent to which a student has moved from Piaget's concrete operations to his formal operations. **Group Assessment of Logical Thinking (GALT), Piagetian Social Sciences Inventory, and Anton Lawson's Classroom Test of Scientific Reasoning.**

EPISTEMOLOGICAL QUESTIONNAIRES

T. Dary Erwin's Scale of Intellectual Development. 115 items (110 scored) marked on a 4 step scale- strongly agree to strongly disagree. Scales: dualism, relativism, commitment & empathy. Developmental Analytics. PO Box 855, Harrisonburg, VA 22801.

Griffith & Chapman's Learning Context Questionnaire. 50 items (26 scored). Developed 1982 by John Griffith and David Chapman of Davidson College. Contact Chapman, Univ. Minnesota: chapm026@umn.edu

Moore's Learning Environment Preferences, "a recognition measure of the Perry scheme. Scales addressing each of 5 "domains" (including content, roles of teachers and students and peers, atmosphere and activities and evaluation); each domain includes 13 "prompts" which the student rates on a four step scale from not at all significant to very significant ; student also selects the three most significant items from each list. For more information, permission to use, scoring instructions etc., contact: Center for the Study of Intellectual Development, 1505 Farwell Ct NW, Olympia. WA 98502 [wsmoore51@home.com]. See: William S. Moore. 1989. *The Learning Environment Preferences: Exploring the construct validity of an objective measure of the Perry scheme of intellectual development.* *J. College Student Development.* 30:504-514.

Schommer's Epistemological Questionnaire. Non-developmental scheme; 63 items; answers marked on 5-step scale (strongly disagree to strongly agree); 12 subsets (including seek single answers, avoid ambiguity, depend on authority, can't learn how to learn). College version: Marlene Schommer. 1998. The influence of age and schooling on epistemological beliefs. *British J. Educational Psychology.* 68:551-562. For permission to use, scoring instructions, etc., contact her at Wichita [Kansas] State University.

EPISTEMOLOGICAL ESSAYS

Baxter Magolda & Porterfield's Measure of Epistemological Reflection. Short essay answer format with 7 main probes, each with 3 or 4 follow-up questions (Main probes include: major decisions among alternatives, most beneficial method of instruction for you, prefer classes where students talk a lot, hard work results in good grades, can one explanation be more correct than another, etc.). Pp. 420-426 in M. B. Baxter Magolda. 1992. *Knowing and Reasoning in College: Gender Related Patterns in Students' Intellectual Development.* Jossey-Bass. ALSO Pp. 283-289 IN: Marcia B. Baxter Magolda. 1999. *Creating Contexts for Learning and Self-Authorship: Constructive-Developmental Pedagogy.* Vanderbilt. For permission to use, scoring instructions etc., contact her at Miami U. of Ohio.

Knefelkamp & Widick's Measure of Intellectual Development with additional prompts by Knefelkamp & Slepitz and Moore & MacGregor. Each of the four prompts includes several sub-questions and should elicit much of a page of written answer. Usually used in groups of two. For more information, permission to use, scoring instructions etc., contact: Center for the Study of Intellectual Development, 1505 Farwell Ct NW, Olympia. WA 98502 [wsmoore51@home.com].

EPISTEMOLOGICAL INTERVIEWS

Baxter Magolda's Study Interview and Questions. Pp. 411-419 in Marcia B. Baxter Magolda. 1992. *Knowing and Reasoning in College: Gender Related Patterns in Students' Intellectual Development.* Jossey-Bass. For permission to use, scoring instructions etc., contact her at Miami University of Ohio.

CSID's Structured Perry Interview Format. Asks students' views on ideal college education, on differences in beliefs among peers, on decision making with incomplete information, etc. For more information, permission to use, scoring instructions etc., contact: Center for the Study of Intellectual Development, 1505 Farwell Ct NW, Olympia. WA 98502 [wsmoore51@home.com].

King and Kitchener's Reflective Judgment Interview. Protocols with five standard problems and examples of discipline specific problems. Pp. 259-265 in Patricia M. King & Karen Strohm Kitchner. 1994. *Developing Reflexive Judgement: Understanding and Promoting Intellectual Growth and Critical Thinking in Adolescents and Adults.* Jossey-Bass. For permission to use, scoring instructions, etc., contact King at Bowling Green [Ohio] State University or Kitchener at the University of Denver.

Perry's Interview Approach is well described in William. G. Perry, Jr. [1970] 1998. *Forms of Intellectual and Ethical Development in the College Years, A Scheme.* Jossey-Bass.

SOME IMPORTANT BASIC RESOURCES [TAKE-HOME]

AIM HIGH: Focus on Major Outcomes

- Marcia Baxter Magolda. 2001. *Making Their Own Way: Narratives for Transforming Higher Education to Promote Self-Development*. Stylus. [Fundamental liberal education including critical thinking, mature valuing, & self-authorship]
- Marcia Mentkowski and Associates 1999. *Learning that Lasts* Jossey-Bass. (Alverno and beyond)

“BACKWARDS DESIGN.” Use one of these in Designing or Revising a Course:

- John Bean. 1996. *Engaging Ideas: The professor's Guide to Integrating Writing, Critical Thinking, and Active learning in the Classroom*. Jossey-Bass.
- L. Dee Fink. 2003. *Creating Significant Learning Experiences: An Integrated Approach to Designing College Courses*. Jossey-Bass.]
- Grant Wiggins & Jay McTighe. 2000. *Understanding by Design*. Assoc. for Supervision & Curriculum Development.

IS IT WORKING? ASSESS AND DOCUMENT WHAT IS HAPPENING IN YOUR CLASS

Treat ALL assessments as measures of the success of the learning design.

Use Some “CATs:” Check on how any course is actually working:

- Tom A. Angelo & K. Patricia Cross. 1993. *Classroom Assessment Techniques*. 2nd edit. Jossey-Bass. Related examples online as *Classroom Assessment Techniques* <http://www.siu.edu/%7Ededer/assess/catmain.htm> and *FLAG (Field-Tested Learning Assessment Guide for Science, Math, Engineering, & Technology)* <http://www.flaguide.org/>

Course Portfolios.

- Pat Hutchings (Ed). 1998. *The Course Portfolio: How Faculty Can Examine Their Teaching To Advance Practice And Improve Student Learning*. Stylus.
- Daniel Bernstein et al. 2006. *Making Teaching and Learning Visible: Course Portfolios and the Peer Review*. Anker.
- Carmen Werder. 2000. *How to prepare a course portfolio*.
<http://pandora.cii.wvu.edu/cii/resources/portfolios/preparation.asp>

LOOK BROADLY Two Major Collections of Teaching Resources:

- Bernice A. Pescosolido & R. Aminzade, Eds. 1999. *The Social Worlds of Higher Education: Handbook for Teaching in a New Century*. Pine Forge Press [55+ articles]. With a companion CD: *Field Guide for Teaching in a New Century: Ideas from Fellow Travelers*. (Includes 70+ additional items on pedagogical techniques.)
- K. A. Feldman, & M. B. Paulsen, Eds. 1998. *Teaching and Learning in the College Classroom*. 2nd Edit. ASHE Reader / Ginn Press [50+ articles. ASHE = Association for the Study of Higher Education] **Revision in press.**

GREAT FIRST DOWNLOADS: Each offers free summaries of research on key topics

- **IDEA Papers.** Topics include *Improving Lectures, Improving Discussions, Improving Essay Tests, Improving Student Writing, Improving Grading, Evaluating Teaching and many more*. 4-8 pages each, feature both techniques and introduction to literature. Free PDFs
<http://www.theideacenter.org/category/helpful-resources/knowledge-base/idea-papers>
- **POD-IDEA Center, Notes on Instructional Improvement.** Free PDFs. <http://www.theideacenter.org/node/64>
- **POD-IDEA Center, Notes on Learning.** Free PDFs. <http://www.theideacenter.org/PODNotesLearning>

BOOKS TO USE WITH STUDENTS (All on Amazon)

- *Authoring Your Life: Developing an Internal Voice to Navigate Life's Challenges*. Marcia B. Baxter Magolda, Matthew Henry Hall & Sharon Daloz Parks (2009) **
- *Developing Textbook Thinking: Strategies for Success in College*. Sherrie Nist & William Diehl (2001) *
- *Integrations: Reading, Thinking, and Writing for College Success* by William S. Robinson & Pam Altman (2002)
- *Learning to Communicate in Science and Engineering: Case Studies from MIT*. Mya Poe, Neal Lerner, & Jennifer Craig (2010) *
- *Thinking Ahead for College Success: A First Year Student's Guide*. Thomas B. Jones (2011) *
- *Urban Learners: Serious About College Success* (3rd Edition). Robert De Lucia (2002)