Physics 4810 / 7810 Week 7
- more than “content” !

Day 12: Fa2008:
The Hidden Curriculum
- Expectations / Epistemology
- Metacognition
- Affect

Projects

Sweet Notes & Fieldwork

- Great job at applying concepts of readings to fieldwork

  “I noticed that Mr. X was using a *bridging* approach to teach about Newton’s 3rd. It seems similar to the elicit, confront, resolve approach, but without the “you’re wrong” part”
- Keep me posted on projects, I’ll provide feedback on your outlines.

Clarifying points

what is this p parameter in that the author claims to be related to statistical significance? If I just look at the STDev and the gain, it seems that the results are not significant.

What are our goals in class?

Novice		**Expert**
Formulas & “plug ‘n chug”	content	**Concepts & Problem Solving**
Pieces	structure	**Coherence**
By Authority	process	**Independent** (experiment)
Drudgery	affect	**Joy**

think about science like a scientist
think about education like a scientist

Adapted from: Hammer (1997) COGNITION AND INSTRUCTION (physics),

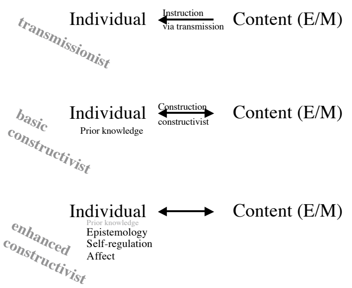
Where are we?

- Theories of cognition
  - Conceptions / Misconceptions (Accommodation)
  - Pieces (p-prims, shema)
  - Content bound to context / situated cognition
- Approaches
  - Elicit / Confront / Resolve; Cognitive Conflict
  - Bridging / Stepwise Development
  - Authentic practice / apprenticeship / play (‘messing about’)
- Built into curricula
  - Tutorials, Peer instruction, ILDs, Context Rich Problems, etc

What are we adding

- Theories of cognition
  - Conceptions / Misconceptions (Accommodation)
  - Pieces (p-prims, shema)
  - Content bound to context / situated cognition
  - Different types of knowledge:
    - regulation processes, framing, and role of situations / environment
- Approaches
  - Elicit / Confront / Resolve; Cognitive Conflict
  - Bridging / Stepwise Development
  - Authentic practice / apprenticeship / play (‘messing about’)
  - Attending to the Hidden Curriculum:
    - Expectations, Metacognition, Affect
- Built into curricula
  - Tutorials, Peer instruction, ILDs, Context Rich Problems, etc

PER Theoretic Background

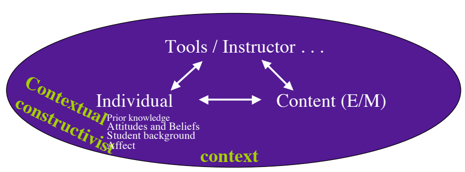


Today

- Expectations / Epistemology
  - Nature of knowing physics
  - Nature of learning physics
- Metacognition
  - Access to knowledge
  - Self regulation / application of knowledge
- Affect
  - Motivation
  - Self-Image
  - Emotion

CAUTION: That's not all!

- In fact we can't really separate all of these because of *CONTEXT*



Student Expectation and Beliefs

Claim: we're pretty lousy at knowing what we know (and don't)

- "2) I think I'm pretty bad at metalearning, how do I teach students this if I'm no good at it myself??"

Role of Expectations

- *Most of my students expect that all they have to do to learn physics is read their text- books and listen to lecture - Redish*
- [Goes on to provide the dead-leaves model p52]
- Where do students get those ideas ??
- Why?

Role of Expectations

- *In addition, their view of the nature of scientific information affects how they interpret what they hear.* -Redish
- View about both *nature of learning* and *nature of science* affects learning science

How to probe?

- I think it is too big of a leap to look at the statistics of how students answered a questions and conclude that their expectations is that "[t]he mathematical manipulation is what's important and what is being tested" (Redish 2003). In my opinion, we should be careful about inferring students' expectations from data that does not directly probe their expectations.

Attitudes and Beliefs

Assessing the "hidden curriculum" - beliefs about physics and learning physics

Examples:

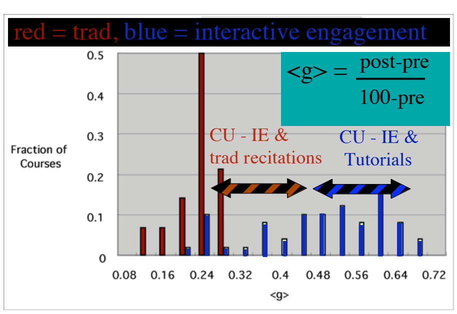
- "I study physics to learn knowledge that will be useful in life."
- "To learn physics, I only need to memorize solutions to sample problems"

Adams et al, (2006). Physical Review: Spec. Topics: PER, 0201010

CLASS categories

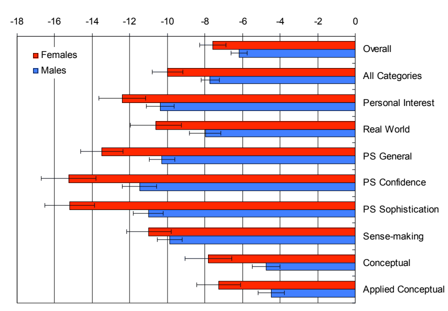
	Shift (%) ("reformed" class)	
Real world connect...	-6	
Personal interest........	-8	Engineers: -12
Sense making/effort...	-12	
Conceptual................	-11	
Math understanding...	-10	
Problem Solving........	-7	
Confidence................	-17	Phys Male: +1 Phys Female: -16
Nature of science.......	+5	
	(All ±2%)	

Force Concept Inventory



R. Hake, "…A six-thousand-student survey…" AJP **66**, 64-74 ('98).

Gender Gaps in Shifts



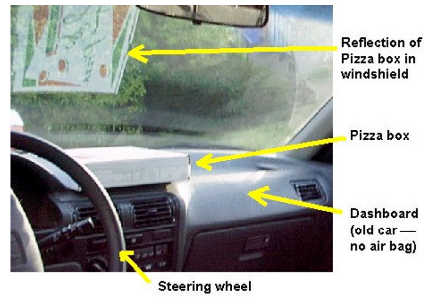
Pre Scores:

F	M
64	66
64	66
62	70
72	74
70	72
69	74
55	60
72	72
63	62
50	52

How do these messages get sent?

"People respond to incentives … How do we get students to develop the "right" incentives?"

Homework Example from 121



Elby's Approach

1. Epistemology lessons embedded into labs, problems, and class discussions
2. "Epistemology" homework and in-class problems
3 Effort-based homework grading, and solutions handed out with the assignment
4. Homework and test questions emphasizing explanation
5. Reduced use of traditional textbook
6. Fluid lesson plans
7. Radically reduced content coverage
8. Instructor commitment to epistemological development

questions from you (for next week)

- Elby seems perfectly willing to sacrifice content at the expense of understanding.
- I thought Elby was a little light on evidence for the need for "wholehearted" commitment to teaching epistemology,
- Also, it would be helpful if students learned these epistemological lessons before they came to college and if they were reinforced in all of their classes.
- How do we teach instructors to focus on this?

Metacognition

- Metacognition refers to the self-referential part of cognition—thinking about thinking. Sometimes these responses are conscious ("Wait a minute. Those two statements can't be consistent."), but the term is also used to refer to the unconscious sense of confidence about thinking ("It just feels right.") - Redish [p53]

Redish claims:

In order for most students to learn how to learn and think about physics, they have to be provided with explicit instruction that allows them to explore and develop more sophisticated schemas for learning

Schoenfeld Approach

- What are you doing?
- Why are you doing it?
- How does it help?

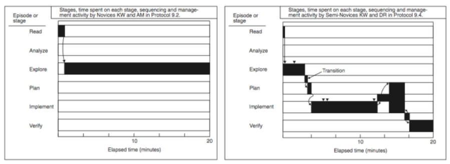


Figure 3.4 Sample plots of student activities in solving math problems in Alan Schoenfeld's metacognitive math class. Small triangles mark metacognitive statements [Schoenfeld 1985].

Teaching Metacognition

- Does it have to be explicit?
- What about implicit framing, or apprenticeship?

Affect

- Motivation
- Self-image
- Emotion

- Why is there so little on this in Redish?

Affect

- Motivation
  - Internal
  - External
  - Weakly motivated
  - Negatively motivated
- Do you buy this?

- "I try to ask more pointed questions that pertain to real life a bit more, and I find that the students are not only more willing to participate, but seem more motivated. Has anyone else seen this?"
- " On page 68 Redish talks about the amount of work students are willing to put into learning. He stresses that it is detrimental to ask for too much before the students are aware of the benefits of learning physics. Is this why the workload in our physics classes is so tame at first, then increases so much around junior year?"