

## Physics 4810 / 7810 Week nine, nicht, niet - what happened?

Day 15: Fa2008:

Assessment

Class-updates:

- you may notice I'm not Noah
- he's off doing something important, no doubt. . .



## What are our goals in class?

**Novice**

Formulas &  
"plug 'n chug"

Pieces

By Authority

Drudgery

**content**

**structure**

**process**

**affect**

**Expert**

Concepts &  
Problem Solving

Coherence

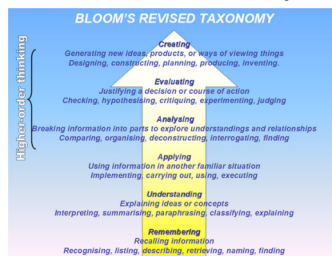
Independent  
(experiment)

Joy

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

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

## Blooms Taxonomy



## For Thurs, expand on Bloom

THE KNOWLEDGE DIMENSION	THE COGNITIVE PROCESS DIMENSION					
	1. REMEMBER	2. UNDERSTAND	3. APPLY	4. ANALYZE	5. EVALUATE	6. CREATE
A. FACTUAL KNOWLEDGE						
B. CONCEPTUAL KNOWLEDGE						
C. PROCEDURAL KNOWLEDGE						
D. META-COGNITIVE KNOWLEDGE						

Fine... those (and others) are our goals... how do we know if we're there ??

- Measurement
- Key distinction:
  - **Formative:** to provide feedback, be a mechanism for learning / change
  - **Summative:** after the fact to measure what happened.
- Key question:
  - When / who would want to use which type?
  - What actually happens?

## Assessment

- Seek to measure what we're after. How?
  - Pre/ Post-Tests
  - Interviews
  - Project-based work
  - Individual / Collaborative
  - Time bound / not-time bound

## Validity and Reliability

### Valid:

- are we measuring what we think we are?
- is the instrument internally consistent?
- would a physicist see this test as physics?

### Reliable:

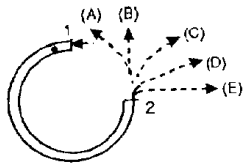
- will students give the same response on two subsequent rounds of inquiry (no teaching in between)?

## A possible “tipping” point

- **Force Concept Inventory\***
- Multiple choice survey, (pre/post)
- Experts (especially skeptics!)
  - necessary (not sufficient) indicator of conceptual understanding.

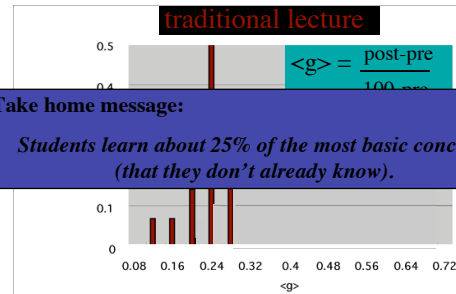
\* Hestenes, Wells, Swackhamer, Physics Teacher 20, (92) 141

## Sample question



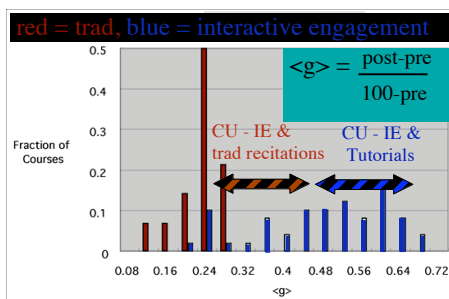
Looking down at a track (flat on table), a ball enters at point 1 and exits at point 2. Which path does it follow as it exits (neglect all friction)?

## Force Concept Inventory



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

## Force Concept Inventory

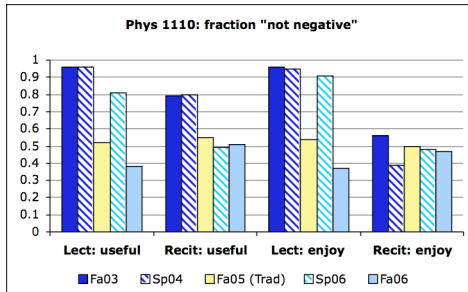


R. Hake, "...A six-thousand-student survey..." AJP 66, 64-74 ('98).

## Other forms of evaluation

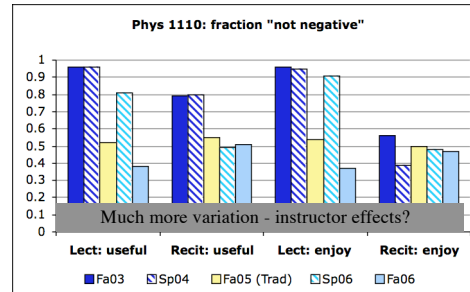
- Grades
- Common Exam Questions
- GRE
- Where people get jobs?
- How happy they are?

### Affect: Tutorials (Phys 1110)



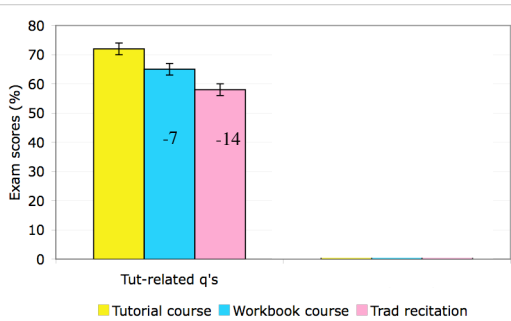
(Missing data for 2 "trad" terms)

### Affect: Tutorials (Phys 1110)



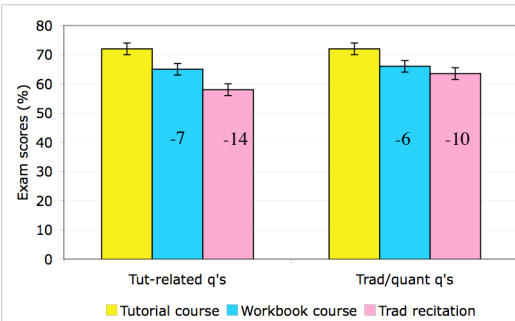
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### Beyond the FMCE: Exam comparisons



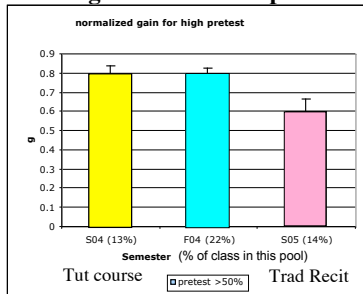
**N.B. 12 points is roughly 1 letter grade.**

### Beyond the FMCE: Exam comparisons



**N.B. 12 points is roughly 1 letter grade.**

### Impact on different pretest populations: "high starters" 50 < pre < 93%



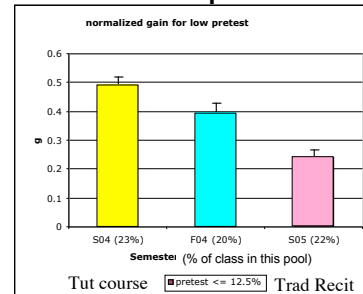
Course

(1)

(2)

(3)

### Impact on different pretest populations: "low starters" pretest <= 12.5%

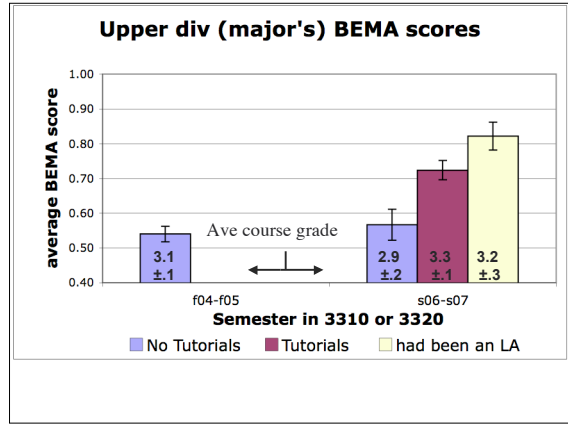
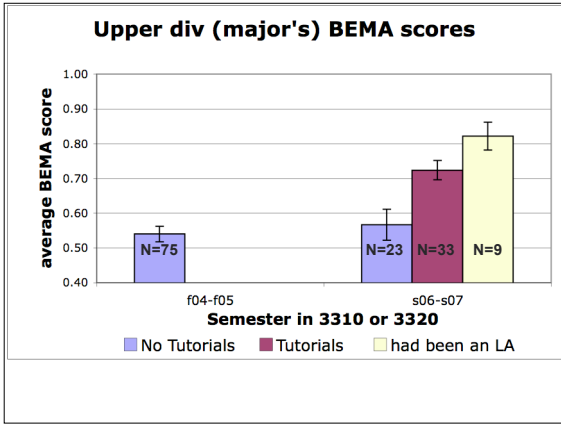


Course

(1)

(2)

(3)



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What's missing?

What are the limitations?

CU "Voluntary" Assessments

Why is the institution interested?

To What End?

- What are benefits?
- What are limitations?