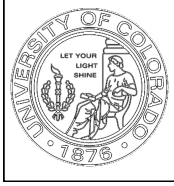
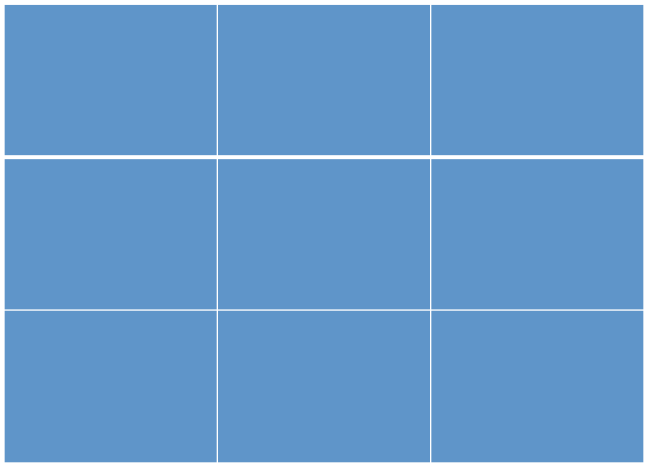
Physics 4460/5460 Week 3 - Situated!

Day 5:
- Situated Cognition
- Metaphors of learning

Fieldwork



How Many did the magic square



Fieldwork

- How is it going?
- Projects?

(yes this is the *authentic practice* we are reading about)

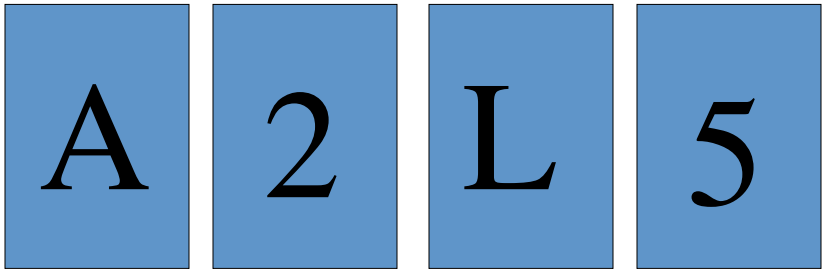
Clarifying Questions

- Do you have any questions of interpretation from the papers?
- E.g. what does *ersatz* mean?

The card game

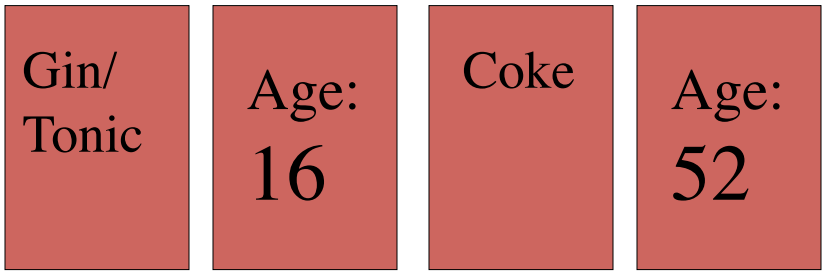
Rule: *If there is a vowel on one side, there is an even number on the other*

Verify the rule for:



The bartender game

- You are a bartender and need to verify that the following drink orders/ ages don't break the law: *if you drink alcohol you must be 21 or older*



Situating Cognition

How can the following make sense?

- 1 is 3
- 3 is 5
- 5 is 4
- 4 is the magic number.

What's a magic number?

How about?

- One is 3
- Three is 5
- Five is 4
- Four is the magic Number?

Largely about CONTEXT

- What do we mean by *context* ?

Latin root of the term, "*contexere*, which means 'to weave together.'"(Cole 1996, p. 135)

Context

- Context is the collection of components and the relations among them – the connected whole which includes constituent elements *and* the relations among them.
- Birdwhistell uses the analogy of a rope to develop such a notion of context:

Context as Rope

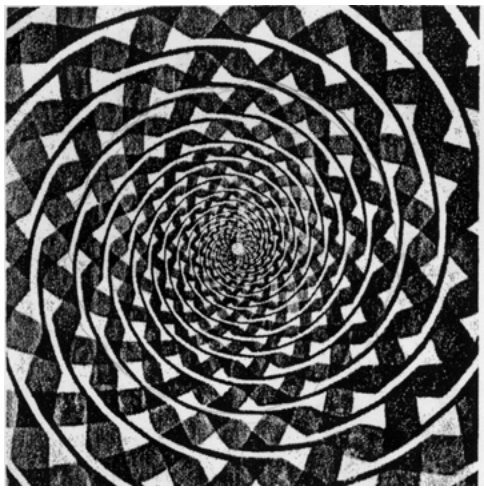
The fibers that make up the rope are discontinuous; when you twist them together you don't make them continuous, you make the thread continuous .... even though it may look in a thread as though each of those particles[fibres] are going all through it, that isn't the case... Obviously, I am not talking about the environment. I am not talking about inside and outside. I am talking about the conditions of the system

(Birdwhistell as quoted in R. McDermott 1993, p. 274).

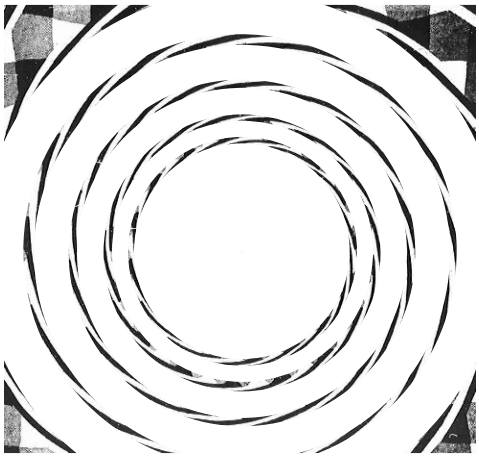
Context

- What roles does context serve?

Foreground / Background

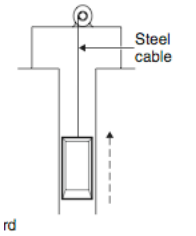


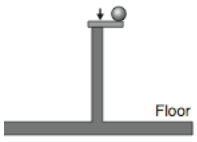
From: McDermott



Context

- How can we get students realize this in practice (use in everyday life)?
- Really? is this all there is to context?





Context

- What roles does context serve?
  - Establish prior knowledge
  - Send message that you know this
  - Create situation that is motivating
  - Physics becomes *a tool* to a natural end

a cultural perspective

- people's knowing / cognition is situated within social, cultural and historical contexts
- what does this mean?

Stroop test

RED	GREEN	BLUE	YELLOW	PINK
ORANGE	BLUE	GREEN	BLUE	WHITE
GREEN	YELLOW	ORANGE	BLUE	WHITE
BROWN	RED	BLUE	YELLOW	GREEN
PINK	YELLOW	GREEN	BLUE	RED

Stroop Test][

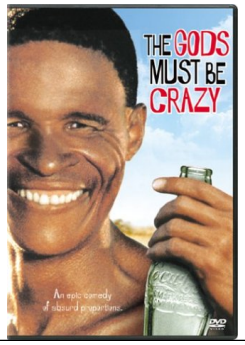
RED	GREEN	BLUE	YELLOW	PINK
ORANGE	BLUE	GREEN	BLUE	WHITE
GREEN	YELLOW	ORANGE	BLUE	WHITE
BROWN	RED	BLUE	YELLOW	GREEN
PINK	YELLOW	GREEN	BLUE	RED

- I don't really know the answer to how to teach culture in a physics class though.
- **How can a physics professor create a culture of physics in a classroom where he or she is outnumbered by 20 to 1, or 50 to 1, or 200 to 1**
- I don't know how not to… [NF]
- I think this is very true for physics instruction. We give students ideas and equations that they are expected to make use of, without also teaching them the cultural norms and what it means to do physics. Not only is this not an effective teaching method, but I think it is unfair to both the students and the discipline.

Physics as a tool . . .

"It is quite possible to acquire a tool but to be unable to use it."

She earned a perfect score on her chemistry final last semester but she doesn't seem to have any idea on how it applies to real life.



Discussion of GOALs / NATURE of physics

- **The way I have always understood this is that the math has the final say, and all the intuitive pictures and metaphors we come up with are ways of helping ourselves to make sense of it, remember it, and apply it to new situations.**

Authentic Practice

- Is "school" not an authentic activity?
- Do students not develop expertise at "school"
- ***I never noticed that the style we teach in during school is different from the way students naturally learned in other subjects as well.***

Goal: Authentic practice (authentic activities… the ordinary practices of a culture)

- **I see 'gaming the system' as contextualized learning, it's just in the very specific context of school and exams. The fact that it exists is proof that we can't ignore context, as much as traditional ideas of education might like to.**

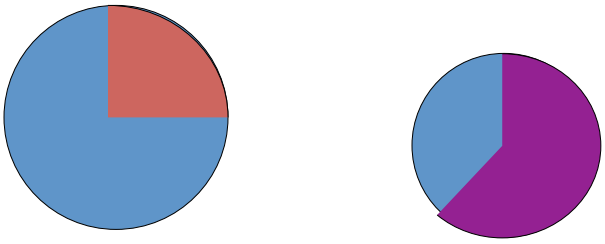
JPFs

TABLE 1.

JPF, Practitioner, and Student Activity

	JPFs	Students	Practitioners
reasoning with:	causal stories	laws	causal models
acting on:	situations	symbols	conceptual situations
resolving:	emergent problems and dilemmas	well-defined problems	ill-defined problems
producing:	negotiable meaning & socially constructed understanding	fixed meaning & immutable concepts	negotiable meaning & socially constructed understanding

Really? Is this better



3/4 x 2/3 = 1/2 ???

Culture

- **I am not really sure what the authors mean by culture. I agree with you in that to teach the culture of "physics" it would be helpful if we focused on what Redish talks about with graphs. However, I think the culture that the authors are talking about goes deeper than this.**
- What is Culture?

Noah's (functional) Definition:
Culture: the historically evolving, collective use of tools, practices and norms.

On Metaphors of Learning

- Acquisition:

  Since the dawn of civilization, human learning is conceived of as an acquisition of something. Indeed, the Collins English Dictionary defines learning as "the act of gaining knowledge." Since the time of Piaget and Vygotski, the growth of knowledge in the process of learning has been analyzed in terms of concept development.

- **I must be deeply embedded in this acquisition metaphor because this IS learning to me. When I was reading this, I was having a hard time understanding how there could be another conception of learning because this one seems so obviously "right."**

On Metaphors of Learning

- Participation:

  In the image of learning that emerges from this linguistic turn, the permanence of having gives way to the constant flux of doing … learning a subject is now conceived of as a process of becoming a member of a certain community. This entails, above all, the ability to communicate in the language

Acquisition		Participation
Acquisition of something	**Learning**	Becoming a Participant
Recipient	**Student**	Apprentice
Provider	**Teacher**	Expert
Property / Possession	**Knowledge**	
	Knowing	Belonging, participating communicating

Adapted from Sfard, 1998

Extend this Figure: provide a pedagogical practice on each side

Pedagogy I	Acquisition		Participation	Pedagogy II
	Acquisition of something	Learning	Becoming a Participant	
	Recipient	Student	Apprentice	
	Provider	Teacher	Expert	
	Property / Possession	Knowledge		
		Knowing	Belonging, participating communicating	
		Measurement/ Assessment		

Metaphors Matter

"…the choice of metaphor is a highly consequential decision. Different metaphors may lead to different ways of thinking and to different activities. We may say, therefore, that metaphors are a double-edged sword: On the one hand… they are what makes our abstract thinking possible, on the other hand, they keep human imagination within the confines of our former experience and conceptions."

-Anna Sfard *On Two Metaphors for Learning and the Dangers of Choosing Just One (pg. 5)*

Redish Gets .. Sort of..

Principle 5: For most individuals, learning is most effectively carried out via social interactions.

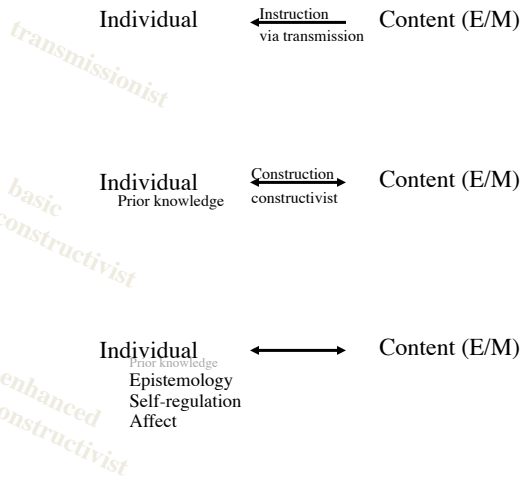
- **Redish's 5th principle here seems to be central to most of the the instructional reforms that we have talked about so far**

A word on learning

??

- All learning is social. Period. (NF perspective)

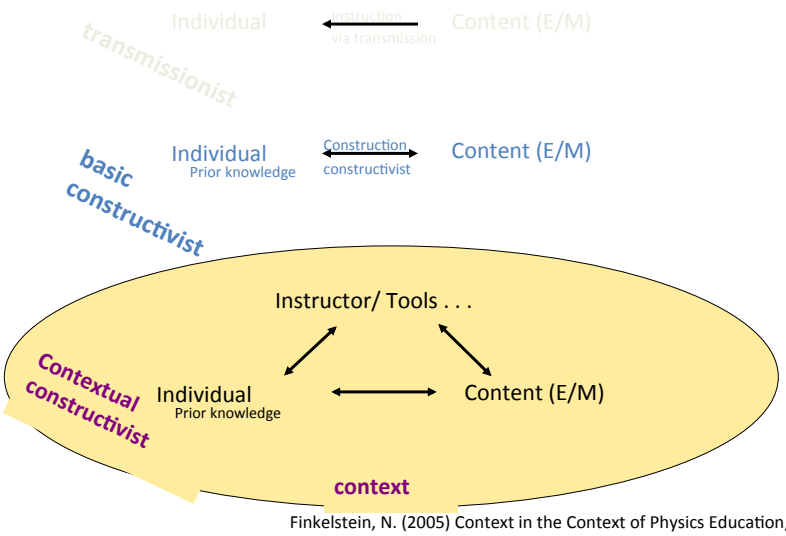
PER Theoretic Background



Context Principle

Principle 2: What people construct depends on the context – including their mental states.

PER Theoretic Background



Finkelstein, N. (2005) Context in the Context of Physics Education, *IJSE*
Finkelstein, N. (2005-2009). NSF CAREER Grant: REC# 0448176

How many people pull?

Toy-theoretical Framework

i. tools mediate our understanding / cognitive processes

ii. context shapes the meaning / use of tools

Finkelstein (2005), adapted from Cole, M. (1996), Cultural Psychology

Tools Allow for Thought

$$\frac{7960.0}{10} = 796.0$$ ← Easy!

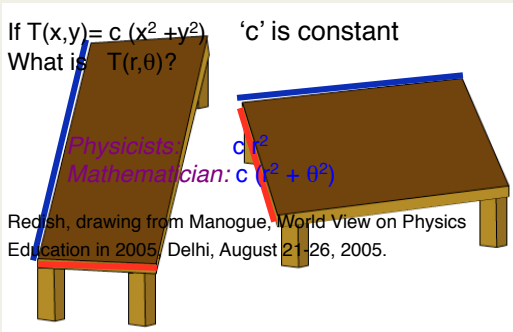
$$\frac{7960.0}{16} = \text{Hard(er)} \Rightarrow \frac{1F18.0}{10} = 1F1.8$$

Decimal (Base 10) *Hex (Base 16)*

Meaning of tools

Evolutionary (biological):

And cultural:



Redish, drawing from Manogue, World View on Physics Education in 2005, Delhi, August 21-26, 2005.

Homework Example from 121

And the last word… .

- **This is a depressing conclusion,**