12th Annual Conference on Teaching and Learning

Making Thinking Visible

What's going on in there?

Bill Cerbin
12th Annual Conference
on Teaching & Learning
August 31, 2010

Making Students' Thinking Visible

Bring to the surface, externalize the mental activity taking place as students learn something

Problem: 1/2 + 1/3 =

Answers of three elementary school children

A. 2/5

B. 2/5

C. About 3/4

The Thinking Behind the Answers

A. First I added the numerators and got 2. Then I added the denominators and got 5. That gave me 2/5.

B. First I changed ½ to 2.1 and then I changed 1/3 to 3.1.
Then I added 2.1 + 3.1 and got 5.2.
Then I changed this back to a fraction, 2/5.

C. Well, I don't know how to add the fractions. But I thought about how big the two fractions are. I imagined a pizza and what ½ and 1/3 of it would look like. It just seemed like if you added ½ a pizza and 1/3 of a pizza you'd get about ¾ of a pizza. I don't know if it's right, it's just kind of an estimate.

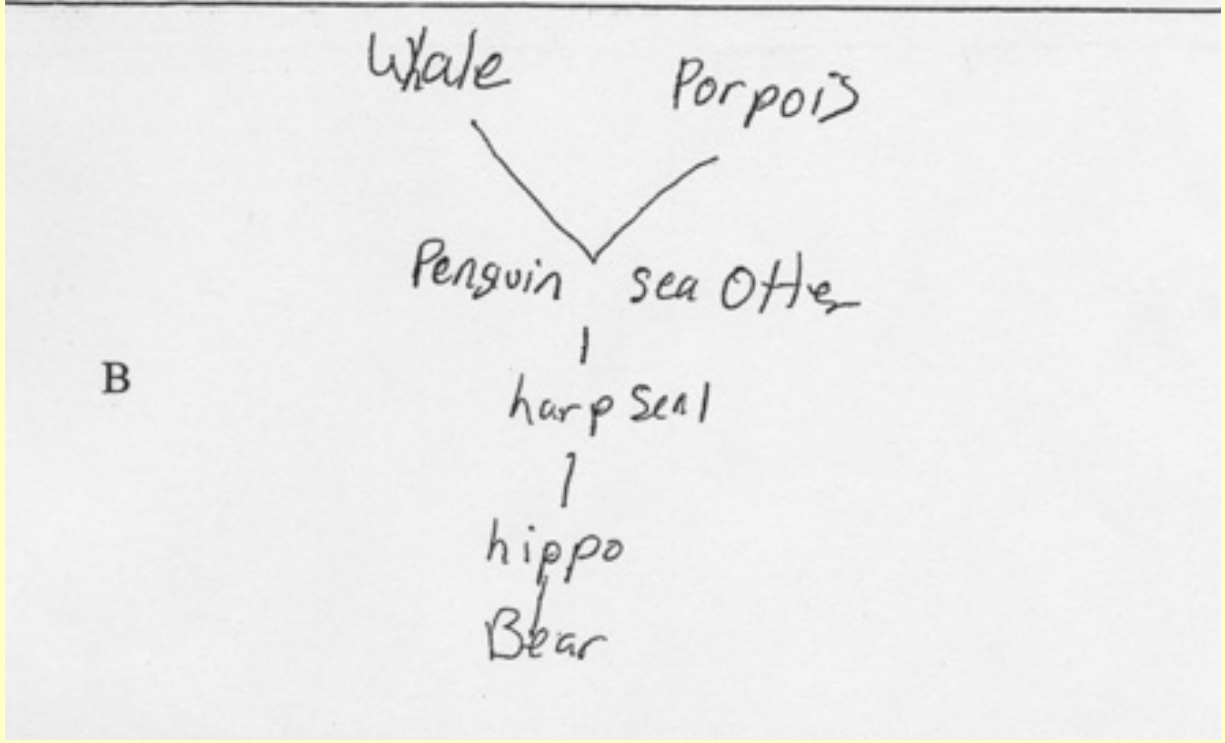
Making Student Thinking Visible in Large Biology Lectures

UW-La Crosse Biology Professor Scott Cooper

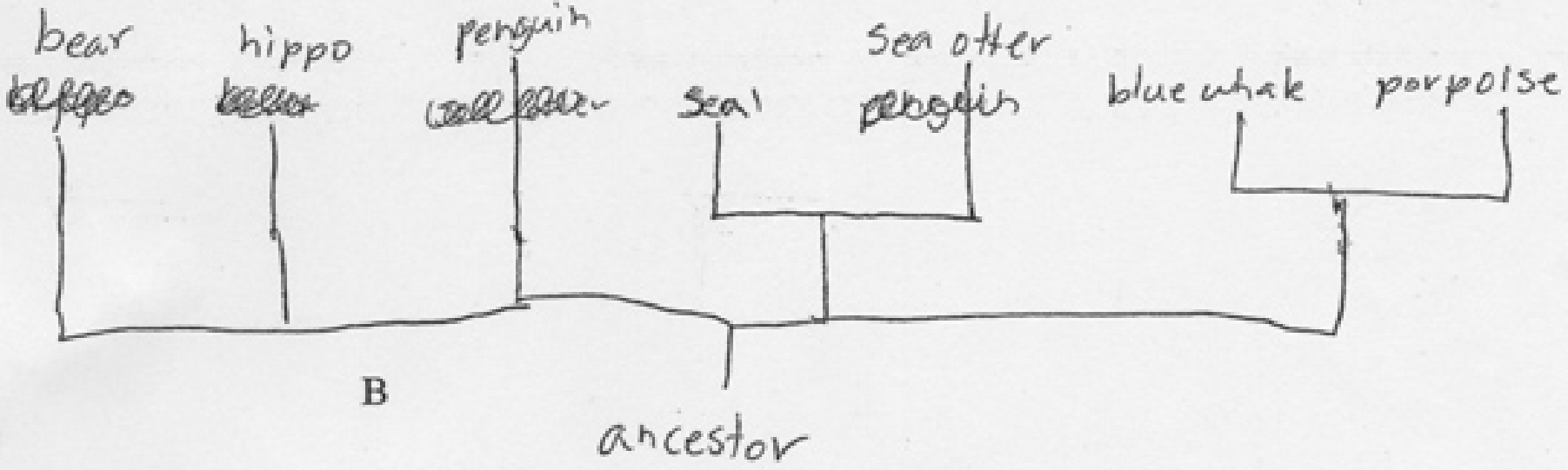
Publication: Problem Solving Modules in Large Introductory Biology Lectures Enhance Student Understanding

- Students work in small groups on a problem in class
- Collect student solutions
- Project several solutions on document camera
- Analyze and comment on solutions

Click on the image to see
a video clip of Scott's class


Whale
Porpoise
Penguin
sea Otter
harp seal
hippo
Bear

B


bear
hippo
penguin
seal
Sea otter
blue whale
porpoise
ancestor

B

Making Experts' Thinking Visible

. . . the processes by which a scholar makes sense of material--what I sometimes call the intermediate processes of cognition--are powerful teaching tools.

Sam Wineburg, *Teaching the Mind Good Habits*

On the Reading of Historical Texts by Sam Wineburg

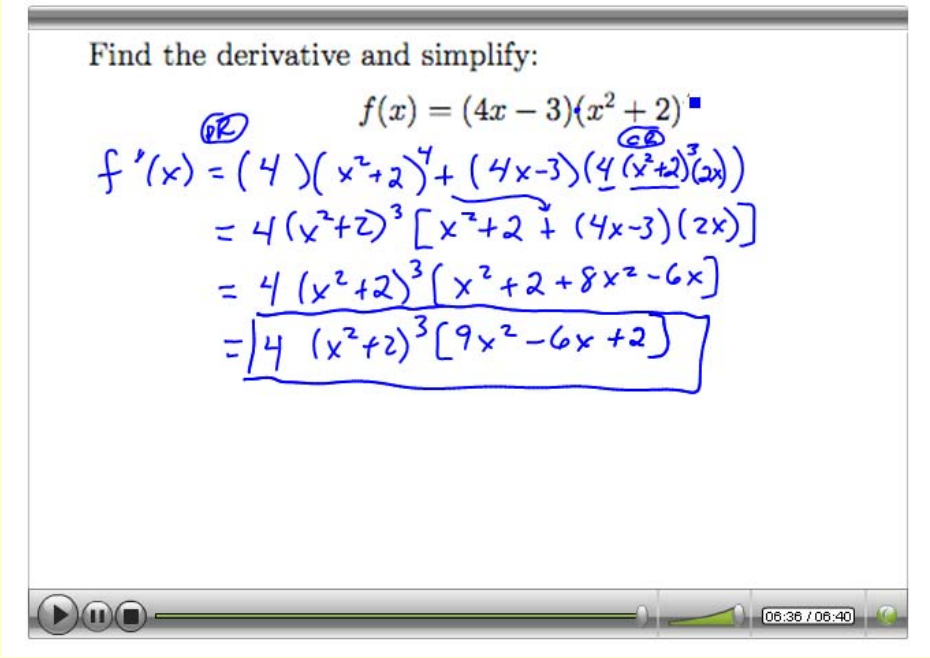
How EXPERTS read historical texts	How NOVICES read historical texts
Seek to *discover context and know content*	Seek only to *know content*
Ask what the text *does* (purpose)	Ask what the text *says* ("facts")
Understand the *subtexts* of the writer's language.	Understand the *literal meanings* of the writer's language.
See any text as *a construction* of a vision of the world	See texts as *descriptions* of the world
See texts as *made by persons with a view of events*	See texts as *accounts of what really happened*
Assume *bias* in text	Assume *neutrality*, *objectivity* in text
Consider word choice (connotation, denotation) and *tone*	*Ignore word choice*, *tone*
Compare texts to judge different, perhaps divergent accounts of the same event or topic	*Learn the right answer*
Get *interested* in *contradictions, ambiguity*	*Resolve* or *ignore contradictions, ambiguity*
Check *sources* of document	Read the *document* only
Read like *witnesses to living, evolving events*	Read like *seekers of solid facts*
Acknowledge *uncertainty and complexity* in the reading, with qualifiers and concessions	Communicate *the truth* of the reading, sounding as certain as possible

Watch historians discuss how they evaluate different genres of primary evidence

History Matters

http://www.historymatters.gmu.edu

Showing Students How to Think More like a Mathematician



UW-La Crosse Mathematics Professor Bob Hoar

See more work by Bob Hoar and his colleagues

http://www.uwlax.edu/iiurl/

Excellent Books and Articles about Student Learning

How People Learn: Brain, Mind & Experience by Bransford, Brown, & Cocking (full text online)

How Students Learn: History, Mathematics & Science in the Classroom by Donovan & Bransford (eds.) (full text online)

Historical Thinking and Other Unnatural Acts by Sam Wineburg

Taking Learning Seriously by Lee Shulman (full text online)

Making Differences: A Table of Learning by Lee Shulman (full text online)

Teaching the Mind Good Habits by Sam Wineburg (full text online)

Understanding by Design by Grant Wiggins & Jay McTighe

Go forth and make thinking visible

Have a nice day