

Seeing with new eyes: developing visual literacy in the sciences

“The real voyage of discovery consists not in seeking new landscapes but in having new eyes.” M. Proust

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6 Blind Men and the Elephant

Like the “6 Blind Men” who check out an elephant and attempt to describe him (see link for image), we may only “see” one perspective...

www.betterparentinginstitute.com/Better-Parenting/wp-content/uploads/2010/03/BlindMenElephant.jpg

What might we be missing?!

DEEP LEARNING

- daring - (difficult?) - desirable



- "...deep learning involves the **critical analysis** of new ideas, **linking** them to already known concepts and principles, and leads to **understanding** and long-term **retention** of concepts so that they can be used for **problem solving in unfamiliar contexts**"

Houghton, 2004

Ideally, learning involves...

Authentic experiences

- *Real world complex problems and their solutions* (Lombardi, 2007)

Active engagement

- *Learning is about conceptual change, not just acquisition of knowledge* (Biggs, 1997)

Transfer, linking - making connections

- *Building on the familiar, and providing multiple contexts* (Bransford et al., 2000)
- *"...questioning is a key means of becoming critical, of learning to reason..."* (Schleffler, 1973)

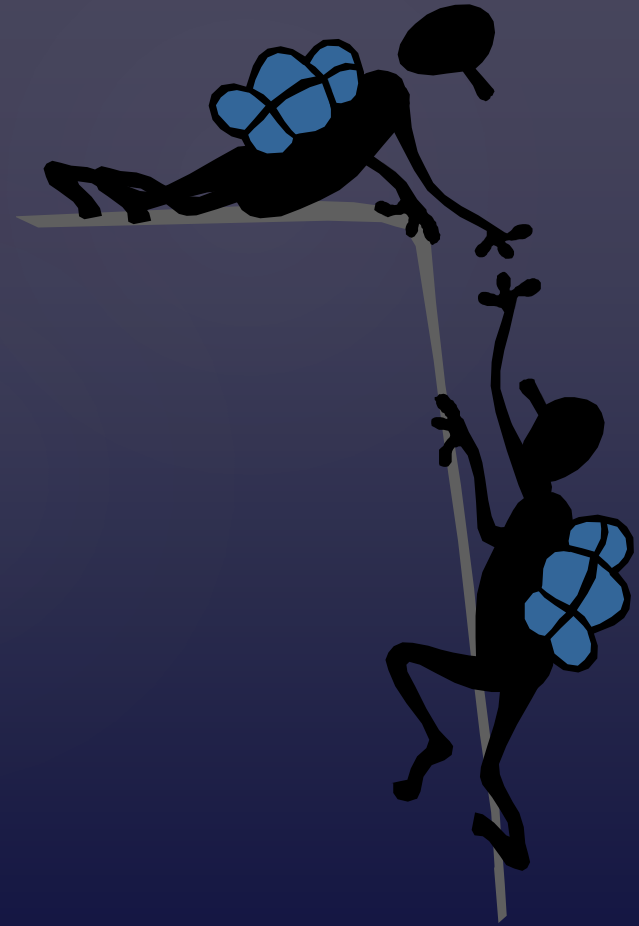
Novice-to-expert: Building Autonomy

- *"enculturation" into the discipline* (Lave and Wenger, 1991)

Element of fun! (challenge)

Where does the visual come into play?

- & Visuals can provide scaffolding (Nilson, 2010)
- & Visuals have an effect comparable to collaborative learning and reinforcement and feedback (Nilson, 2010; Marzano, 2003)



Cognitive Theory: The Big Picture

Experts have...
hierarchical and weblike
structure of discipline
easily retrievable

Novices need... and
graphics provide... "big
picture" organization of
discipline
...provision of mental
structures of knowledge
...hierarchical and / or
weblike



WEB OF THE DISCIPLINE

Dual-coding theory (Paivio, 1971; Vekiri, 2002)

How visuals work with text

2 memories:
semantic (verbal)
episodic (visual-spatial)

Implies learners process material twice in one cognitive event

Visual argument theory (Larkin & Simon, 1987; & others)

Convey information more efficiently, because it...

Draws attention to conceptual relationships

Enables pattern-recognition

Aids in integrating new knowledge into existing cognitive structures

Ideas are not always black and white...





So... what "text" goes with this diagram?

ENGAGING

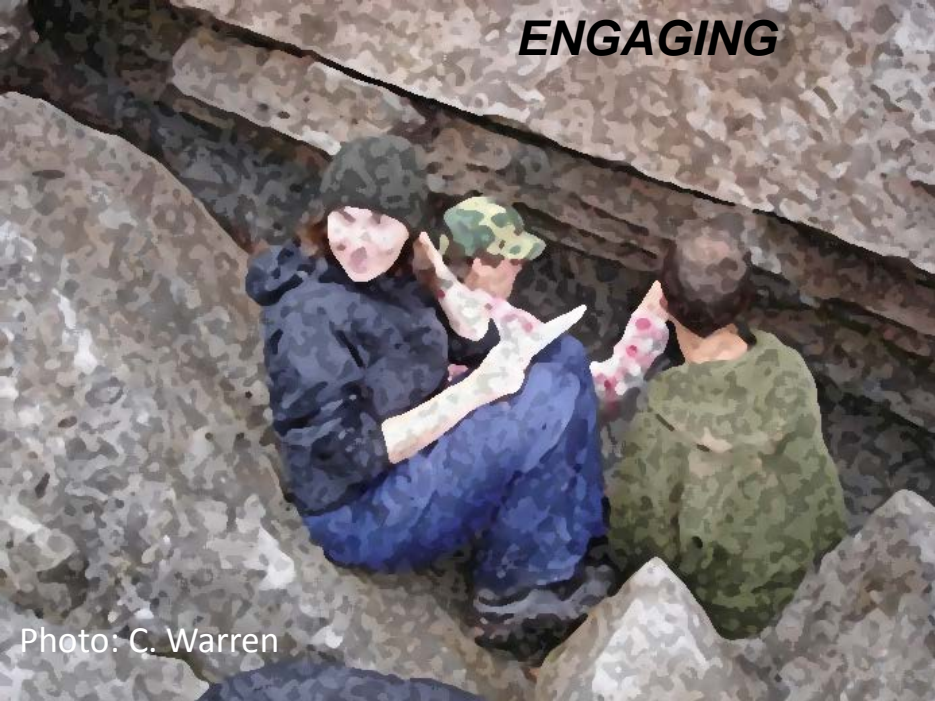


Photo: C. Warren

ENJOYABLE



Photo: L. Plug – Honours Field Trip – US – Didjeree Dune

In an ideal world...

ENRICHED



Photo: M. Zentilli – Honours Field Trip – Chile – Inukshuk in the Andes

http://farm1.static.flickr.com/46/169058276_9550e92ae5.jpg

& Reality...!



Photo: P. Wallace

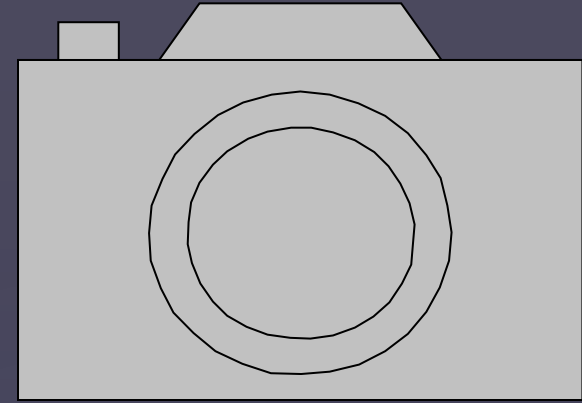
The Goal

& Moving from this...

... to this



Student Activity



6 Photographs - *something of relevance to course*

Write a figure caption - *clear, explicit connection*

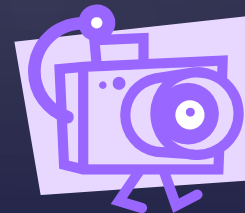
Indicate your "best" and your "most shaky"

OUTCOMES

- ⌘ Students' comment on increased understanding, enjoyment, "fun", and engagement
- ⌘ Mastery and misconceptions obvious to instructor
- ⌘ Heightened interest, skills, confidence
- ⌘ Students take their class-learning to the "real" world and *visa versa* (authentic activity)



- ⌘ Additional (not intended)



- ⌘ Involvement of others (parents, family, friends)
- ⌘ Students continued to bring in / send me photos, materials / connections

Your Task

- **Leave the classroom to locate...** (15 minutes)
 - 1 and 2: Something VISUAL you can envisage incorporating into your teaching
 - This can be something concrete or something conceptual, large or small, BUT it must be linked to something you see when you leave this room!
 - 3 and 4. As you do this NOTE frustrations, confusion, difficulties, excitement, "fun"...
- **Restrictions**
 - 5. You cannot use either a computer or a book (or your office / department, if from Western!)
 - Please do feel free to work alone, in pairs, in small groups, but each must come up with something related to their discipline
- **When you come back - in groups of 3-4** (10-15 minutes)
 - Indicate your discipline, what you have chosen (but initially, not WHY you chose it!)
 - Discuss all, share ideas, summarize, **CREATE A QUESTION**, and report

1

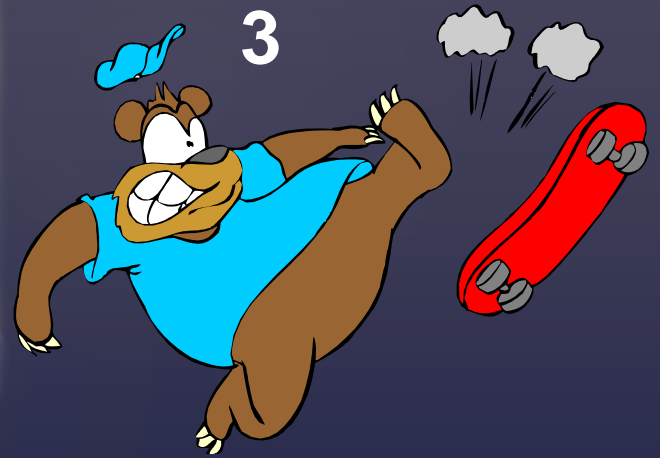


Your Task

2



3

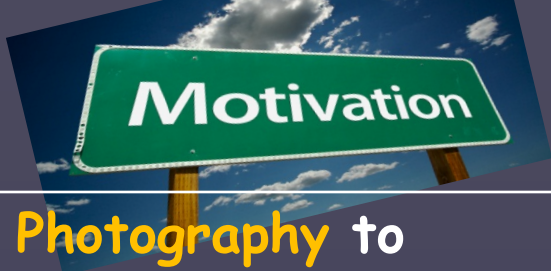


5!



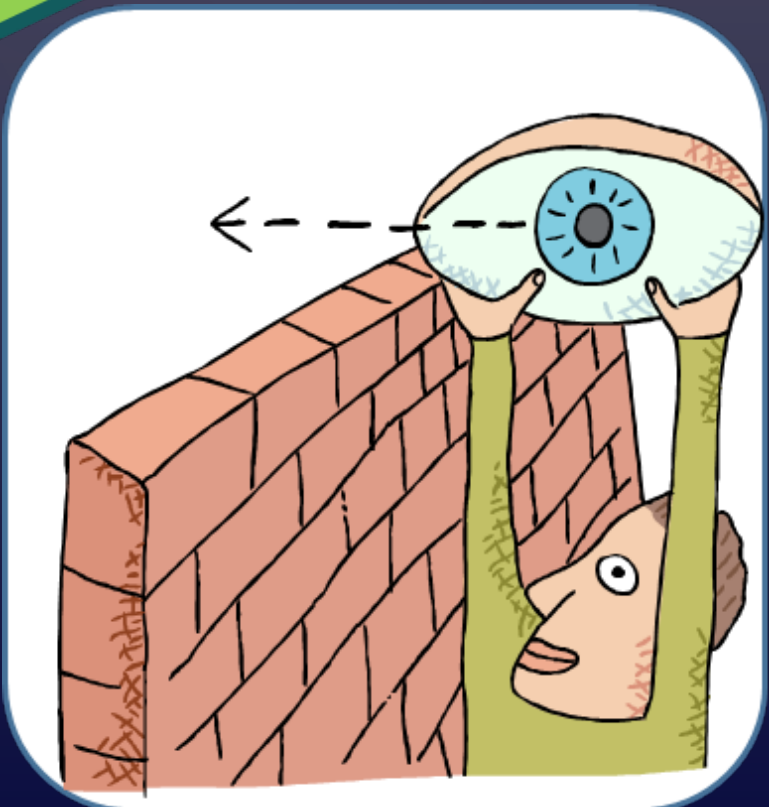
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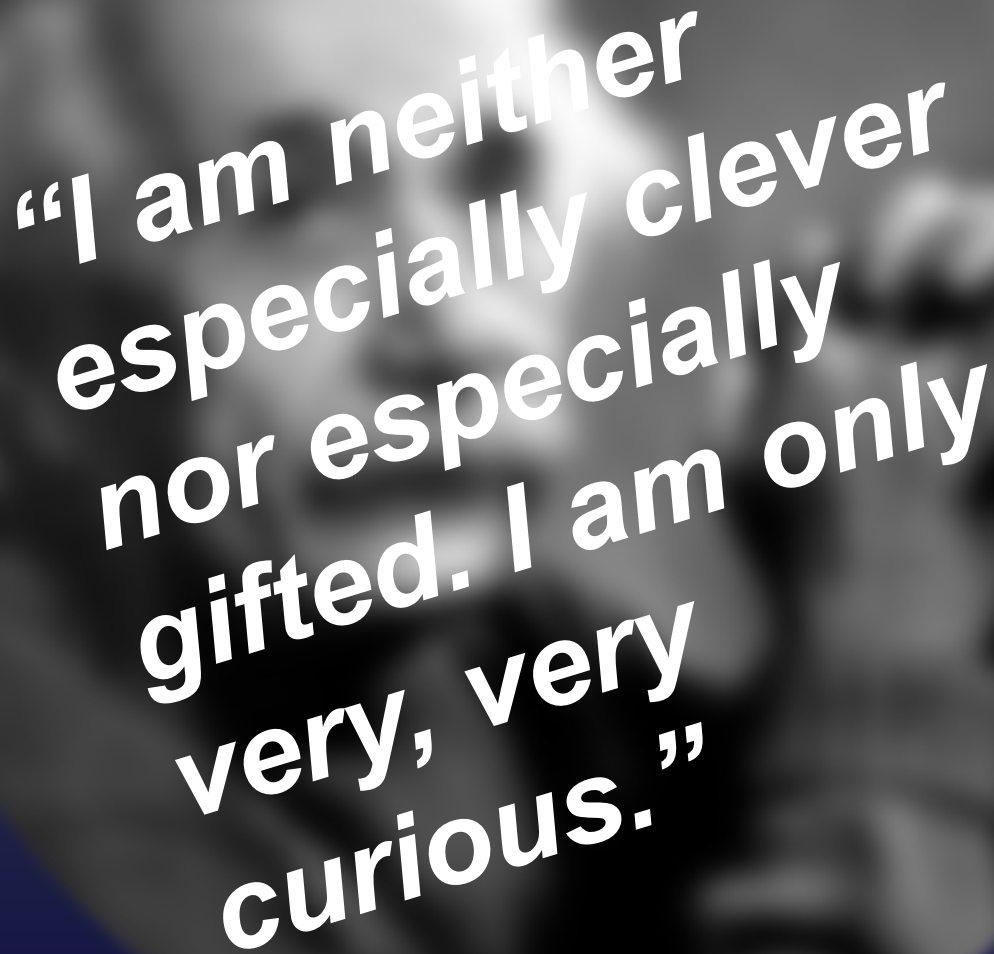




Photography to motivate / create authentic learning experiences	Photography to aid question-generation, communication	Photography to aid evaluation
Scavenger hunt	Sketching from photo	Sketching from photo
Create a wall of "f(r)ame"	Writing directions	Using photos/diag with instructor-generated questions
Linking in-class learning with "real" world	Poster presentation	Poster presentation
How many different ways to look at the same thing? (multiple perspectives!)	Writing photo / figure captions	Writing captions / sketching a different perspective, etc
Develop concept / mind maps	Develop concept / mind maps	Develop concept / mind maps

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**“I am neither
especially clever
nor especially
gifted. I am only
very, very
curious.”**