Combating 'One and Done':
Maximizing the Impact of an Undergraduate Science Course

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The Setting: Wheelock College

- A small, private college with a public mission – to improve the lives of families and children
- Common majors include elementary and early childhood education, social work, human development.
- Urban setting but adjacent to the Muddy River portion of Boston's Emerald Necklace.

Challenge A: The Learners

- Many students have poor conceptions of the nature and process of science.
- Students often have limited or misconceived science content knowledge.
- Fears, anxieties and other negative attitudes toward science are common.

Challenge B: Constraints

- Most majors require that students only complete one science course.
- Students often delay taking their science course(s) and select what fits into their schedule.

The Approach

- Create a science course that accepts the reality of learner characteristics.
- Design so as to improve students' –
  - Attitude toward science/Confidence/Identity
  - Understanding of the nature of science
  - Science process skills and content knowledge

Science Inquiry and the Earth

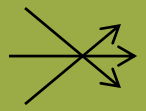
- Reintroduce Science.
- Use the Muddy and/or Charles Rivers as a study area.
- Allow time for personal interest to develop.
- Guide personal projects to greater sophistication.
- Encourage group work, discourse, sharing of knowledge.
- Explicitly teach earth science as content theme.

What is meant by “Reintroduce Science”?

- Who are scientists? Creative, Experts
- What is science? Process, Knowledge
- What do scientists study? Content areas, Earth Science

Characteristics of Creative Individuals and their Fields of Inquiry

- Observation
- Pattern Recognition
- Abstraction
- Analogy



- Science
- Literature
- Painting/Drawing
- Dance

Creative Characteristic	Field of Inquiry

Characteristics of Creative and Expert Individuals: Selected References and Resources

Sparks of Genius: The Thirteen Thinking Tools of the World's Most Creative People. Robert and Michele Root-. Bernstein. Houghton Mifflin, 1999

Imagine That! Blog on Creativity by Michele and Robert Root-Bernstein
http://www.psychologytoday.com/blog/imagine

Ericsson et al summary paper
http://www.psychologytoday.com/files/u81/Ericsson__Roring__and_Nandagopal__2007_.pdf

K. Anders Ericsson, Ralf Th. Krampe, and Clemens Tesch-Romer. *The Role of Deliberate Practice in the Acquisition of Expert Performance.* Psychological Review 1993, Vol. 100. No. 3, 363-406

Ericsson, K.A., and Ward, P., 2007, *Capturing the Naturally Occurring Superior Performance of Experts in the Laboratory*, Current Directions in Psychological Science 16 (2007):346-50

Creativity

Expertise


Muddy River, Boston, MA

Student Project Progression

- Is this water salty?
- Why is the water murky?
- Why is this bank eroded?

Original Question

- Defining the Nature and Extent of the Charles River Salt Wedge
- Determination of Organic versus Inorganic Suspended Load
- The Mechanism of River System Meandering

Ultimate Project

Changing Attitudes?

	Fall '06		Spring '07		Spring '09		Spring '11		Fall '11	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
I like science.	**2.7**	**2.5**	**3.0**	**2.4**	**2.4**	**2.2**	**3.2**	**3.1**	**3.5**	**2.9**
I can learn science.	**2.6**	**1.9**	**2.5**	**2.0**	**2.0**	**1.5**	**2.3**	**2.3**	**2.3**	**1.9**

1 – student agrees to 5 – student disagrees

The origins of reform.....

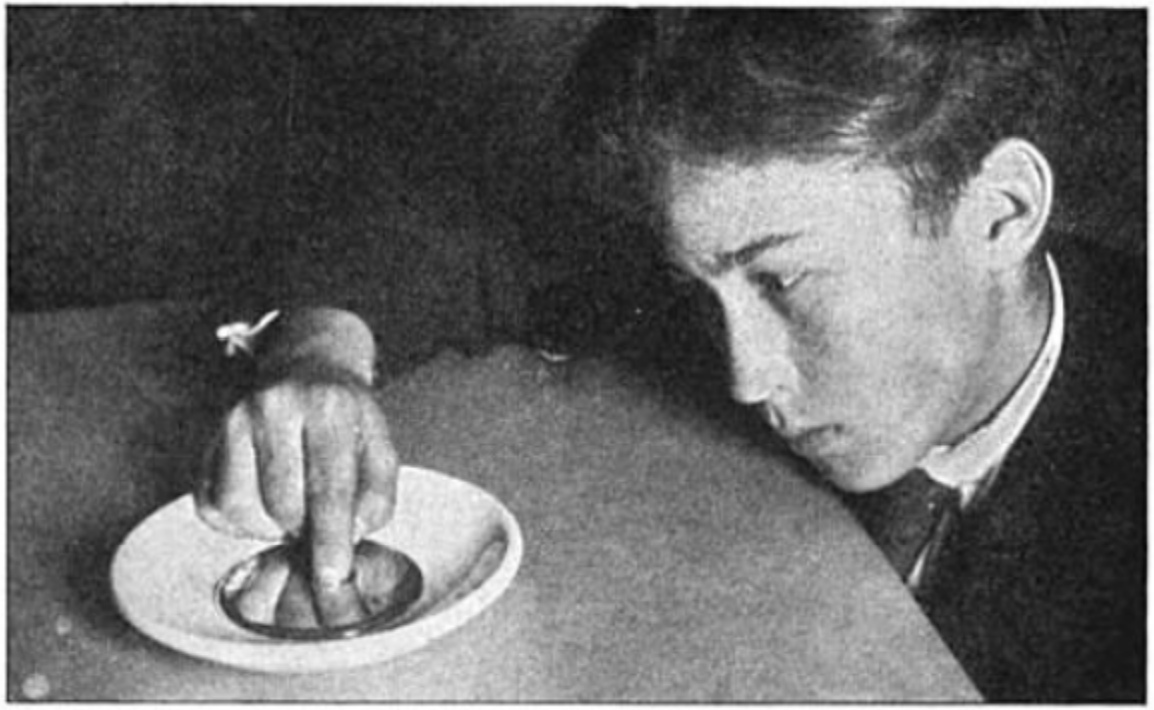


FIG. 23. The mercury does not wet the finger, and as the finger is lifted the mercury does not follow it.

in Experiment 14. When you pull your finger all the way out, has the mercury wet it at all? Put a lamp wick or a

From “Common Science” by Carleton Wolsey Washburne, 1920

Questions/Comments?

Thank you.