Building Upon SAMR

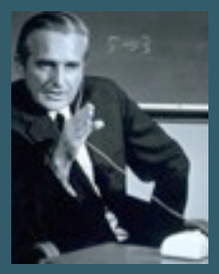
Ruben R. Puentedura, Ph.D.

Goals

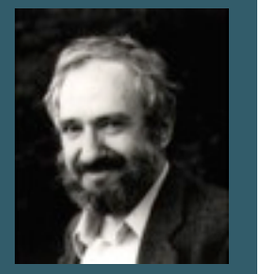
Focus

Models

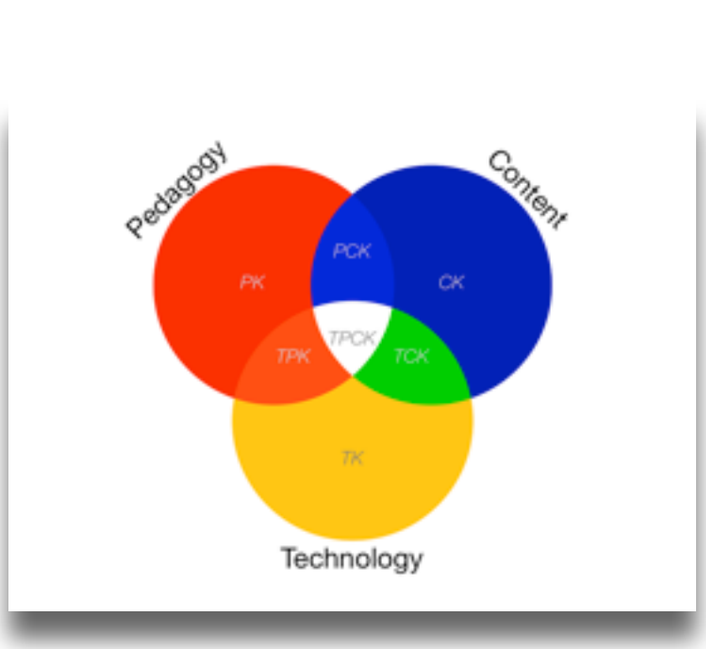
Technology



Augmenting Human Intellect & Learning Capacity



21st Century Learning



One-to-One Technologies

Redefinition

Tech allows for the creation of new tasks, previously inconceivable

Modification

Tech allows for significant task redesign

Transformation

Enhancement

Augmentation

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Substitution

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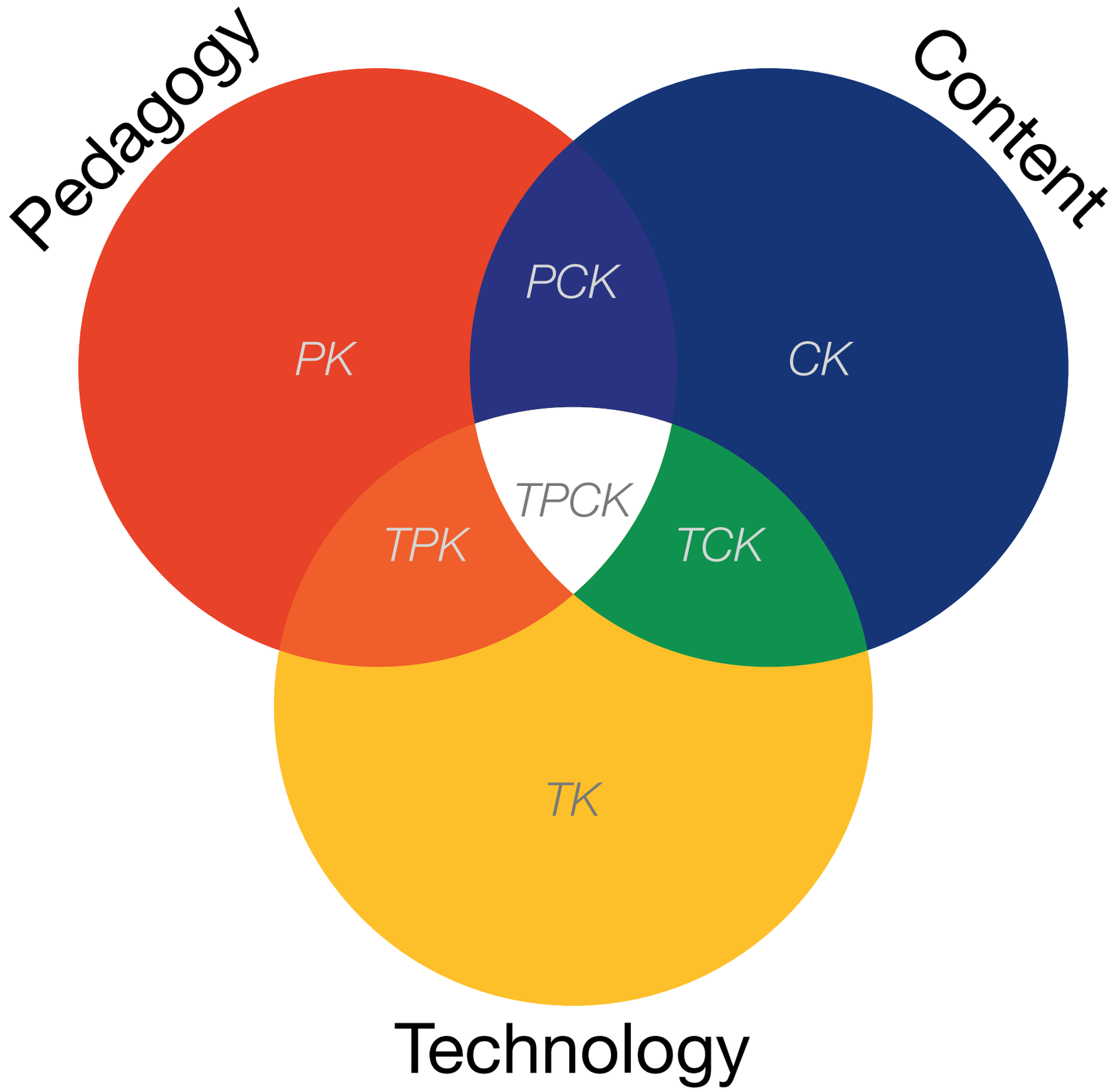
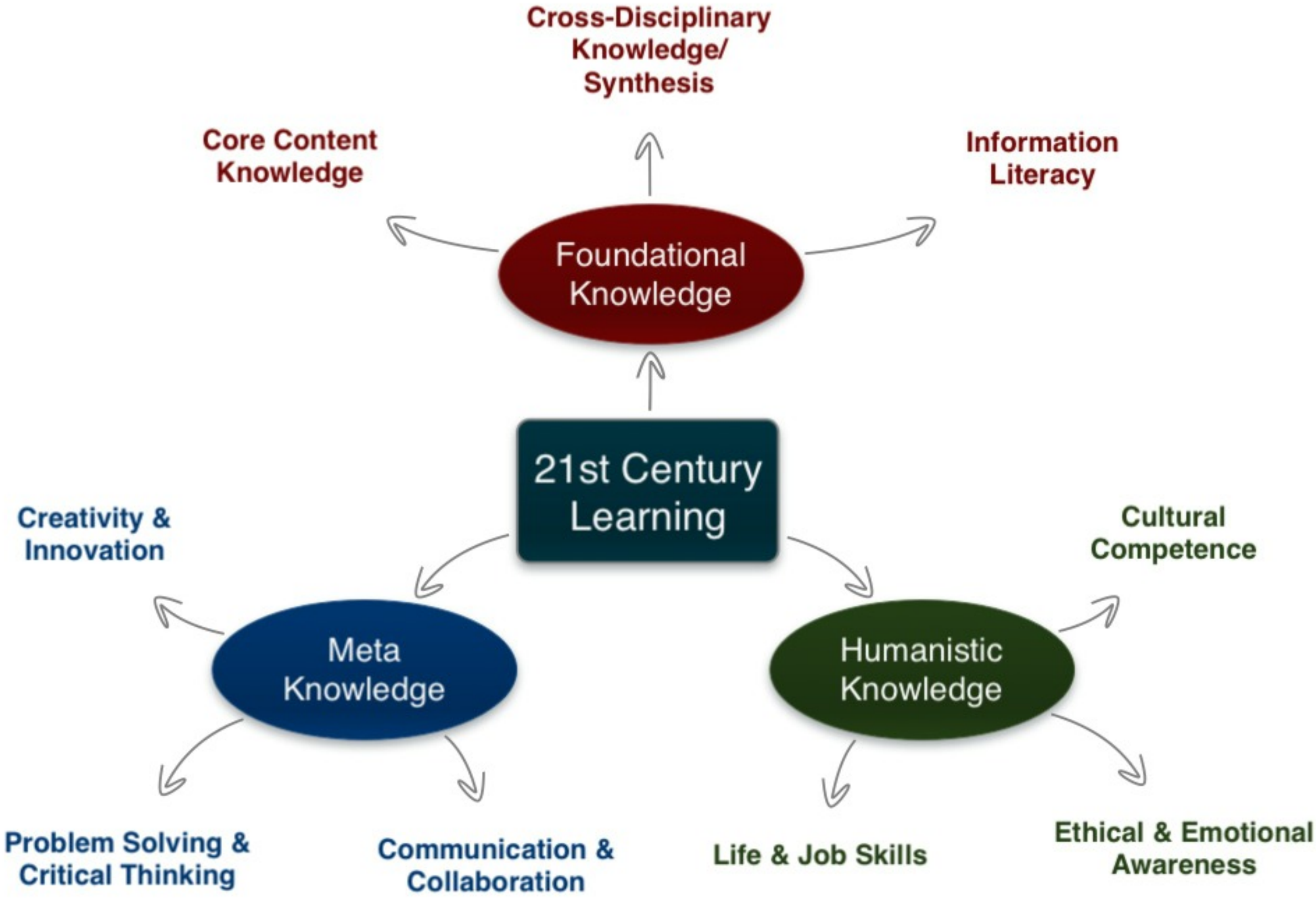
Podcasts on iTunes U: http://tinyurl.com/aswemayteach


Pedagogy
Content
PK
PCK
CK
TPCK
TPK
TCK
TK
Technology

Social	Mobility	Visualization	Storytelling	Gaming
200,000 years	70,000 years	40,000 years	17,000 years	8,000 years



P. Mishra and K. Kereluik. “What is 21st Century Learning? A review and synthesis.” SITE2011 Conference Presentation. (2011)

P21 Common Core Toolkit

A Guide to Aligning the Common Core State Standards with the Framework for 21st Century Skills

Partnership for 21st Century Skills

It is imperative that the CCSS be considered the "floor"—not the "ceiling"—when it comes to expectations for student performance in the 21st century.

History

Lesh: Teaching History – Concepts and Criteria

- **Core Concepts:**
  - Causality
  - Chronology
  - Multiple Perspectives
  - Contingency
  - Empathy
  - Change and Continuity Over Time
  - Influence/Significance/Impact
  - Contrasting Interpretations
  - Intent/Motivation
- **Guiding Criteria:**
  - Does the question represent an important issue to historical and contemporary times?
  - Is the question debatable?
  - Does the question represent a reasonable amount of content?
  - Will the question hold the interest of middle or high school students?
  - Is the question appropriate given the materials available?
  - Is the question challenging for the students you are teaching?
  - What organizing historical concepts will be emphasized?

Bruce Lesh. ''*Why Won't You Just Tell Us the Answer?*'' *Teaching Historical Thinking in Grades 7-12*. Stenhouse Publishers. (2011)

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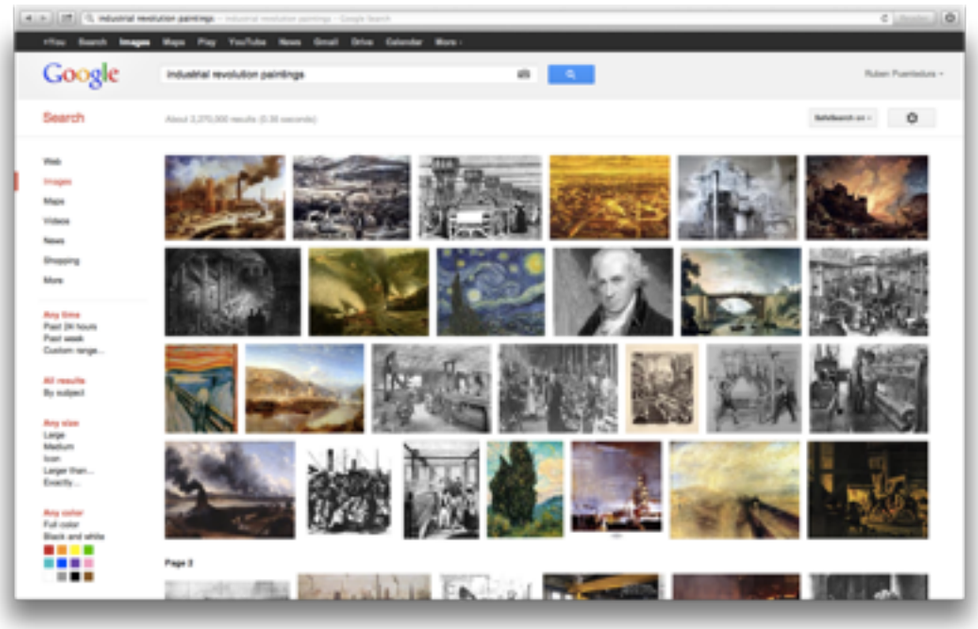

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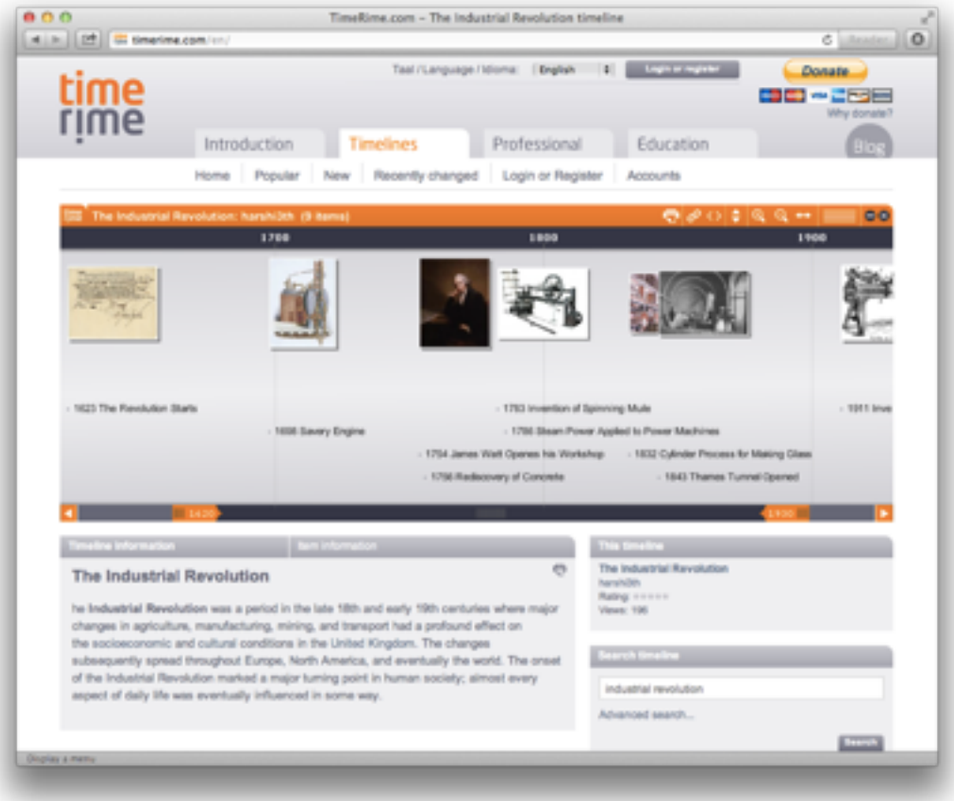

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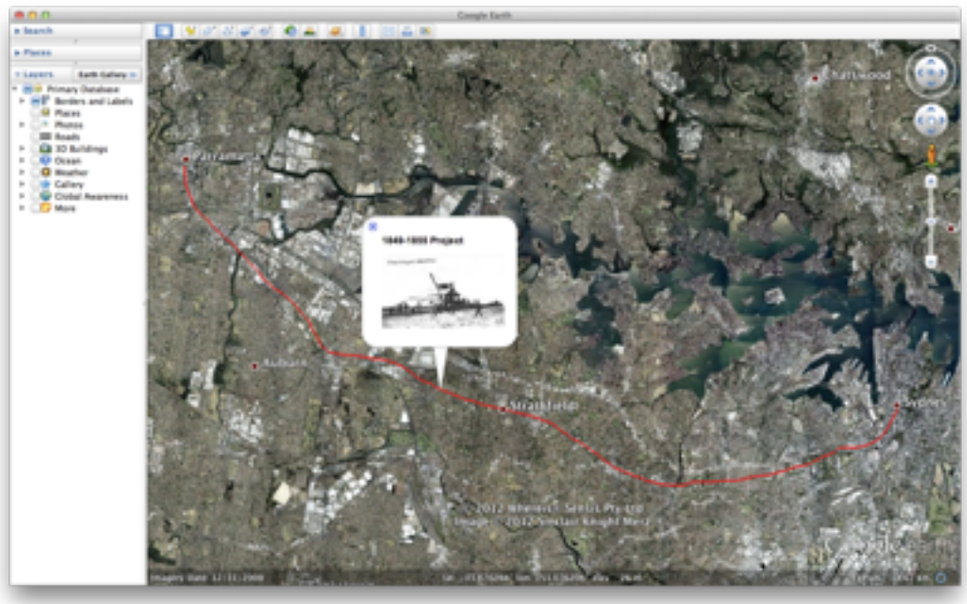

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English

Marzano:
Six Steps to Effective Vocabulary Instruction

- Step 1: The Teacher Provides a Description, Explanation, or Example of the New Term
- Step 2: Students Restate the Explanation of the New Term in Their Own Words
- Step 3: Students Create a Nonlinguistic Representation of the Term
- Step 4: Students Periodically Do Activities That Help Them Add to Their Knowledge of Vocabulary Terms
- Step 5: Periodically Students Are Asked to Discuss the Terms with One Another
- Step 6: Periodically Students Are Involved in Games That Allow Them to Play with the Terms

R.J. Marzano. *Building Background Knowledge for Academic Achievement: Research on What Works in Schools*. Alexandria, VA: ASCD, 2004

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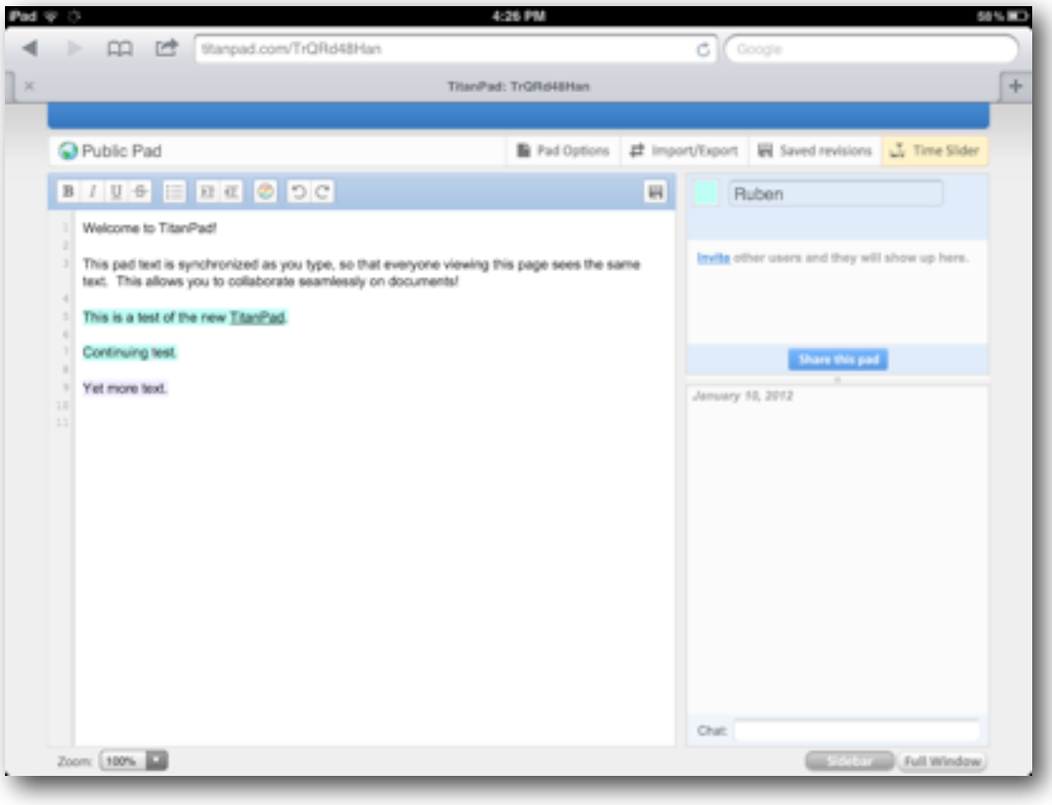

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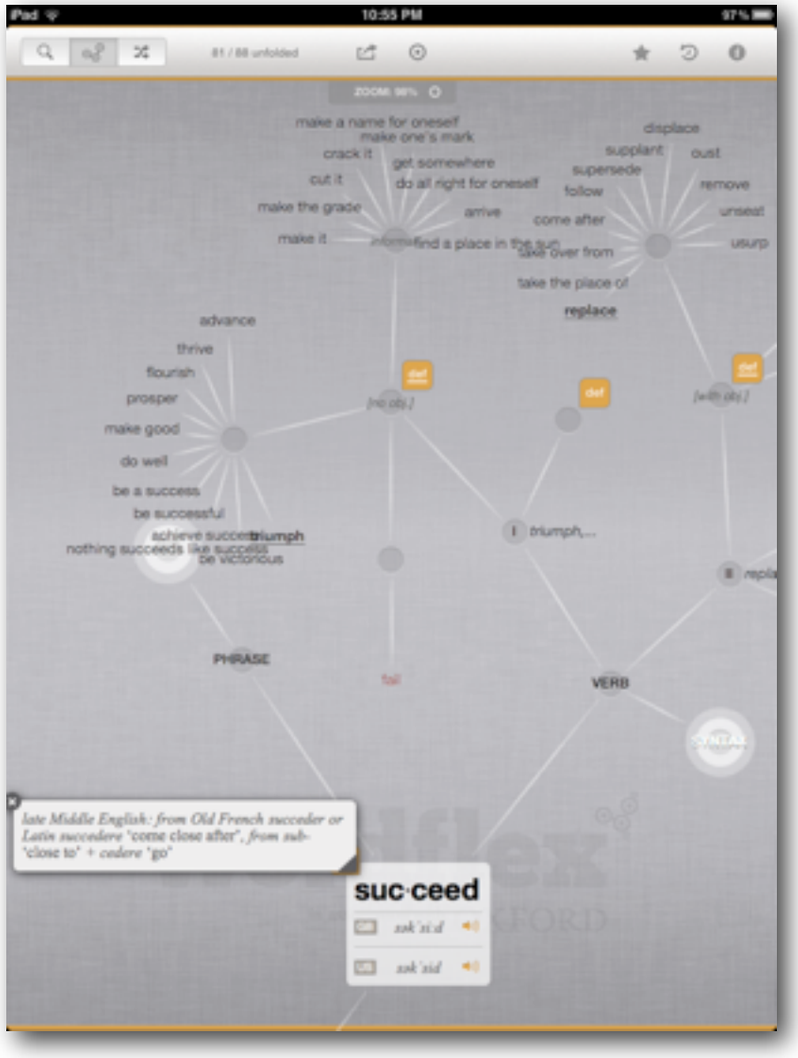

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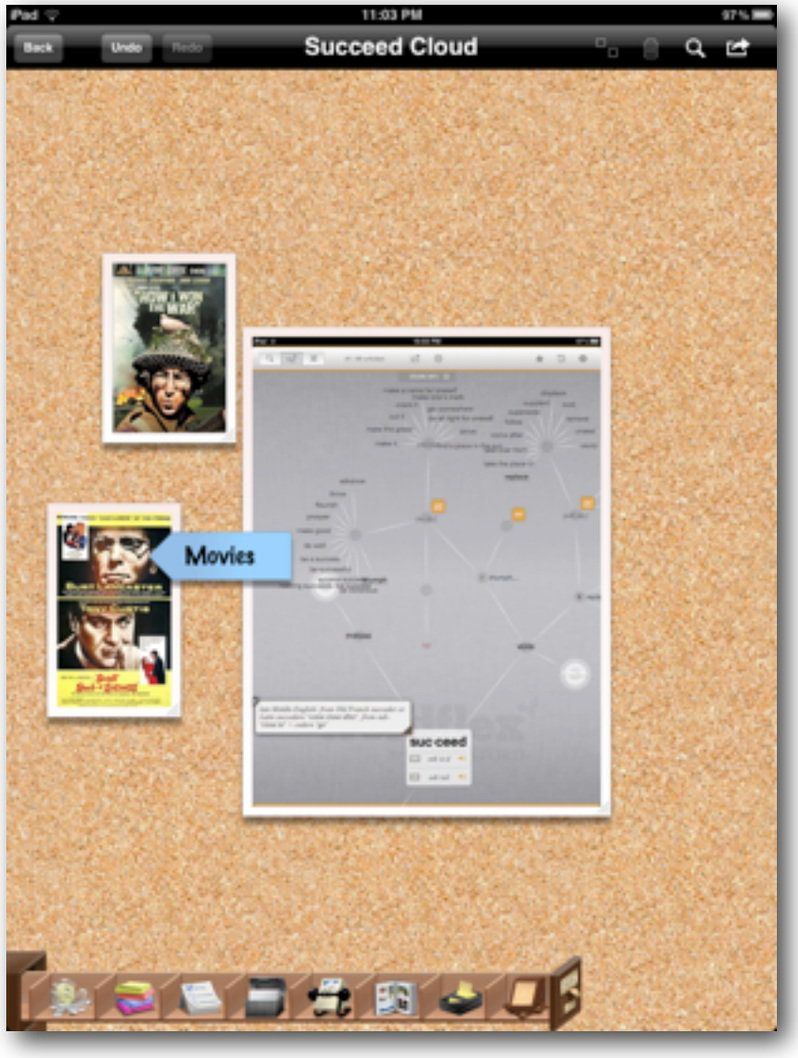

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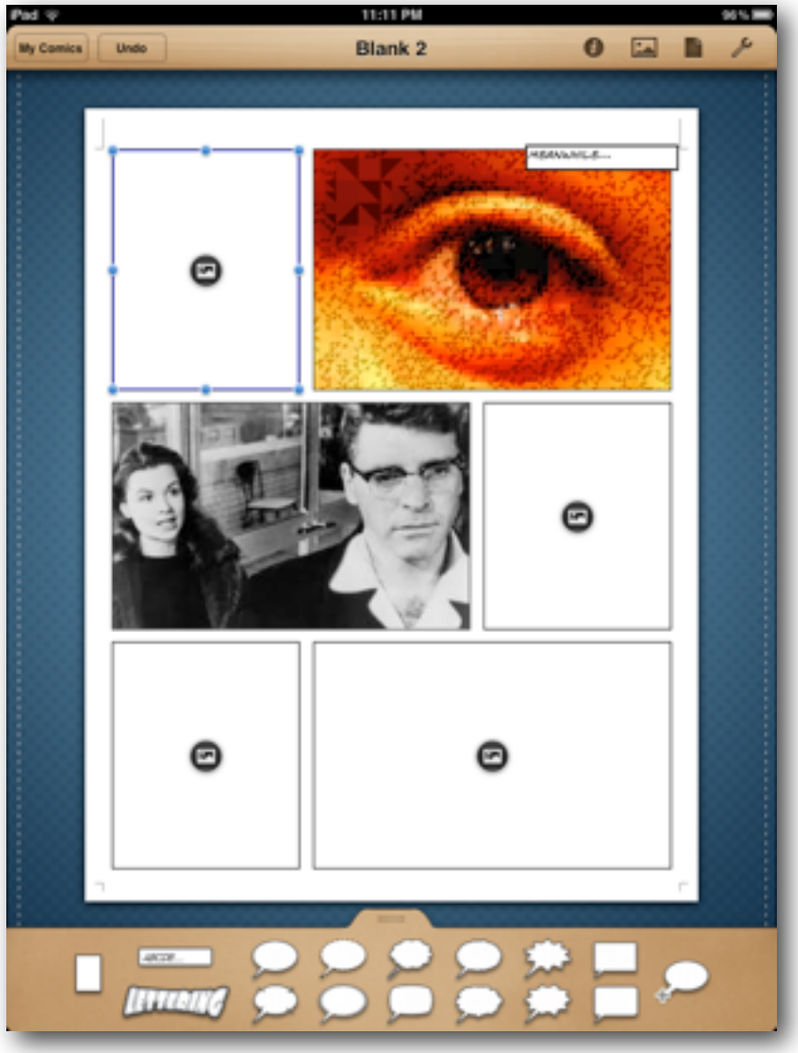
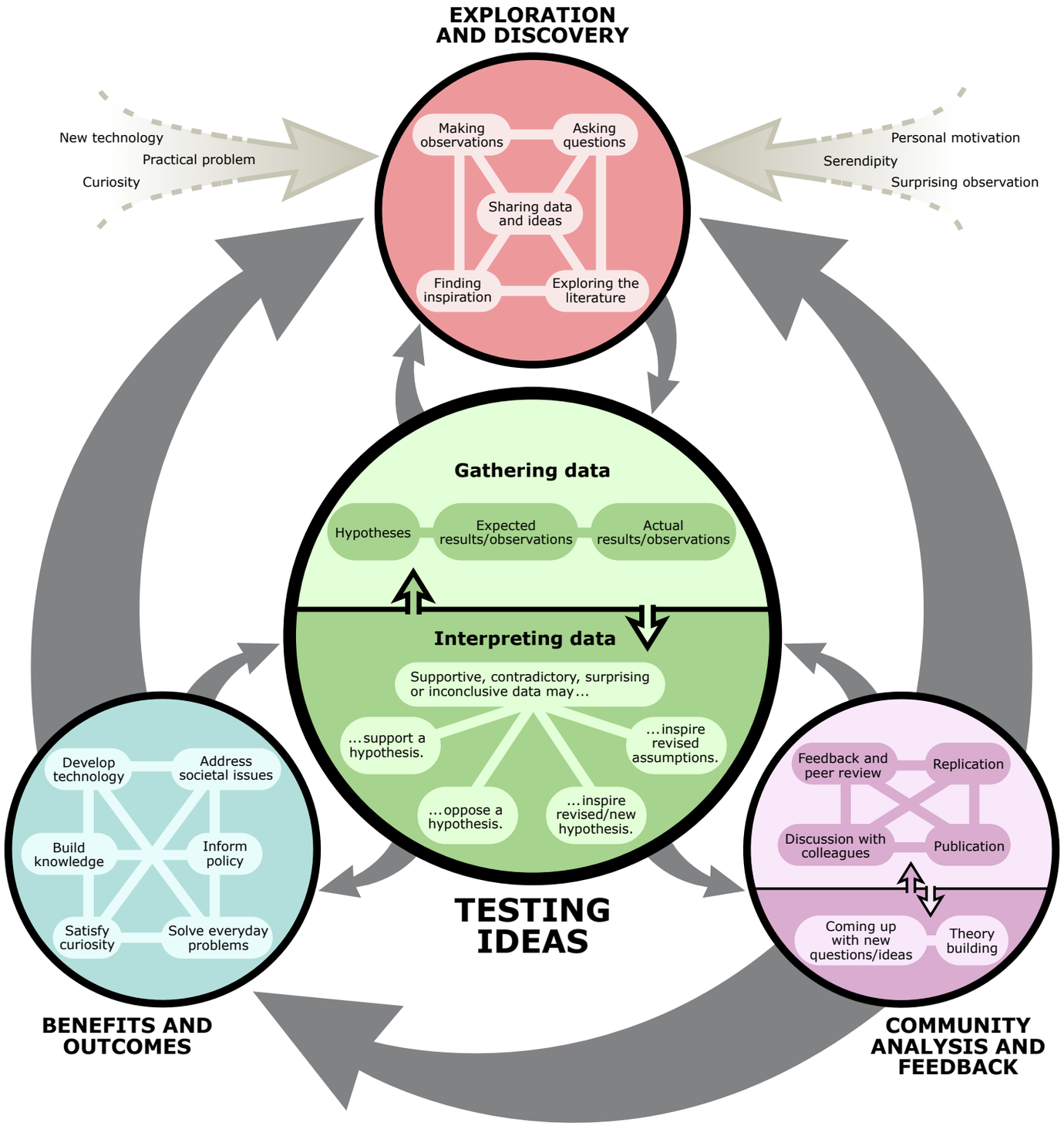


Biology

Understanding Science:
How Science Works



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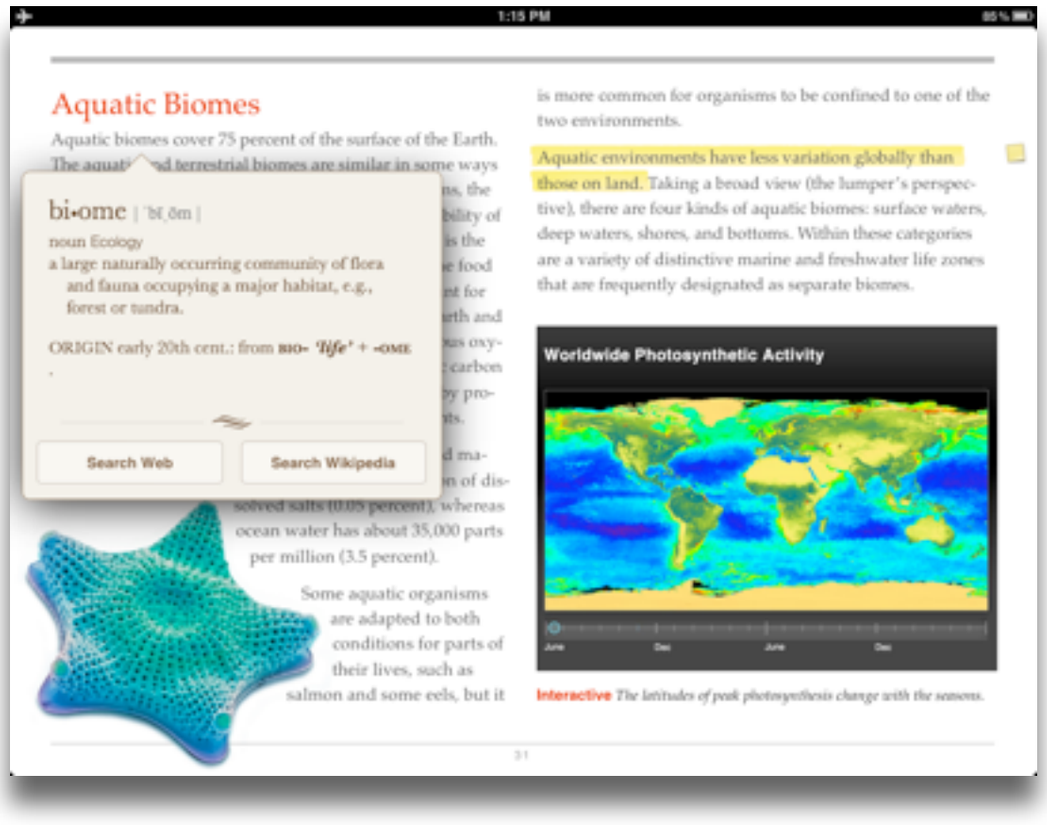

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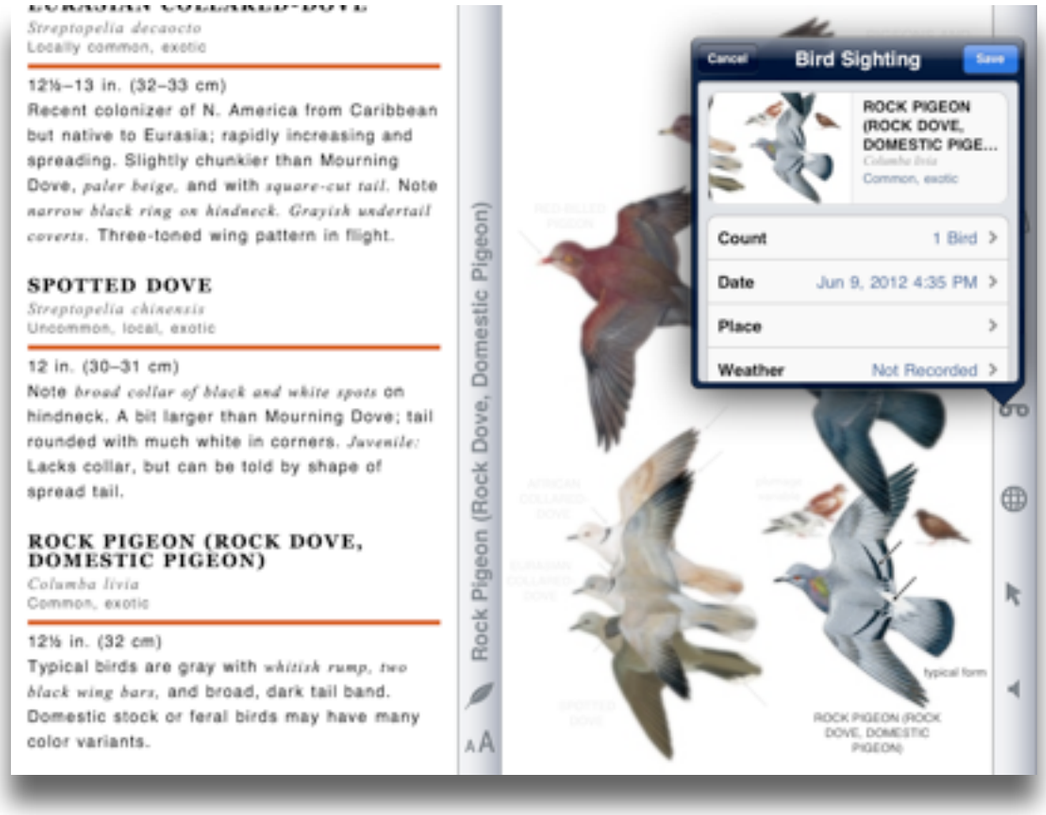

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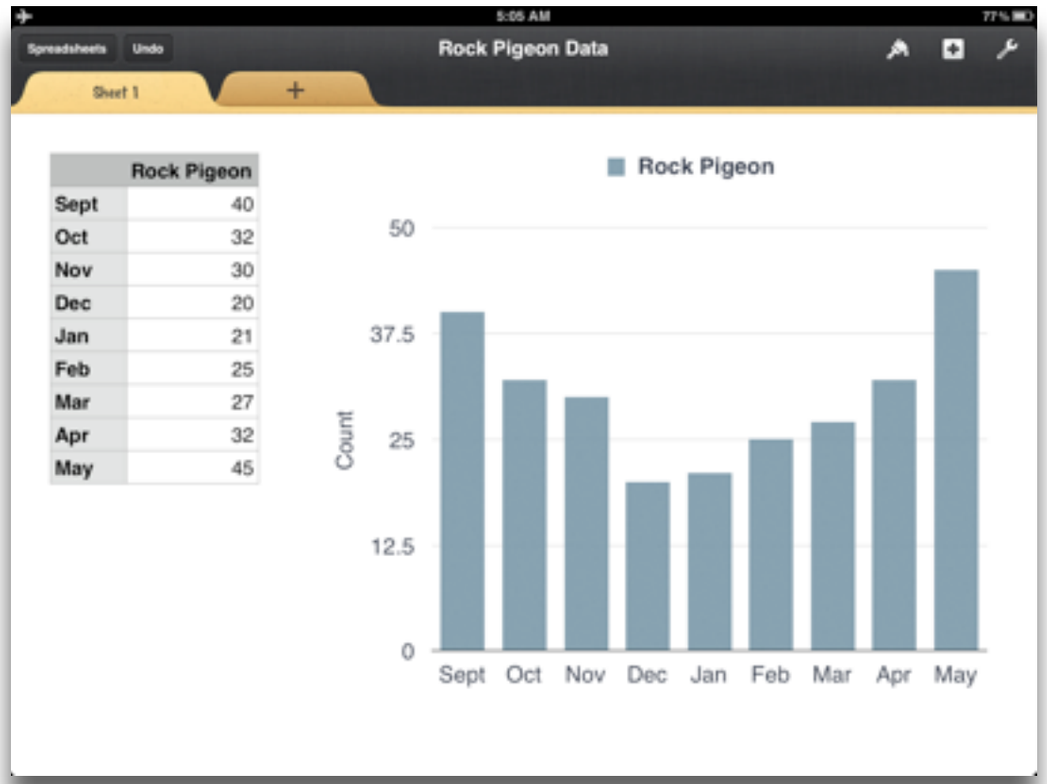

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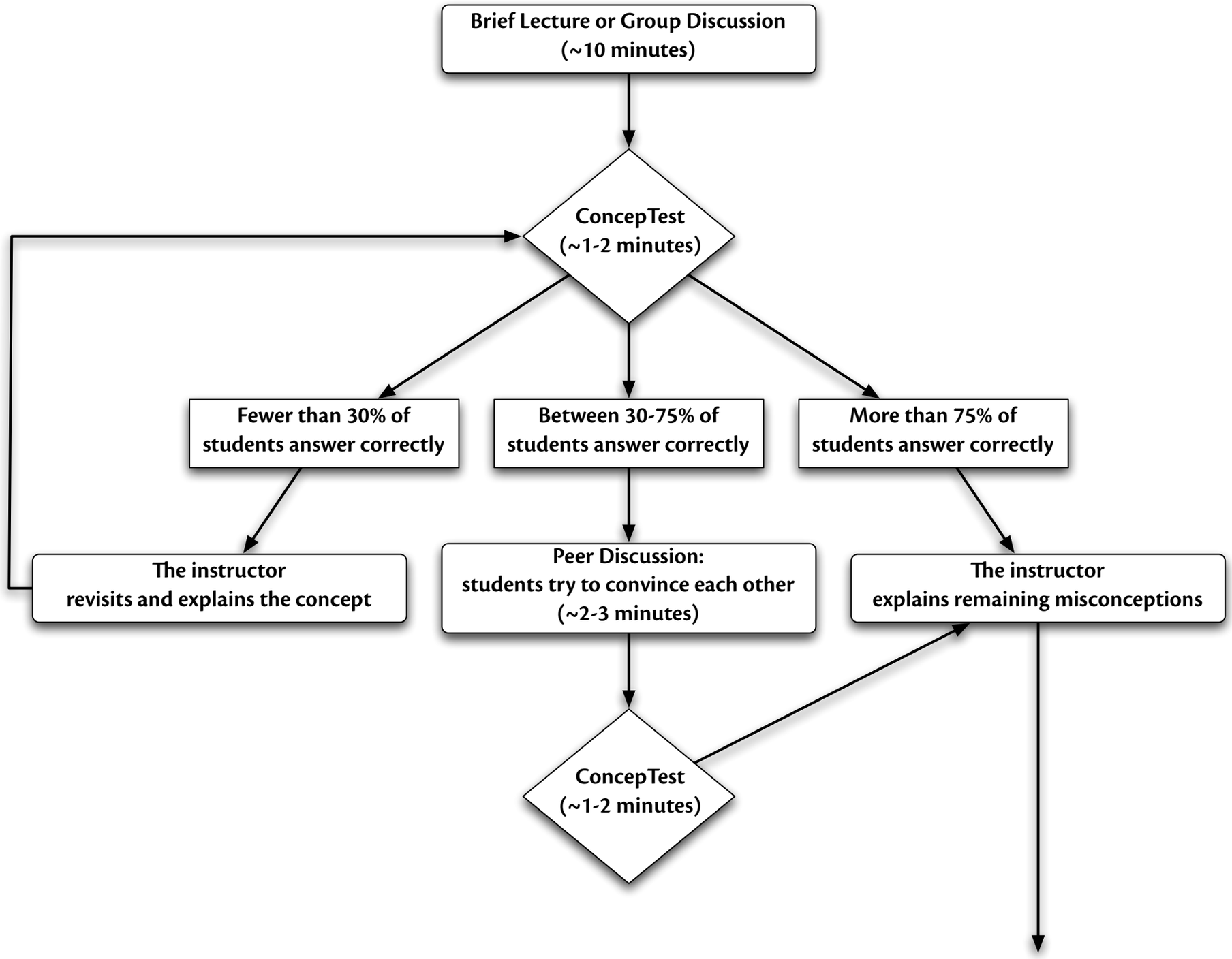
Literature

Flipping the Classroom: ConcepTests



Mazur, E. *Peer Instruction - A User's Manual*. Prentice Hall (1997)

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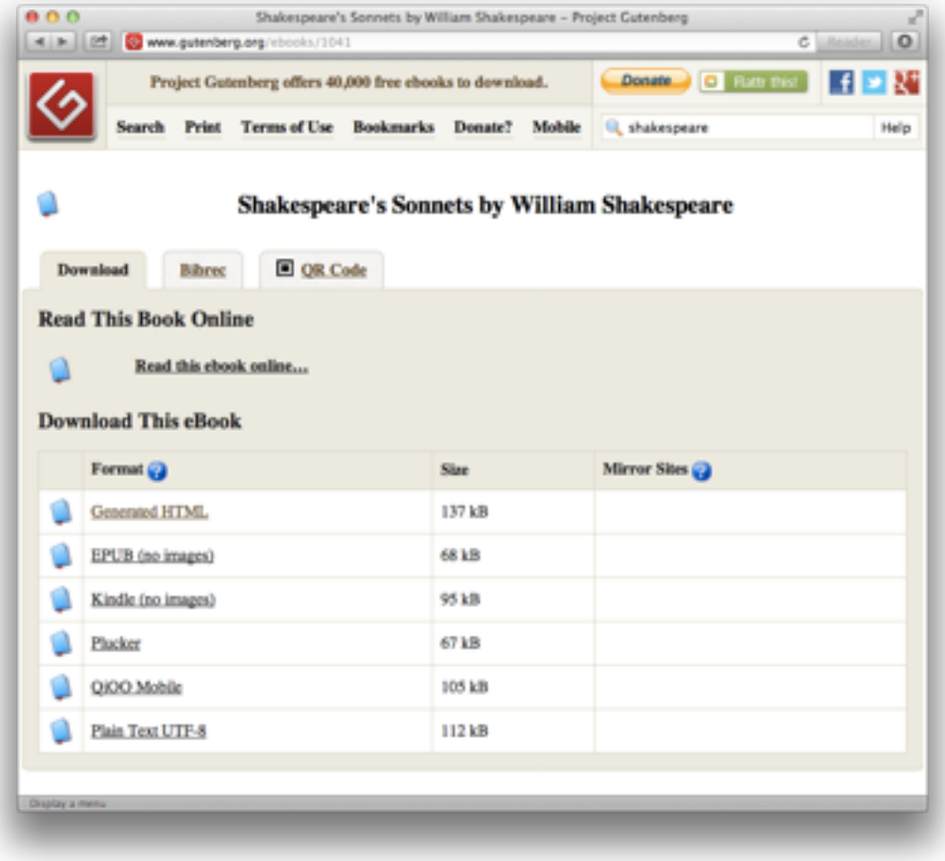

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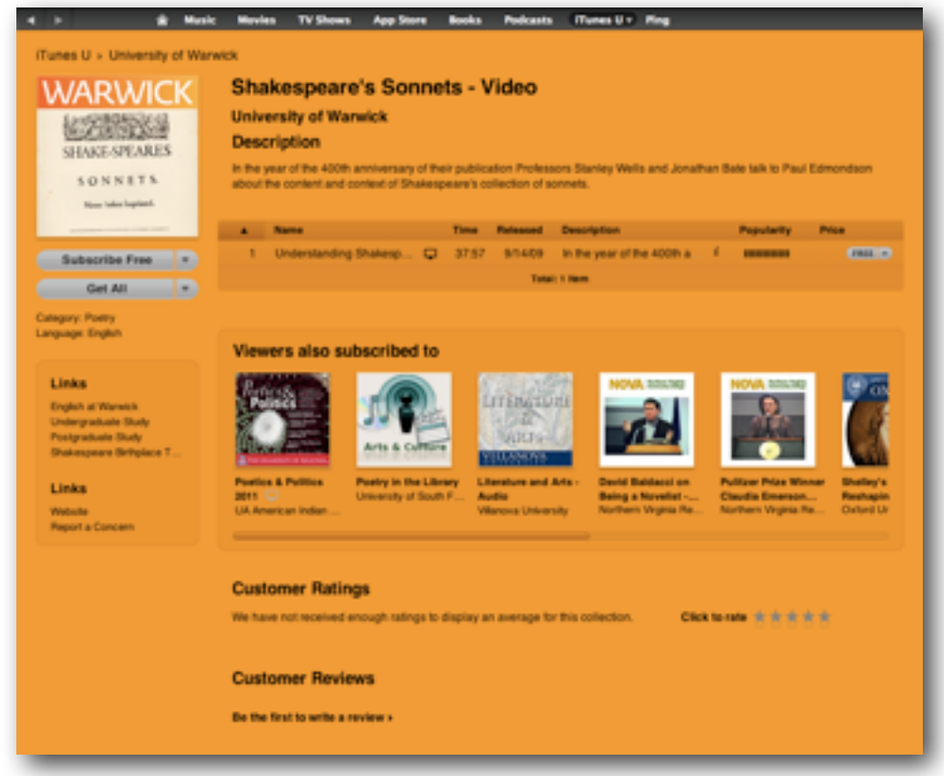

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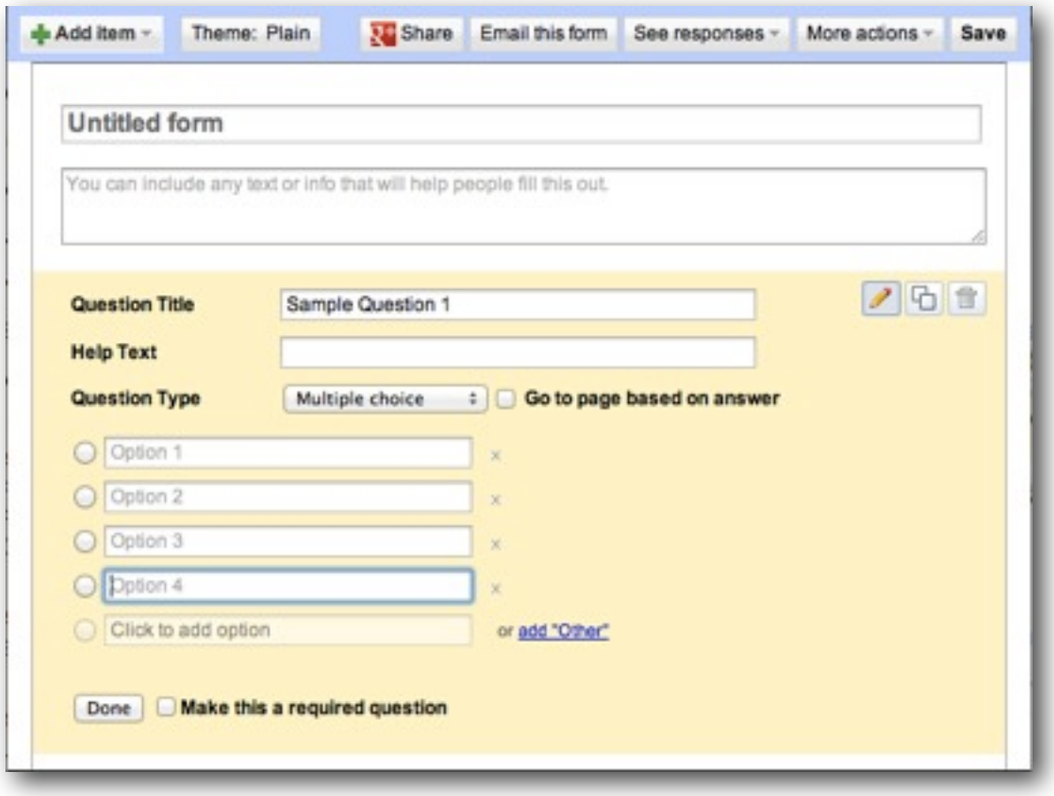

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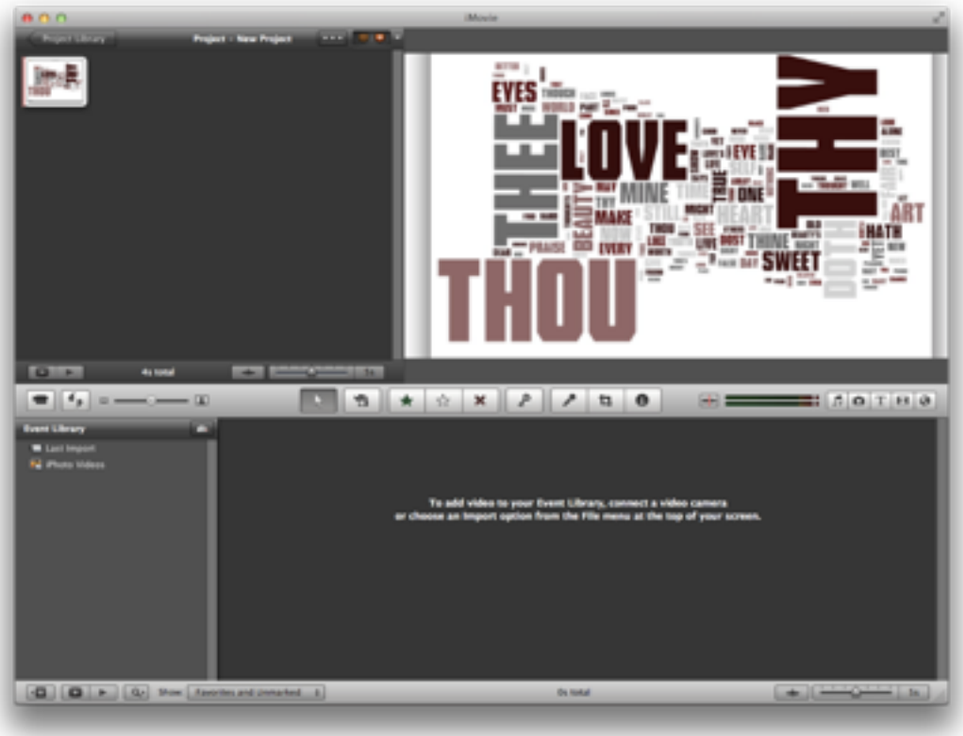

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Chemistry

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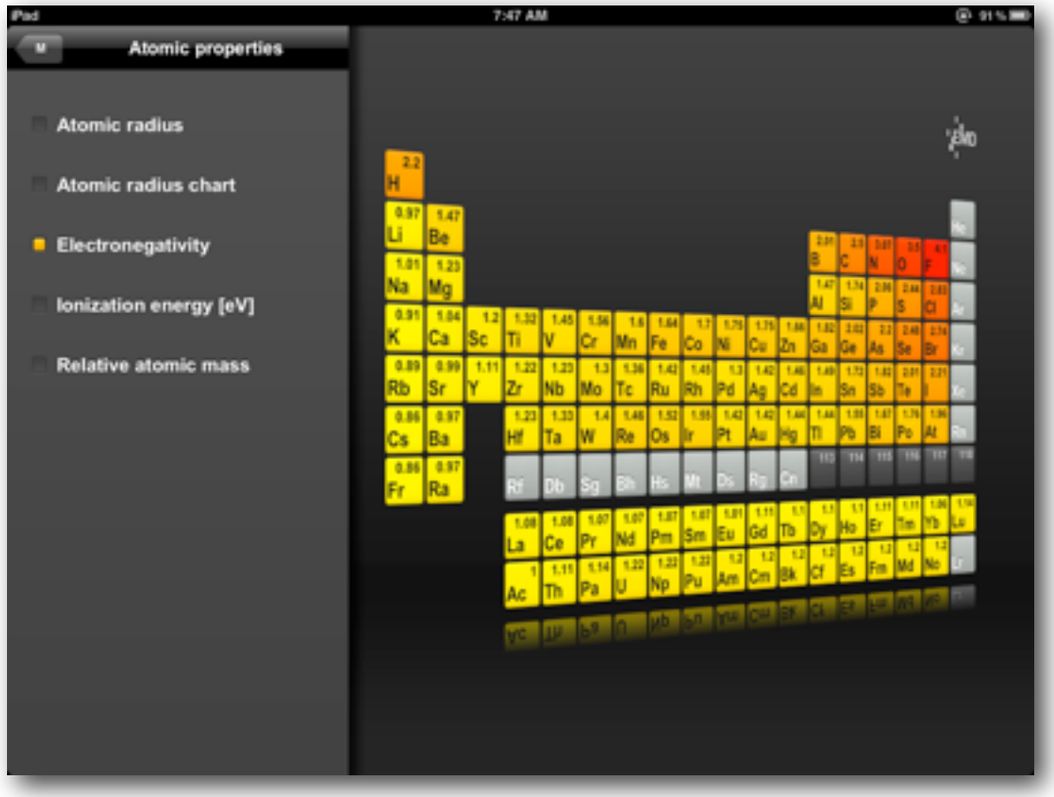

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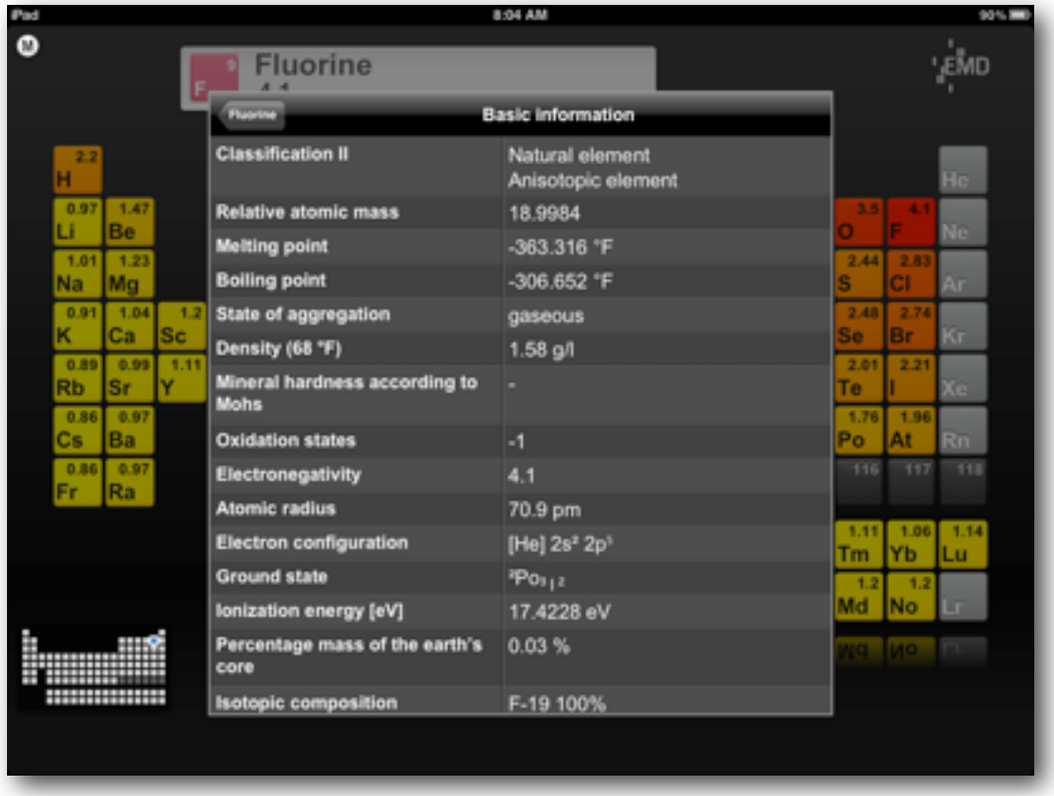

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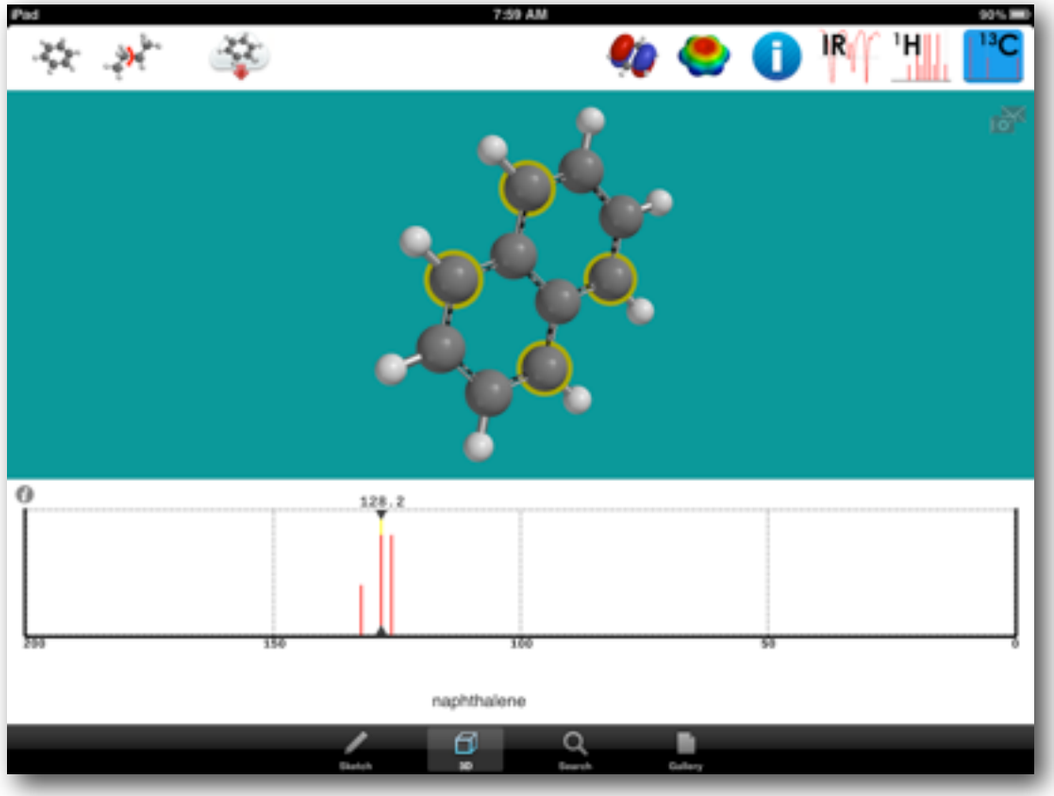

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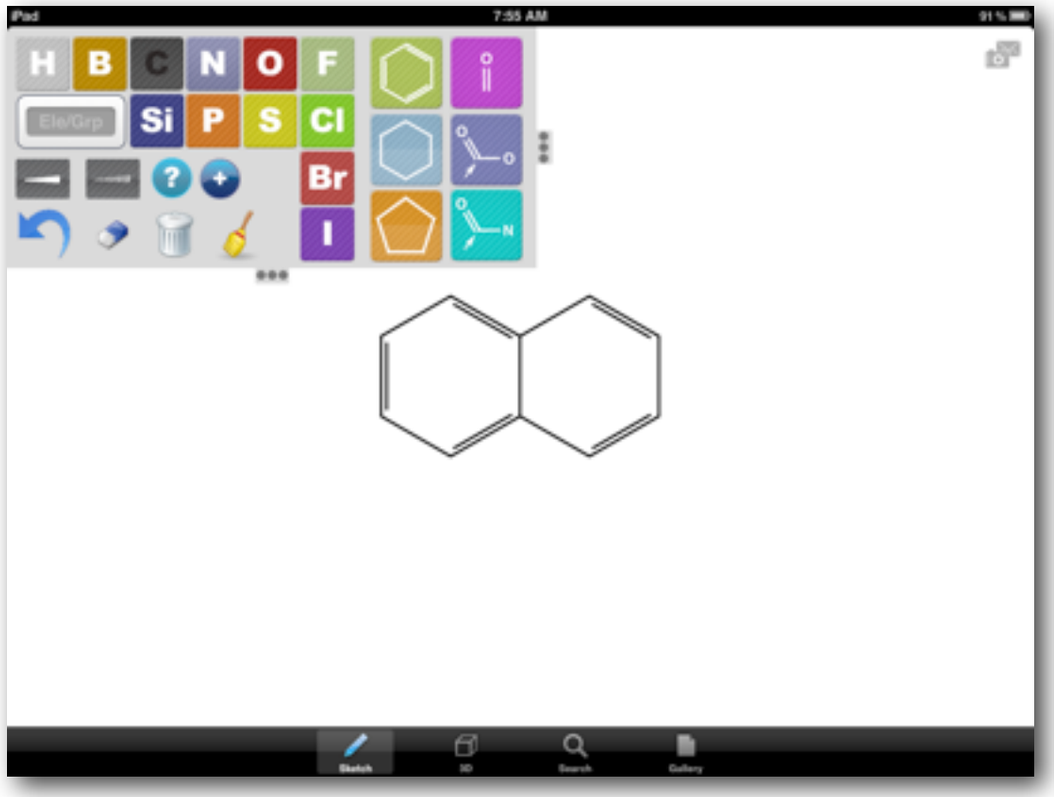

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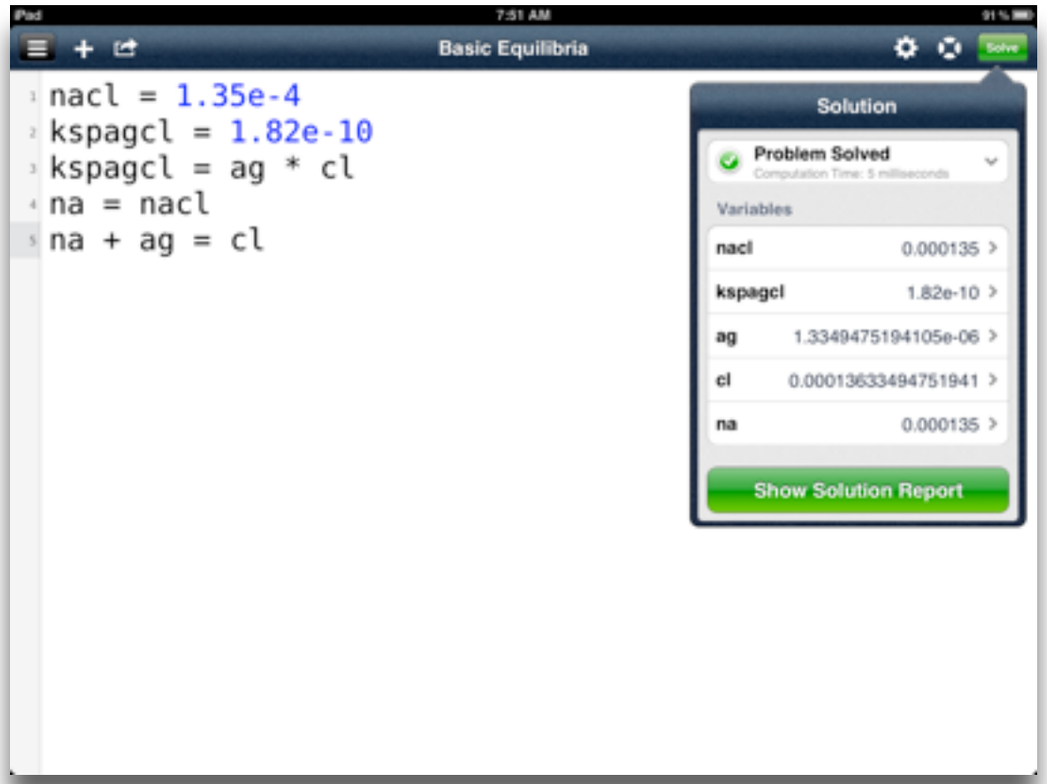

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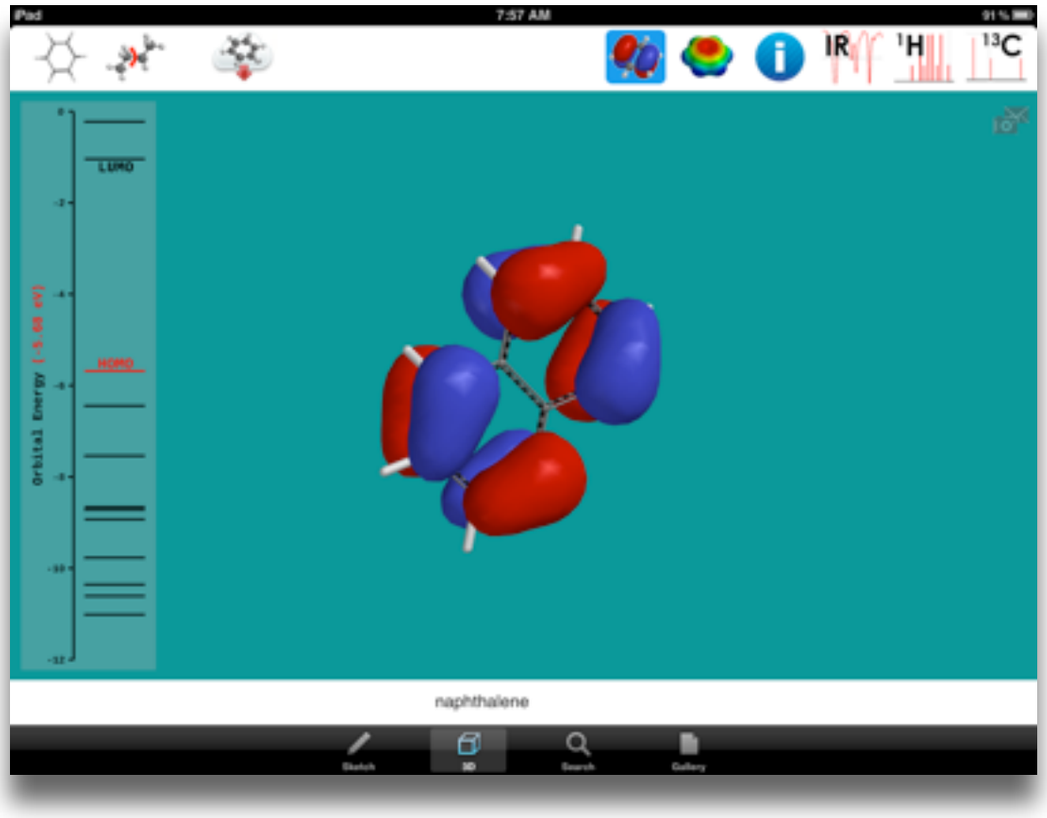

Geography

Gersmehl:
Teaching Geography – Four Cornerstones

- Location
  - Position in space
- Condition
  - Mix of natural & artificial features that give meaning to a location
- Links
  - Connections between places
- Region
  - Formal region: group of places with similar conditions
  - Functional region: group of places linked together by a flow

Phil Gersmehl. *Teaching Geography*. The Guilford Press. (2005)

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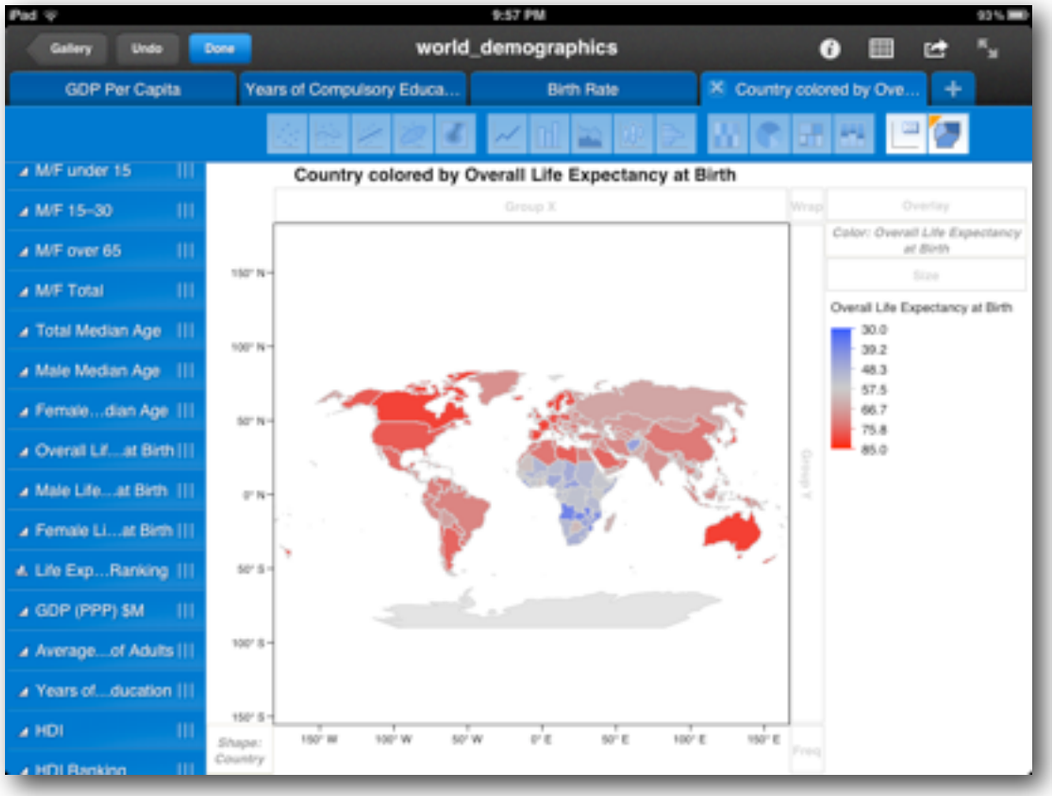

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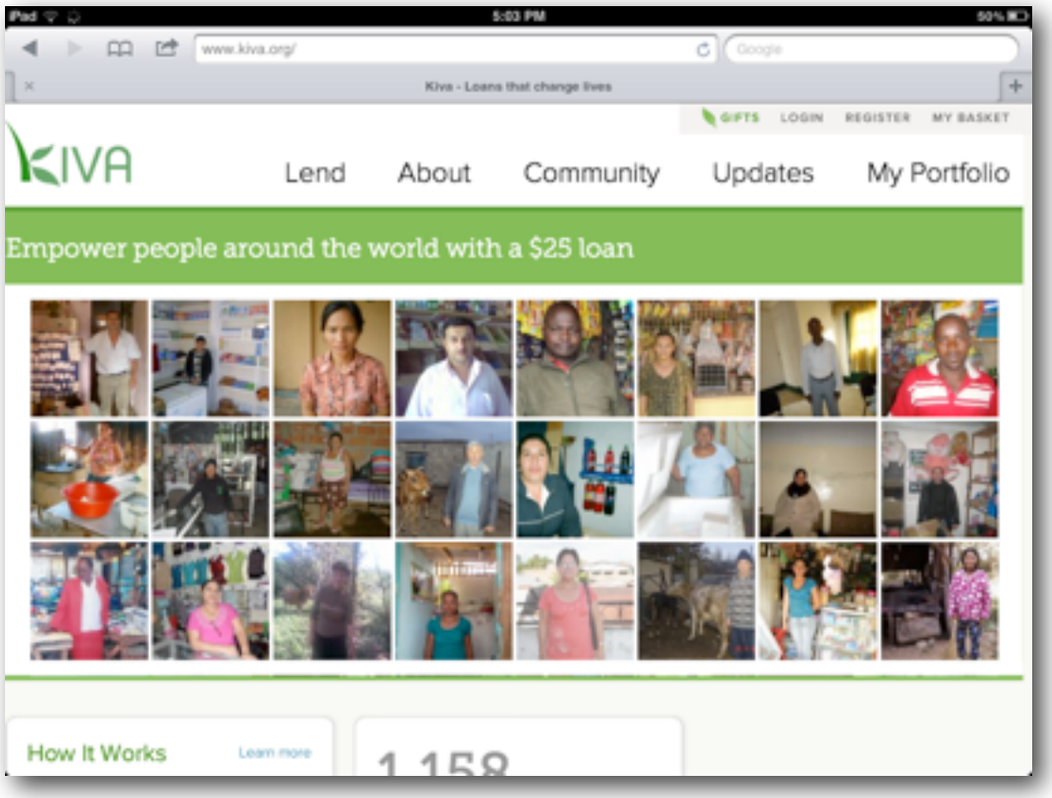

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Mathematics I

Mathematical Proficiency: Five Strands

- Conceptual Understanding
  - Comprehension of concepts, operations, relations
- Procedural Fluency
  - Carrying out procedures accurately, efficiently, flexibly, appropriately
- Strategic Competence
  - Formulate, represent, solve problems in autonomous/real world situations
- Adaptive Reasoning
  - Logical thought, reflection, explanation, justification
- Productive Disposition
  - Habitual inclination to see mathematics as sensible, useful, worthwhile
  - Self-confidence in ability to master material

National Research Council. *Adding It Up: Helping Children Learn Mathematics*. National Academies Press. (2001)

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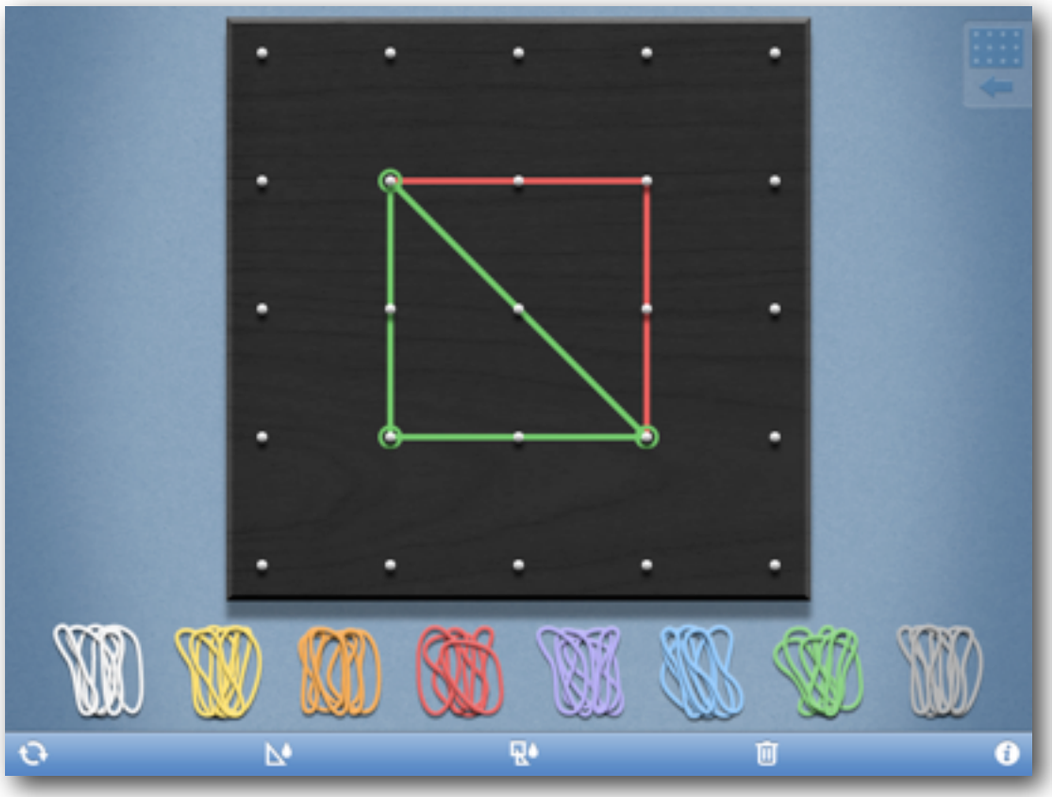

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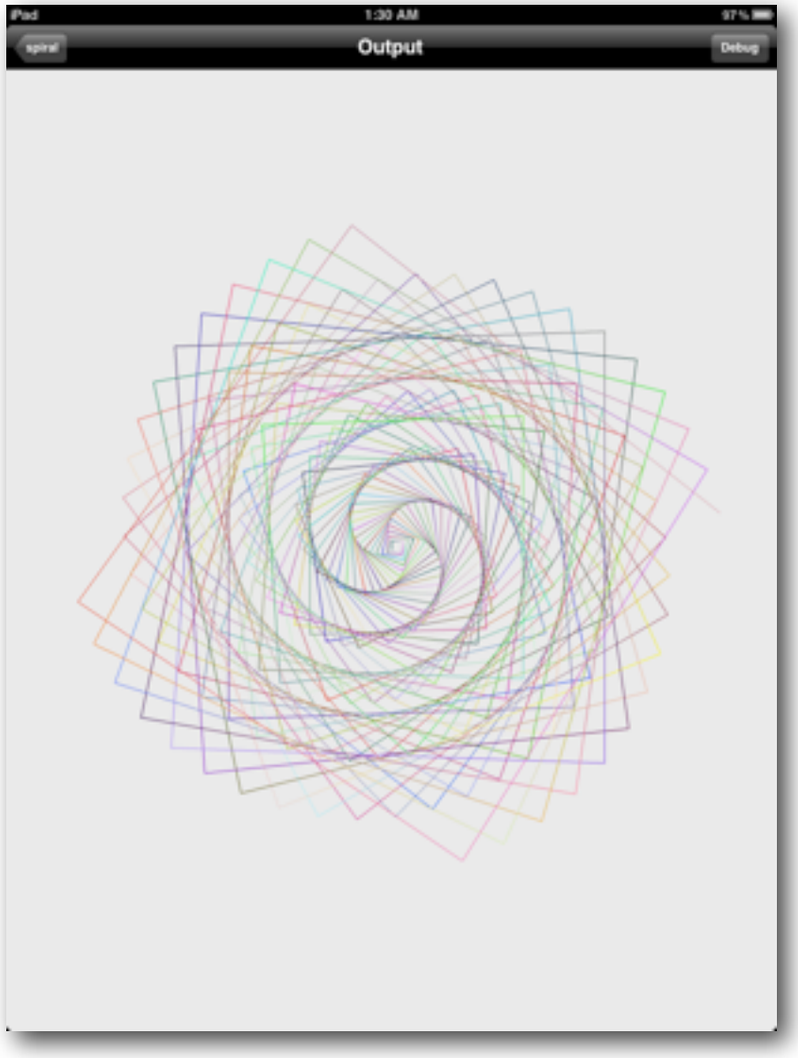

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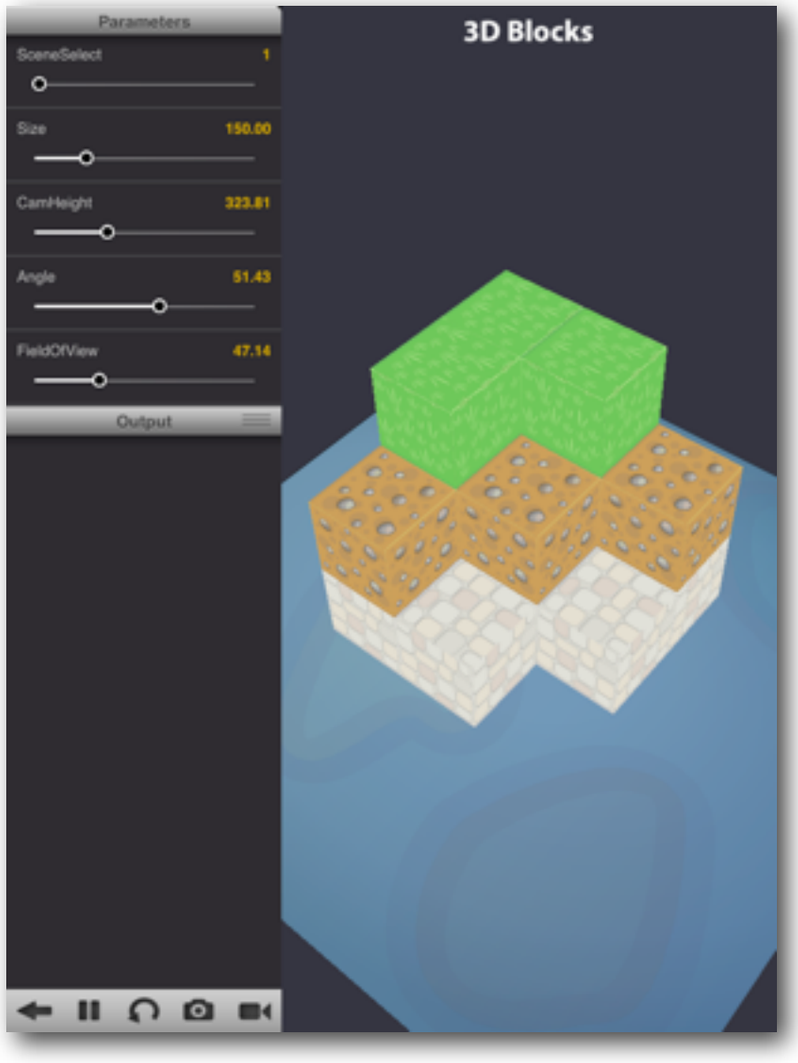

Mathematics II

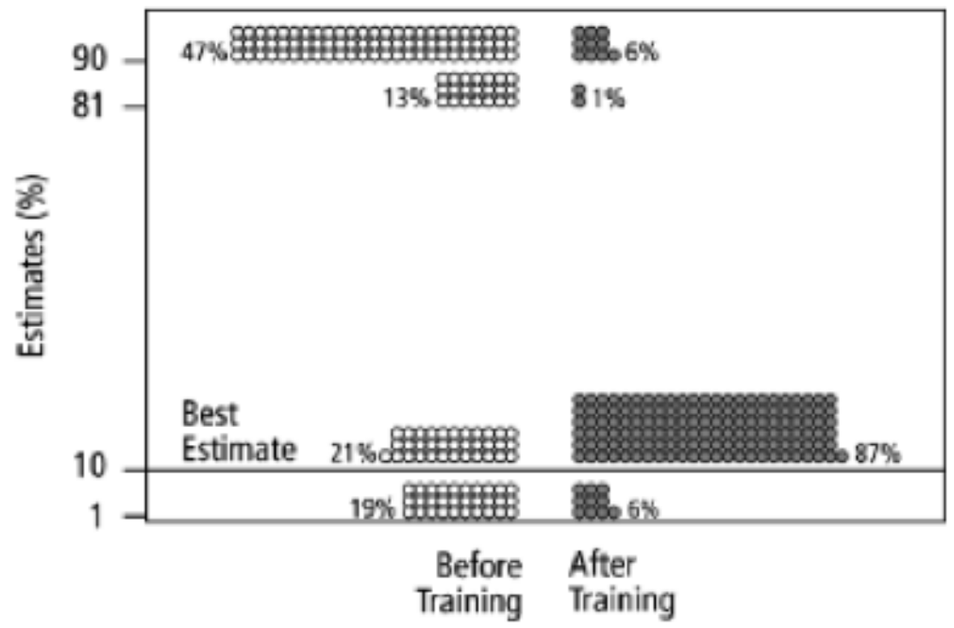

Fig. 2. Estimates by 160 gynecologists of the probability that a woman has breast cancer given a positive mammogram, before and after receiving training in how to translate conditional probabilities into natural frequencies.

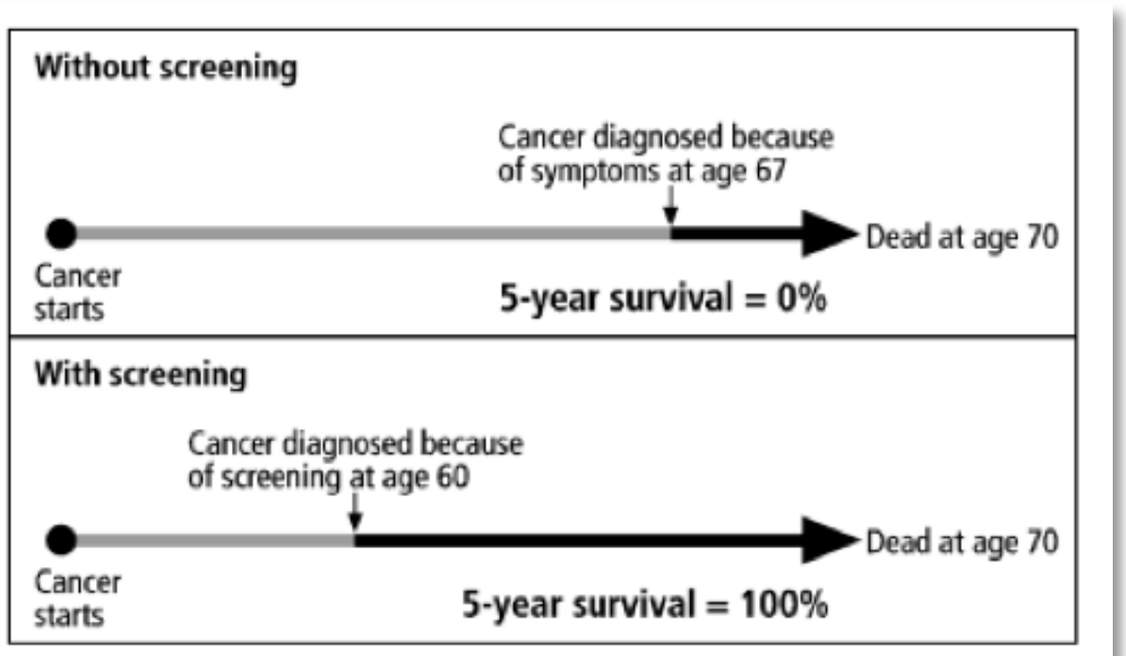

Fig. 4. Lead-time bias. Even if the time of death in not changed by screening—and thus no life is saved or prolonged—advancing the time of diagnosis in this way can result in increased 5-year survival rates, causing such statistics to be misleading.

Gerd Gigerenzer *et.al*. "Helping Doctors and Patients Make Sense of Health Statistics" *Psychol. Sci. Public Interest*. 2007;8:53–96

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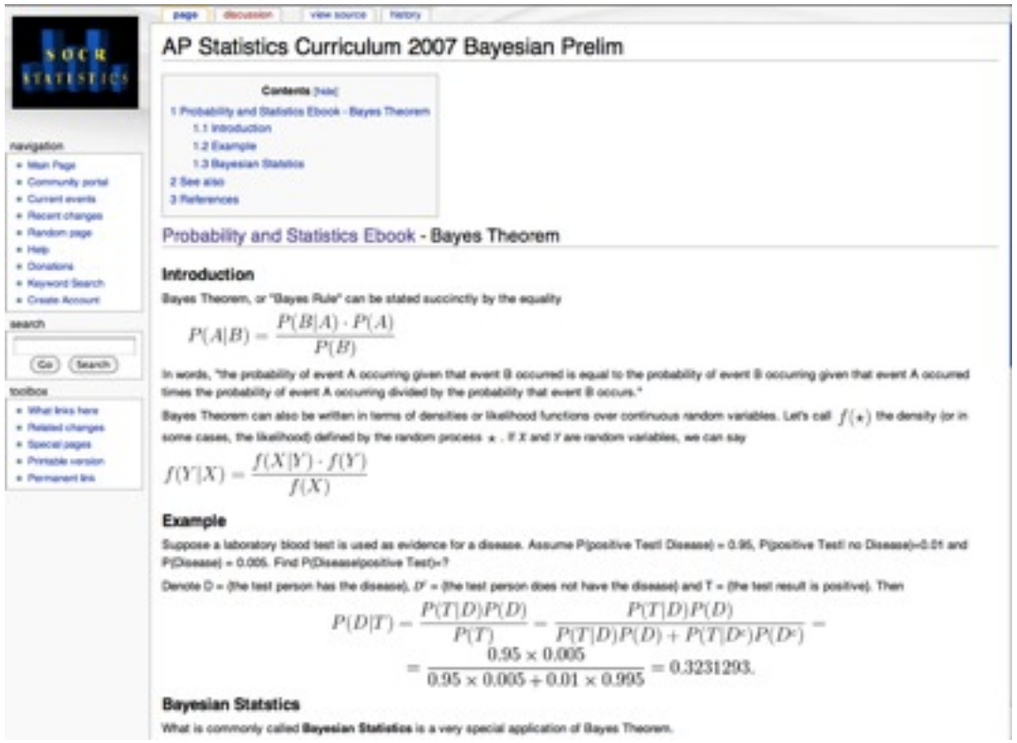

AP Statistics Curriculum 2007 Bayesian Prelim

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Probability and Statistics Ebook - Bayes Theorem

Introduction

Bayes Theorem, or "Bayes Rule" can be stated succinctly by the equality

$$P(A|B) = \frac{P(B|A) \cdot P(A)}{P(B)}$$

In words, "the probability of event A occuring given that event B occurred is equal to the probability of event B occuring given that event A occurred times the probability of event A occurring divided by the probability that event B occurs."

Bayes Theorem can also be written in terms of densities or likelihood functions over continuous random variables. Let's call $f(\star)$ the density (or in some cases, the likelihood) defined by the random process $\star$. If X and Y are random variables, we can say

$$f(Y|X) = \frac{f(X|Y) \cdot f(Y)}{f(X)}$$

Example

Suppose a laboratory blood test is used as evidence for a disease. Assume P(positive Test| Disease) = 0.95, P(positive Test| no Disease)=0.01 and P(Disease) = 0.005. Find P(Disease|positive Test)=?

Denote D = (the test person has the disease), D^c = (the test person does not have the disease) and T = (the test result is positive). Then

$$P(D|T) = \frac{P(T|D)P(D)}{P(T)} = \frac{P(T|D)P(D)}{P(T|D)P(D) + P(T|D^c)P(D^c)} =$$
$$= \frac{0.95 \times 0.005}{0.95 \times 0.005 + 0.01 \times 0.995} = 0.3231293.$$

Bayesian Statstics

What is commonly called **Bayesian Statistics** is a very special application of Bayes Theorem.

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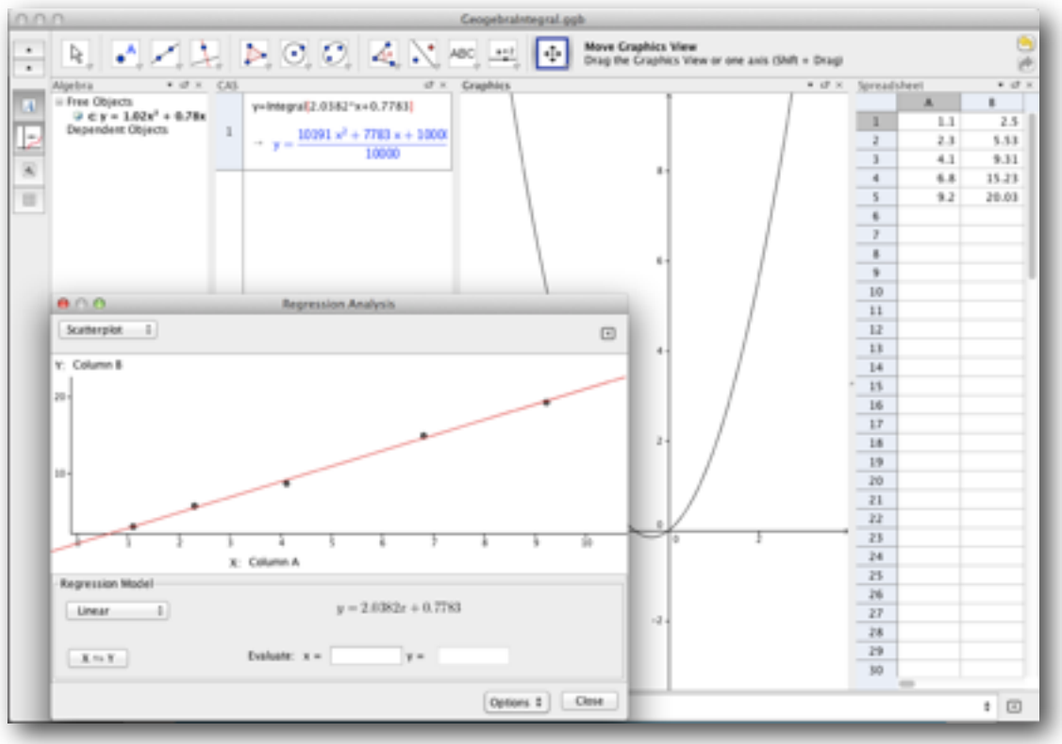

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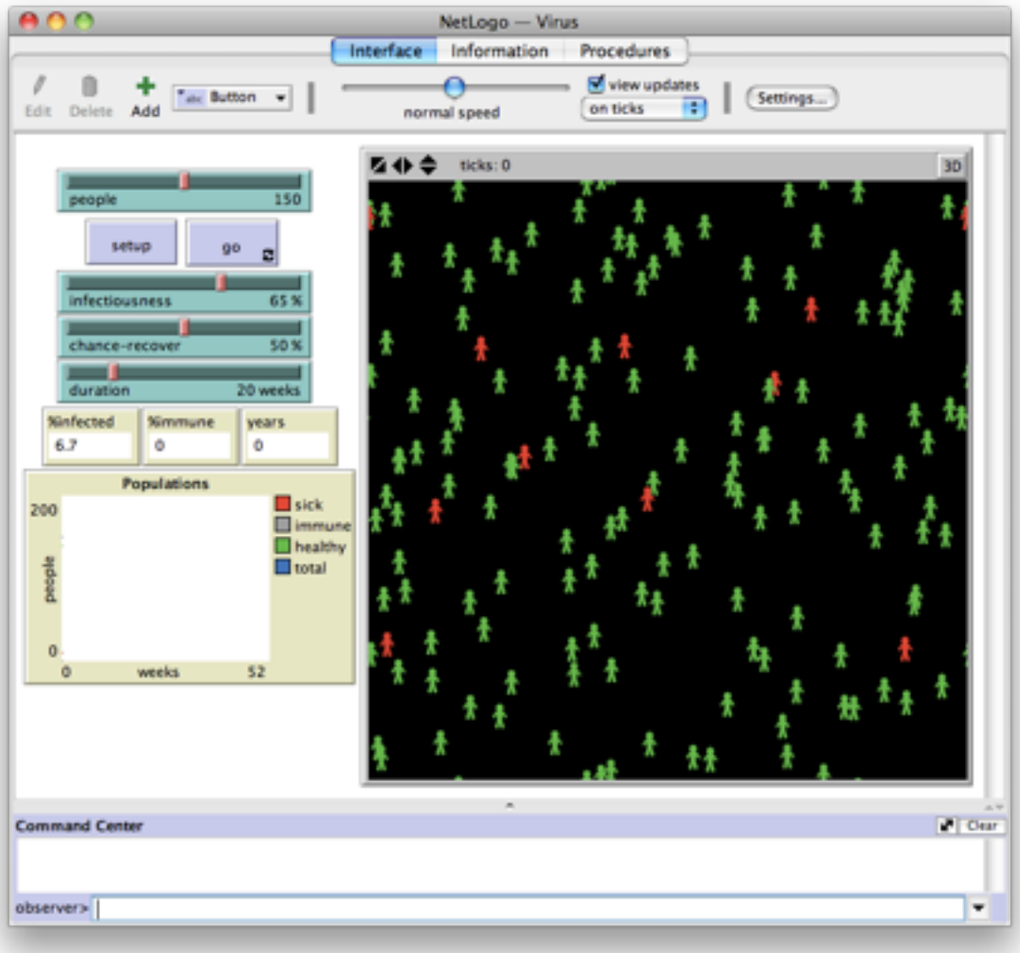

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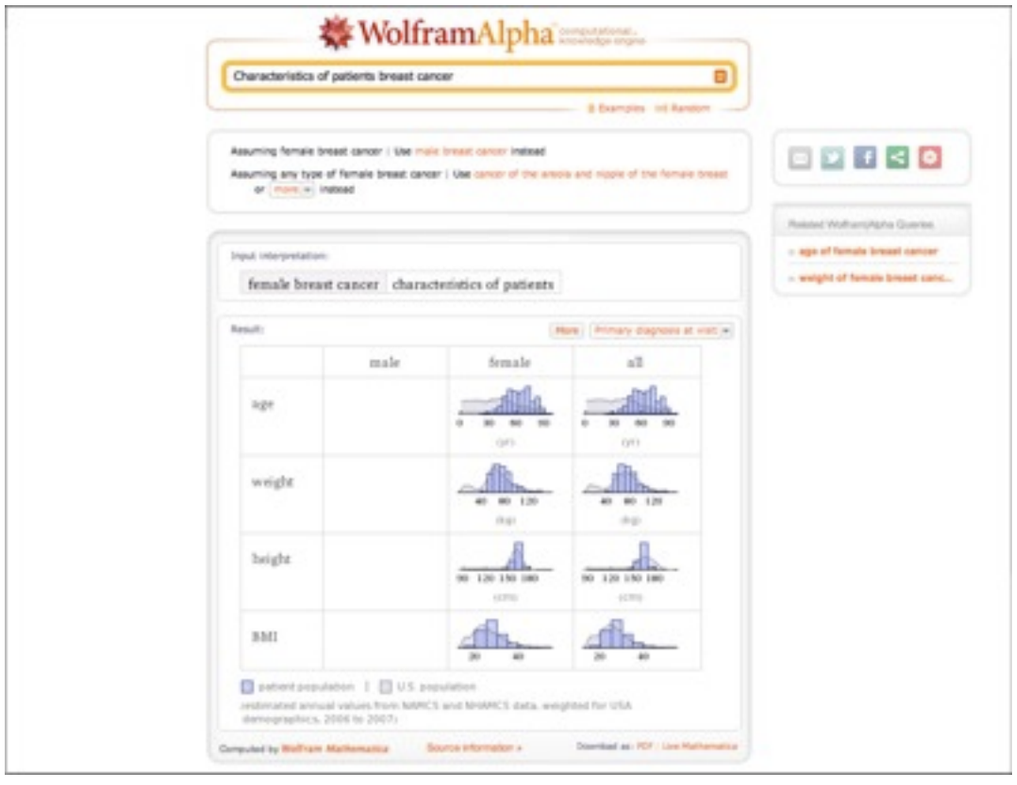

Music

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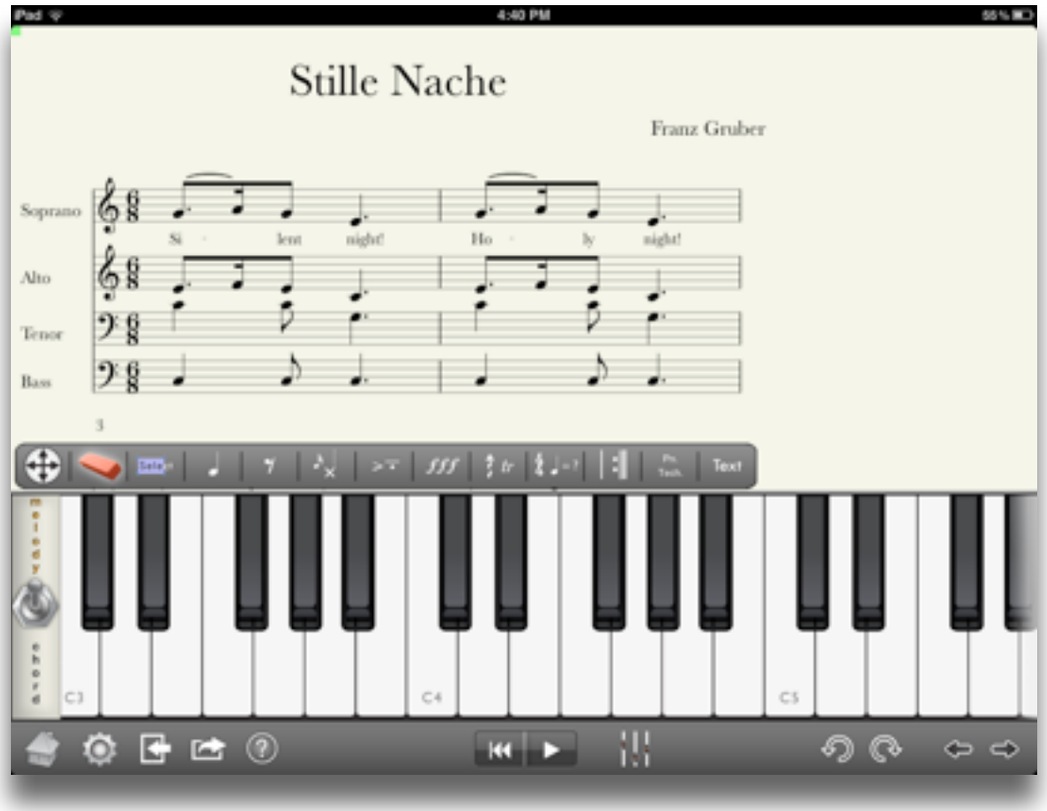

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Additional Resources

Resources

Background:

- Vannevar Bush, “As We May Think”. *The Atlantic Monthly*. (July 1945) Online at: http://www.theatlantic.com/magazine/archive/1969/12/as-we-may-think/3881/
- Douglas C. Engelbart, *A Research Center for Augmenting Human Intellect*. (December 1968 live demo) Archived online at: http://sloan.stanford.edu/mousesite/1968Demo.html
- Alan Kay, “A Personal Computer for Children of All Ages”. *Proceedings of the ACM National Conference*. Boston (August 1972) Online at: http://www.mprove.de/diplom/gui/Kay72a.pdf
- Seymour Papert, “On Making a Theorem for a Child”. *Proceedings of the ACM National Conference*. Boston (August 1972) Online at: http://portal.acm.org/citation.cfm?id=569942

SAMR and TPCK:

- Ruben R. Puentedura, *Transformation, Technology, and Education*. (2006) Online at: http://hippasus.com/resources/tte/
- Ruben R. Puentedura, *As We May Teach: Educational Technology, From Theory Into Practice*. (2009) Online at: http://tinyurl.com/aswemayteach
- *TPCK - Technological Pedagogical Content Knowledge*. (2008-2010) Online at: http://www.tpck.org/tpck/index.php?title=Main_Page
- AACTE (Eds.) *The Handbook of Technological Pedagogical Content Knowledge for Educators*. New York:Routledge, 2008.

Resources – Part II

Defining Mobile Devices/The Lively Sketchbook

- Ruben R. Puentedura, “Drawing On The Lively Sketchbook”. *Connect@NMC Talks*. (2010) Online at: http://www.nmc.org/connect/2010/april/16
- Ruben R. Puentedura, “The Lively Sketchbook”. (2010) Online at: http://www.hippasus.com/rrpweblog/archives/2010_01.html

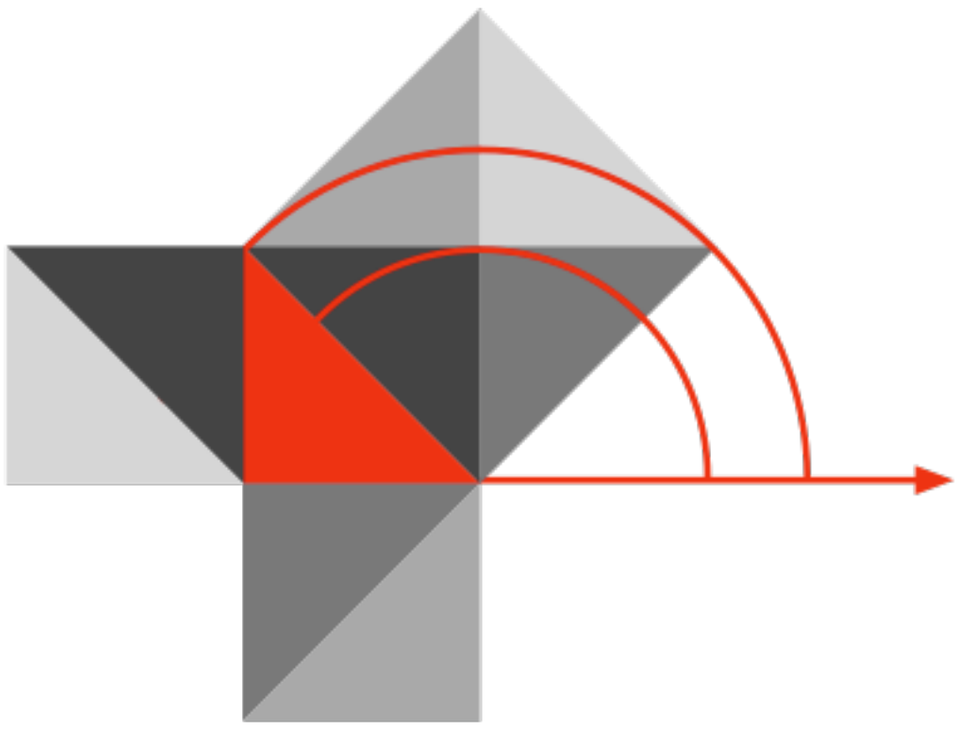
The Curiosity Amplifier

- John Seely Brown. “A New Culture of Learning”. NMC Summer Conference, Closing Keynote. (2010) Online at: http://www.nmc.org/2010-summer-conference/jsb-keynote-video

Technology In Education: The First 200,000 Years

- Ruben R. Puentedura. “Technology In Education: The First 200,000 Years”. NMC Summer Conference, *Ideas that Matter* Presentation. (2012) Online at: http://www.hippasus.com/rrpweblog/archives/000069.html

Hippasus



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