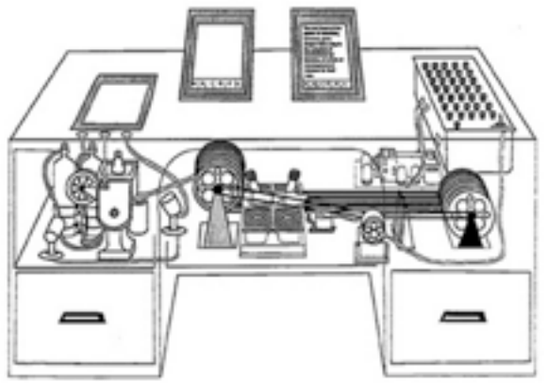
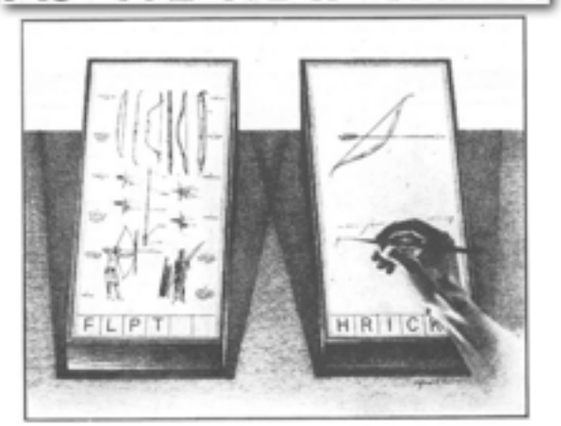
Education, Technology, and Change: SAMR and TPCK in Context

Ruben R. Puentedura, Ph.D.

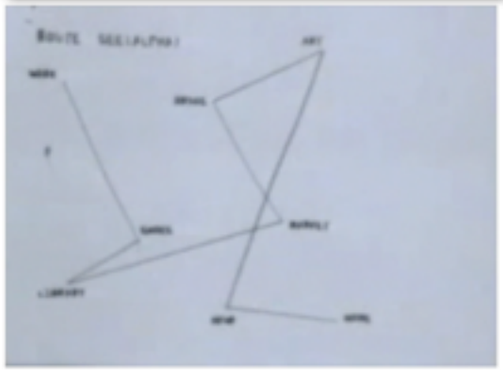
Prologue: Metaphors



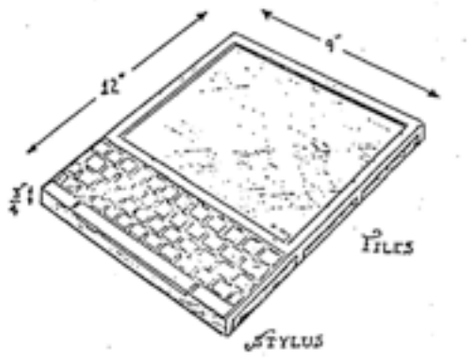
AS WE MAY THINK

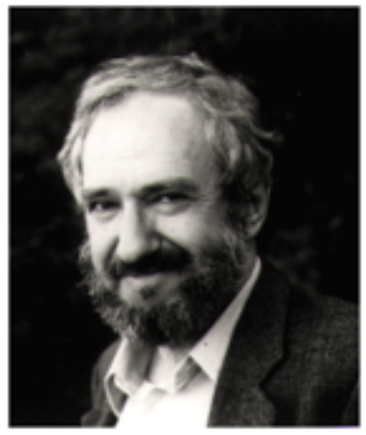


a research center
for augmenting human
intellect



A Personal Computer for Children of All Ages





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TO POLY :ANGLE :STEP
1.   FORWARD :STEP
2.   RIGHT :ANGLE
3.   POLY :ANGLE :STEP

END
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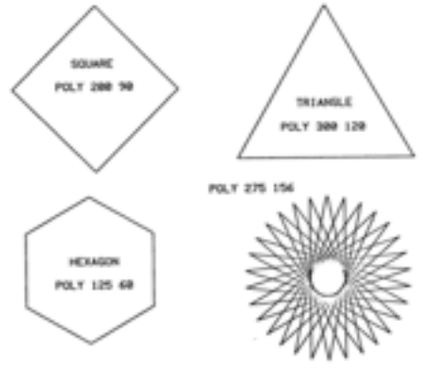
ON MAKING A THEOREM FOR A CHILD



The SAMR Model

Redefinition

Tech allows for the creation of new tasks, previously inconceivable

Modification

Tech allows for significant task redesign

Transformation

Enhancement

Augmentation

Tech acts as a direct tool substitute, with functional improvement

Substitution

Tech acts as a direct tool substitute, with no functional change

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

Literacy and Vocabulary

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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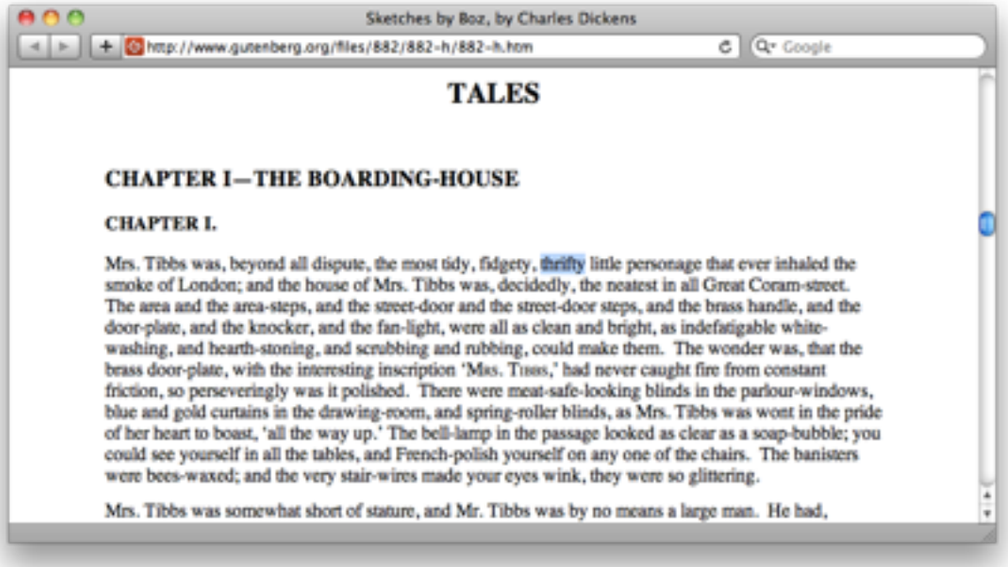

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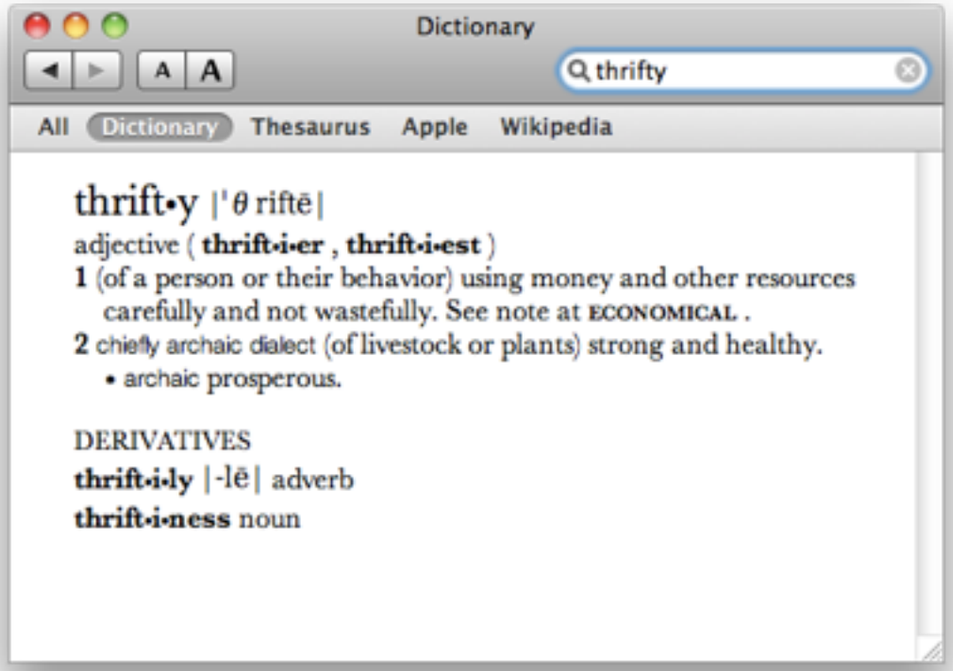

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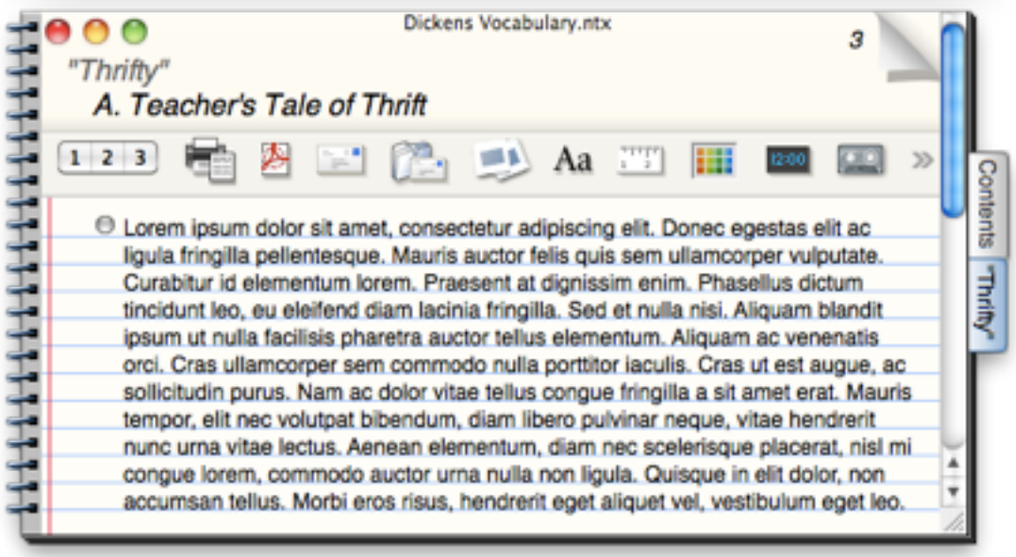

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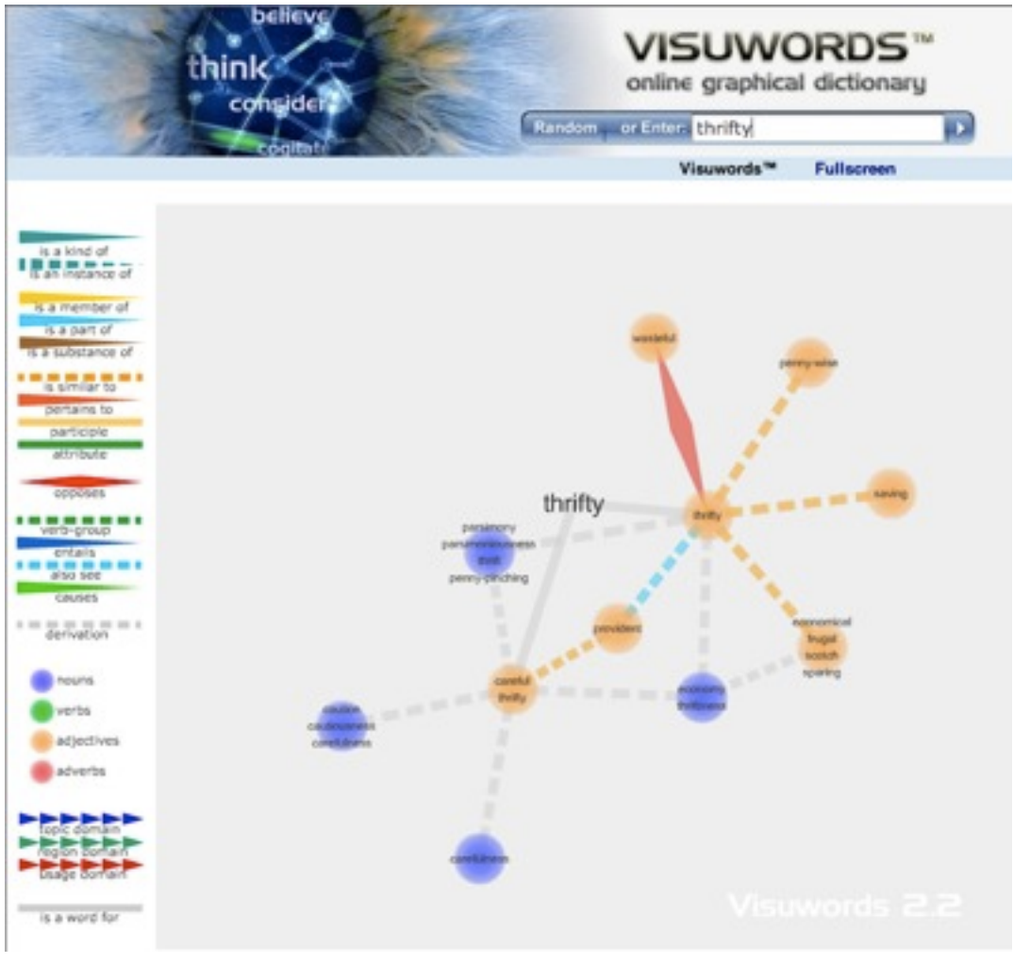

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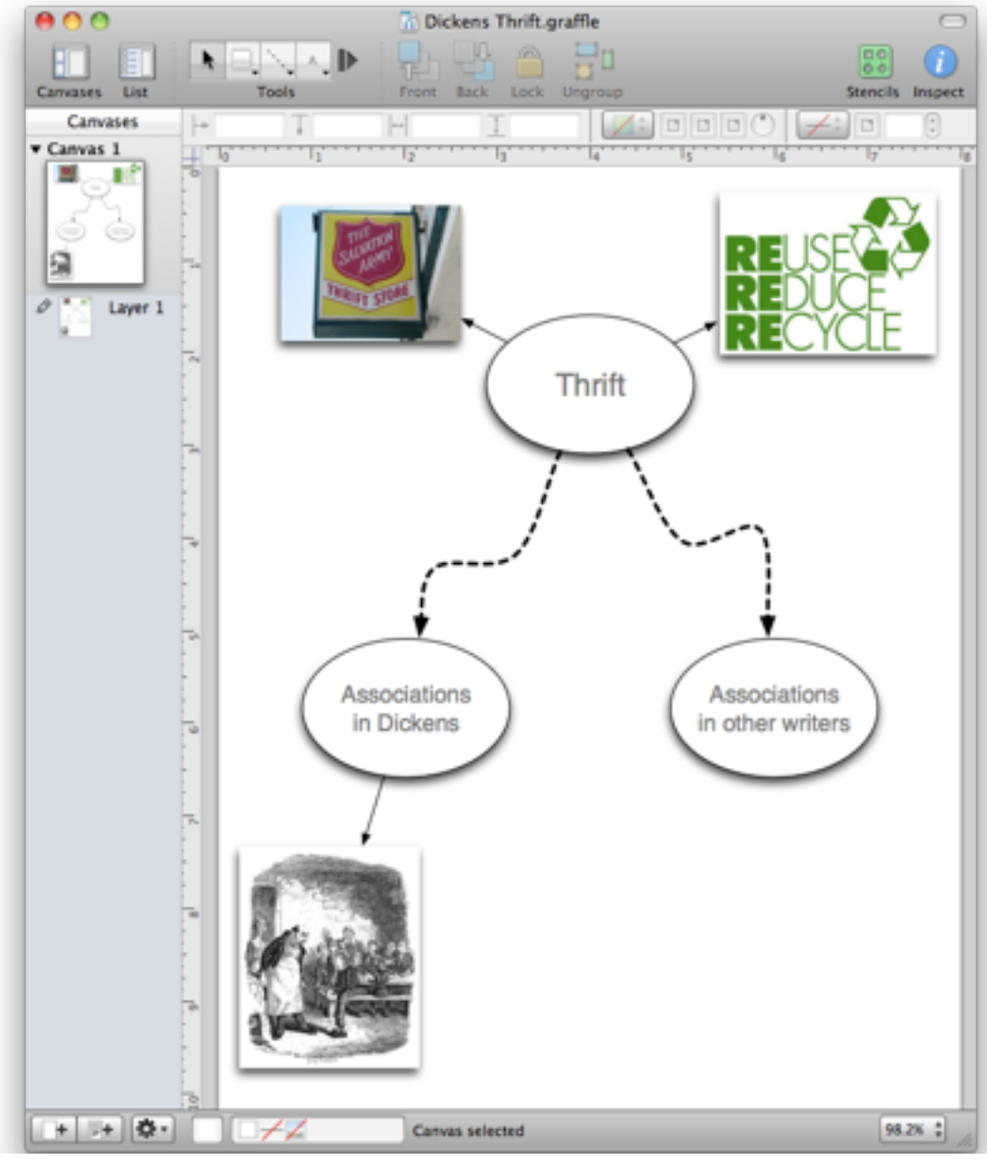

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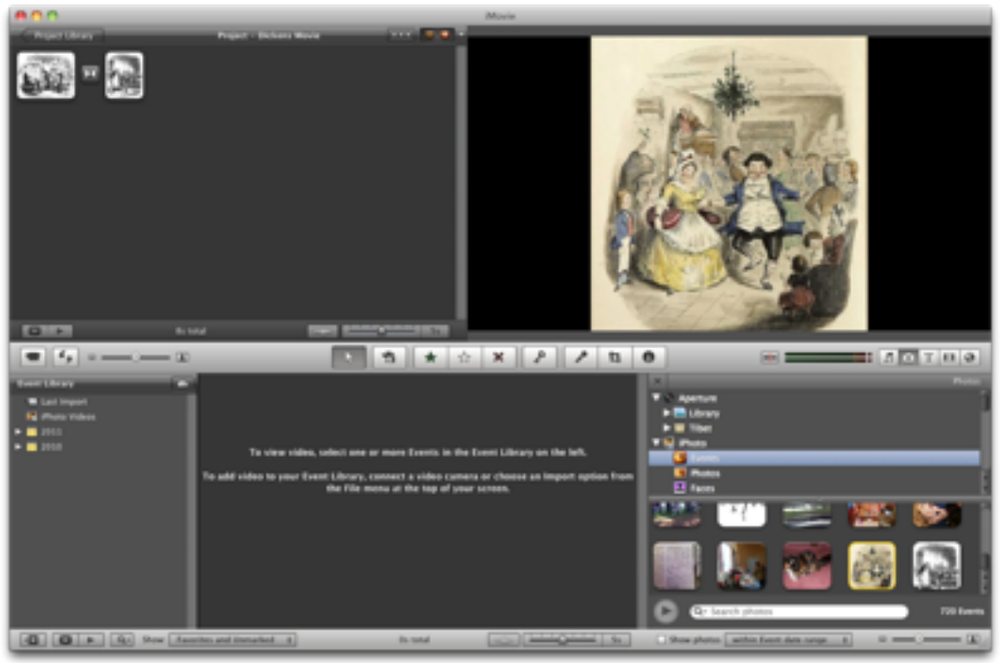

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The Student Historian

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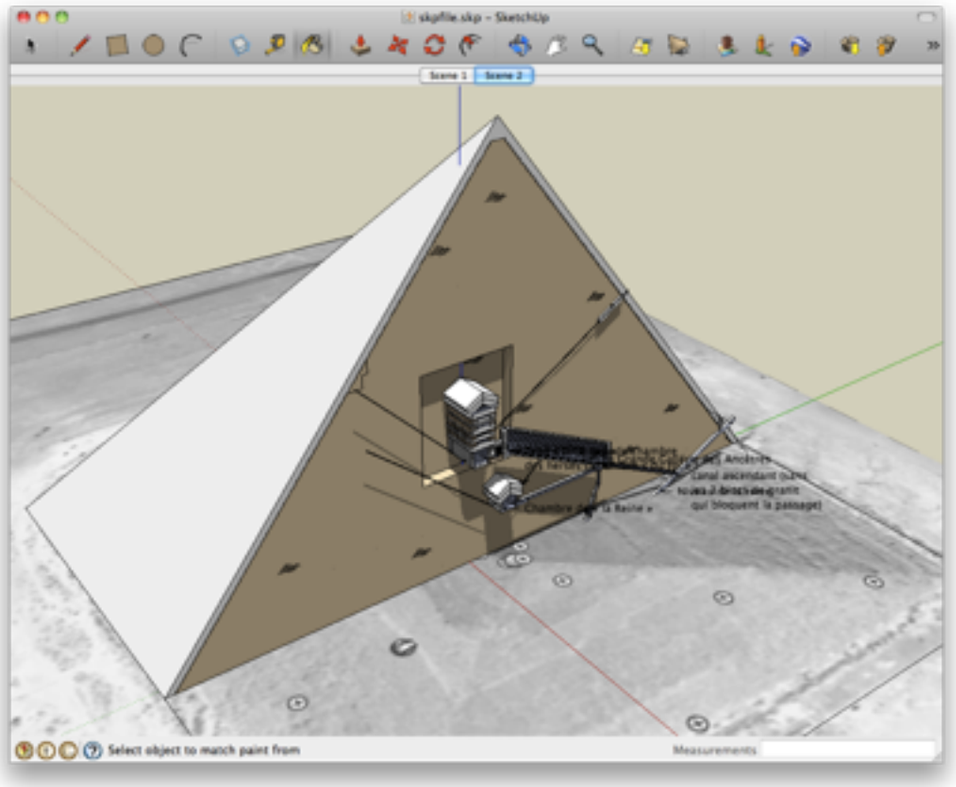

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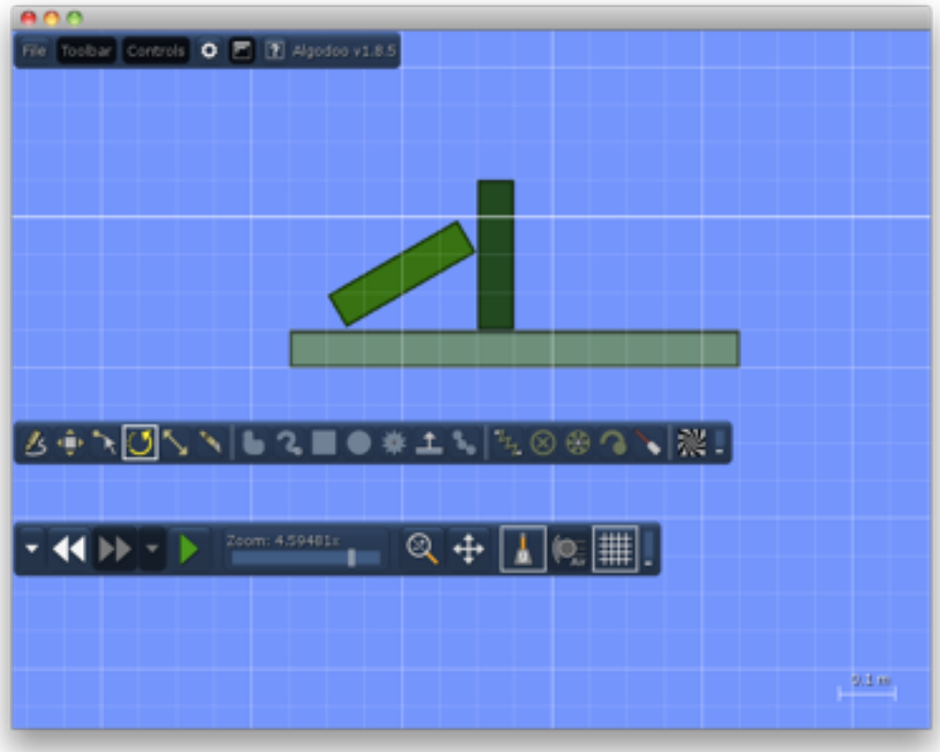

Science as Concrete Abstraction

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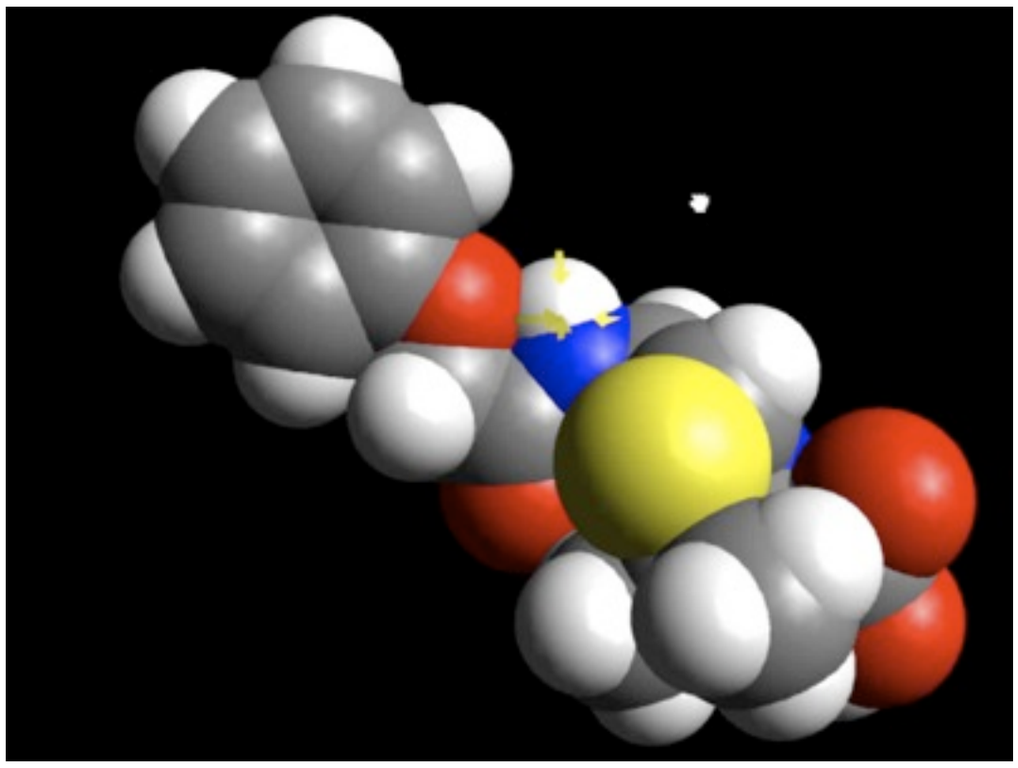

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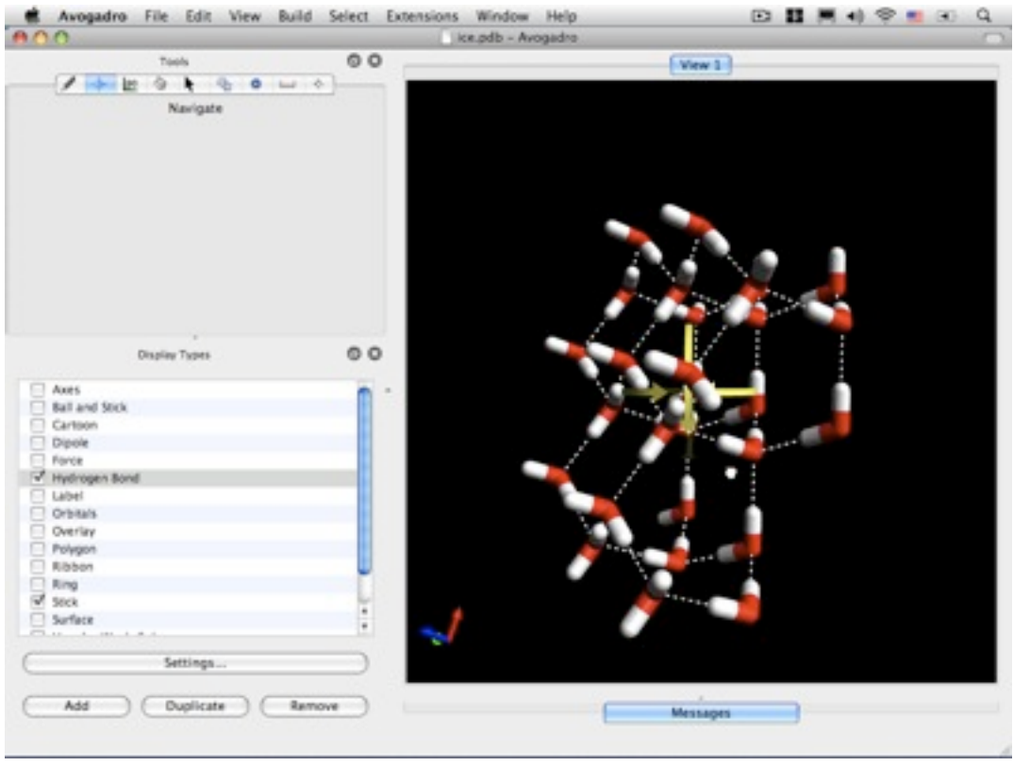

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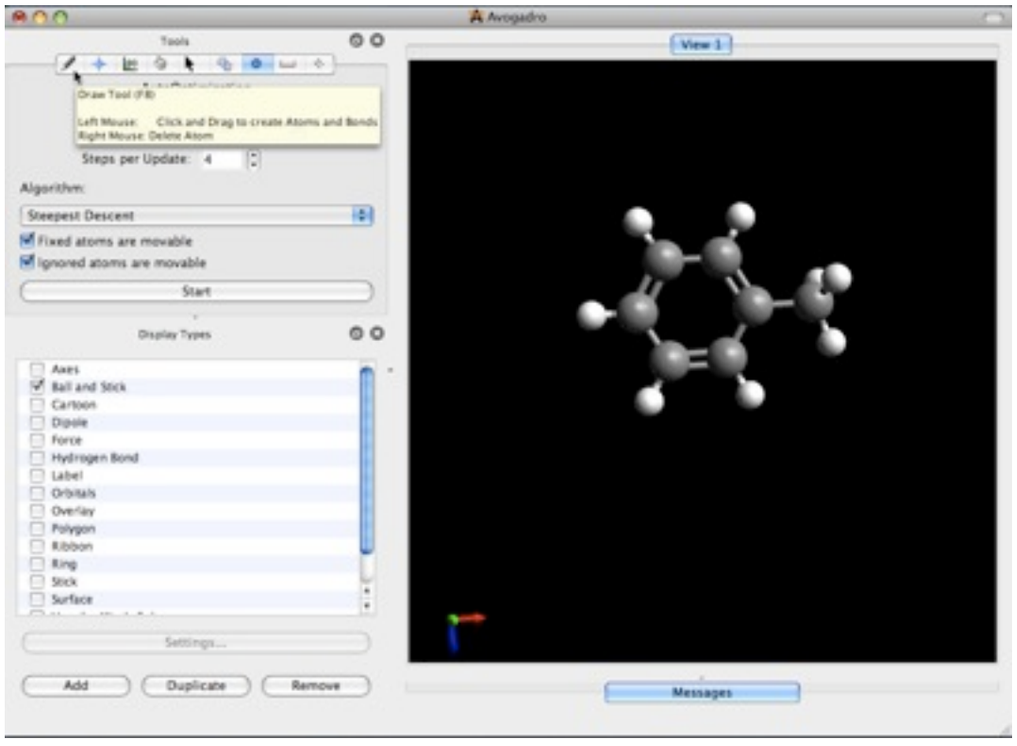

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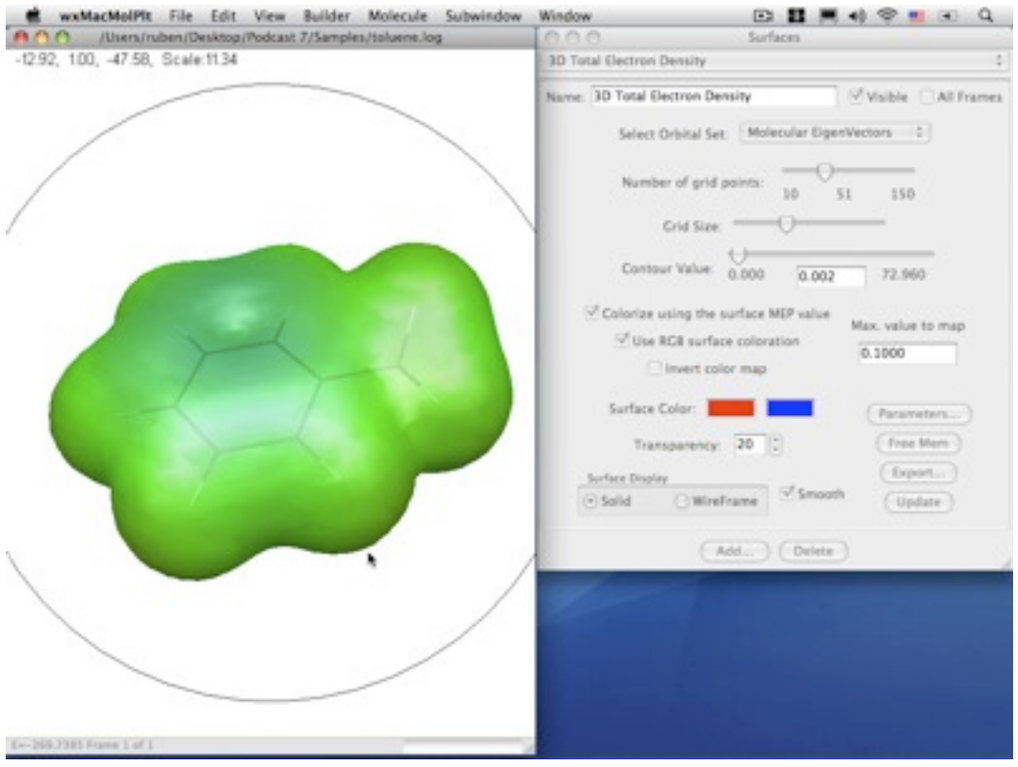

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Opening Up the Math Candy Store

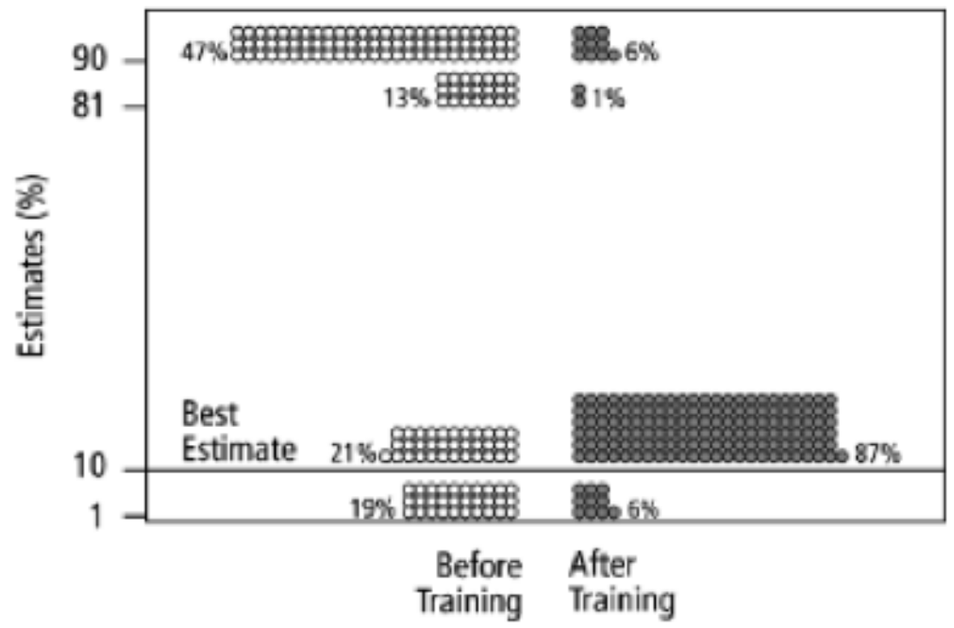

Fig. 2. Estimates by 160 gynecologists of the probability that a woman has breast cancer given a positive mammogram, before and after receiving training in how to translate conditional probabilities into natural frequencies.

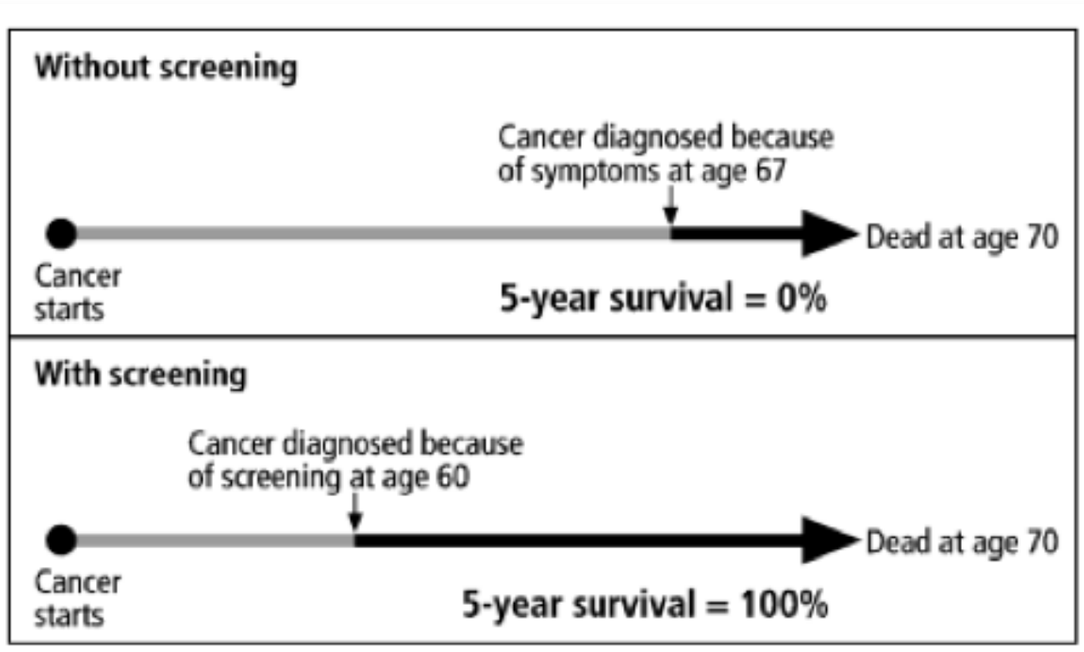

Fig. 4. Lead-time bias. Even if the time of death in not changed by screening—and thus no life is saved or prolonged—advancing the time of diagnosis in this way can result in increased 5-year survival rates, causing such statistics to be misleading.

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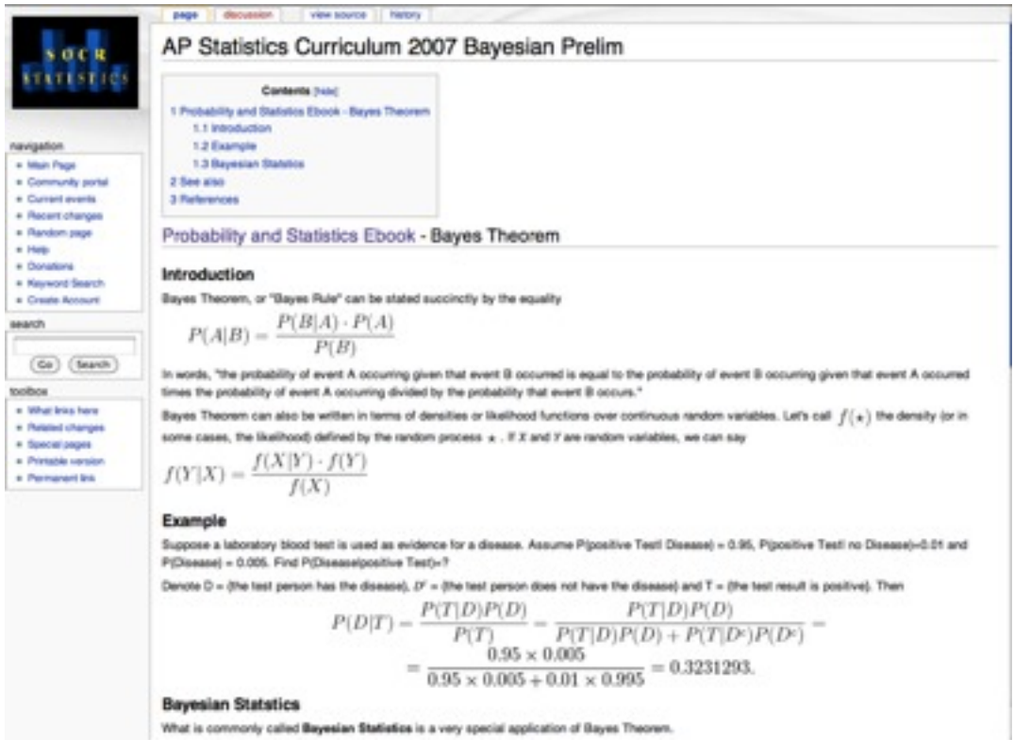

AP Statistics Curriculum 2007 Bayesian Prelim

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1 Probability and Statistics Ebook - Bayes Theorem
- 1.1 Introduction
- 1.2 Example
- 1.3 Bayesian Statistics

2 See also

3 References

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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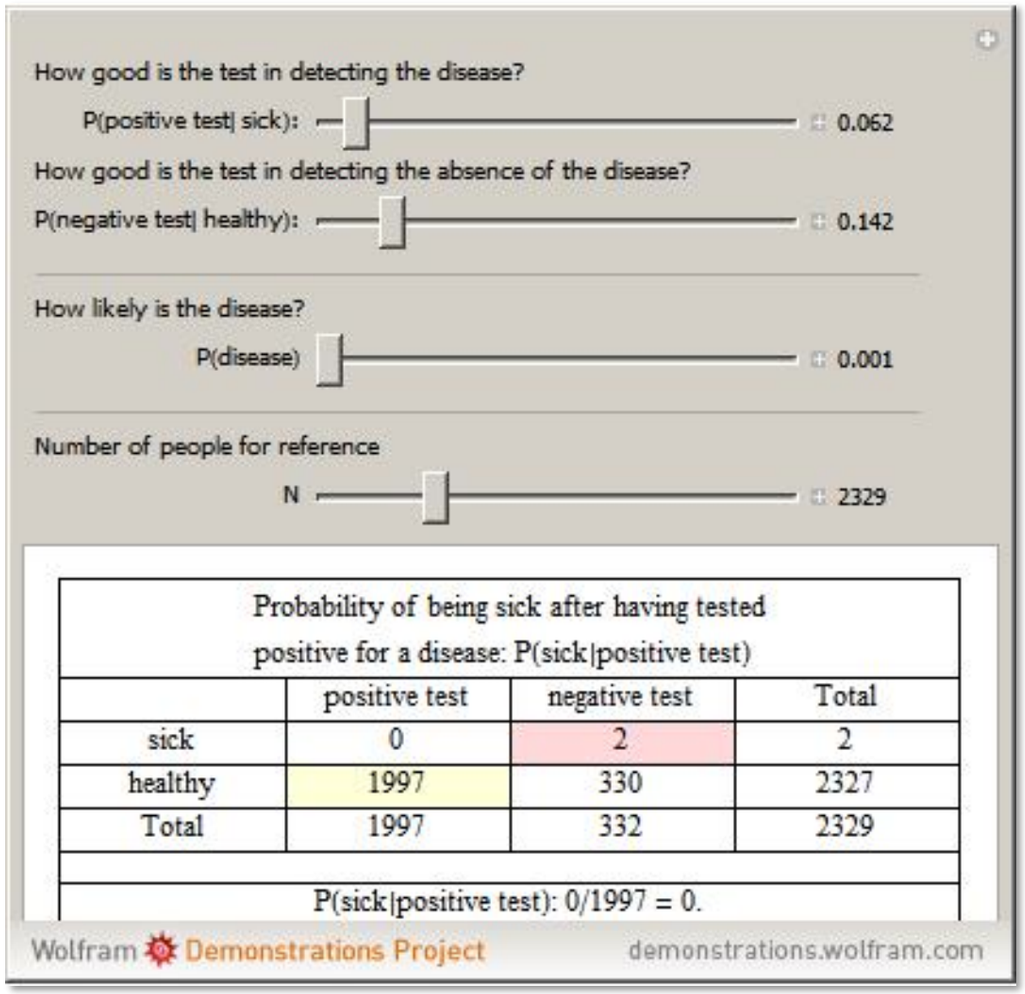

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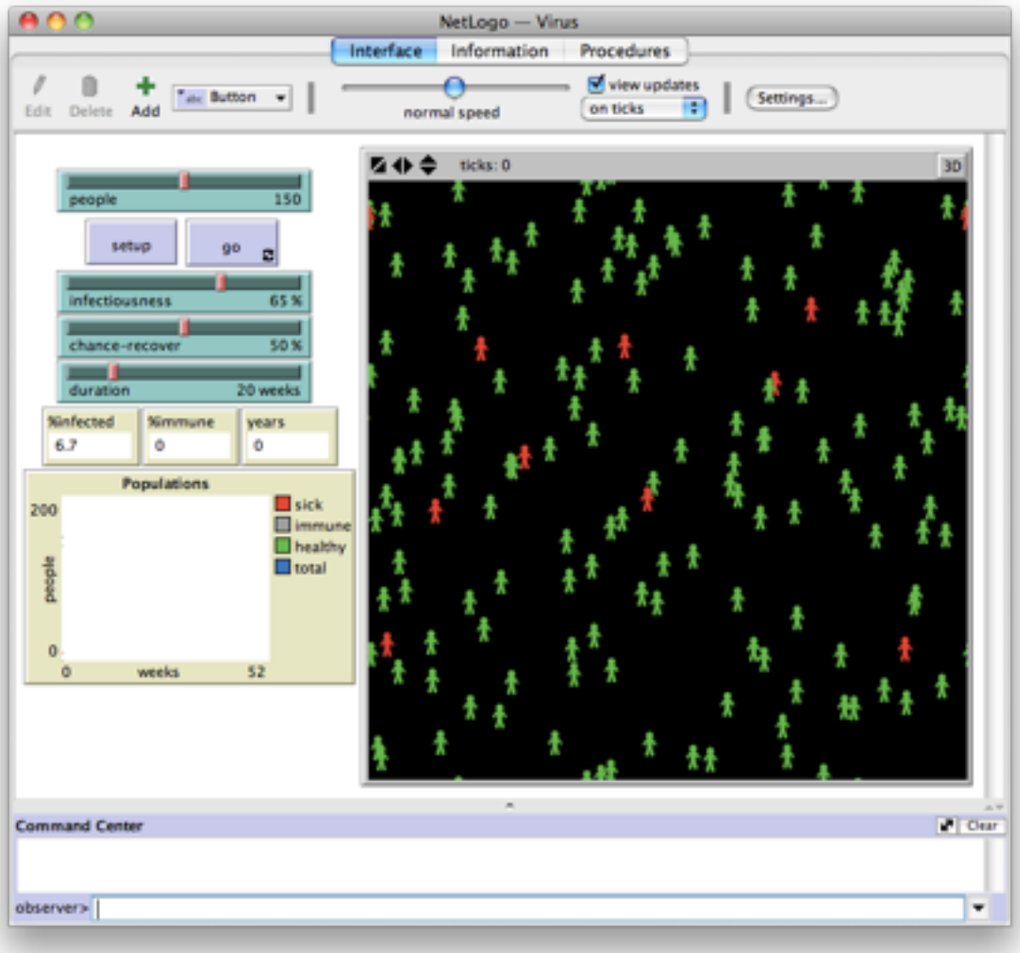

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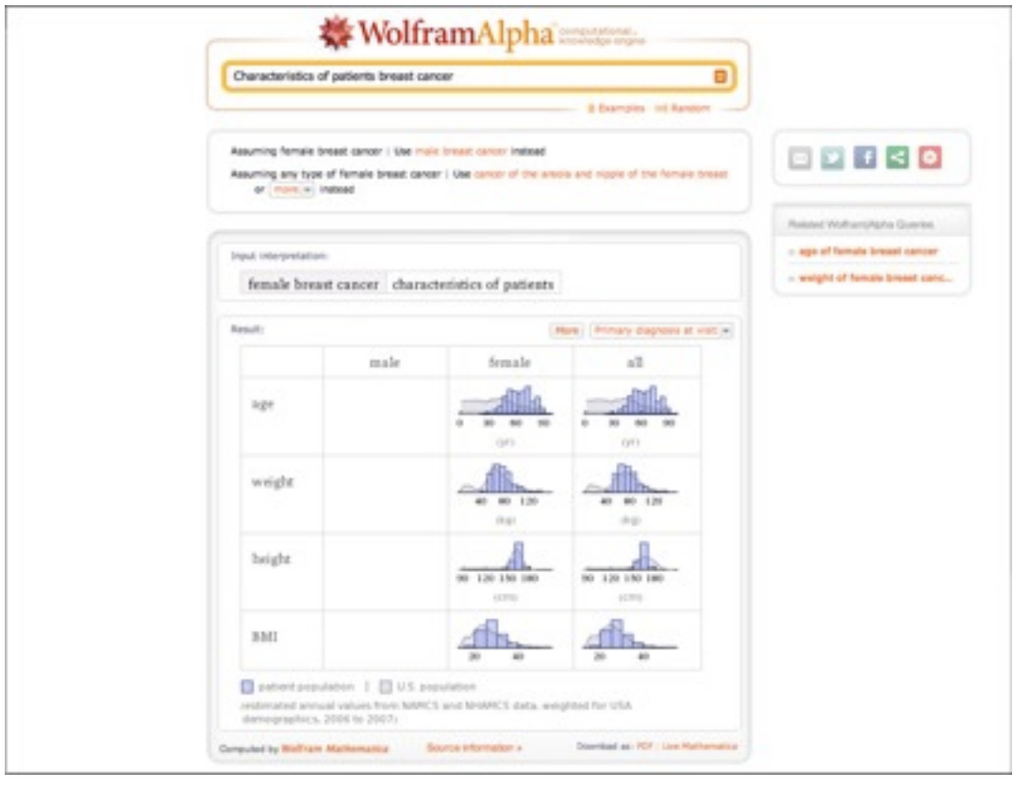

The Personal Learning Network

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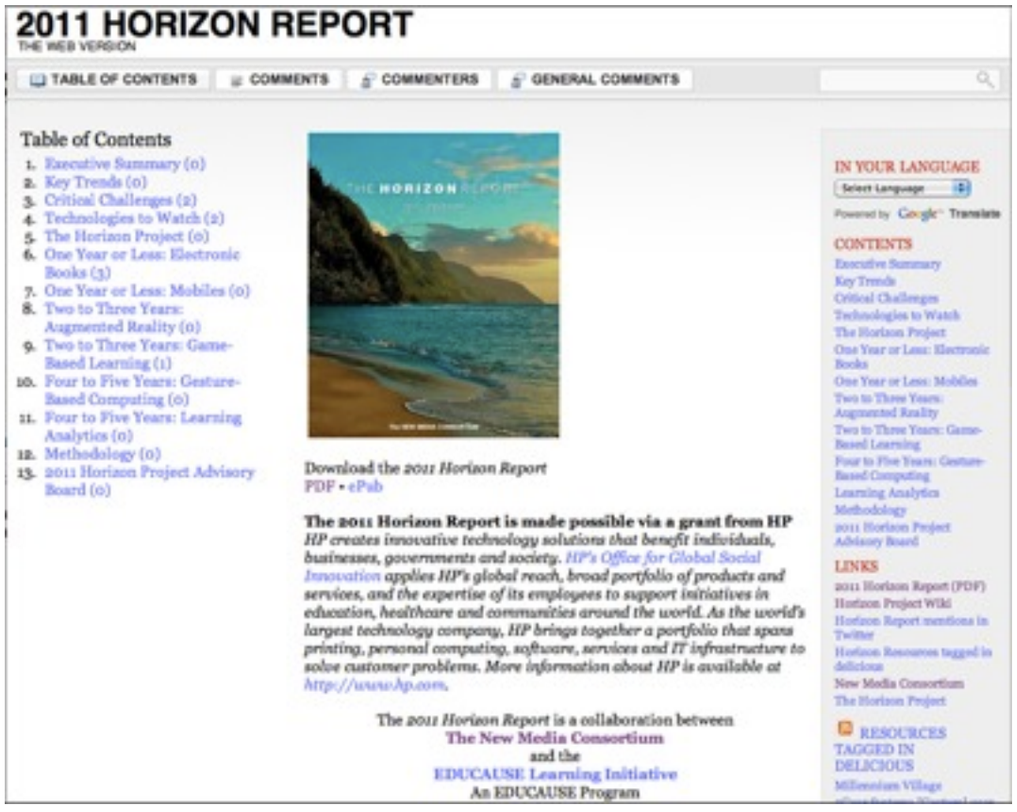

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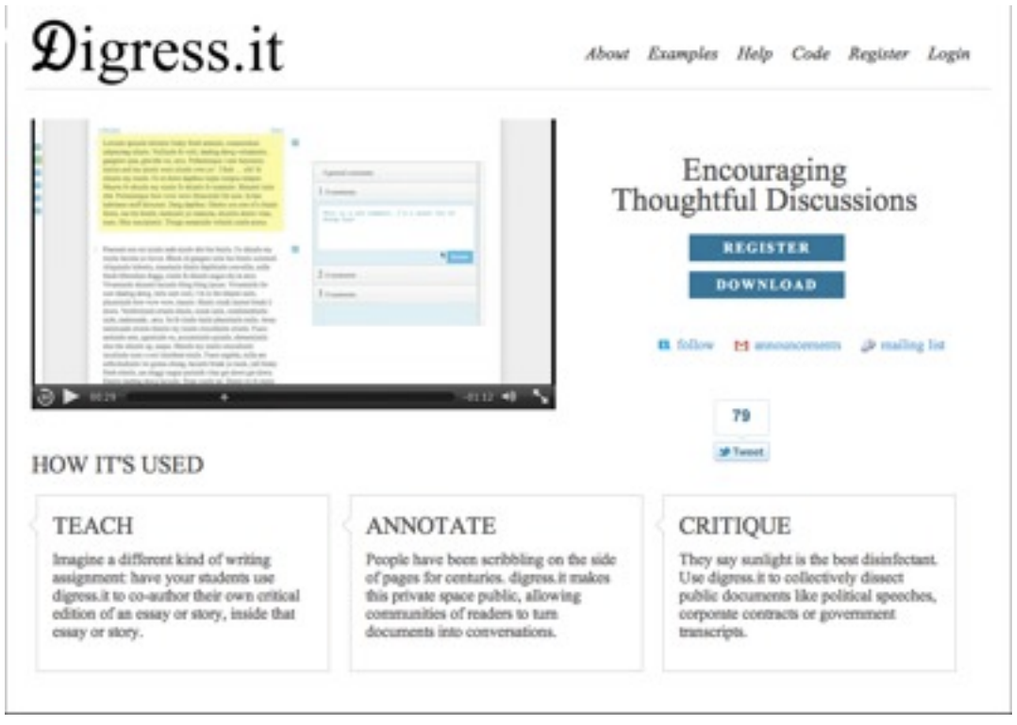

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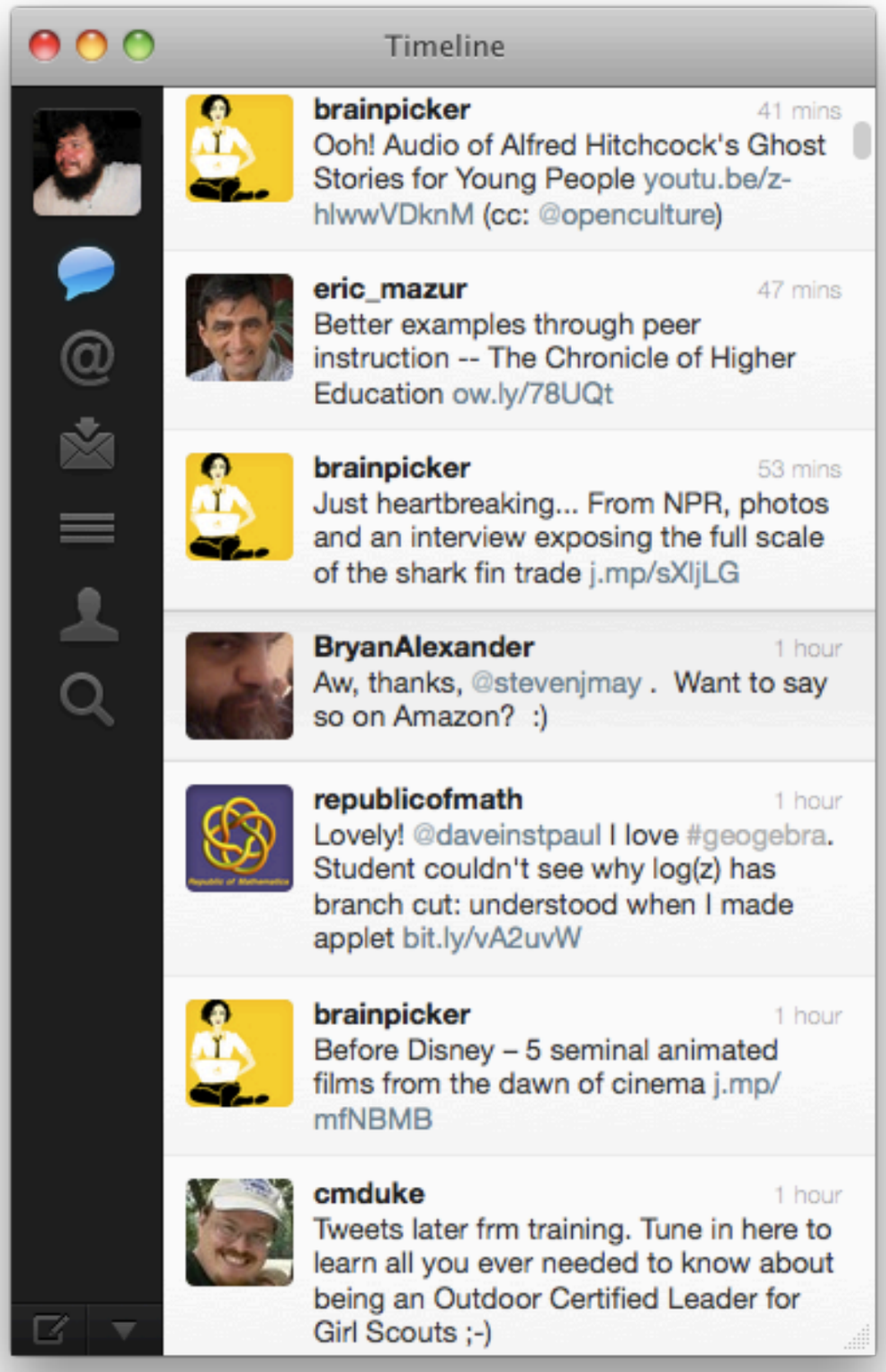

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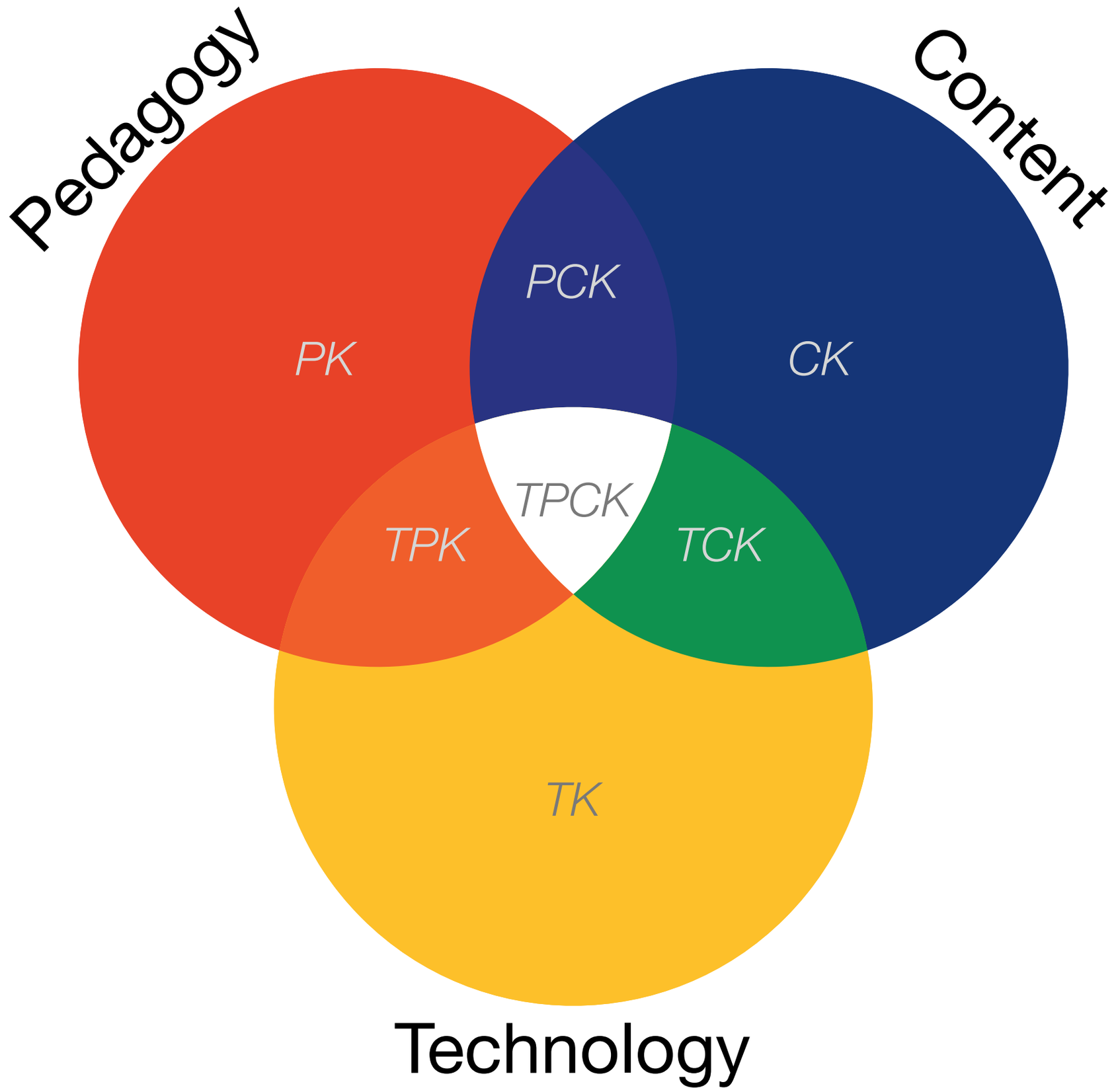
The TPCK Model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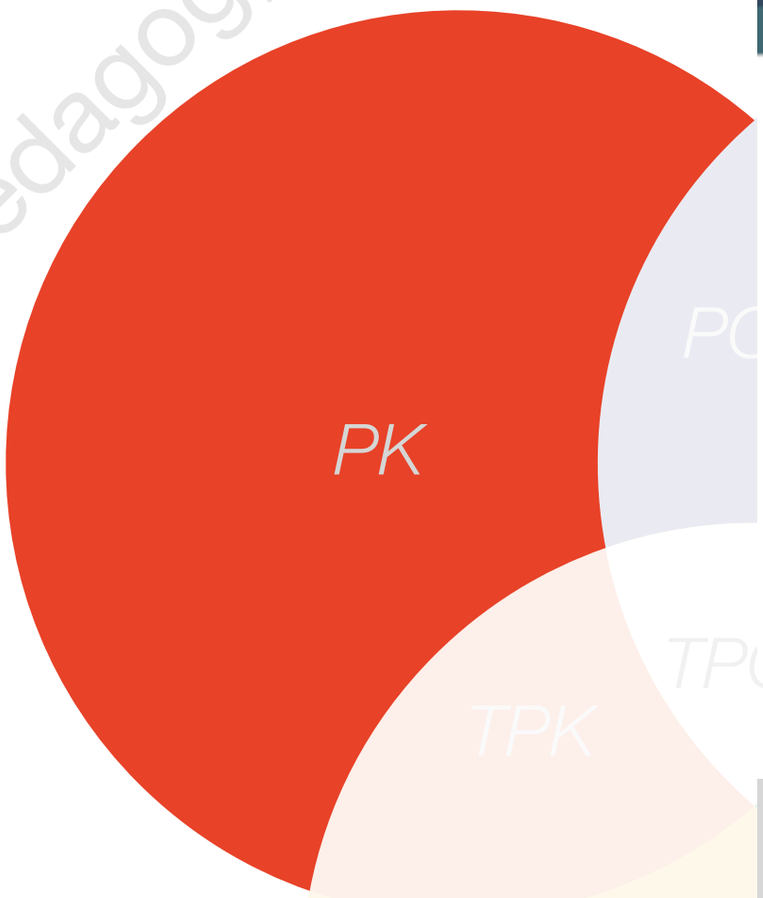
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NEW SCIENCE OF LEARNING
An article in Science magazine (July 17, 2009), entitled "Foundations for a New Science of Learning," was co-written by Andrew Meltzoff and Patrica Kuhl, LIFE Center Leads, with Javier Movellan and Terrence Sejnowski of the Temporal Dynamics of Learning Center. Read more.
LIFE Center
LIFE is a multi-institution NSF Science of Learning Center hosted at the University of Washington in partnership with Stanford University and SRI International. The LIFE Center seeks to develop and test principles about the social foundations of human learning in informal and formal environments with the goal of enhancing human learning from infancy to adulthood. Learn more.
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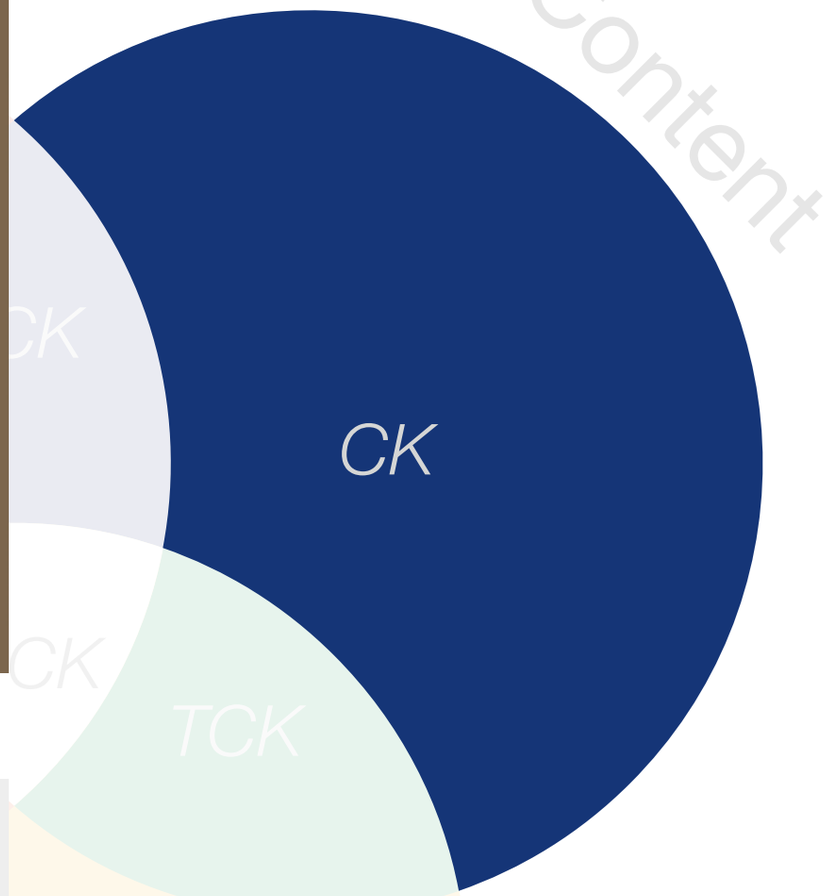
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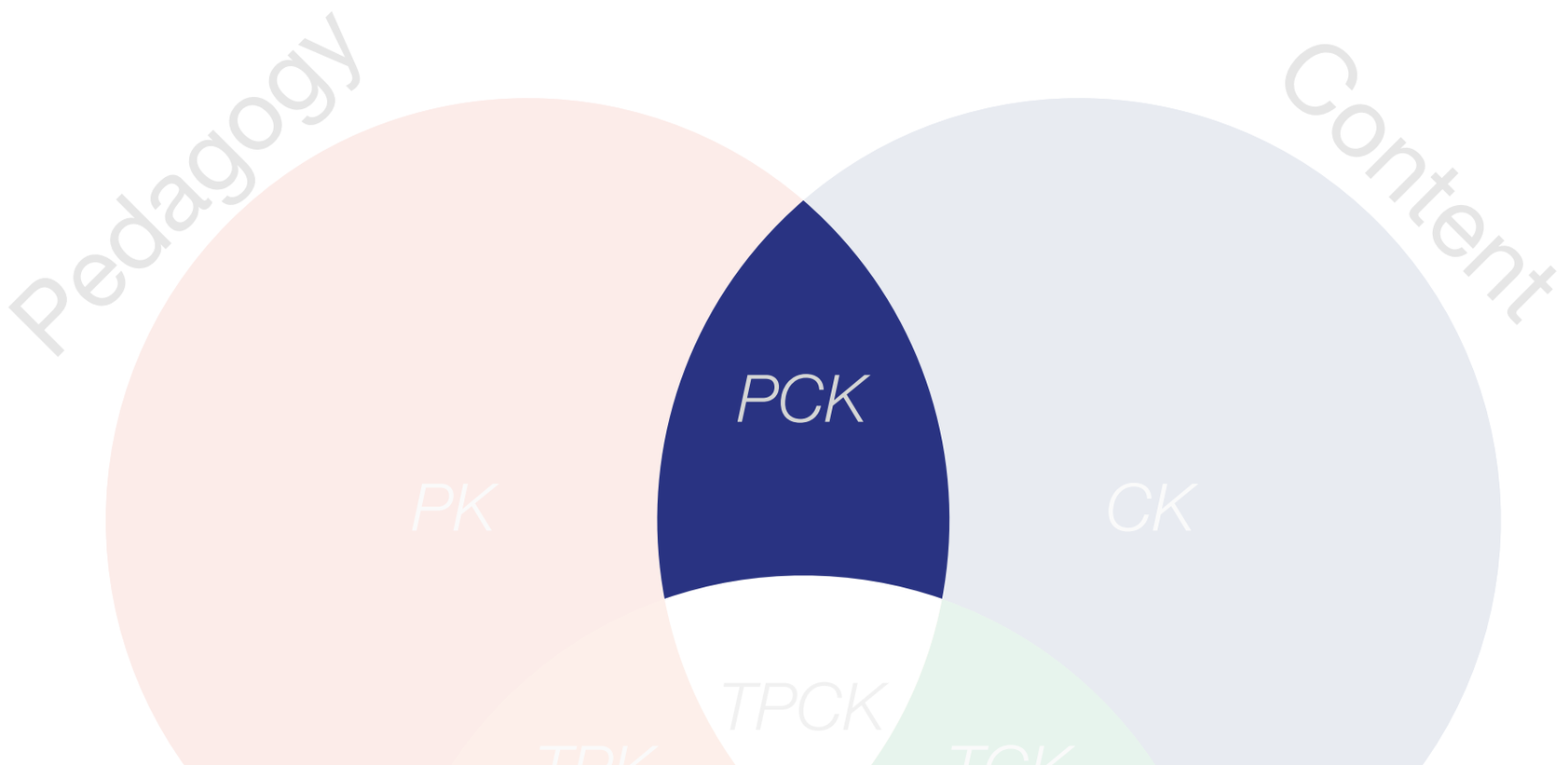

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Making Sense of Evidence

This section helps students and teachers make effective use of primary sources. "Making Sense of Documents" provide strategies for analyzing online primary materials, with interactive exercises and a guide to traditional and online sources. "Scholars in Action" segments show how scholars puzzle out the meaning of different kinds of primary sources, allowing you to try to make sense of a document yourself then providing audio clips in which leading scholars interpret the document and discuss strategies for overall analysis.

Making Sense of Documents

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EJ913993 - "Old Stuff" for New Teaching Methods: Outreach to History Faculty Teaching with Primary Sources

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Authors:	Malkmus, Doris
Descriptors:	Research Methodology; Primary Sources; Educational Change; Research Skills; Historians; History Instruction; Teaching Methods; Courses; Educational Innovation; Reference Services; Undergraduate Study; Followup Studies; Interviews; Surveys; Electronic Libraries
Source:	portal: Libraries and the Academy, v10 n4 p413-435 Oct 2010
Peer-Reviewed:	Yes
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Publication Date:	2010-10-00
Pages:	23
Pub Types:	Journal Articles; Reports - Research
Abstract:	New approaches to undergraduate history education rely on primary sources. This study, based on a 2008-2009 online survey of 627 academic historians and 25 follow-up interviews, captures a snapshot of the current use of online, published, and archival primary sources used in new teaching methods. It identifies three distinct ways faculty utilize primary sources--analyzing documents in freshman courses, building

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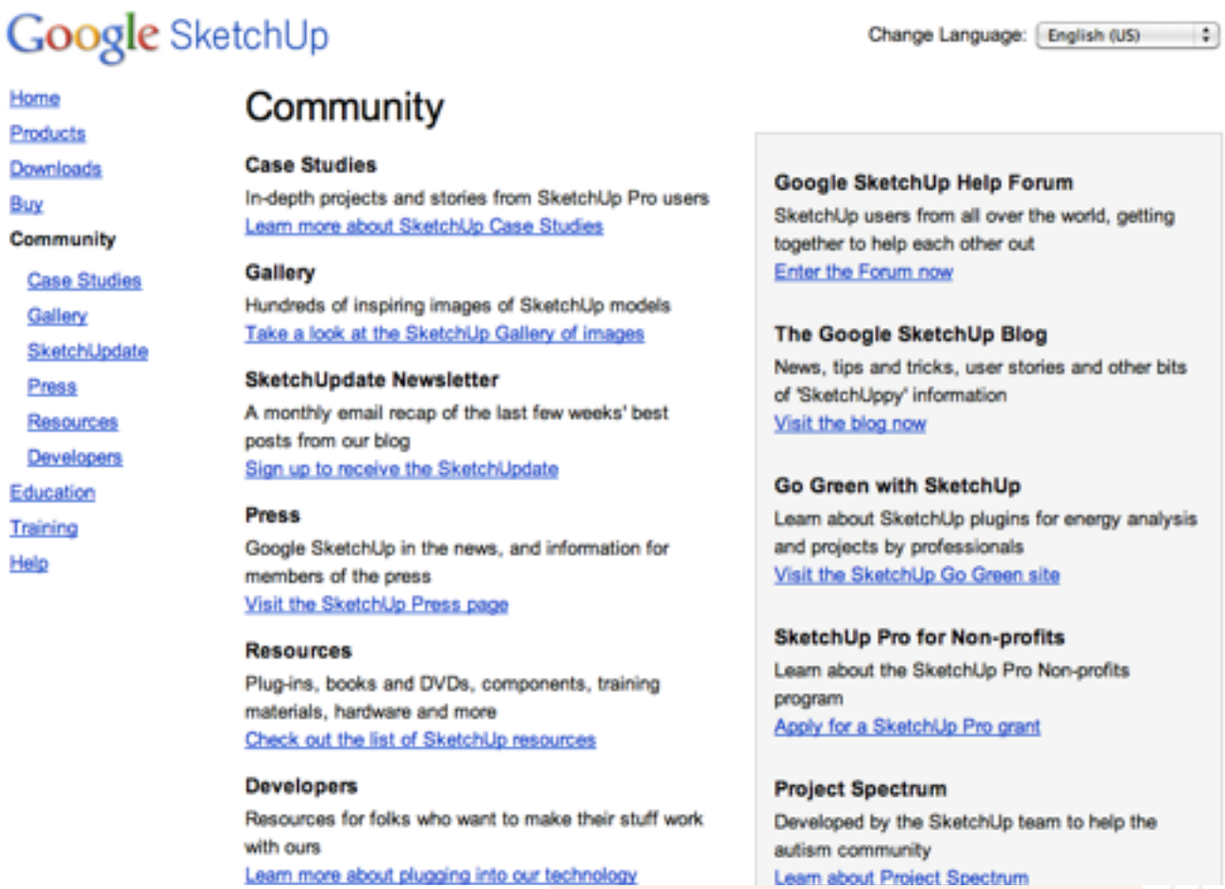
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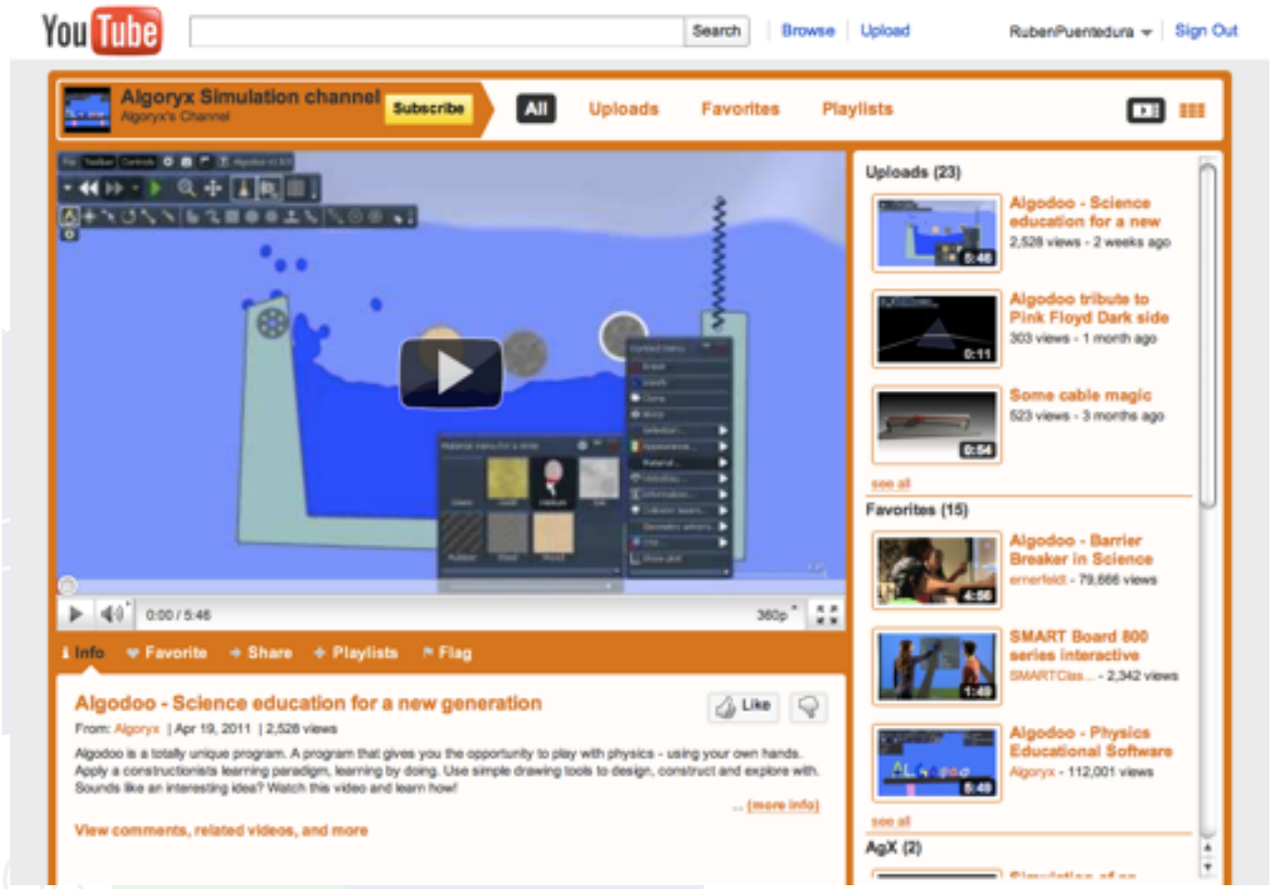
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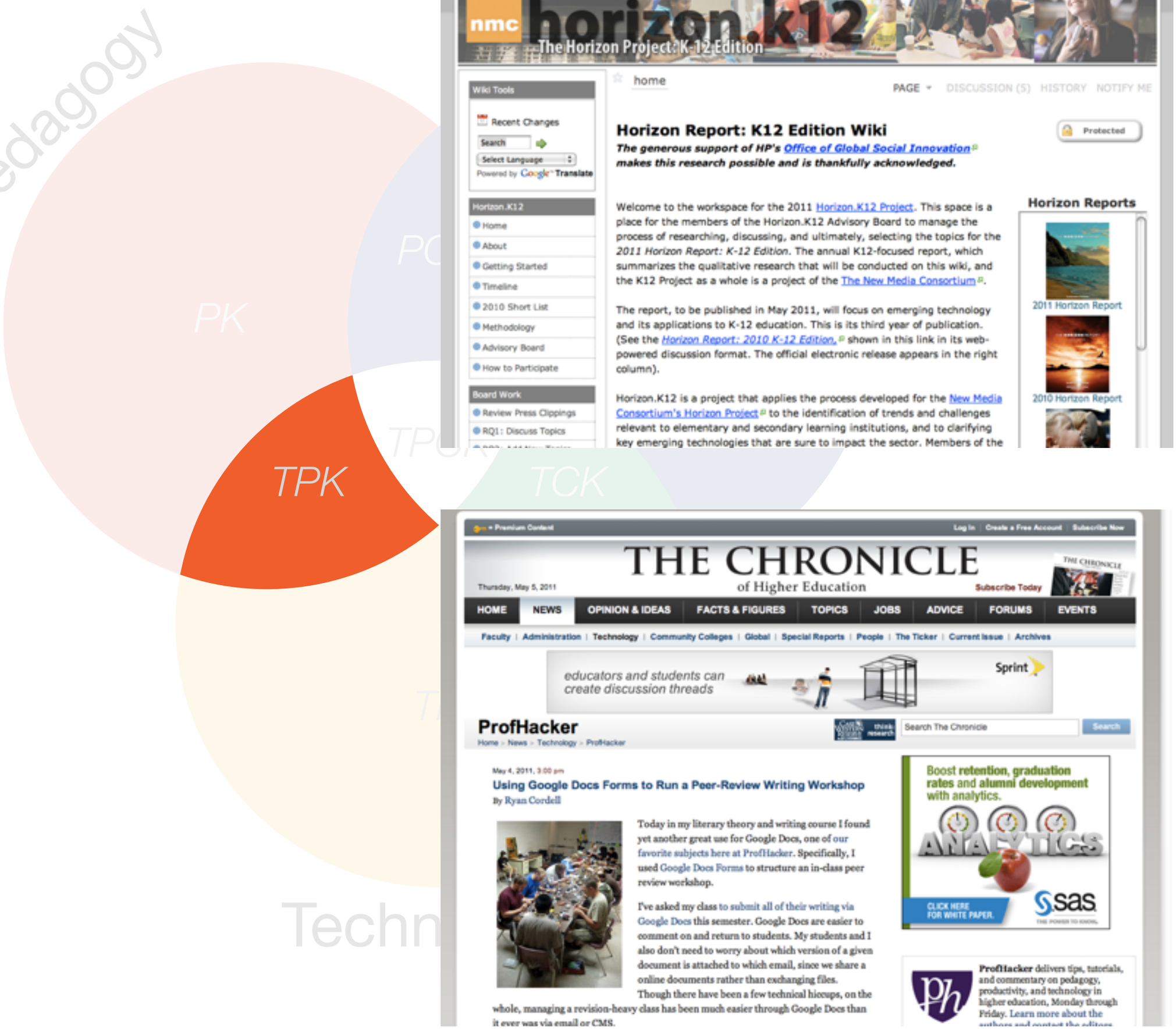
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Horizon Report: K12 Edition Wiki
The generous support of HP's Office of Global Social Innovation makes this research possible and is thankfully acknowledged.
Protected
Welcome to the workspace for the 2011 Horizon.K12 Project. This space is a place for the members of the Horizon.K12 Advisory Board to manage the process of researching, discussing, and ultimately, selecting the topics for the 2011 Horizon Report: K-12 Edition. The annual K12-focused report, which summarizes the qualitative research that will be conducted on this wiki, and the K12 Project as a whole is a project of the The New Media Consortium.
The report, to be published in May 2011, will focus on emerging technology and its applications to K-12 education. This is its third year of publication. (See the Horizon Report: 2010 K-12 Edition, shown in this link in its web-powered discussion format. The official electronic release appears in the right column).
Horizon.K12 is a project that applies the process developed for the New Media Consortium's Horizon Project to the identification of trends and challenges relevant to elementary and secondary learning institutions, and to clarifying key emerging technologies that are sure to impact the sector. Members of the
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May 4, 2011, 3:00 pm
Using Google Docs Forms to Run a Peer-Review Writing Workshop
By Ryan Cordell
Today in my literary theory and writing course I found yet another great use for Google Docs, one of our favorite subjects here at ProfHacker. Specifically, I used Google Docs Forms to structure an in-class peer review workshop.
I've asked my class to submit all of their writing via Google Docs this semester. Google Docs are easier to comment on and return to students. My students and I also don't need to worry about which version of a given document is attached to which email, since we share a online documents rather than exchanging files. Though there have been a few technical hiccups, on the whole, managing a revision-heavy class has been much easier through Google Docs than it ever was via email or CMS.
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A Companion to Digital Humanities

Notes on Contributors
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1. The History of Humanities C
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5. Computing and the Historic
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7. Linguistics Meets Exact Scie
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9. Music
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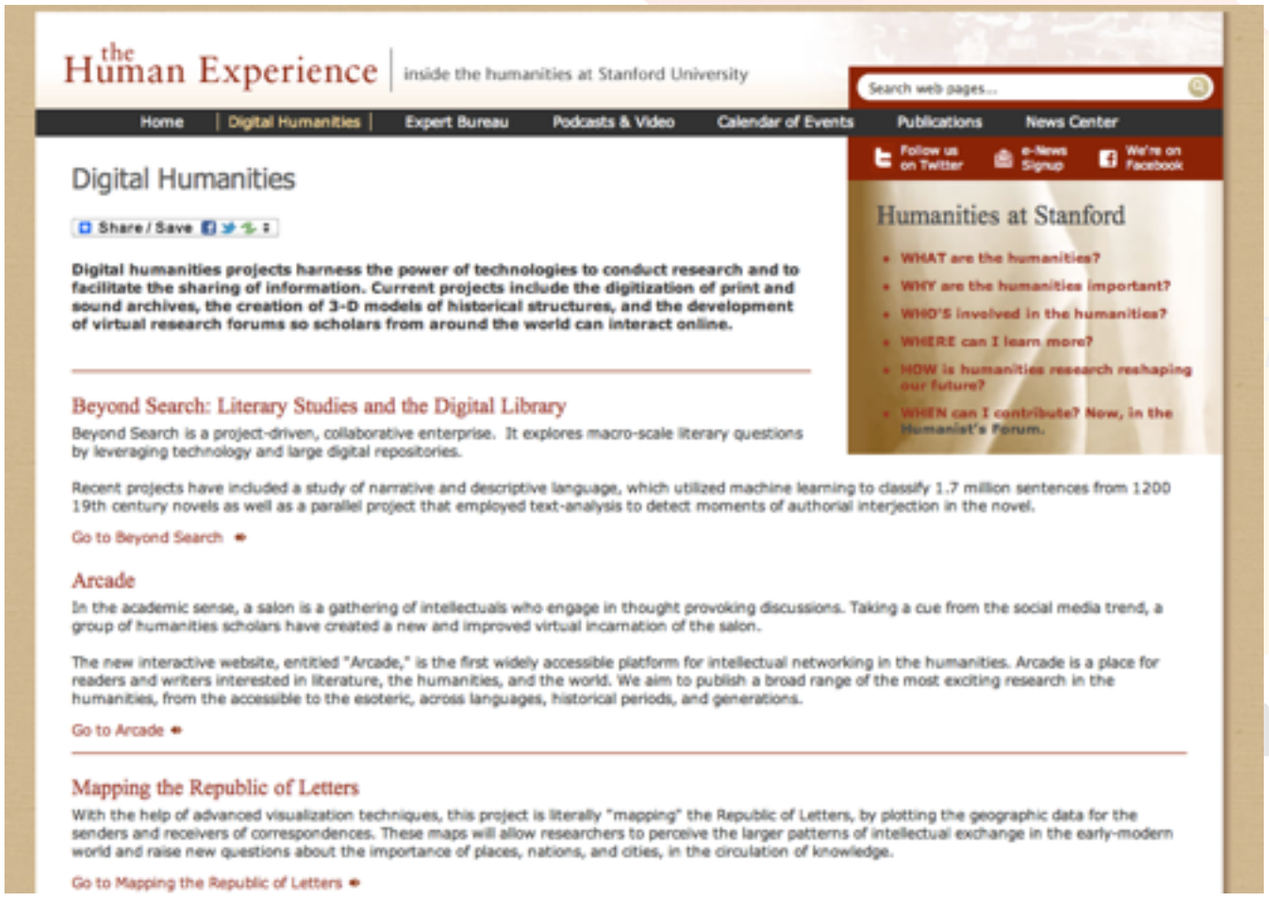

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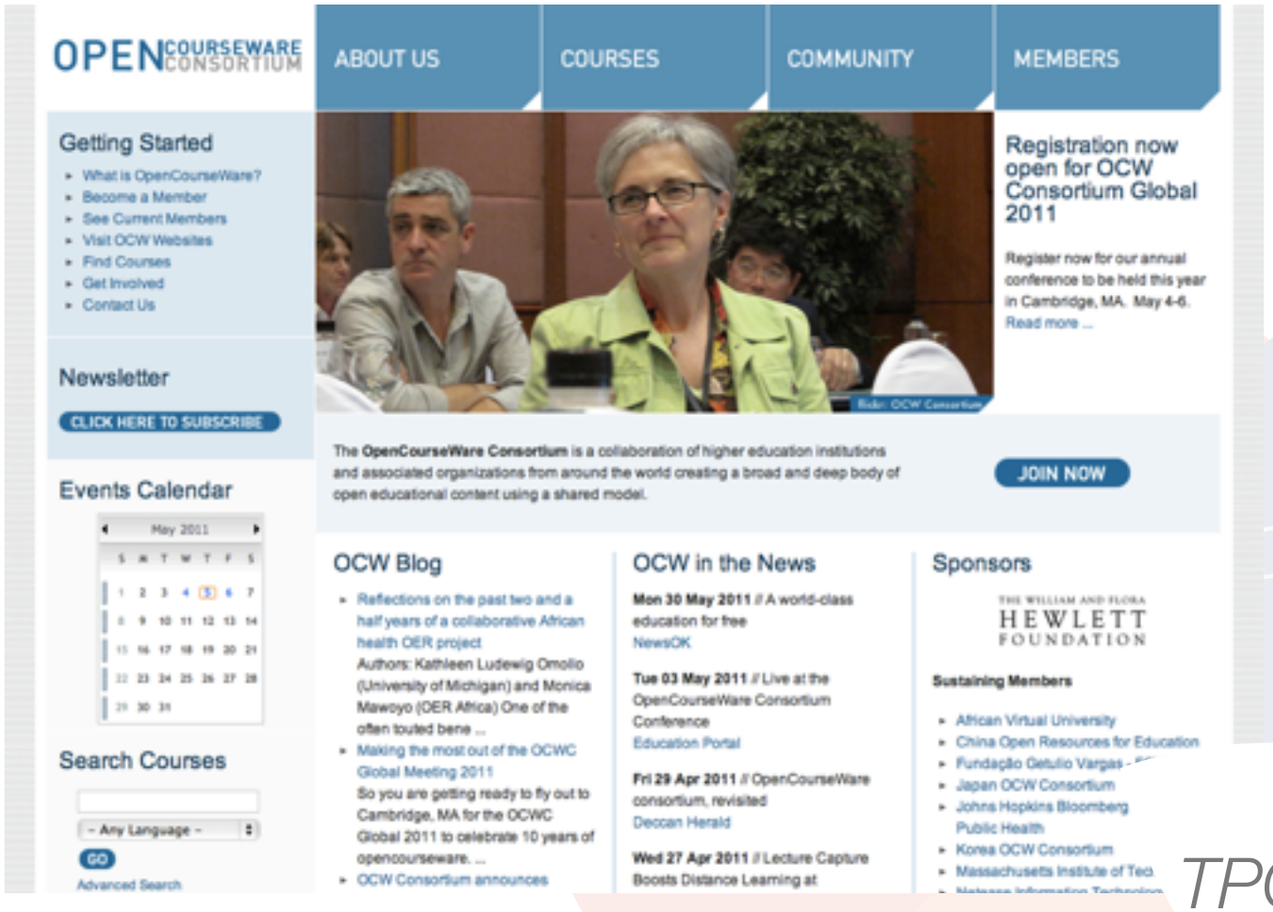

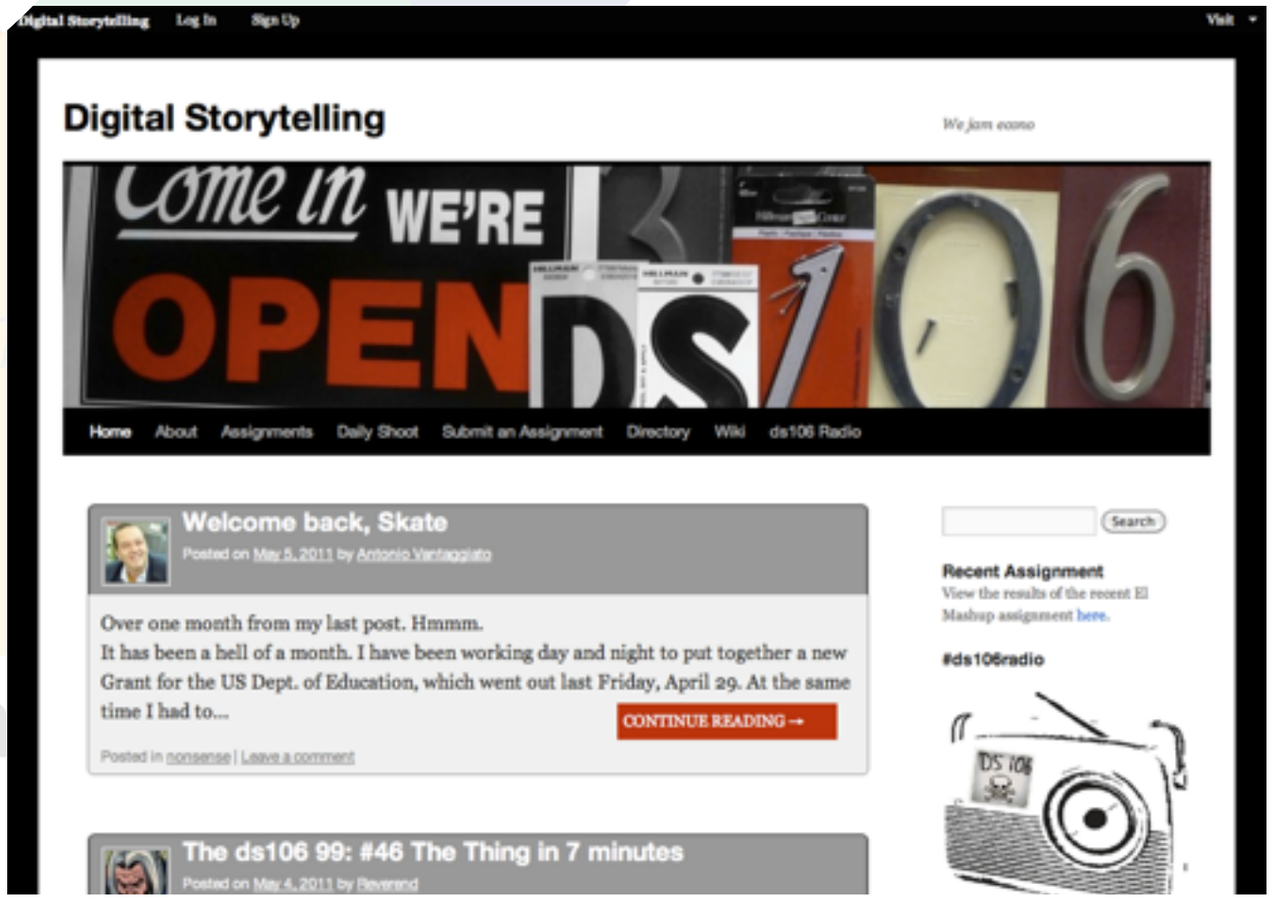

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SAMR and Assessment

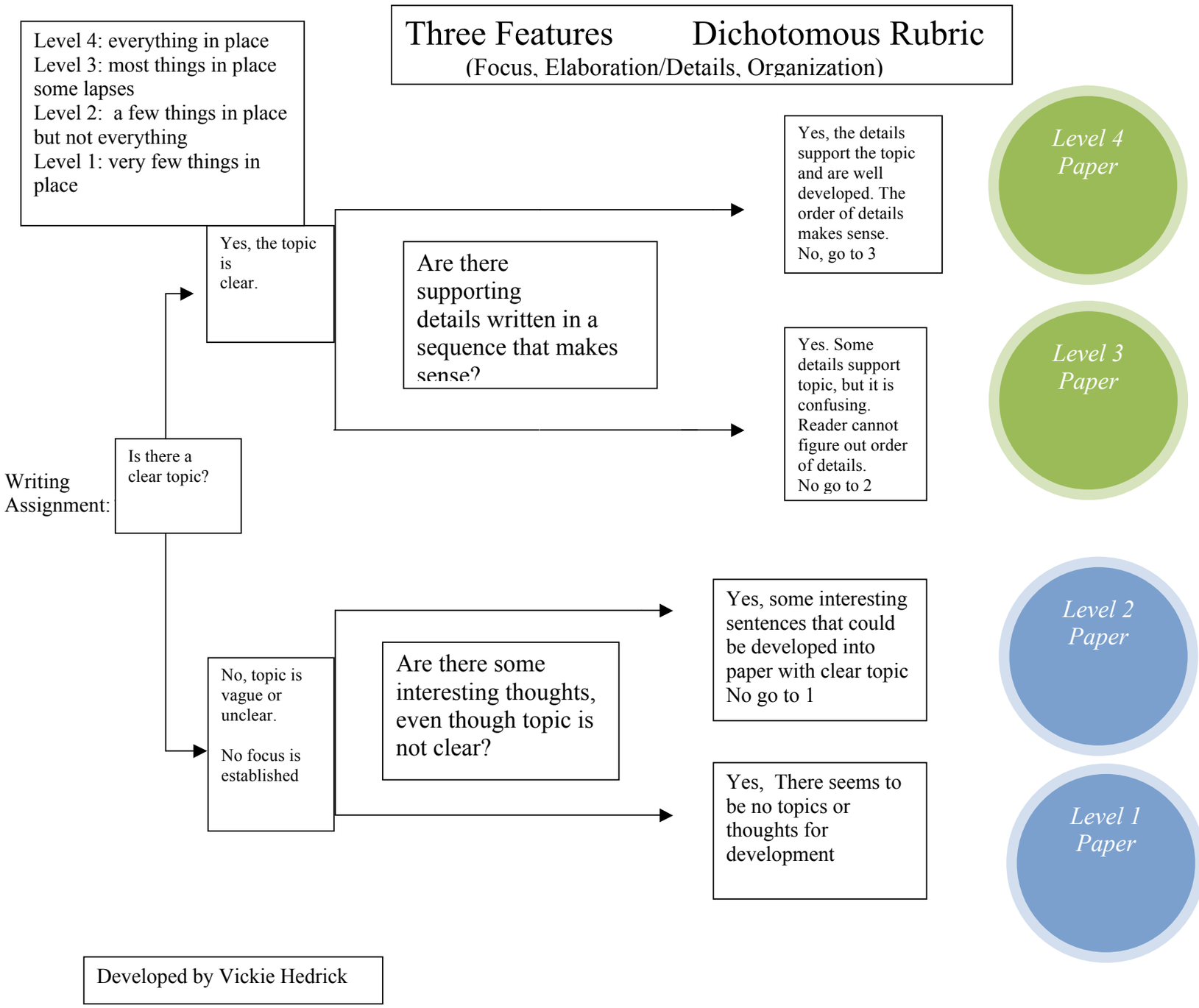
	Where the learner is going	Where the learner is right now	How to get there
Teacher	**1** Clarifying learning intentions and criteria for success	**2** Engineering effective class-room discussions and other learning tasks that elicit evidence of student understanding	**3** Providing feedback that moves learners forward
Peer	Understanding and sharing learning intentions and criteria for success	**4** Activating students as instructional resources for one another	
Learner	Understanding learning intentions and criteria for success	**5** Activating students as the owners of their own learning	

Black, P. and Wiliam D. “Developing the theory of formative assessment.” *Educational Assessment, Evaluation and Accountability*. 21:5-31 (2009)

Substitution: *Sociology Online Discussion Rubric* (Evans, 2010)

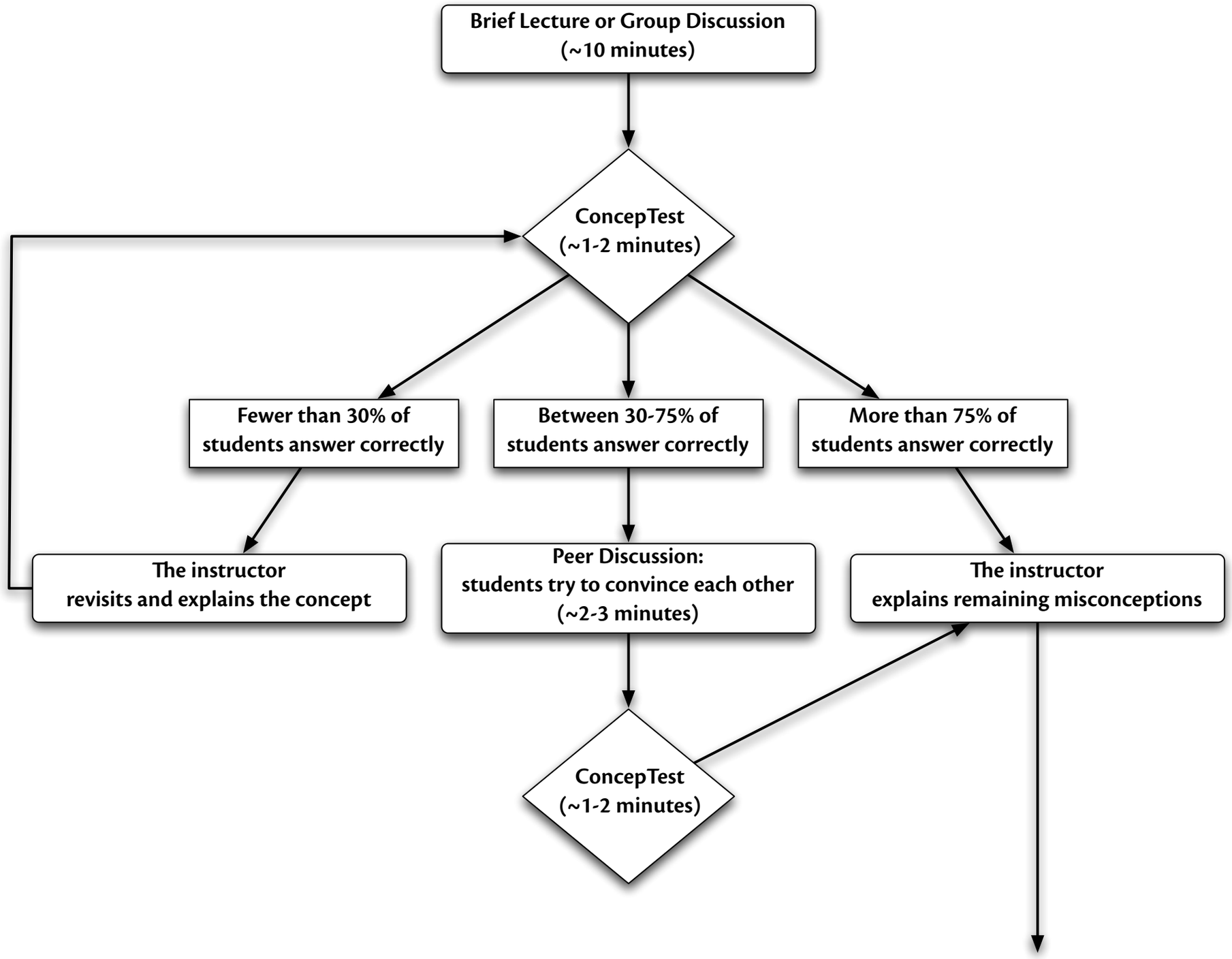
	4 Points	2 Point	0 Points
Content	You show that you can apply or extend the idea you are discussing.	Some of your messages analyze, interpret, or apply the material well, but some do not. This might either be because the analysis was not done well, or because it was not attempted (that is, was simply opinion or hearsay).	Your messages generally show little evidence of analysis, consisting instead of opinion, feelings and impressions.
Accuracy	You accurately represent the concepts discussed.	You generally represent the concepts accurately, but you do not do so in all cases.	You have significant issues with regard to accurately representing the concepts.
Use of material	You use and cite sources, including the text and articles and/or bring in an outside source, all of which clearly add *significantly* to the discussion.	You clearly refer back to a definition, example or concept from the reading or lecture.	You do not bring in or refer to any material from the text, outside sources, or lectures.
Sociological Analysis	You focus on the sociological implications of the issue at hand (e.g., social meaning, the outcomes for society or groups, the social function served).	You touch on some sociological issues, but focus also on individual ones.	You focus primarily on individual issues.
	2 Points	**1 Point**	**0 Points**
Responses	You extend or politely question the post of another person in a way that advances the discussion.	You add new examples that continue the idea created by another person.	Your responses are primarily agreement.
Participation	You write at least three or more substantive comments (using the above criteria) based on the discussion assigned.		You write fewer than three substantive comments.
Time of Posting	Your posts are spread widely during the discussion.	You post at two significantly different times.	Your posts are clustered within a short period of time.
Posts Read	You have read at least 75% of the posts in the discussion.	You read at least 50% of the posts in the discussion.	You read less than 50% of the posts in the discussion.
Clarity	You use standard grammar and spelling and your meaning is clear.	Your posts have some grammar or spelling mistakes or your meaning is not entirely clear.	Your posts have significant grammar or spelling mistakes or your meaning is not clear.

Augmentation: *A Branching Rubric for Writing* (Hedrick, 2010)



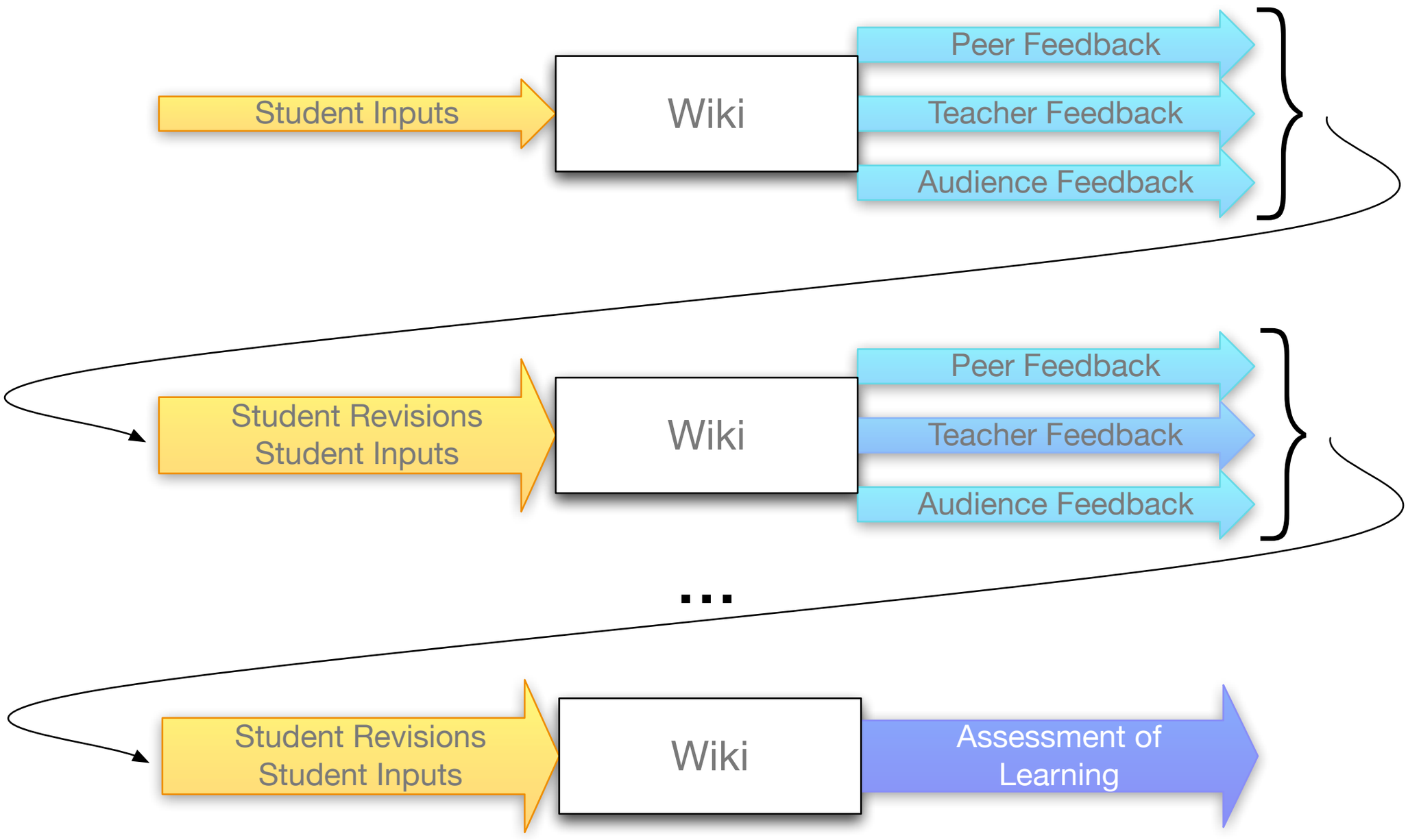
Hedrick, V. *Continuous Improvement in the Language Arts Classroom*. Quality Press (2010)

Modification: *ConcepTests* (Mazur, 1997)



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

Redefinition: *Designing for Wiki Learning* (Beasley-Murray, 2008)



Wikipedia:WikiProject Murder Madness and Mayhem

Epilogue: Expectations

Seymour Papert: Four Expectations

- **Expectation 1:** the scholastically unsuccessful group among the students will advance by several grade levels on standard achievement tests in mathematics and language. We shall, of course, confirm the significance of any such observation by comparison with a control group matched on a series of variables set up before the outset of the experiment.

- **Expectation 2:** observers will agree that the student in the experiment not only learned more than in a traditional class, but learned it in a more articulate, richer, more integrated way.

- **Expectation 3:** students will develop, or adapt concepts and metaphors derived from computers and use them not only as intellectual tools in the construction of models of such things as "number" and "theory" but also in elaborating models of their own cognitive processes. This will in turn have an impact on their styles of learning and problem-solving.

- **Expectation 4:** the use of computer metaphors by children will have effects beyond what is normally classed as "cognitive skill". We expect it will influence their language, imagery, games, social interactions, relationships, etc…

S. Papert. *An Evaluative Study of Modern Technology in Education*. MIT Artificial Intelligence Laboratory Memo No. 371. (June, 1976)

Additional Resources

Resources

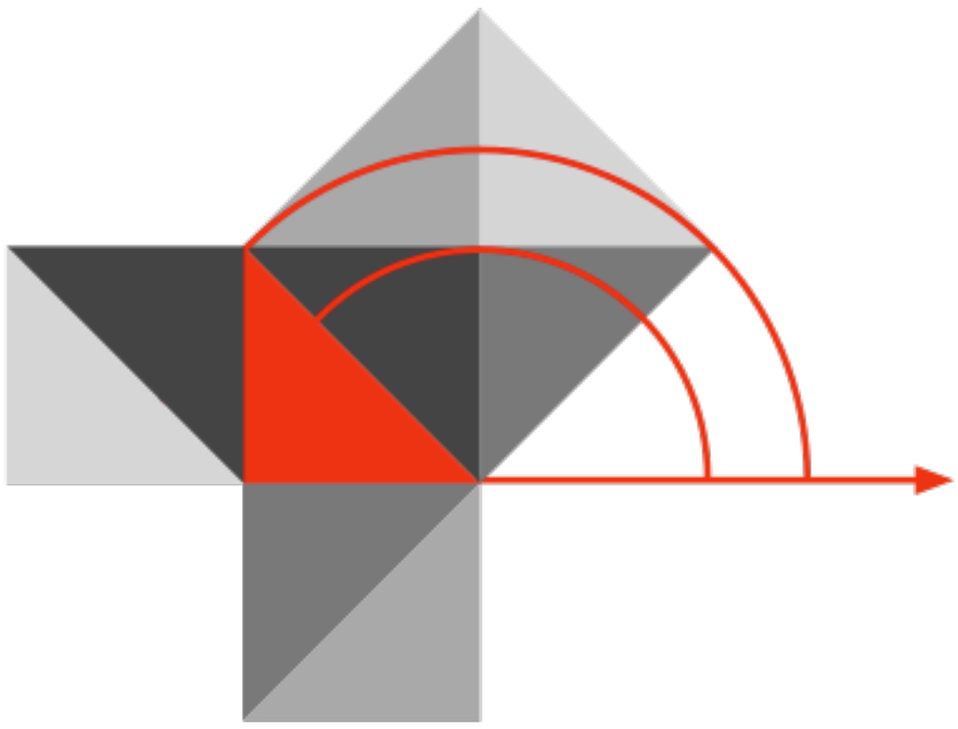
Metaphors:

- 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.

Hippasus



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