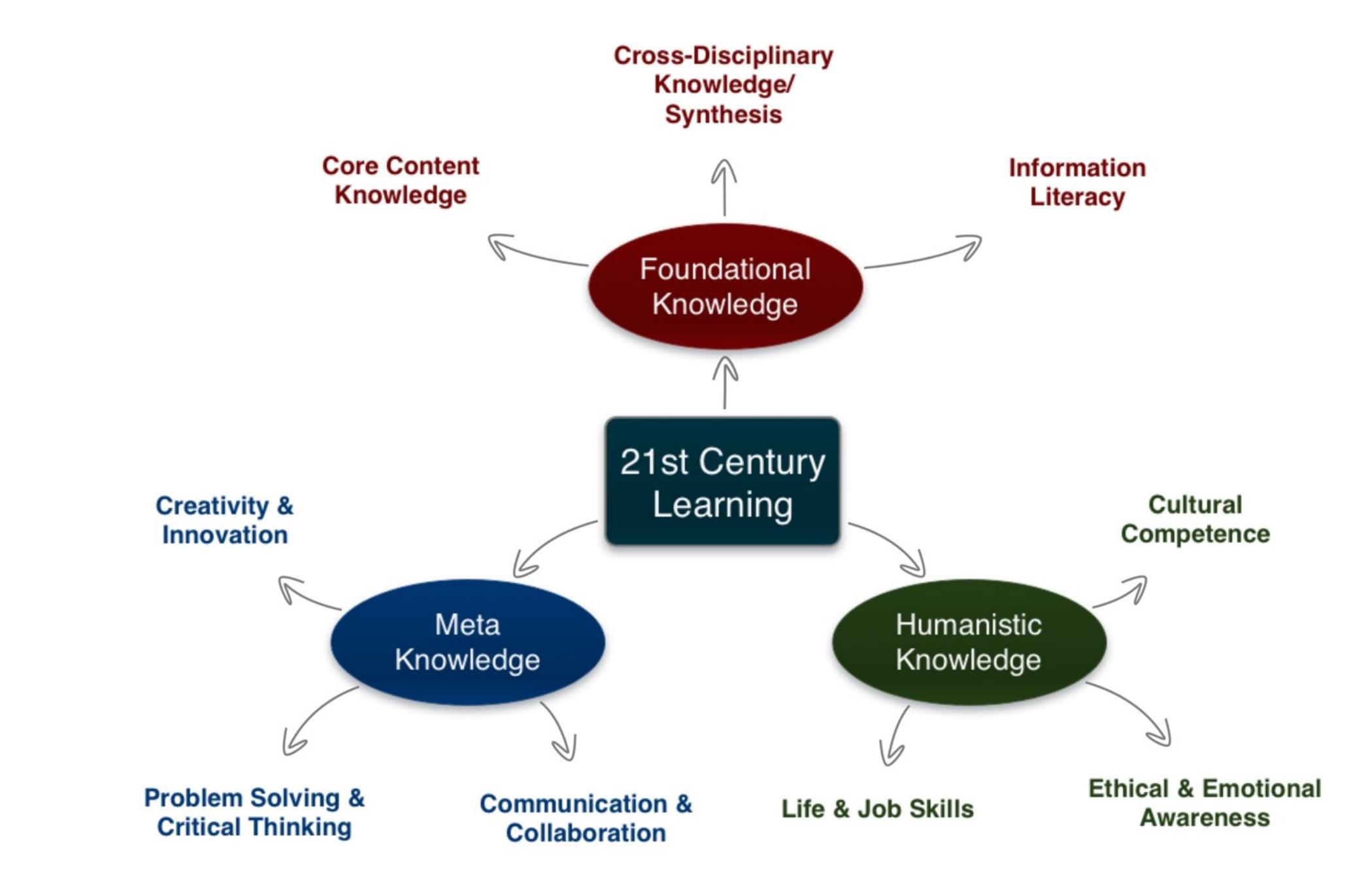
## Technology, SAMR, and Learning

Ruben R. Puentedura, Ph.D.



Tech acts as a direct tool substitute, with functional improvement

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

Redefinition Tech allows for the creation of new tasks, previously inconceivable

Modification Tech allows for significant task redesign Transformation

## Augmentation

Ruben R. Puentedura, As We May Teach: Educational Technology, From Theory Into Practice. (2009)

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By R	OSLYN SULCAS	FEB. 9, 2015	
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Y	Tweet	Unexpectedly, the sho	
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		0	heavy library Werner, the lead e character, and f trepidation about putting ed to set him firmly against

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### New York Times

## e City That Sherlock Holmes Knew



John O'Connor's "From Pentonville Road Looking West: Evening," in a show at the Museum of London. Museum of London

ng on an exhibition about a st the real city of London in

## Modification Tech allows for significant task redesign

## Augmentation Tech acts as a direct tool substitute, with functional improvement

## **Substitution**

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

#### Sir Arthur Conan Doyle

dead, shall be safe with us."

"Farewell, then," said the old man solemnly. "Your own deathbeds, when they come, will be the easier for the thought of the peace which you have given to mine." Tottering and shaking in all his giant frame, he stumbled slowly from the room.

"God help us!" said Holmes after a long silence. "Why does fate play such tricks with poor, helpless worms? I never hear of such a case as this that I do not think of Baxter's words, and say, 'There, but for the grace of God, goes Sherlock Holmes.' "

James McCarthy was acquitted at the Assizes on the strength of a number of objections which had been drawn out by Holmes and submitted to the defending counsel. Old Turner lived for seven months after our interview, but he is now dead; and there is every prospect that the son and daughter may come to live happily together in ignorance of the black cloud which rests upon their past.

#### ADVENTURE V. THE FIVE OR-ANGE PIPS

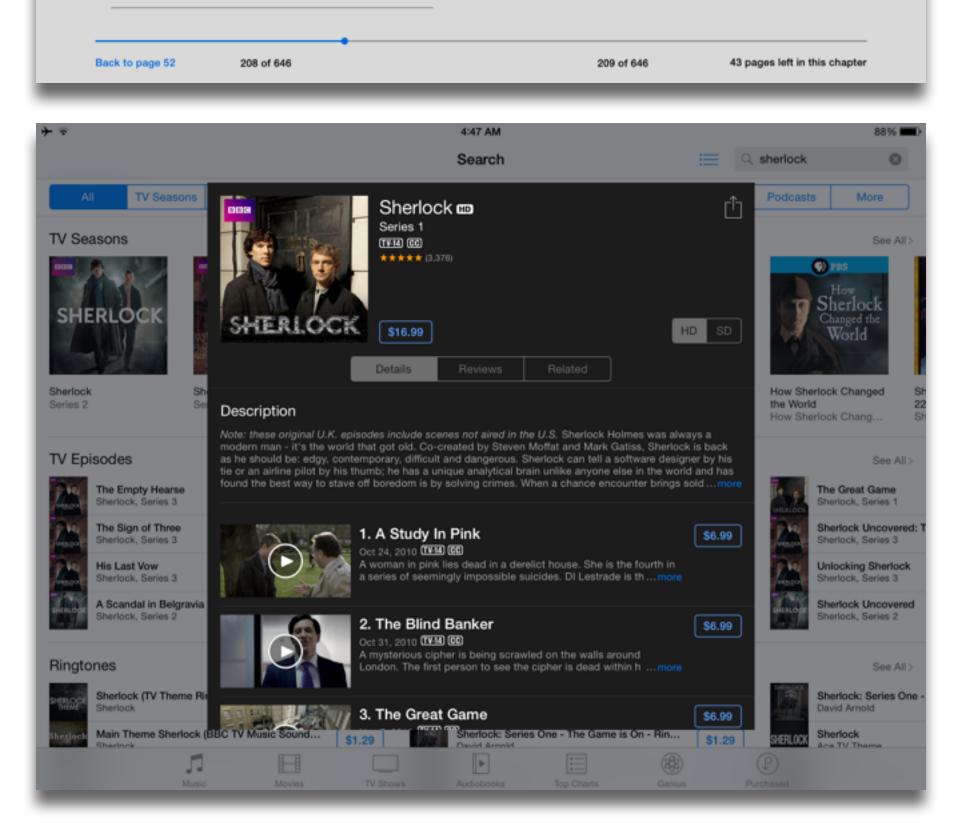
The Adventures of Sherlock Holmes

AQD

When I glance over my notes and records of the Sherlock Holmes cases between the years

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in so mgn a degree, a. . which it is the object of these papers to illustrate. Some, too, have baffled his analytical skill, and would be, as narratives, beginnings without an ending, while others have been but partially cleared up, and have their explanations founded rather upon conjecture and surmise than on that absolute logical proof which was so dear to him. There is, however, one of these last which was so remarkable in its details and so



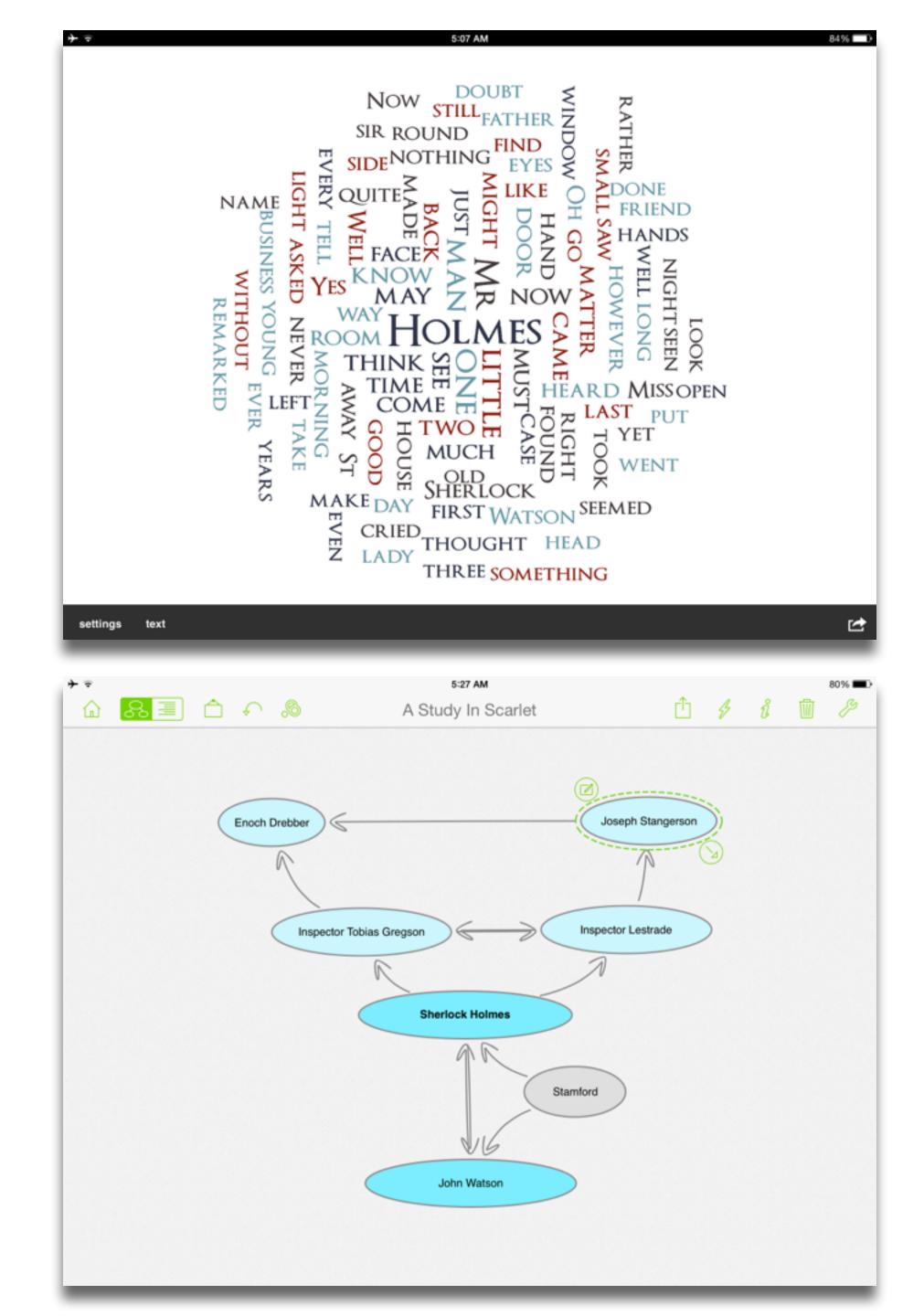
Library

## Modification Tech allows for significant task redesign

### Augmentation

Tech acts as a direct tool substitute, with functional improvement

**Substitution** 



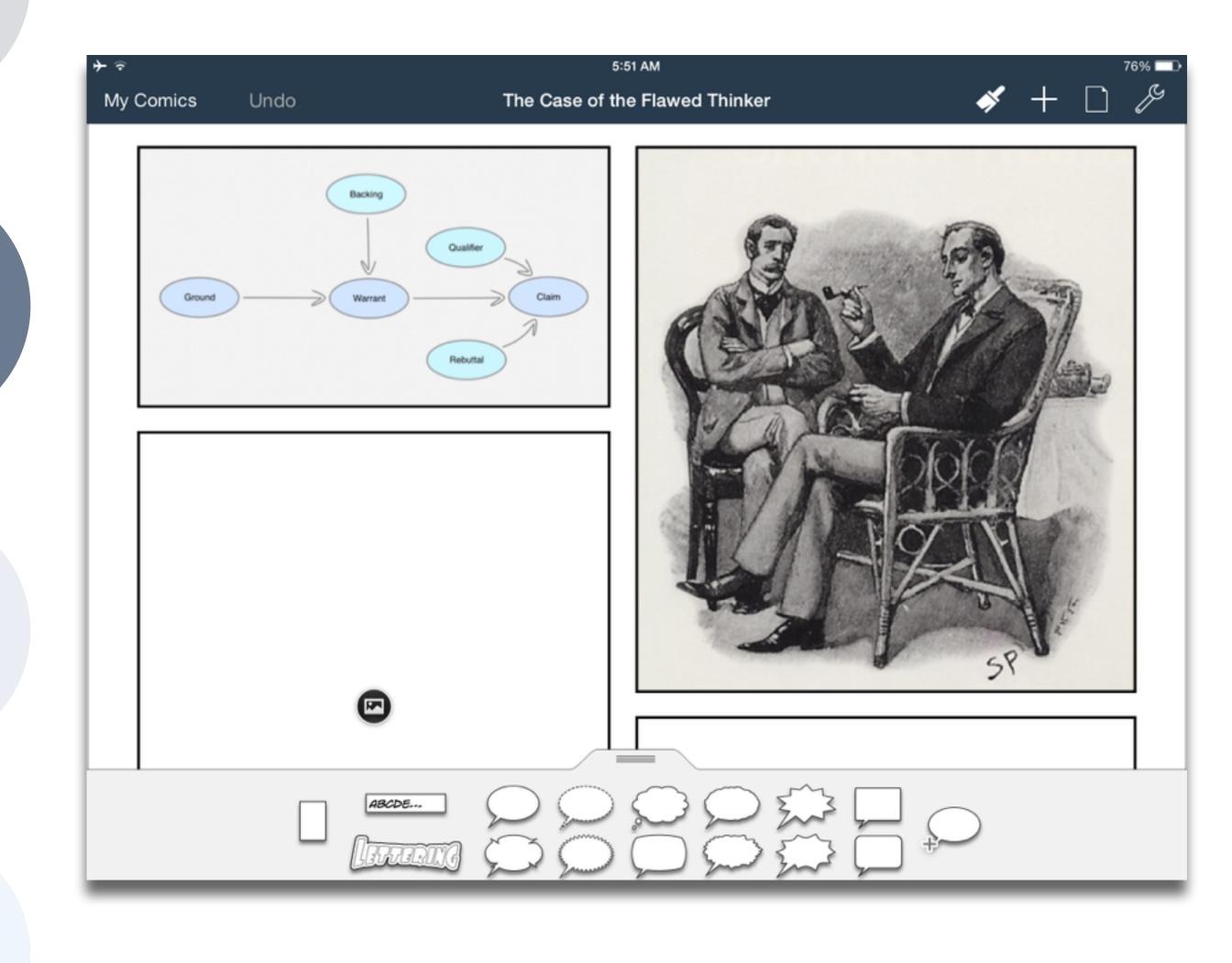
## Modification

Tech allows for significant task redesign

### Augmentation

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**Substitution** 



### Redefinition

# Tech allows for the creation of new tasks, previously inconceivable

## Modification Tech allows for significant task redesign

### Augmentation

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**Substitution** 

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

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#### hippasus.com

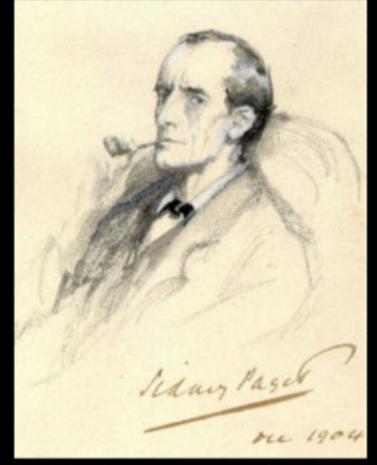
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### Watson's First Case: The Game Is Afoot

Based on characters created by Sir A.C. Doyle

Share

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Sherlock Holmes stands here. He fixes you in his gaze, saying "Dr. Watson, I presume? You come at the right time. As a medical man, I could make use of your knowledge. A man was found unconscious yesterday in Frying Pan Alley. Some locals think he worked at a cement kiln, others at the local brewery. I've just mixed some residue from his clothes with phenolphthalein, and it turned pink. Dr. Watson, do you realize what this means?" You reply: He's a cement worker

He's a brewer

**}** ≑



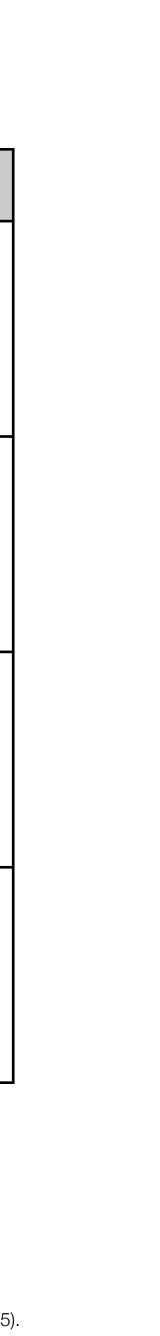
Meta-analysis	Number of studies	ES type	Mean ES	SE
Bangert-Drowns (1993)	19	Missing	0.27	0.11
Bayraktar (2000)	42	Cohen's d	0.27	0.05
Blok, Oostdam, Otter, and Overmaat (2002)	25	Hedges's g	0.25	0.06
Christmann and Badgett (2000)	16	Missing	0.13	0.05
Fletcher-Flinn and Gravatt (1995)	120	Glass's ∆	0.24	0.05
Goldberg, Rus- sell, and Cook (2003)	15	Hedges's g	0.41	0.07
Hsu (2003)	25	Hedges's g	0.43	0.03
Koufogiannakis and Wiebe (2006)	8	Hedges's g	-0.09	0.19
Kuchler (1998)	65	Hedges's g	0.44	0.05
Kulik and Kulik (1991)	239	Glass's $\Delta$	0.30	0.03
Y. C. Liao (1998)	31	Glass's ∆	0.48	0.05
YI. Liao and Chen (2005)	21	Glass's ∆	0.52	0.05
Y. K. C. Liao (2007)	52	Glass's ∆	0.55	0.05

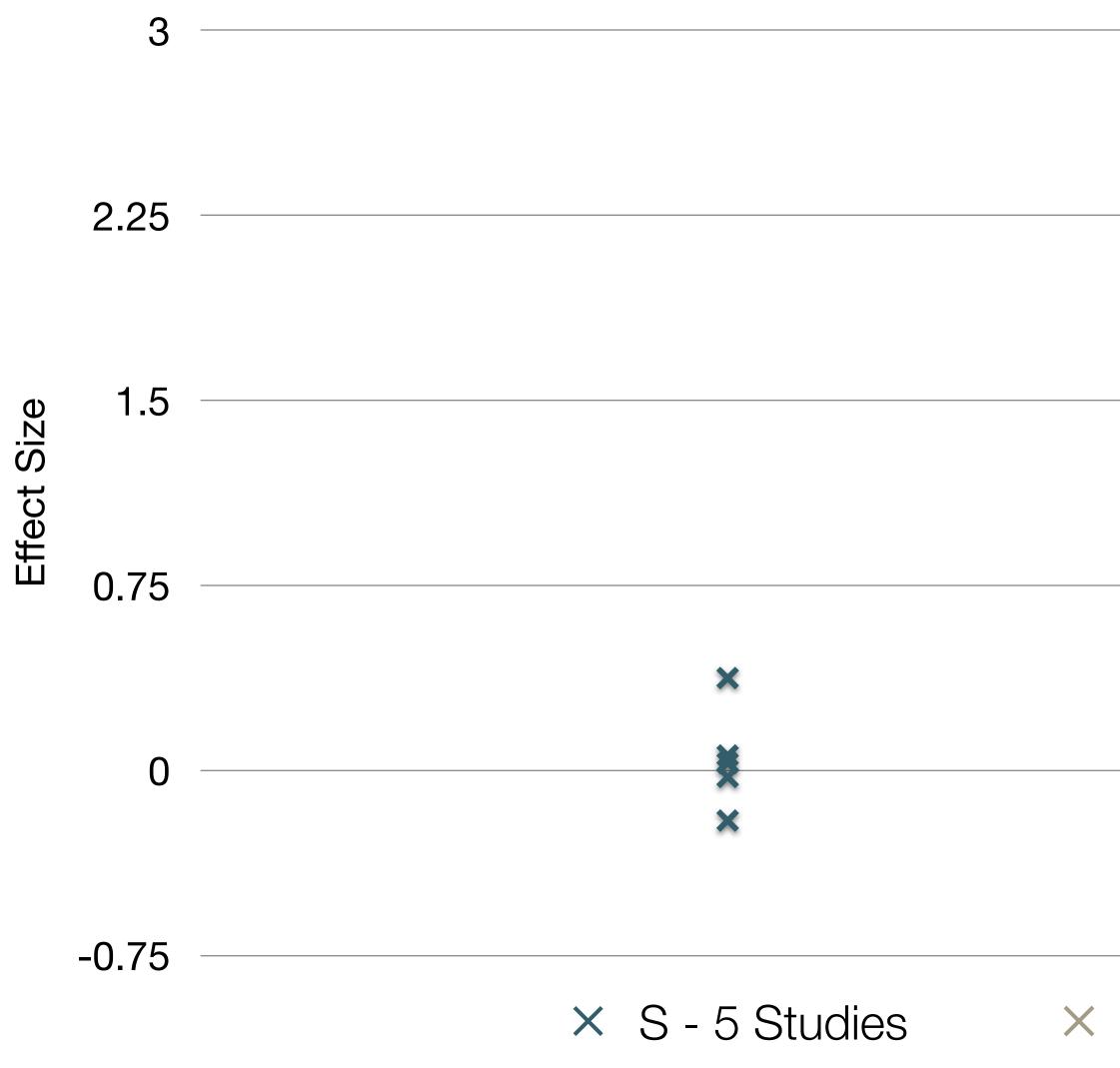
	Number of		Mean	
Meta-analysis	studies	ES type	ES	SE
Michko (2007)	45	Hedges's g	0.43	0.07
Onuoha (2007)	35	Cohen's d	0.26	0.04
Pearson, Ferdig, Blomeyer, and Moran (2005)	20	Hedges's g	0.49ª	0.11
Roblyer, Castine, and King (1988)	35	Hedges's g	0.31	0.05
Rosen and Salo- mon (2007)	31	Hedges's g	0.46	0.05
Schenker (2007)	46	Cohen's d	0.24	0.02
Soe, Koki, and Chang (2000)	17	Hedges's g and Pearson's r <sup>a</sup>	0.26ª	0.05
immerman and Kruepke (2006)	114	Pearson's r <sup>a</sup>	0.24	0.03
Forgerson and Elbourne (2002)	5	Cohen's d	0.37	0.16
Waxman, Lin, and Michko (2003)	42	Glass's ∆	0.45	0.14
Yaakub (1998)	20	Glass's $\Delta$ and g	0.35	0.05
Zhao (2003)	9	Hedges's g	1.12	0.26

a. Converted to Cohen's d.



Study	SAMR Level	Description	Effect Size
Ligas (2002)	S	CAI system used to support direct instruction approach for at-risk students.	<b>0.029</b> (50th perc. → 51st perc.)
Xin & Reith (2001)	Α	Multimedia resources provided to contextualize learning of word meanings and concepts.	<b>0.264</b> (50th perc. → 60th perc.)
Higgins & Raskind (2005)	Μ	Software/hardware used for text-to-speech, definitions, pronunciation guide for children with reading disabilities.	<b>0.600</b> (50th perc. → 73rd perc.)
Salomon, Globerson & Guterman (1989)	R	Software presents students with reading principles and metacognitive questions as part of the reading process.	<b>1.563</b> (50th perc. → 94th perc.)

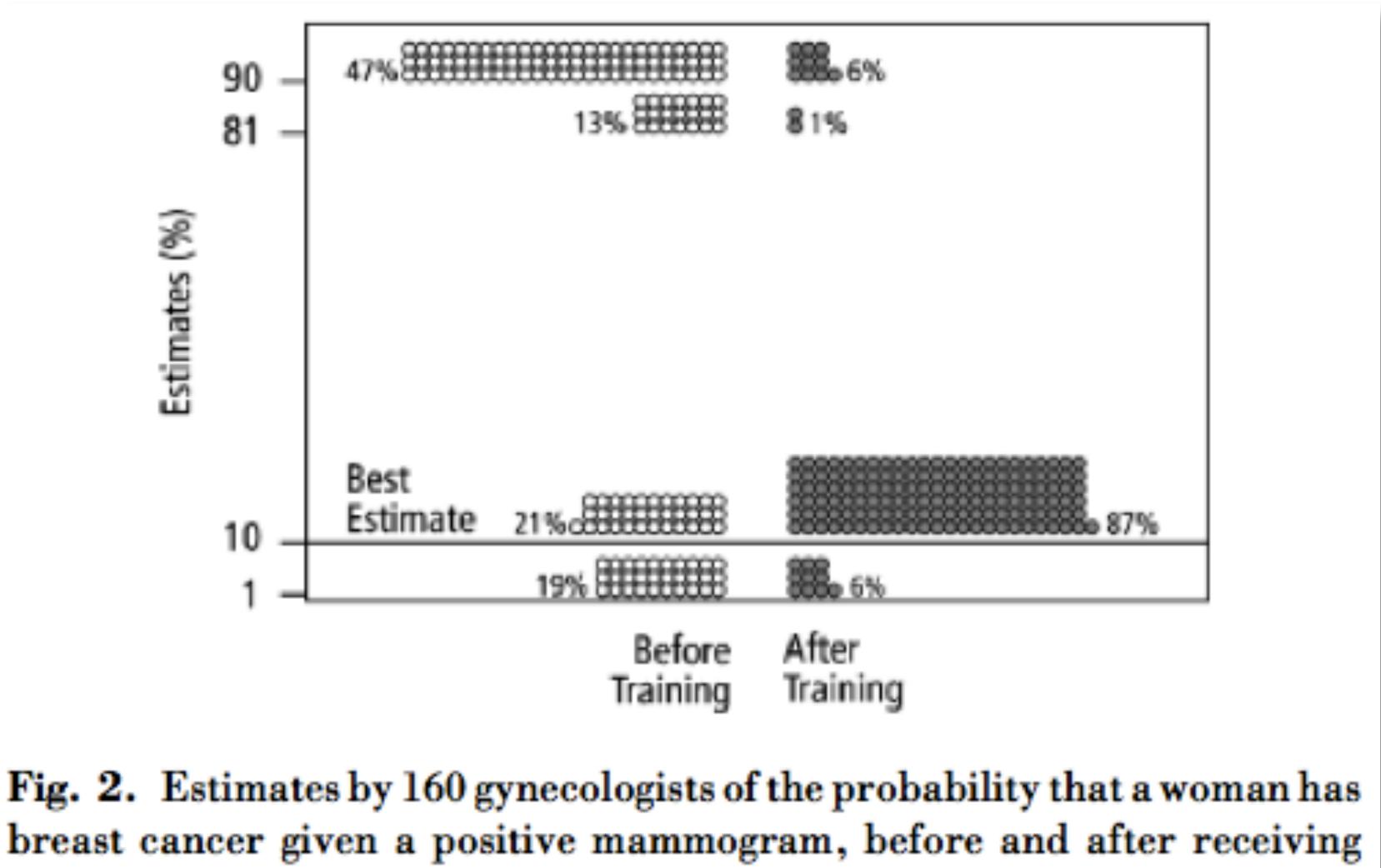




Pearson, P.D., Ferdig, R.E., Blomeyer Jr, R.L., & Moran, J. "The Effects of Technology on Reading Performance in the Middle-School Grades: A Meta-Analysis With Recommendations for Policy." Learning Point Associates/North Central Regional Educational Laboratory (NCREL) (2005).

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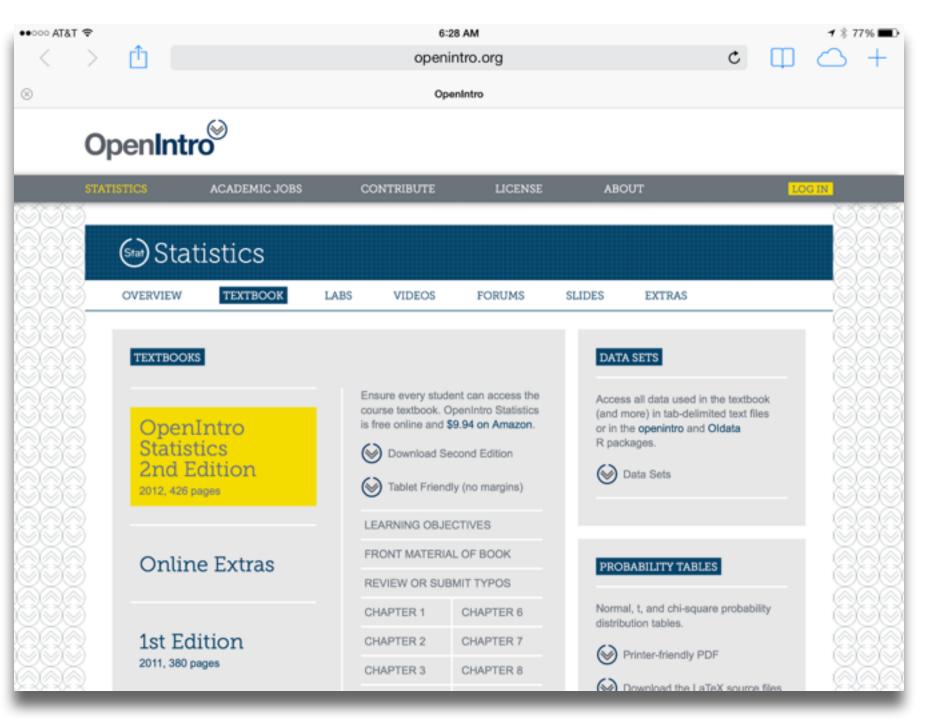


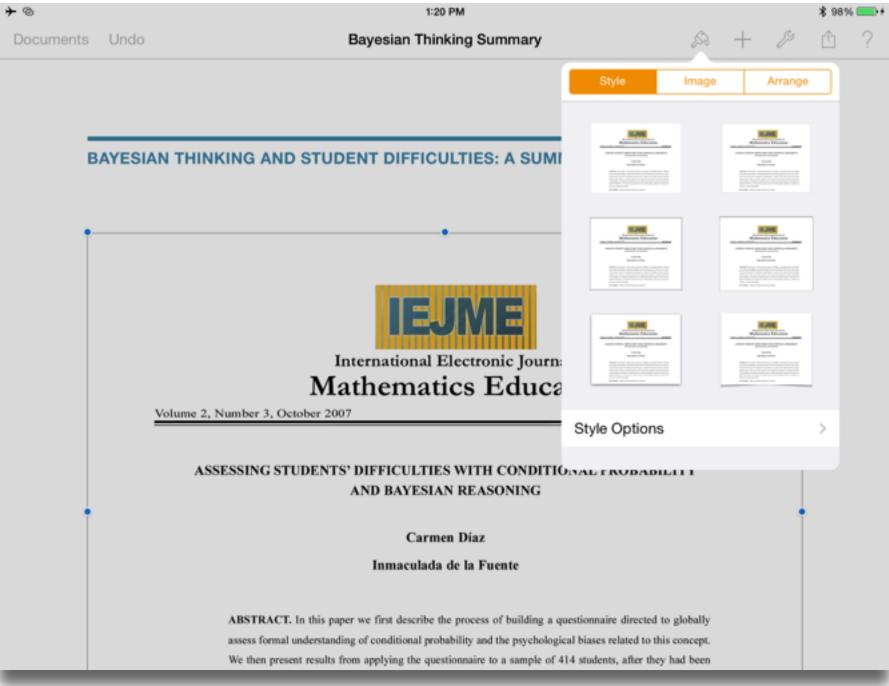
training in how to translate conditional probabilities into natural frequencies.

## Modification Tech allows for significant task redesign

## Augmentation Tech acts as a direct tool substitute, with functional improvement

## **Substitution**





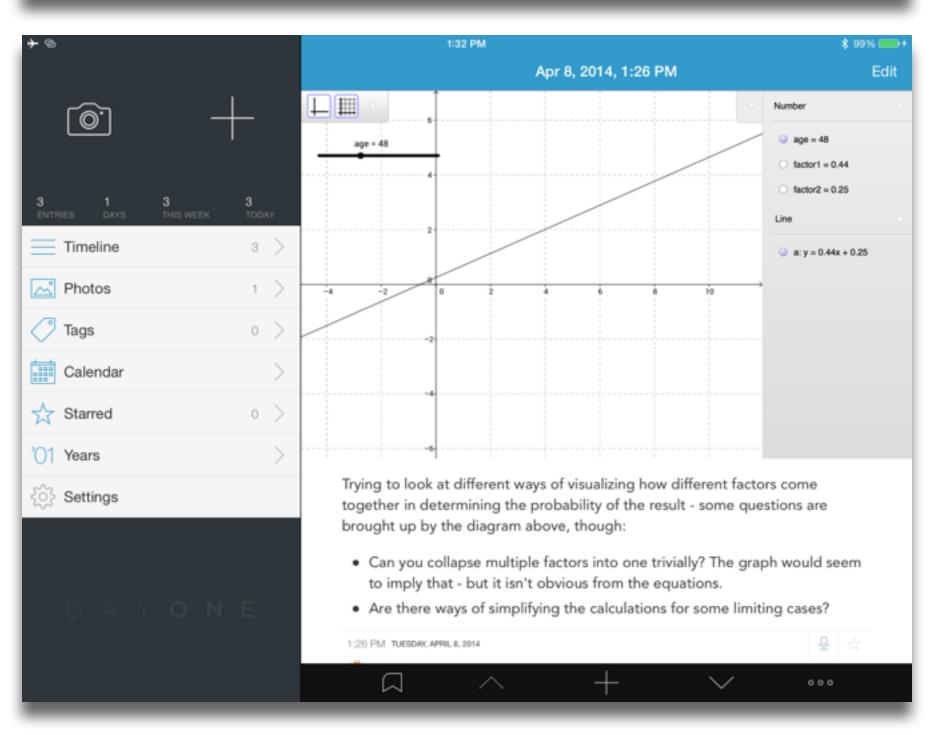
## Modification Tech allows for significant task redesign

### Augmentation

Tech acts as a direct tool substitute, with functional improvement

**Substitution** 

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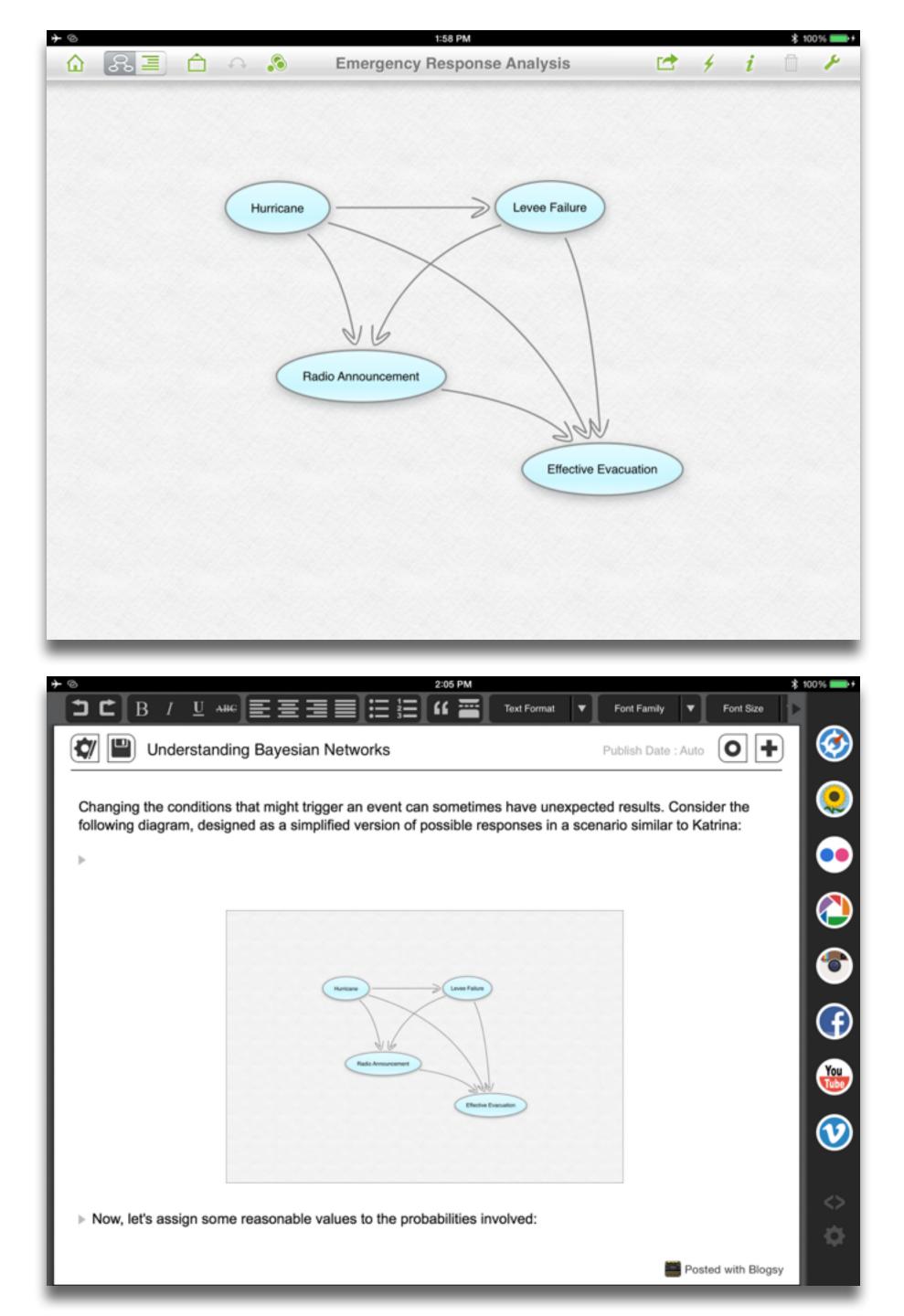
## Modification

Tech allows for significant task redesign

### Augmentation

Tech acts as a direct tool substitute, with functional improvement

**Substitution** 



## Redefinition

# Tech allows for the creation of new tasks, previously inconceivable

## Modification Tech allows for significant task redesign

### Augmentation

Tech acts as a direct tool substitute, with functional improvement

**Substitution** 

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		Irgent procedure	3.27	2.5-5.54	<0.0001
And the second s		emale sex	1.464	1.03-2.07	0.0321
		hronic obstructive pulmonary disease	1.541	1.04-2.276	0.03
		lypertension	1.622	1.037-2.535	0.0339
	3	-Year Survival			
	>	1 vessel treated	1.252	1.072-1.462	0.0045
	N	IYHA functional class III or IV	1.35	1.015-1.796	0.0389
	P	rior myocardial infarction	1.411	1.077-1.848	0.0047
	A	ge >65 yr	2.182	1.663-2.864	< 0.0001
	C	hronic renal insufficiency	1.963	1.481-2.602	< 0.0001
	V.	alvulopathy	1.641	1.183-2.277	0.0031
	F	amily history of coronary artery disease	0.615	0.437-0.865	0.0039
		lyperlipidemia	0.66	0.518-0.841	0.0002
		ongenital heart disease	2.312	1.692-3.16	< 0.0001
	P. D	eripheral vascular disease	1.921	1.452-2.541	< 0.0001

searching, browsing, accessing, collecting

## Discovering

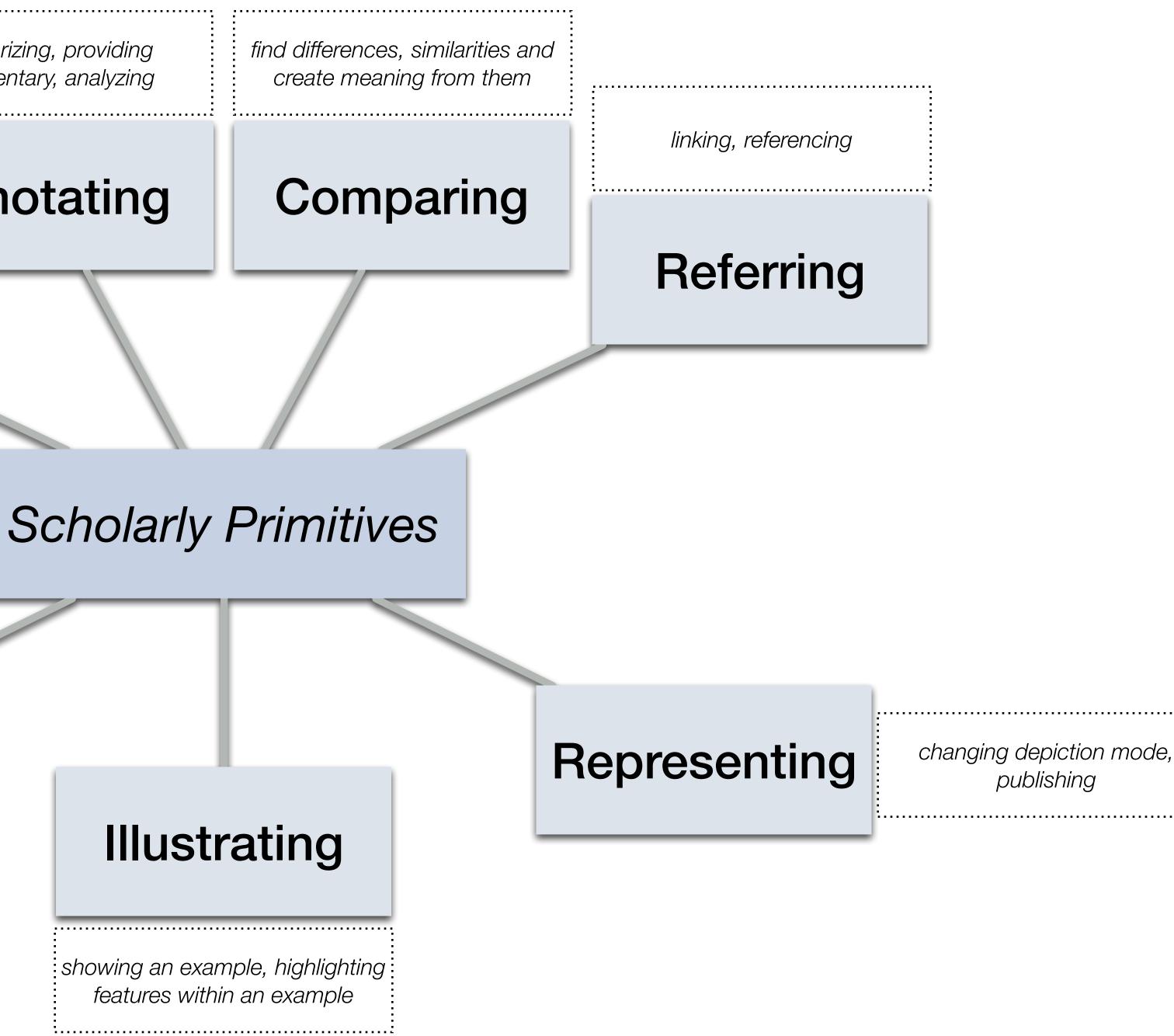
categorizing, providing commentary, analyzing

## Annotating

selecting according to a criterion, showing relationships of items selected to the original set

Sampling

John Unsworth. Scholarly Primitives: What Methods Do Humanities Researchers Have in Common and How Might Our Tools Reflect This? Humanities Computing, Formal Methods, Experimental Practice Symposium, Kings College, London. (May 2000)



Social	Mobility	Visualization	Storytelling	Gaming
200,000 years	70,000 years	40,000 years	17,000 years	8,000 years
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	Ruben R. Puentedura, "Technology In Educati	on: The First 200,000 Years" The NMC Perspective Series: Ideas	that Matter. NMC Summer Conference, 2012.	





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

## Discussions

Blogging

Telepresence



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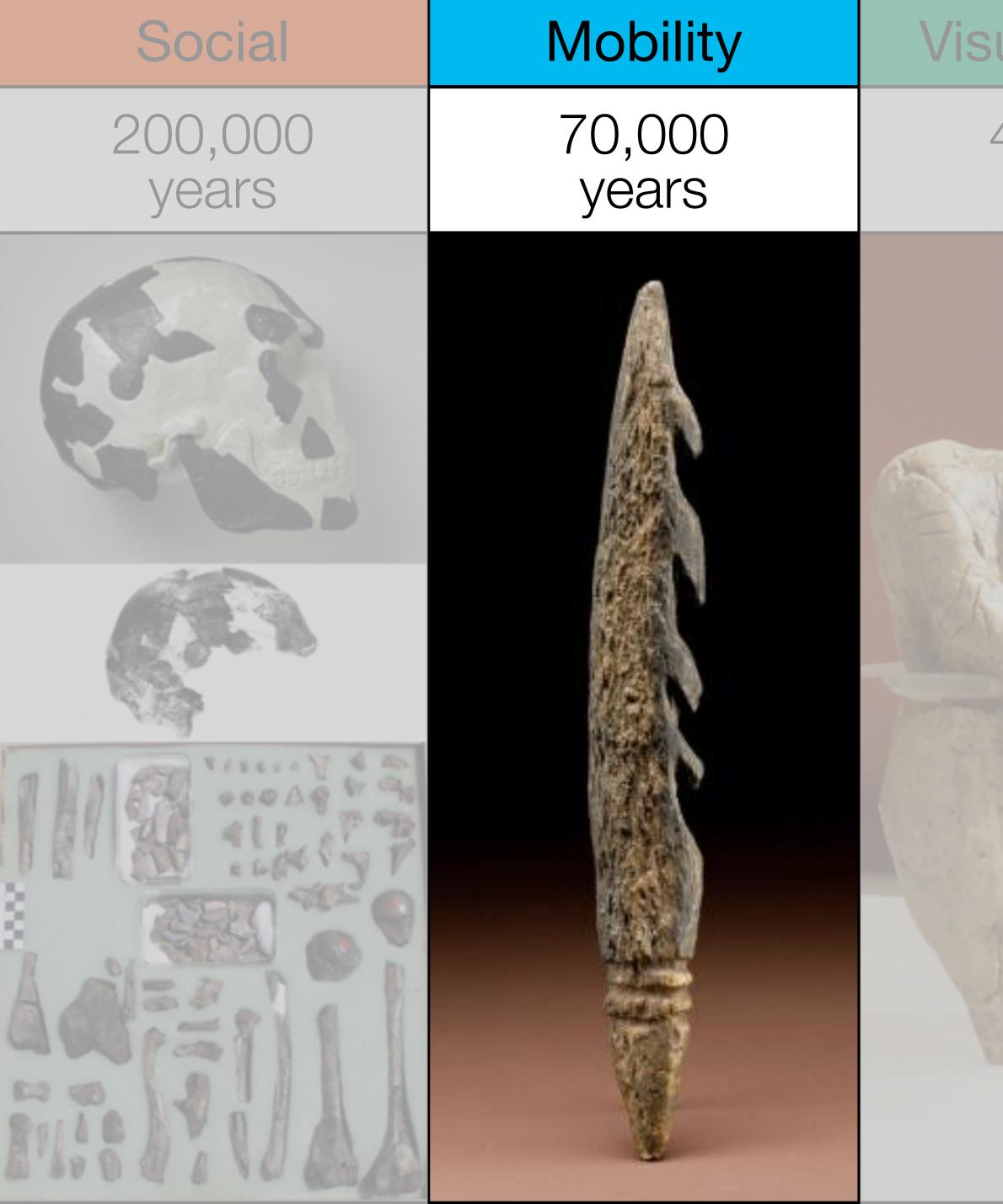
# Microblogging



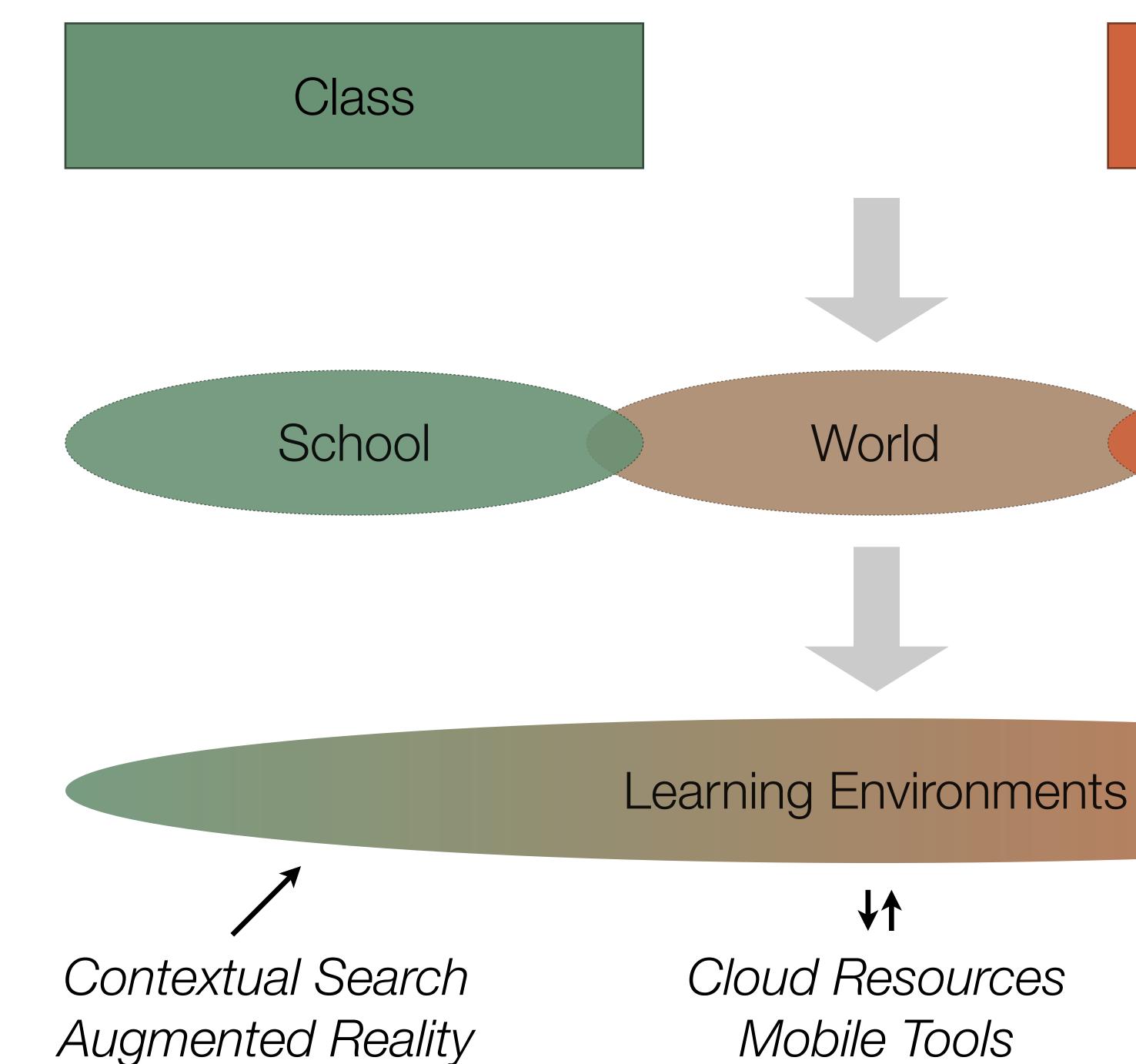


Wikis

File Sharing



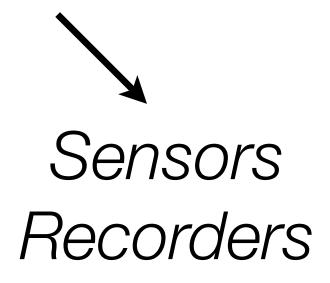
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40,000 years	17,000 years	8,000 years





## Home

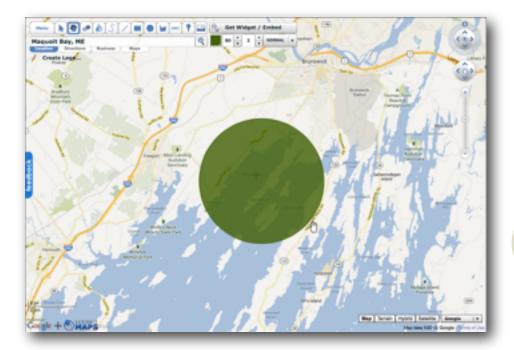
Mobile Tools





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40,000 years	17,000 years	8,000 years

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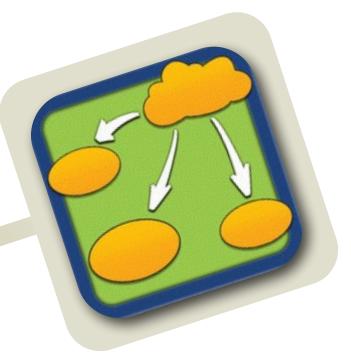
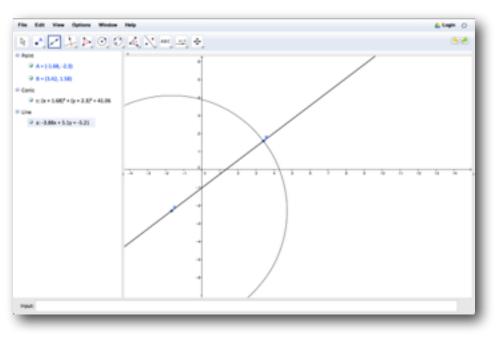
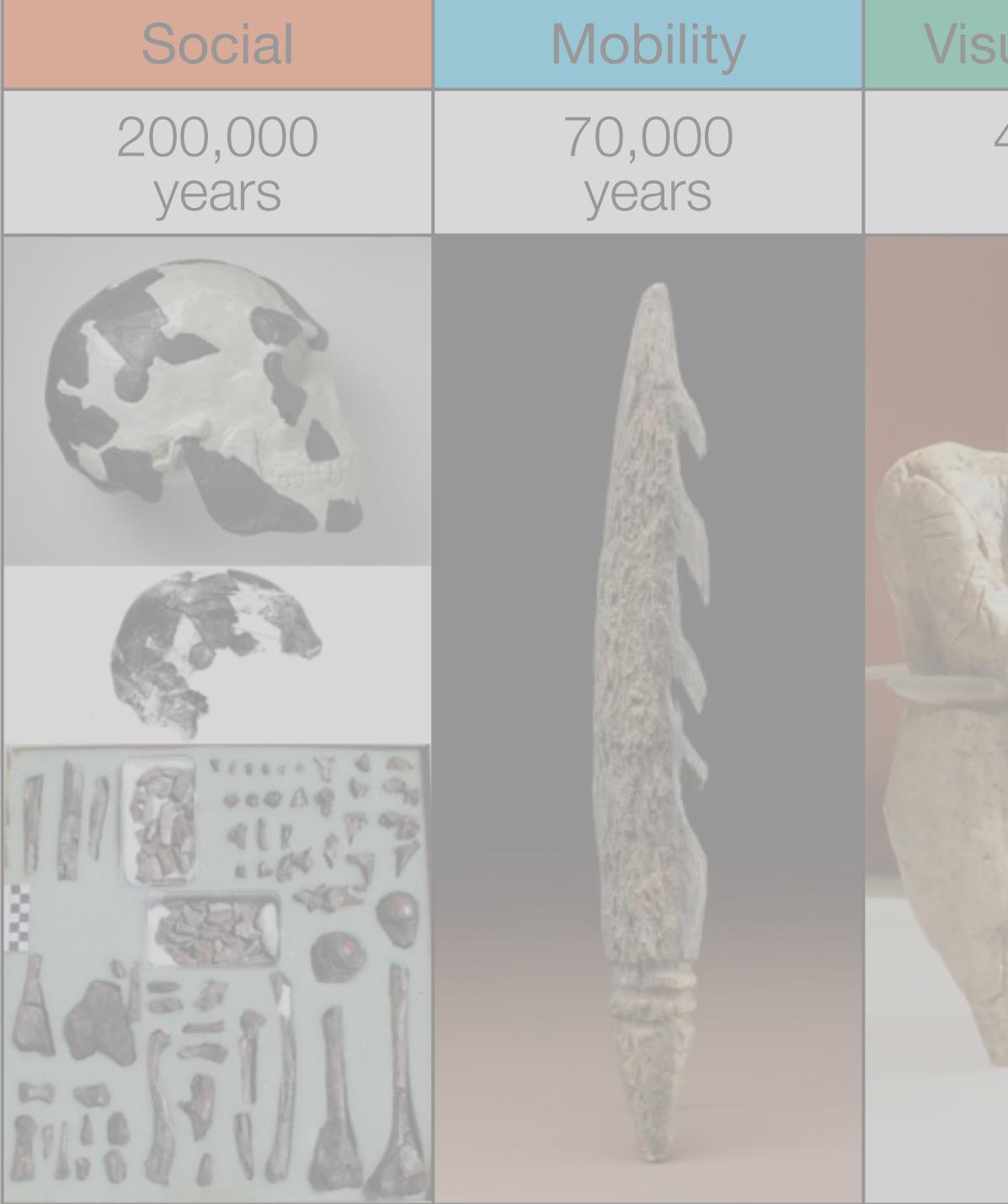


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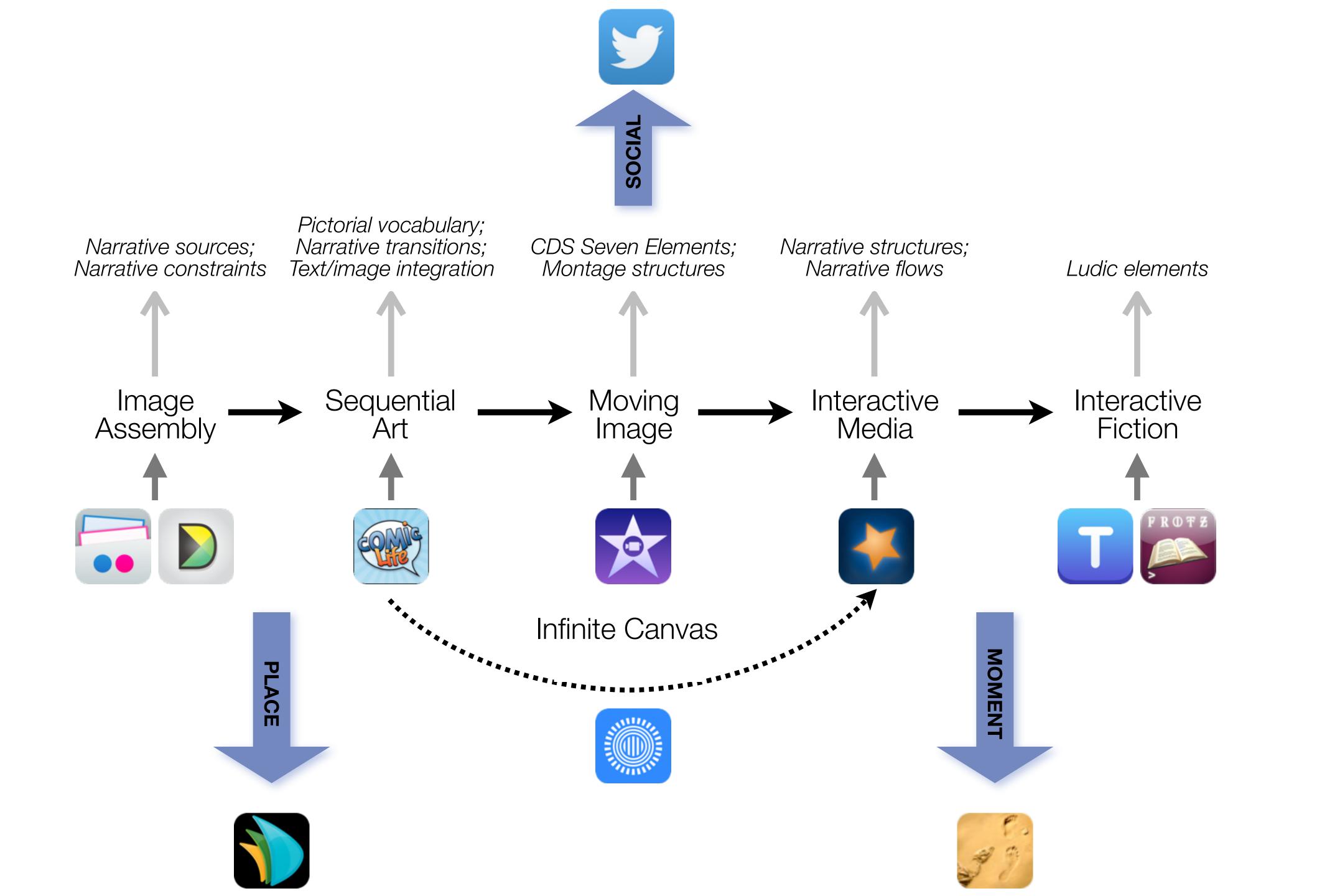


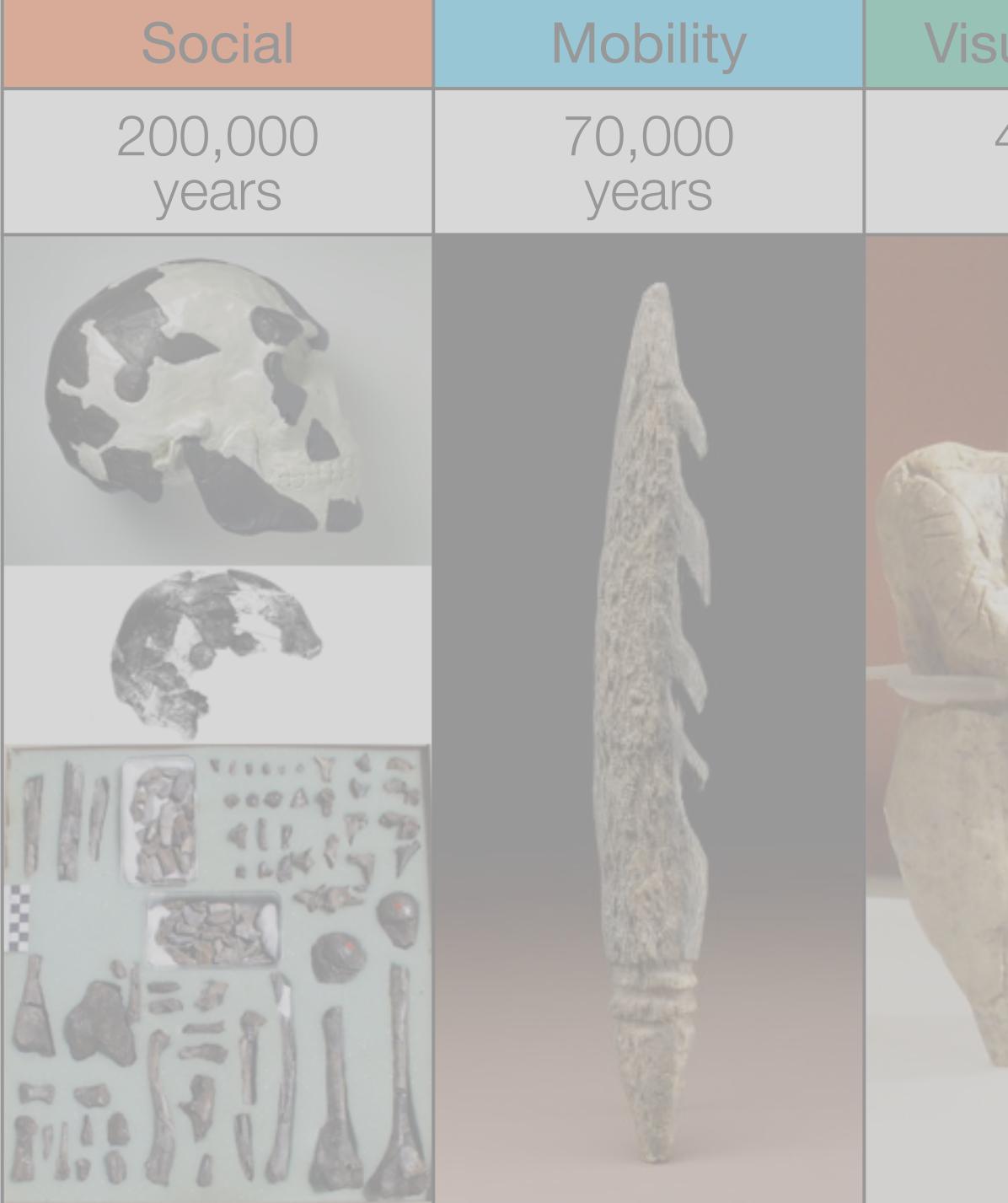






ualization	Storytelling	Gaming
40,000 years	17,000 years	8,000 years





ualization	Storytelling	Gaming
40,000 years	17,000 years	8,000 years





## Formal Definition of **Game** (Salen & Zimmerman)

# "A game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome."

Salen, K. and E. Zimmerman. Rules of Play : Game Design Fundamentals. The MIT Press. (2003)

The EdTech Quinte	
Social	Commur
Mobility	Anytime, /
Visualization	Making
Storytelling	Knowledg
Gaming	Feedback L

## et – Associated Practices

- nication, Collaboration, Sharing
- Anyplace Learning and Creation
- g Abstract Concepts Tangible
- ge Integration and Transmission
- Loops and Formative Assessment

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My Page

#### /// TWIN MUSEUM EVENTS

The New Media Consortium and Learning Revolution held twin events about the future of museums on July 23rd & 24th, 2014. Both events were focused on four main themes from the NMC Horizon Report > 2013 Museum Edition:

- Bring Your Own Device
- Location-Based Services
- Crowdsourcing
- Makerspaces

### July 23rd - The NMC Virtual Symposium on the Future of

Museums was an exclusive symposium for you, the curators, creators, innovators, museum professionals, and educators. In this limited-space event, participants engaged with panels on these topics and helped to shape the conversation around the future of museums.

More information at go.nmc.org/future-museums

July 24th - The Learning Revolution

#### /// WELCOMEI



network

### /// KEYNOTES

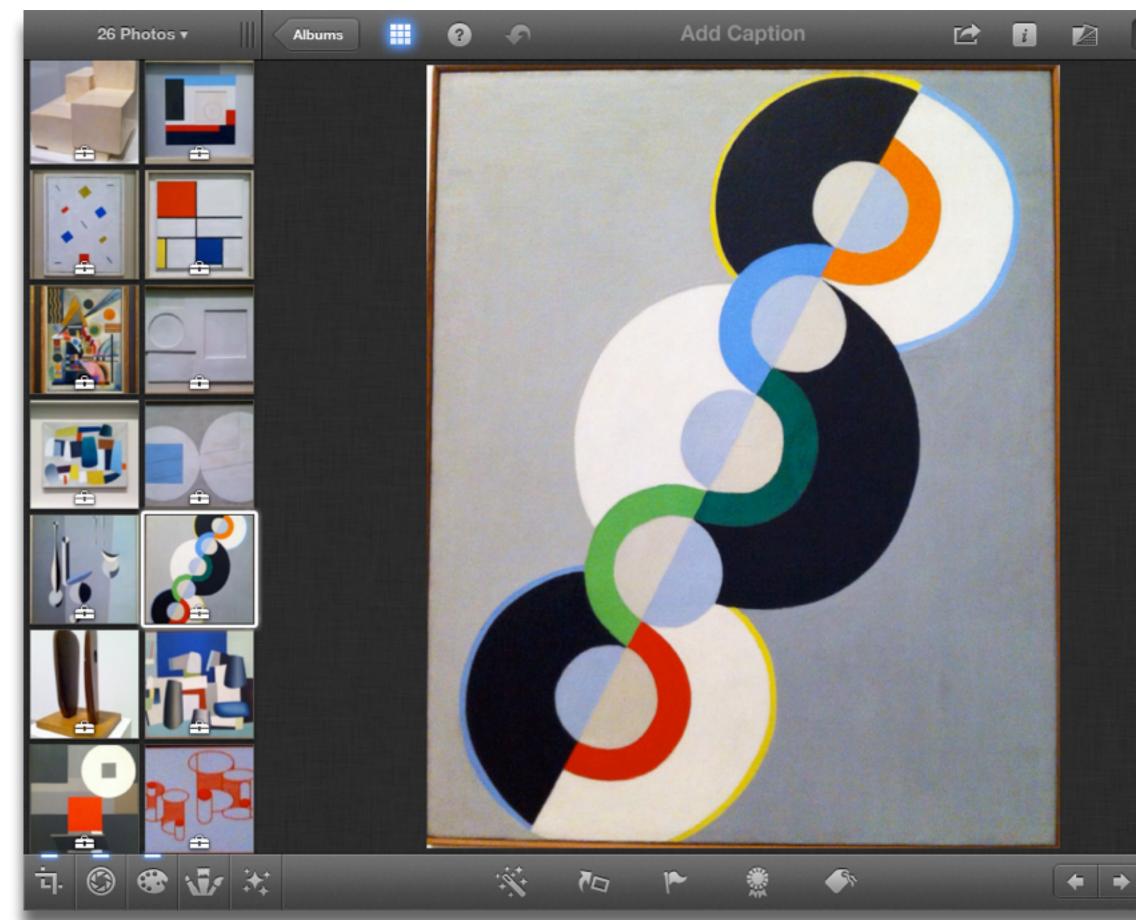




## Modification Tech allows for significant task redesign

## Augmentation Tech acts as a direct tool substitute, with functional improvement

## **Substitution**



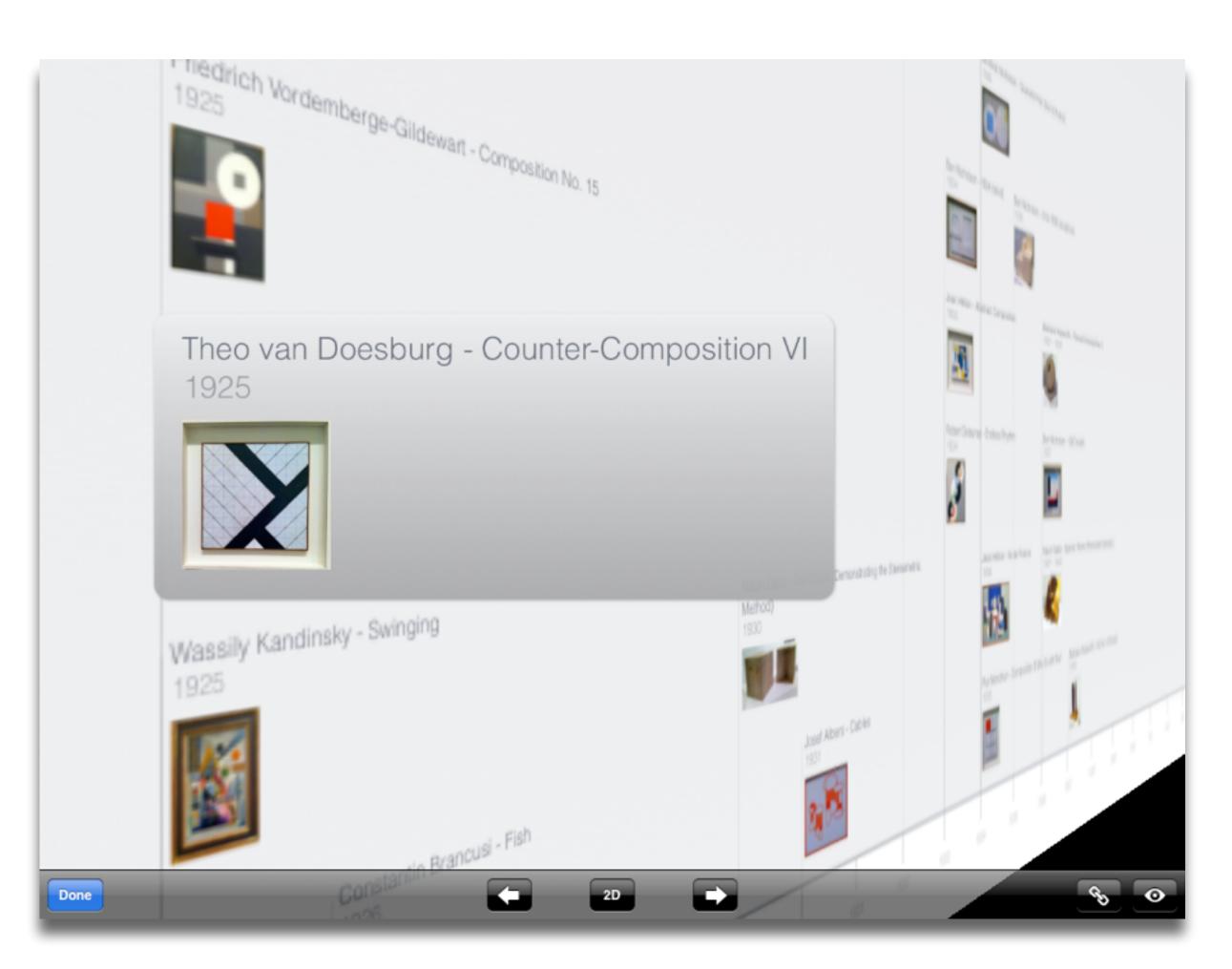


## Modification Tech allows for significant task redesign

### Augmentation

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**Substitution** 



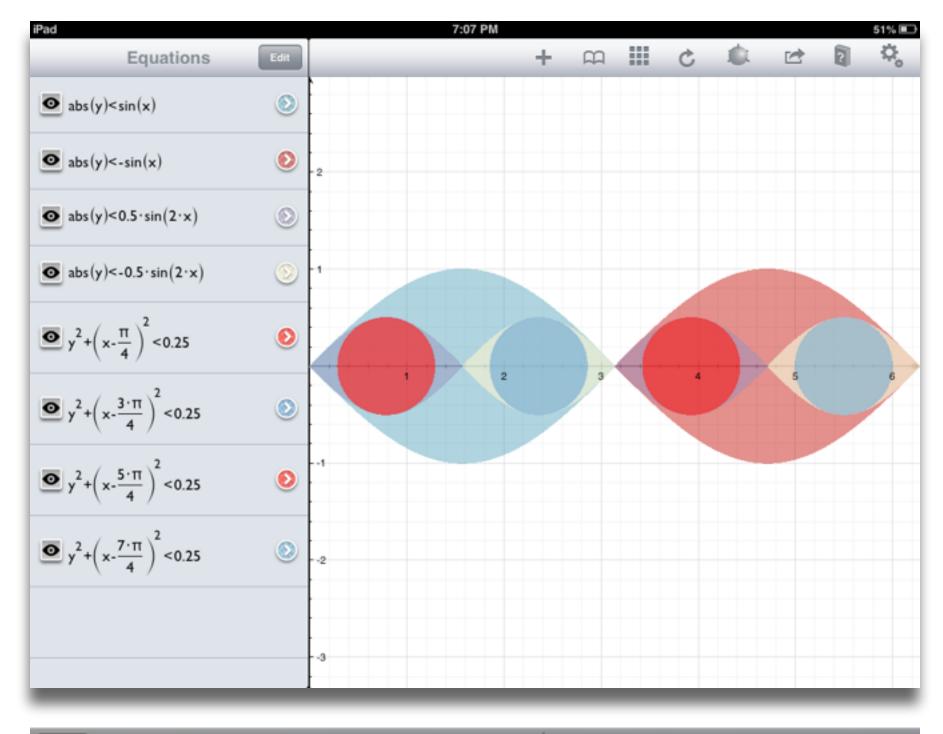
## Modification

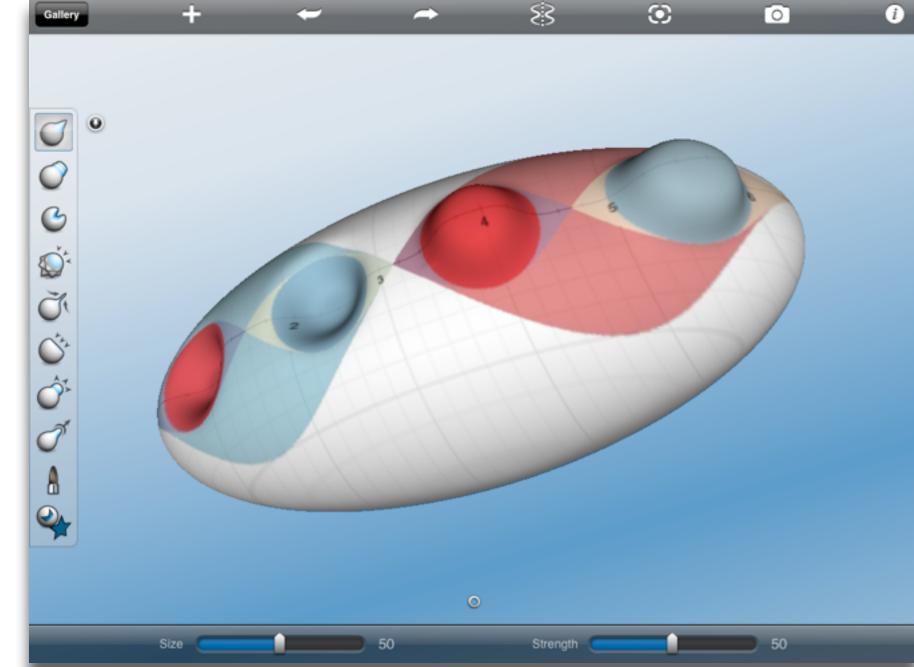
Tech allows for significant task redesign

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## Redefinition

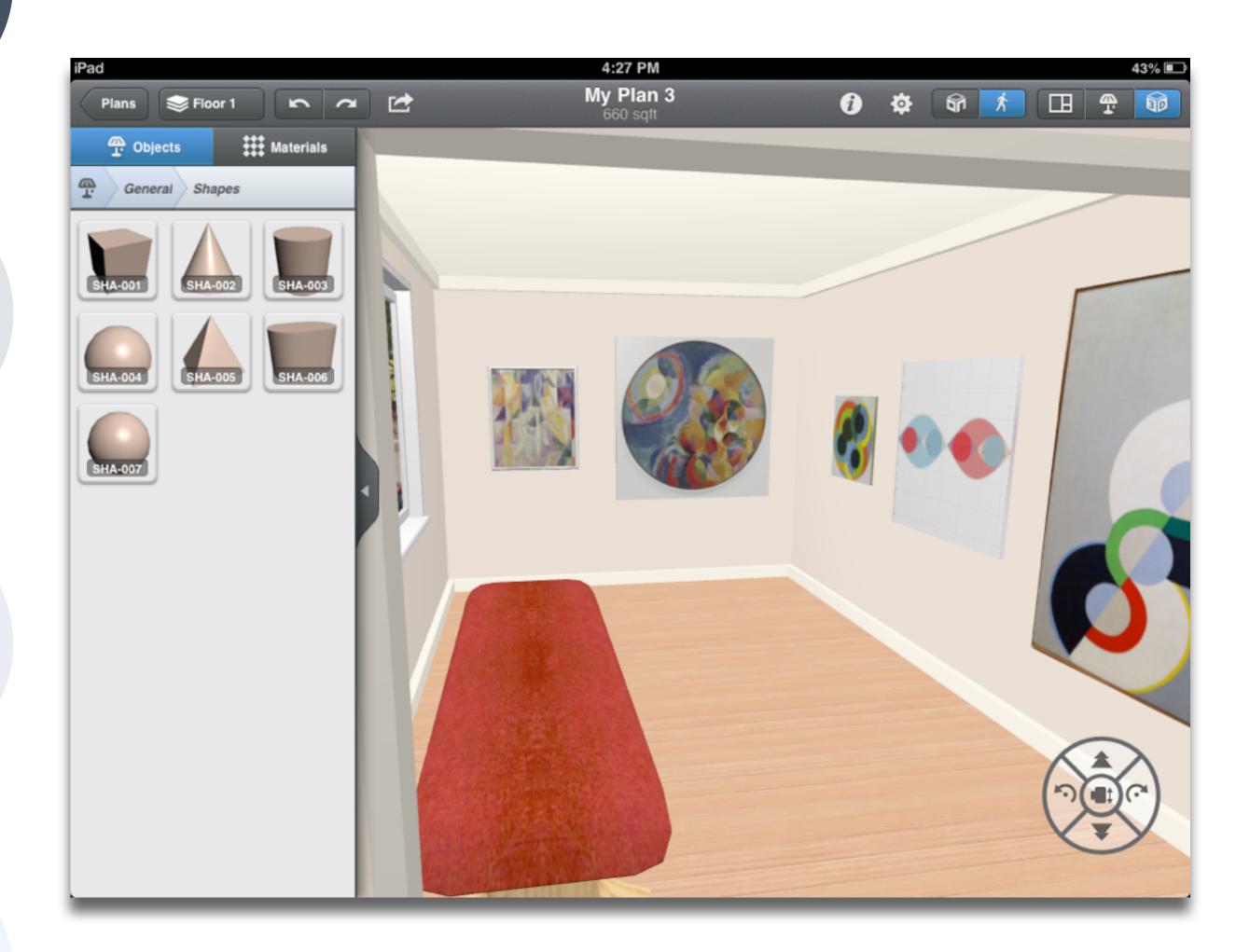
# Tech allows for the creation of new tasks, previously inconceivable

## Modification Tech allows for significant task redesign

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**Substitution** 



## Choosing the First SAMR Ladder Project: Three Options

## • Your Passion:

- subject you teach, what would it be?
- Barriers to Your Students' Progress:
  - beyond?
- What Students Will Do In the Future:
  - future studies or in their lives outside school?

• If you had to pick one topic from your class that best exemplifies why you became fascinated with the

• Is there a topic in your class that a significant number of students get stuck on, and fail to progress

• Which topic from your class would, if deeply understood, best serve the interests of your students in

Research Article

## The Pen Is Mightier Than the Keyboard: **Advantages of Longhand Over Laptop Note Taking**



Pam A. Mueller<sup>1</sup> and Daniel M. Oppenheimer<sup>2</sup> <sup>1</sup>Princeton University and <sup>2</sup>University of California, Los Angeles

### Abstract

Taking notes on laptops rather than in longhand is increasingly common. Many researchers have suggested that laptop note taking is less effective than longhand note taking for learning. Prior studies have primarily focused on students' capacity for multitasking and distraction when using laptops. The present research suggests that even when laptops are used solely to take notes, they may still be impairing learning because their use results in shallower processing. In three studies, we found that students who took notes on laptops performed worse on conceptual questions than students who took notes longhand. We show that whereas taking more notes can be beneficial, laptop note takers' tendency to transcribe lectures verbatim rather than processing information and reframing it in their own words is detrimental to learning.



Psychological Science 1 - 10© The Author(s) 2014 Reprints and permissions: sagepub.com/journalsPermissions.nav DOI: 10.1177/0956797614524581 pss.sagepub.com





## Augmentation Tech acts as a direct tool substitute, with functional improvement

## **Substitution**

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

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### Modification Tech allows for significant task redesign

### Generalize patterns

Augmentation Tech acts as a direct tool substitute, with functional improvement

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



## **Redefinition** Tech allows for the creation of new tasks, previously inconceivable

## Modification Tech allows for significant task redesign

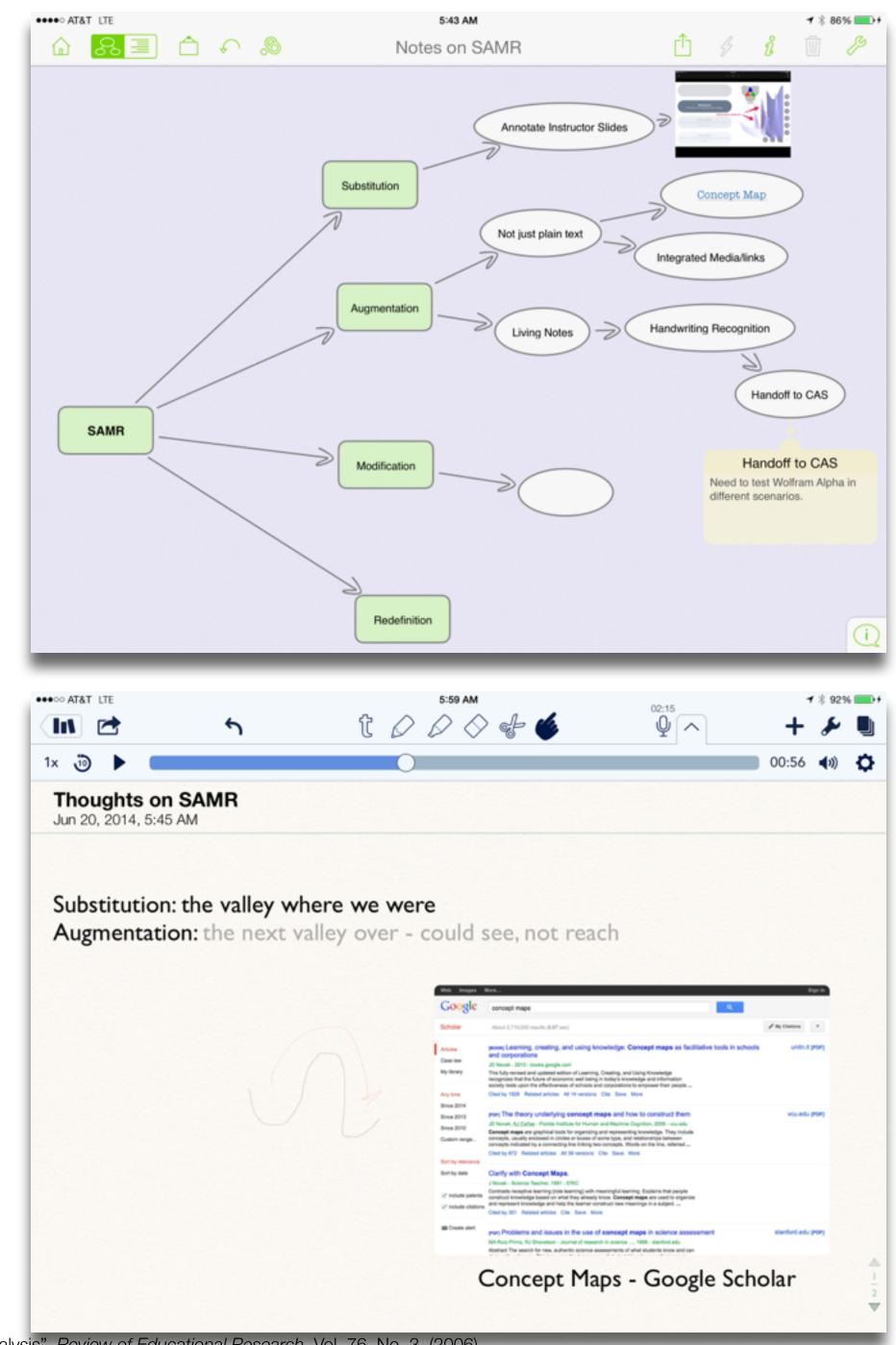
### Augmentation

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

John C. Nesbit and Olusola O. Adesope, "Learning With Concept and Knowledge Maps: A Meta-Analysis". Review of Educational Research, Vol. 76, No. 3. (2006)



## **Redefinition** Tech allows for the creation of new tasks, previously inconceivable

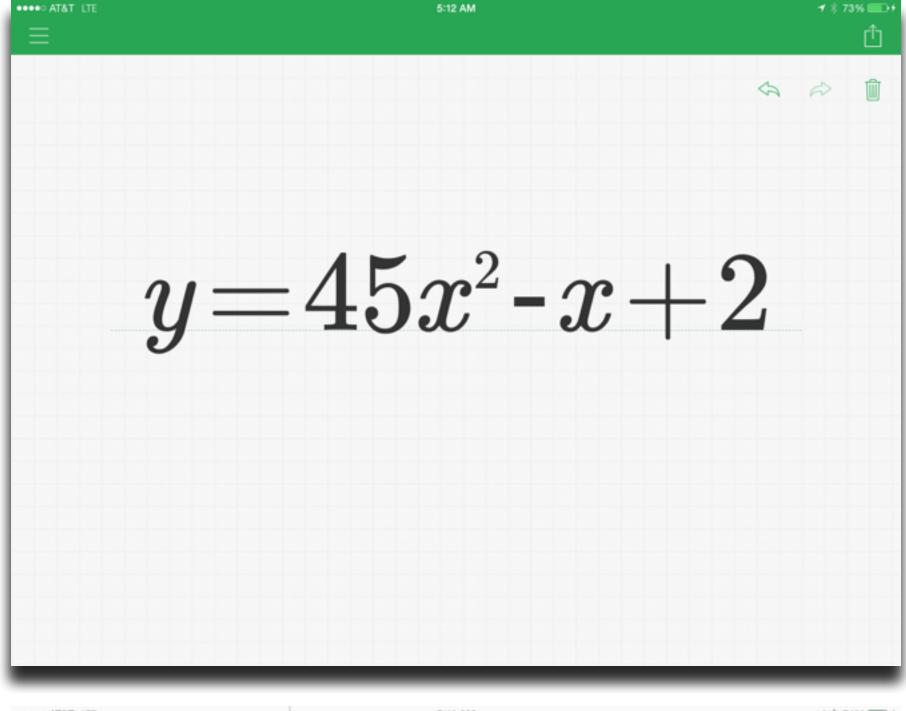
## Modification Tech allows for significant task redesign

### Augmentation

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**Substitution** 

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## Modification

Tech allows for significant task redesign

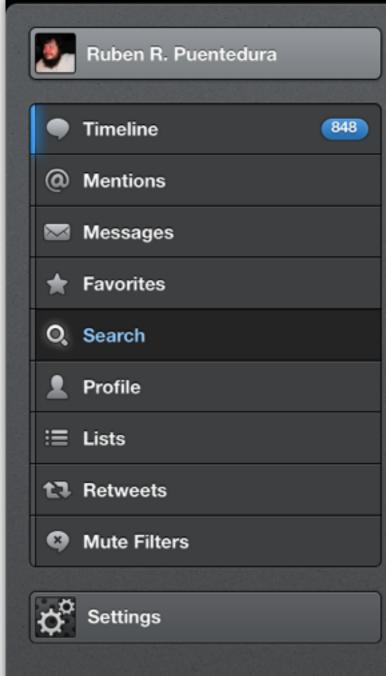
### Augmentation

Tech acts as a direct tool substitute, with functional improvement

**Substitution** 

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### ●●●●○ AT&T LTE



### 5:22 AM

### #thoughtvectors

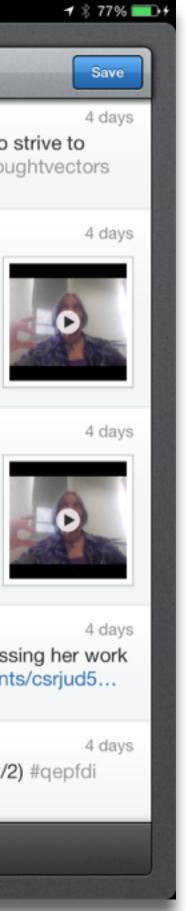


Search

Cindy Jennings @cljennings Sad to me: @ChristinaDEI noting that her father had to strive to share his vision in ways that ppl wanted to hear it. #thoughtvectors

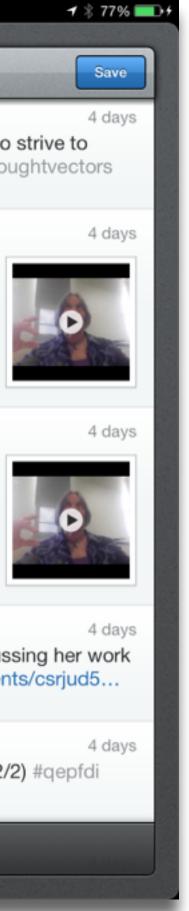


Jon Becker @jonbecker Watch @GardnerCampbell interview @ChristinaDEI, Doug Engelbart's daughter, LIVE
youtube.com/watch?v=NBKjI0... #thoughtvectors





Gardner Campbell @GardnerCampbell #thoughtvectors Hangout w Christina Engelbart (@ChristinaDEI): youtube.com/watch?v=NBKjI0.... Join us there or G+ plus.google.com/events/ csrjud5...





Gardner Campbell @GardnerCampbell Hangout w Christina Engelbart (@ChristinaDEI), discussing her work w #thoughtvectors at VCU. 4:30! plus.google.com/events/csrjud5...



Cindy Jennings @cljennings Early mention of Maria Montessori has my attention! (2/2) #qepfdi #thoughtvectors

100 Tweets

# Tech allows for the creation of new tasks, previously inconceivable

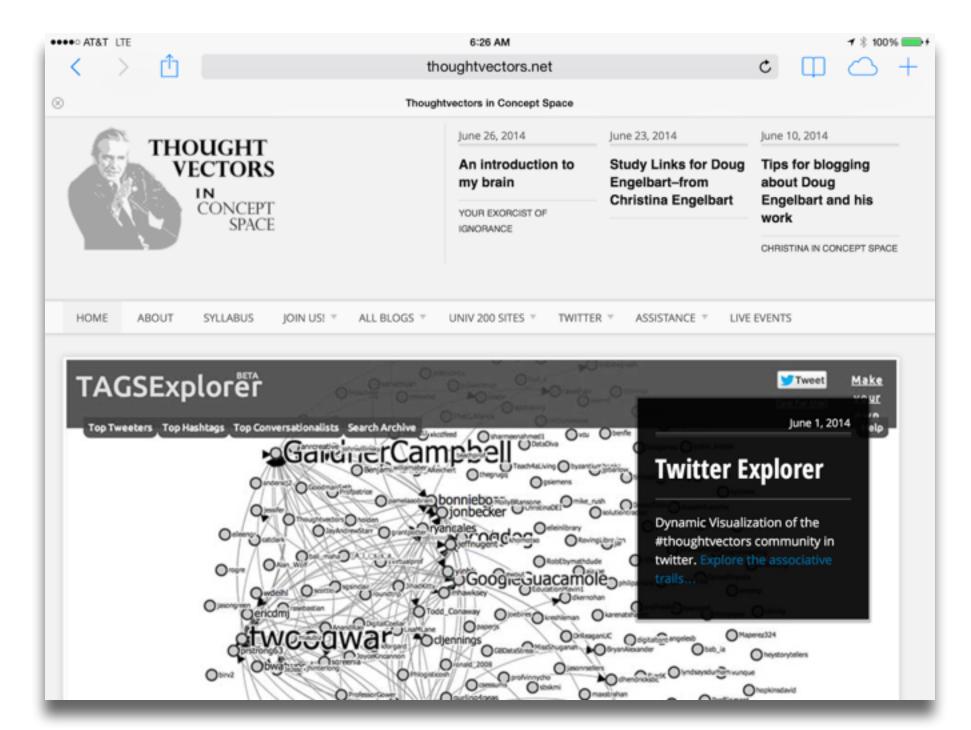
## Modification Tech allows for significant task redesign

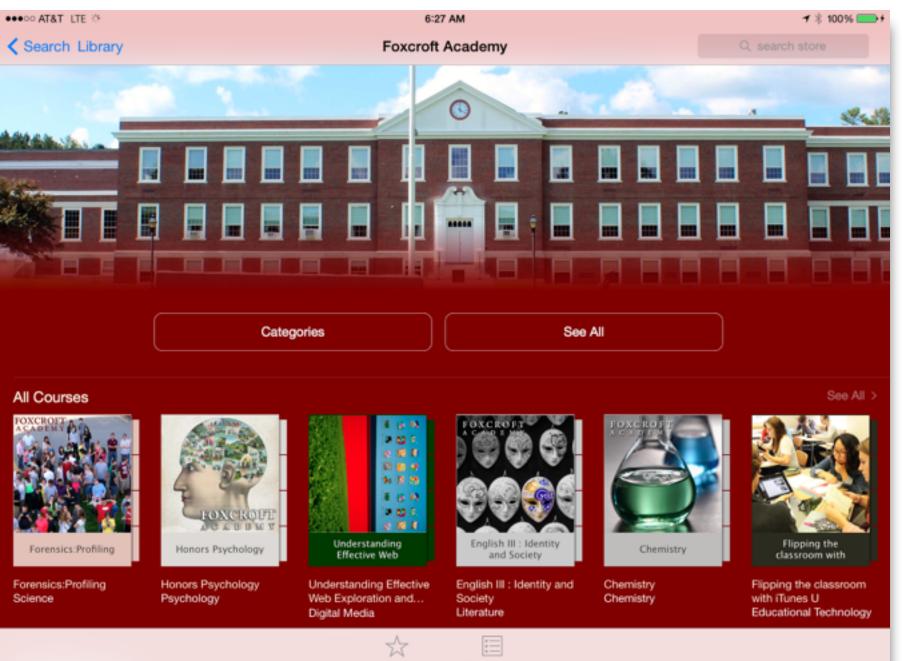
### Augmentation

Tech acts as a direct tool substitute, with functional improvement

**Substitution** 

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



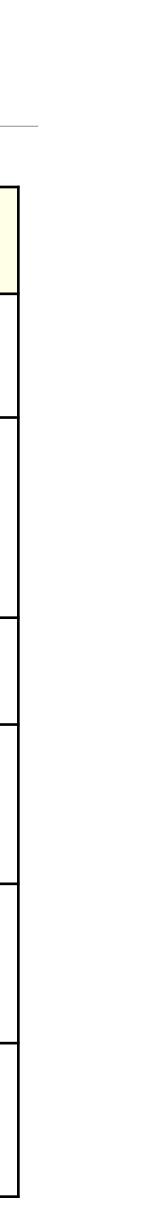


Featured

Top Charts

# Bloom's Taxonomy: Cognitive Processes

Anderson & Krathwohl (2001)	Characteristic Processes		
Remember	<ul> <li>Recalling memorized knowledge</li> <li>Recognizing correspondences between memorized knowledge and new material</li> </ul>		
Understand	<ul> <li>Paraphrasing materials</li> <li>Exemplifying concepts, principles</li> <li>Classifying items</li> <li>Summarizing materials</li> </ul>	<ul> <li>Extrapolating principles</li> <li>Comparing items</li> </ul>	
Apply	<ul> <li>Applying a procedure to a familiar task</li> <li>Using a procedure to solve an unfamiliar, but typed task</li> </ul>		
Analyze	<ul> <li>Distinguishing relevant/irrelevant or important/unimportant portions of material</li> <li>Integrating heterogeneous elements into a structure</li> <li>Attributing intent in materials</li> </ul>		
Evaluate	<ul> <li>Testing for consistency, appropriateness, and effectiveness in principles and procedures</li> <li>Critiquing the consistency, appropriateness, and effectiveness of principles and procedures, basing the critique upon appropriate tests</li> </ul>		
Create	<ul> <li>Generating multiple hypotheses based on given criteria</li> <li>Designing a procedure to accomplish an untyped task</li> <li>Inventing a product to accomplish an untyped task</li> </ul>		



Tech allows for the creation of new tasks, previously inconceivable

## Modification

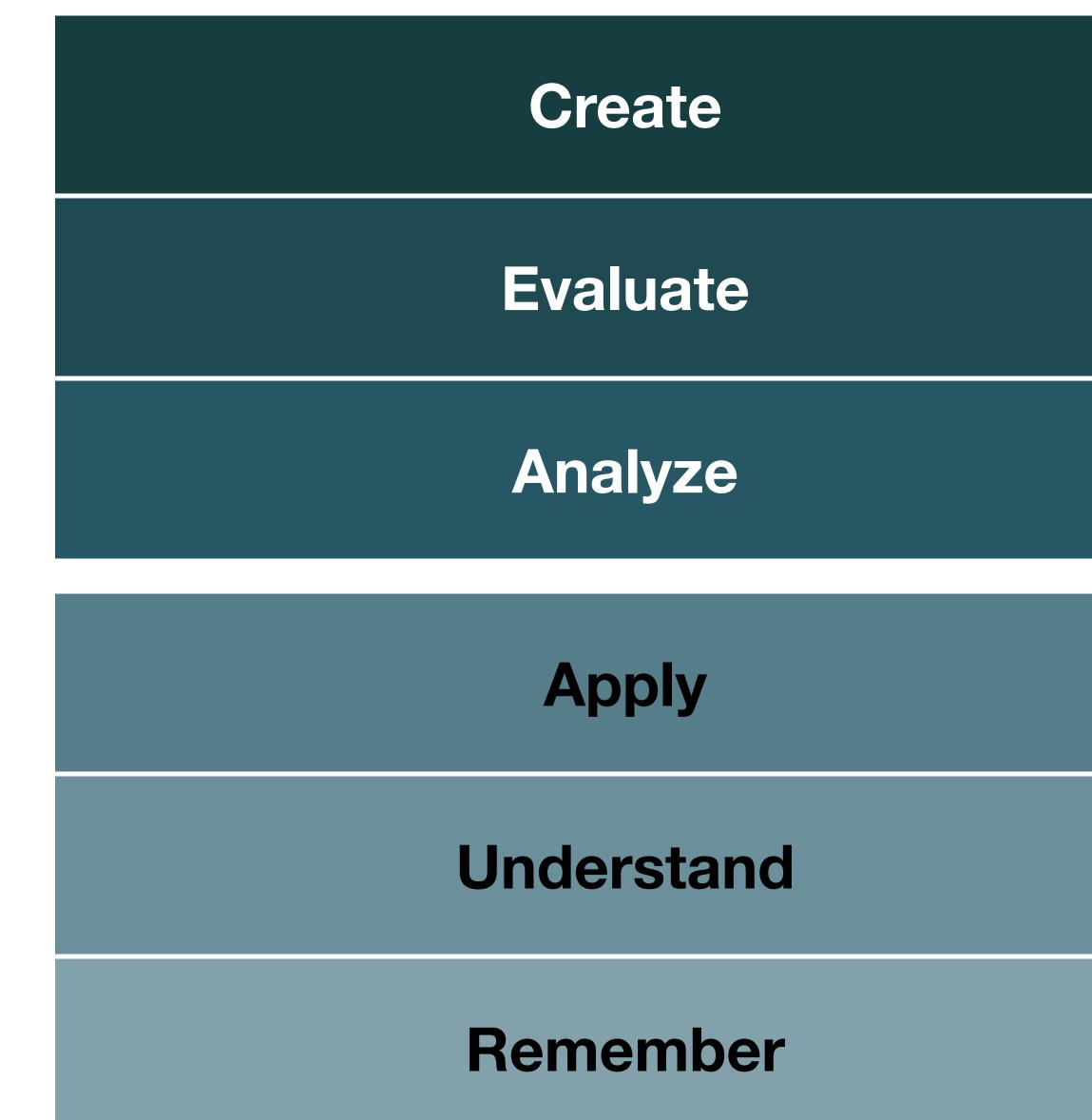
Tech allows for significant task redesign

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# Modification

## Augmentation Tech acts as a direct tool substitute, with functional improvement

## **Substitution**

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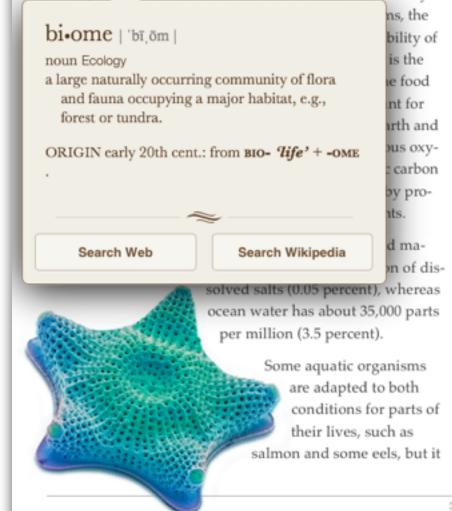
## Understand

## Remember

### 1:15 PM

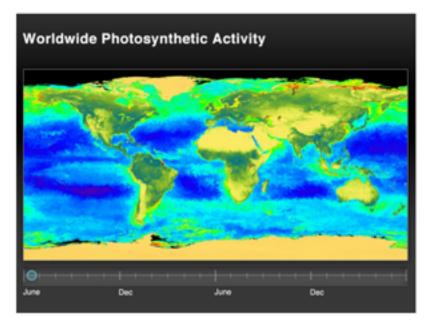
### **Aquatic Biomes**

Aquatic biomes cover 75 percent of the surface of the Earth. The aquation d terrestrial biomes are similar in some ways



is more common for organisms to be confined to one of the two environments.

Aquatic environments have less variation globally than those on land. Taking a broad view (the lumper's perspective), there are four kinds of aquatic biomes: surface waters, deep waters, shores, and bottoms. Within these categories are a variety of distinctive marine and freshwater life zones that are frequently designated as separate biomes.



Interactive The latitudes of peak photosynthesis change with the seasons.

## **Redefinition** Tech allows for the creation of new tasks, previously inconceivable

## Modification Tech allows for significant task redesign

### Augmentation

Tech acts as a direct tool substitute, with functional improvement Apply

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

### Streptopelia decaocto Locally common, exotic

12½-13 in. (32-33 cm)

Recent colonizer of N. America from Caribbean but native to Eurasia; rapidly increasing and spreading. Slightly chunkier than Mourning Dove, paler beige, and with square-cut tail. Note narrow black ring on hindneck. Grayish undertail coverts. Three-toned wing pattern in flight.

### SPOTTED DOVE

Streptopelia chinensis Uncommon, local, exotic

### 12 in. (30-31 cm)

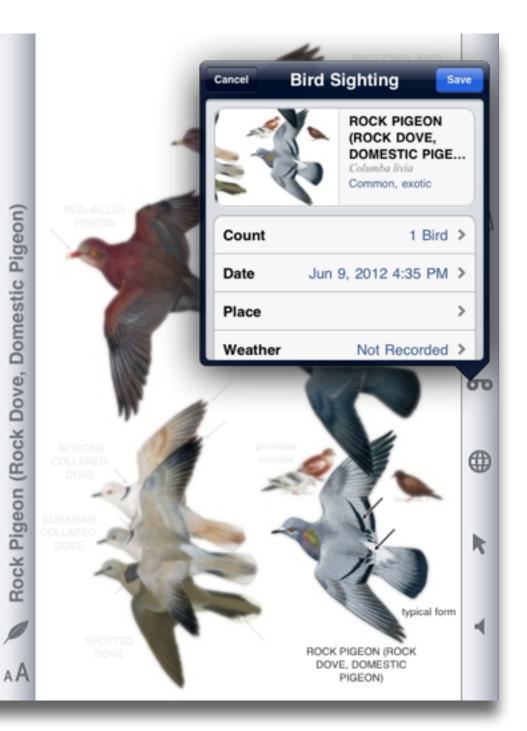
Note broad collar of black and white spots on hindneck. A bit larger than Mourning Dove; tail rounded with much white in corners. Juvenile: Lacks collar, but can be told by shape of spread tail.

### ROCK PIGEON (ROCK DOVE, DOMESTIC PIGEON)

Columba livia Common, exotic

### 121/2 in. (32 cm)

Typical birds are gray with whitish rump, two black wing bars, and broad, dark tail band. Domestic stock or feral birds may have many color variants.



# Understand

## **Redefinition** Tech allows for the creation of new tasks, previously inconceivable

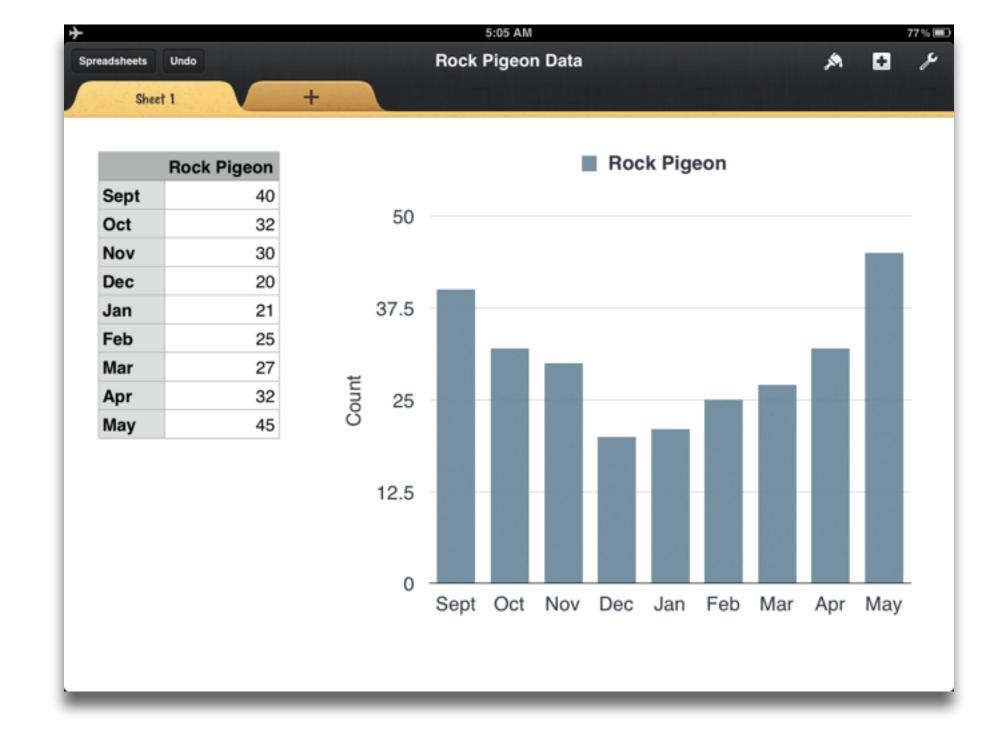
## Modification Tech allows for significant task redesign

# **Evaluate**

# Analyze

Augmentation Tech acts as a direct tool substitute, with functional improvement

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



Tech allows for the creation of new tasks, previously inconceivable



Evaluate

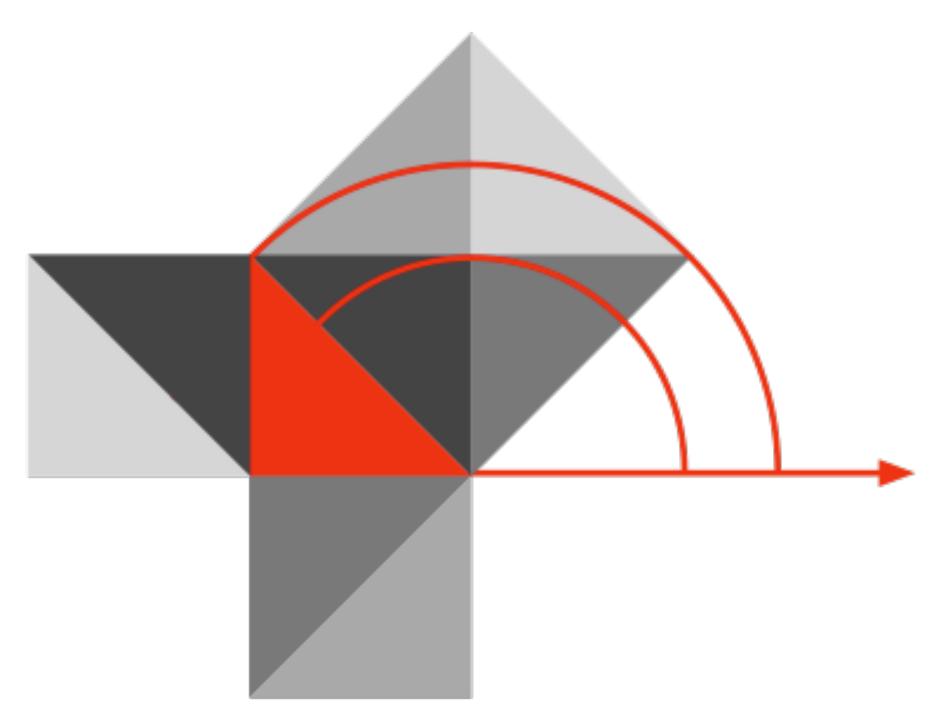
Modification

Augmentation Tech acts as a direct tool substitute, with functional improvement

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

Audio		Local Ecosystem	<ul> <li>(*)</li> </ul>				
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# Hippasus



## Blog: http://hippasus.com/blog/ Email: rubenrp@hippasus.com Twitter: @rubenrp

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