Putting SAMR and the EdTech Quintet to Work

Ruben R. Puentedura, Ph.D.

Part 1 – The SAMR Model and the EdTech Quintet

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

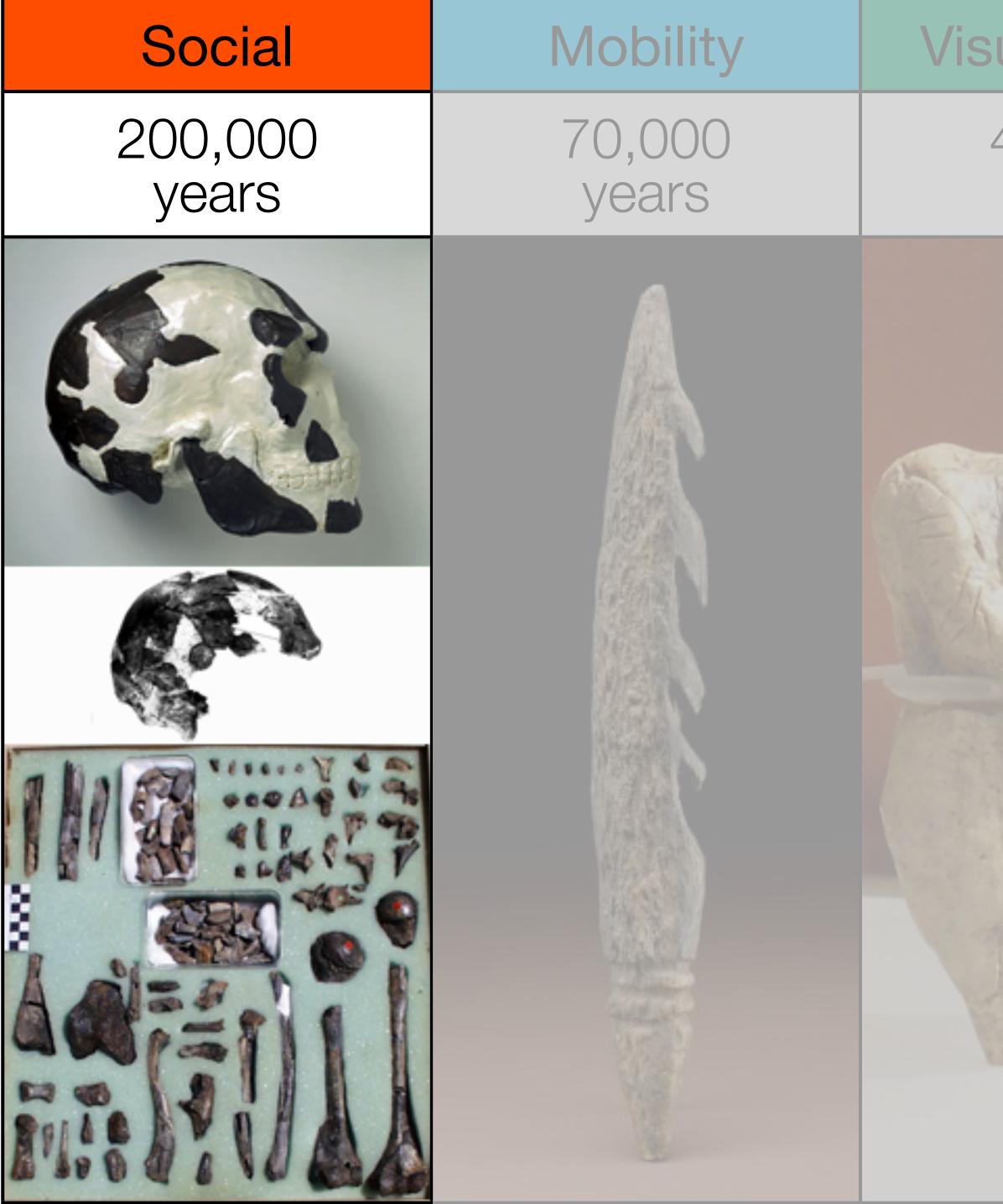
Modification Tech allows for significant task redesign Transformation

Augmentation

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





Bookmarks

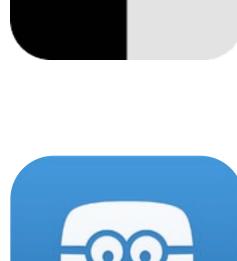
Discussions

Blogging

Telepresence



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Microblogging



File Sharing

Modification Tech allows for significant task redesign

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Substitution

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Library

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Back to page 10

William Rosen

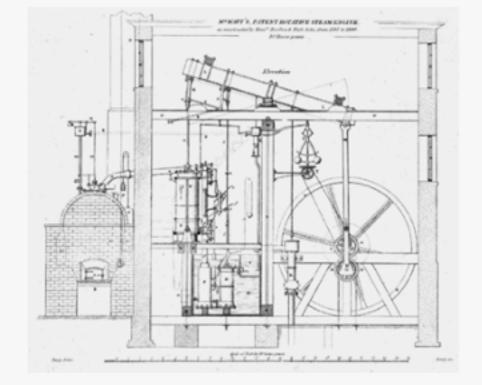


Fig. 5: The caption for this technical drawing reads "Mr. Watt's Patent Rotative Steam Engine as constructed by Messrs. Boulton & Watt, Soho, from 1787 to 1800. 10 Horse power." By 1787, the engine had evolved considerably from the earlier versions, using the sun-and-planet gear to drive the large wheel; the Watt linkage to connect the beam with the cylinder, on the left; and even Watt's feedback-

driven flyball governor—the two balls hanging above and to the left of the large wheel—to control

440 of 850

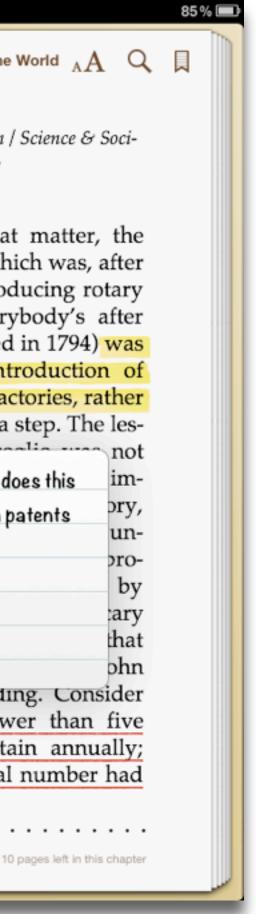
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The Most Powerful Idea in the World ${}_{\mathrm{A}}\mathrm{A}$ Q 🔲

the wheel's speed. Science Museum / Science & Society Picture Library

THE SUN-AND-PLANET (or, for that matter, the crank plus connecting rod, which was, after all, Watt's first choice for producing rotary motion, and would be everybody's after the Wasbrough patent expired in 1794) was a huge step toward the introduction of steam power into mills and factories, rather than pumps. But it was only a step. The lesson of the Washrough imbrasilia mon not Get data & graph this; how does this immei ory, pro but compare with later trends in patents unissued per year? con protect by 178 ary that pac ohn ĥad Locke in the centur, preceding. Consider that from 1700 to 1740, fewer than five patents were issued in Britain annually; from 1740 to 1780, the annual number had

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Modification Tech allows for significant task redesign

Augmentation

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Substitution

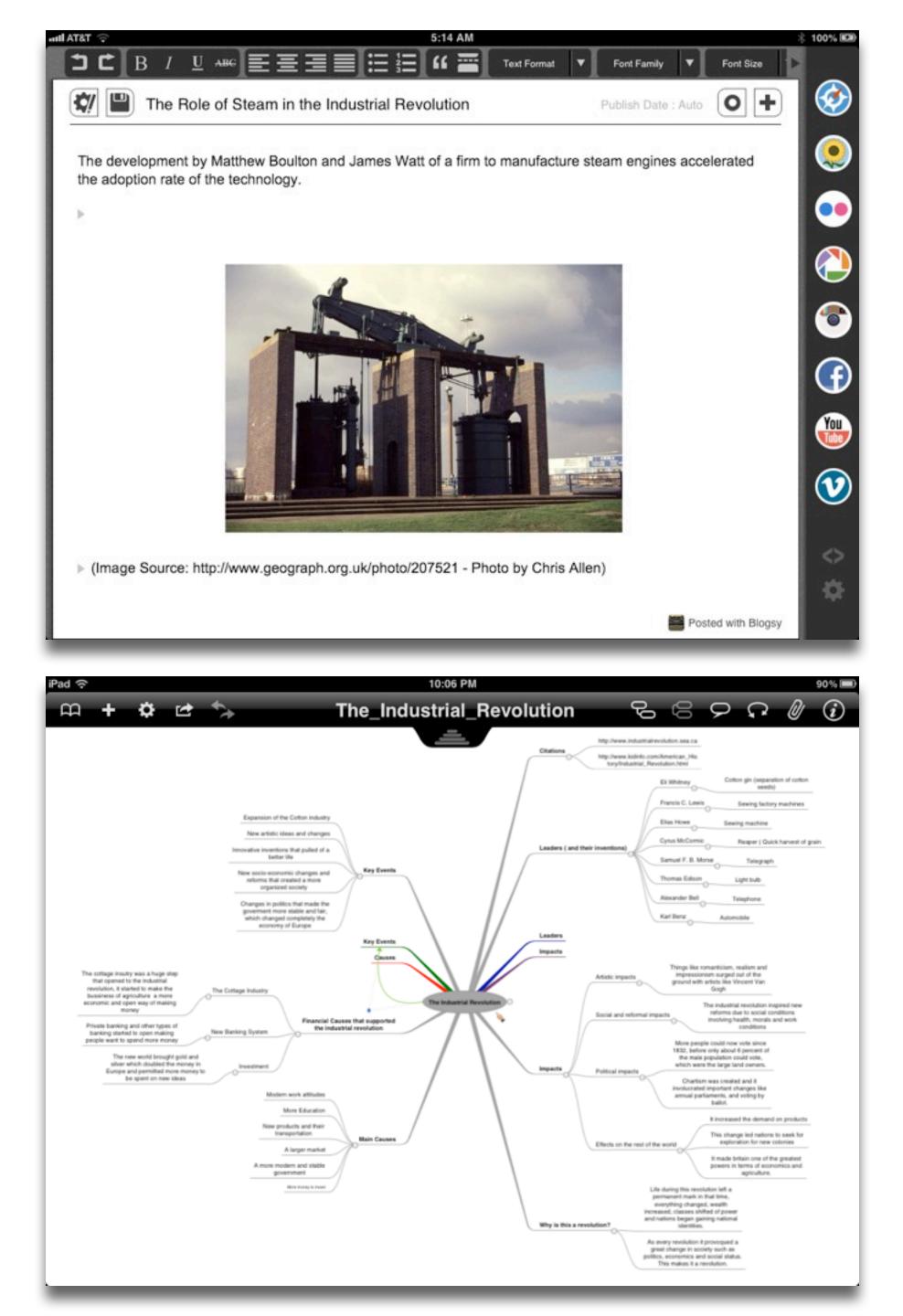


Modification

Tech allows for significant task redesign

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

Substitution



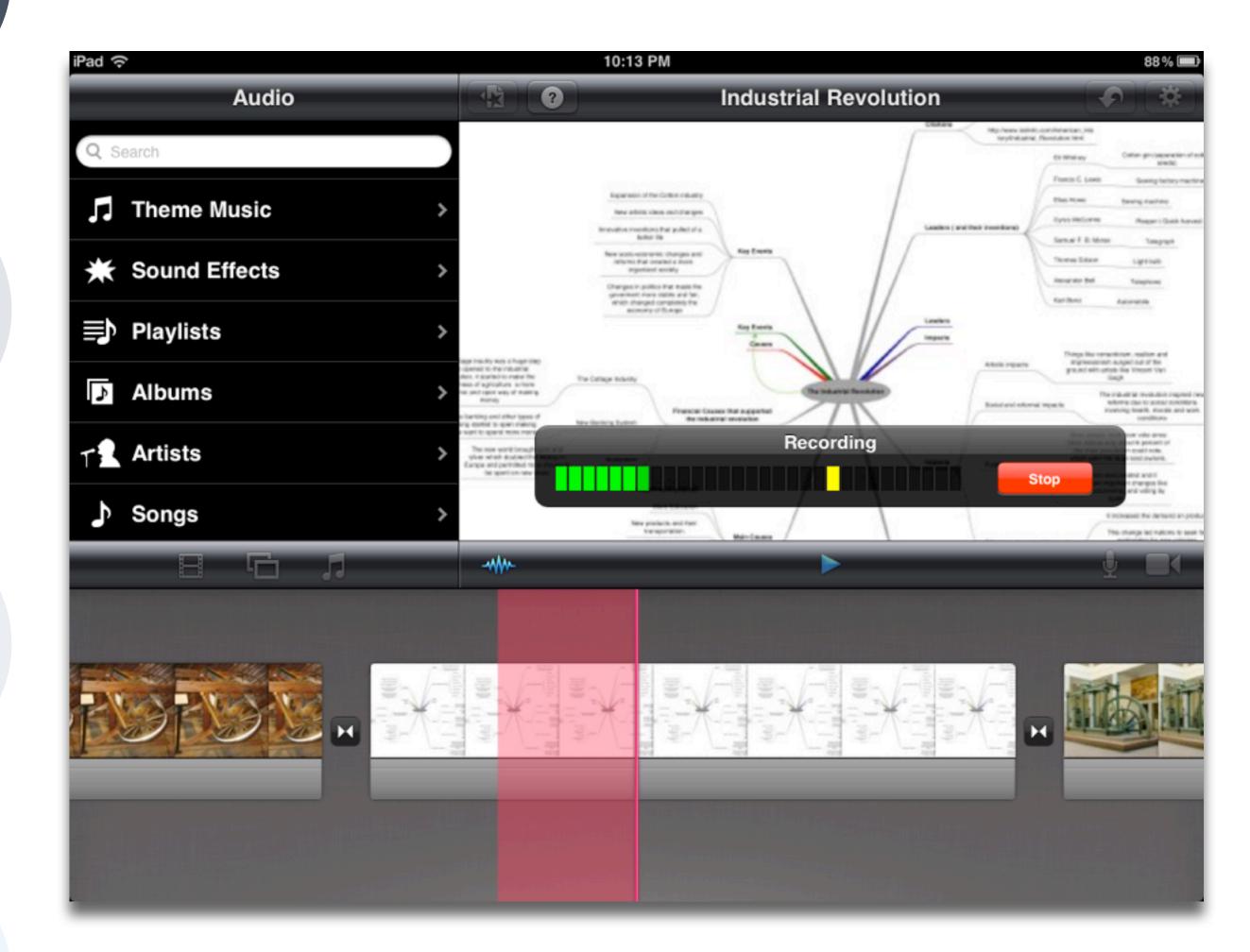
Redefinition

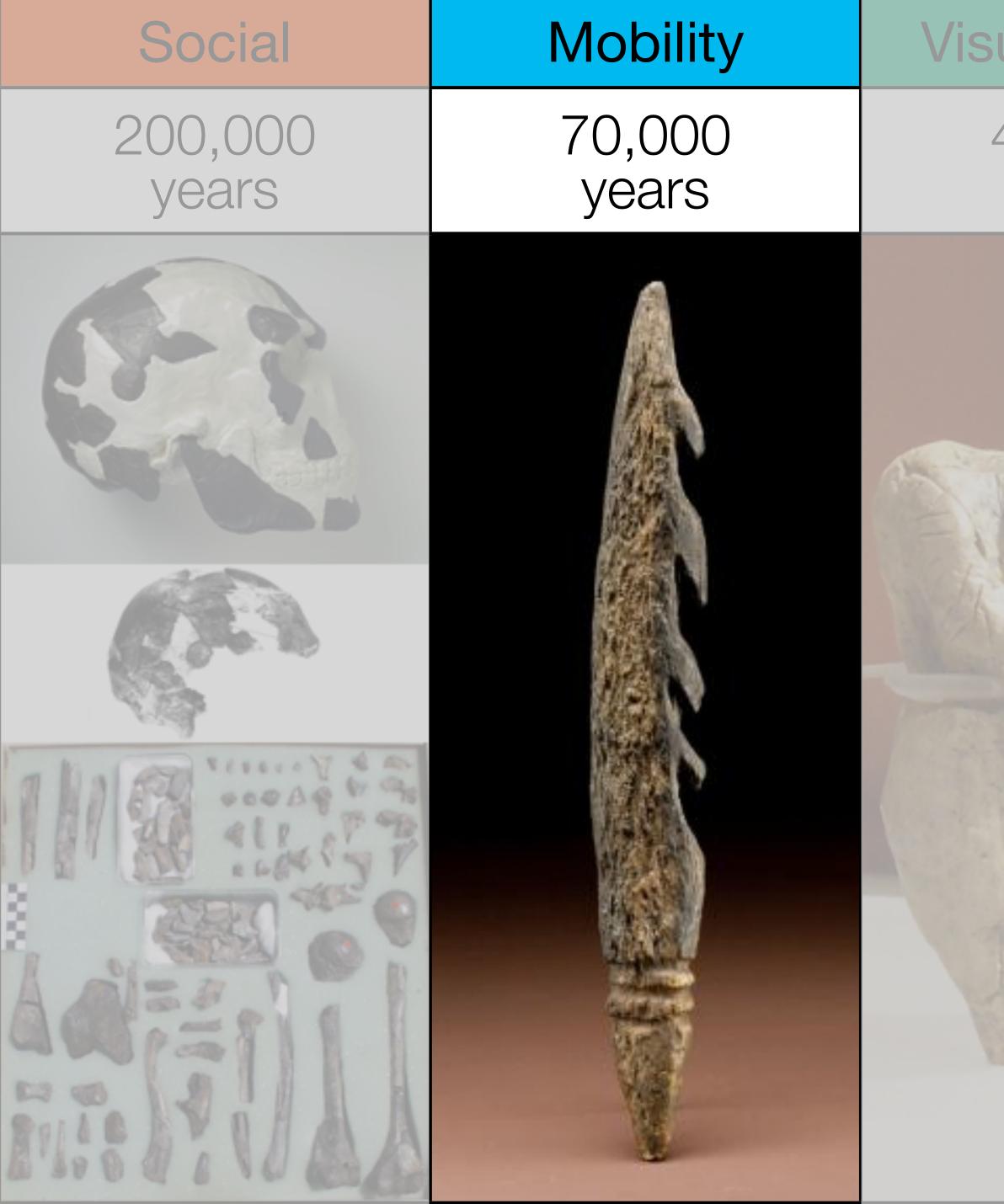
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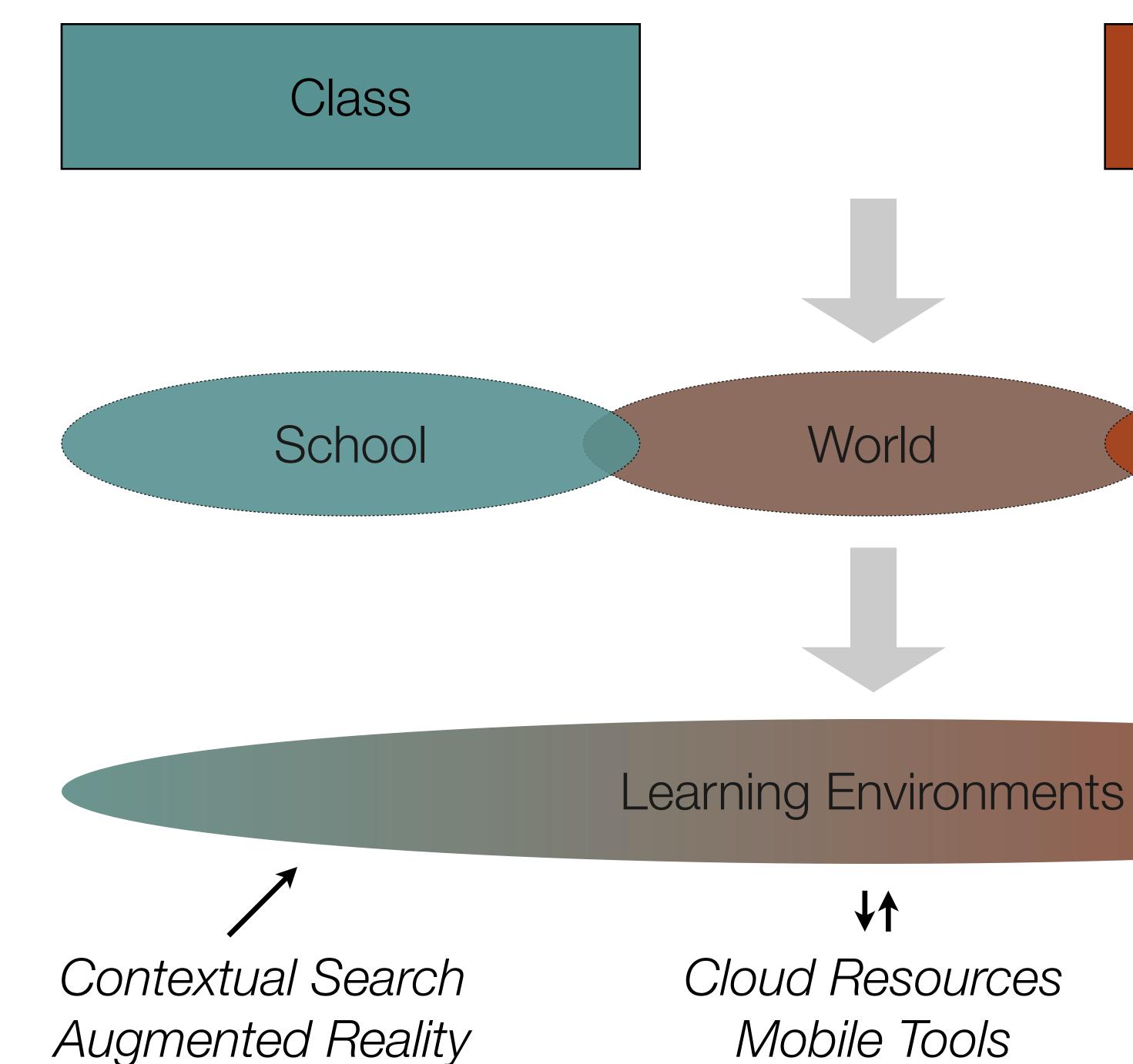




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40,000 years	17,000 years	8,000 years



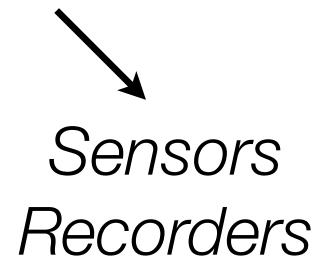






Home

Mobile Tools



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Aquatic Biomes

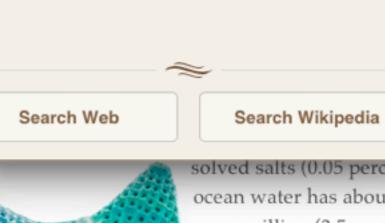
Aquatic biomes cover 75 percent of the surface of the Earth. The aquation d terrestrial biomes are similar in some ways

bi•ome | 'bī,ōm |

noun Ecology

a large naturally occurring community of flora and fauna occupying a major habitat, e.g., forest or tundra.

ORIGIN early 20th cent.: from BIO- 'life' + -OME



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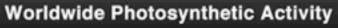
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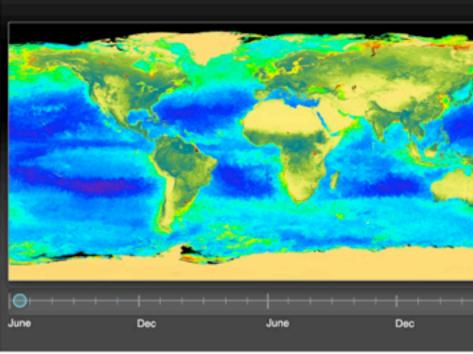
solved salts (0.05 percent), whereas ocean water has about 35,000 parts per million (3.5 percent).

> Some aquatic organisms are adapted to both conditions for parts of their lives, such as salmon and some eels, but it

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

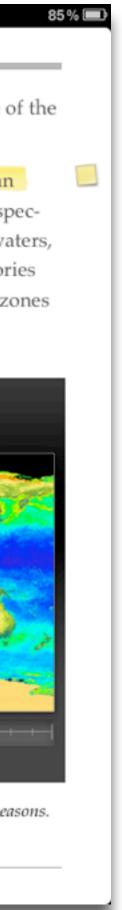
Aquatic environments have less variation globally than those on land. Taking a broad view (the lumper's perspective), there are four kinds of aquatic biomes: surface waters, deep waters, shores, and bottoms. Within these categories are a variety of distinctive marine and freshwater life zones that are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





Interactive The latitudes of peak photosynthesis change with the seasons.

31



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EURADIAN CULLARED-DUVE

Streptopelia decaocto Locally common, exotic

121/2-13 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.

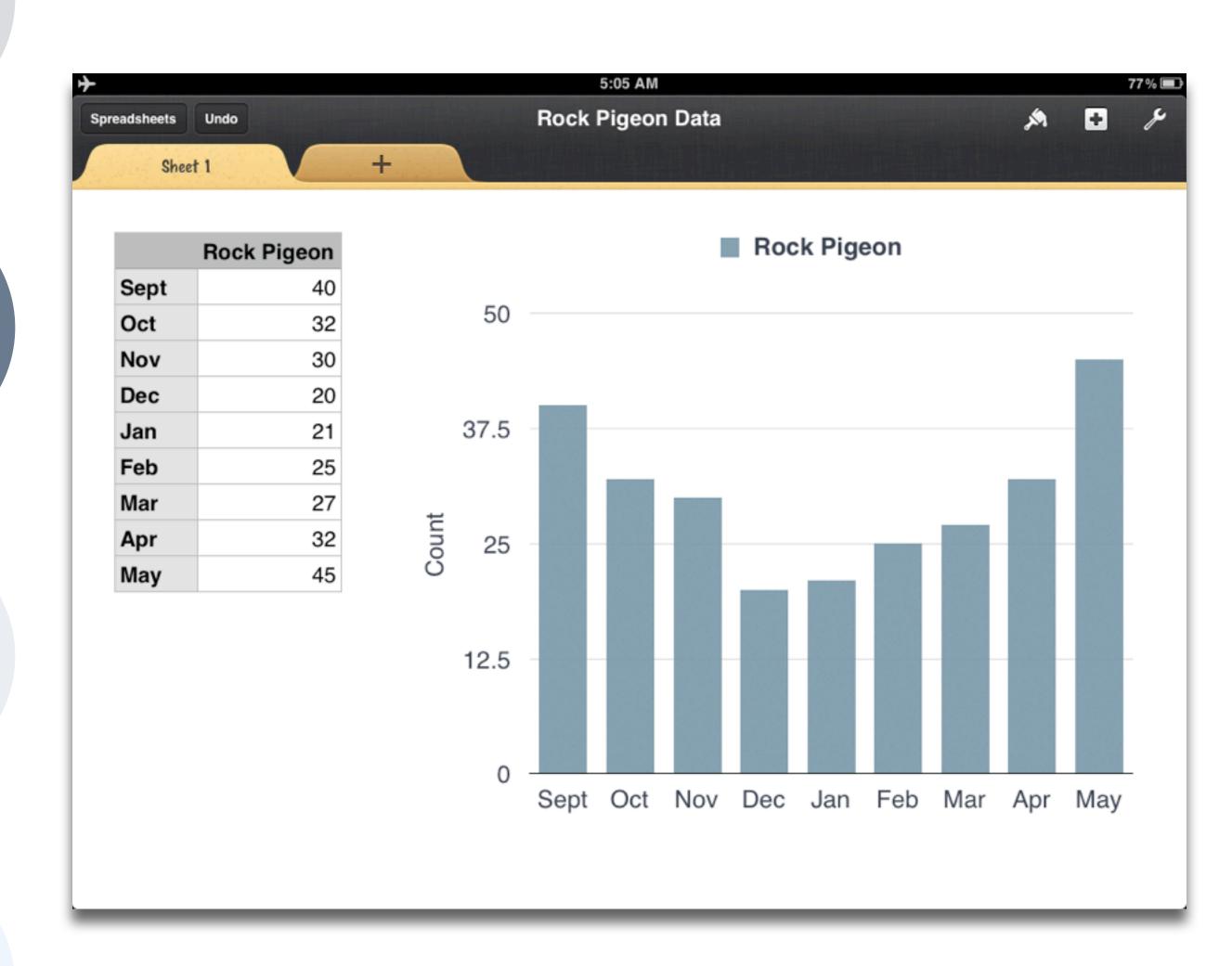


Modification

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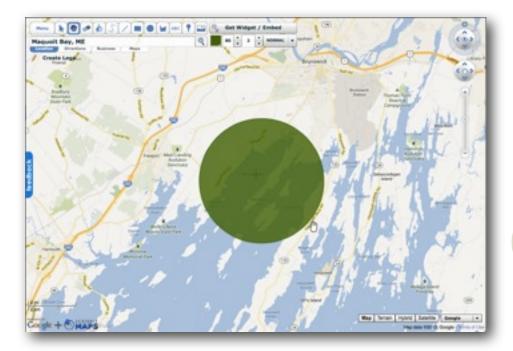


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40,000 years	17,000 years	8,000 years





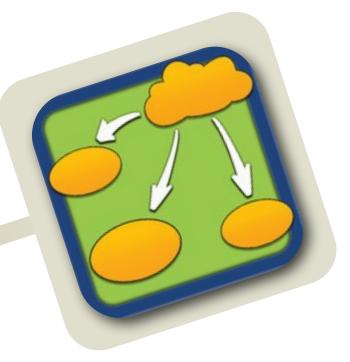
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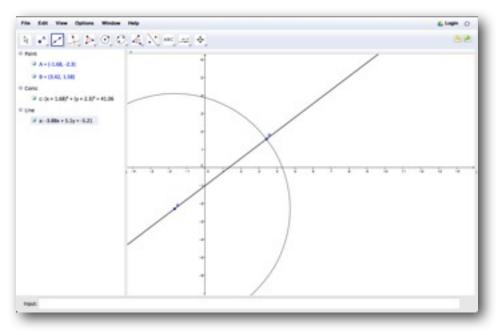






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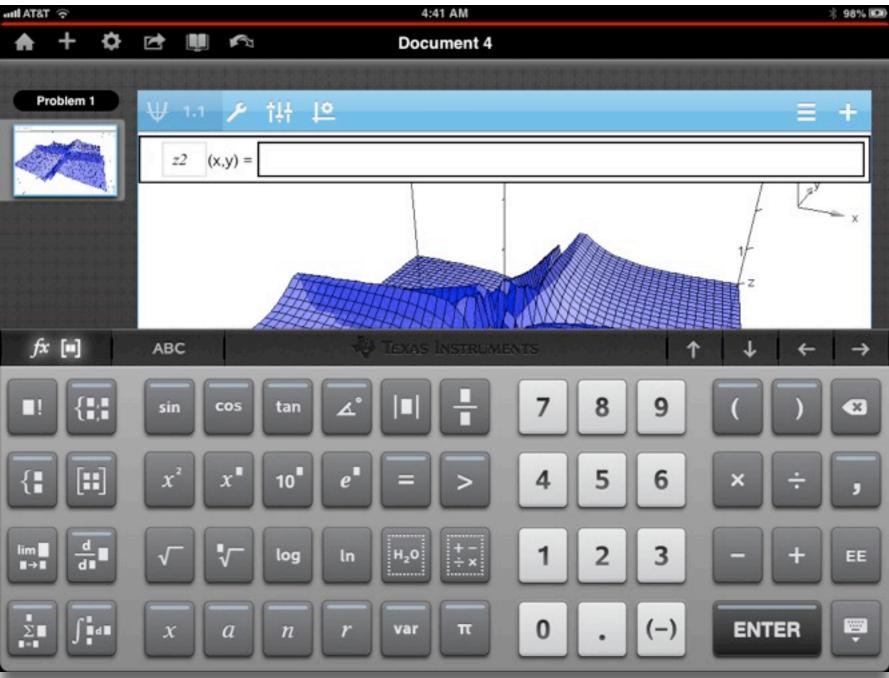
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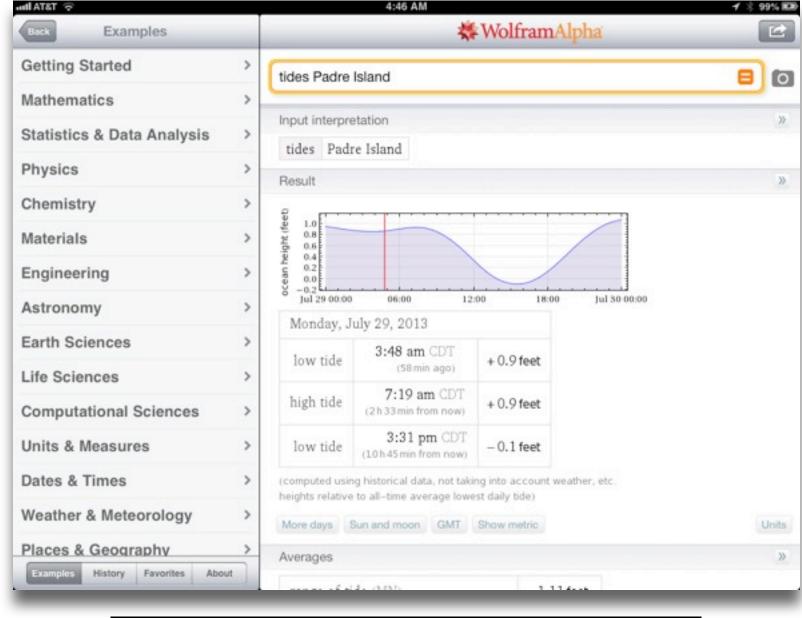


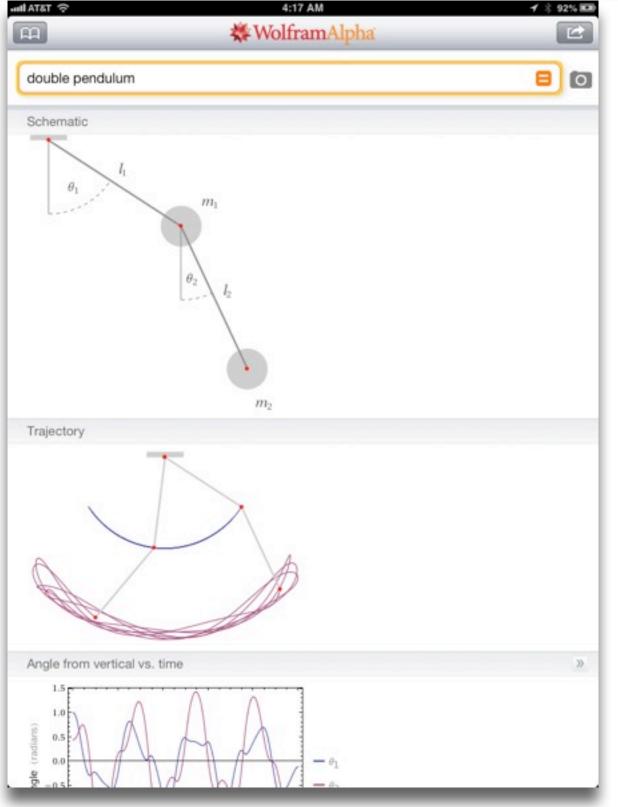
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Redefinition

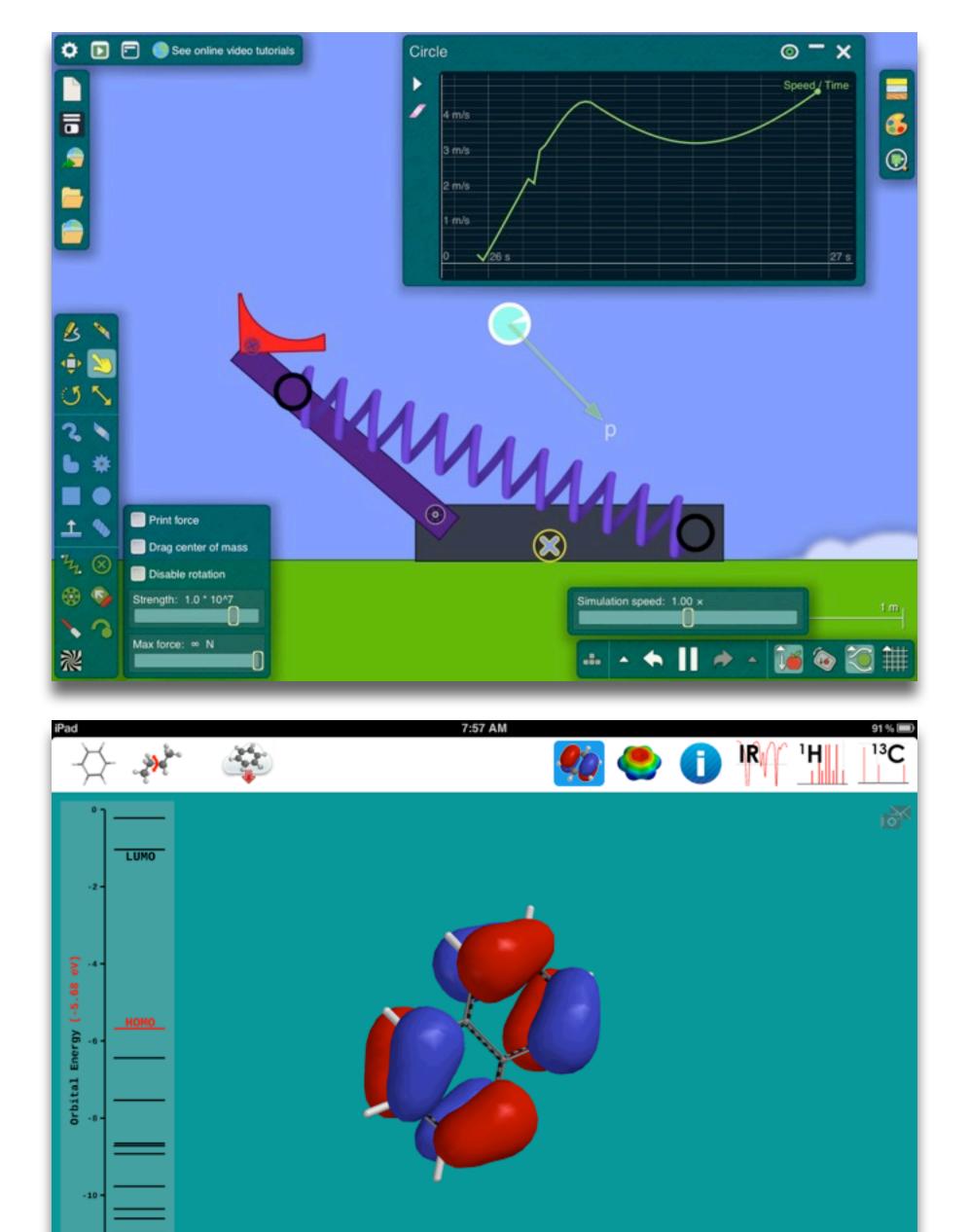
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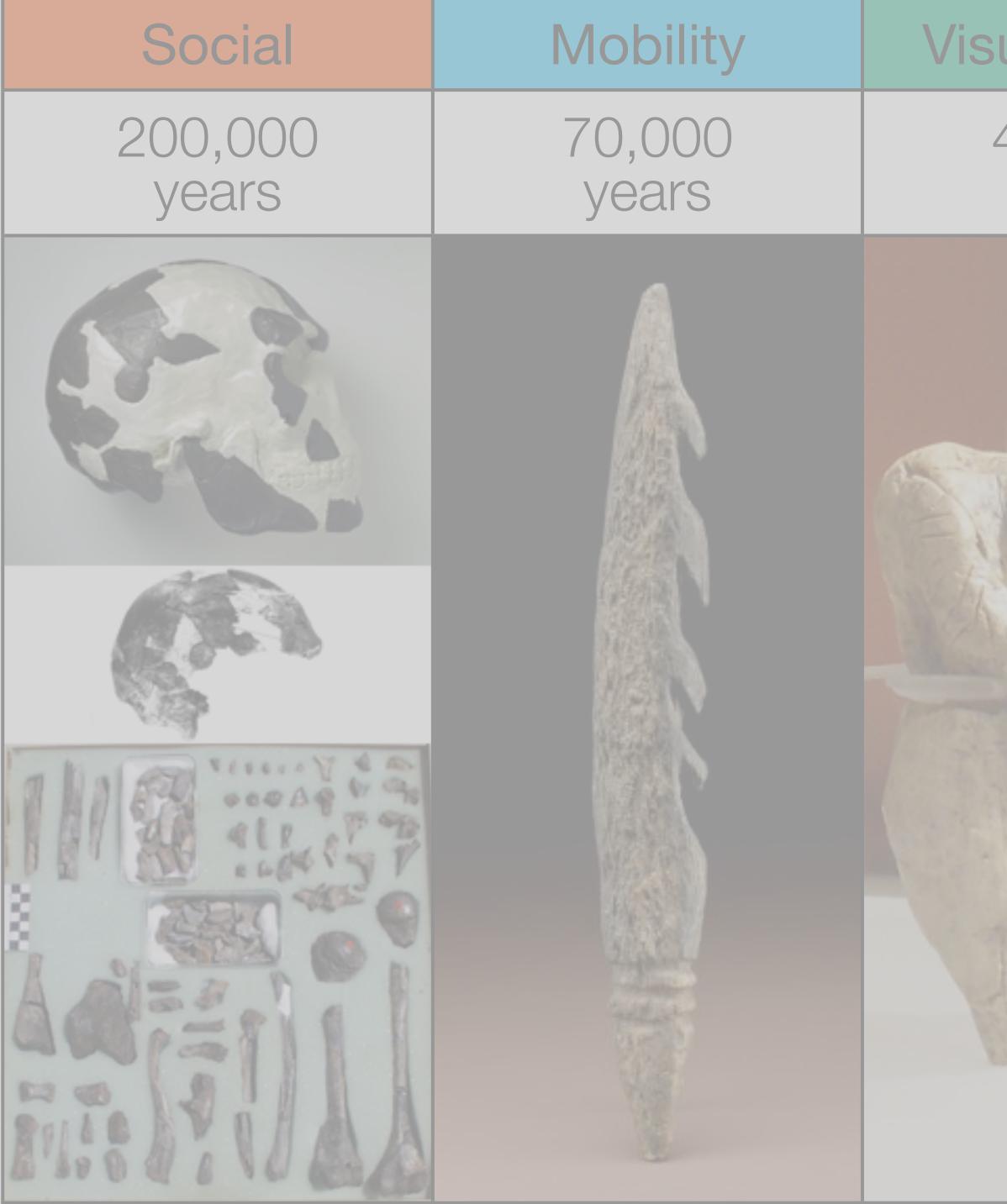
Substitution

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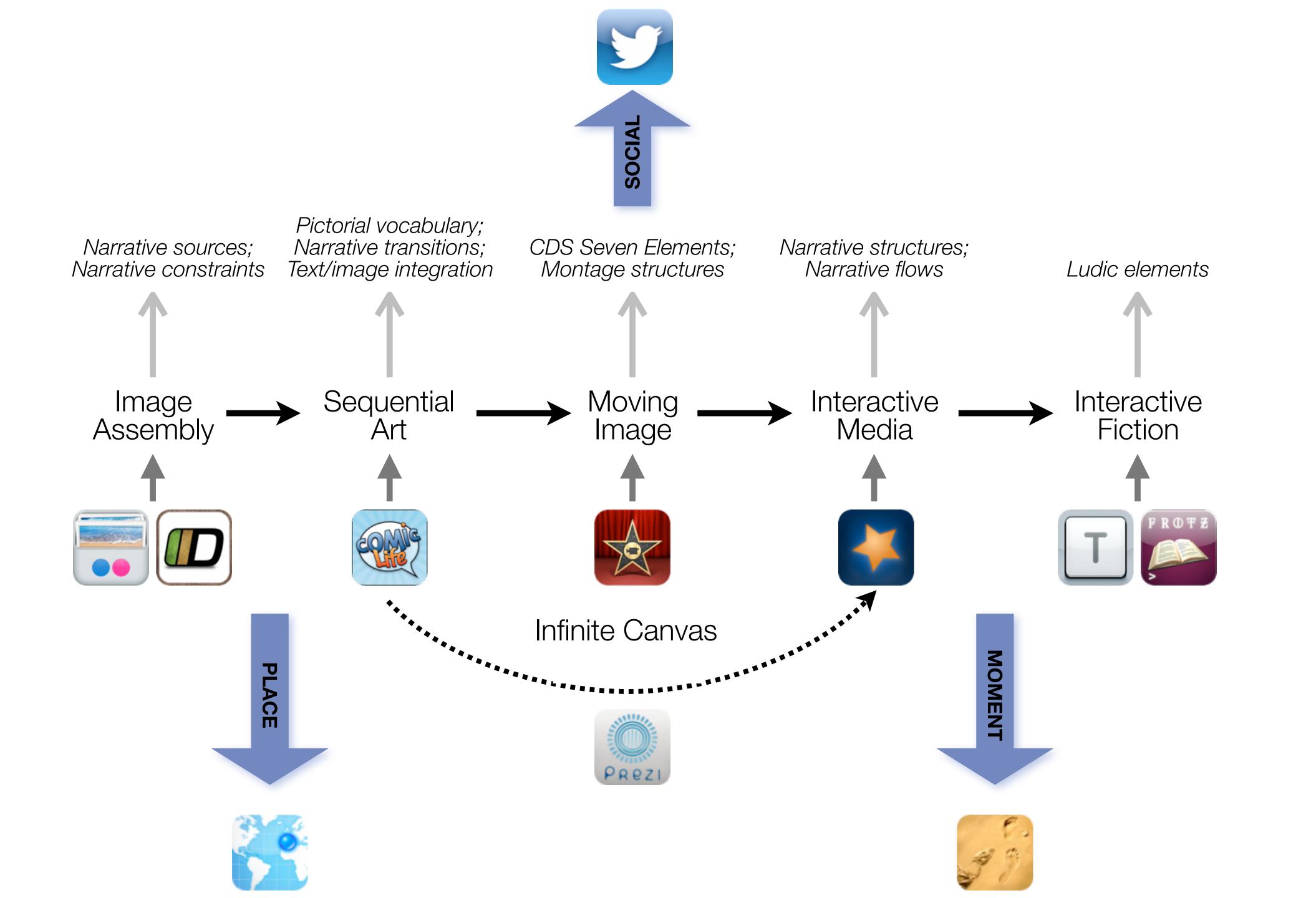
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40,000 years	17,000 years	8,000 years



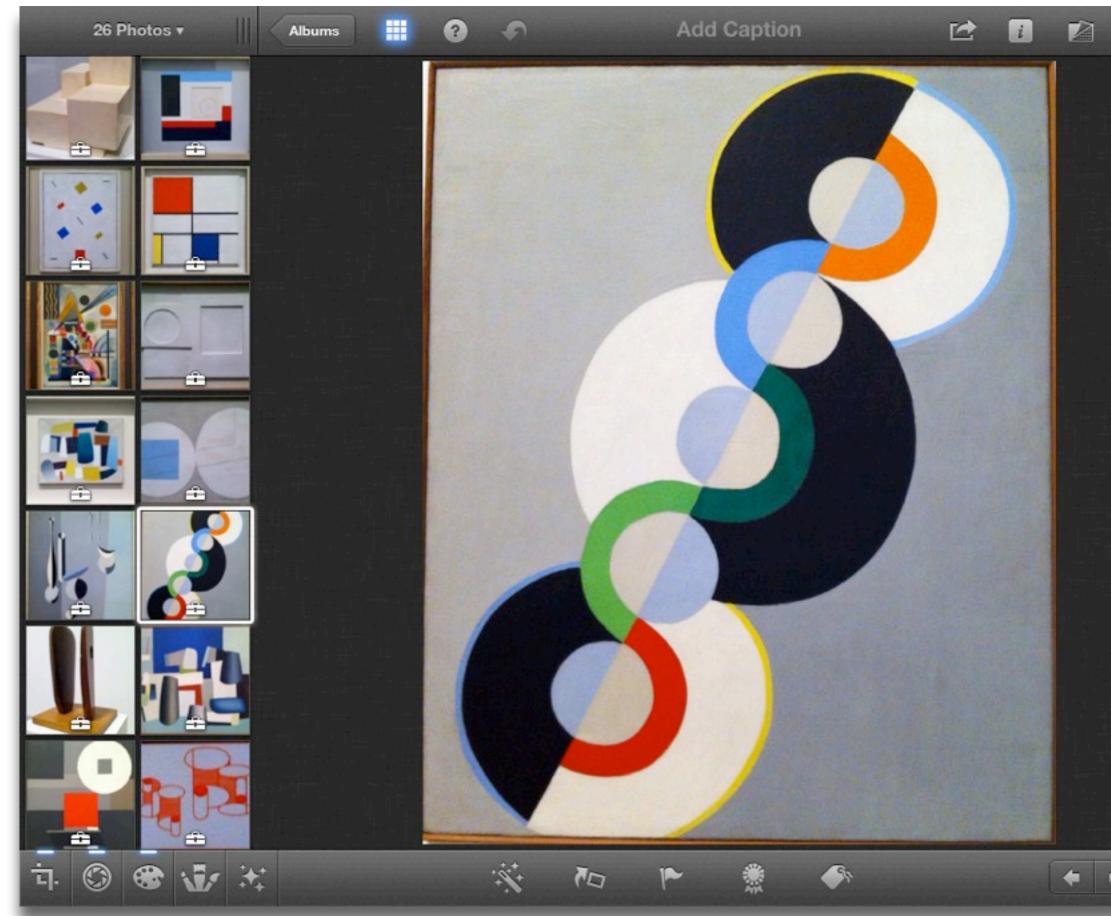




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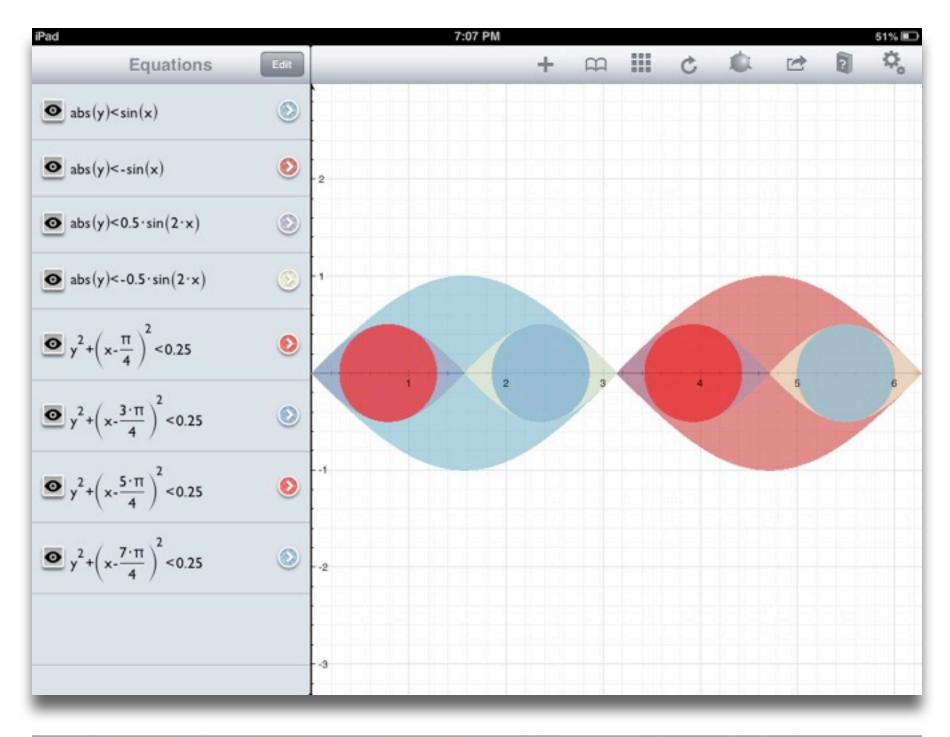


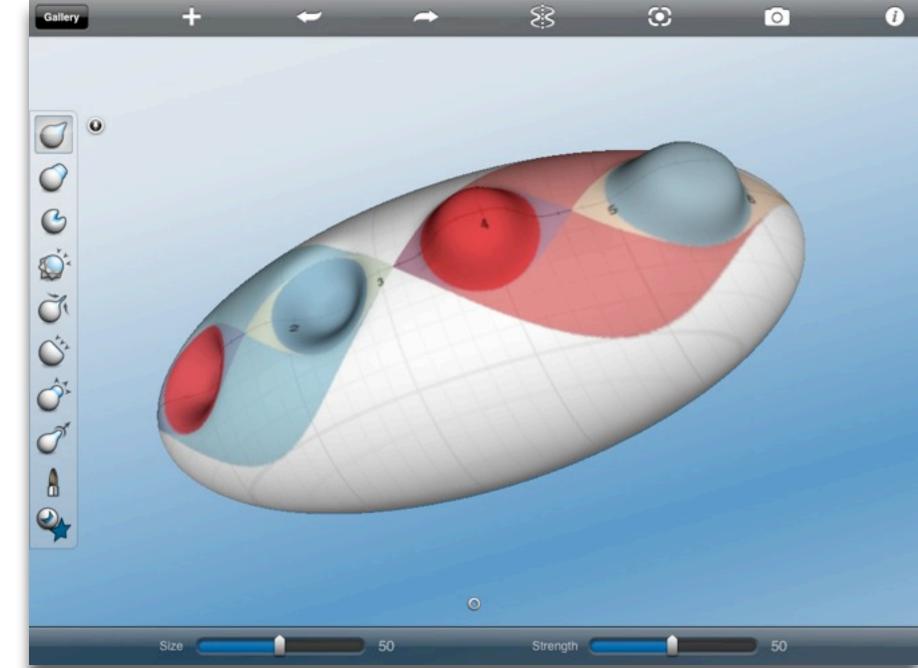
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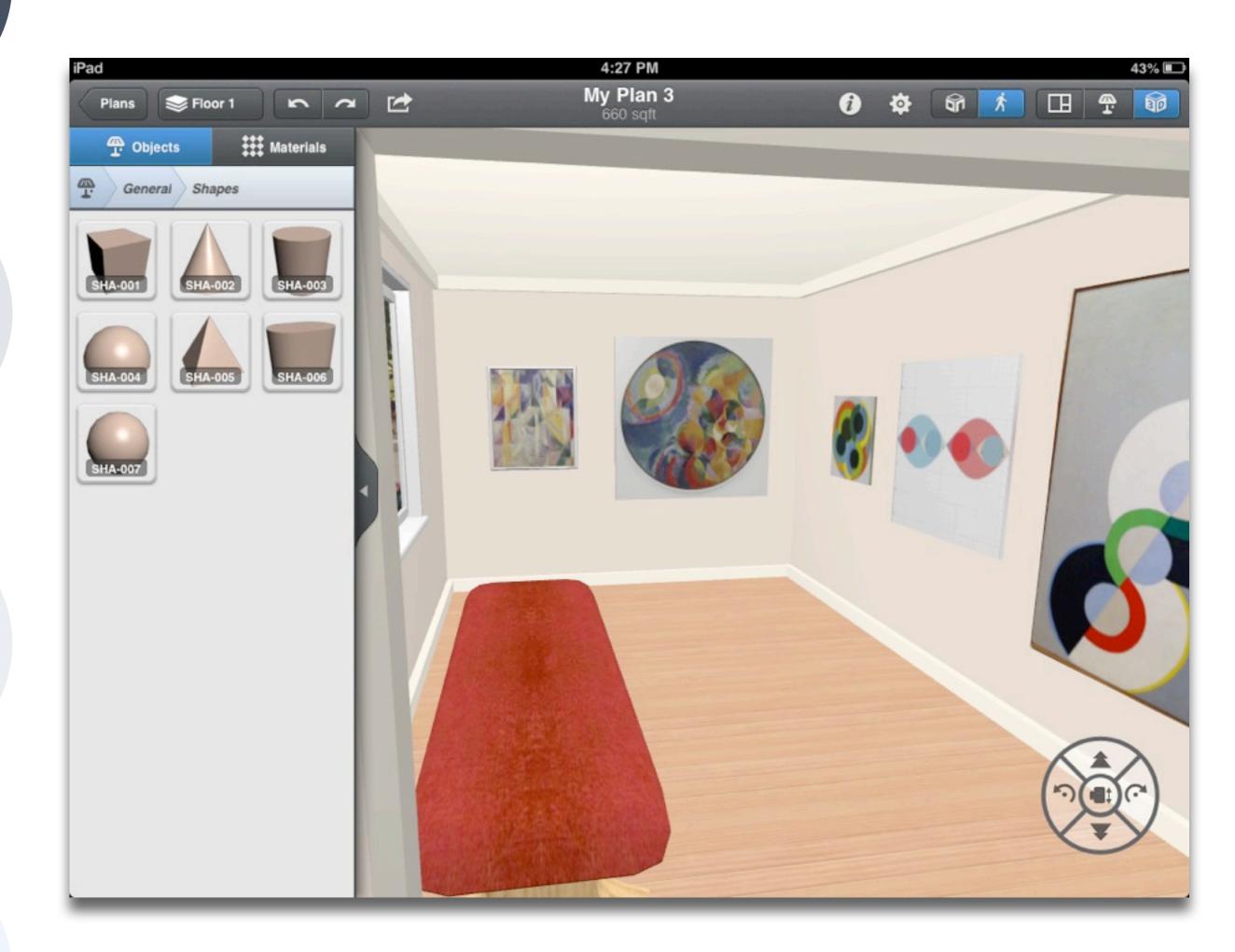
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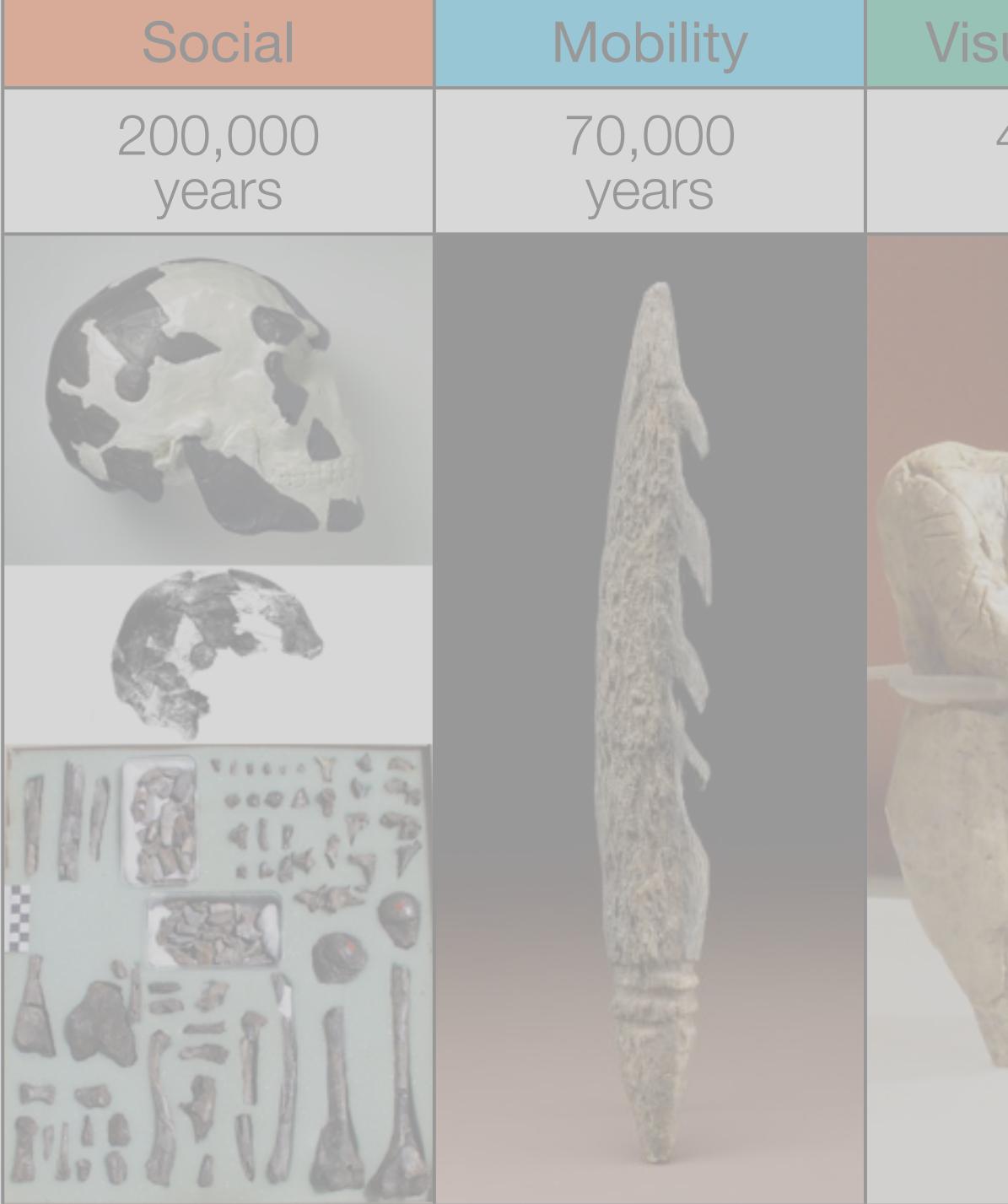
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Formal Definition of **Game** (Salen & Zimmerman)

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

Modification Tech allows for significant task redesign

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

Substitution

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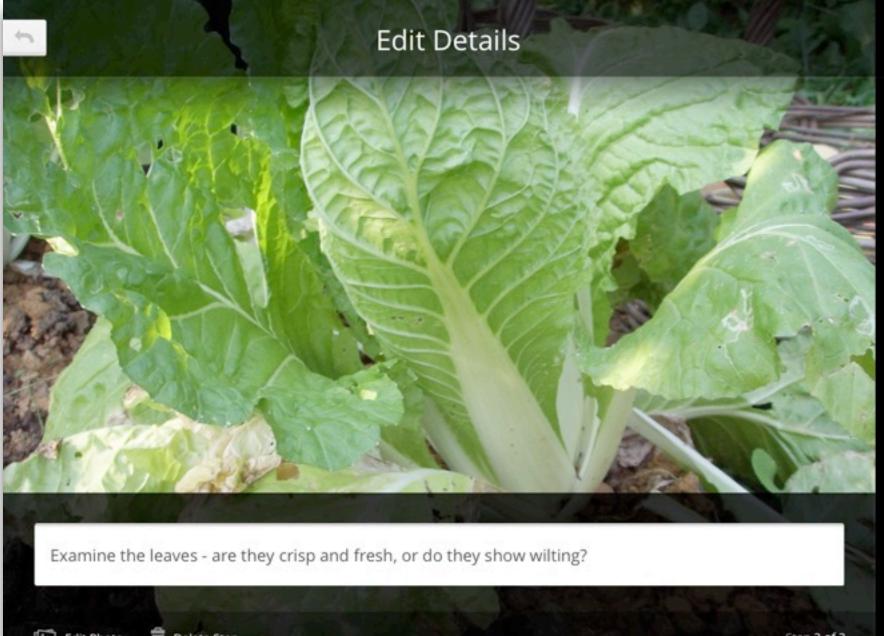
Modification Tech allows for significant task redesign

Augmentation

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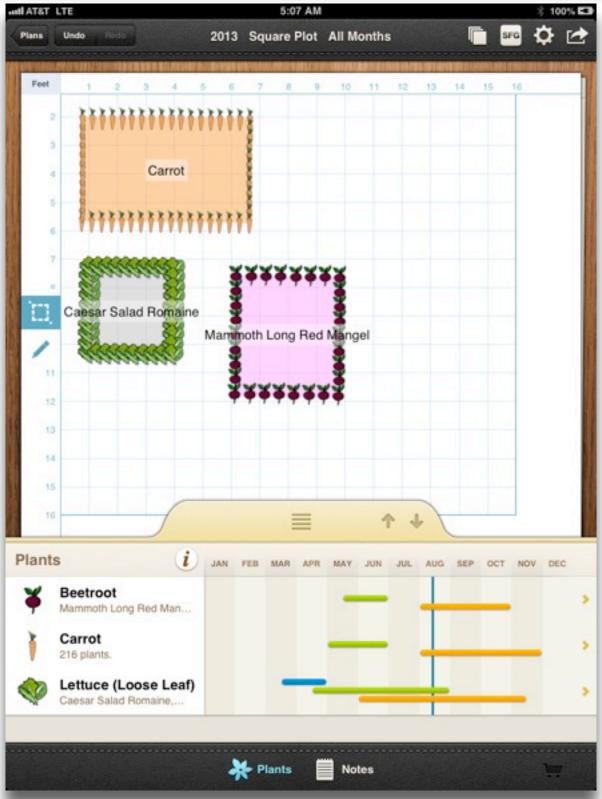
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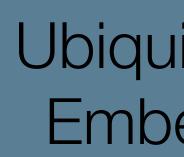
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Part 2 – Mobile Devices and the iPad









Lively Sketchbook

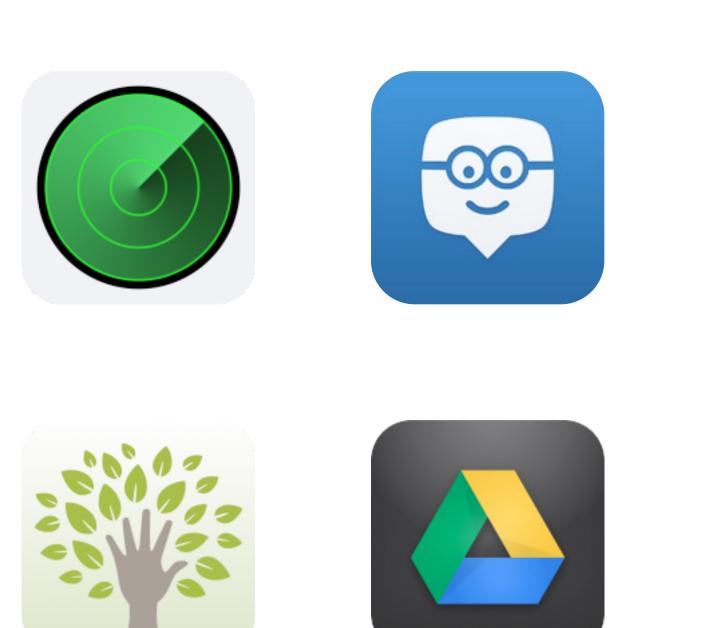
Social	Mobility
200,000 years	70,000 years
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Ubiquity, Intimacy, Embeddedness

Curiosity Amplifier

Visualization	Storytelling	Gaming
40,000 years	17,000 years	8,000 years
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Visualizing the WCCS Core App Set







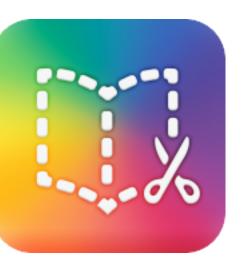


























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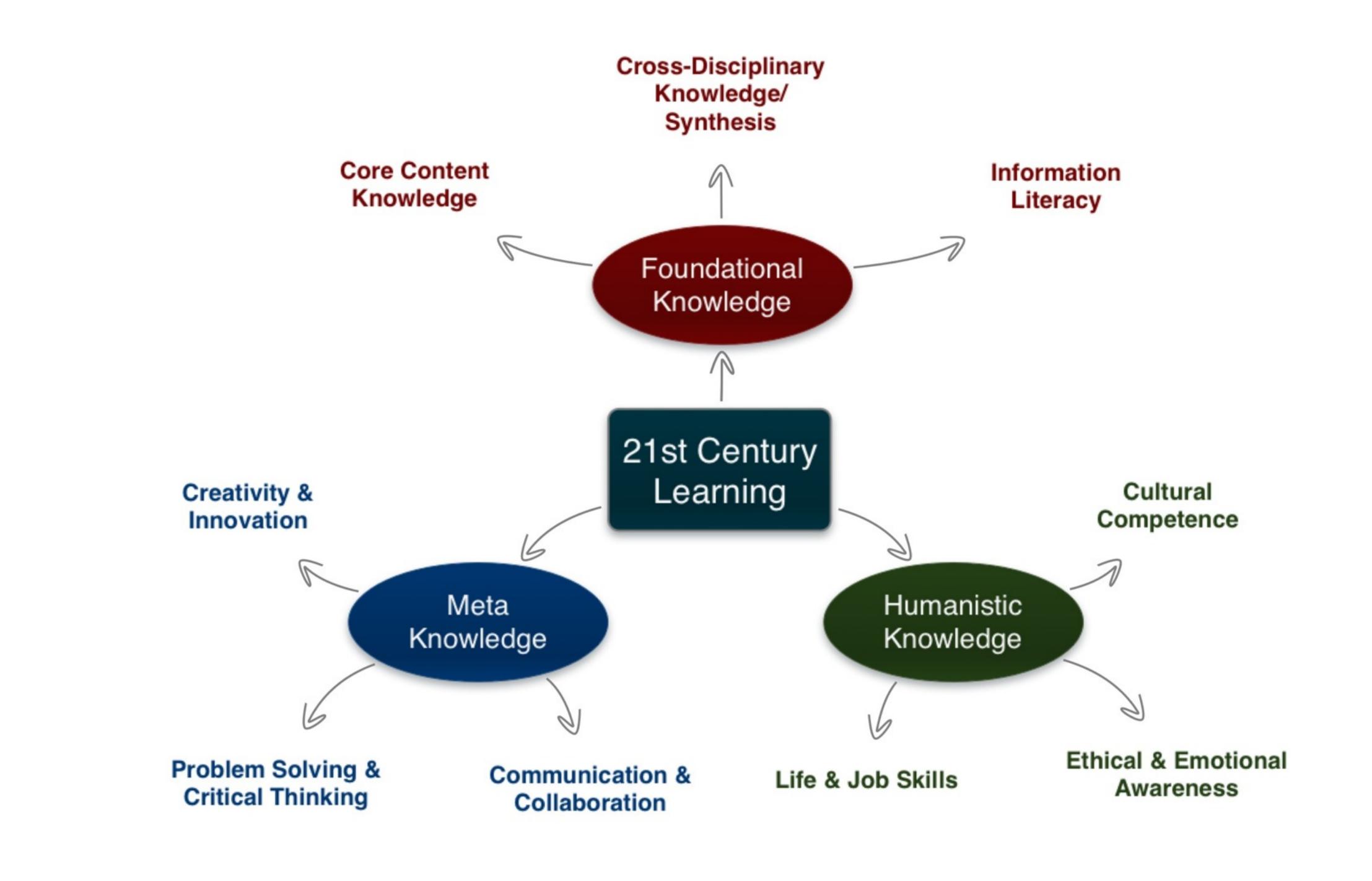








Part 3 – Workshop: SAMR in Action



SAMR: Framing Goals for Transformation

Choosing the First SAMR Ladder Project: Three Options

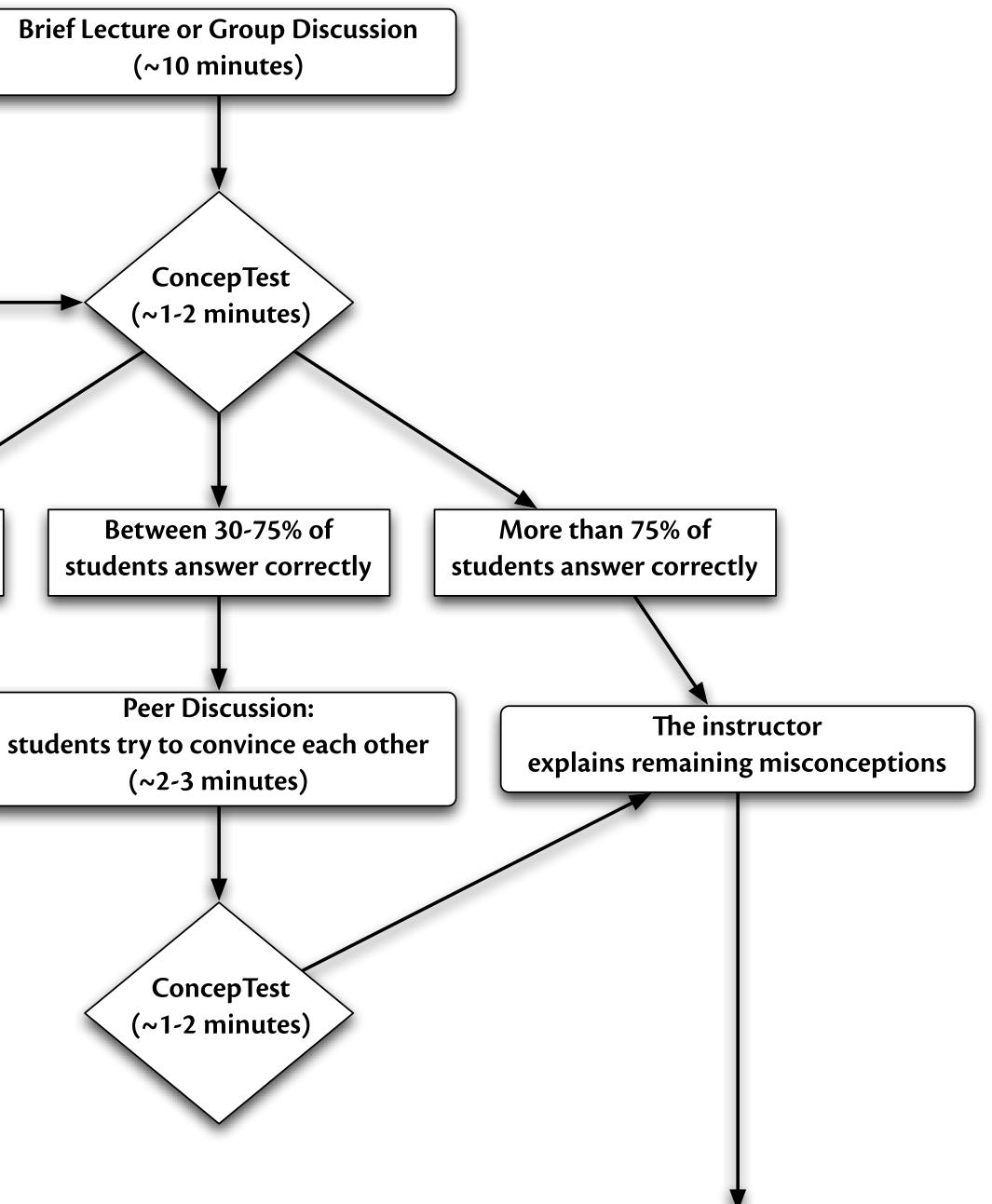
• Your Passion:

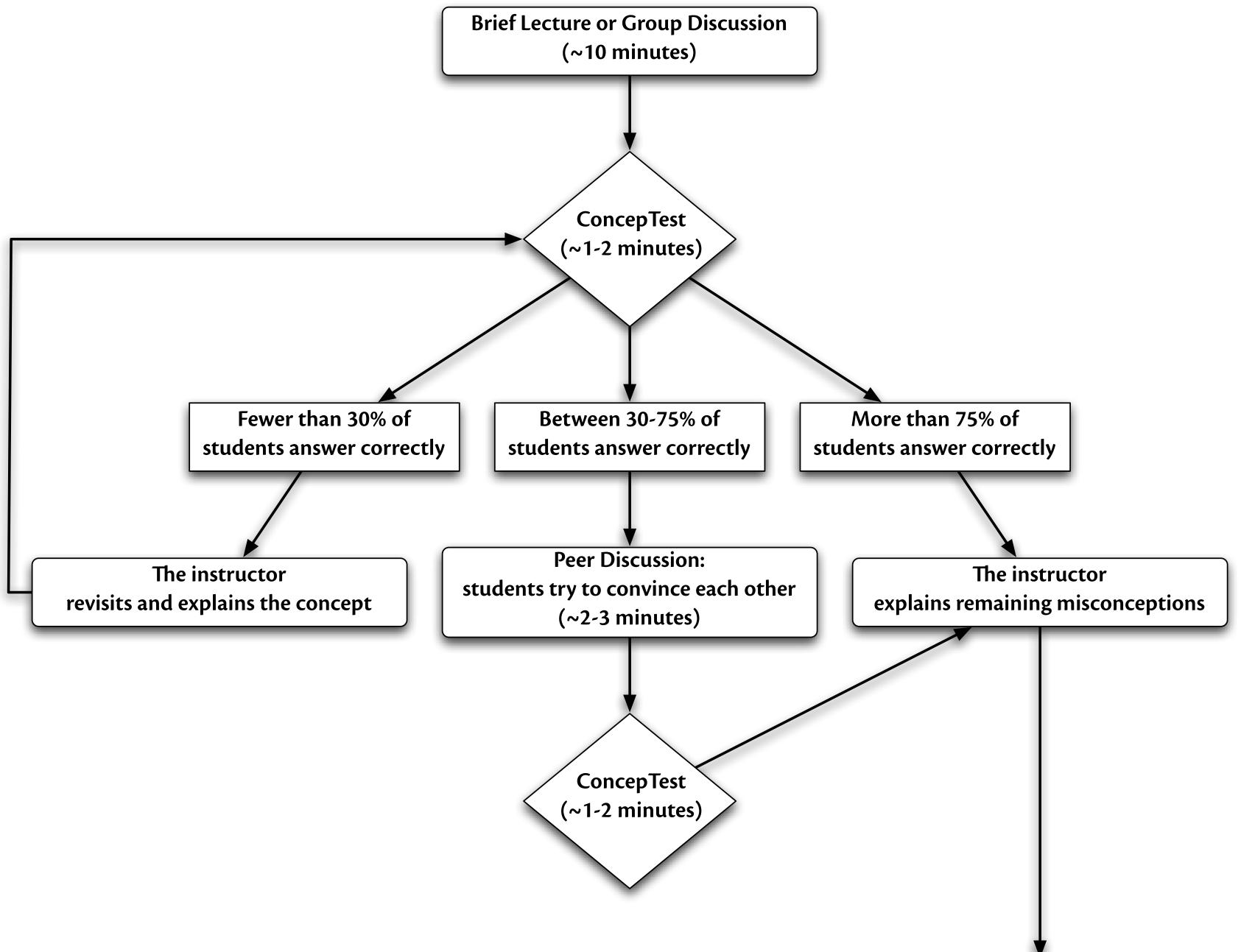
- subject you teach, what would it be?
- Barriers to Your Students' Progress:
 - beyond?
- What Students Will Do In the Future:
 - future studies or in their lives outside school?

• 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







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Substitution

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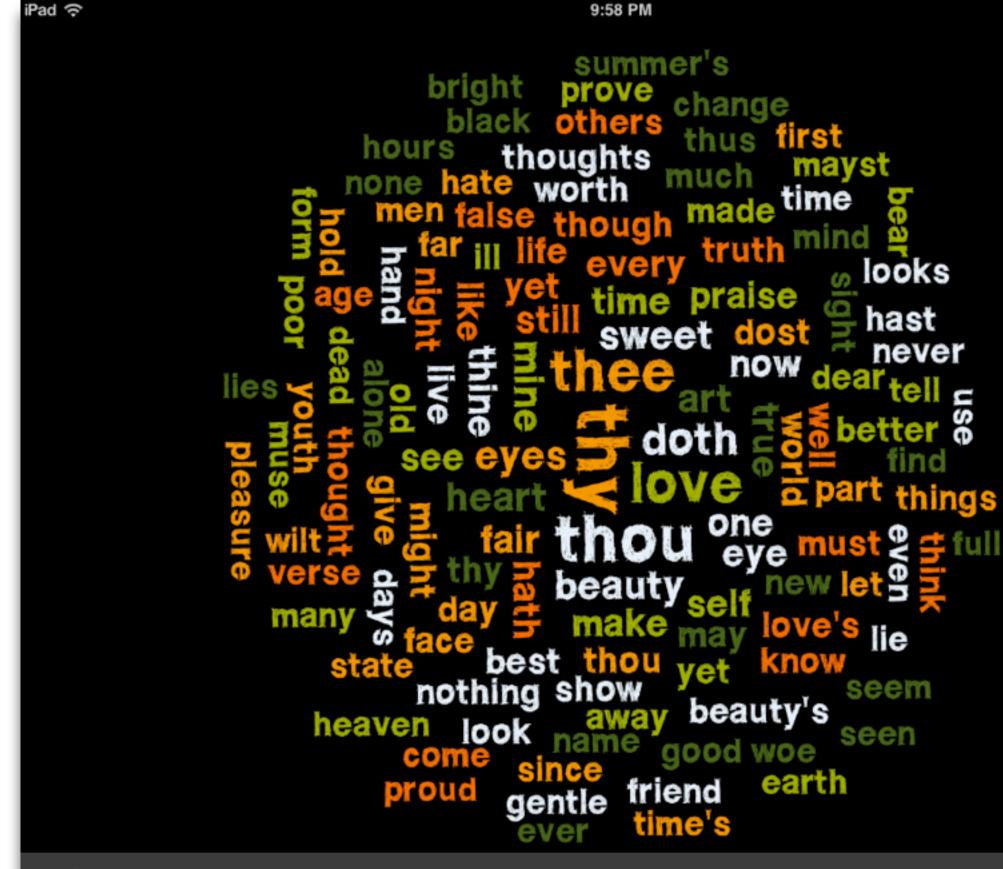
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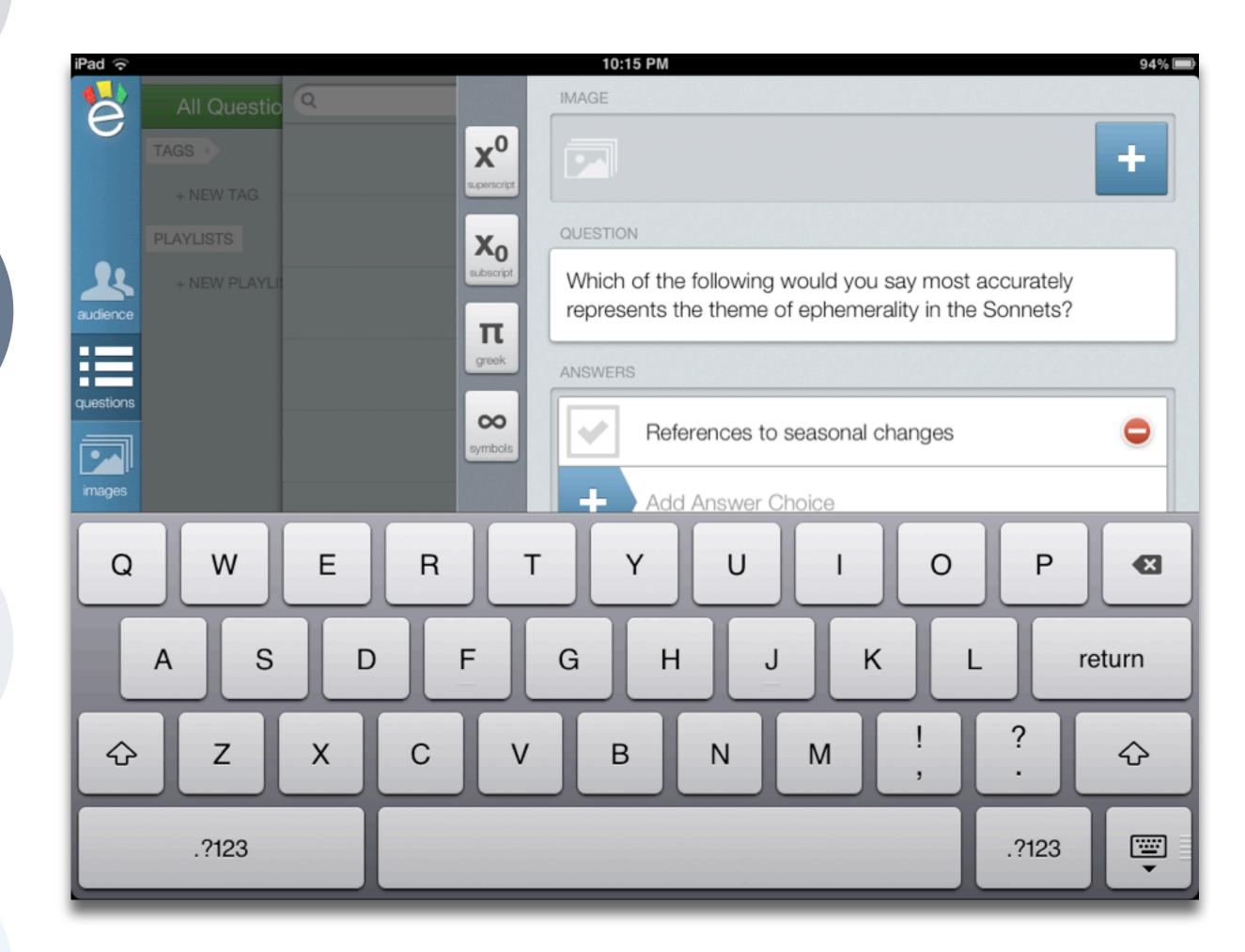


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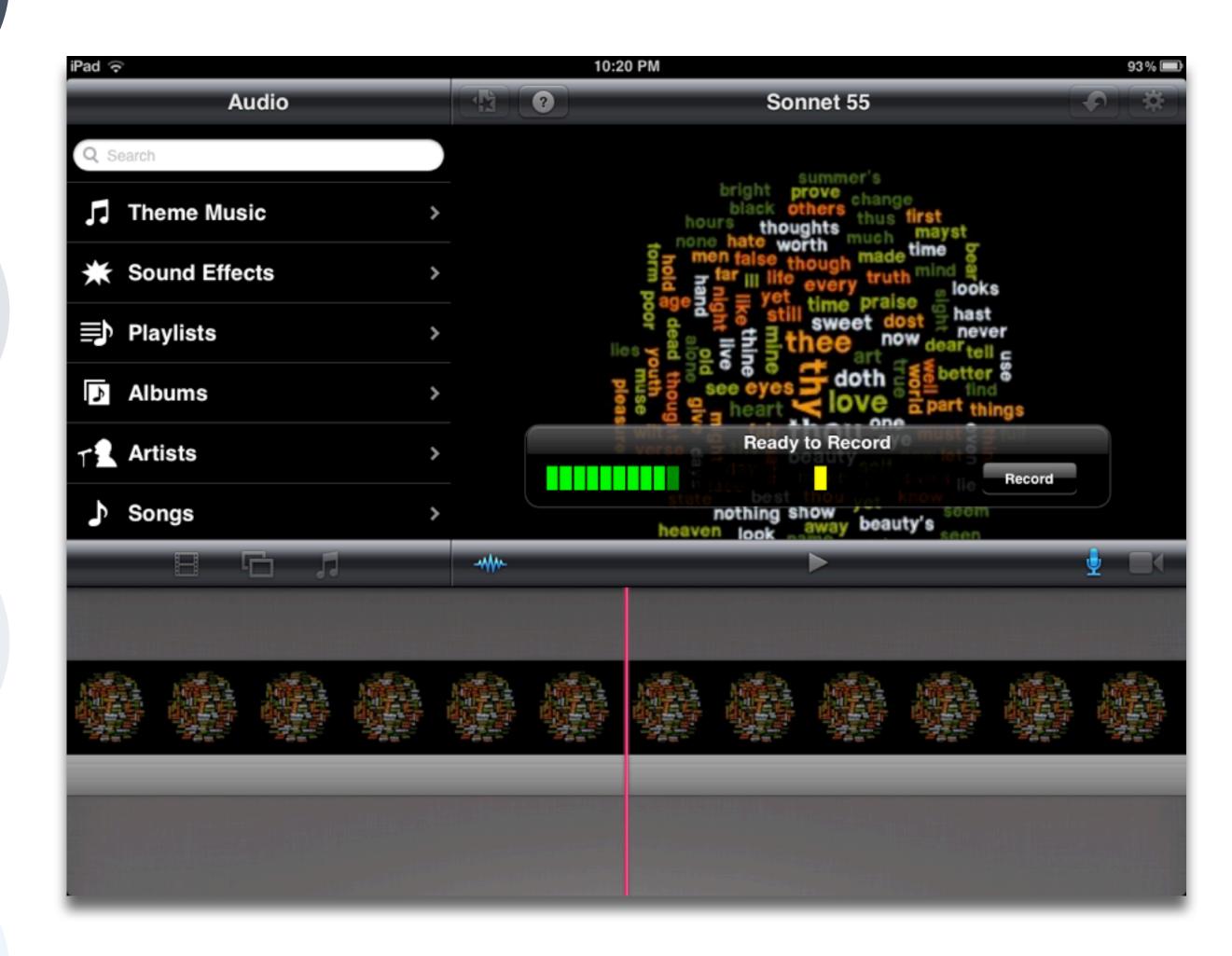
Redefinition

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Substitution



The SAMR Ladder: Questions and Transitions

• Substitution:

- What will I gain by replacing the older technology with the new technology?
- Substitution to Augmentation:
 - technology at a fundamental level?
 - How does this feature contribute to my design?
- Augmentation to Modification:
 - How is the original task being modified?
 - Does this modification fundamentally depend upon the new technology?
 - How does this modification contribute to my design?
- Modification to Redefinition:
 - What is the new task?
 - Will any portion of the original task be retained?
 - How is the new task uniquely made possible by the new technology?
 - How does it contribute to my design?

Have I added an improvement to the task process that could not be accomplished with the older

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100 man 100	Unit Vectors and Engineering Notation Using unit vectors to represent the components of a vector	
	Clearing the Green Monster at Fenway Setting up the problem to determine the minimum veloc	Photo by Jared Vincent (under CC-
And the second s	Green Monster at Fenway Part 2 Solving the problem to determine the minimum veloc	$\ \vec{v}_{i}\ = v_{i} \qquad v_{i} \otimes v_{i} \otimes$
	Unit Vector Notation Expressing a vector as the scaled sum of unit vectors	Clearing the Green Monster at Fenway
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2: [3] [] 3. 5. (403. [17]] 5: 17. 4] [17] 11.45]	Unit Vector Notation (part 2) More on unit vector notation.	5:53 good enough to hit the top part of the wall, let's think about what that displacement vector would have
100 100 100 100 100 100 100 100 100 100	Showing that adding the x an	5:57 to be and we'll solve for that velocity and then any velocity better than that will m go even further
	Projectile Motion with Ordered Set Notation Solving the second part to the	6:02 and faster and higher and all of the rest of the things. So right when its crossing if we want
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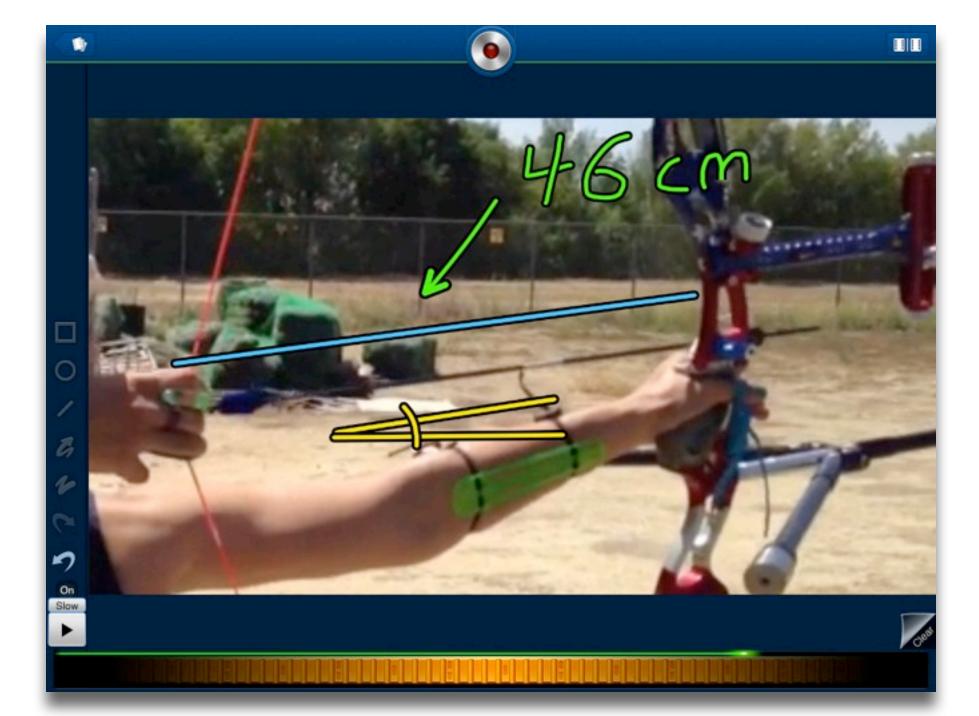


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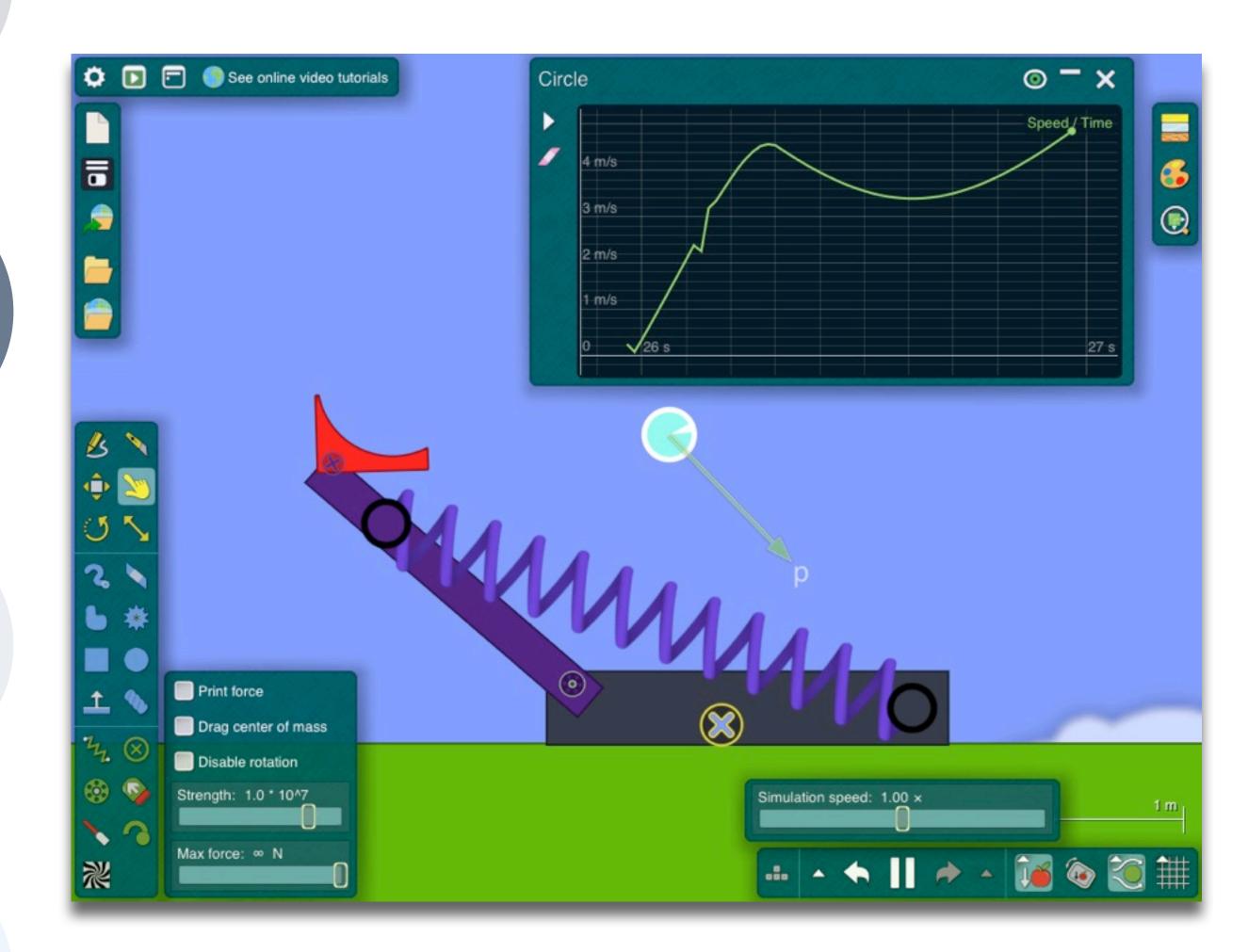
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Vectors	vector (1,3,-1) + (-2,1,6)	B	0	
compute properties of a vector			-	
vector {2, -5, 4}	Input interpretation			
specify a vector as a linear combination of unit vectors	(1, 3, -1) + (-2, 1, 6)			
TOUGHT .	Result	Х	>>	
vector 3i + 5j	(-1, 4, 5)			
vector 2i - 4j + 3k	Vector plot			
compute the norm of a vector	3 42 -1 0 1			
norm {12, -5}	2			
Vector Algebra	6			
do vector computations	4			
vector (1,3,-1) + (-2,1,6)	2			
7 {1, 0, -2, 1} - 4 {2, -1, 1, -1}	0 - (-1, 4, 5)			
	- (-2, 1, 6)			
(i + j + k) + (2i - 3j + 8k)	- (1, 3, -1)			
compute a dot product	Vector length		_	
{12, 20} . {16, -5}	√42 ≈ 6.48074			
Examples History Favorites About	More digits			

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

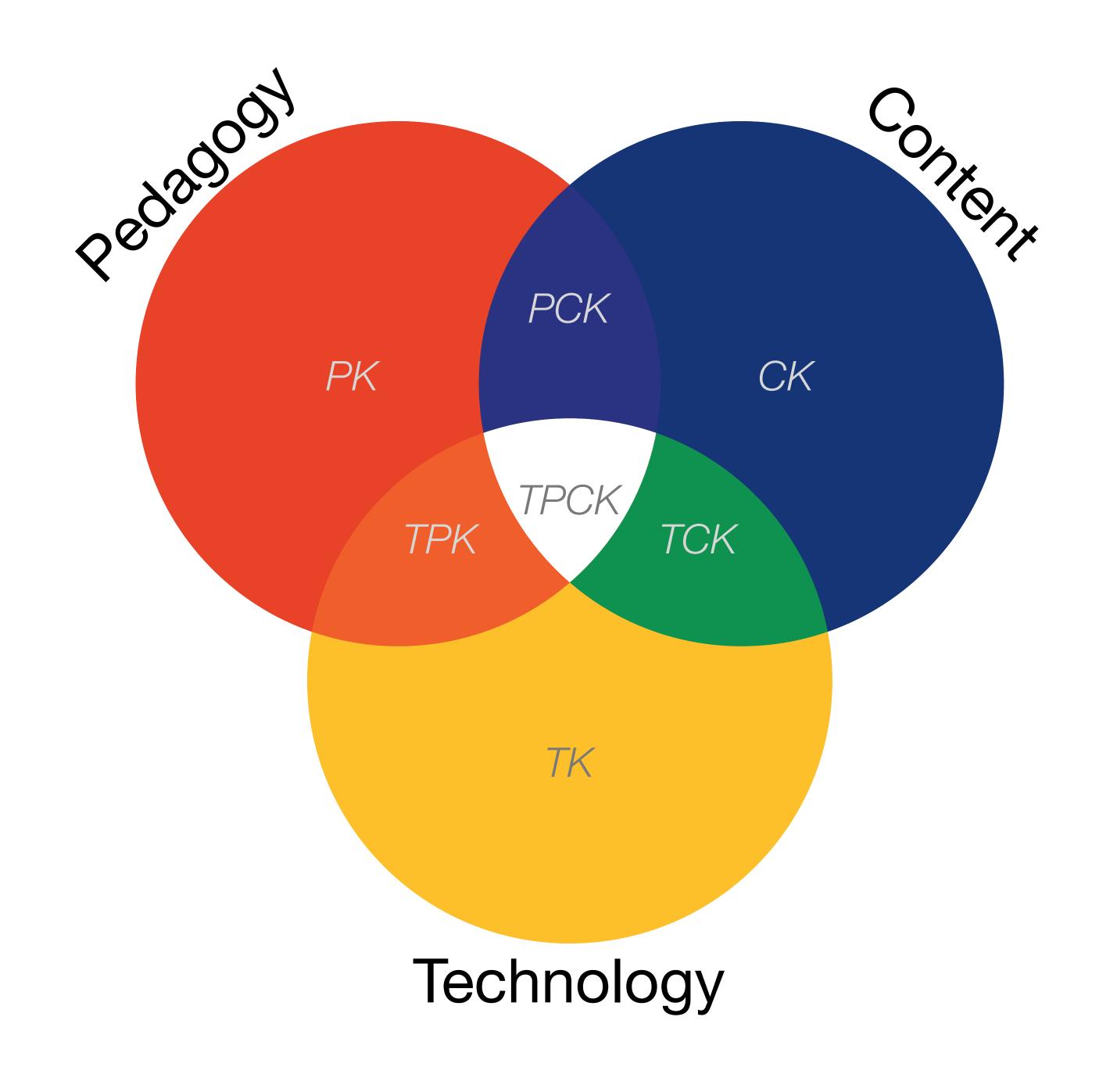
Augmentation Tech acts as a direct tool substitute, with functional improvement

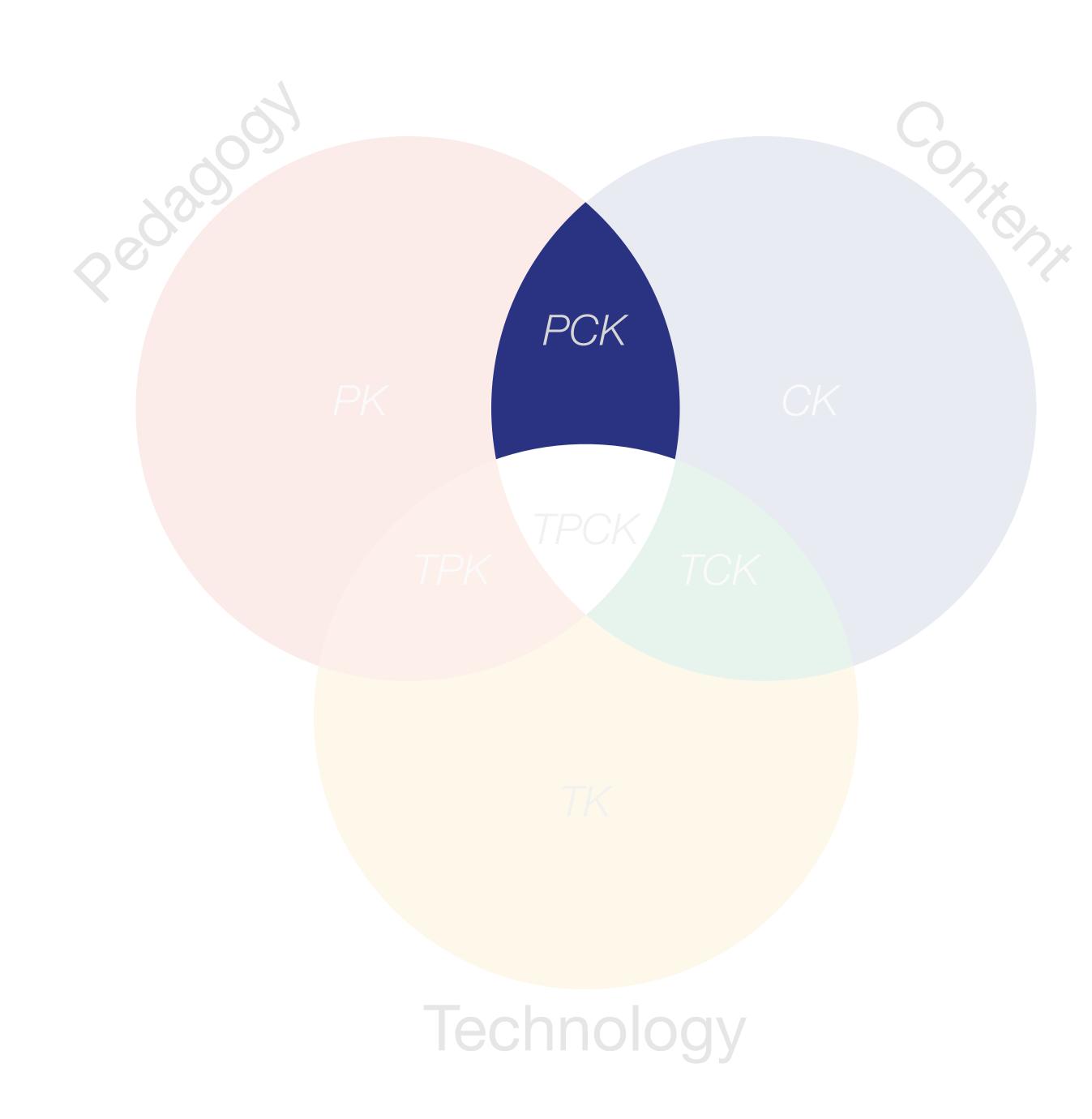
Substitution





The PCK Question





Lee S. Shulman, "Those Who Understand: Knowledge Growth in Teaching." Educational Researcher, Vol. 15, No. 2 (Feb., 1986)

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

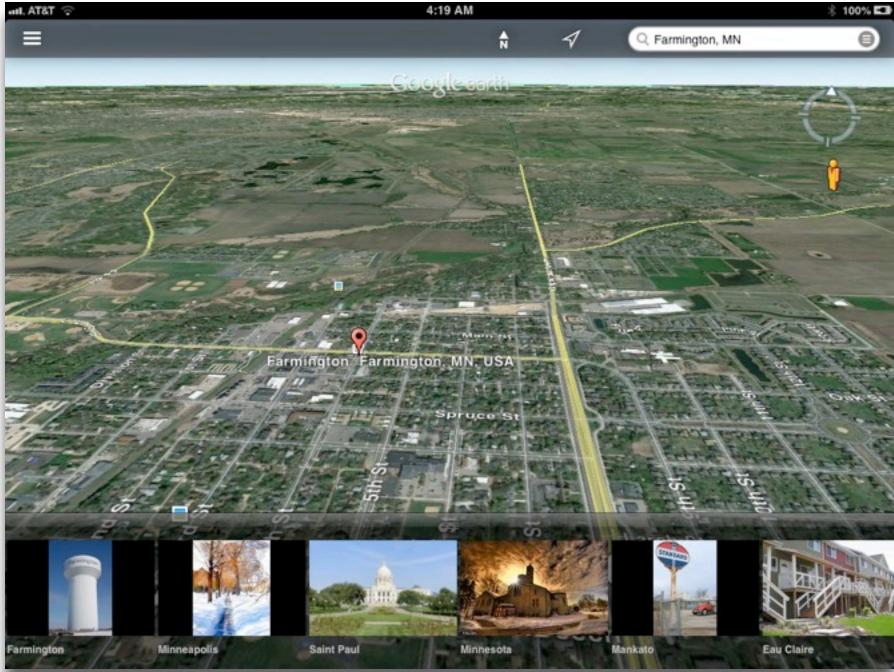
Phil Gersmehl. Teaching Geography. The Guilford Press. (2005)

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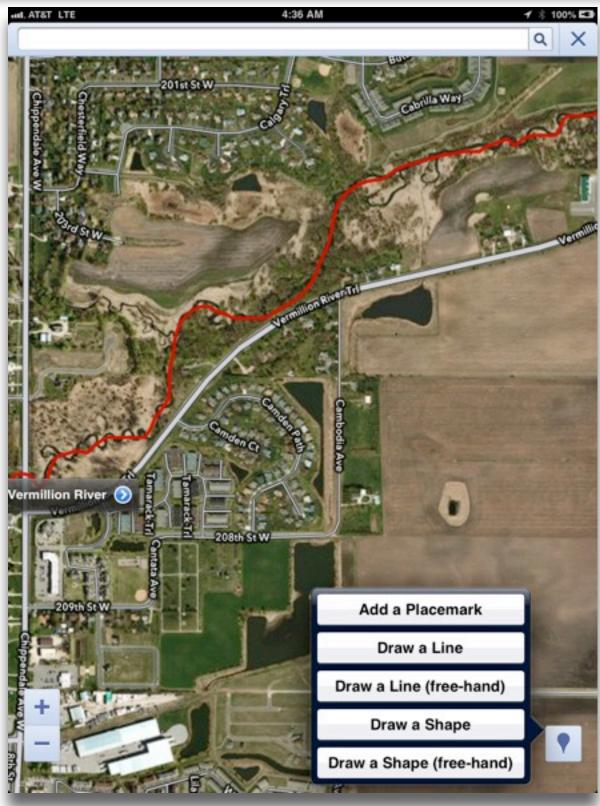
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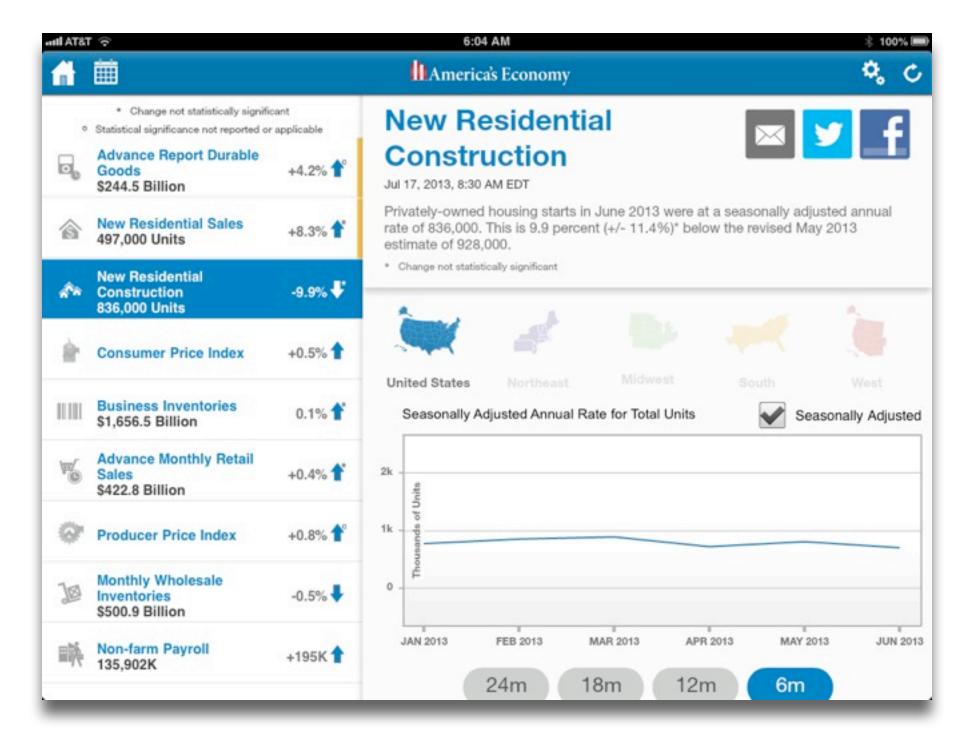


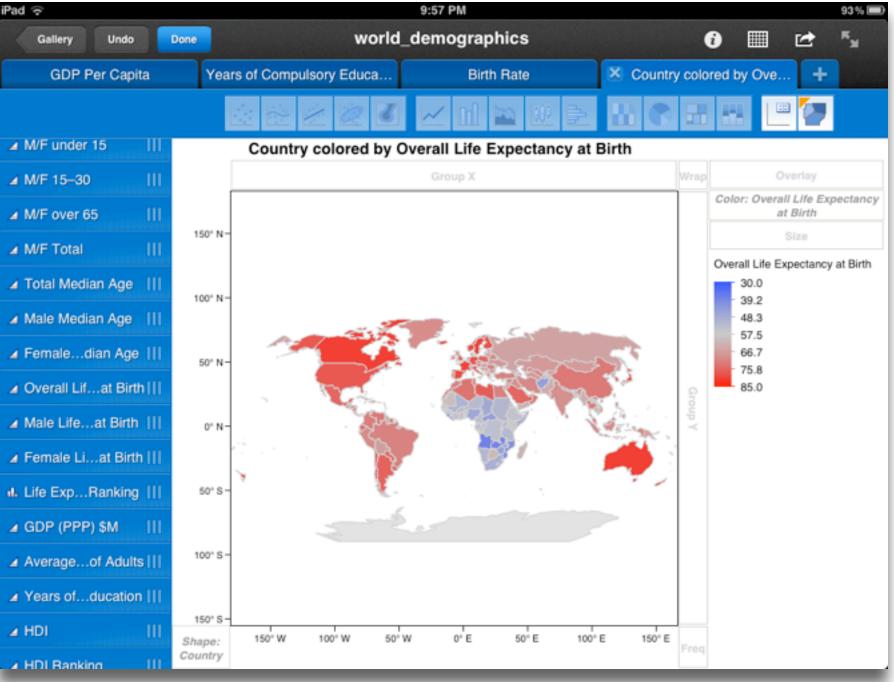
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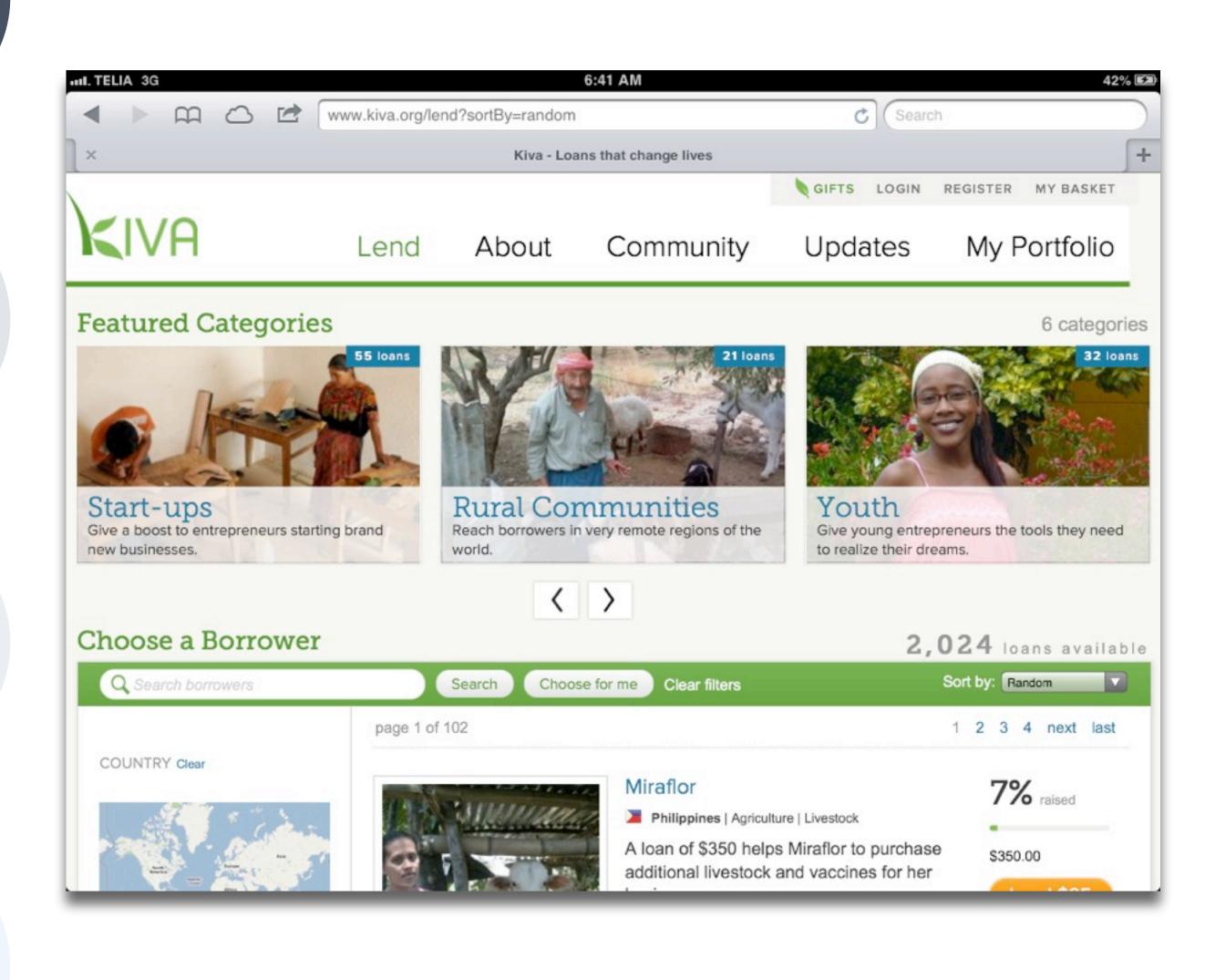
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Design From Expectations

Seymour Papert: Four Expectations

- the experiment.
- class, but learned it in a more articulate, richer, more integrated way.
- and problem-solving.
- etc...

• 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

• Expectation 2: observers will agree that the student in the experiment not only learned more than in a traditional

• 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

• 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,





Measuring the Four Expectations

- Expectation 1: suitably designed formative/summative assessment rubrics will show improvement when compared to traditional instruction.
- Expectation 3: student work will demonstrate more and more varied critical thinking cognitive skills, particularly in areas related to the examination of their own thinking processes.
- their community, and engagement with communities beyond their own.

• Expectation 2: students will show more instances of work at progressively higher levels of Bloom's Taxonomy.

• Expectation 4: student daily life will reflect the introduction of the technology. This includes (but is not limited to) directly observable aspects such as reduction in student attrition, increase in engagement with civic processes in



Black and Wiliam: Defining Formative Assessment

"Practice in a classroom is formative to the extent that evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have taken in the absence of the evidence that was elicited."

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

Wiliam: A Framework for Formative Assessment

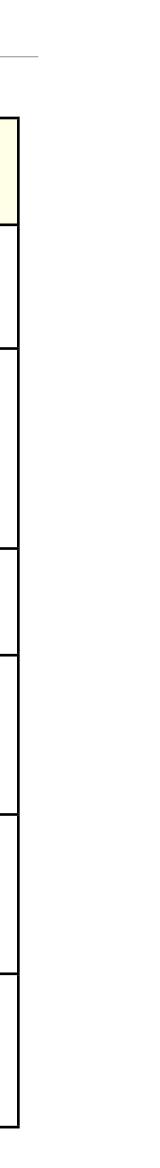
	Where the learner is going	Where the learner is right now	How to get there
Teacher	1 Clarifying learning intentions and criteria for success	2 Engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding	3 Providing feedback that moves learners forward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

Dylan Wiliam, Embedded Formative Assessment. Solution Tree (2011)

Bloom's Taxonomy: Cognitive Processes

Anderson & Krathwohl (2001)	Characterist	ic Processes
Remember	 Recalling memorized knowledge Recognizing correspondences between mer 	morized knowledge and new material
Understand	 Paraphrasing materials Exemplifying concepts, principles Classifying items Summarizing materials 	 Extrapolating principles Comparing items
Apply	 Applying a procedure to a familiar task Using a procedure to solve an unfamiliar, but 	t typed task
Analyze	 Distinguishing relevant/irrelevant or important Integrating heterogeneous elements into a statistical structure Attributing intent in materials 	
Evaluate	 Testing for consistency, appropriateness, an Critiquing the consistency, appropriateness, procedures, basing the critique upon appropri 	and effectiveness of principles and
Create	 Generating multiple hypotheses based on gi Designing a procedure to accomplish an untiple Inventing a product to accomplish an untype 	typed task

Lorin W. Anderson and David R. Krathwohl (Eds.), A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives, Complete Edition. Longman. (2000)



Facione: Critical Thinking – Cognitive Skills and Subskills

Skill	Subskills
Interpretation	Categorization Decoding Significance Clarifying Meaning
Analysis	Examining Ideas Identifying Arguments Analyzing Arguments
Evaluation	Assessing Claims Assessing Arguments
Inference	Querying Evidence Conjecturing Alternatives Drawing Conclusions
Explanation	Stating Results Justifying Procedures Presenting Arguments
Self-Regulation	Self-examination Self-correction

Peter Facione, Critical Thinking: A Statement of Expert Consensus for Purposes of Educational Assessment and Instruction - Executive Summary. "The Delphi Report". American Philosophical Association, Committee on Pre-College Philosophy. California Academic Press, 1990

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

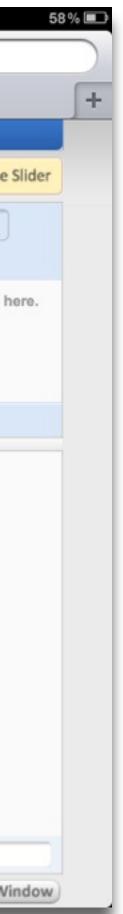
R.J. Marzano. Building Background Knowledge for Academic Achievement: Research on What Works in Schools. Alexandria, VA: ASCD, 2004

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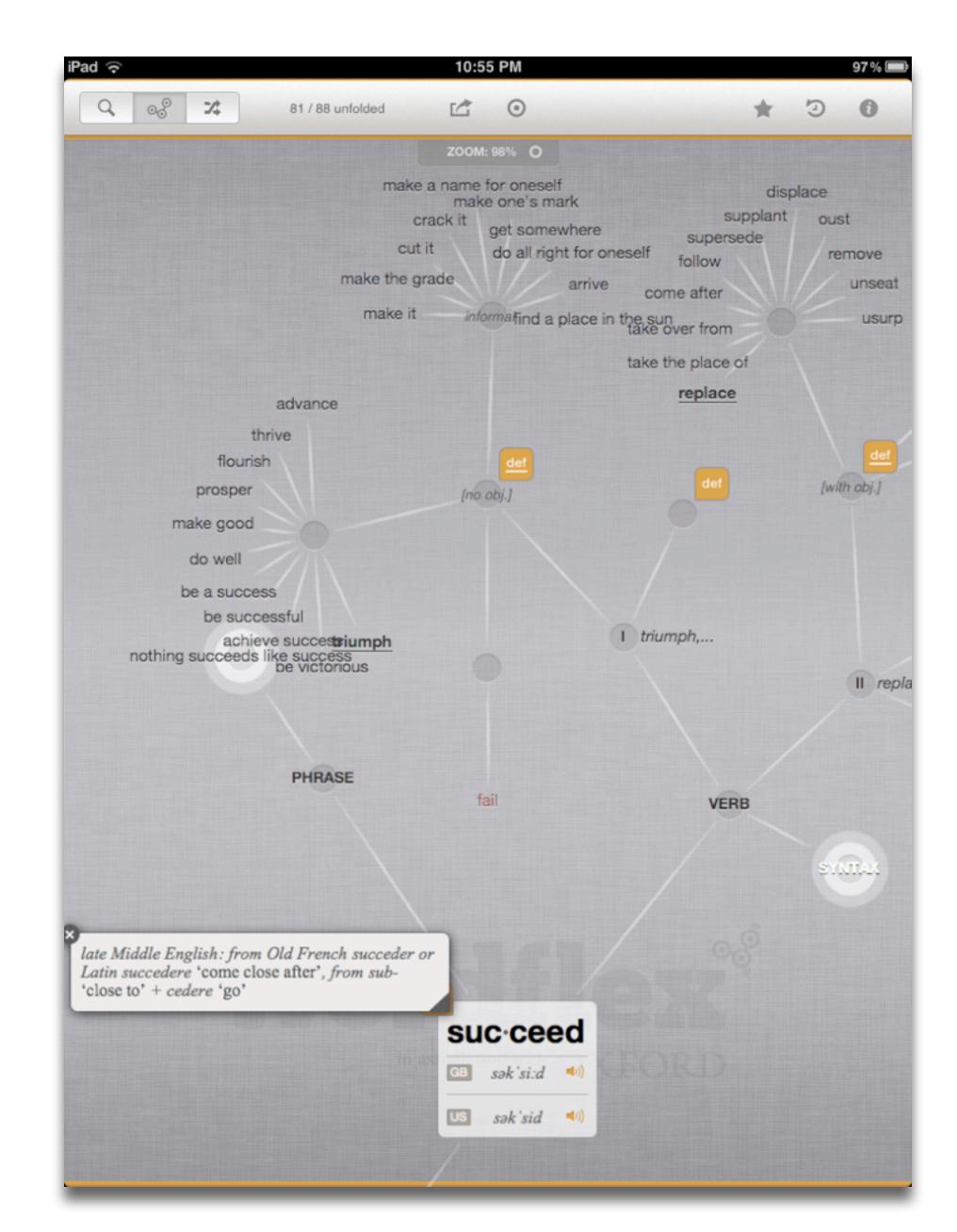


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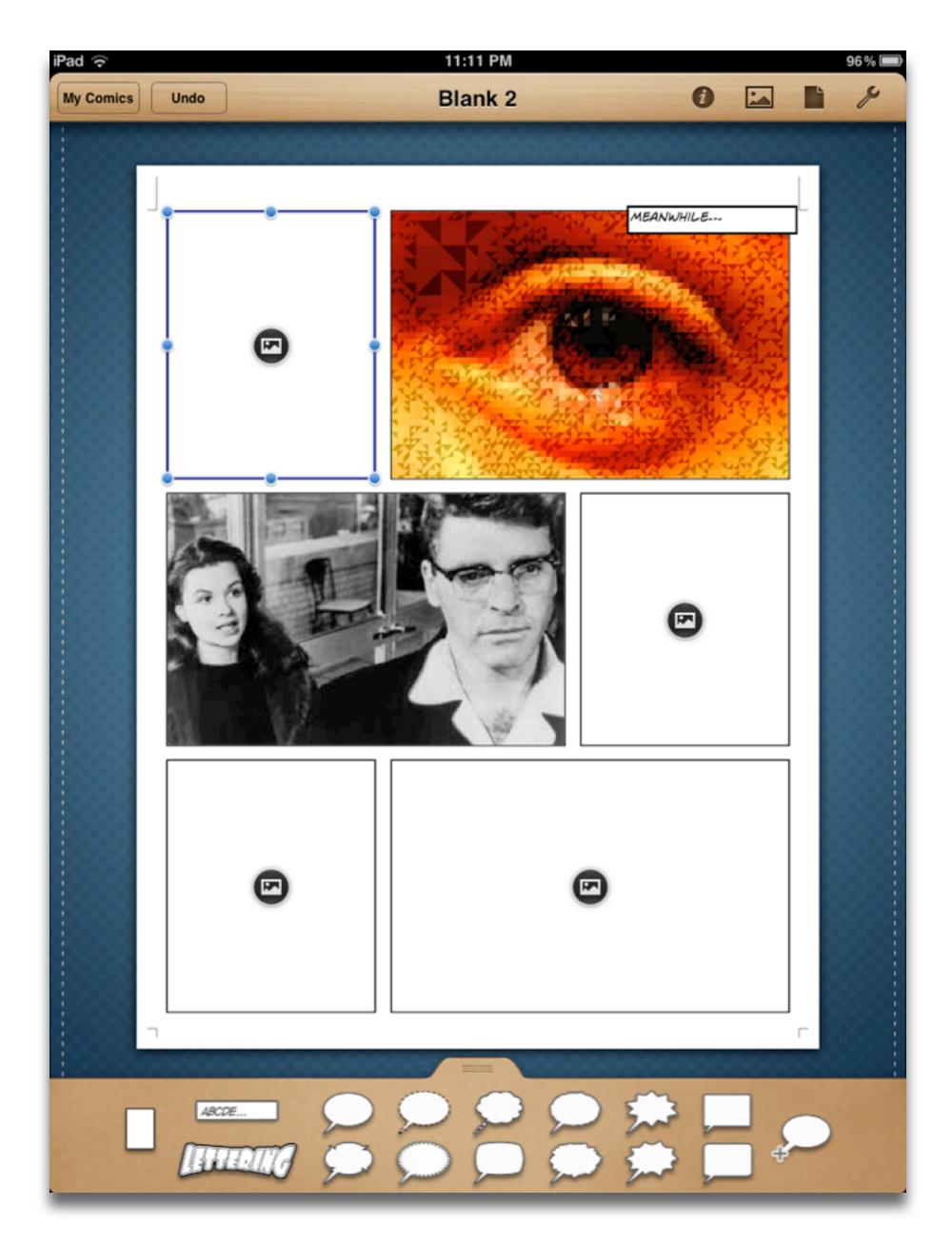


Photo Credits

• *iPad in Subway*: Takashi M

- YouTube + iPad + Hanalei = Happiness: Wayan Vota
- Parcours-jeu multimedia : Les métiers du musée: Jean-Pierre Dalbéra

Resources

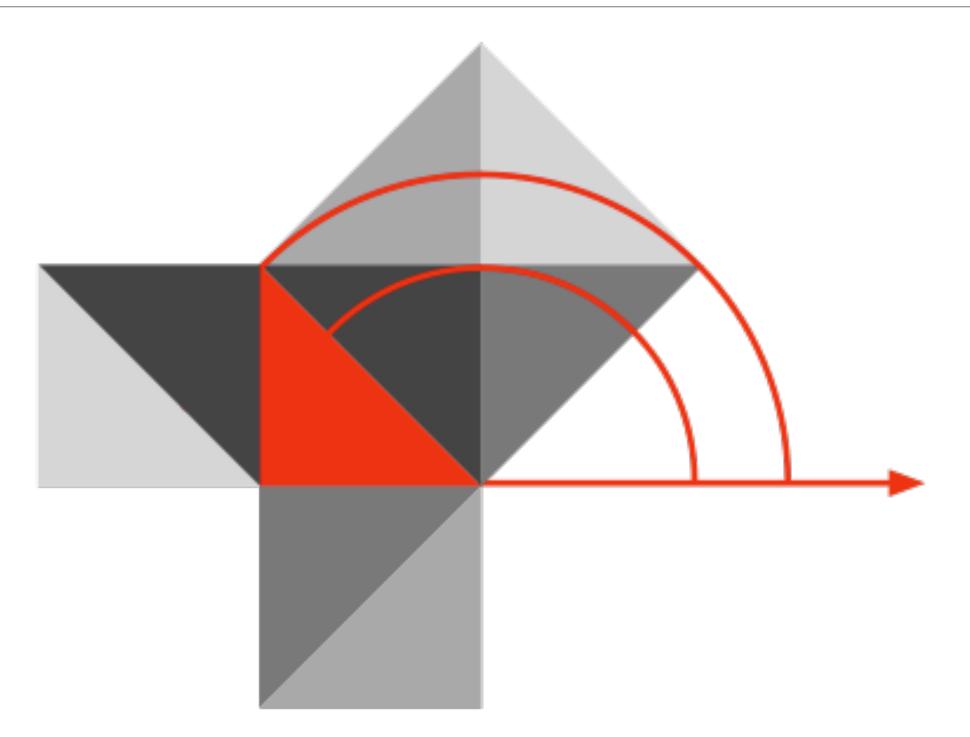
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• Punya Mishra & Matthew J. Koehler, "Technological pedagogical content knowledge: A framework for teacher knowledge". Teachers College Record, 108(6).

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