# An Intro to SAMR: Building Ladders

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)

Competency	Evaluate Historical Accounts	Interpret Primary Sources	Apply Chronological Reasoning	Contextualize	Construct Acceptable Historical Accounts
History as an Interpretive Account					
The Relationship of Past and Present					
Historical Evidence					
Complex Causality					
Significance					

Measuring College Learning Project + Resource Center - Online at: http://highered.ssrc.org/projects/measuring-college-learning-project/

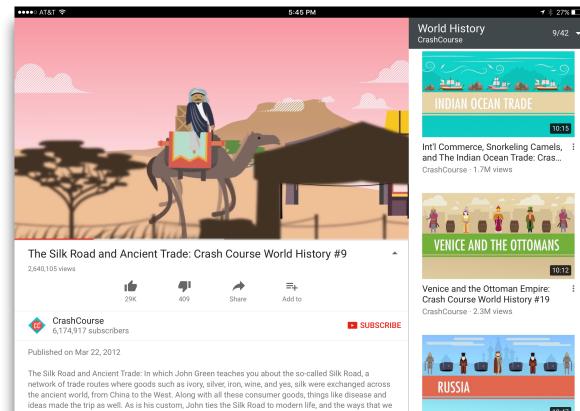


#### Modification Tech allows for significant task redesign

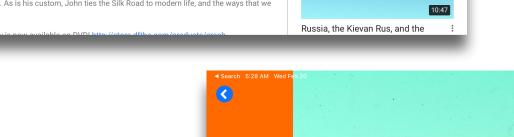
#### Augmentation Tech acts as a direct tool substitute, with functional improvement

#### **Substitution**

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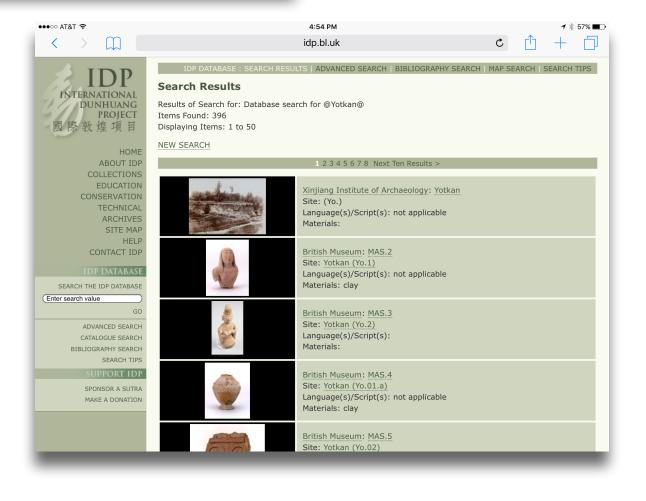
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Significant exchanges of trade and ideas occurred in all the world zones. But the most important exchange networks emerged in Afro-Eurasia. This world zone included Africa, Europe, and Asia. At this time, the four zones were still isolated from each other. Humans living in one zone knew nothing of events in the other zones.

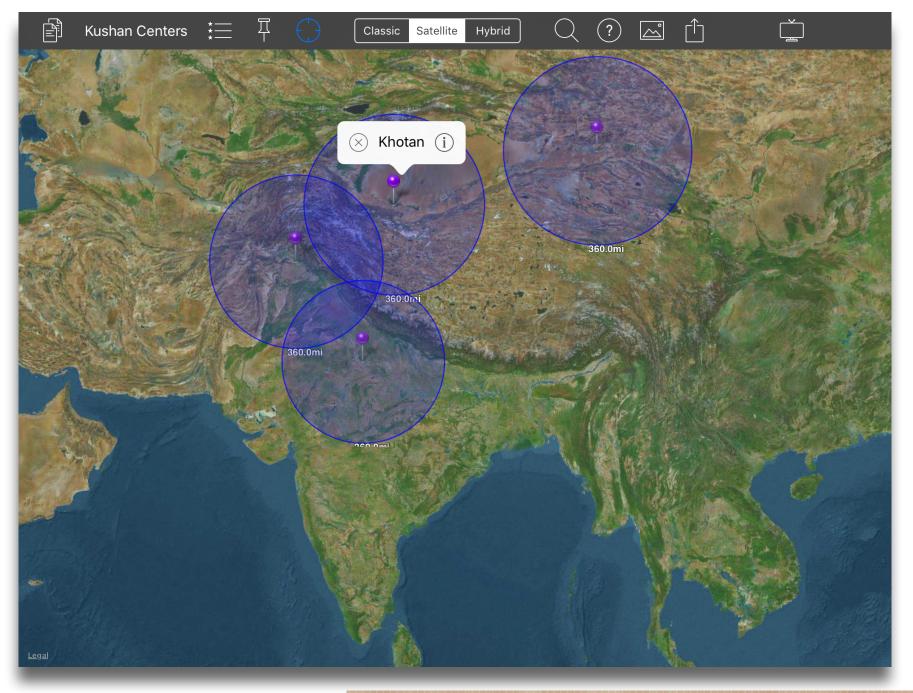
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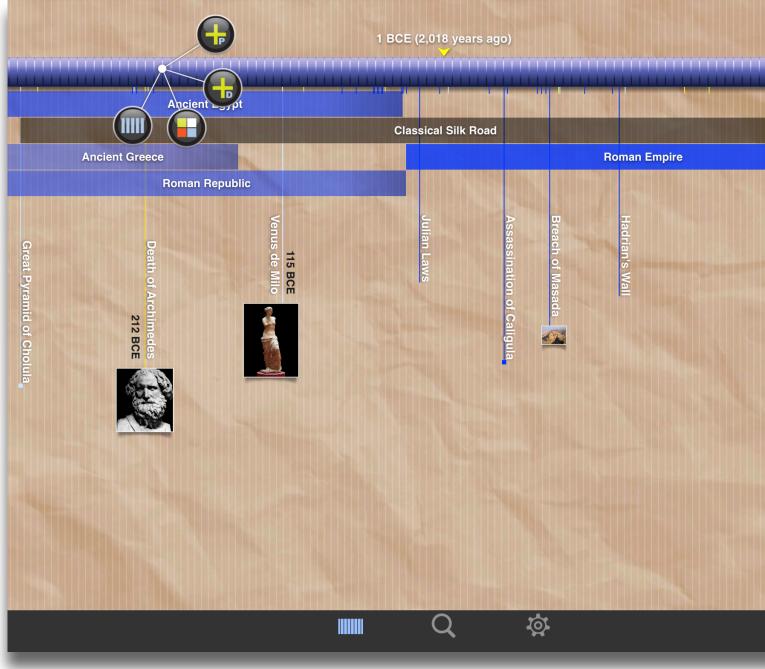


#### Modification Tech allows for significant task redesign

#### Augmentation

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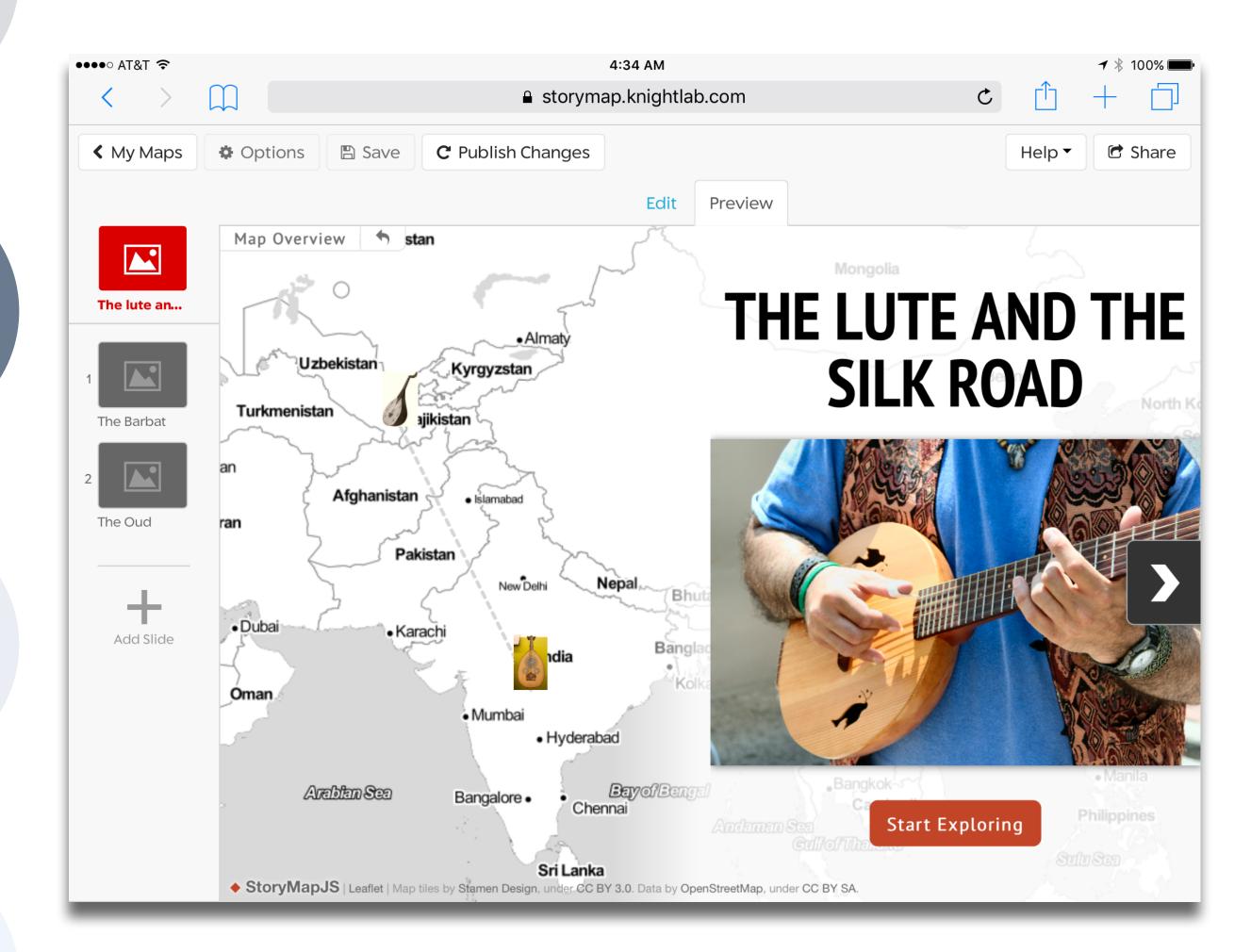




#### Modification

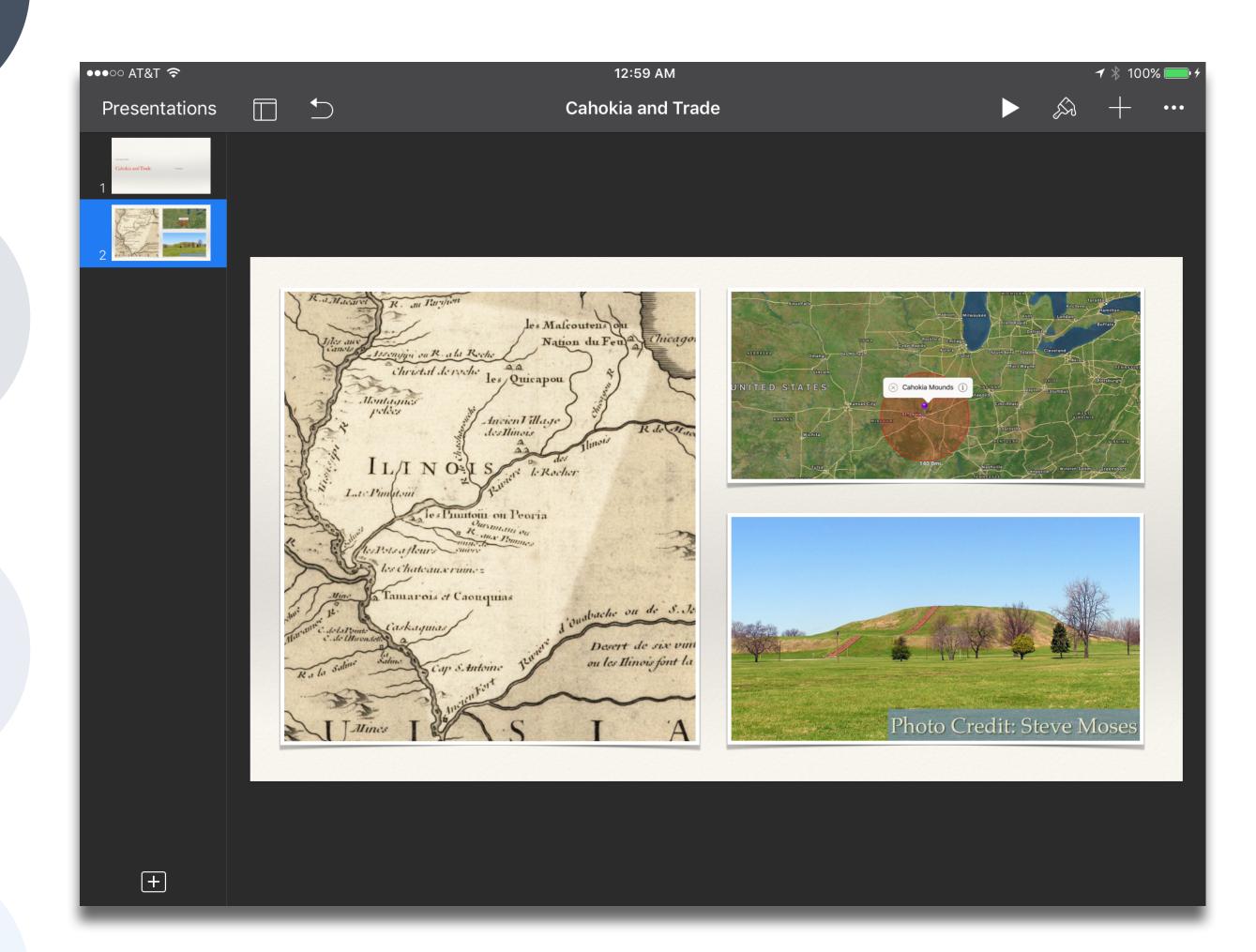
Tech allows for significant task redesign

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



# Modification Tech allows for significant task redesign

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



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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#### **Extended Thinking**

## Strategic Thinking

## **Skills and Concepts**

#### **Recall and Reproduction**

Webb, Norman L. Depth-of-knowledge levels for four content areas. (2002)









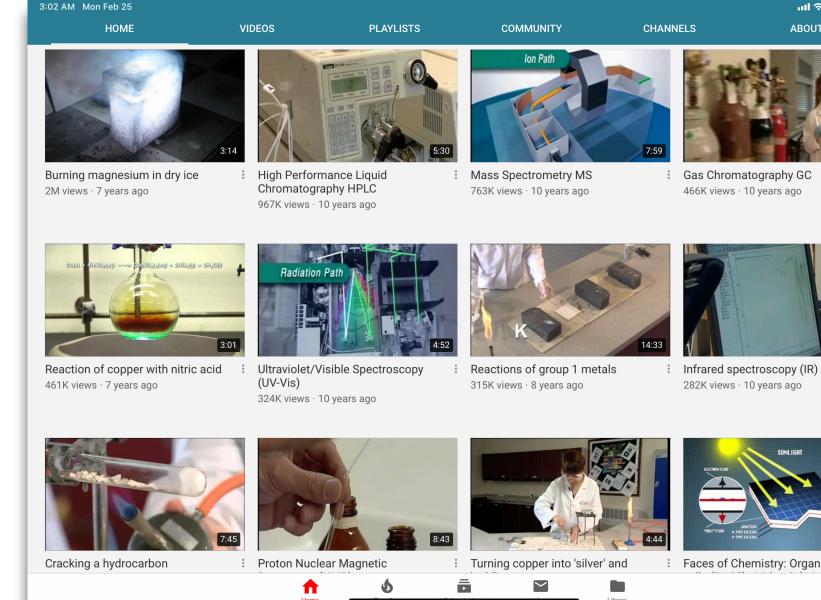
# Modification

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

#### **Substitution**

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Quantum Theor John Polkinghorne ☆☆☆☆☆	Peter Atkins >	John Polk QUANT THEC A Very Short Intro
Physical Chemis Peter Atkins ☆☆☆☆☆	tr BUY   \$7.99	
Organic Chemis Graham Patrick ☆☆☆☆☆		
The Brain: A Ver Michael O'Shea ☆☆☆☆☆	Publisher Description In this Very Short Introduction Peter Atkins inspires us to look at chemistry through new eyes. Considering the remarkable achievements chemistry has made, he presents a fascinating, clear, and rigorous exploration of the world of chemistry – its structure, core concepts, and contributions to the material comfort and culture of the modern world.	Publisher Description In simple language, withou ideas that make the subate offers the general reader a physics and one of the ous
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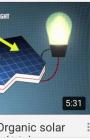


# **Recall and** Reproduction









# Modification

#### Augmentation

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

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<pre>     Examples Chemistry </pre>	🔆 WolframAlpha <sup>*</sup> 🖞
Do dilution computations:	
molarity of 1 ml of 5 M HCl in 5 L of water =	0.2 mol CH4 + O2 -> 7 mL H2O + CO2
Chemical Reactions	Structures
Balance a chemical equation:	Skeletal structure
octane + O2 -> water + CO2 =	Н
Calculate reaction stoichiometry:	$H_{-}^{H} C_{-}^{-H} + 0 = 0 \rightarrow H_{-}^{0} H_{+} o = 0$
0.2 mol CH4 + O2 -> 7 mL H2O + CO2 =	
Find chemical reactions using reactants or products:	Names
hydrogen + oxygen -> =	methane + oxygen $\rightarrow$ water + carbon dioxide
-> nitrate =	Reaction thermodynamics
Chemical Thermodynamics	Enthalpy
Find properties of a substance in a given phase:	$\Delta H_{rxn}^0$ – 965.2 kJ/mol – – 74.6 kJ/mol = – <b>890.6 kJ/mol</b> (exothermic)
trimethylamine gas =	Gibbs free energy
Compute properties at a specified temperature:	$\Delta G_{rxn}^0$ - 868.6 kJ/mol - 412.4 kJ/mol = - 1281 kJ/mol (exergonic)
vapor pressure of ethanol at 300K =	
Do computations with the Arrhenius equation:	Entropy
Arrhenius equation =	$\Delta S_{\rm rxn}^0$ 353.8 J/(molK) – 596 J/(molK) = – 242.2 J/(molK) (excentropic)
Estimate thermodynamic properties using the Joback method:	More
2,3-methano-5,6-dichloroindene =	Equilibrium constant
Examples History Favorites About	$K_{c} = \frac{\left[\mathrm{H}_{2}\mathrm{O}\right]^{2}\left[\mathrm{CO}_{2}\right]}{\left[\mathrm{CH}_{4}\right]\left[\mathrm{O}_{2}\right]^{2}}$

#### **Skills and** Concepts

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#### **Modification**

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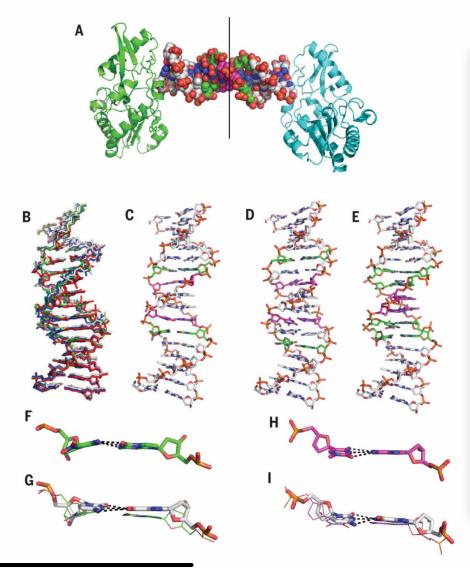
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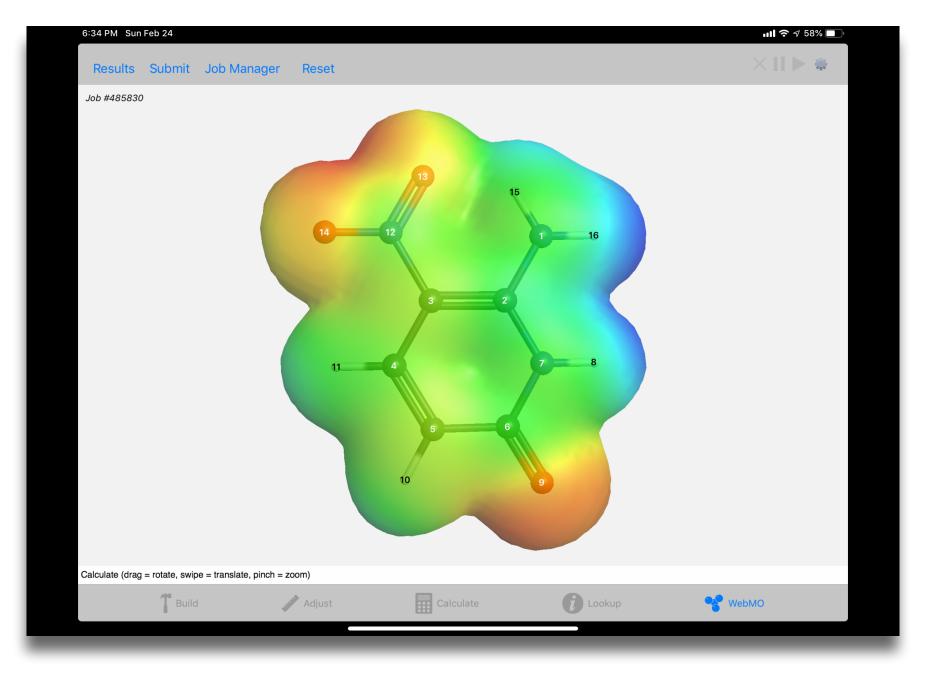
Hoshika, S., Leal, N. A., Kim, M.-J., Kim, M.-S., Karalkar, N. B., Kim, H.-J., ... Benner, S. A. (2019). Hachimoji DNA and RNA: A genetic system with eight building blocks. Science, 363(6429), 884

## Strategic Thinking

**RESEARCH** | REPORT

Fig. 3. Crystal structures of PB, PC, and PP hachimoji DNA. (A) The host-guest complex with two N-terminal fragments from Moloney murine leukemia virus reverse transcriptase (in green and cyan) bound to a 16-mer PP hachimoji DNA; in the duplex sphere model, Z:P pairs are green and S:B pairs are magenta. The asymmetric unit includes one protein molecule and half of the 16-mer DNA, as indicated by the line. (B) Hachimoji DNA structures PB (green), PC (red), and PP (blue) are superimposed with GC DNA (gray). (C) Structure of hachimoji DNA with self-complementary duplex 5'-CTTATPBTASZATAAG ("PB"). (D) Structure of hachimoji DNA with self-complementary duplex 5'-CTTAPCBTASGZTAAG ("PC"). (E) Structure of hachimoji DNA with self-complementary duplex with six consecutive nonstandard 5'-CTTATPPSBZZATAAG (PP) components. DNA structures are shown as stick models with P:Z pairs (carbon atoms, green), B:S pairs (carbon atoms, magenta), and natural pairs (carbon atoms, gray). (F to I) Examples of largest differences in detailed structures. The Z:P pair from the PB structure (F) is more buckled than the corresponding G:C pair (G). The S:B pair from the PB structure (H) exhibits a propeller angle similar to that in the corresponding G:C pair (I).







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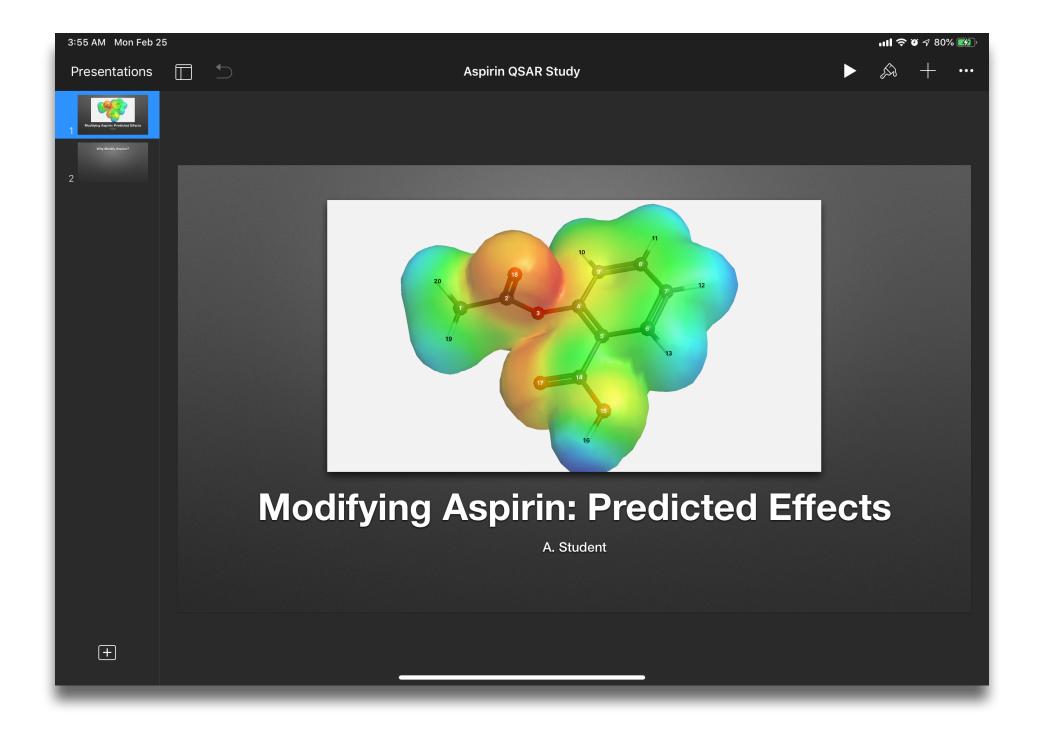
# Modification

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# Extended Thinking



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





# Bookmarks

# Discussions

Social

Blogging

Telepresence







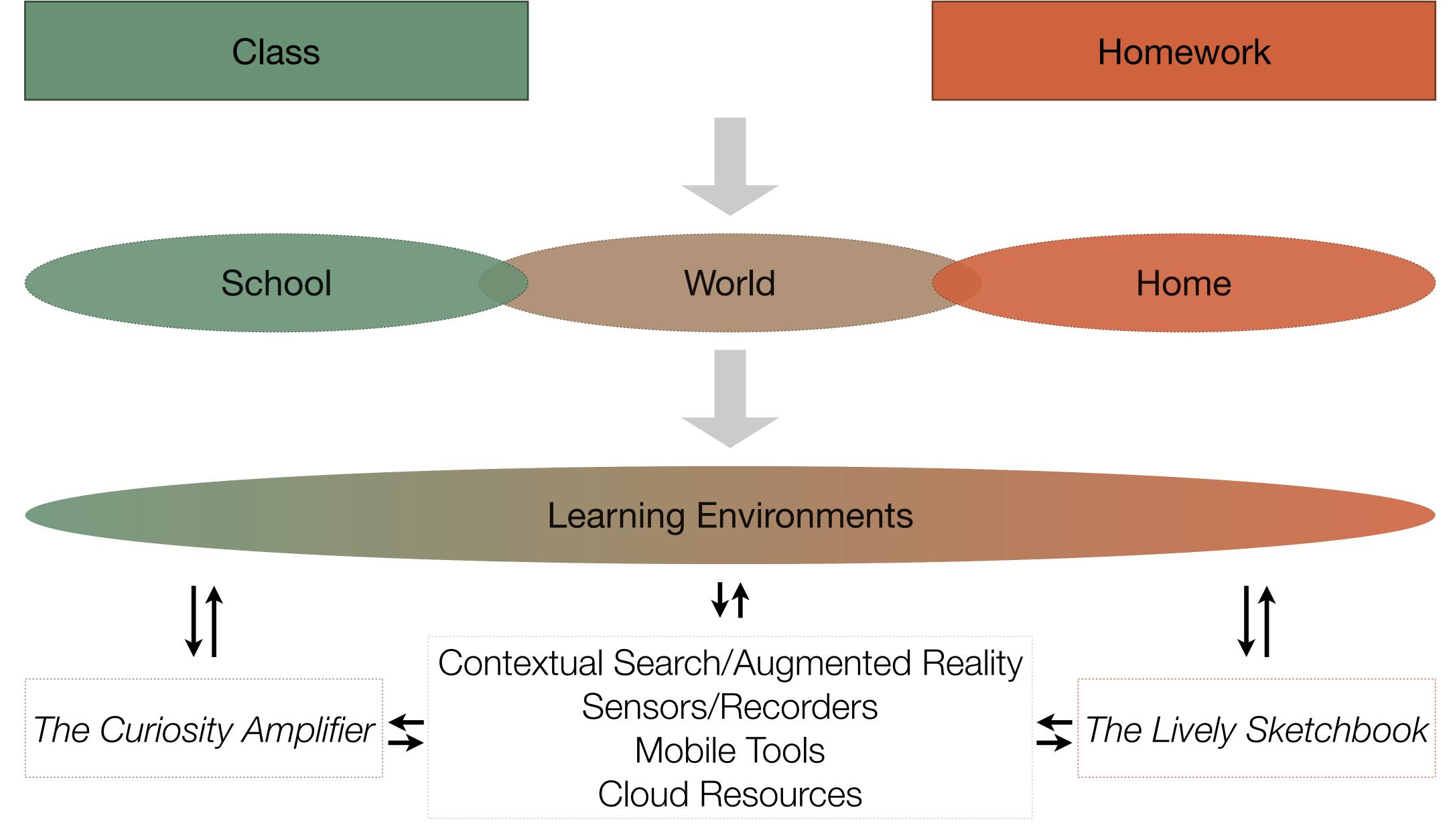




# Microblogging

Wikis

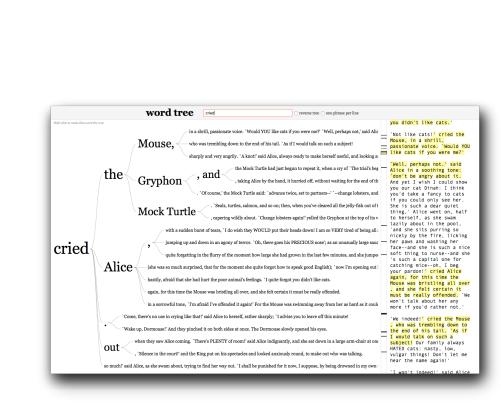
File Sharing



Mobility







knight lab

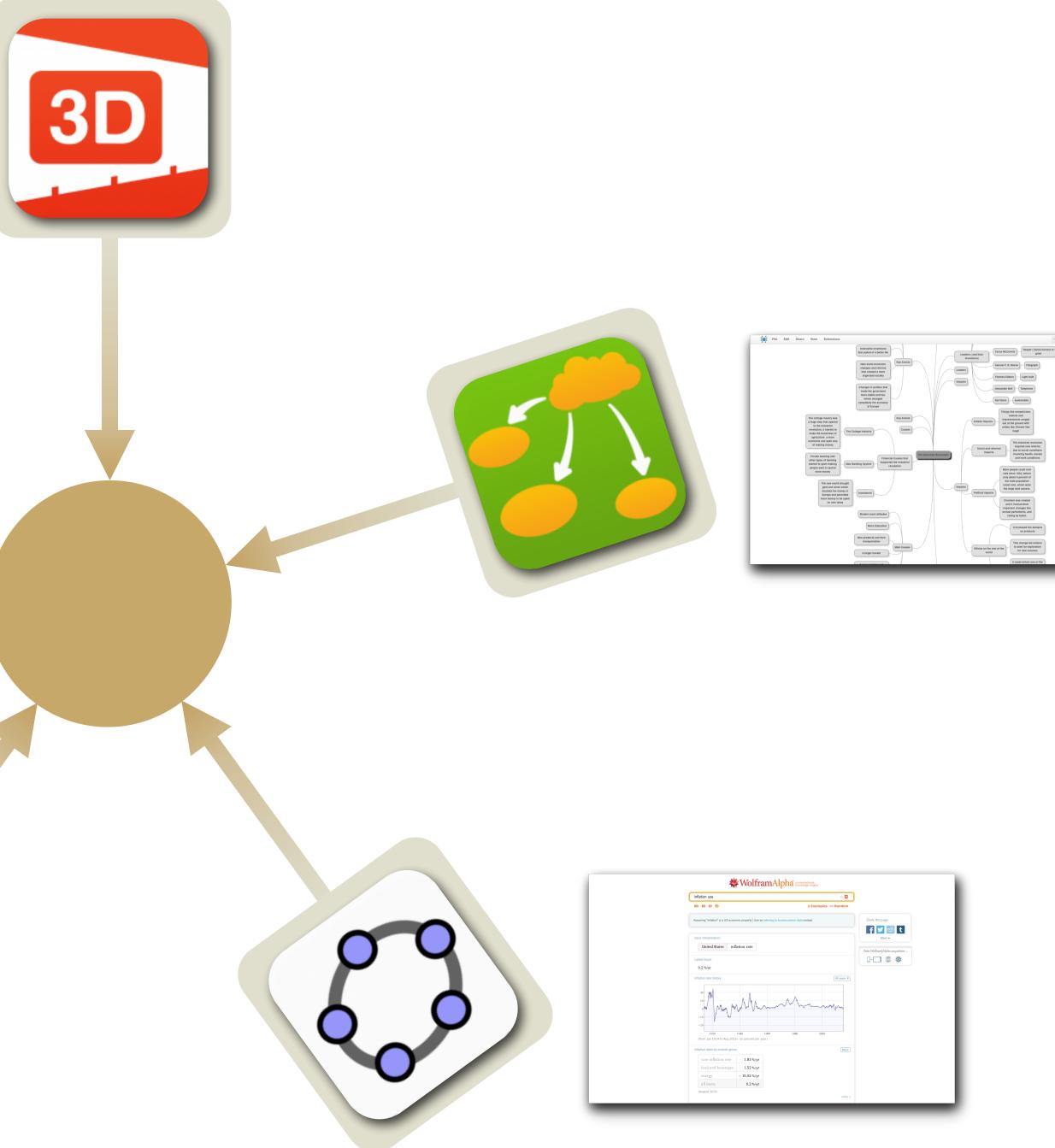
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StoryMap 🌇

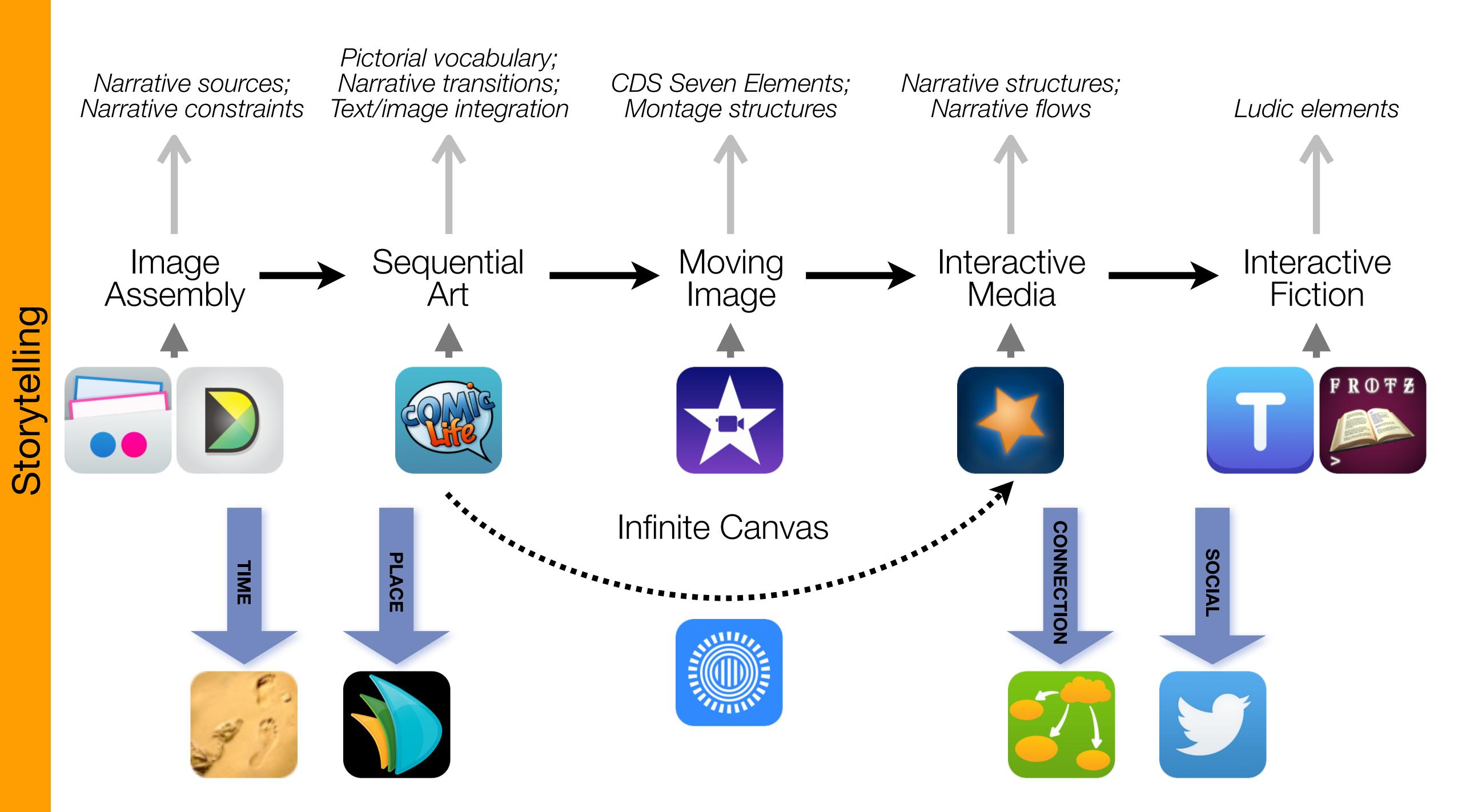
Maps that tell stories.

Make a storymap now









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

"A game is a system in which players rules, that results in a quantifiable outcome."

# engage in an artificial conflict, defined by

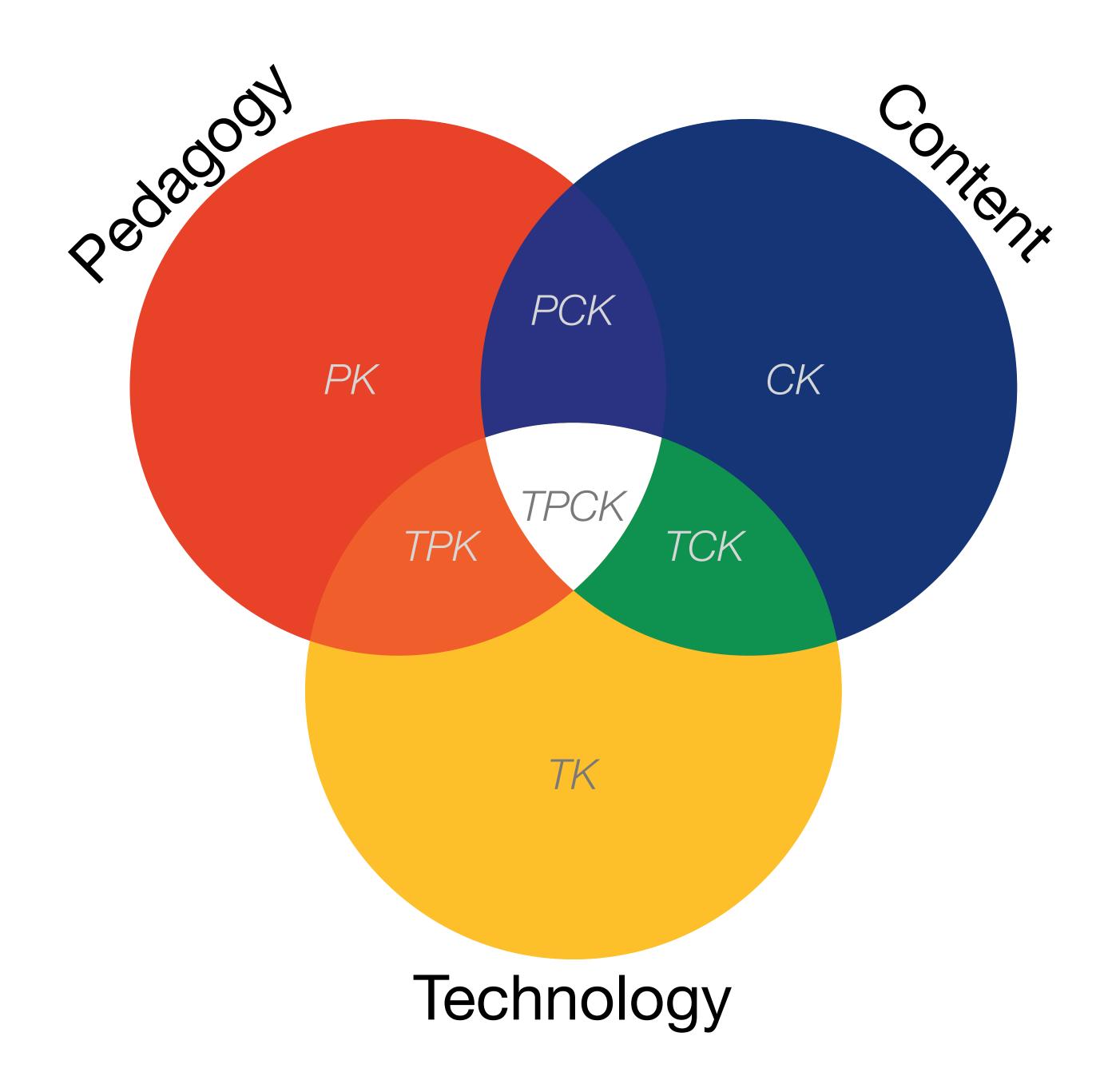
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Social	Commur
Mobility	Anytime, /
Visualization	Making
Storytelling	Knowledg
Gaming	Feedback L

## et – Associated Practices

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

# S to A: The Value of Shared Practices

- Augmented Note Taking and Annotation
- Visualization Methods:
  - 5 Primary Domains: Space, Time, Networks, Text, Number
- Simple Blogging
- Simple Digital Storytelling Video •
- Flipped Classroom: •
  - Materials Creation
  - Peer Discussion/Instruction Methods
- Simple Interactive Fiction
- LMS Practices



Punya Mishra & Matthew J. Koehler, "Technological pedagogical content knowledge: A framework for teacher knowledge". Teachers College Record, 108(6). (2006)

# Building a SAMR Ladder

- Four steps:
  - Select a unit of instruction •

  - Redesign the development of the unit at the A, M levels

Redesign the intro to the unit (basic knowledge, materials) at the S level

• Redesign/create a student culminating experience for the unit at the R level

# Why Build a Ladder?

- using SAMR
- Some advantages in this context:
  - Proximity to existing practice
  - Sustainability of effort •
  - Option for gradual implementation

Only one of many possible approaches to redesigning a unit of instruction

Particularly well-suited to "first efforts" in technology-based curricular redesign



# Three Questions (and Followups)

- Which unit of instruction would you like to redesign?
  - Why?
- What did you do before in this unit that worked?
  - Why did you do it?
- What would you like to change or replace?
  - Why?

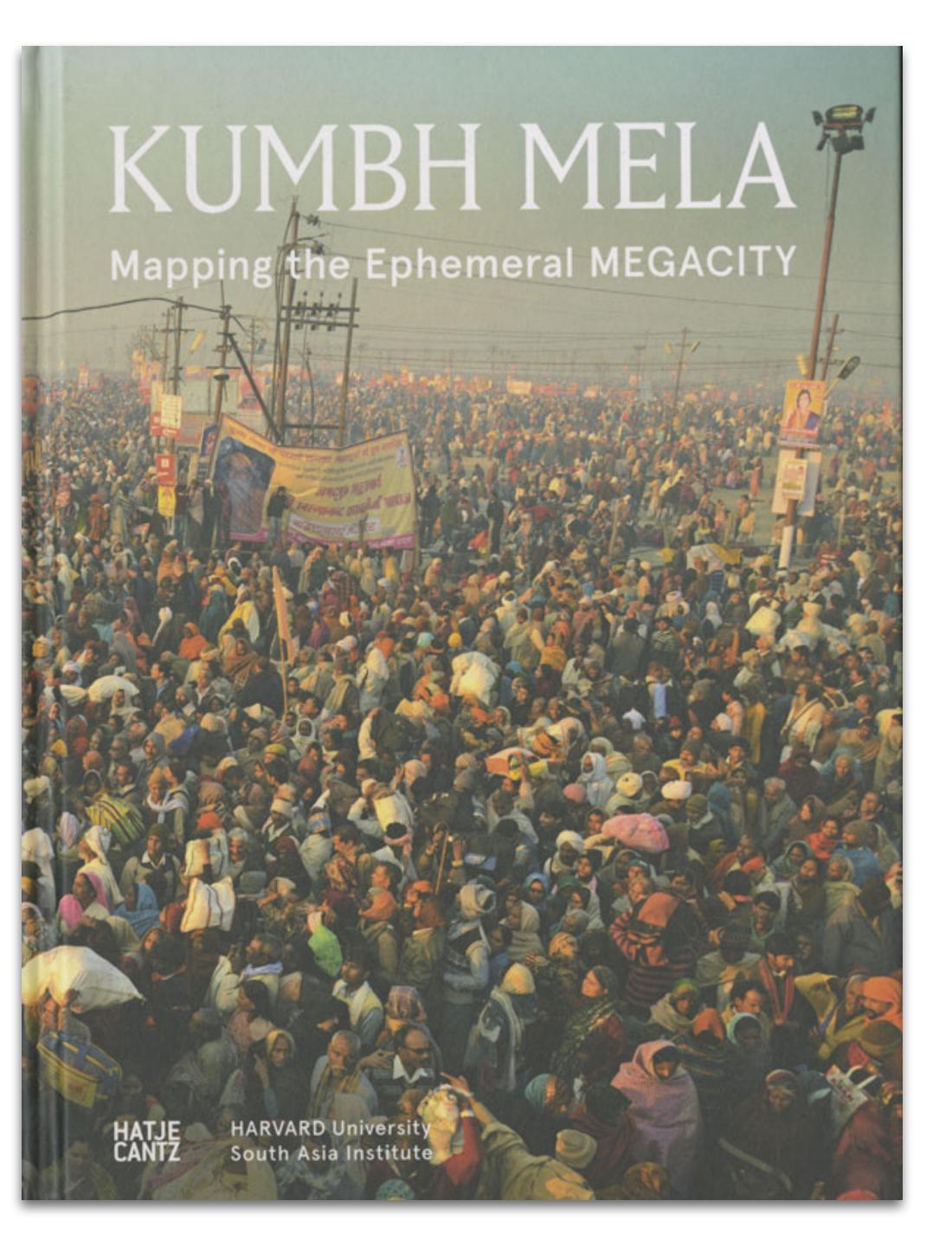
# The Two-Pass Ladder – Pass 1

- - S: Go for low-hanging fruit, e.g.
    - access to resources
    - coordination of social environments
    - basic approaches to information management
  - A: Go for enhancing what you chose in S, e.g.
    - curation of resources
    - organization of peer discussion/instruction experiences
    - information analysis and visualization

#### • Redesign at the S/A levels, using one of Technology, Pedagogy, or Content as your driver:

# The Two-Pass Ladder – Pass 2

- Now, redesign at the M/R levels for a different driver (from Technology, Pedagogy, or Content), but in light of the first pass driver:
  - M: Go for defining extended experiences in student exploration/creation that leverage the choices made for A
  - R: Go for student agency, allowing them to build their own exploration/ creation using the experiences developed at M



#### Modification

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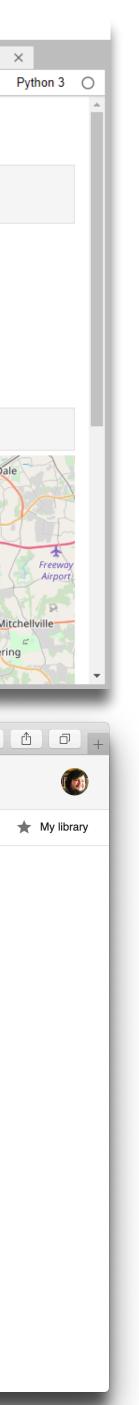
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#### Augmentation

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#### **Substitution**

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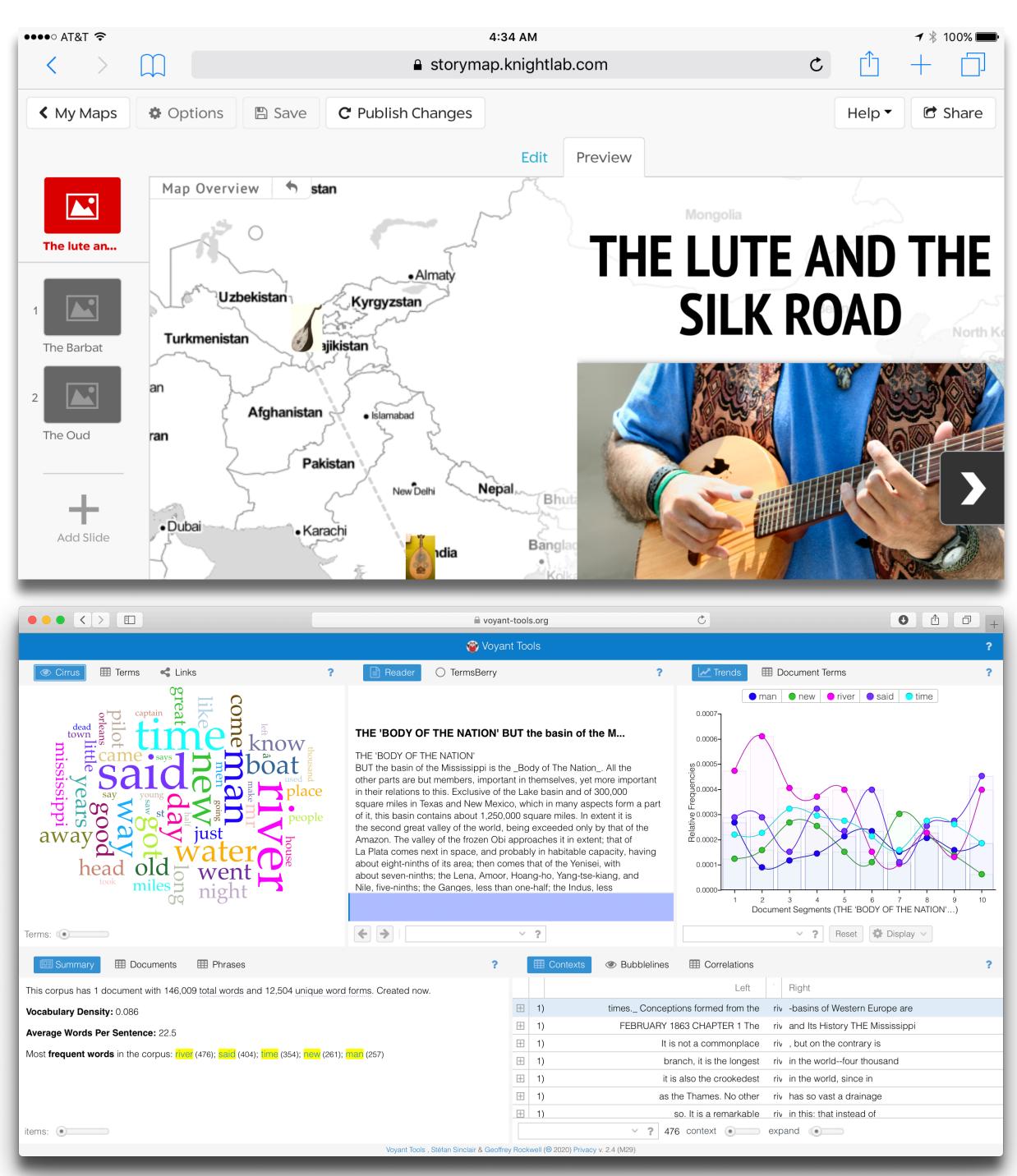


#### **Modification**

Tech allows for significant task redesign

#### Driver: C

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



# 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:

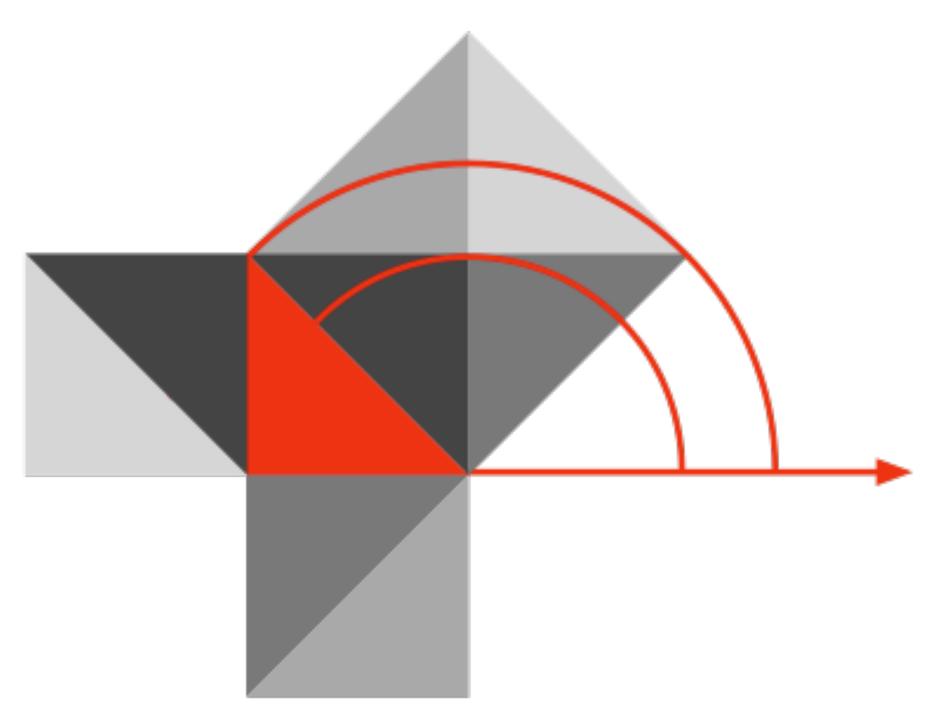
future studies or in their lives outside school?

• 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

# Hippasus



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

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