

# Technology in Education: Designing for Growth

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Ruben R. Puentedura, Ph.D.



# Revisiting SAMR, TPACK, and the EdTech Quintet

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## Transformation

### **Redefinition**

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

### **Modification**

*Tech allows for significant task redesign*

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### **Augmentation**

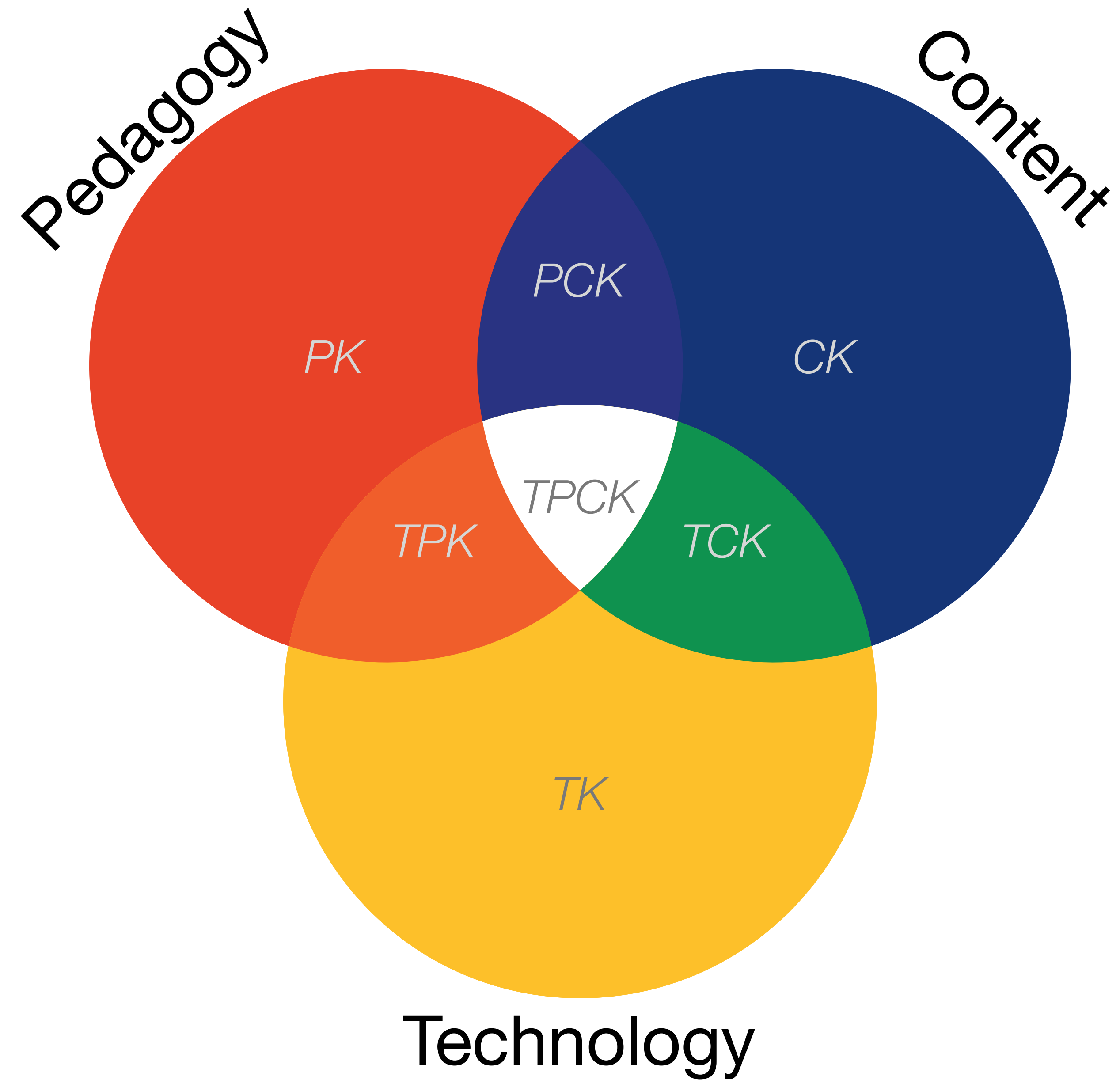
*Tech acts as a direct tool substitute, with  
functional improvement*

### **Substitution**






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

## Enhancement







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







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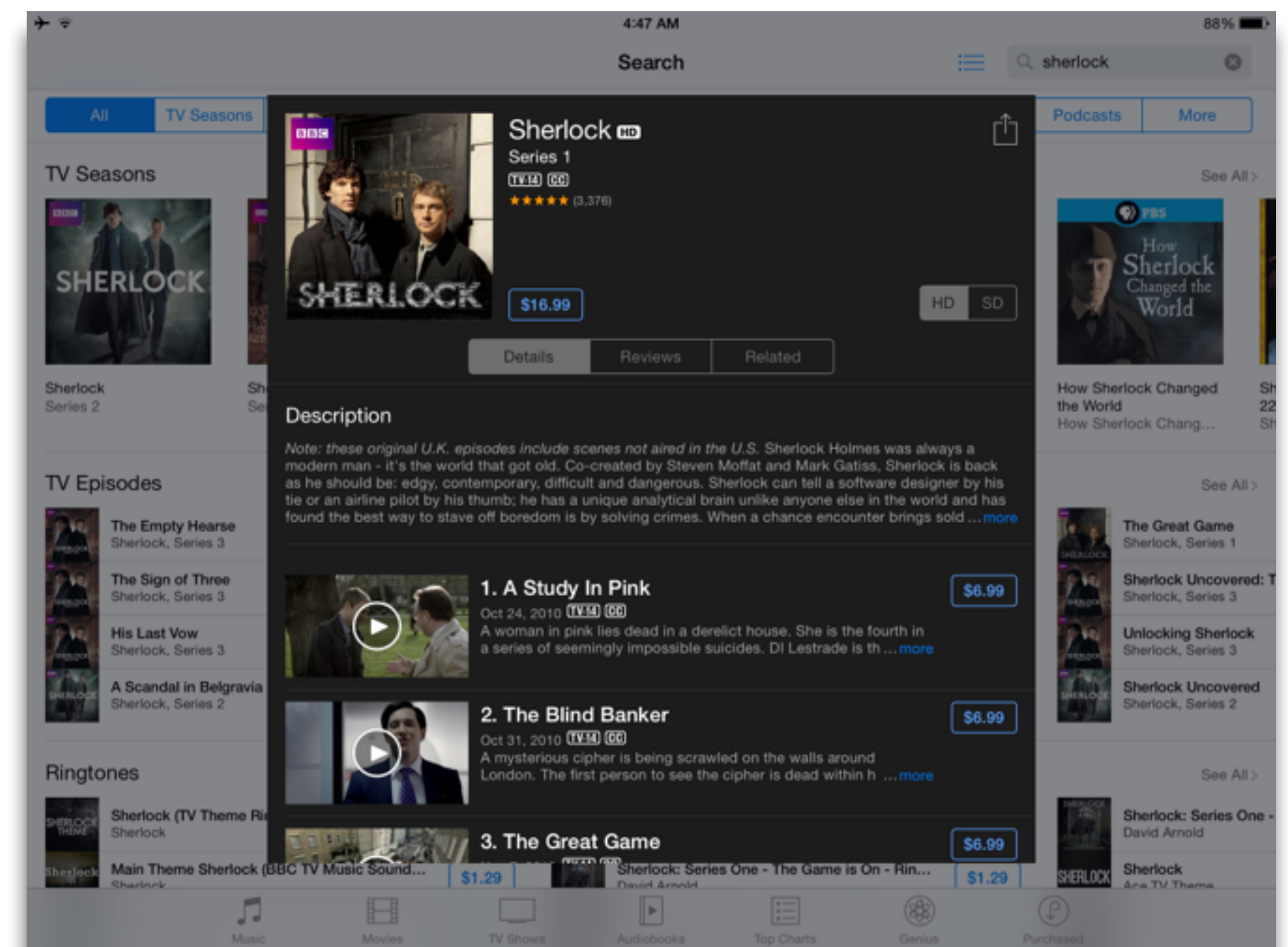
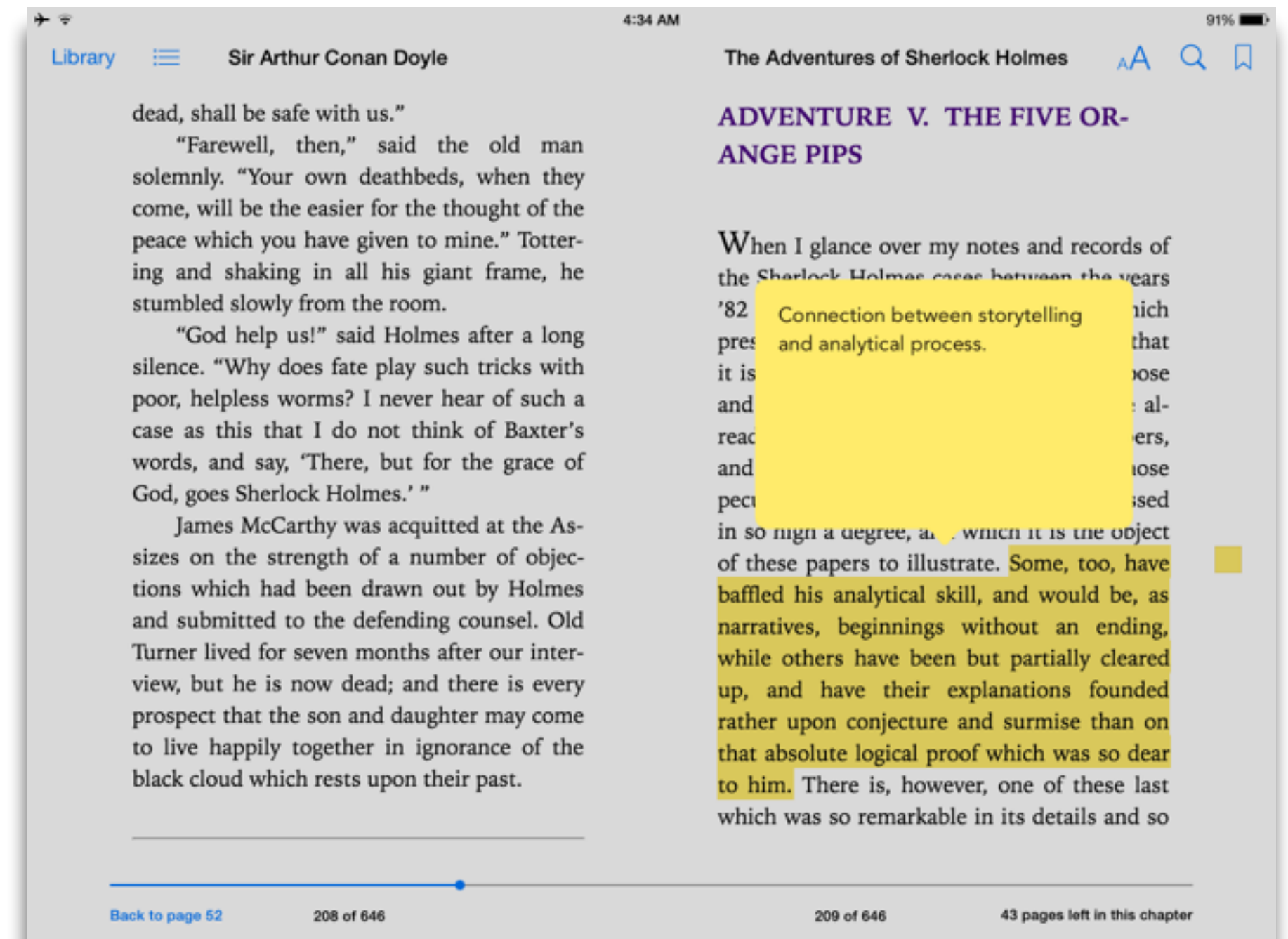
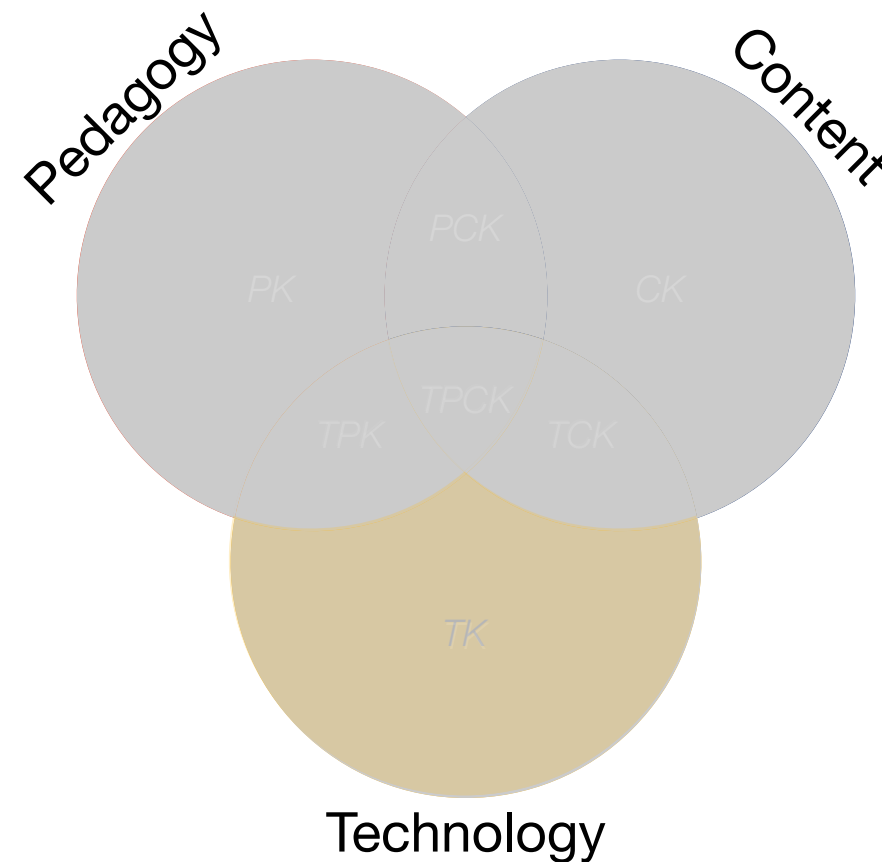
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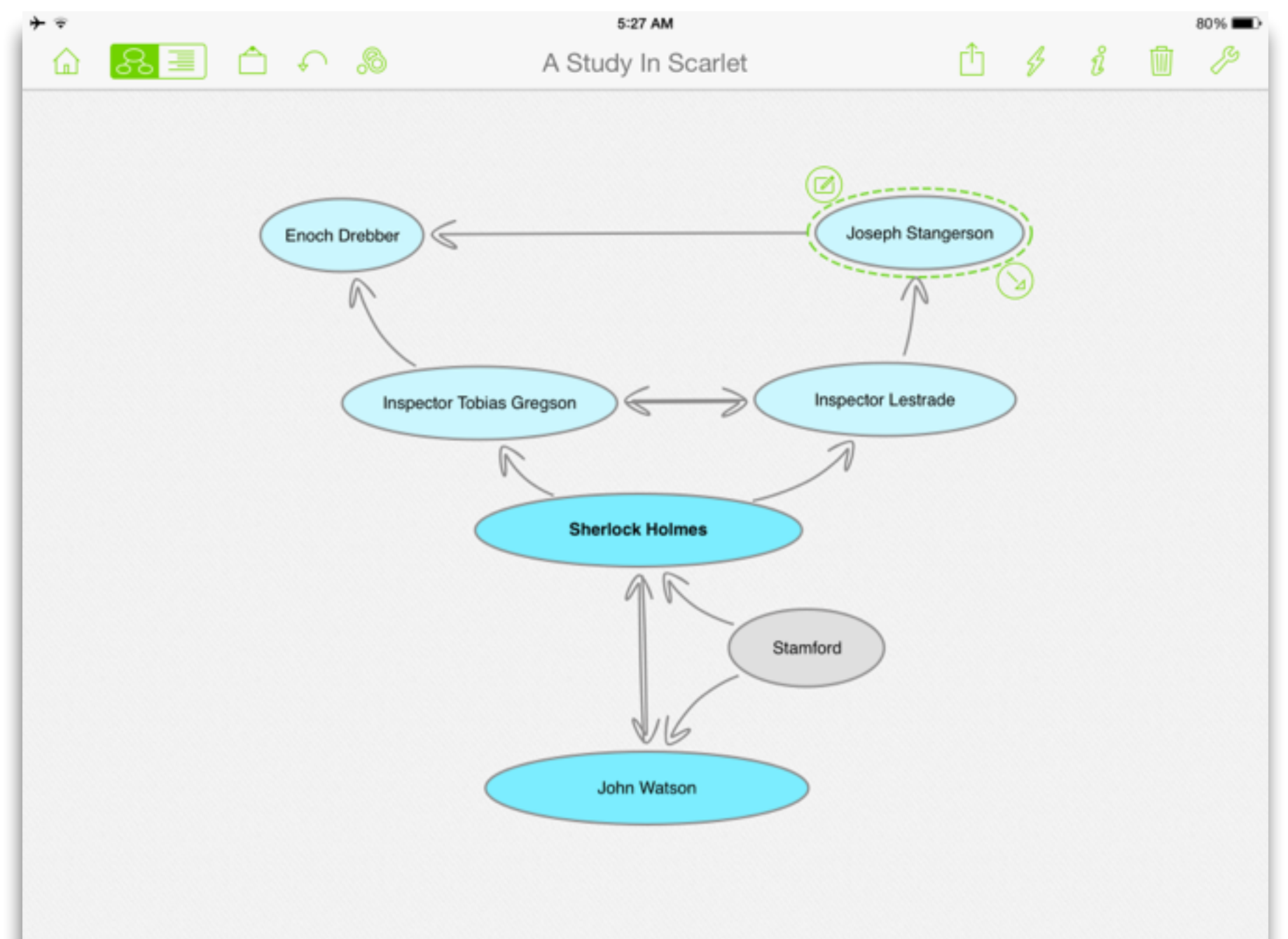
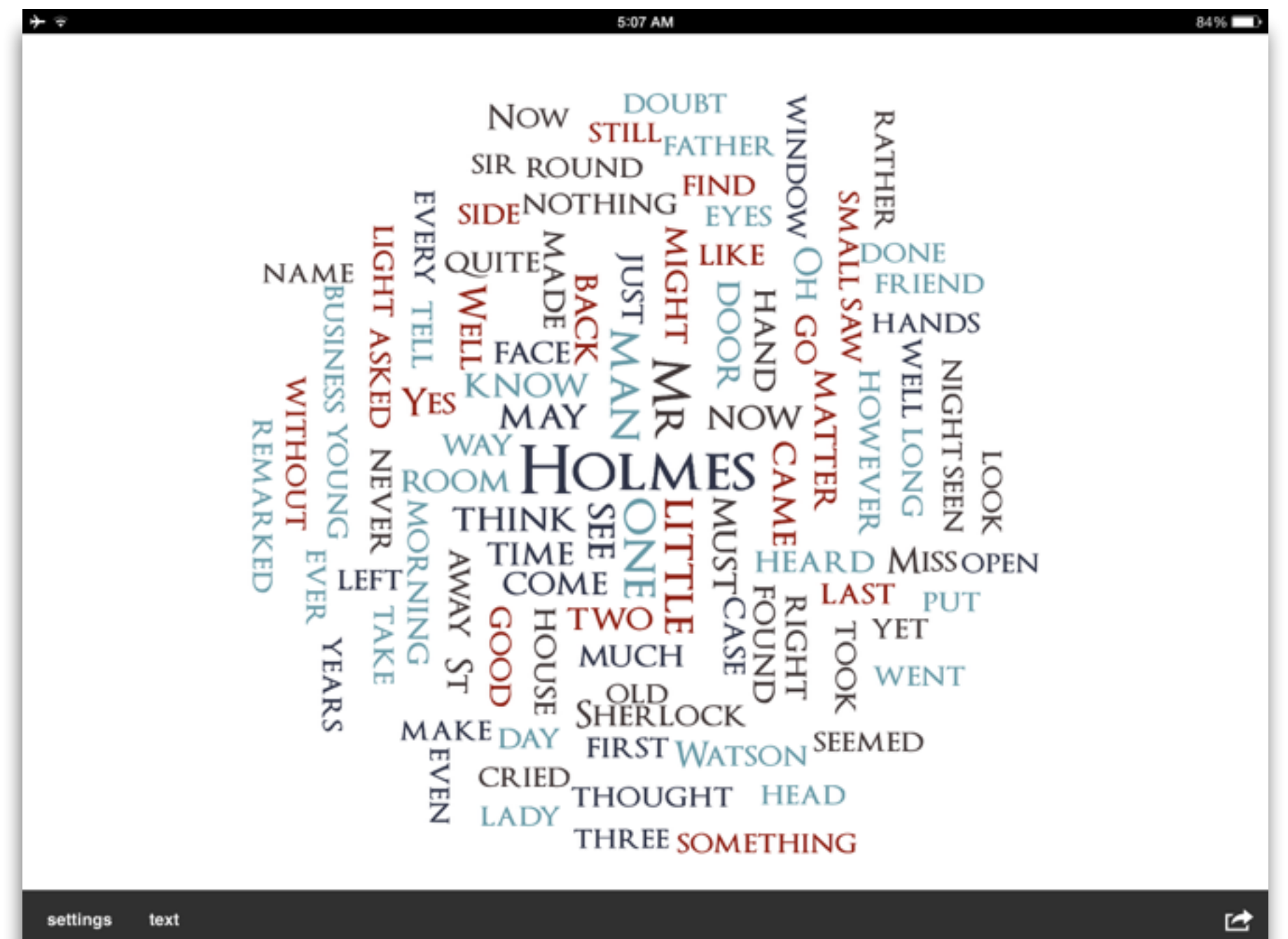
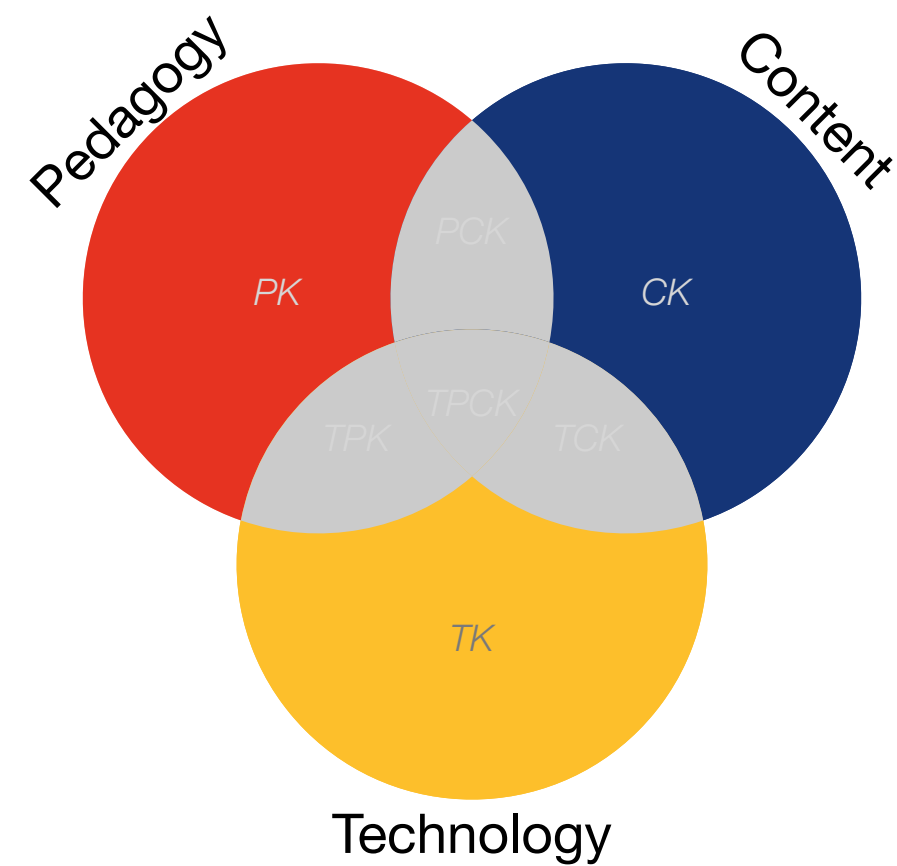
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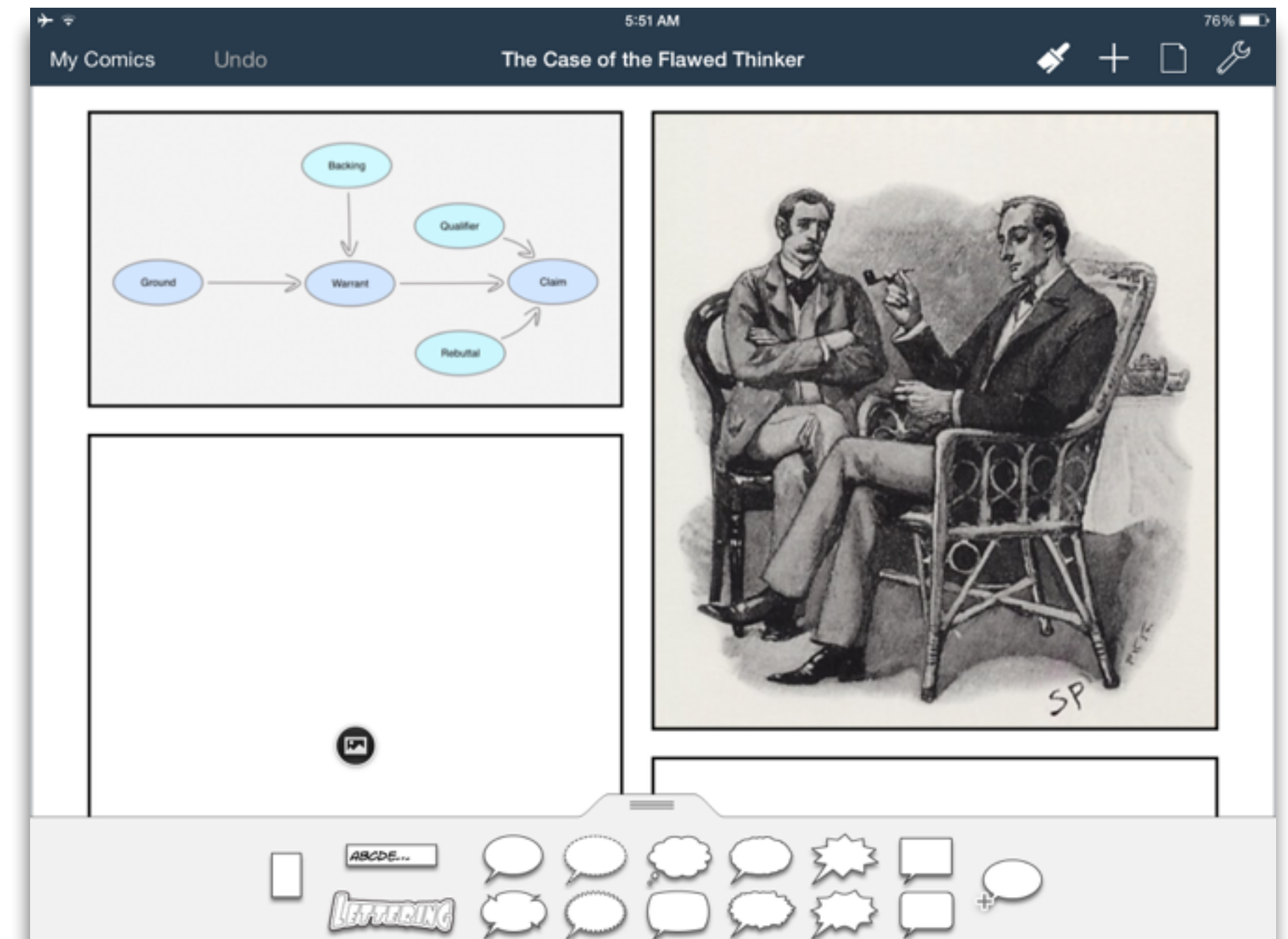
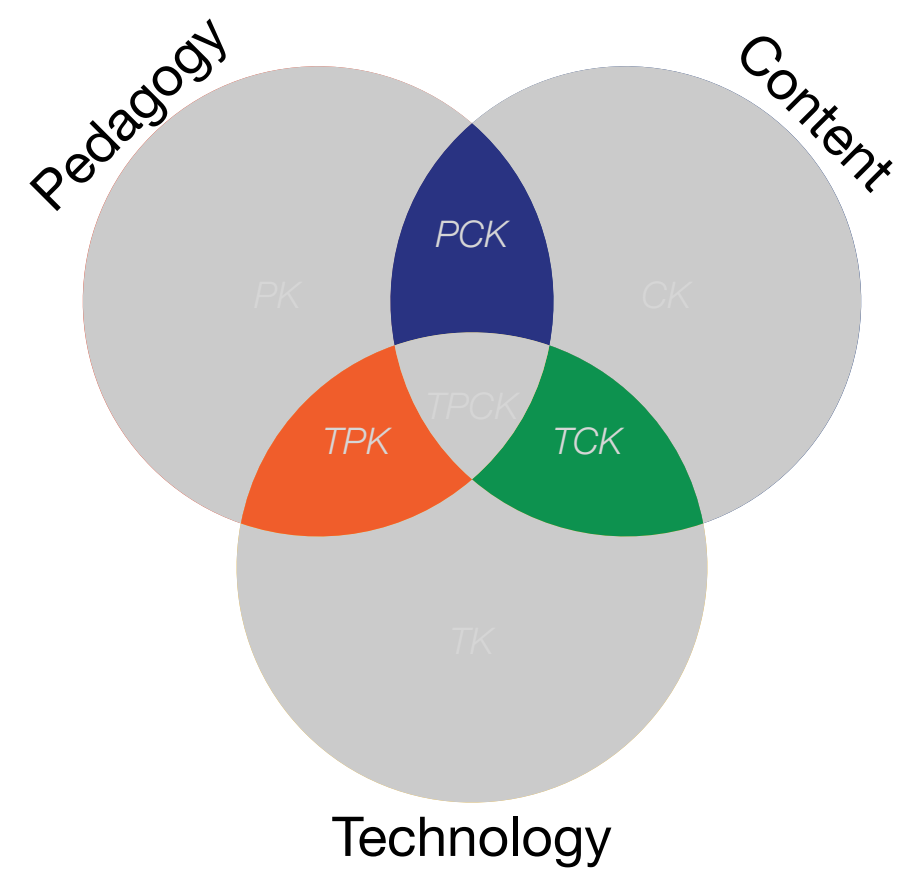
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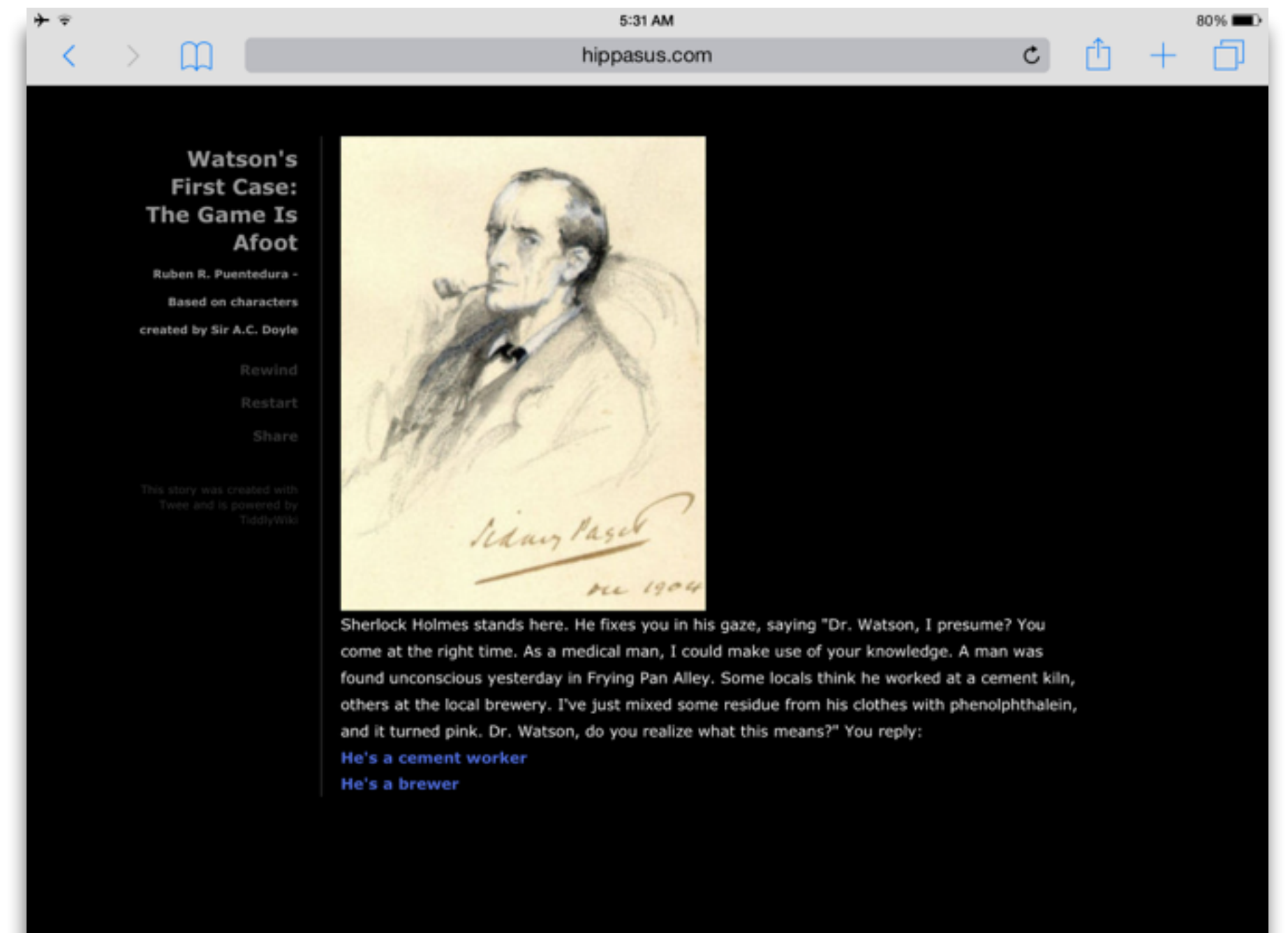
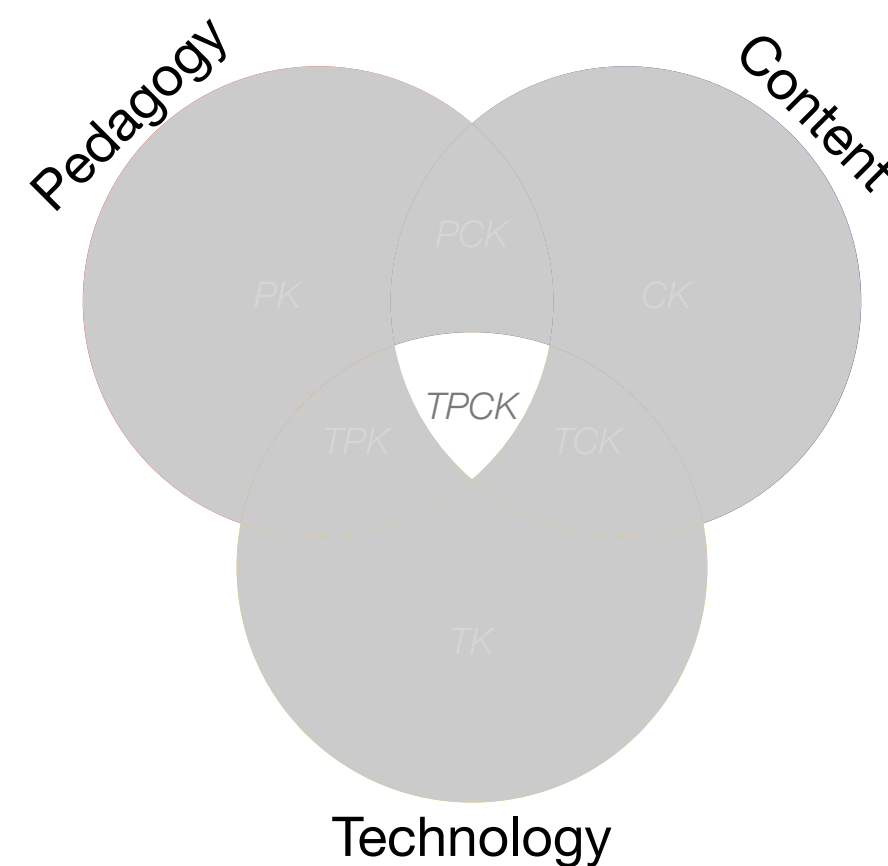
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# Shared Practices

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# Some Valuable S/A Shared Practices

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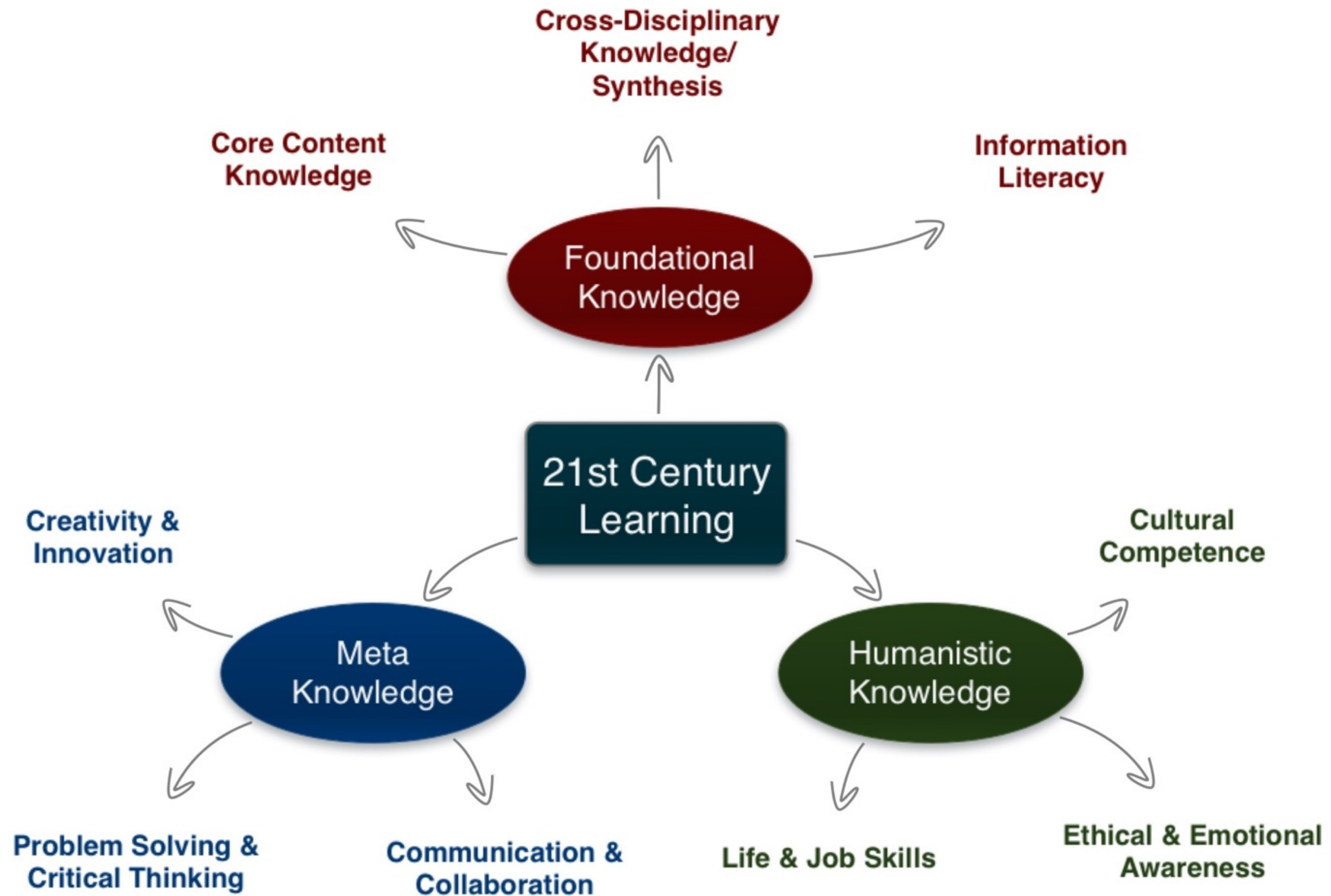
- Checklists
- Augmented Note Taking Strategies
- Flipped Classroom – Materials Creation
- Flipped Classroom – Peer Discussion/Instruction Methods
- Visualization Methods (5 Primary Domains)
- Simple Digital Storytelling Video
- LMS Practices








# Refraction

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



## The EdTech Quintet – Associated Practices




Social	Communication, Collaboration, Sharing
Mobility	Anytime, Anyplace Learning and Creation
Visualization	Making Abstract Concepts Tangible
Storytelling	Knowledge Integration and Transmission
Gaming	Feedback Loops and Formative Assessment



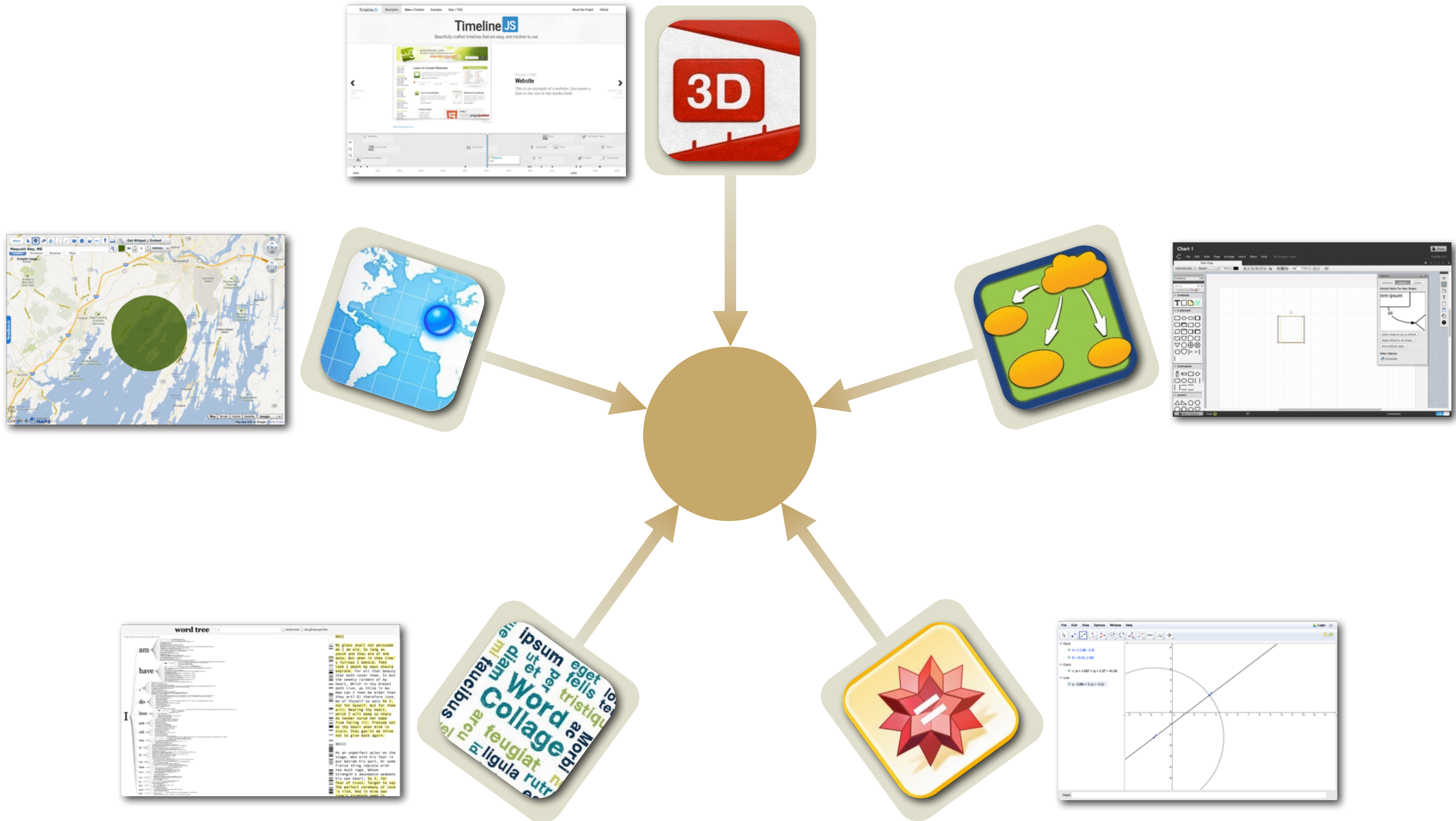
## Example 1: *Connecting the Dots*

Primary 21C Lens: Cross-Disciplinary Knowledge & Synthesis  
Primary Toolset Focus: Visualization

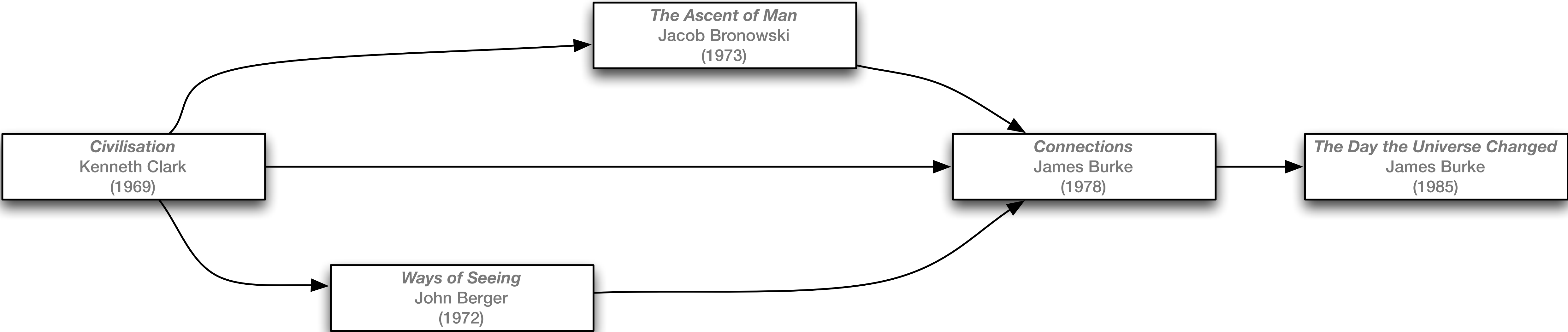


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## CONNECTIONS - # 4 FAITH IN NUMBERS

## "The Road Ahead"

**Contents**

Summary  
General Map  
Official Working  
Key points & questions

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## SUMMARY

- James Inghel, Science Editor
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- Why the computer and the biological sciences are essential
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# CRITICAL THINKING


- The solution to a problem can always be found from the lessons learnt in history, i.e. Fall of Roman Empire
- Advancement is inevitable in life. Changing scenarios change the requirements and lead to evolution
- Evolution is never planned; its impossible to plan, indeed
- The history shows, technical development has been a game of musical chairs; its always about the right timing and the right problem- if you have it, you move further! An Example - The Romans (worn out cloth in abundance; hammers to make paper)
- The book boom - expanded knowledge; the internet boom: knowledge everywhere- These innovations were on the same line, just very different in scale

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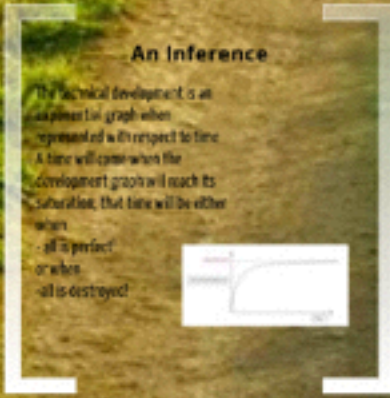

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## Mechanical Devices

**Electronic Circuit**  
This circuit is used to control the operation of the motor.  
It consists of a 555 timer, a 10k resistor, and a 100nF capacitor.

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## Fast Weaving & Spinning

**Introduction**

It is a pleasure to have you at the 2008 Textile Institute Conference and Exhibition. The Textile Institute is pleased to have you at the 2008 Textile Institute Conference and Exhibition.

**Registration**

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- Introduction**
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  - Why are they important?
- Key Components**
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  - Ownership and control
  - Exit strategies
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**Printing**

Interactograph  
with 600 dpi resolution

Resolution:  
300 dots per inch

Image  
resolution up to 600 dpi

Color  
CMYK color printing

[illegible][illegible]

## Download Client

**File Name:**  
C:\Program Files\Microsoft Office\Office12\Word\Word.exe  
**Size:** 10,987,654 bytes

**Version:**  
12.0.6605.5509  
**Platform:**  
x86

**Source:**  
Microsoft Office 12.0.6605.5509

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**Exercises:**

1.  $\frac{1}{2} + \frac{1}{3} = ?$
2.  $\frac{1}{4} + \frac{1}{5} = ?$
3.  $\frac{1}{6} + \frac{1}{7} = ?$
4.  $\frac{1}{8} + \frac{1}{9} = ?$
5.  $\frac{1}{10} + \frac{1}{11} = ?$
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**Exercises:**

1. Find the area of the triangle with vertices  $A(1, 2)$ ,  $B(4, 6)$ , and  $C(7, 2)$ .
2. Find the area of the triangle with vertices  $A(3, 4)$ ,  $B(6, 8)$ , and  $C(9, 4)$ .
3. Find the area of the triangle with vertices  $A(2, 5)$ ,  $B(5, 9)$ , and  $C(8, 5)$ .





## James Burke Connections Episode 4

Science historian [James Burke](#)'s ten part series *Connections* traces the progression of technology from ancient to modern times. According to Burke, every invention comes from putting the right pieces of already available technology together to build something new. By tracing the history of technology through a series of "triggers," each one of which sets off the next, Burke demonstrates how technology is an interconnected web and how one seemingly unrelated innovation leads to another.

### Episode Overview

The fourth episode of *Connections* shows us how Europeans transitioned from the [Middle Ages](#) to the [Renaissance](#). When the Roman Empire fell, Western civilization was once again splintered; people were not sharing ideas or striving for knowledge as they once had. However, increased commercialism and international markets, which originated shortly before the onset of the [plague](#) and later flourished when survivors were made rich with inheritances, fueled international communication. The invention of the printing press eased the spread of knowledge to set off a revolution of innovation and chain of invention.

### Jump to Episode

1. [The Trigger Effect](#)
2. [Death in the Morning](#)
3. [Distant Voices](#)
4. [Faith in Numbers](#)
5. [The Wheel of Fortune](#)

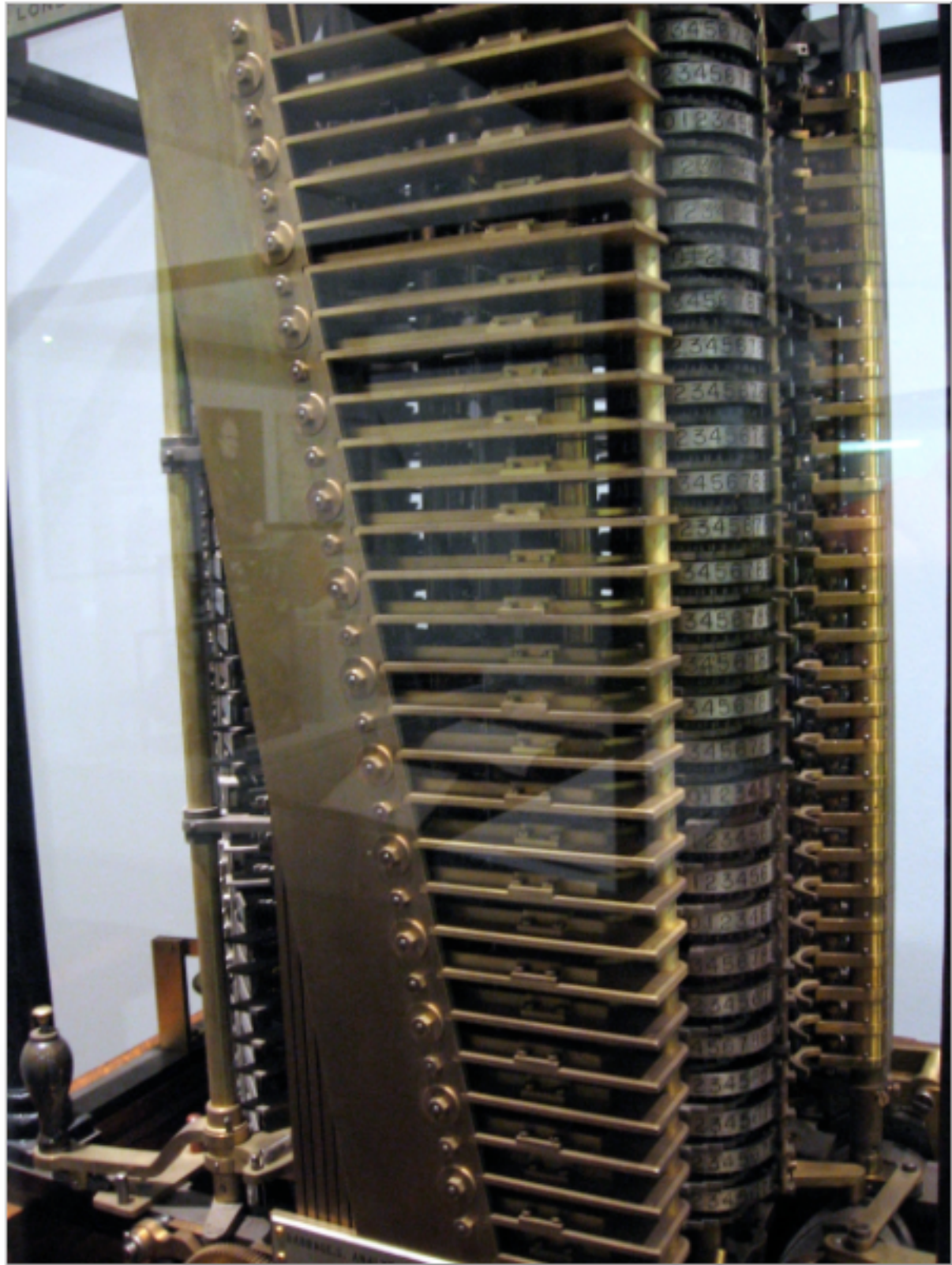
### Fast Facts

Fact:	Written and presented by James Burke
Fact:	Directed by Mick Jackson
Episode length	50 minutes
Fact:	First aired in 1978
Network	<a href="#">BBC</a>
Fact:	Shot at over 150 locations in 19 countries <sup>1</sup>

### Recommended For You

[James Burke](#)





By [Marcin Wichary](#) via Wikimedia Commons

This modern model of the Analytical Engine is housed at the Science Museum in London.

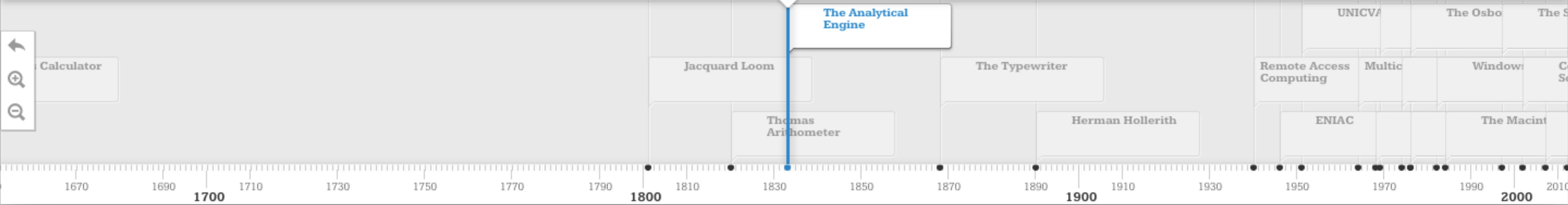
1833

# *The Analytical Engine*

Charles Babbage designed but was never able to produce a working model but it is significant in that it relied upon punched cards for data and programs and would employ a language similar to modern assembly language complete with loops and conditional branching (for the nerds out there).

1868

The Typewriter






storymap.knightlab.com

StoryMap JSCreateGigapixelAdvancedExamplesHelp

Map OverviewBack To Beginning ↶



President of the the United political crisis. ment, and

Lynchburg

Wikipedia

Hillsboro

Leesburg

New Vienna


Greenfield

Frankfort

Bainbrid

Waverly

Pike



41st & 42nd Congress newly elected

# 1870: FINALLY COUNTING EVERYONE

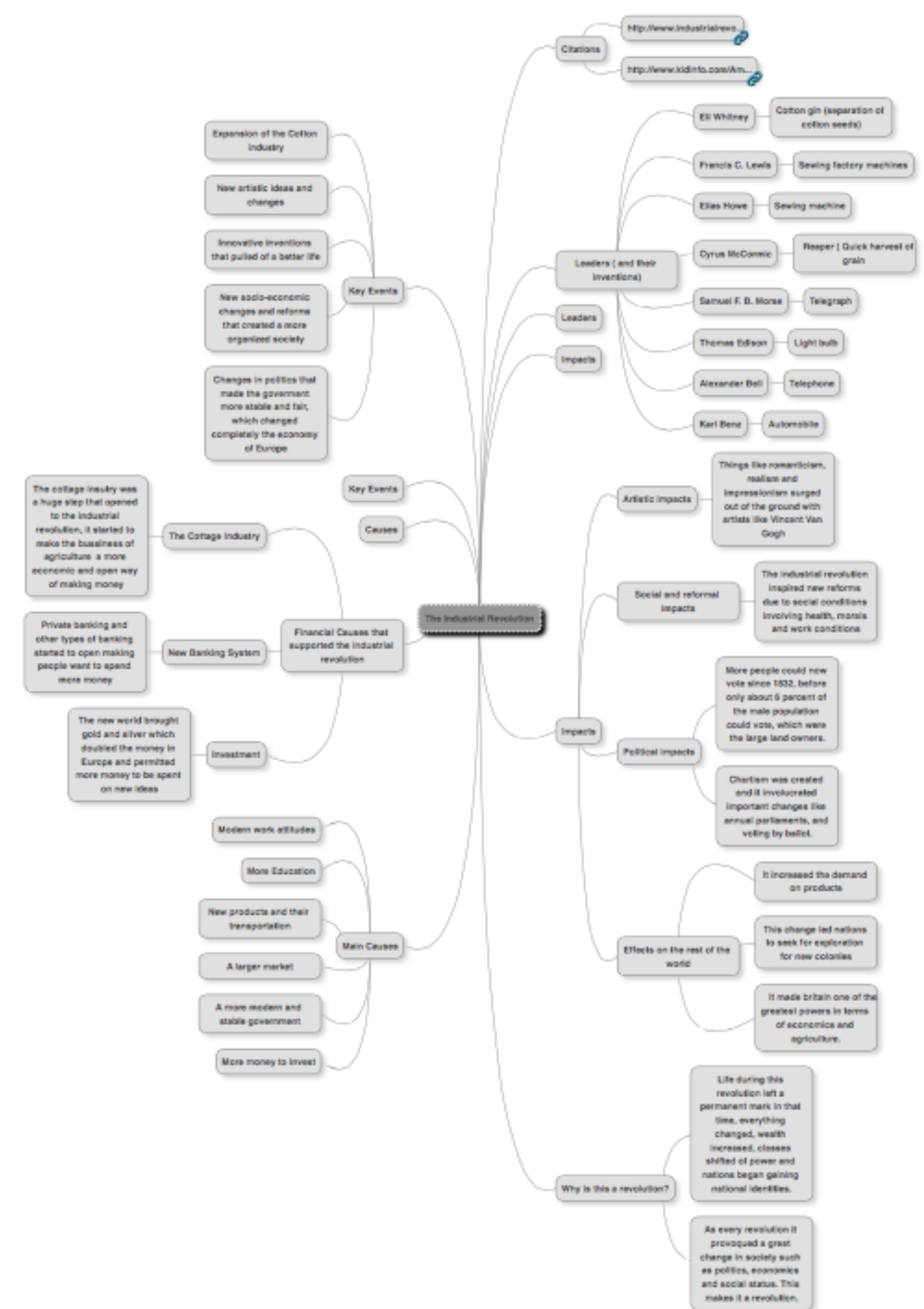
This census was the first to record the names and other personal information of all African-Americans, including those who were formerly enslaved. In researching your African-American ancestors, moving backward from the present, the 1870 federal census may be the last census in which you are able to identify these ancestors by name. The 1870 census often even serves as a powerful tool in identifying former slave owners, a necessary step for anyone desiring to reclaim the heritage of their enslaved ancestors.

examiner

Waverly

Pike







Example 2: *All the News That's Fit to Print (and Read, and Write...)*

Primary 21C Lens: Information Literacy  
Primary Toolset Focus: Social Media



# Nicholas Lemann - The Journalistic Method

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- Awareness
- Forming a hypothesis
- Mapping the discourse
- Evaluating the data
- Transparency



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Bookmarks



RSS Feeds

Discussions



Microblogging

Blogging



Wikis

Telepresence



File Sharing



# Ingredients

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- [Google](#), [Google Translate](#), [Google Scholar](#)
- [Newseum](#), [Global Voices](#), [FiveThirtyEight](#)
- [Twitter](#), [Flickr](#), [YouTube](#)
- [Hashtagify](#), [Media Meter Dashboard](#)
- [Diigo](#), [WordPress](#)



# Two Challenges

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1. S/A: Use the resources listed to either:
  - find out more about a current event, or
  - find a network of resources related to a topic of interest, focused on a current event
2. A/M: Create an account on WordPress.com, and share with others what you found out in 1. by creating a series of posts that embed some of the materials you found (e.g. tweets) to tell a story.
  - WordPress will take care of the embedding for you if you use HTML mode, and post the URL of e.g. the tweet on a line by itself: <https://en.support.wordpress.com/twitter/twitter-embeds/>
  - (Optional) After you're done, let others know what you've created by posting a tweet with an agreed-upon hashtag



# Aspirational Goals

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# Build Molecule

## Status

rubenrp  
webmo  
unlimited  
unlimited  
0 jobs

## Progress

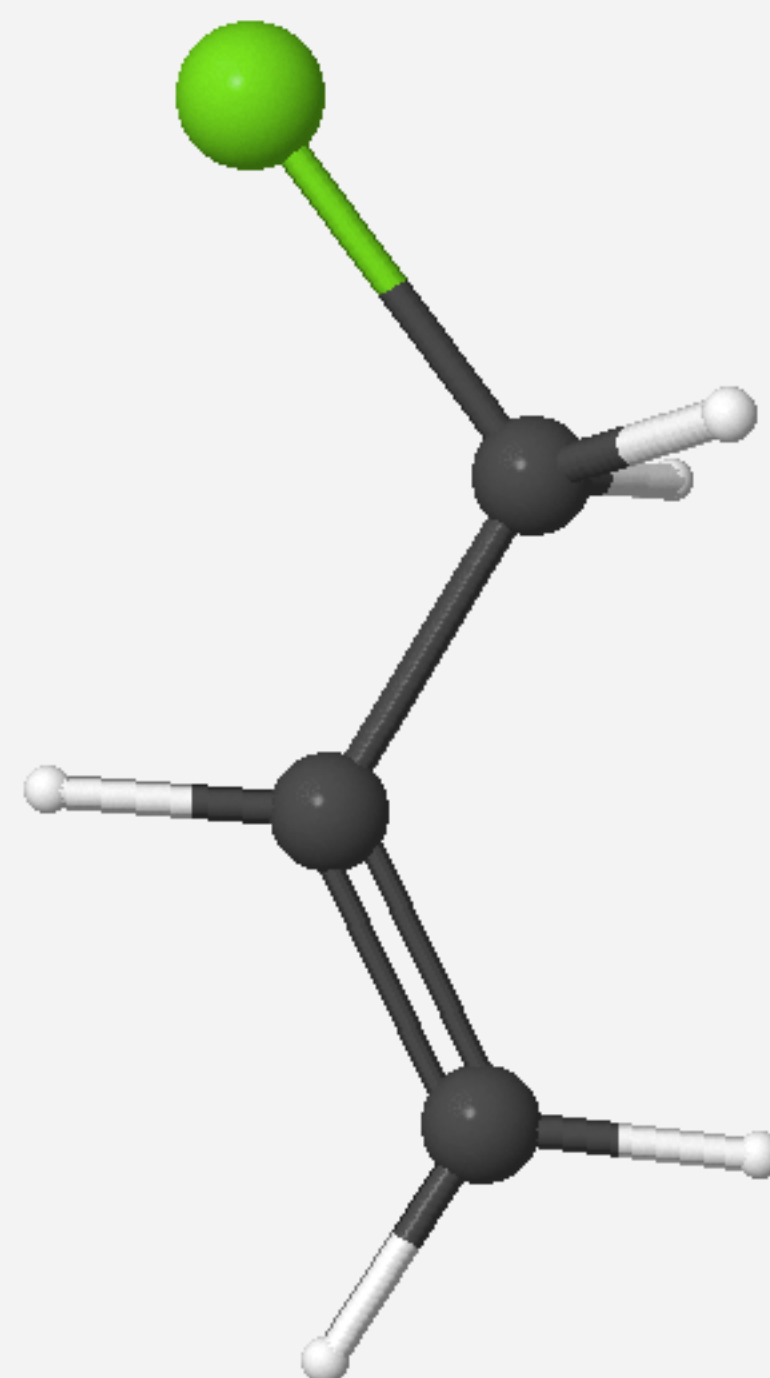
- [Job manager](#)
- **Build molecule**

Build a new molecule using the WebMO editor, or [import](#) an existing molecule from a file. Additionally, you can [export](#) the molecule to a variety of file formats.

- [Choose engine](#)
- [Job options](#)
- [Submit job](#)

[Editor help](#)

File Edit Tools View Build Adjust Clean-Up Calculate Help



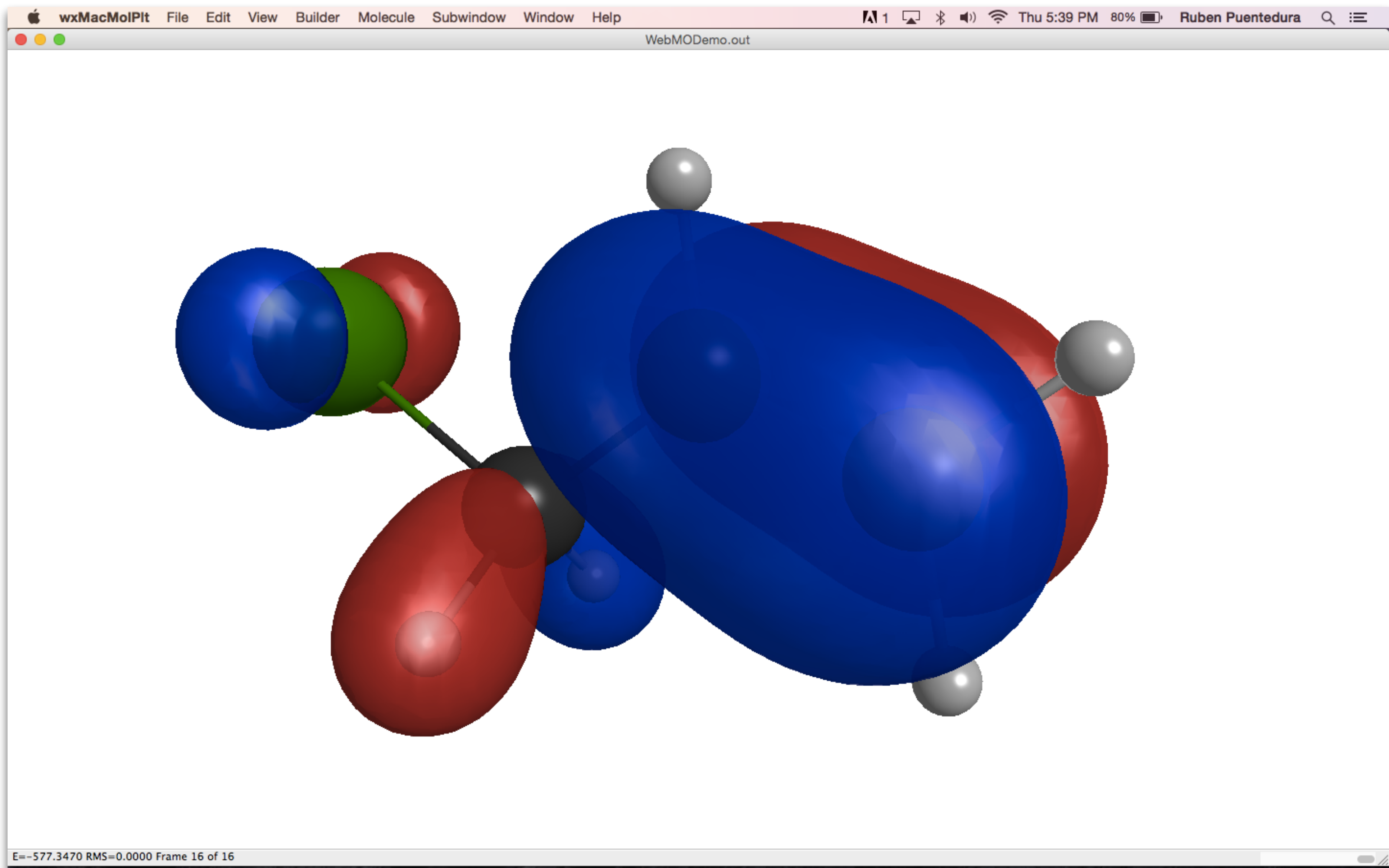
View Mode – Zoom (drag up = bigger; drag down = smaller)

[Lookup Molecule](#) [Import Molecule](#) [Export Molecule](#)

---Select Database---

[Open...](#)







ibm.com

IBM Watson


What is Watson?

Use Watson ▾

Build with Watson ▾


About Watson ▾

| IBM.com




Say hello to Watson


Meet IBM Watson, a cognitive system that enables a new partnership between people and computers that enhances, scales and accelerates human expertise.



Transform clinical trial matching  
with cognitive computing



Try out Chef Watson



Watson, now learning Japanese

Explore Watson  
▼

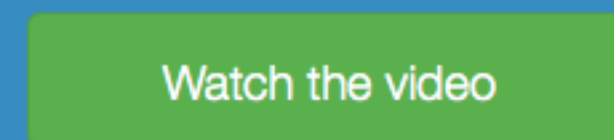






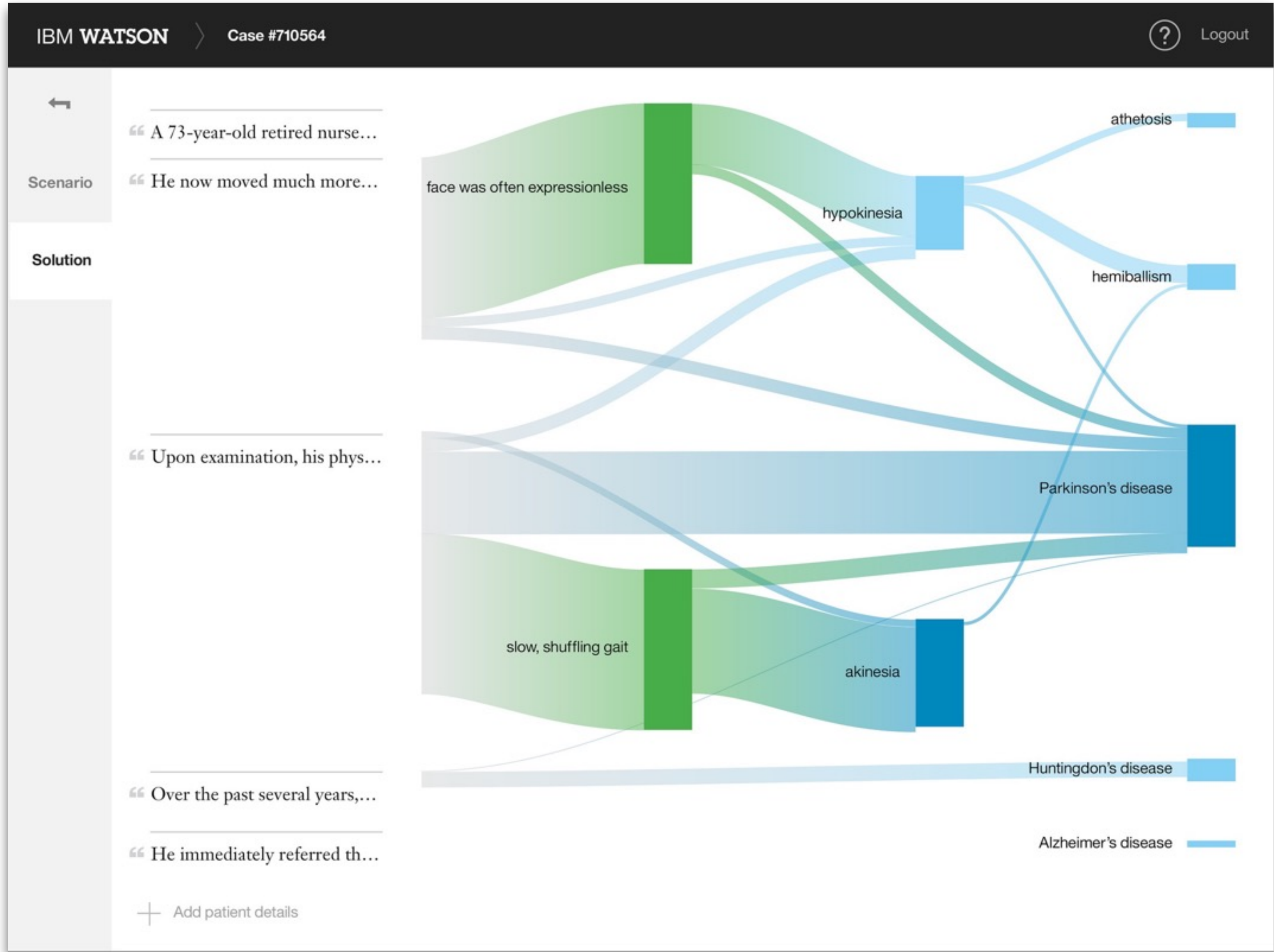


Watch the video





# IBM Research – WatsonPaths





# Assessment

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# Black and Wiliam: Defining Formative Assessment

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“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.”



# Wiliam: A Framework for Formative Assessment

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	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 instructional resources for one another	
Learner	Understanding learning intentions and criteria for success	5 Activating students as the owners of their own learning	



# Traditional Rubric Design

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	Advanced	Proficient	Basic	Below Basic
Topic	Topic is clear	Topic is generally clear	Topic is vague	Topic is unclear
Focus	Demonstrates focus on topic	Minor lapses in focus on topic	Major lapses in focus on topic	Fails to demonstrate focus on topic
...	...	...	...	...



	Advanced	Proficient	Basic	Below Basic
Pretty noises	Has multiple pretty noises	Has only one pretty noise	No pretty noises	Bad, bad, ugly noises
Photos	Lots of colorful photos	One colorful photo	No colorful photos	Ugly, drab photos
(Oh yeah, we'll get to why they created this - eventually...)	...	...	...	...



# Example: A Rubric for Concept Maps

(Shuman *et al.*, 2004)

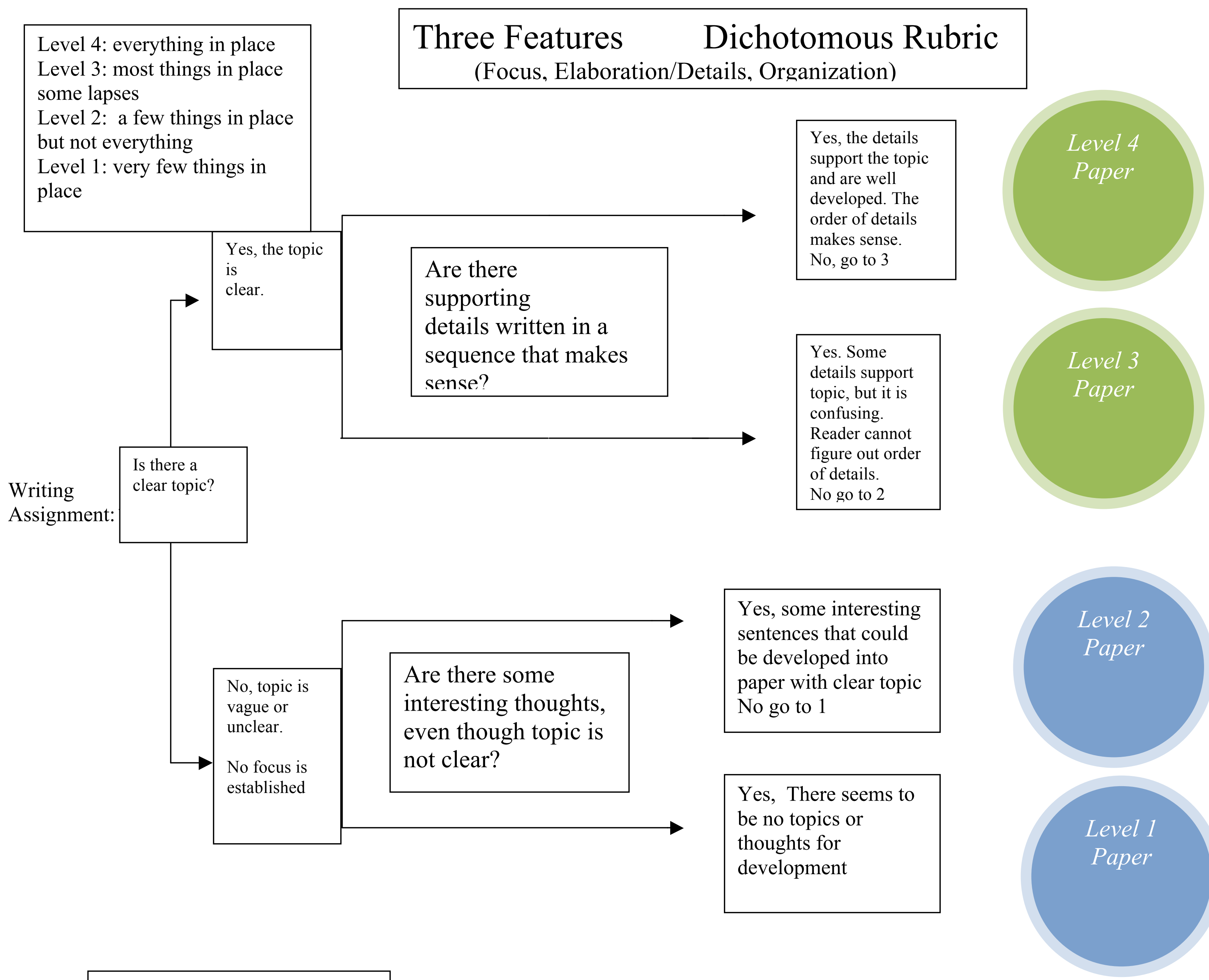
	<i>1</i>	<i>2</i>	<i>3</i>
<i>Comprehensiveness</i> – covering completely/broadly	The map lacks subject definition; the knowledge is very simple and/or limited. Limited breadth of concepts (i.e. minimal coverage of coursework, little or no mention of employment, and/or lifelong learning). The map barely covers some of the qualities of the subject area.	The map has adequate subject definition but knowledge is limited in some areas (i.e., much of the coursework is mentioned but one or two of the main aspects are missing). Map suggests a somewhat narrow understanding of the subject matter.	The map completely defines the subject area. The content lacks no more than one extension area (i.e., most of the relevant extension areas including lifelong learning, employment, people, etc. are mentioned).
<i>Organization</i> – to arrange by systematic planning and united effort	The map is arranged with concepts only linearly connected. There are few (or no) connections within/between the branches. Concepts are not well integrated.	The map has adequate organization with some within/between branch connections. Some, but not complete, integration of branches is apparent. A few feedback loops may exist.	The map is well organized with concept integration and the use of feedback loops. Sophisticated branch structure and connectivity.
<i>Correctness</i> - conforming to or agreeing with fact, logic, or known truth	The map is naïve and contains misconceptions about the subject area; inappropriate words or terms are used. The map documents an inaccurate understanding of certain subject matter.	The map has few subject matter inaccuracies; most links are correct. There may be a few spelling and grammatical errors.	The map integrates concepts properly and reflects an accurate understanding of subject matter meaning little or no misconceptions, spelling/grammatical errors.



# Example: A Rubric for Sociology Online Discussion (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 <i>significantly</i> 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.



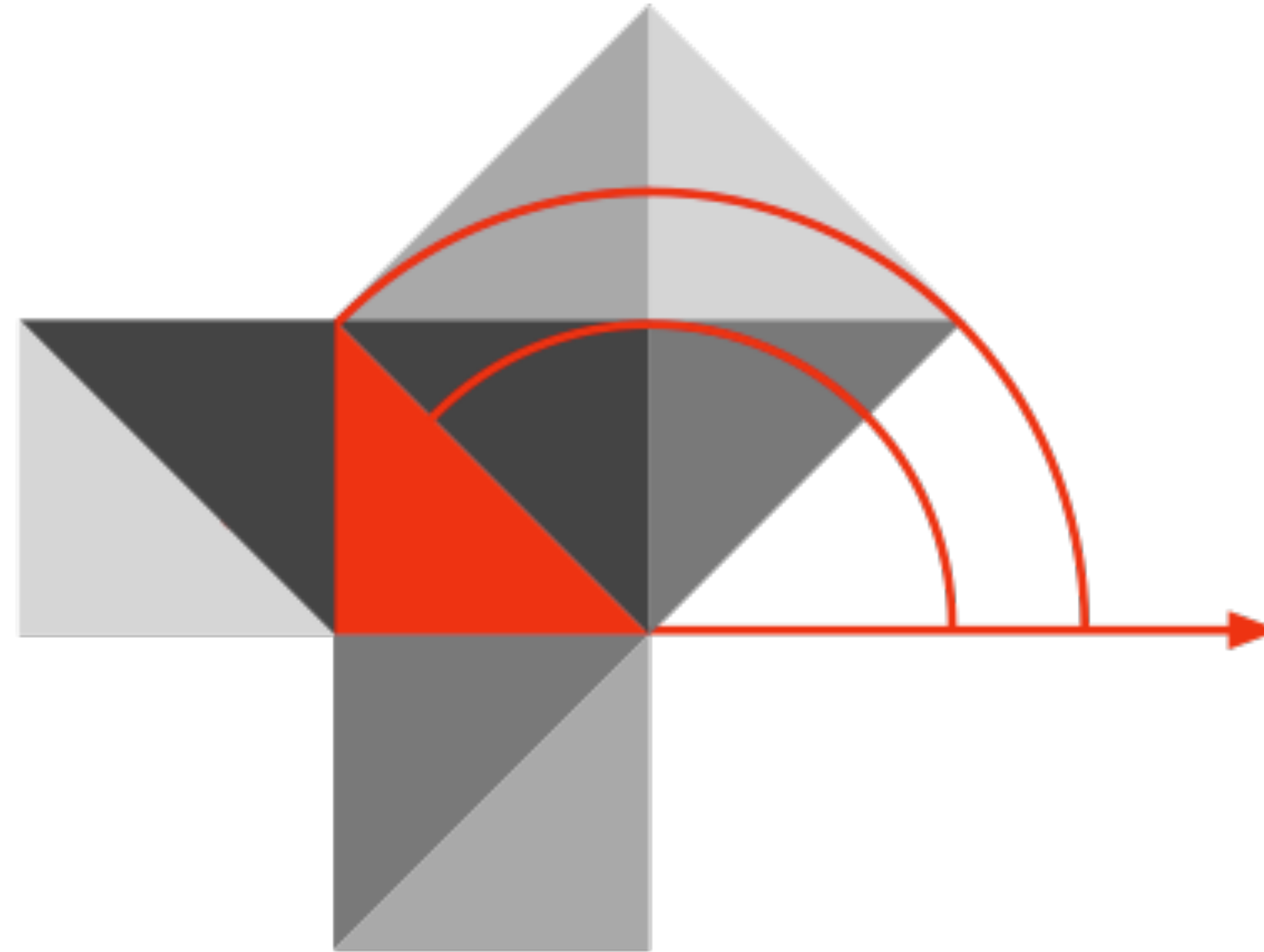


Developed by Vickie Hedrick



# Hippasus

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Blog: <http://hippasus.com/blog/>  
Email: [rubenrp@hippasus.com](mailto:rubenrp@hippasus.com)  
Twitter: @rubenrp

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