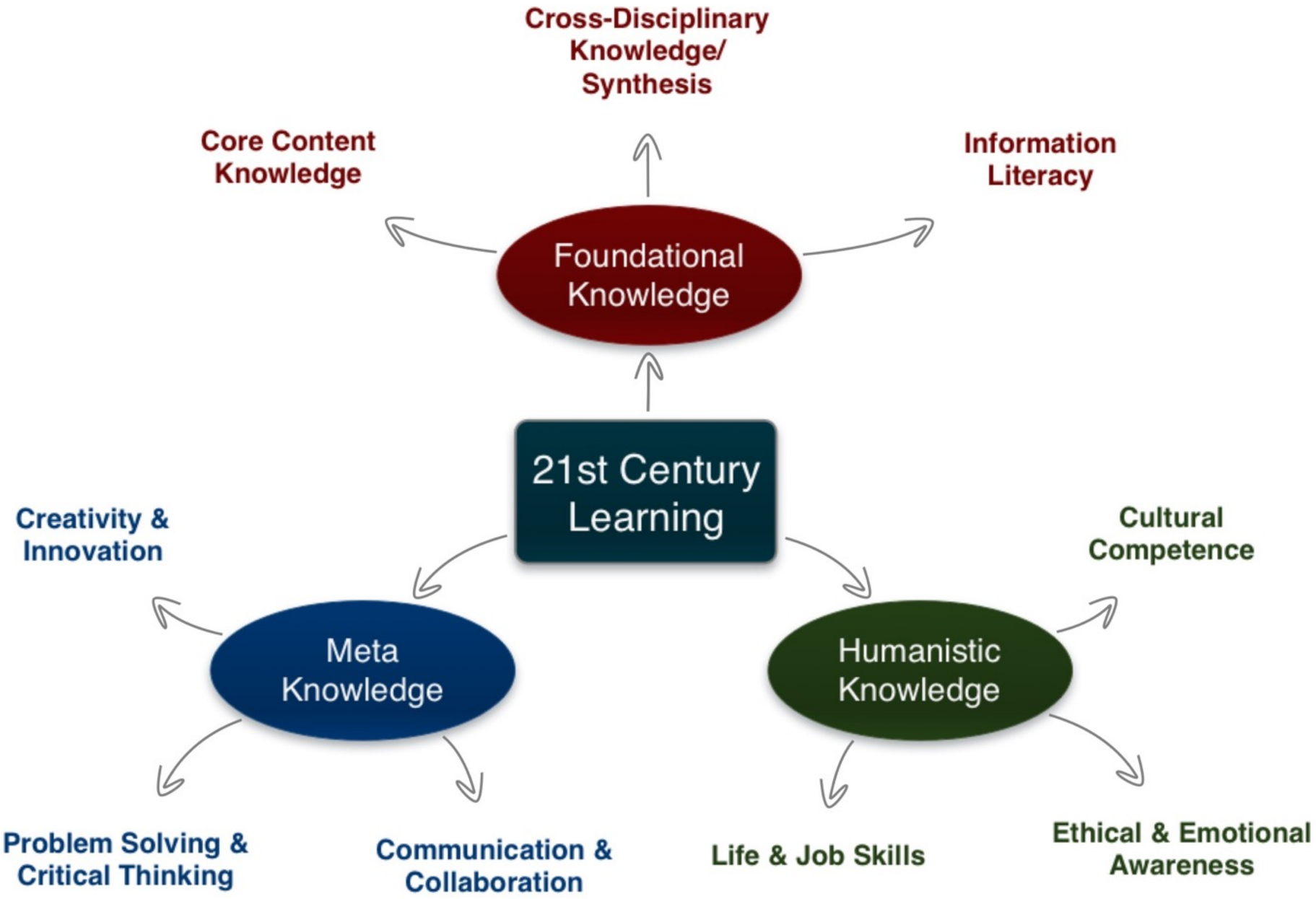
Designing for Assessment: SAMR, TPCK, and the EdTech Quintet

Ruben R. Puentedura, Ph.D.

Part 1: SAMR, TPCK, and the EdTech Quintet



Kristen Kereluik, Punya Mishra, Chris Fahnoe, and Laura Terry, “What Knowledge Is of Most Worth: Teacher Knowledge for 21st Century Learning”. *Journal of Digital Learning in Teacher Education (29)* 4 (2013)

Redefinition

Tech allows for the creation of new tasks, previously inconceivable

Modification

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Transformation

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Substitution

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Enhancement

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

ART & DESIGN

At the Museum of London, the City That Sherlock Holmes Knew

By ROSLYN SULCAS FEB. 9, 2015

LONDON — A riveting exhibition here at the Museum of London has capitalized on the full-blown Sherlockmania that seems to have seized the Western world, judging by a new spate of movies, television shows and books.

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

Unexpectedly, the show, "Sherlock Holmes: The Man Who Never Lived and Will Never Die," which has drawn record numbers to the museum and continues until April 12, does not focus on the stories about Holmes or his creator, Arthur Conan Doyle, though an opening section shows some early notebooks and illustrations as well as a rare portrait of the author in his 30s.

"We deliberately didn't want to make it a text- and manuscript-heavy library exhibition," said Alex Werner, the lead curator. "It's about the character, and although I had a bit of trepidation about putting on an exhibition about a fictional being, we tried to set him firmly against the real city of London in which the stories take place."

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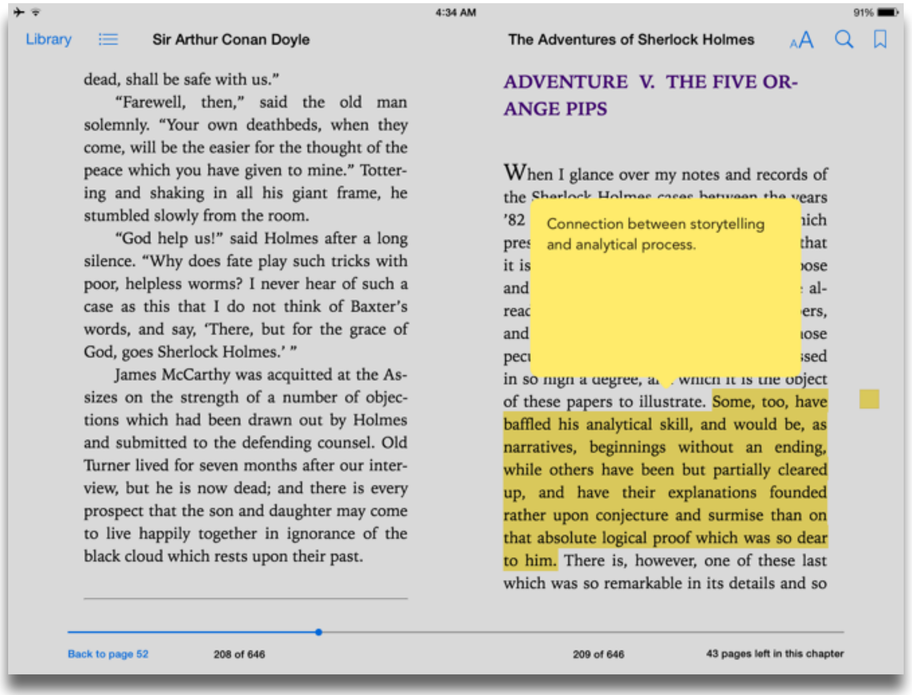

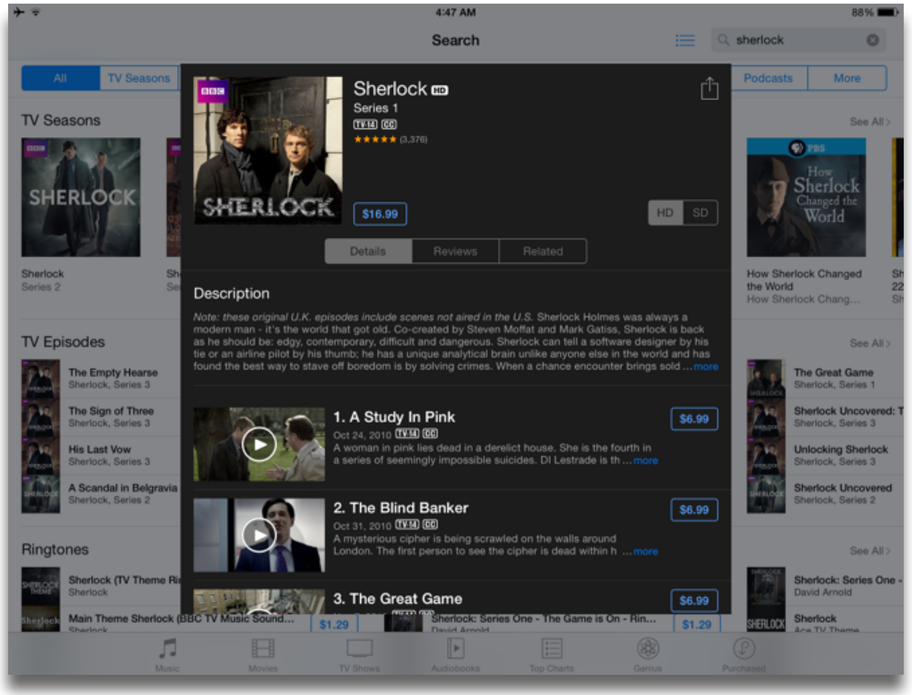

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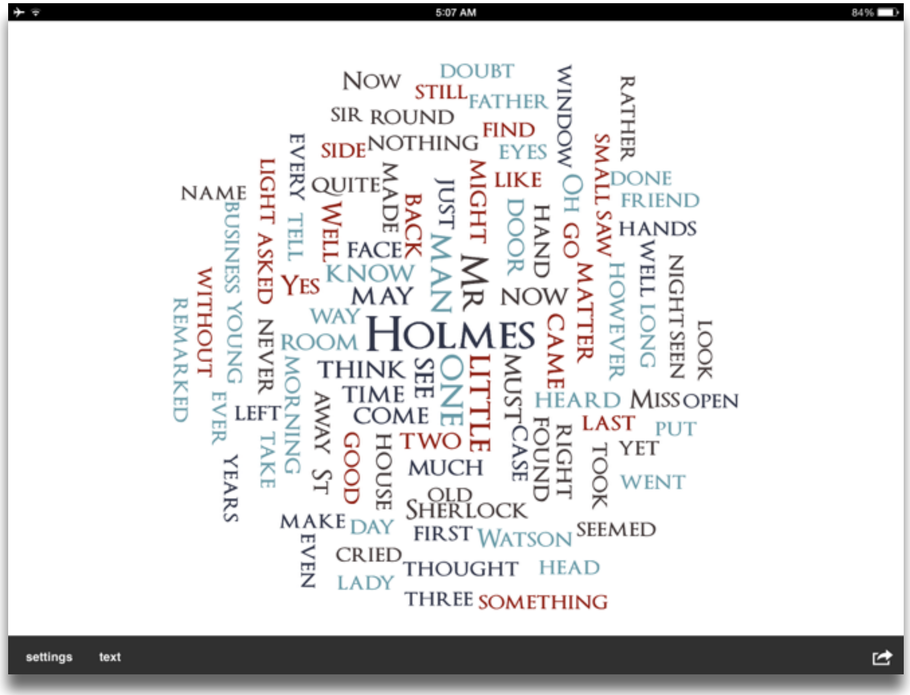

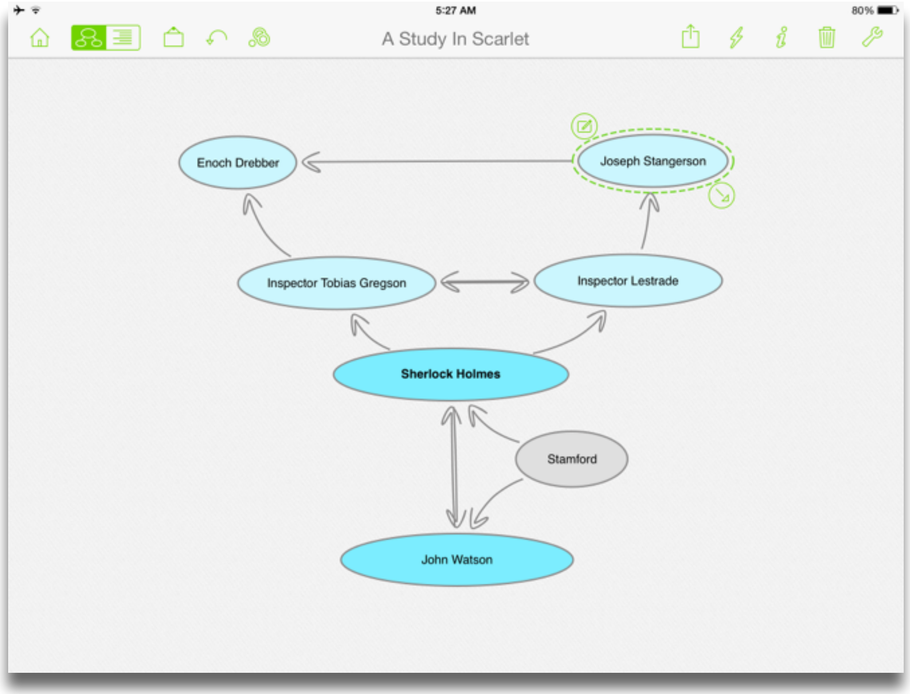

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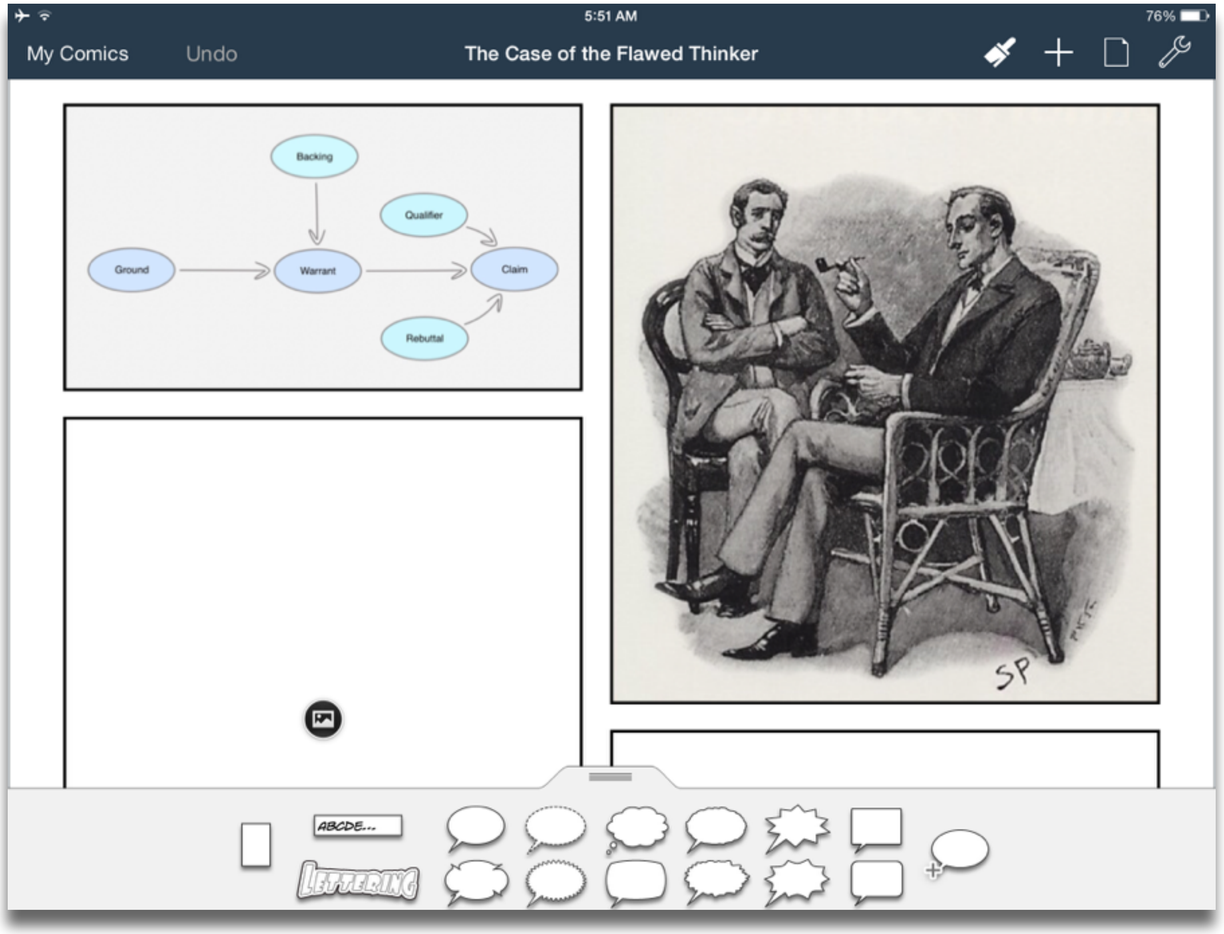

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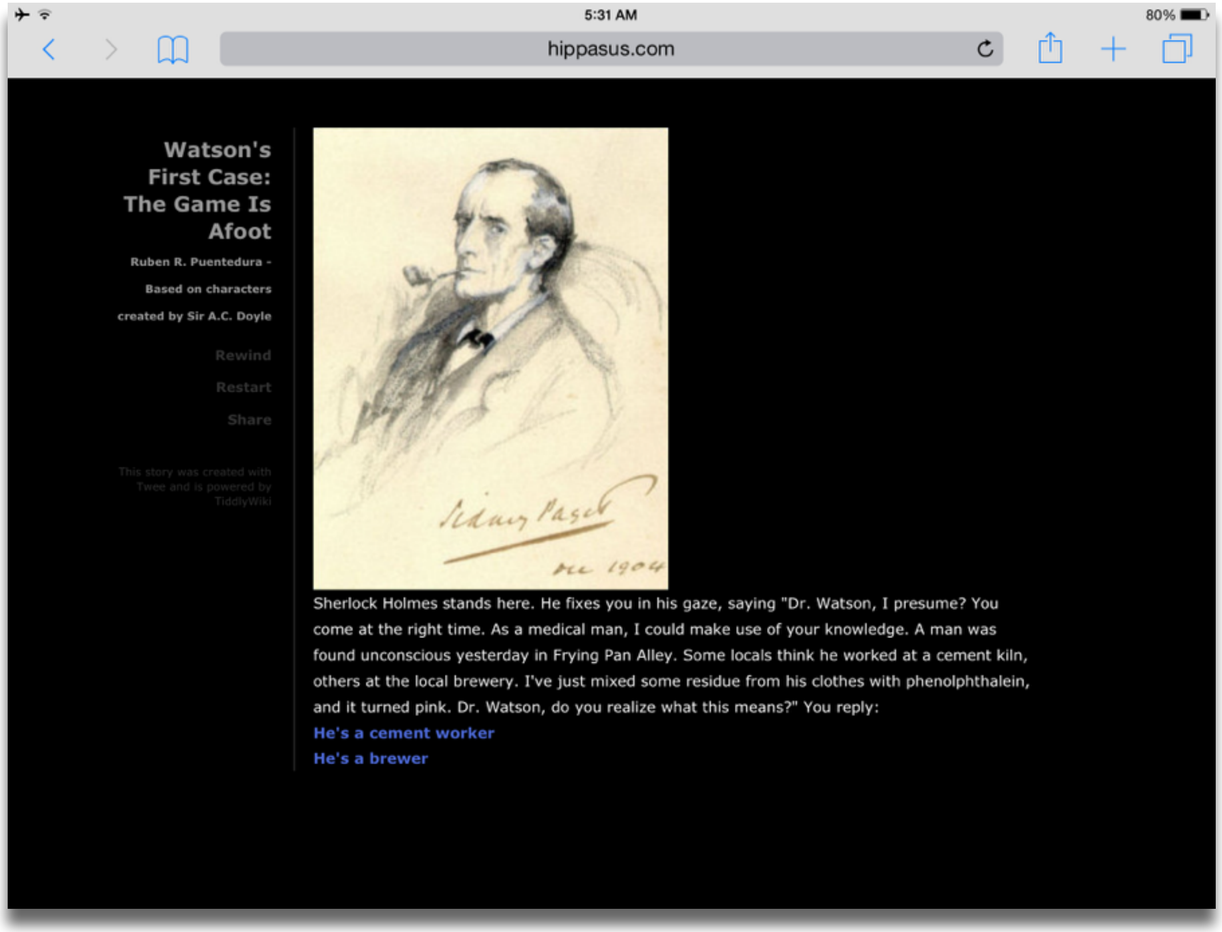
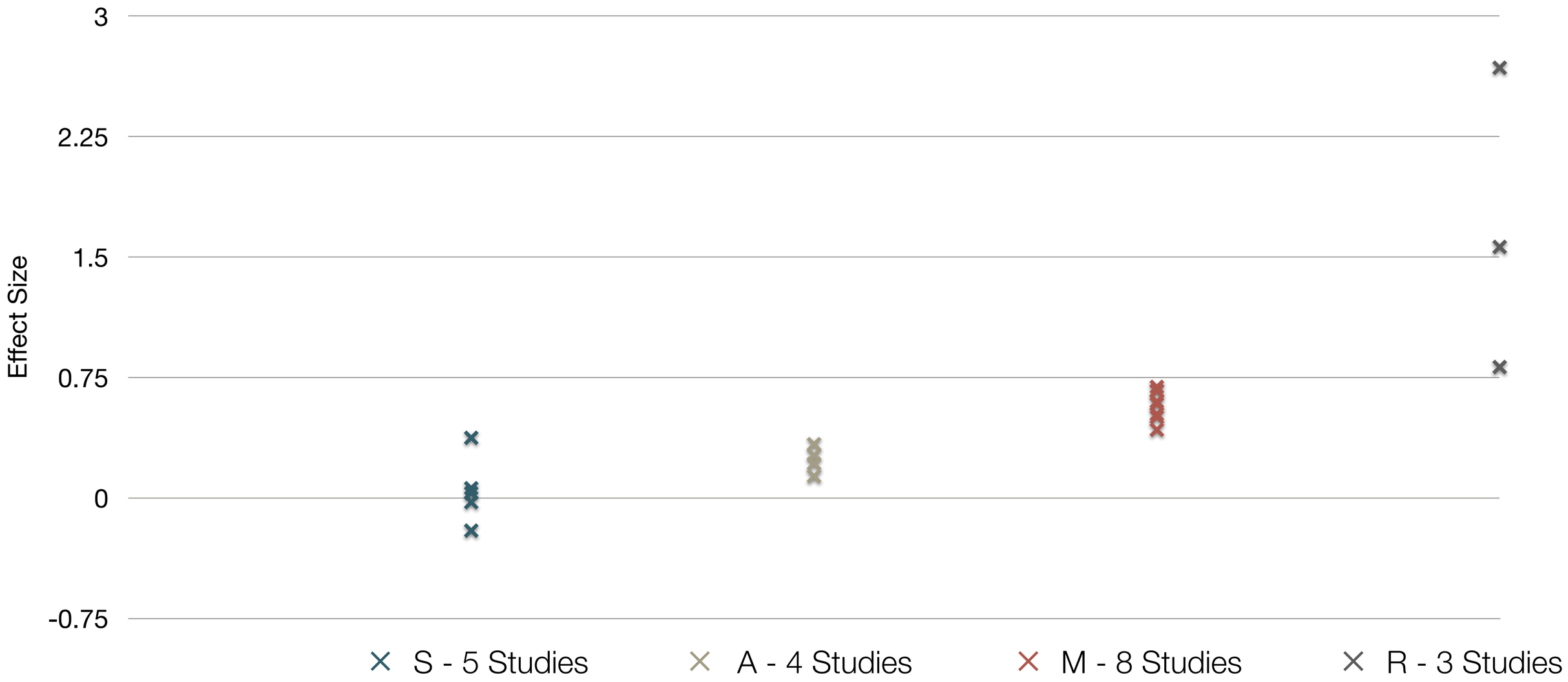


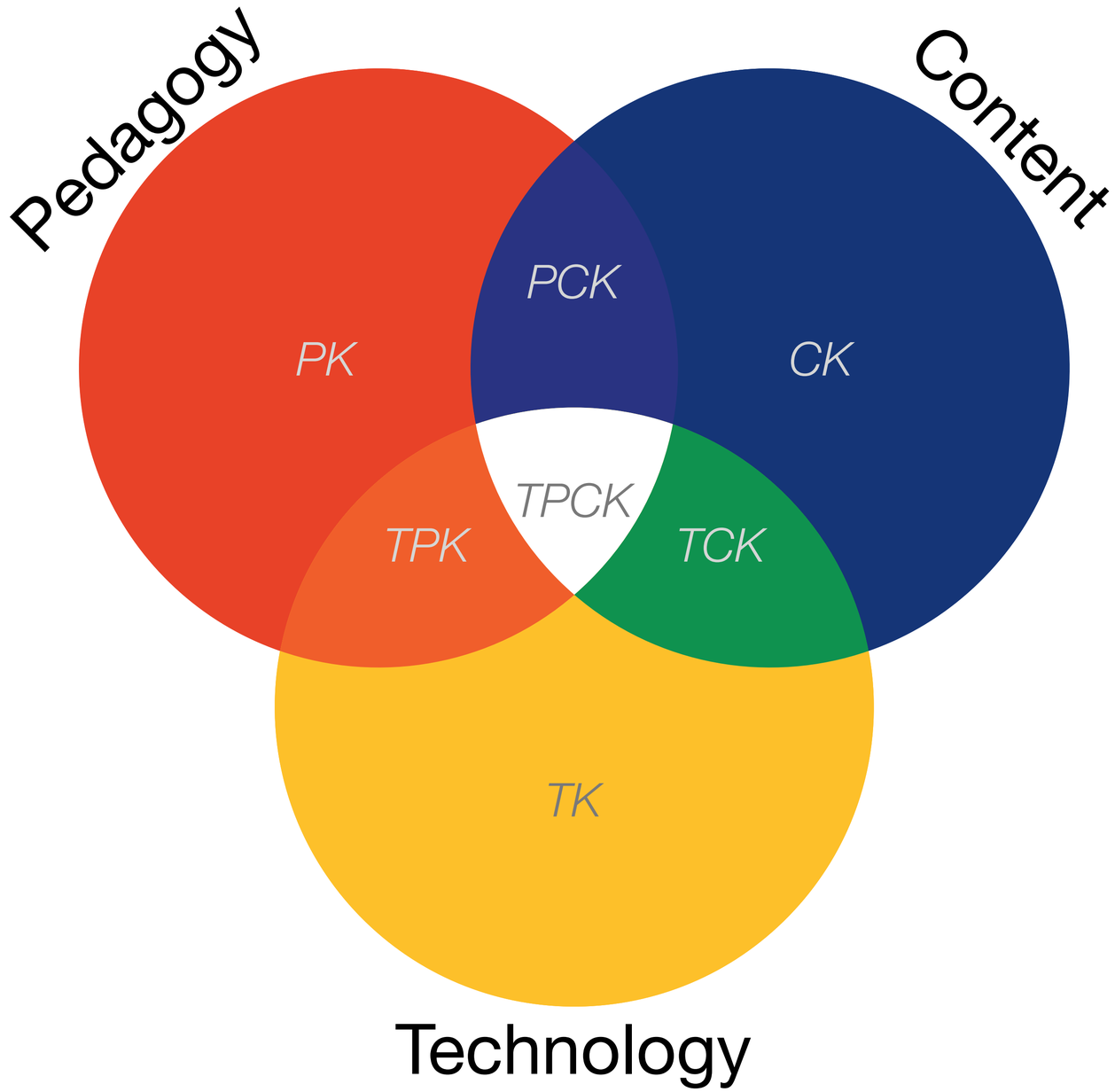
Meta-analysis	Number of studies	*ES* type	Mean *ES*	*SE*
Bangert-Drowns (1993)	19	Missing	0.27	0.11
Bayraktar (2000)	42	Cohen's *d*	0.27	0.05
Blok, Oostdam, Otter, and Overmaat (2002)	25	Hedges's *g*	0.25	0.06
Christmann and Badgett (2000)	16	Missing	0.13	0.05
Fletcher-Flinn and Gravatt (1995)	120	Glass's Δ	0.24	0.05
Goldberg, Russell, 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 Δ	0.30	0.03
Y. C. Liao (1998)	31	Glass's Δ	0.48	0.05
Y.-I. Liao and Chen (2005)	21	Glass's Δ	0.52	0.05
Y. K. C. Liao (2007)	52	Glass's Δ	0.55	0.05
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*	0.49[a]	0.11
Roblyer, Castine, and King (1988)	35	Hedges's *g*	0.31	0.05
Rosen and Salomon (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*[a]	0.26[a]	0.05
Timmerman and Kruepke (2006)	114	Pearson's *r*[a]	0.24	0.03
Torgerson and Elbourne (2002)	5	Cohen's *d*	0.37	0.16
Waxman, Lin, and Michko (2003)	42	Glass's Δ	0.45	0.14
Yaakub (1998)	20	Glass's Δ and *g*	0.35	0.05
Zhao (2003)	9	Hedges's *g*	1.12	0.26

a. Converted to Cohen's *d*.

Tamim, Rana M., Robert M. Bernard, Eugene Borokhovski, Philip C. Abrami, and Richard F. Schmid. "What forty years of research says about the impact of technology on learning a second-order meta-analysis and validation study." *Review of Educational Research 81*, no. 1 (2011): 4-28.



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).



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

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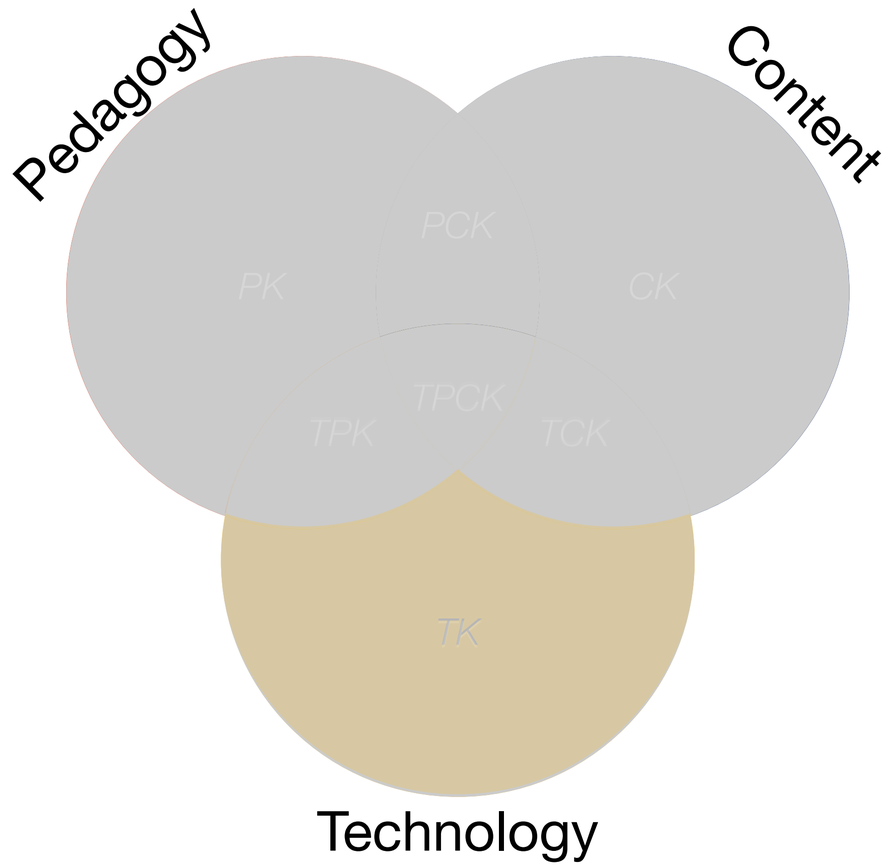

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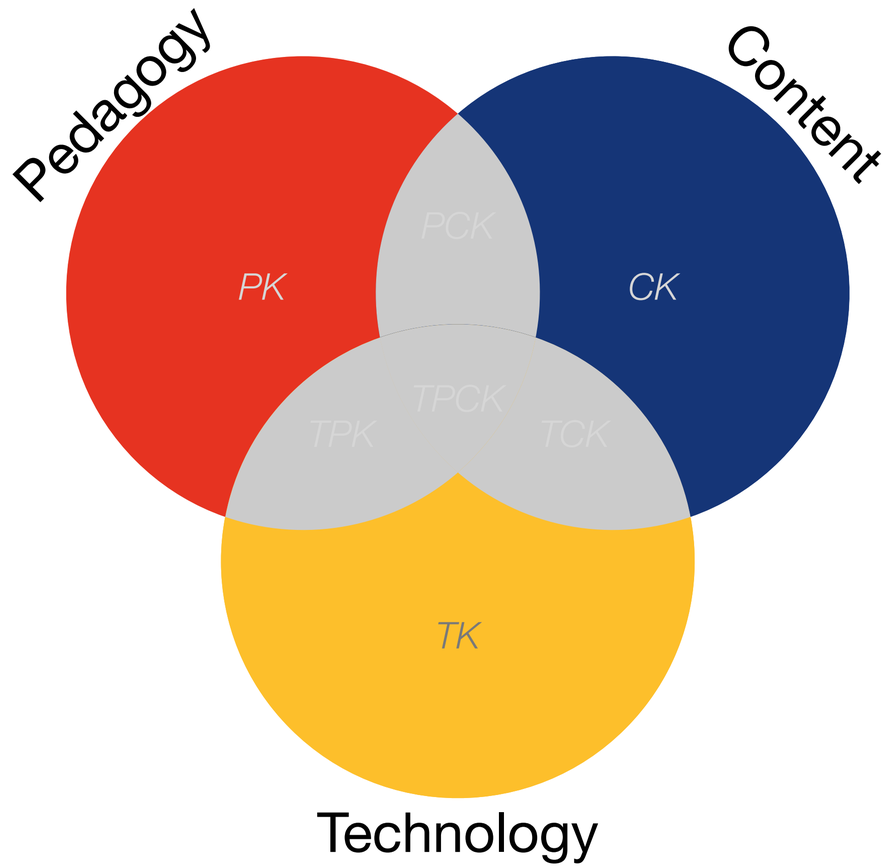

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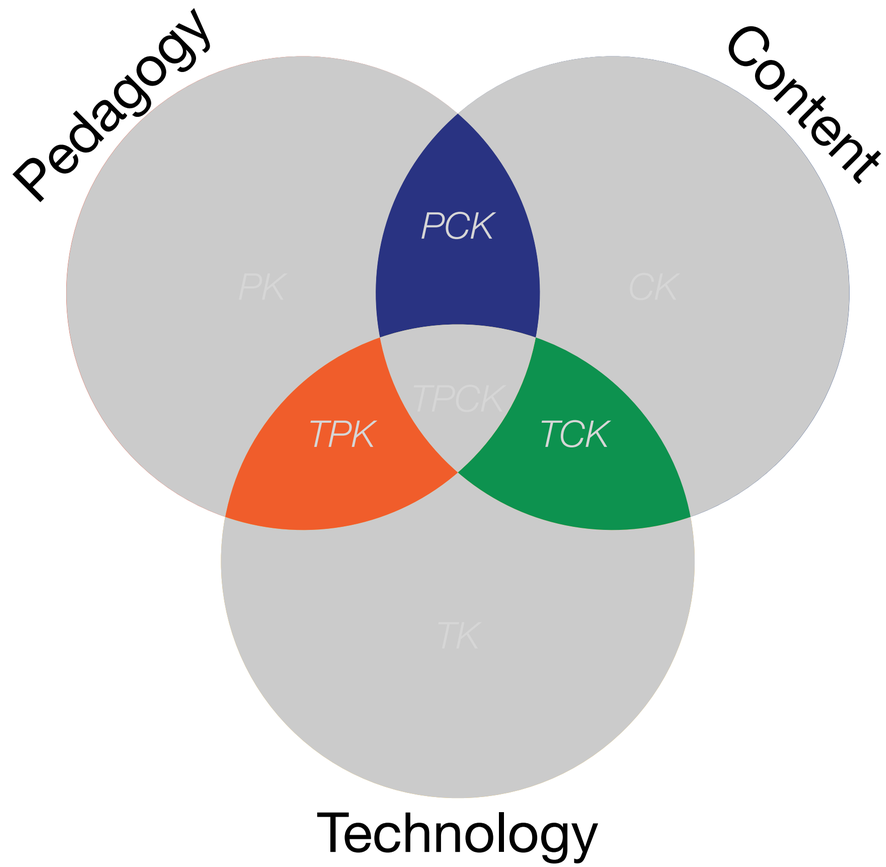

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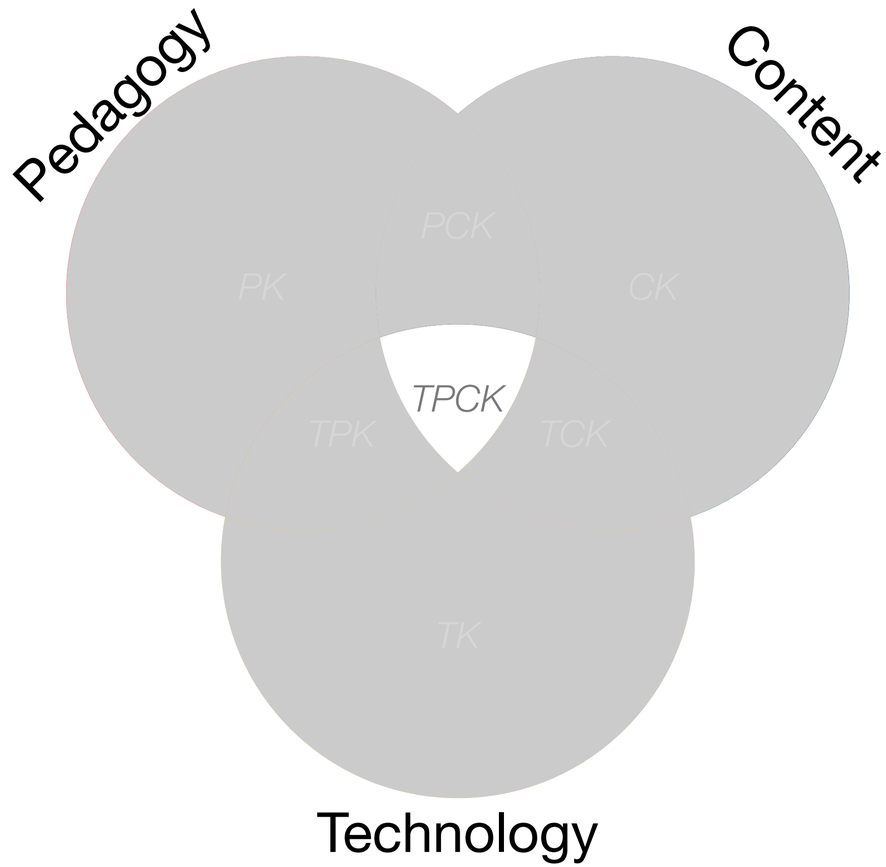
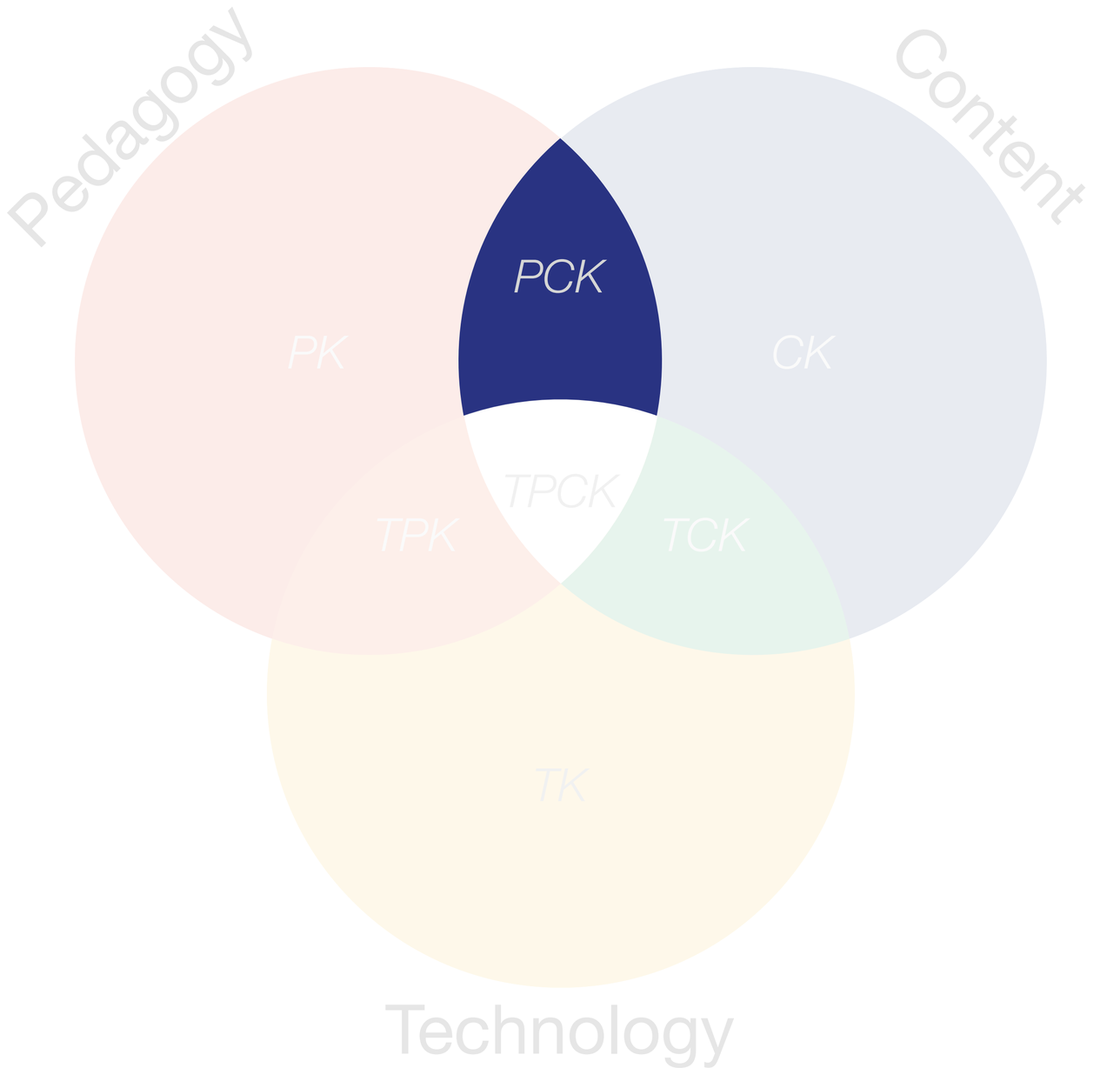
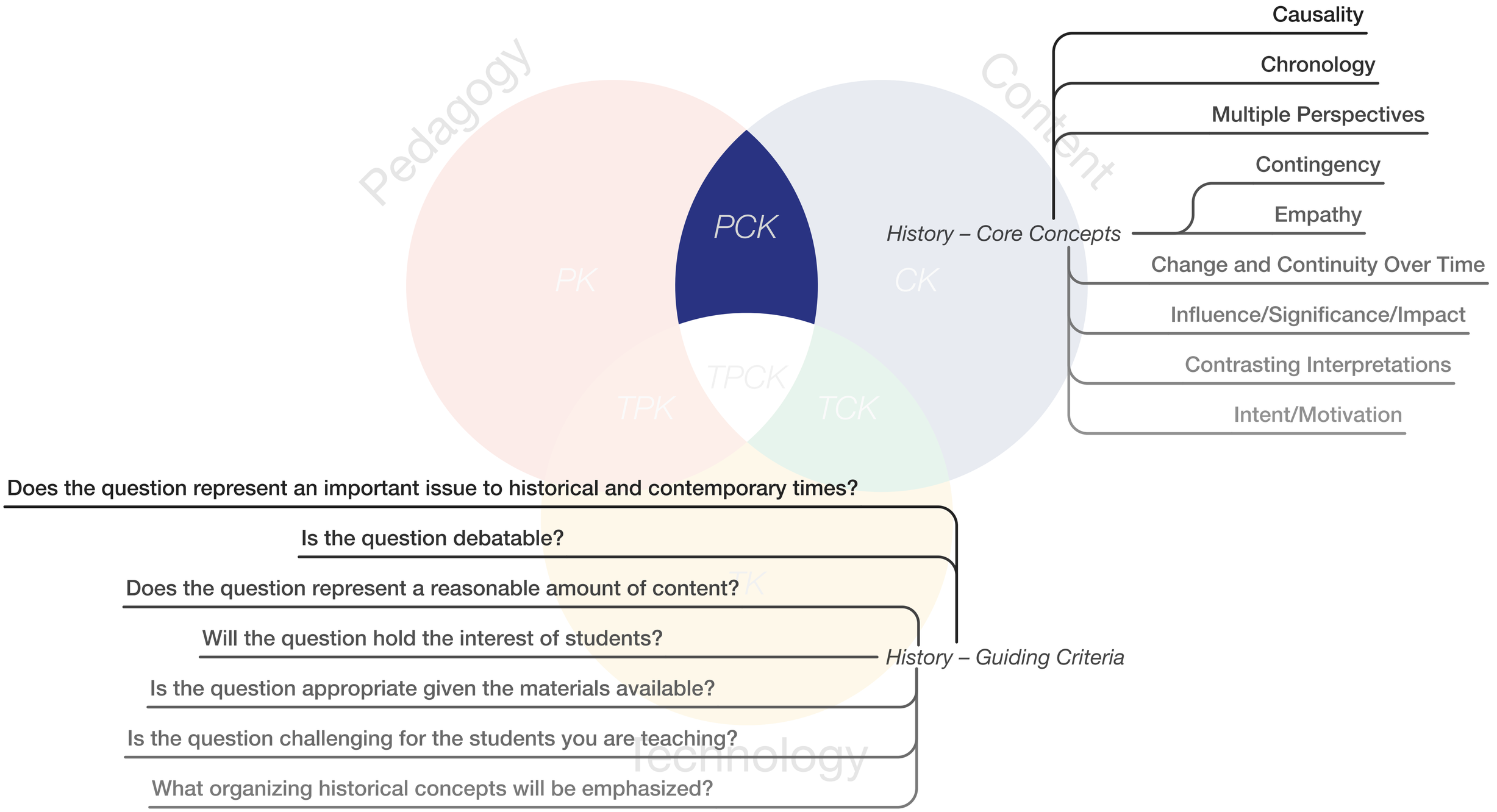




Lee S. Shulman, "Those Who Understand: Knowledge Growth in Teaching." *Educational Researcher*, Vol. 15, No. 2 (Feb., 1986)



Bruce Lesh. ''*Why Won't You Just Tell Us the Answer?*'' *Teaching Historical Thinking in Grades 7-12*. Stenhouse Publishers. (2011)

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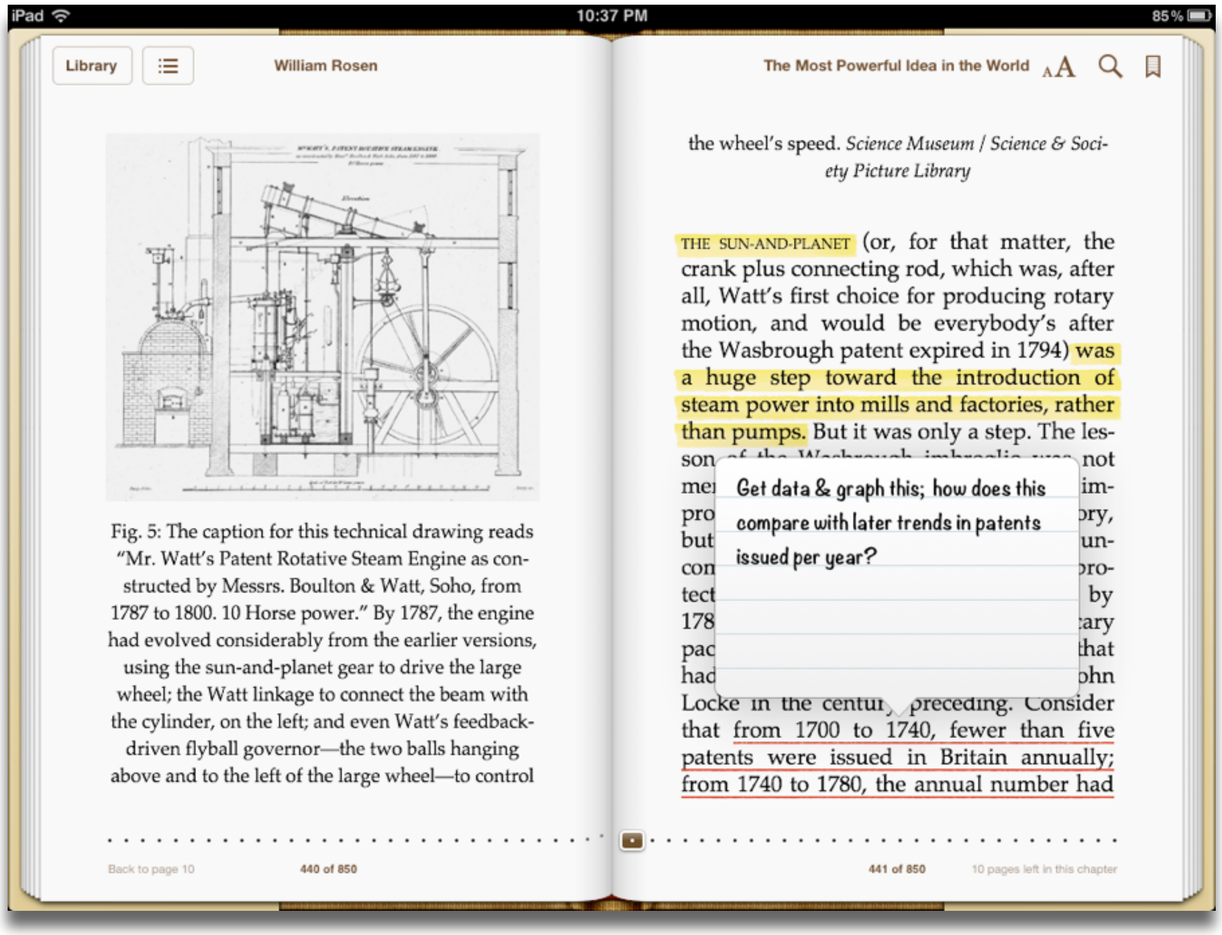

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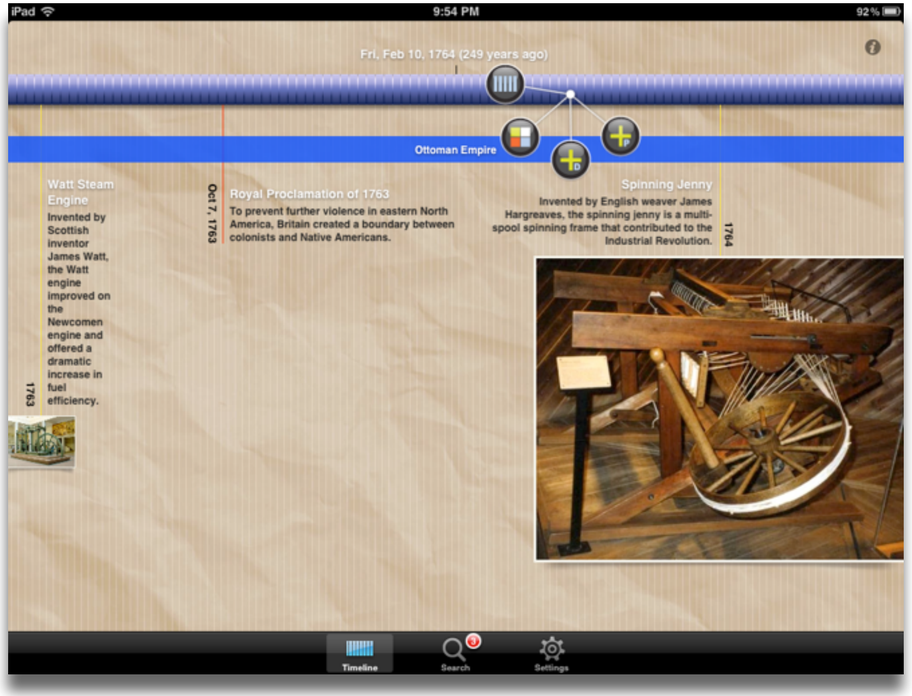

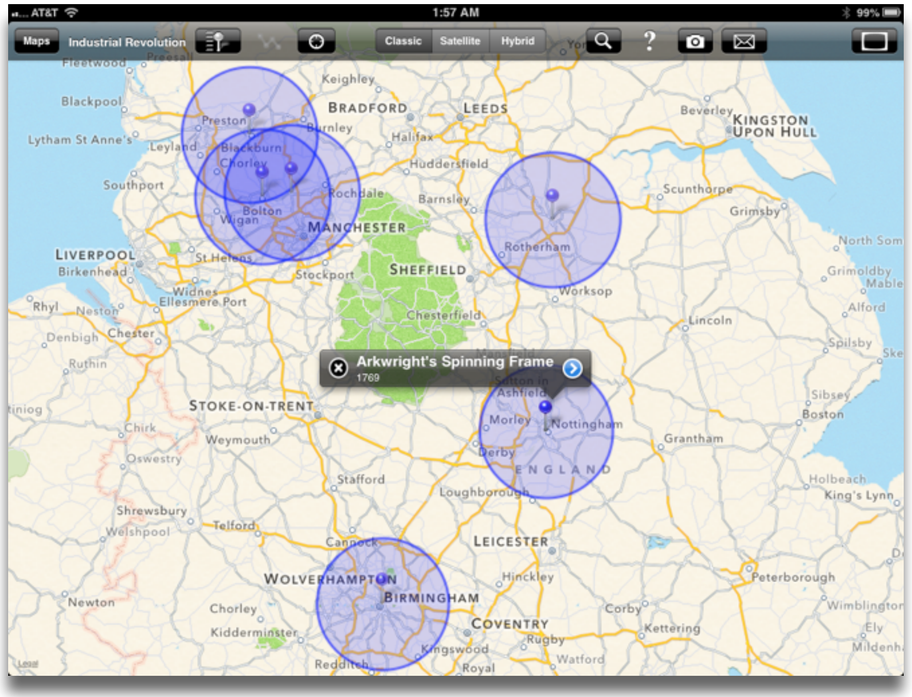

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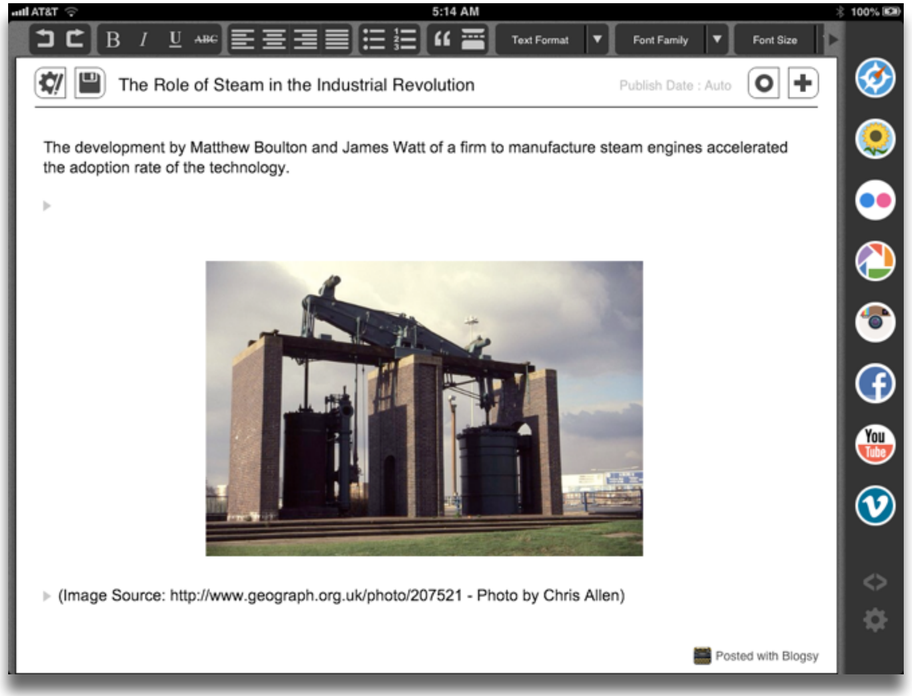

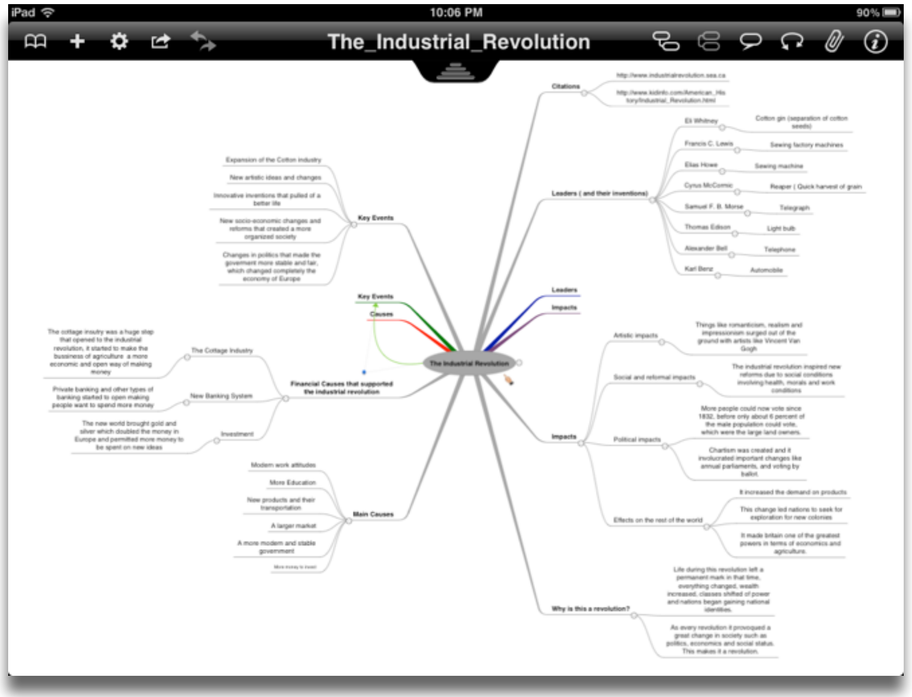

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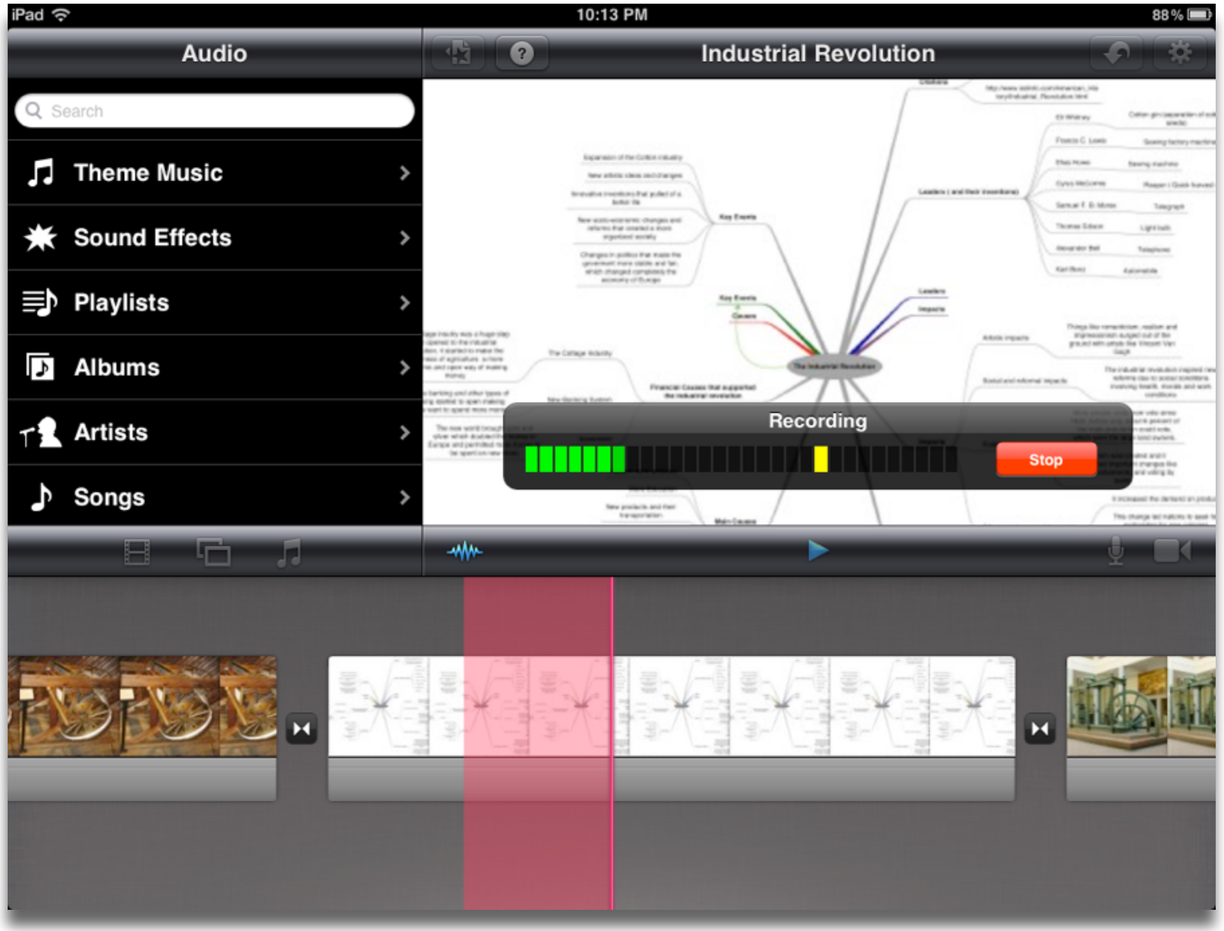

Social	Mobility	Visualization	Storytelling	Gaming
200,000 years	70,000 years	40,000 years	17,000 years	8,000 years

Ruben R. Puentedura, “Technology In Education: The First 200,000 Years” *The NMC Perspective Series: Ideas that Matter*. NMC Summer Conference, 2012.

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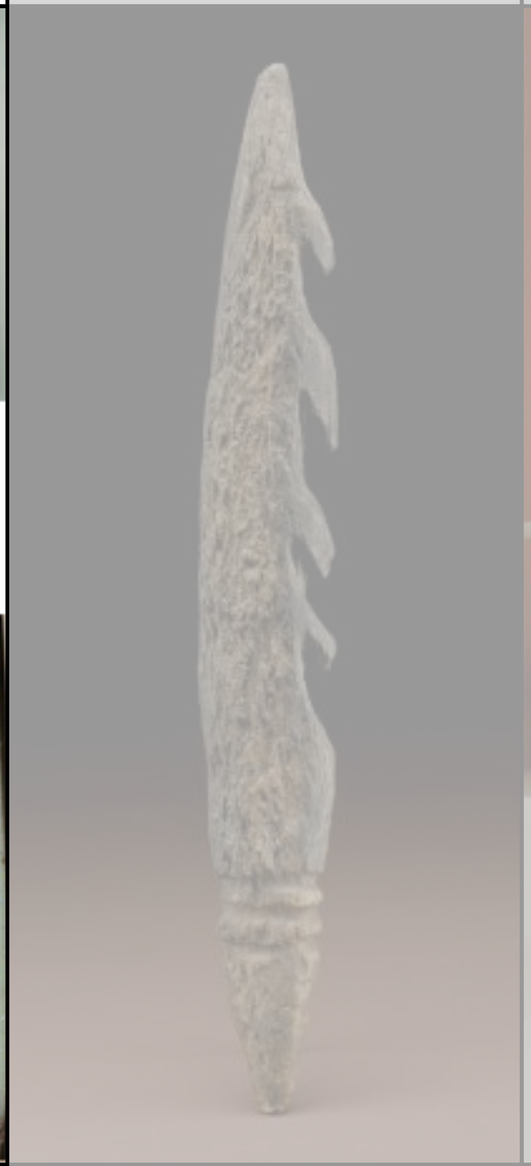

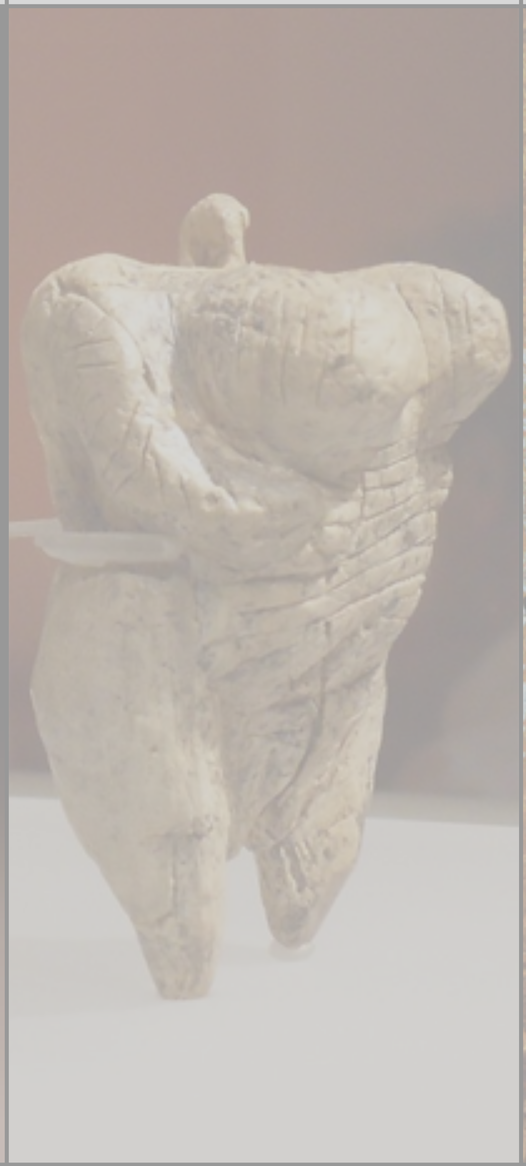

Bookmarks

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Discussions

Microblogging

Blogging

Wikis

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File Sharing

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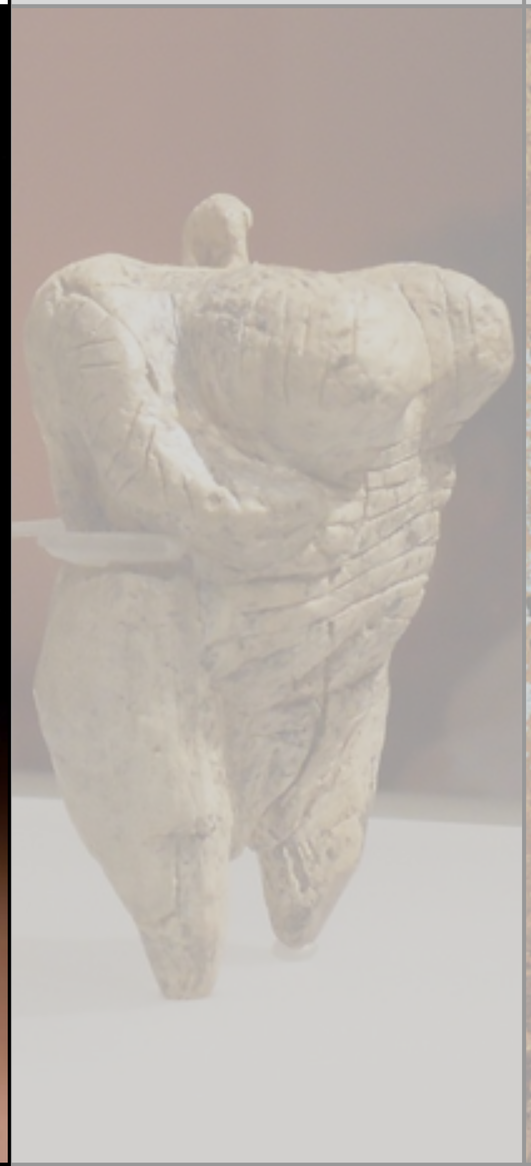

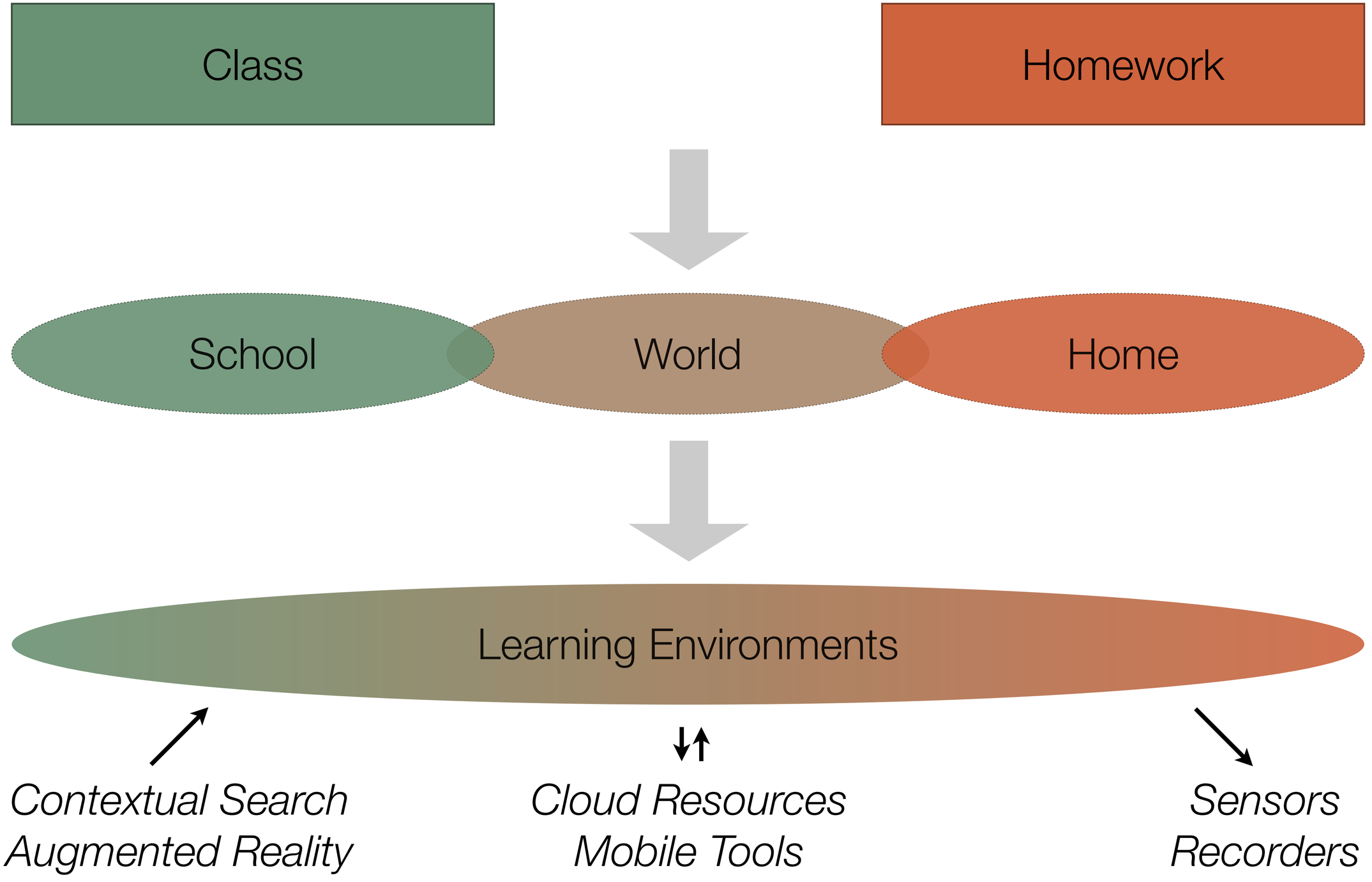
Class
Homework
School
World
Home
Learning Environments
Contextual Search
Augmented Reality
Cloud Resources
Mobile Tools
Sensors
Recorders

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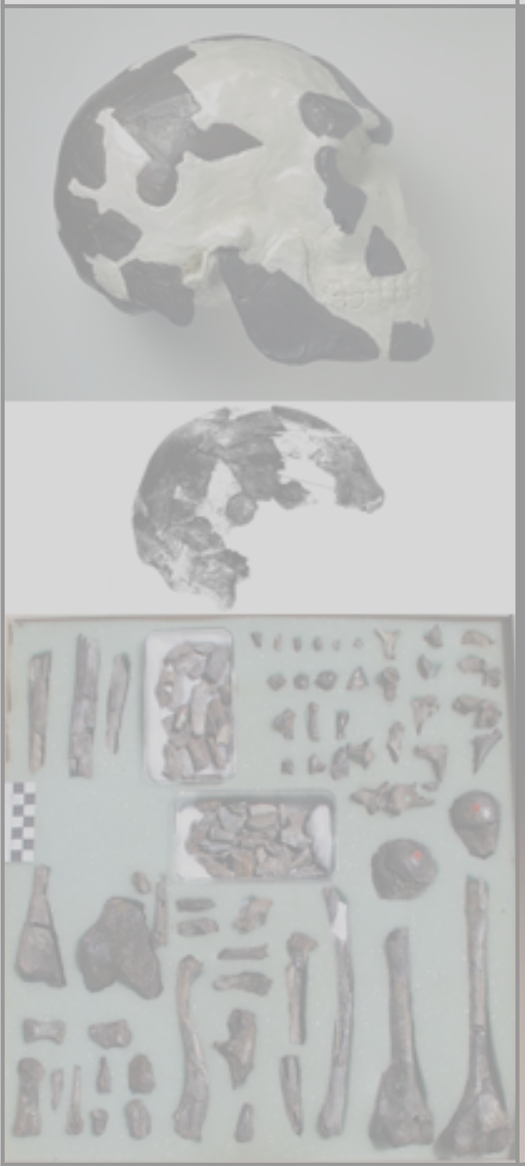
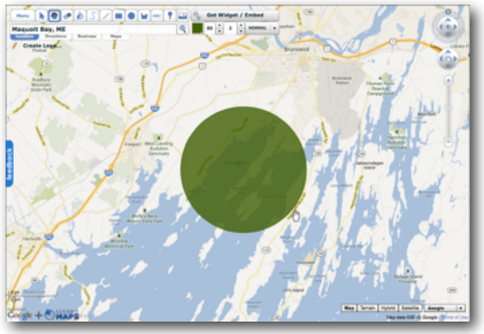
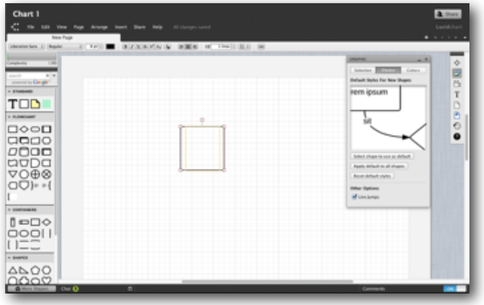



TimelineJS
Website

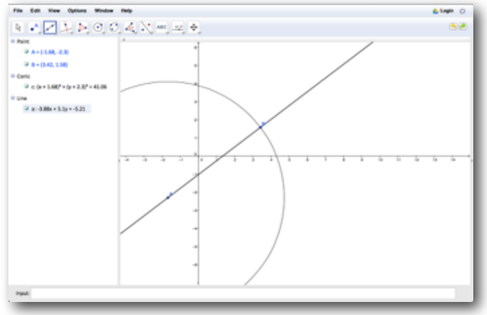

3D






word tree
I
am
have
do
love


Word
Collage



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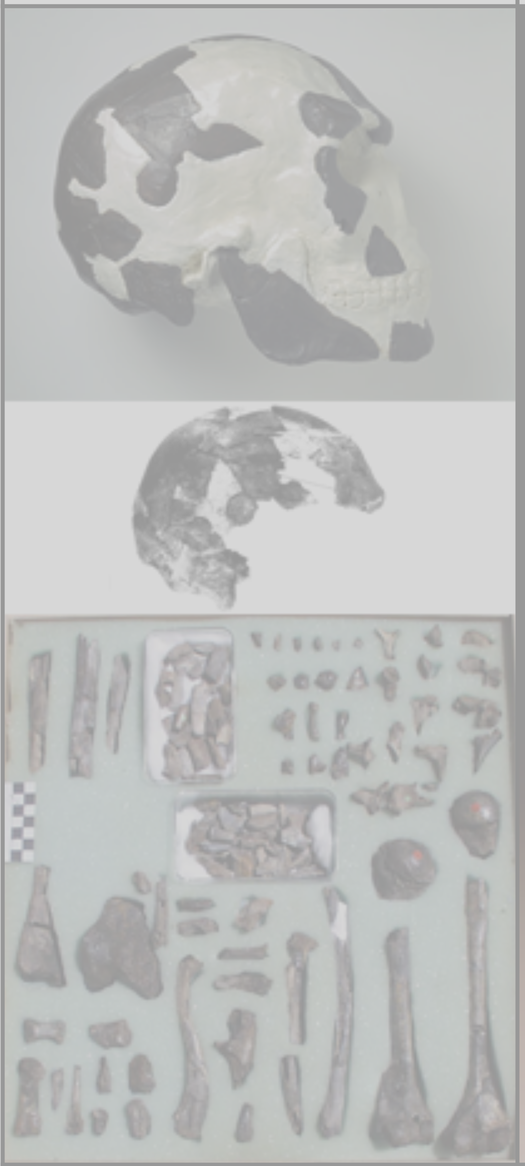

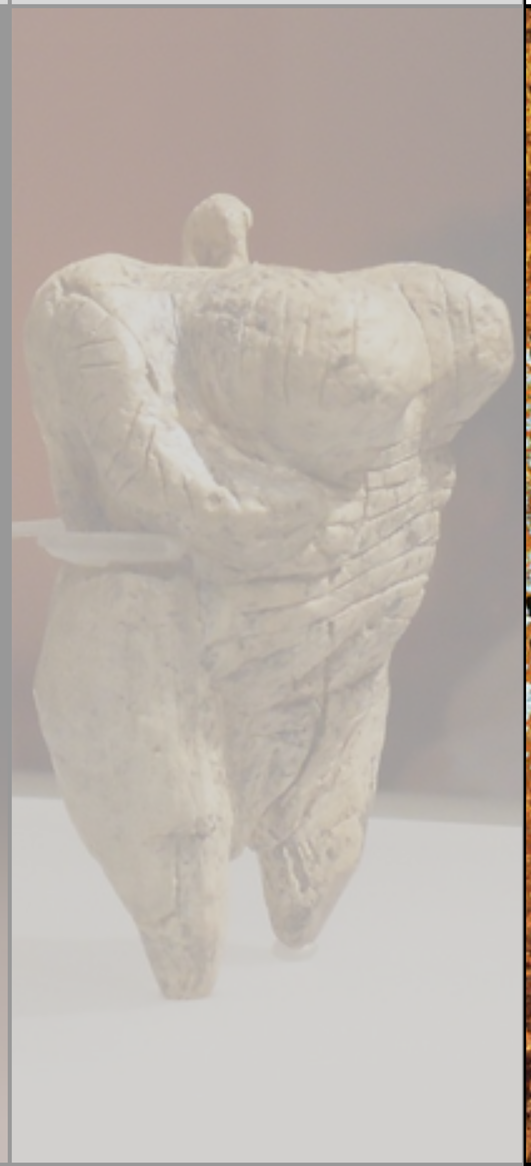

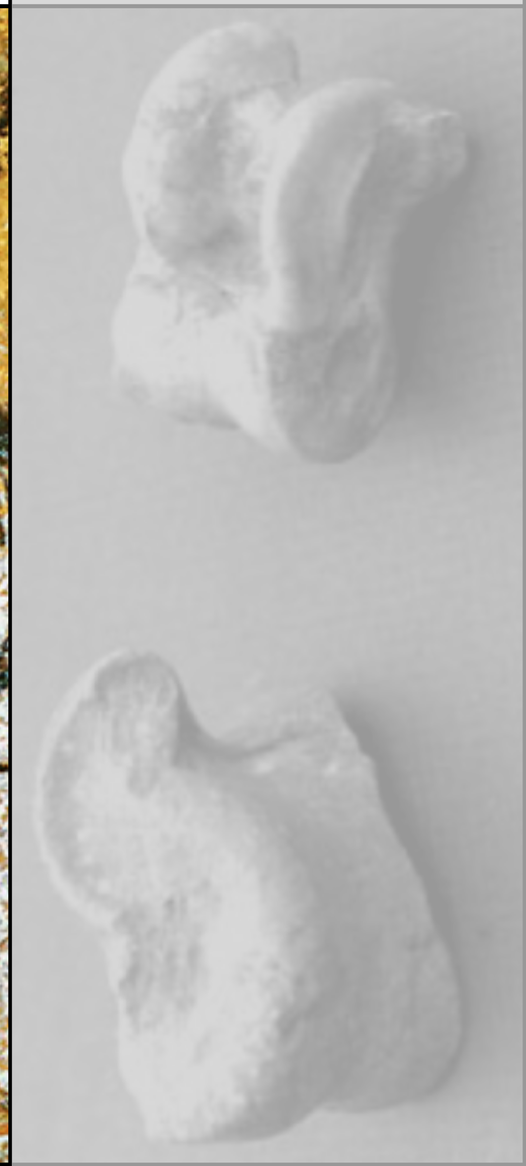

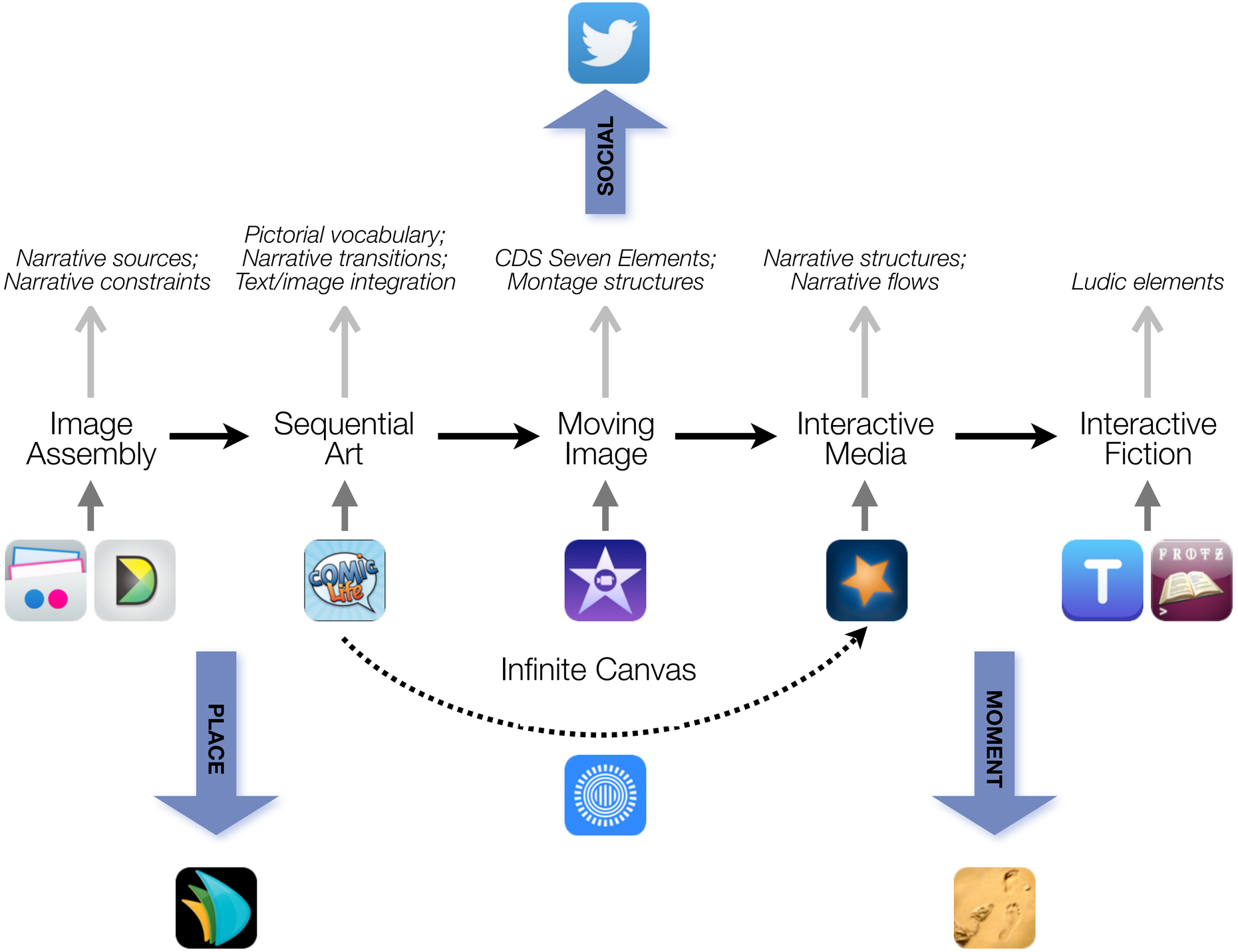
SOCIAL
Narrative sources;
Narrative constraints
Pictorial vocabulary;
Narrative transitions;
Text/image integration
CDS Seven Elements;
Montage structures
Narrative structures;
Narrative flows
Ludic elements
Image Assembly
Sequential Art
Moving Image
Interactive Media
Interactive Fiction
Infinite Canvas
PLACE
MOMENT

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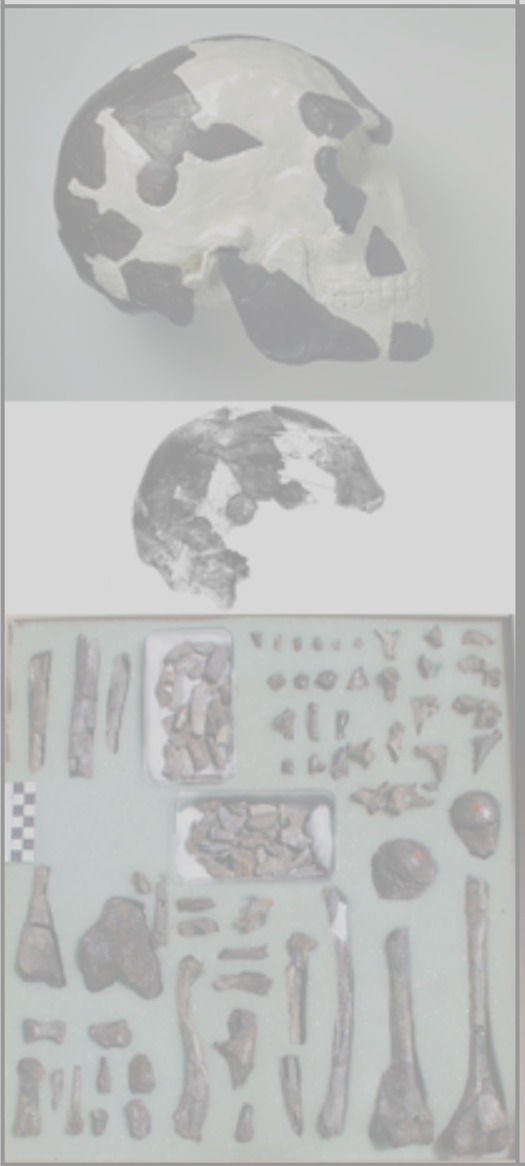

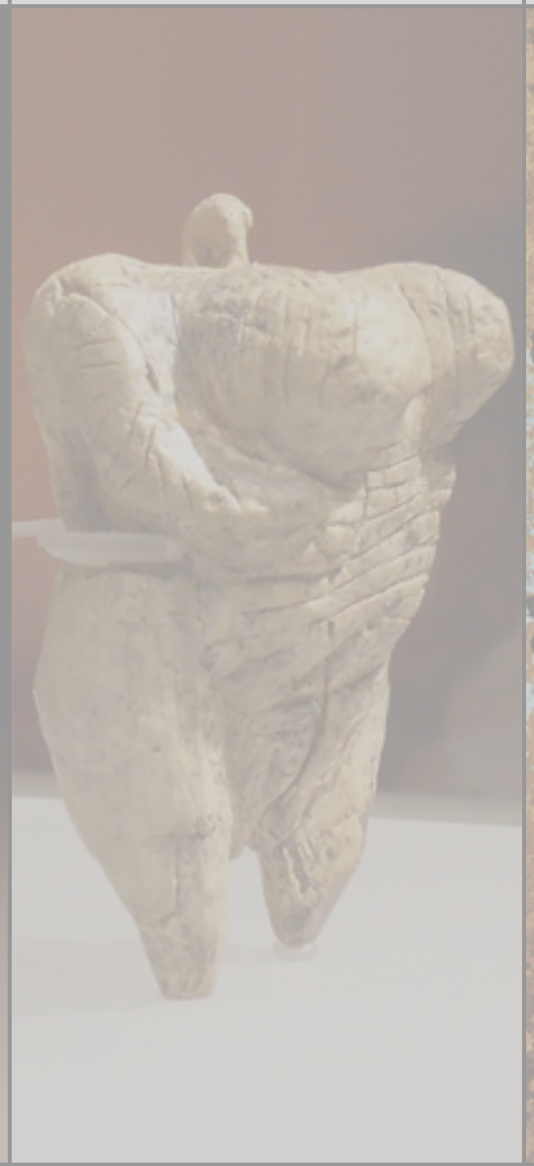

Formal Definition of **Game** (Salen & Zimmerman)

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

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

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

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/// 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

/// WELCOME!

THE FUTURE OF MUSEUMS CONFERENCE

The Future of Museums Conference was held from 10am - 5pm US-Eastern Time on **July 24th, 2014**, and featured keynote speakers and crowd-sourced presentations by your peers.

The conference was a collaborative global conversation about technology, museums, and the future. A welcome letter with the conference strands is here.

To be kept informed of future conference news and updates, please join this network!

/// KEYNOTES







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The Future of Museums Conference
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/// 2014 CONFERENCE

Conference

- Welcome + Information
- Attending + Schedule
- Con

Sign in to chat!

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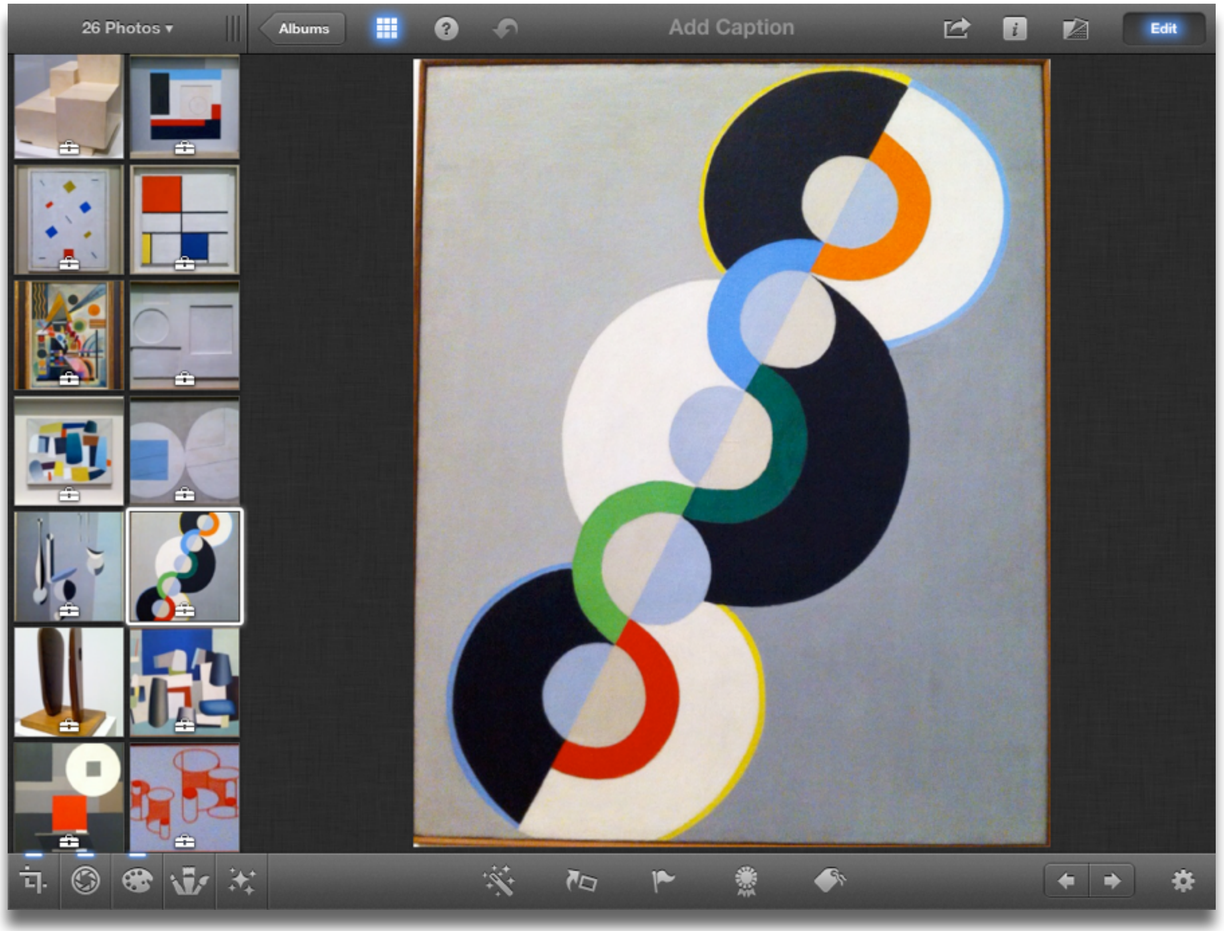

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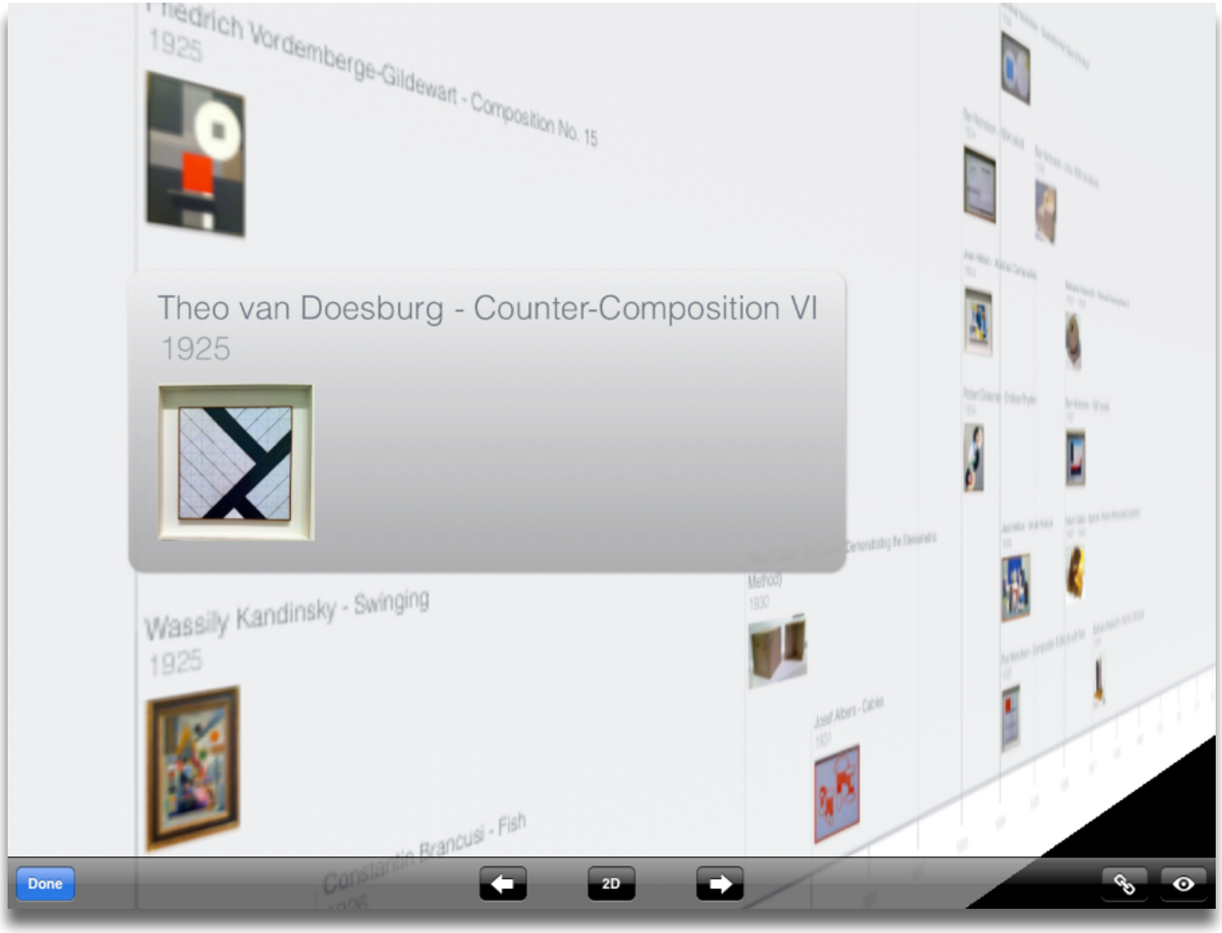

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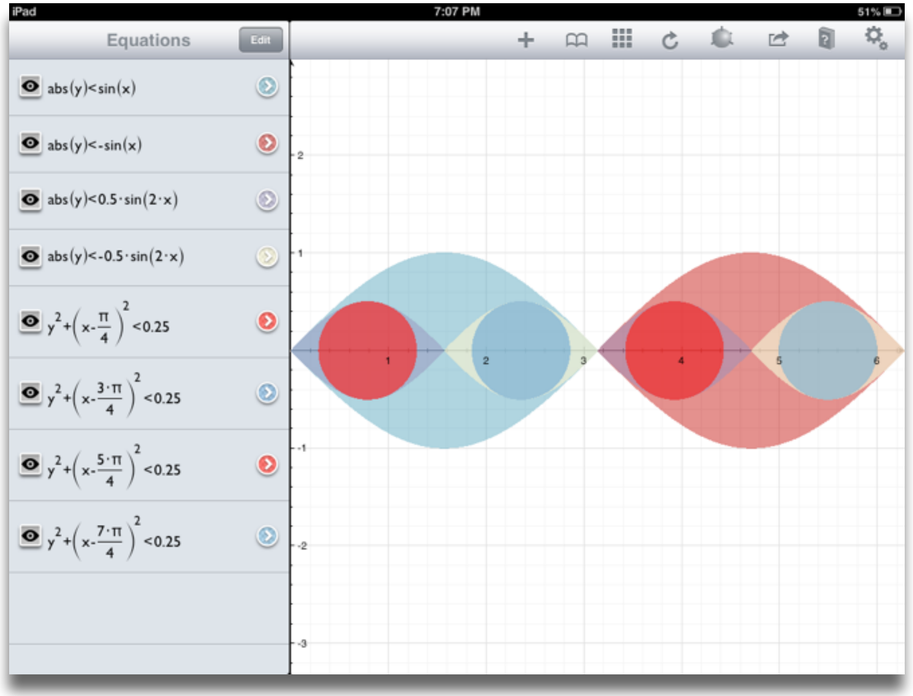

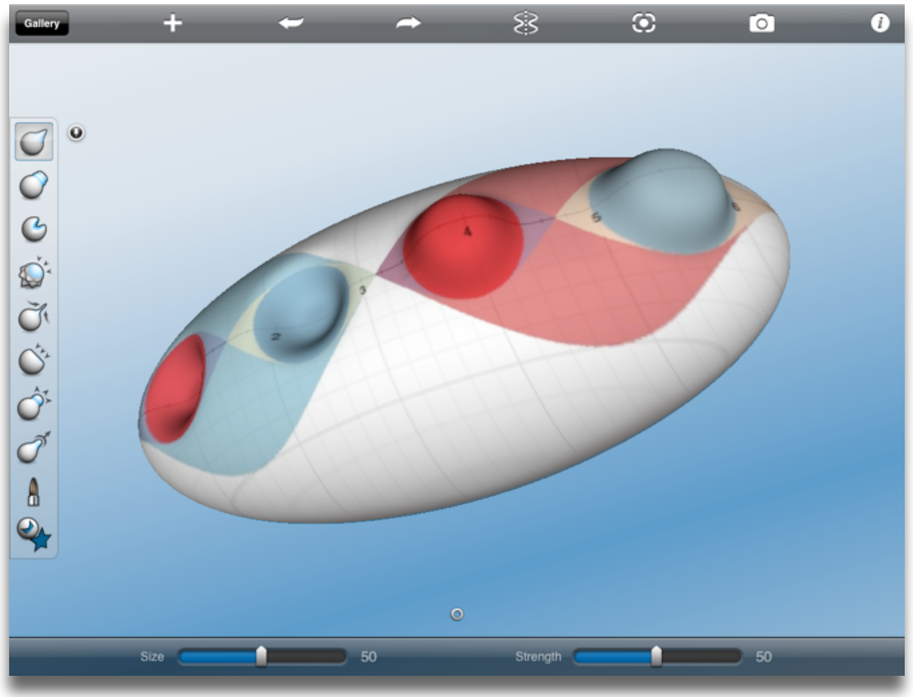

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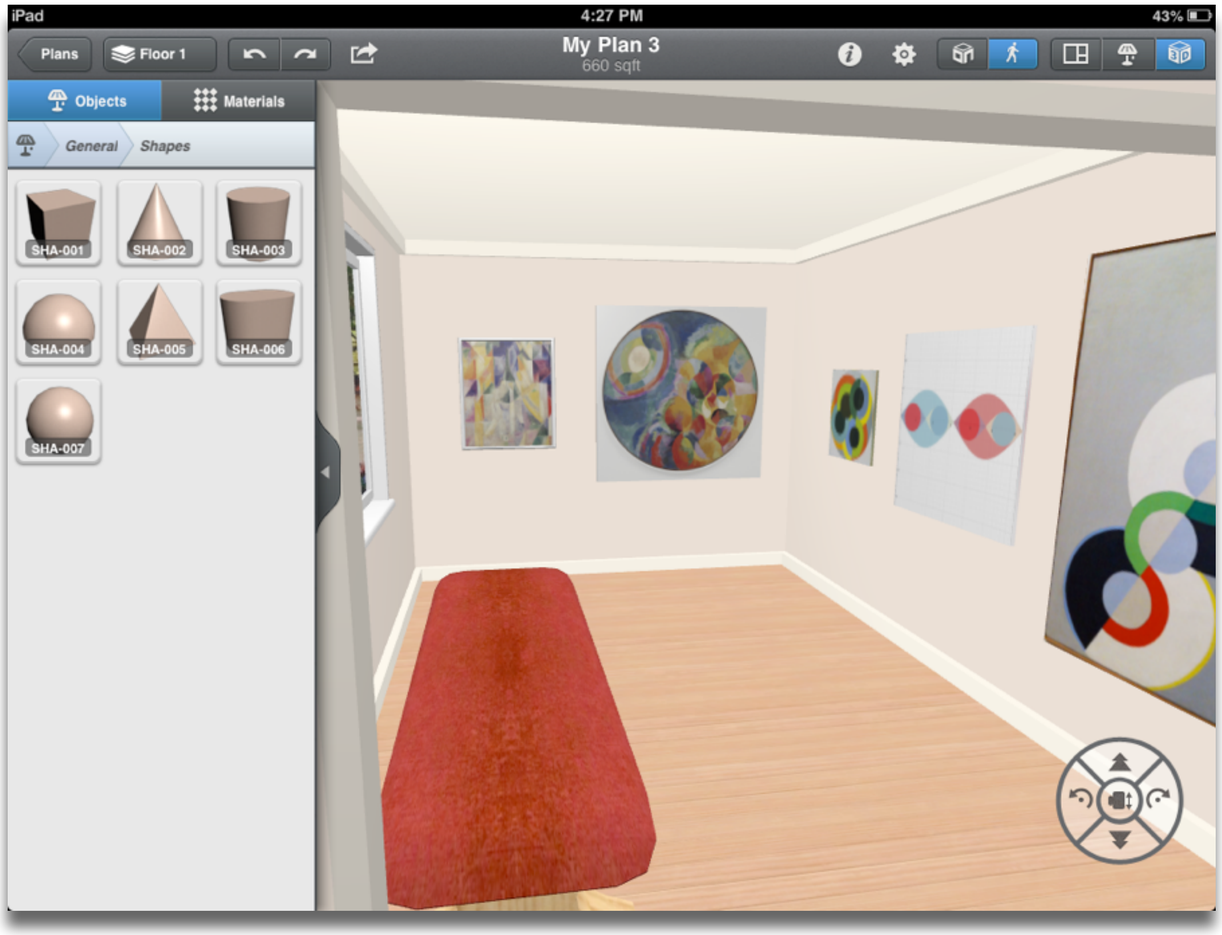


Choosing the First SAMR Ladder Project: Three Options

- **Your Passion:**
  - If you had to pick one topic from your class that best exemplifies why you became fascinated with the subject you teach, what would it be?
- **Barriers to Your Students' Progress:**
  - Is there a topic in your class that a significant number of students get stuck on, and fail to progress beyond?
- **What Students Will Do In the Future:**
  - Which topic from your class would, if deeply understood, best serve the interests of your students in future studies or in their lives outside school?

Part 2: The Assessment Challenge

Surveying Seymour Papert’s Four Expectations

- **Expectation 1:** suitably designed formative/summative assessment rubrics will show improvement when compared to traditional instruction.
- **Expectation 2:** students will show more instances of work at progressively higher levels of Bloom's Taxonomy.
- **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.
- **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 their community, and engagement with communities beyond their own.

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

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)

Bloom's Taxonomy: Cognitive Processes

Anderson & Krathwohl (2001)	Characteristic Processes	
Remember	• Recalling memorized knowledge • Recognizing correspondences between memorized 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 typed task	
Analyze	• Distinguishing relevant/irrelevant or important/unimportant portions of material • Integrating heterogeneous elements into a structure • Attributing intent in materials	
Evaluate	• Testing for consistency, appropriateness, and effectiveness in principles and procedures • Critiquing the consistency, appropriateness, and effectiveness of principles and procedures, basing the critique upon appropriate tests	
Create	• Generating multiple hypotheses based on given criteria • Designing a procedure to accomplish an untyped task • Inventing a product to accomplish an untyped 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

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

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

1. Clarifying, Sharing, and Understanding Learning Intentions and Criteria for Success

- Rubric Dichotomies:
  - Task-specific *vs*. generic rubrics
  - Product-focused *vs*. process-focused
  - Official *vs*. student-friendly Language
- Rubric Design:
  - Three key components in presenting learning intentions and success criteria to students:
    - WALT: we are learning to
    - WILF: what I'm looking for
    - TIB: this is because
  - Make explicit progressions within rubrics, and progressions across rubrics
- Students and Rubrics:
  - Have students look at samples of other students' work, then rank them by quality
    - Students become better at seeing issues in their own work by recognizing them in others' work
    - Not a "somebody wins" exercise, but rather a quality exercise that engages students
  - Have students design test items, rubrics

Traditional Rubric Design

	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)

	1	*2*	*3*
Comprehensiveness – 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).
Organization – 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.
Correctness - 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.

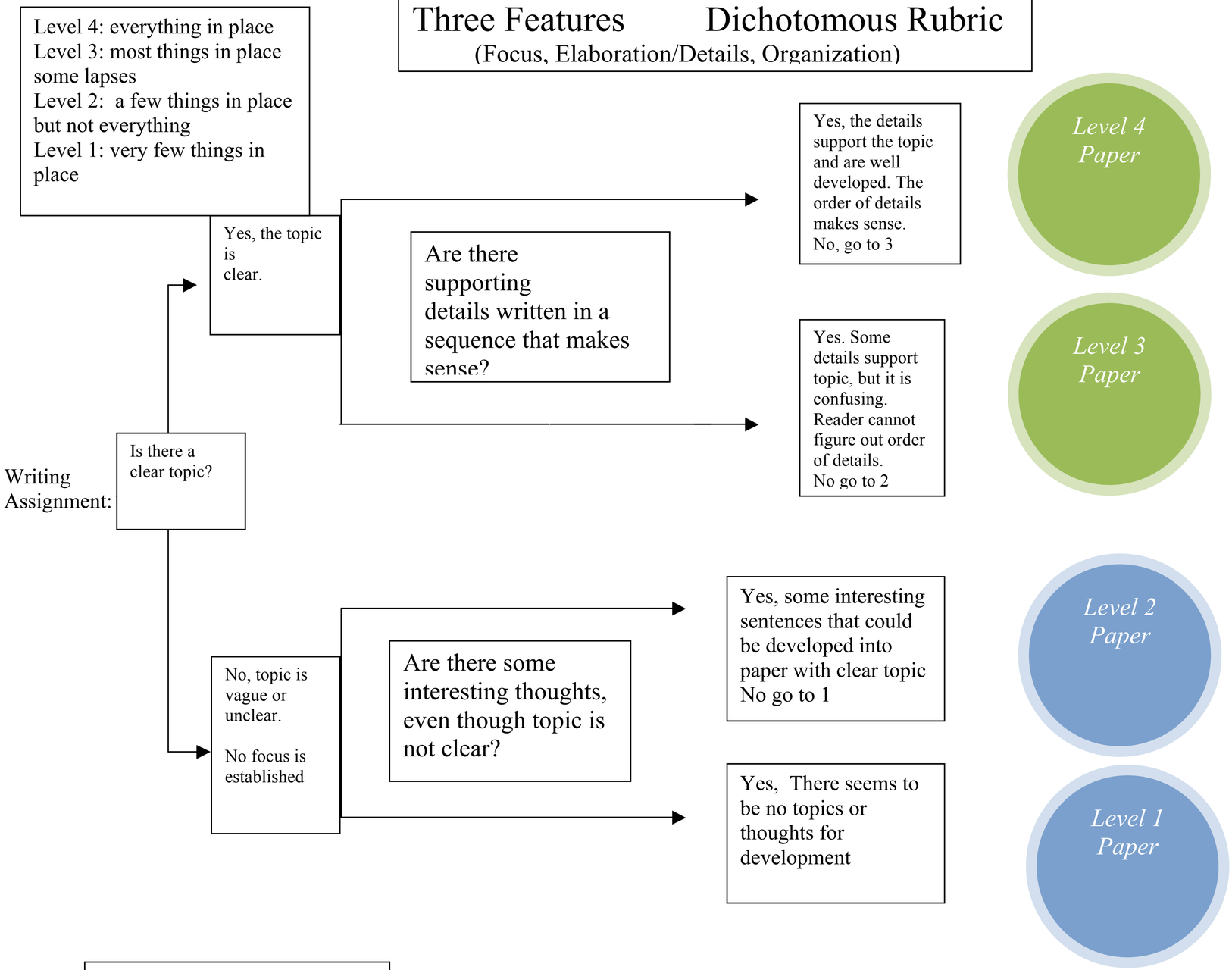
Shuman, L.J., M.E. Besterfield-Sacre, J. Gerchak, M. Lyons and H. Wolfe. “Scoring Concept Maps: An Integrated Rubric for Assessing Engineering Education.” *Journal of Engineering Education*. 105-115 (April 2004)

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 *significantly* to the discussion.	You clearly refer back to a definition, example or concept from the reading or lecture.	You do not bring in or refer to any material from the text, outside sources, or lectures.
Sociological Analysis	You focus on the sociological implications of the issue at hand (e.g., social meaning, the outcomes for society or groups, the social function served).	You touch on some sociological issues, but focus also on individual ones.	You focus primarily on individual issues.
	2 Points	**1 Point**	**0 Points**
Responses	You extend or politely question the post of another person in a way that advances the discussion.	You add new examples that continue the idea created by another person.	Your responses are primarily agreement.
Participation	You write at least three or more substantive comments (using the above criteria) based on the discussion assigned.		You write fewer than three substantive comments.
Time of Posting	Your posts are spread widely during the discussion.	You post at two significantly different times.	Your posts are clustered within a short period of time.
Posts Read	You have read at least 75% of the posts in the discussion.	You read at least 50% of the posts in the discussion.	You read less than 50% of the posts in the discussion.
Clarity	You use standard grammar and spelling and your meaning is clear.	Your posts have some grammar or spelling mistakes or your meaning is not entirely clear.	Your posts have significant grammar or spelling mistakes or your meaning is not clear.

Three Features Dichotomous Rubric

(Focus, Elaboration/Details, Organization)

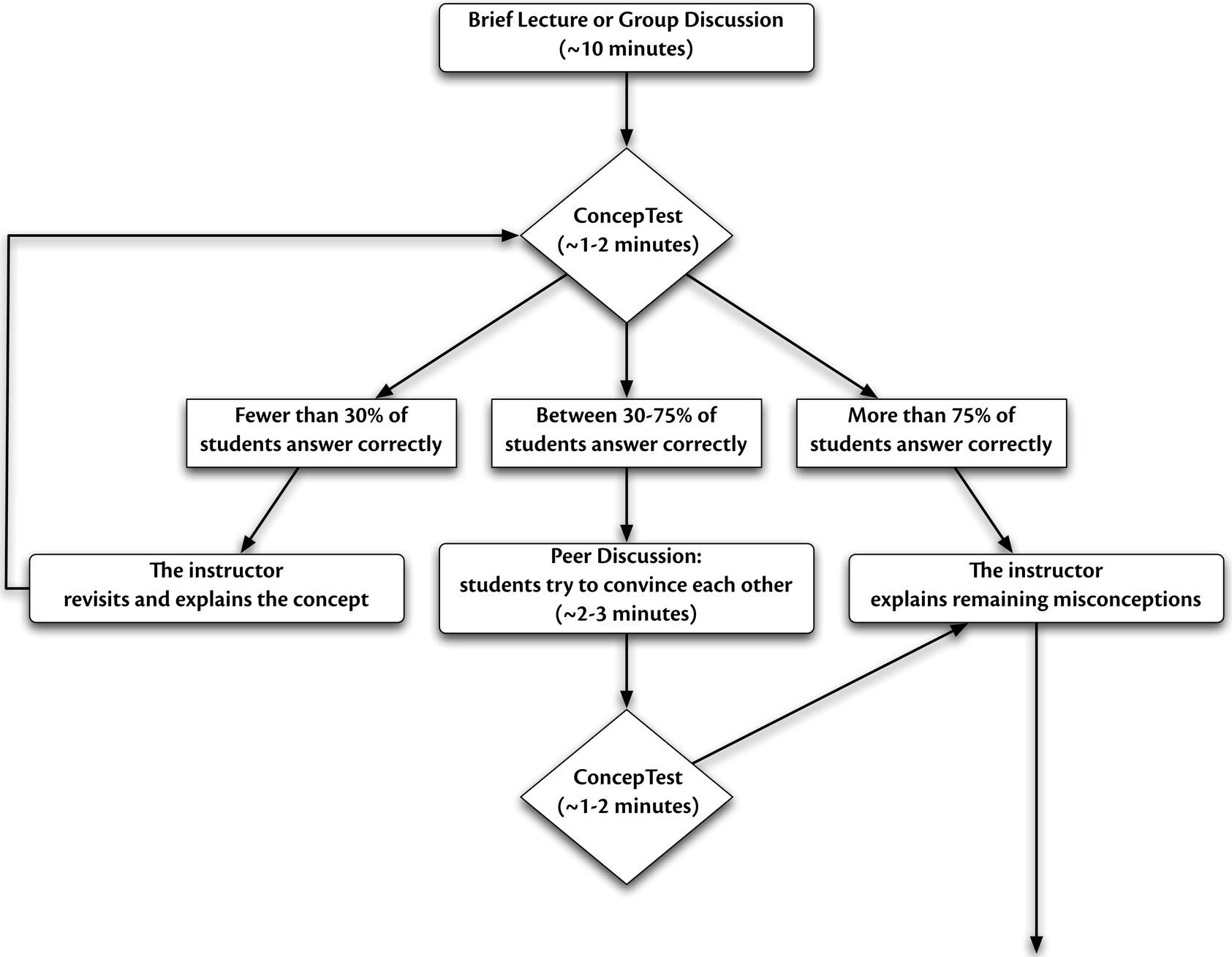


Developed by Vickie Hedrick

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

2. Eliciting Evidence of Learners' Achievement in the (Extended) Classroom

- Asking questions in class:
  - Chosen to act as a discussion/thinking trigger
  - Should provide info for varying instruction on the fly and in the long term
  - Examples:
    - ConcepTest
    - POE (Predict-Observe-Explain)
    - TPS (Think-Pair-Share)
    - Virtual Whiteboard



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

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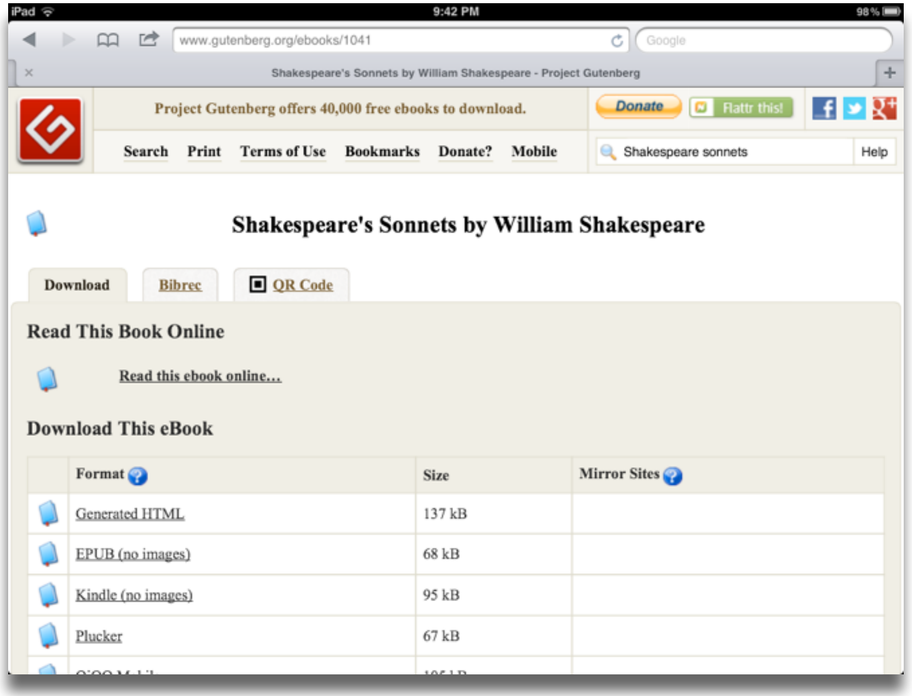

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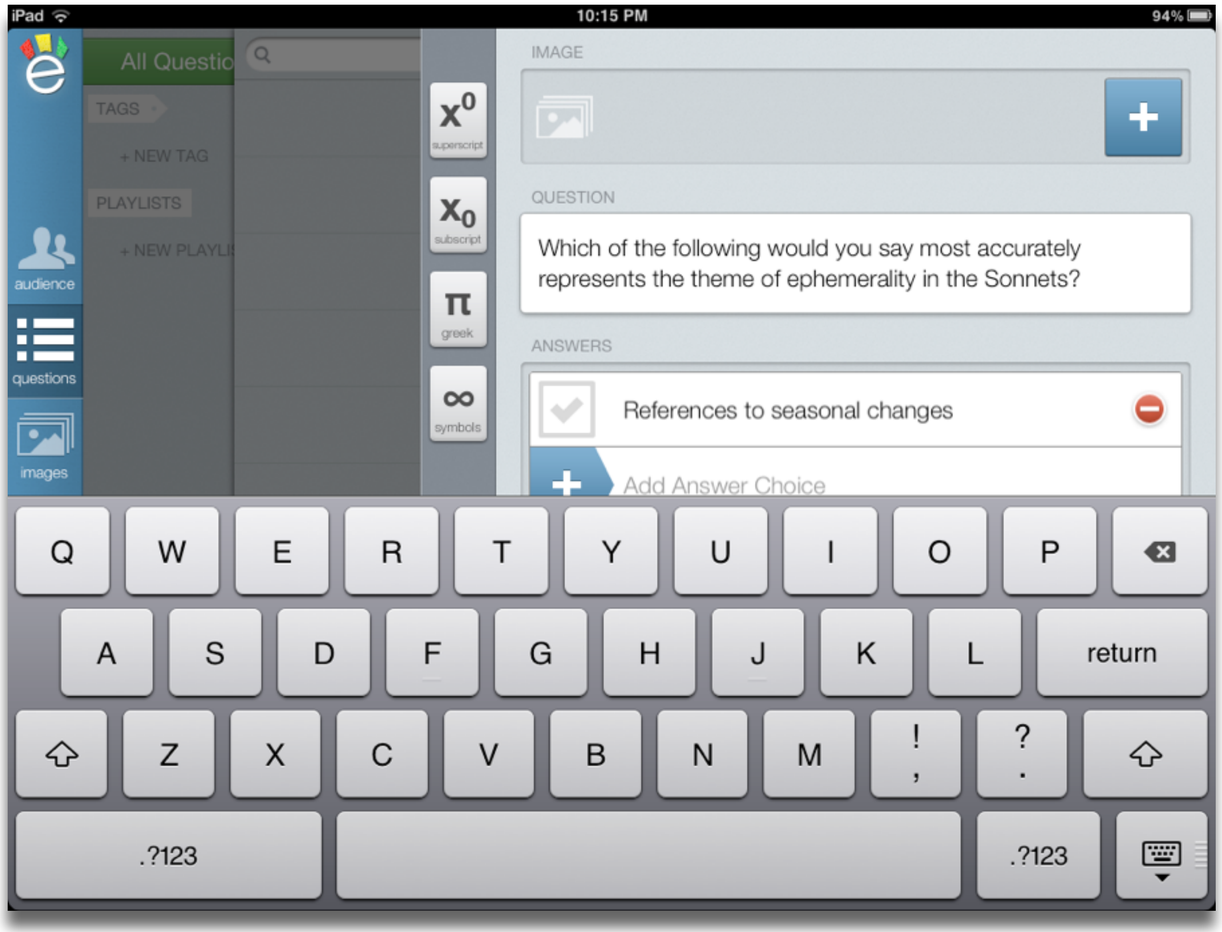

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3. Providing Feedback that Moves Learners Forward

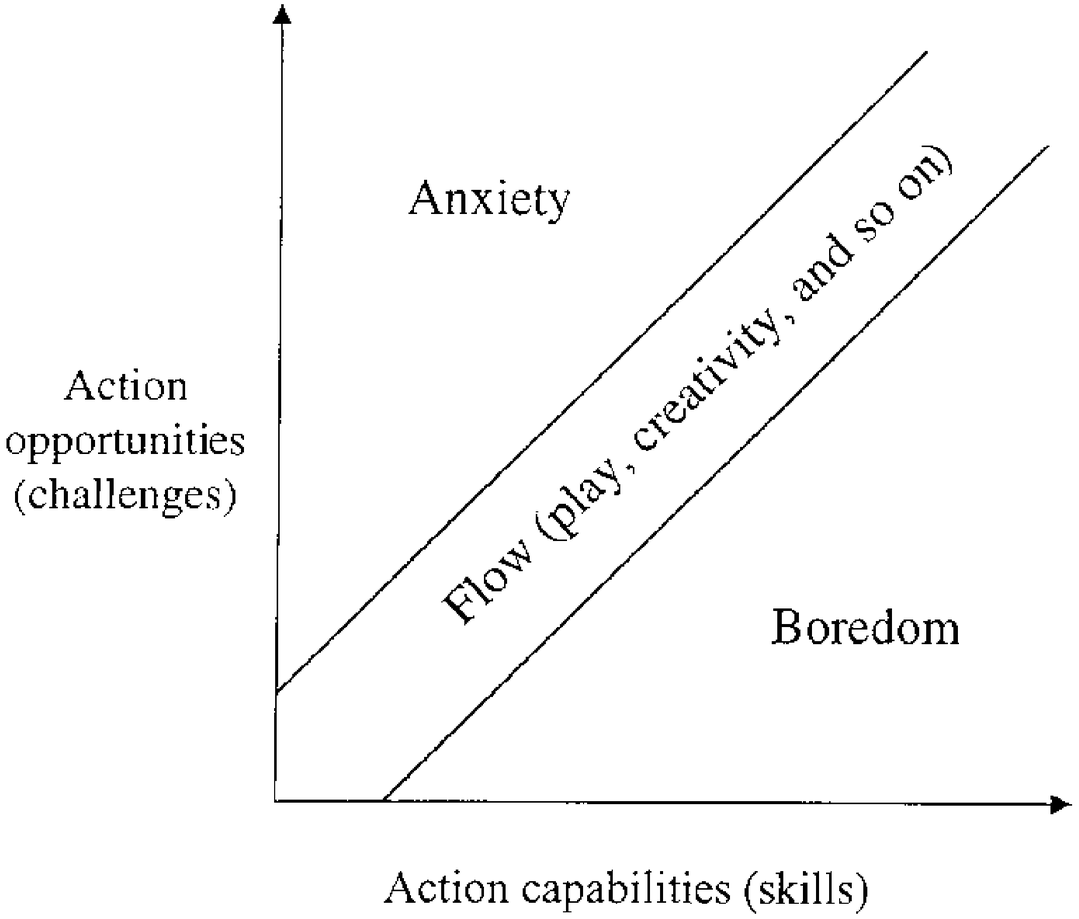
- The feedback process must provide a recipe for future action
- Feedback should:
  - Be more work for the recipient than the donor, i.e., not just right/wrong – make them think about what did not work
  - Be focused: less is more
  - Relate explicitly to goals/rubrics
- How:
  - Scores or praise alone do not provide this; comments do
  - Supplying minimal scaffolded responses (i.e., where the student got stuck) >> supplying a full response to the problem
    - This emphasizes the crucial role of the draft object and process
  - Oral feedback >> written feedback
    - Consider using recordings
  - Create (sometimes together with students) process rubrics that embody this scaffold
  - Provide time for students to use this feedback
- Minimize grading:
  - Avoid false stopping points
  - Avoid ratchet effect

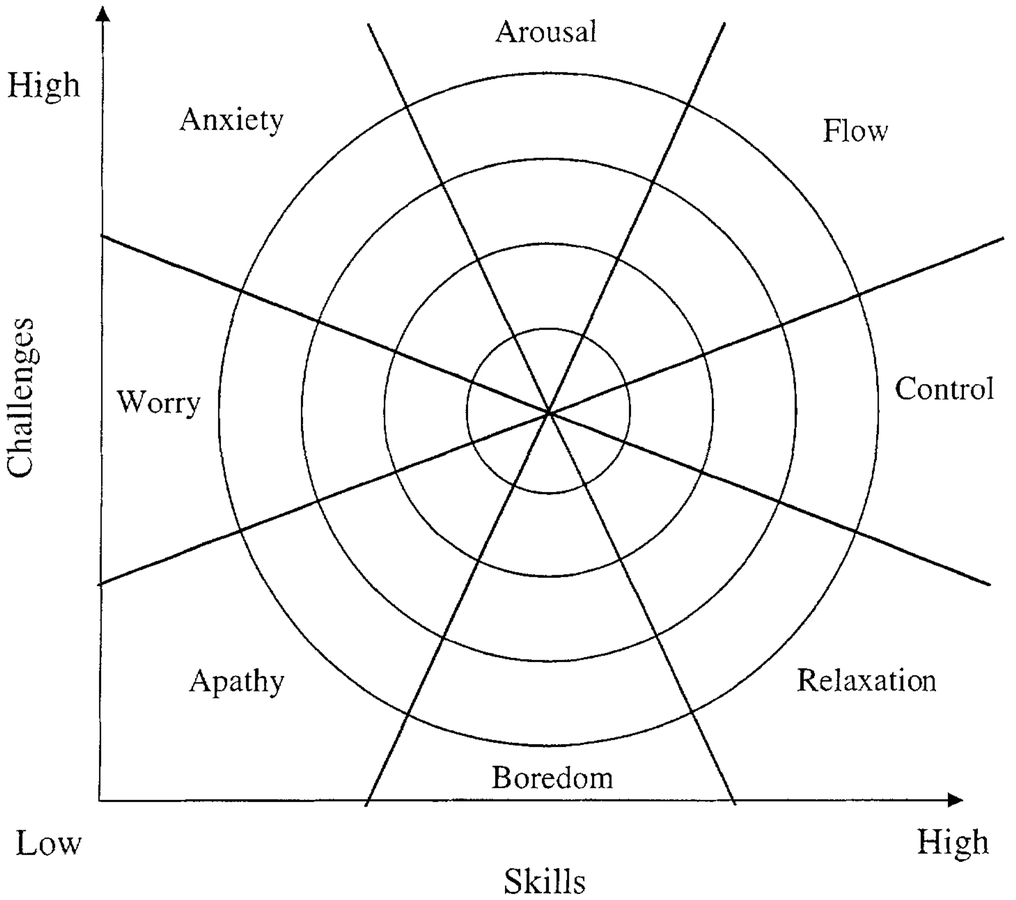
4. Activating Students as Instructional Resources for One Another

- Two key elements:
  - Group goals
  - Individual accountability
- Effectiveness due to (in order of importance):
  - Personalization
  - Cognitive Elaboration
  - Motivation
  - Social Cohesion
- Reciprocal help only works when it takes the form of elaborated explanations:
  - Not simple answers or procedures
  - Looks to the upper levels of Bloom for both participants
- Reciprocal help is more effective (by a factor of up to 4) if the product being assessed is the result of the aggregate of individual contributions, rather than just one group product

5. Activating Students as Owners of their Own Learning

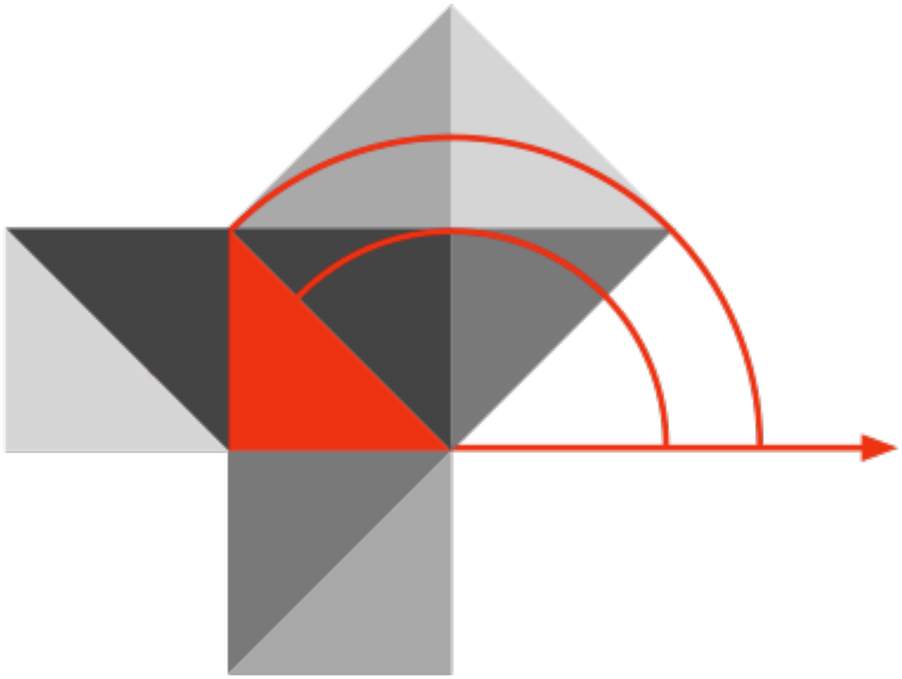
- Effective self-assessment is up to twice as effective as other-assessment
- Two key components:
  - Metacognition:
    - Metacognitive knowledge: know what you know
    - Metacognitive skills: what you can do
    - Metacognitive experience: what you know about your cognitive abilities
  - Motivation:
    - Traditionally viewed as a cause (intrinsic/extrinsic), but is better viewed as an outcome:
      - Flow (M. Csikszentmihalyi): the result of a match between capability and challenge
        - Students are motivated to reach goals that are specific, within reach, and offer some degree of challenge
- Three sources of info for students to decide what they will do:
  - Perceptions of the task and its context
  - Knowledge about the task and what it will take to be successful
  - Motivational beliefs
- The role of the draft process and object resurfaces as a crucial component here
- Important Tools:
  - Learning logs and journals
  - Learning portfolios





Jeanne Nakamura & Mihaly Csikszentmihalyi, "The Concept of Flow" in: *Handbook of Positive Psychology* (C. R. Snyder and Shane J. Lopez, Editors). Oxford University Press. (2002)

Hippasus



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