SAMR: Getting To Transformation

Ruben R. Puentedura, Ph.D.

SAMR: Framing Goals for Transformation

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

Modification
Tech allows for significant task redesign

Transformation

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

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

Enhancement

Choosing Your 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?

The SAMR Ladder:
Questions and Transitions

- **Substitution:**
  - What will I gain by replacing the older technology with the new technology?
- **Substitution to Augmentation:**
  - Have I added an improvement to the task process that could not be accomplished with the older 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?

Design From Expectations

Seymour Papert: Four Expectations

- **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 the experiment.
- **Expectation 2:** observers will agree that the student in the experiment not only learned more than in a traditional class, but learned it in a more articulate, richer, more integrated way.
- **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 and problem-solving.
- **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, etc…

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

Measuring the 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.

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	Clarifying learning intentions and criteria for success	Engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding	Providing feedback that moves learners forward
Peer	Understanding and sharing learning intentions and criteria for success	Activating students as instructional resources for one another	
Learner	Understanding learning intentions and criteria for success	Activating students as the owners of their own learning	

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

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	

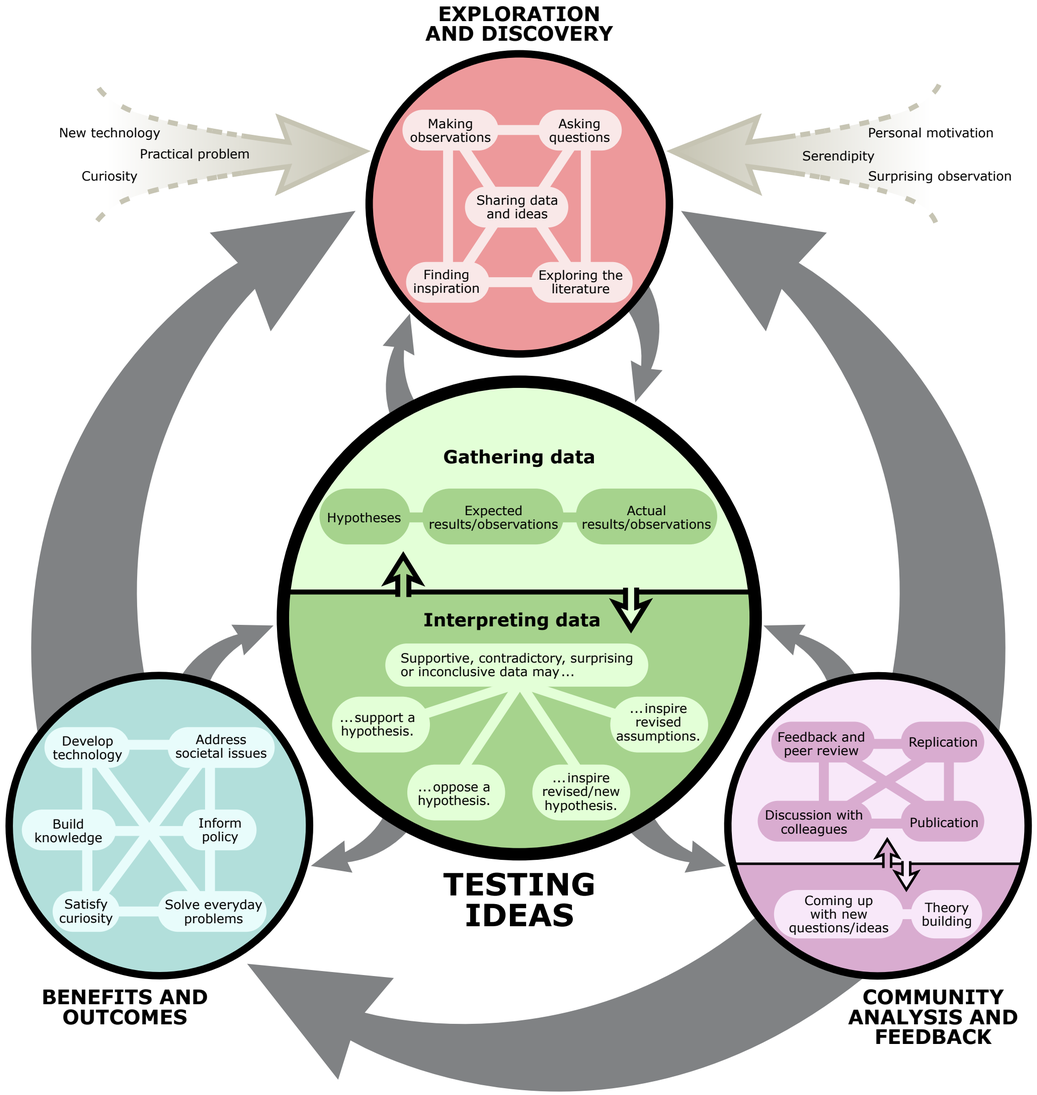
Lorin W. Anderson and David R. Krathwohl (Eds.), *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives, Complete Edition*. Longman. (2000)

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

Understanding Science:
How Science Works



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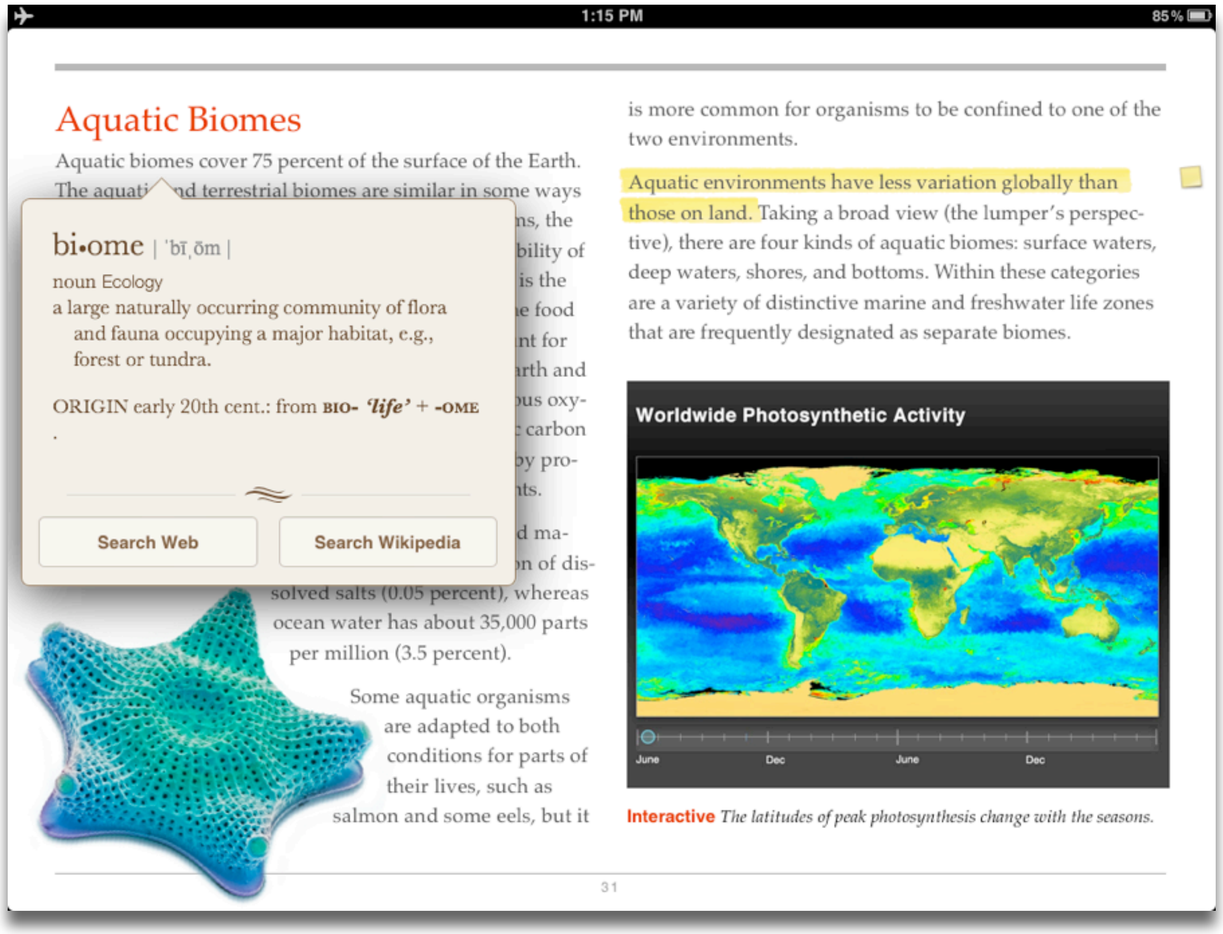

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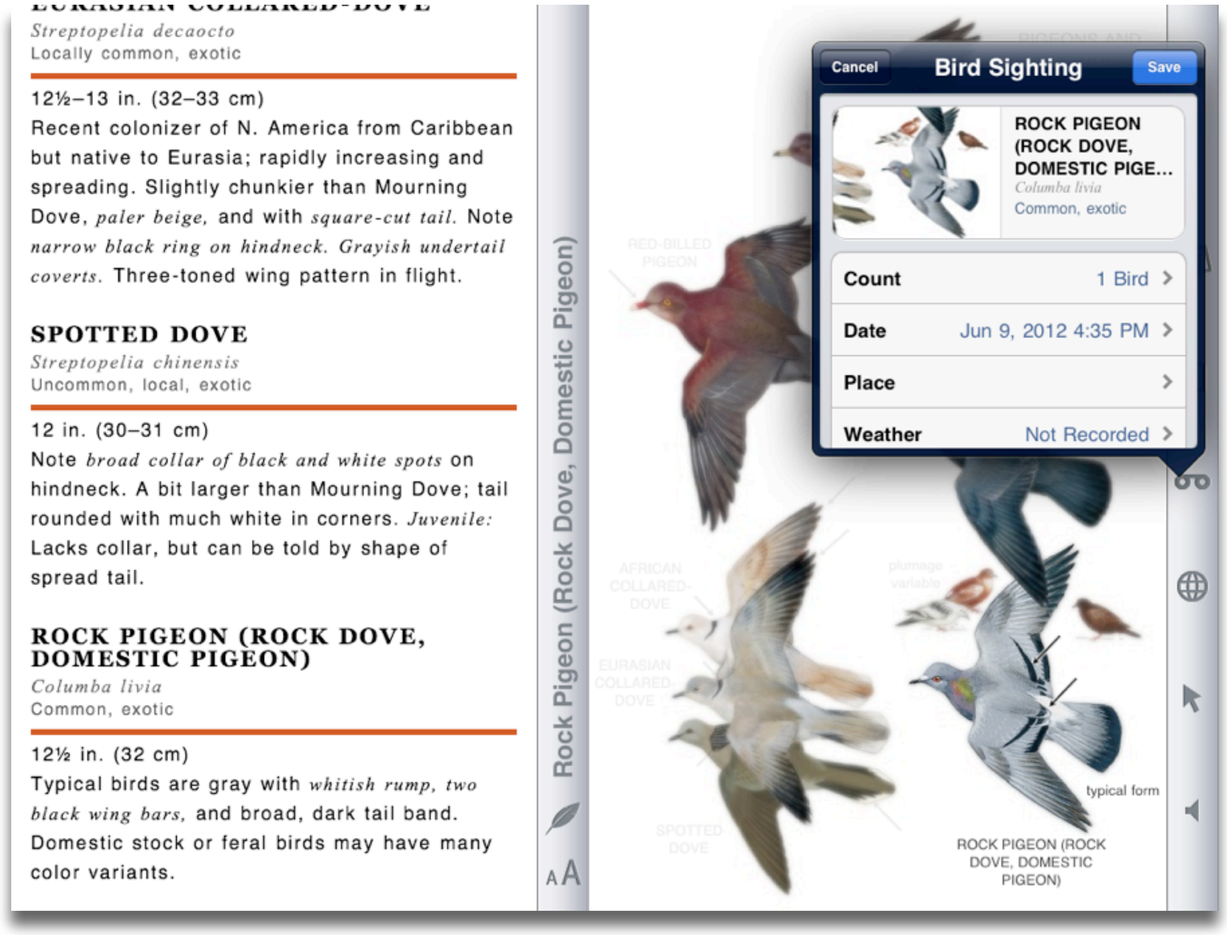

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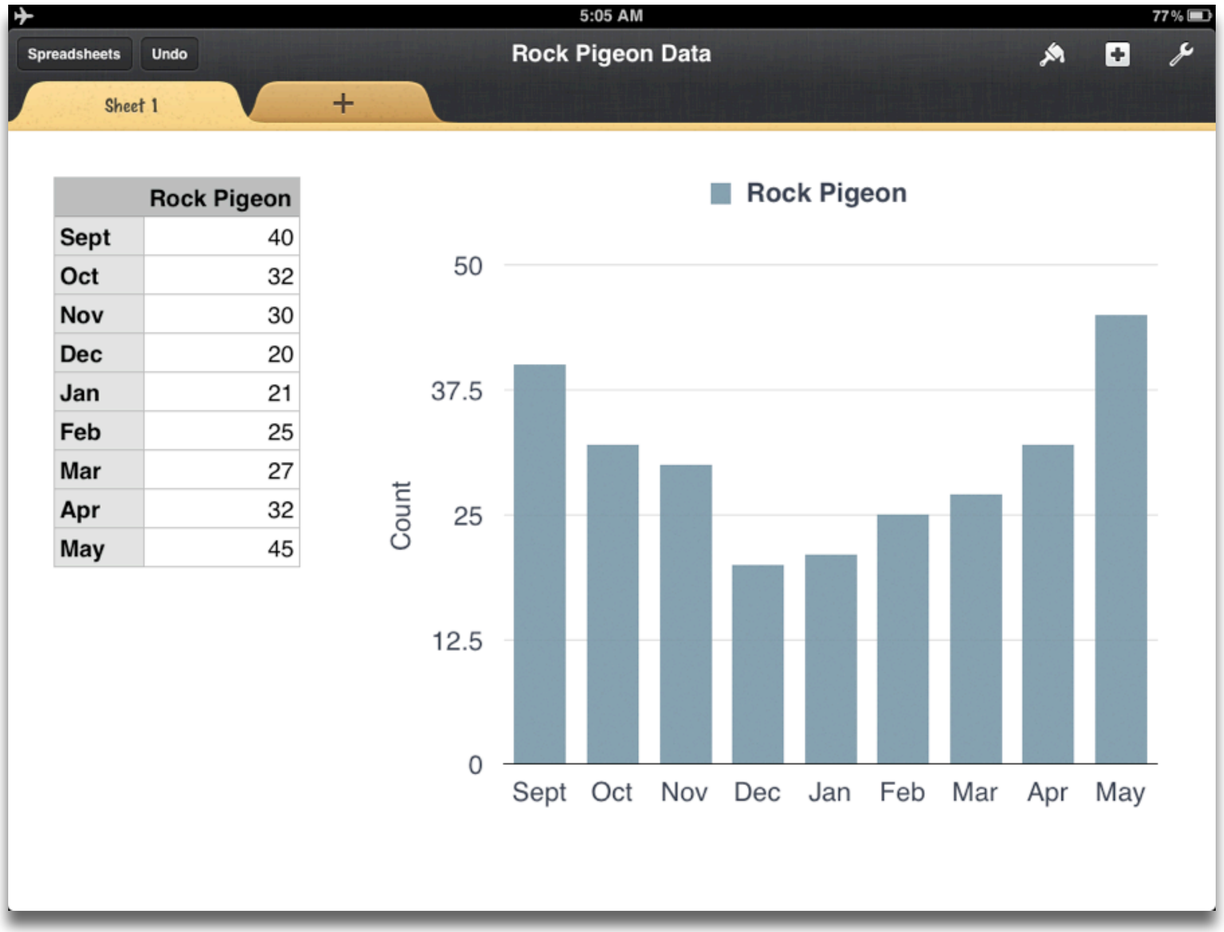

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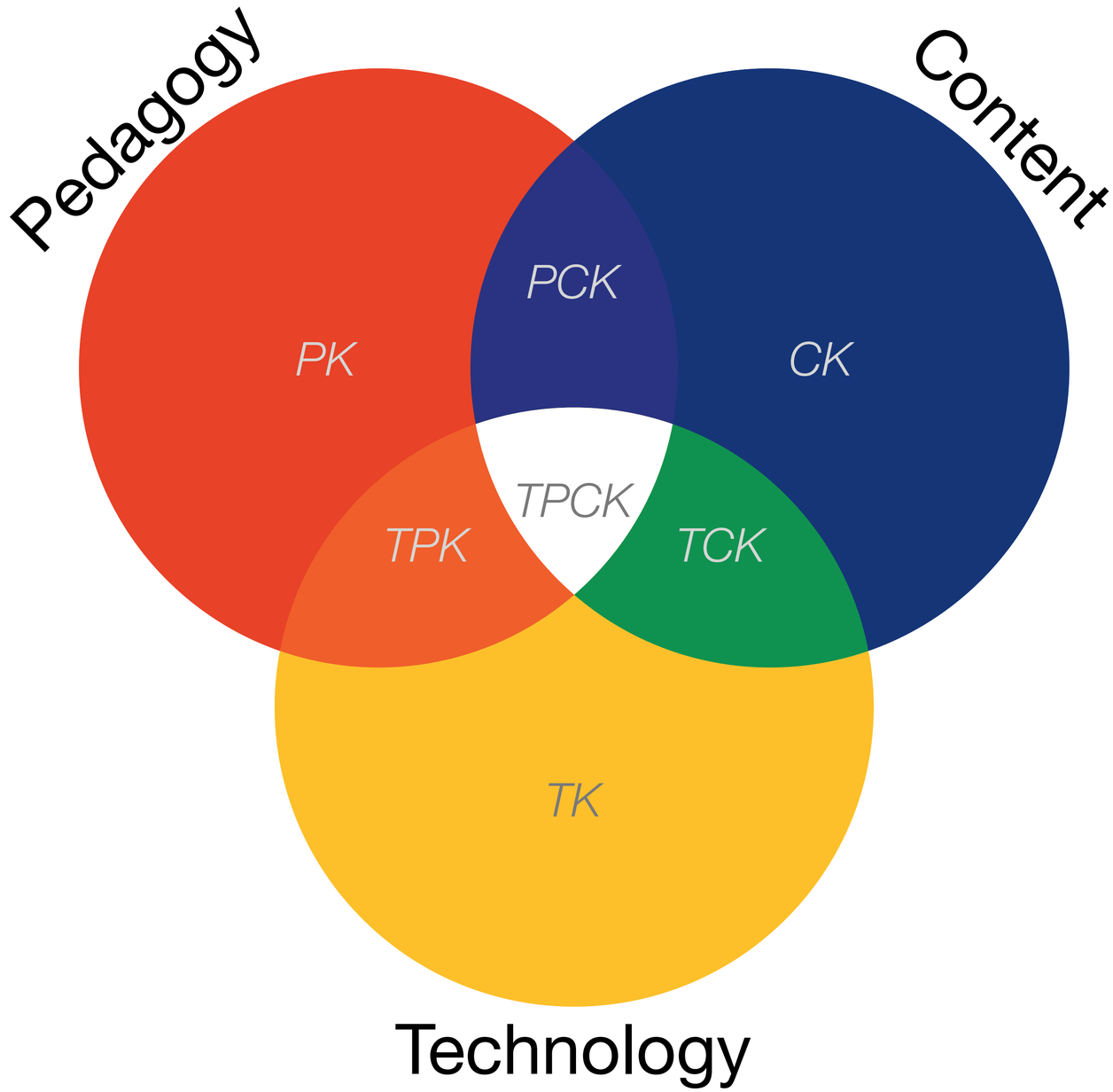
The PCK Question

Why Study History?

- **Problematic claims:**
  - *To learn lessons for the present* - implies definite predictions of an unknowable future
    - Better: *To draw lessons for consideration* - examples through which we might contemplate our future actions
  - *History provides us with an identity* - true, but the past as a basis for identity can also become a prison for the present, limiting choices for action and for seeing ourselves
  - *To divine essential aspects of the human condition* - not only are such essences not in evidence, assuming that they exist can have a high price
- **Stronger reasons:**
  - *Enjoyment*
  - *A tool for thought* - exploring an alternative world makes us more aware of our own lives and contexts
  - *To be made aware of the possibility of doing things differently* - history is an argument, showing that there have always been many courses of action, many ways of being

John Arnold. *History: A Very Short Introduction*. Oxford University Press. (2000)


Pedagogy
Content
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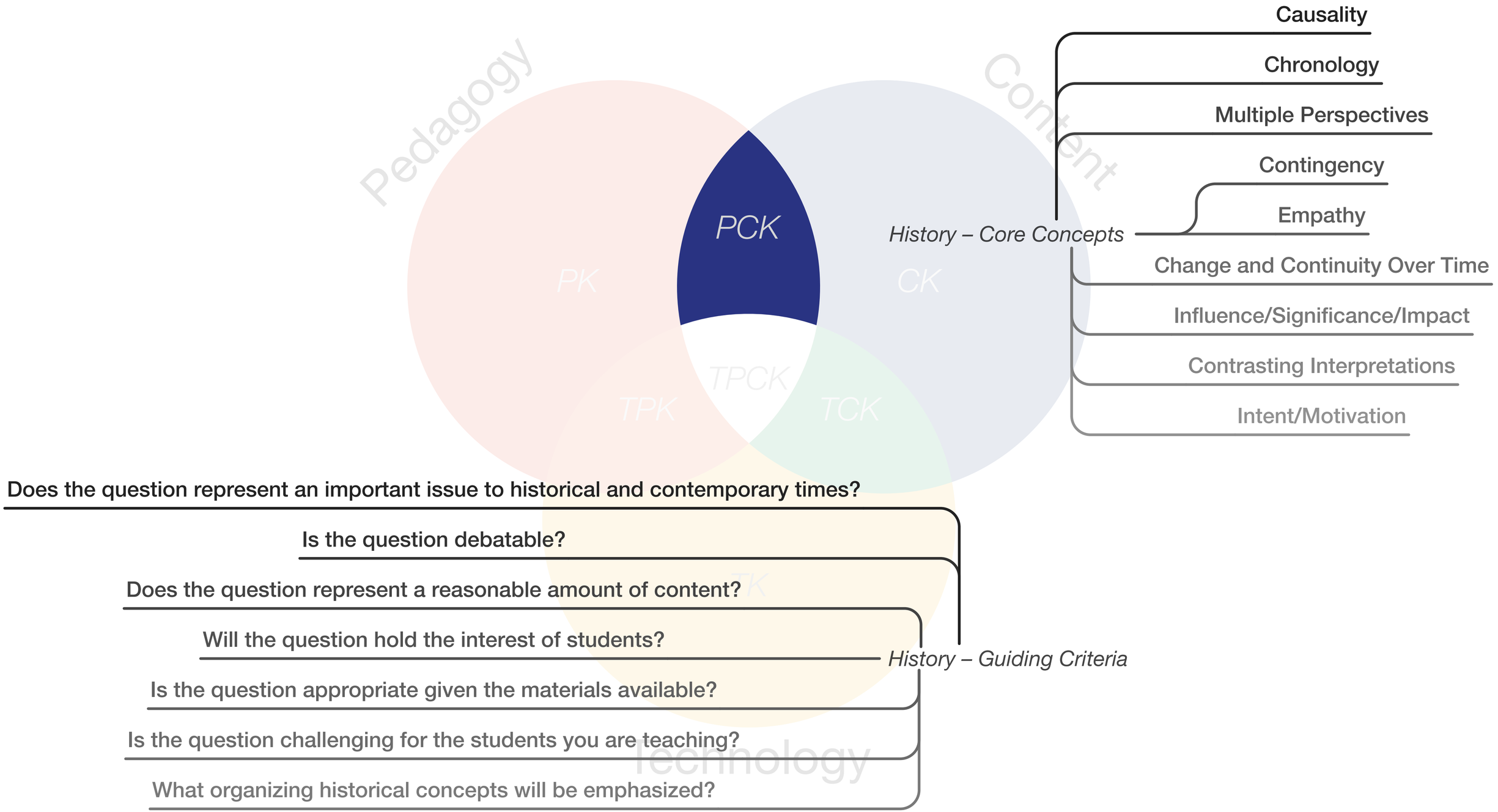
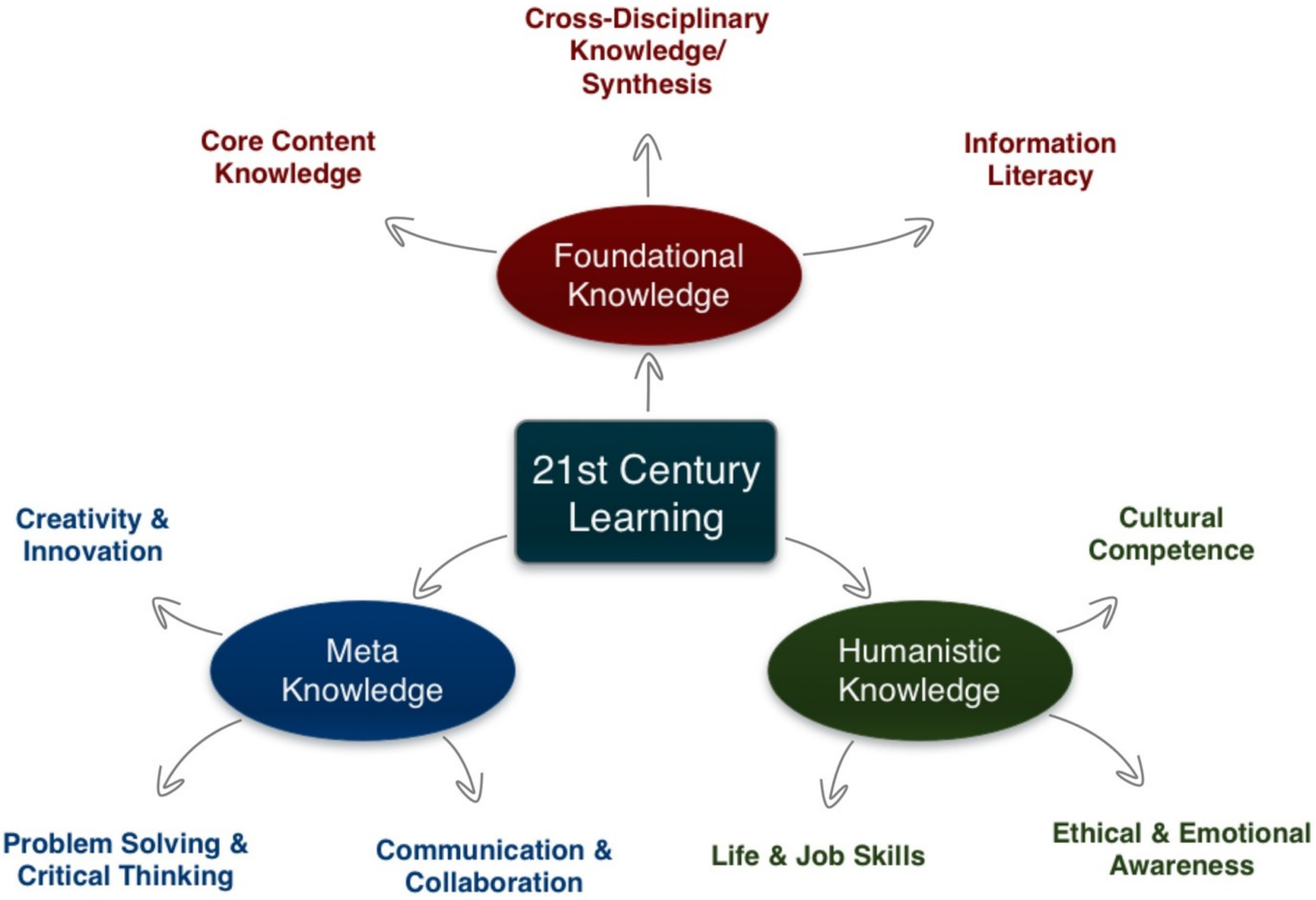
TK



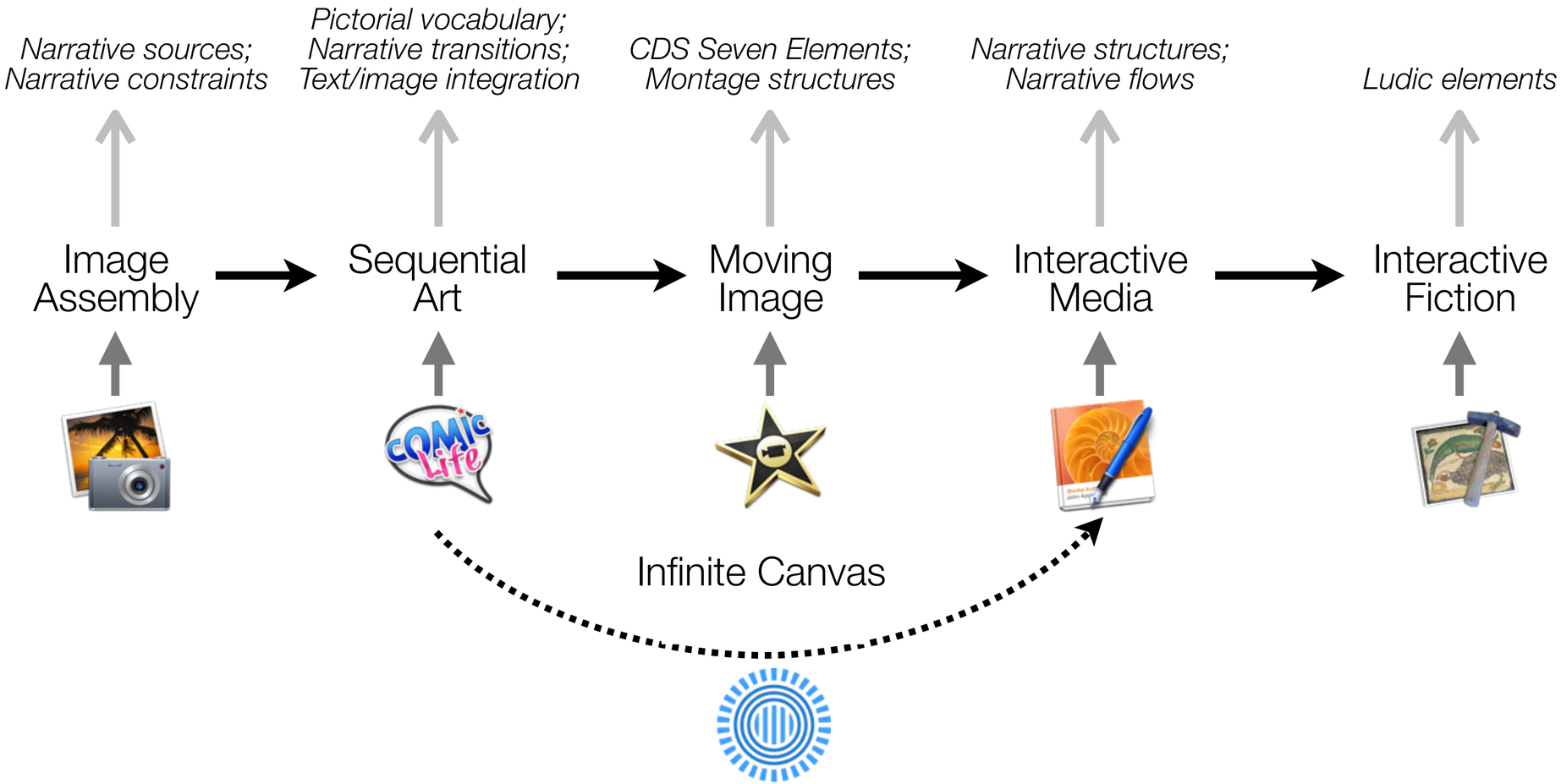
Lee S. Shulman, "Those Who Understand: Knowledge Growth in Teaching." *Educational Researcher*, Vol. 15, No. 2 (Feb., 1986)

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

Information Literacy and Reading Comprehension: Digital Storytelling and Visualization Tools


Cross-Disciplinary Knowledge/ Synthesis
Core Content Knowledge
Information Literacy
Foundational Knowledge
21st Century Learning
Creativity & Innovation
Cultural Competence
Meta Knowledge
Humanistic Knowledge
Problem Solving & Critical Thinking
Communication & Collaboration
Life & Job Skills
Ethical & Emotional Awareness

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


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


bubbl.us
BRUTUS
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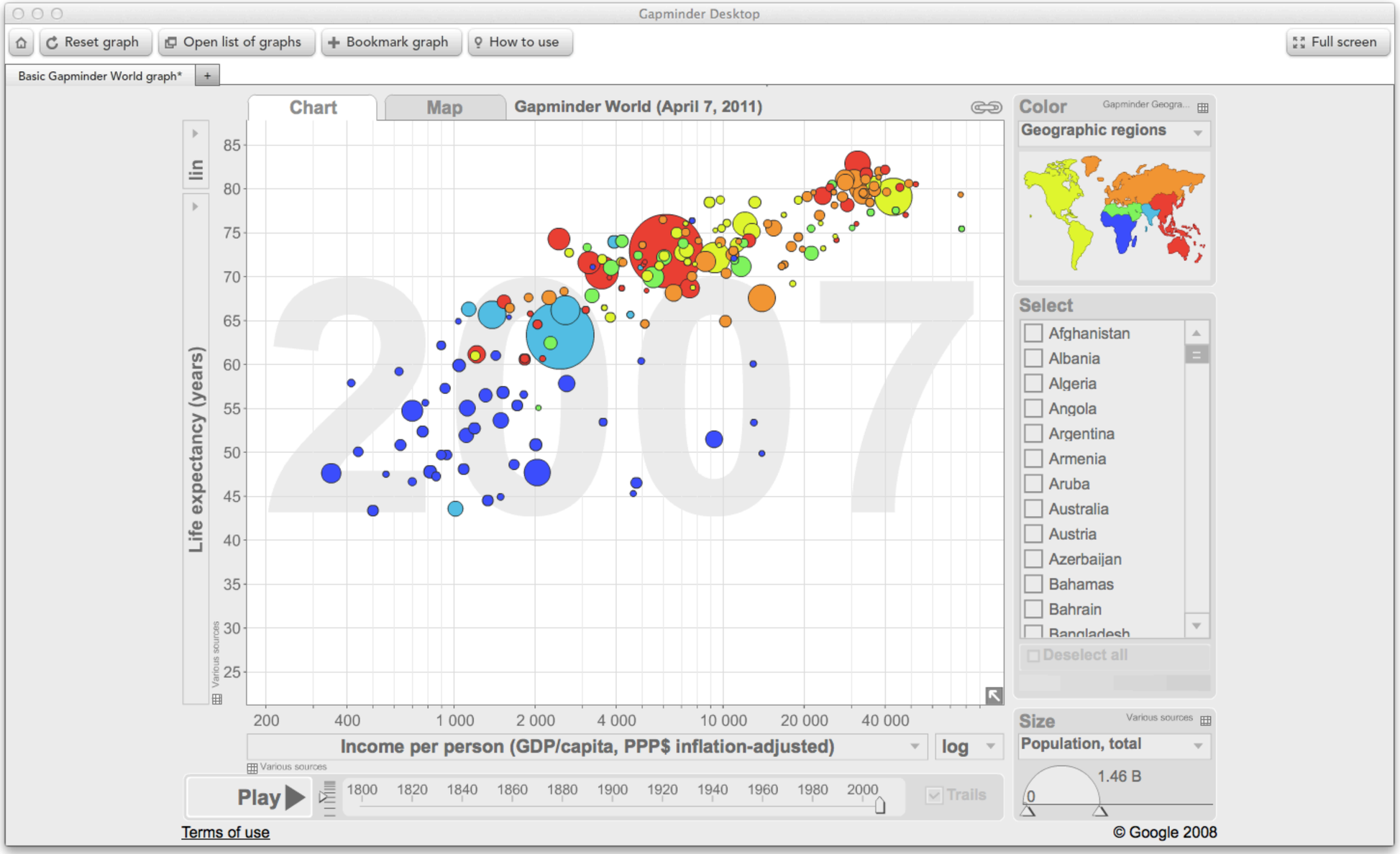
Gapminder Desktop
Reset graph
Open list of graphs
Bookmark graph
How to use
Full screen
Basic Gapminder World graph*
Chart
Map
Gapminder World (April 7, 2011)
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Life expectancy (years)
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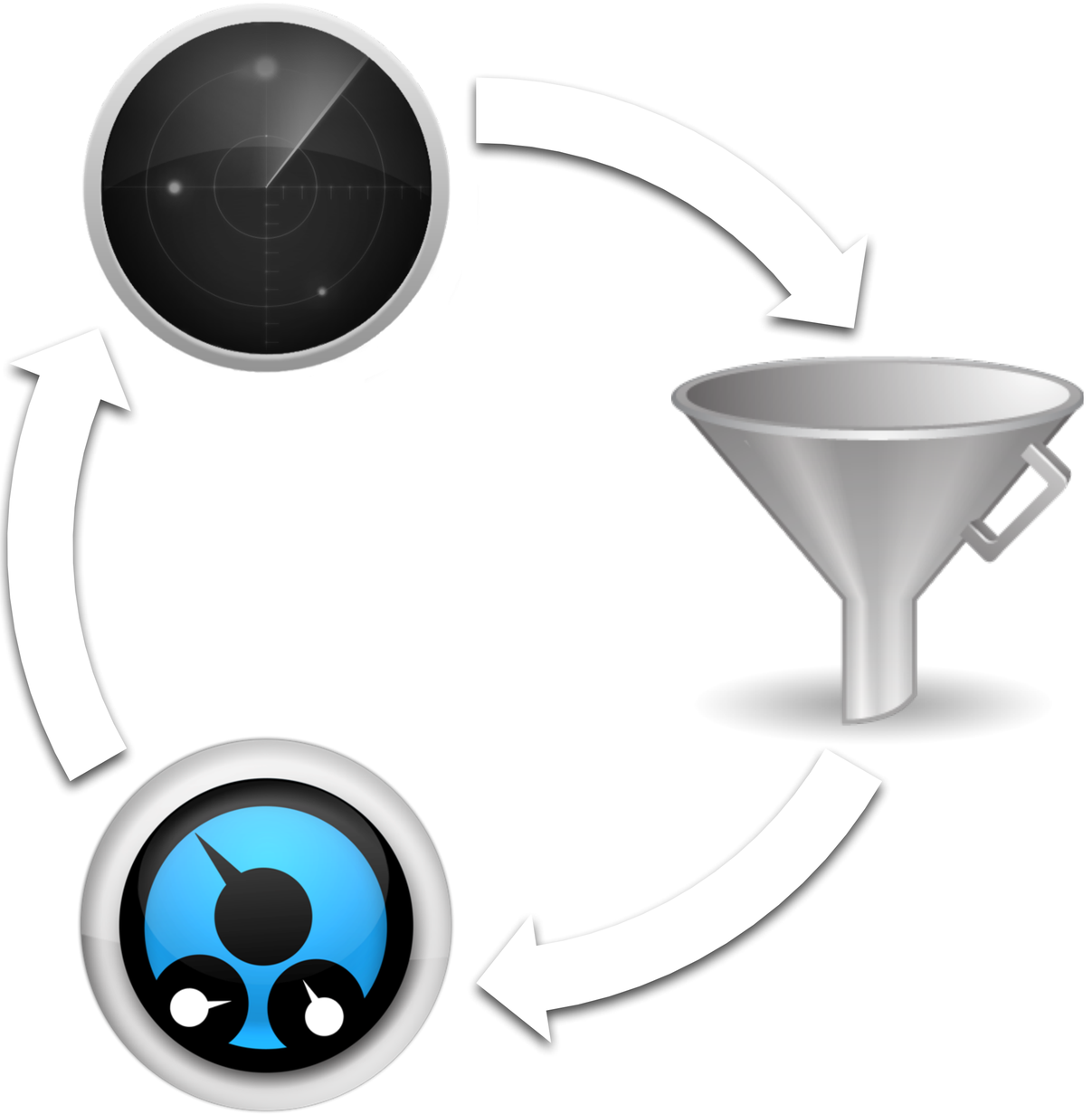
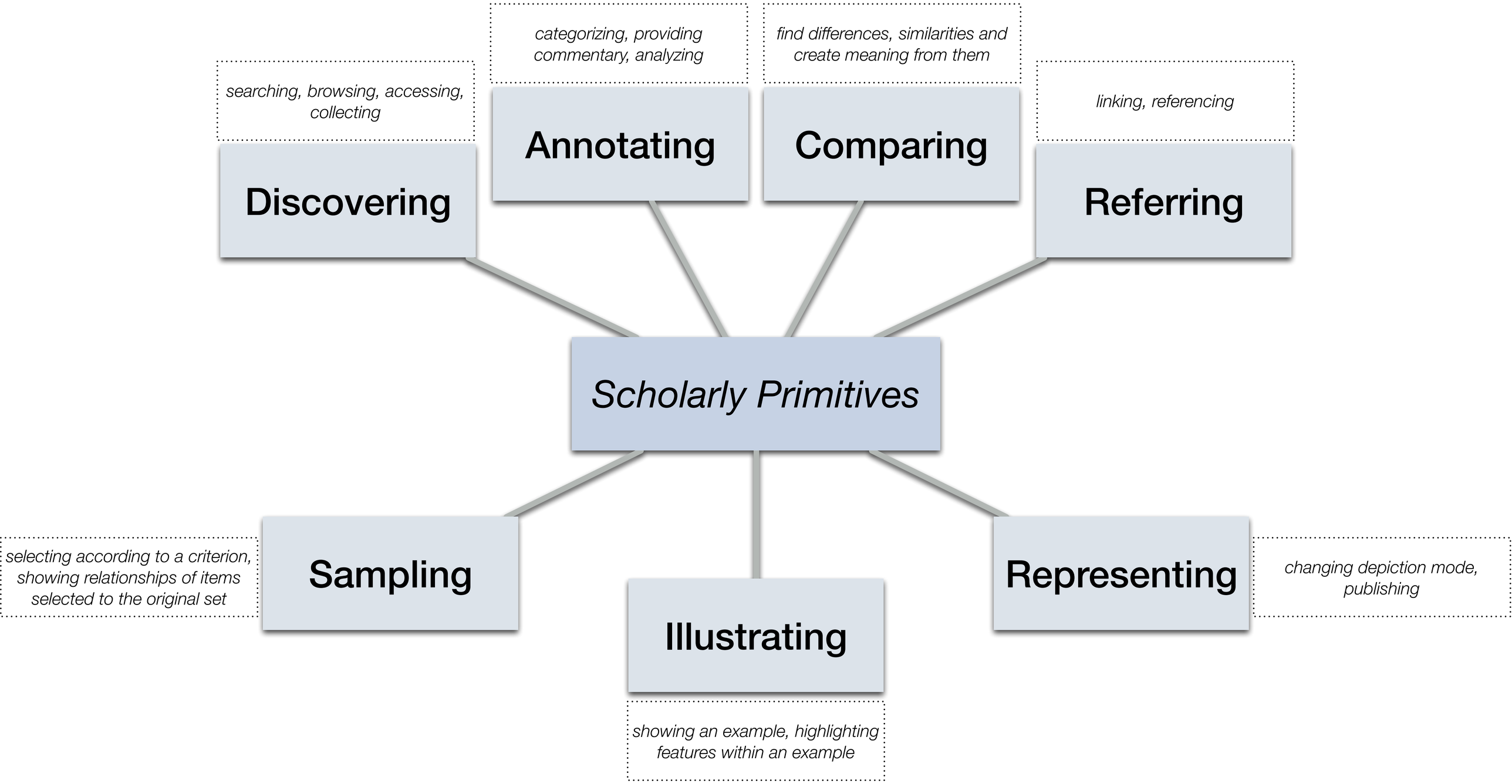
© Google 2008

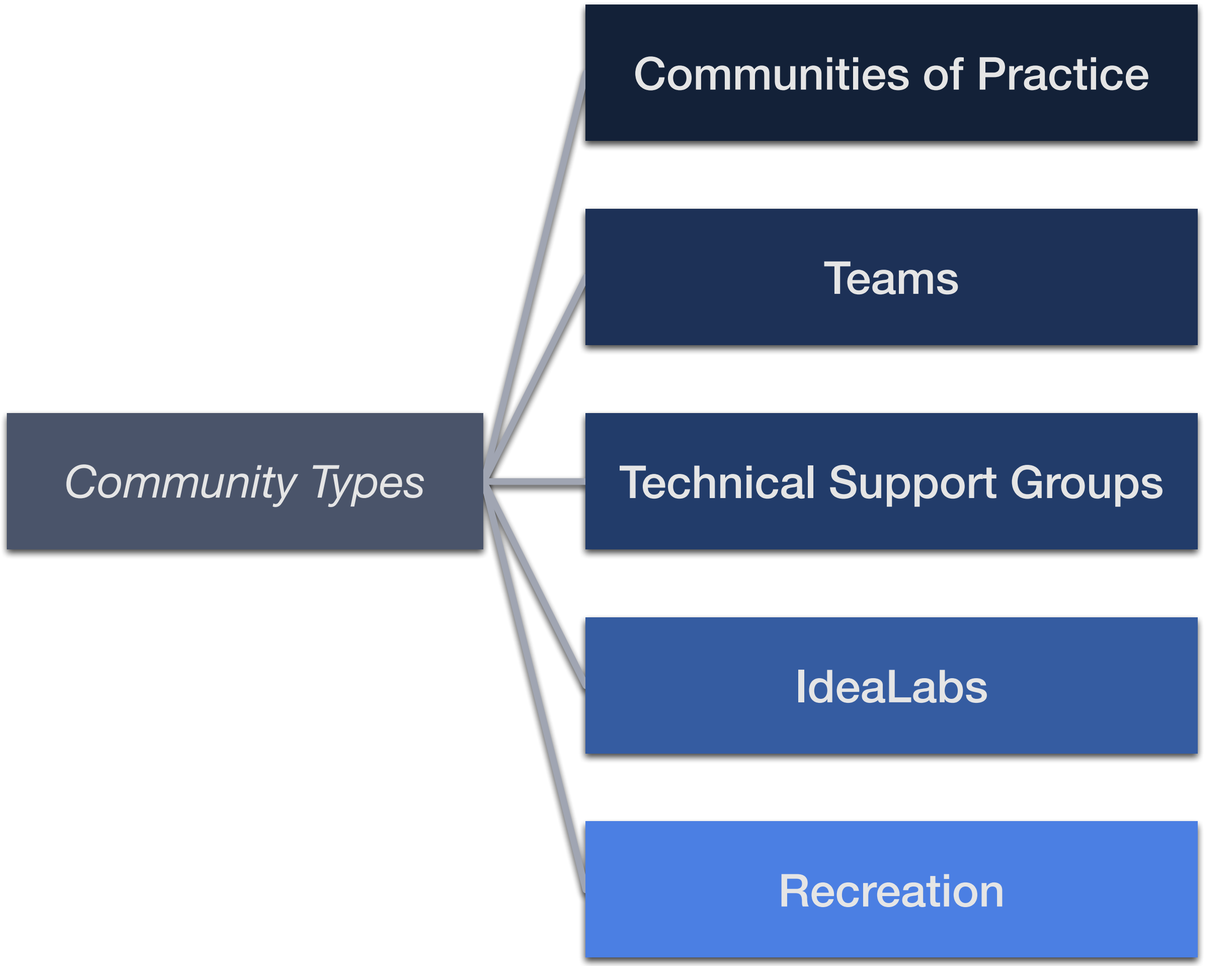
Information Literacy and Reading Comprehension: Research Needs and Social Structures



Howard Rheingold. *Net Smart: How to Thrive Online*. MIT Press (2012)



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



A group of people with a common interest or practice who share information and/or network.

Communities working on a shared goal for a particular project or function.

Provide technical support for a particular software or hardware tool.

Communities in which members brainstorm around a set of questions or issues for a limited period of time, usually one to three days long.

Communities devoted to recreational activities unrelated to work.

Muller, M., Ehrlich, K., Matthews, T., Perer, A. A., Ronen, I., and Guy, I. *Diversity among enterprise online communities: Collaborating, teaming, and innovating through social media*. 2012 ACM SIGCHI Conf. on Human Factors in Computing Systems (2012)

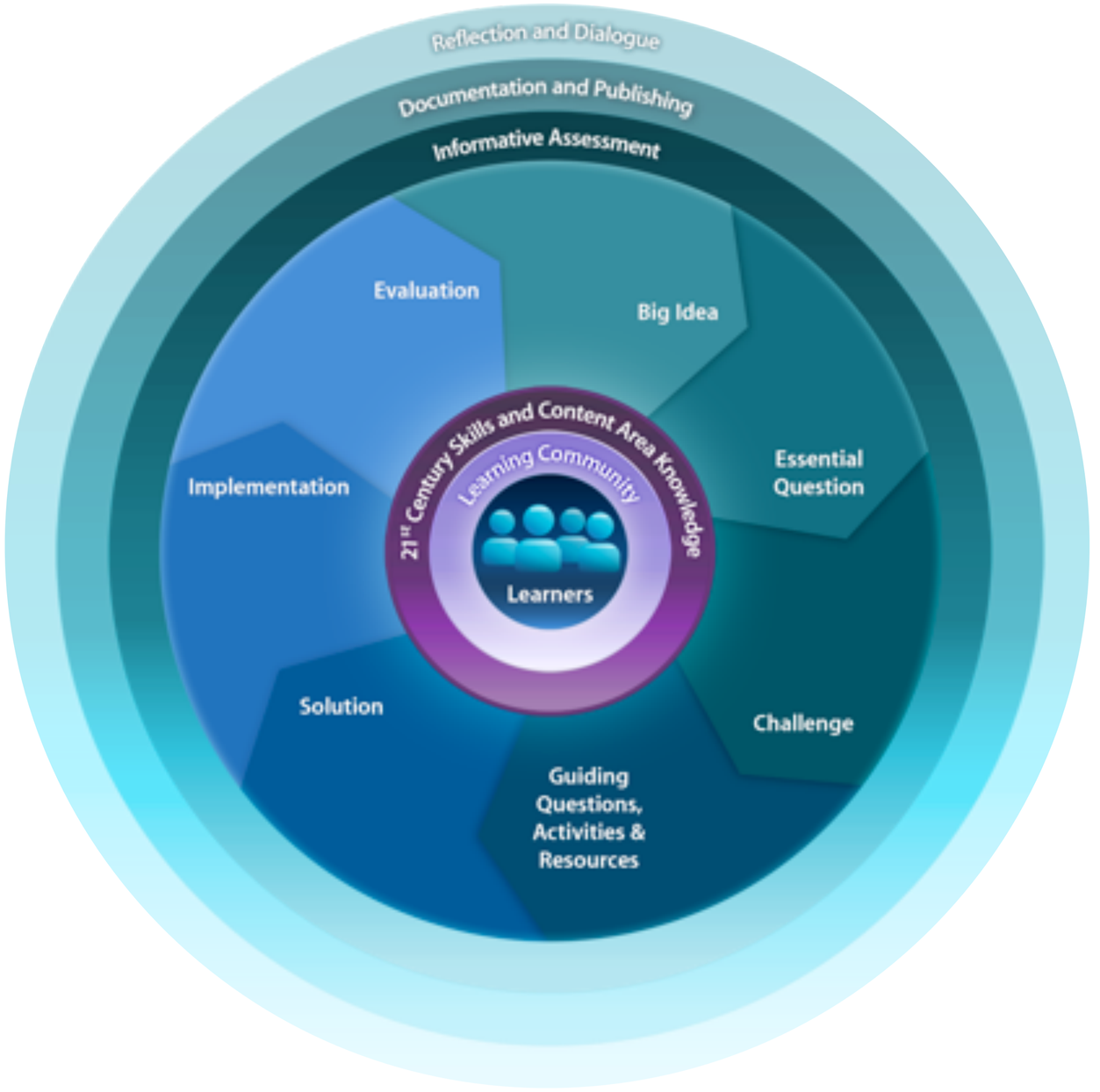
A Basic Toolkit

- Bookmarks: Delicious, Diigo
- RSS Feeds: Reeder
- Forums: itslearning
- Microblogging: Twitter
- Blogging: WordPress
- Wikis: MediaWiki

Framing Cross-Disciplinary Work

Three Categories

- Convergent Design
  - What is a common underlying feature connecting different activities in different subject areas?
  - Example: how does marketing appear as a common feature to be addressed across vocational areas?
- Divergent Design
  - What do different disciplines have to say about one central theme?
  - Example: what do different subject areas contribute to the understanding of the European Union?
- Challenge Based Learning
  - How do we go from a big idea, to a challenge, to implementing a solution, to assessing it?
  - Example: what challenge and response could we derive from the idea of sustainability?


Reflection and Dialogue
Documentation and Publishing
Informative Assessment
Evaluation
Big Idea
Essential Question
Challenge
Guiding Questions, Activities & Resources
Solution
Implementation
21st Century Skills and Content Area Knowledge
Learning Community
Learners

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Big Idea

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Solution

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Evaluation

The CBL Process

Collaborative Space
- How will the teams communicate?
- Where will resources be shared?

Introduction
- Why is this idea important to the students?
- Why is this idea important to the community?

Team Formation
- What makes up a productive design team?
- How do we capitalize on everyone's skills?

Assessment
- How will the process be assessed?
- How will the solution be assessed?

Guiding Questions
- What do we need to know in order to meet the challenge?

Guiding Activities
- What do we need to do to answer our guiding questions?
- What resources are needed?

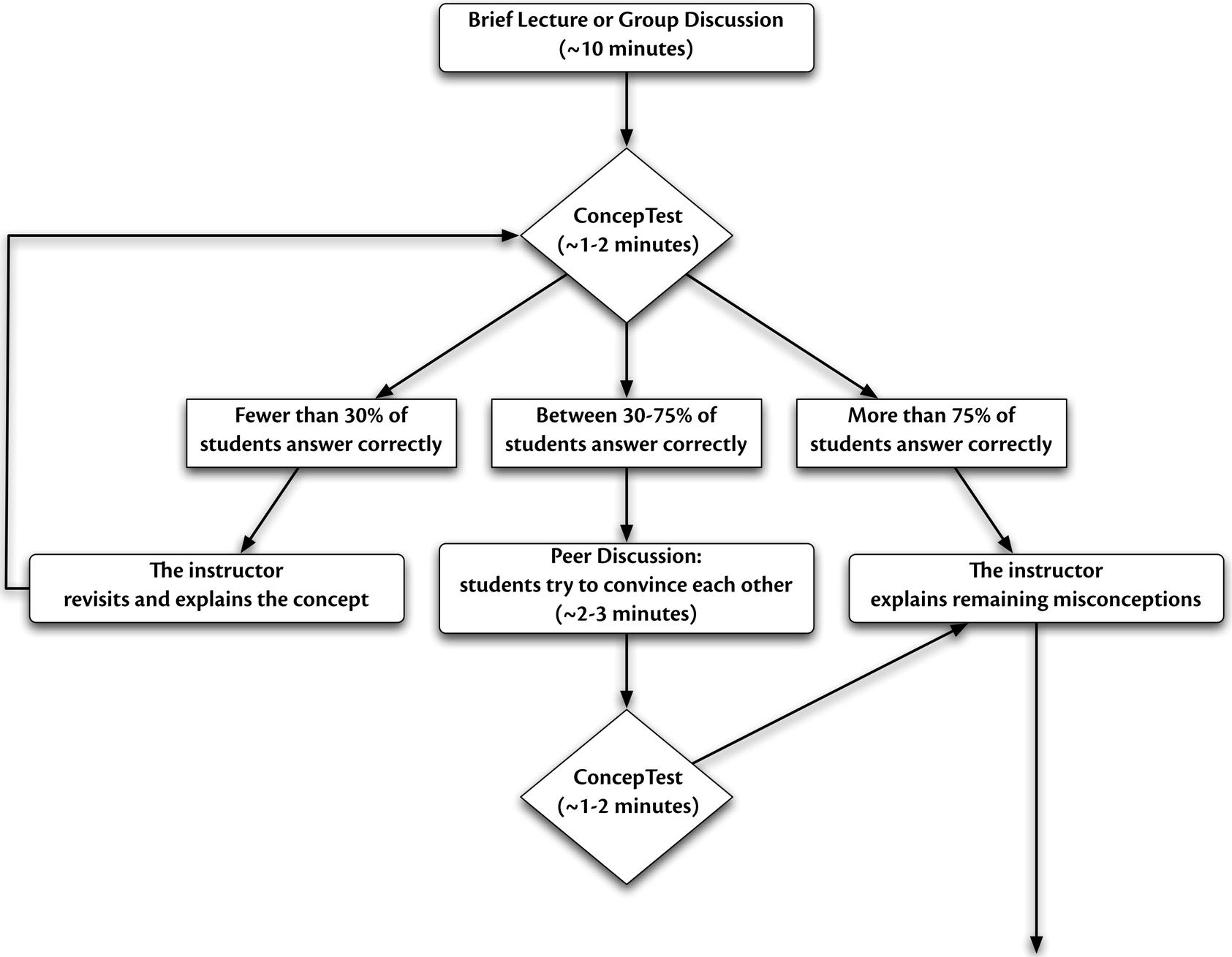
Solution Development
- How do we meet the challenge?
- Is the solution justified?

Implement and Assess
- How can the solution be tested?
- Did the solution work?

Document/Reflect
- What did we learn?
- What would we do differently?

Publish
- How do we share our results?
- What is the story behind the solution?

Thinking About Assessment



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

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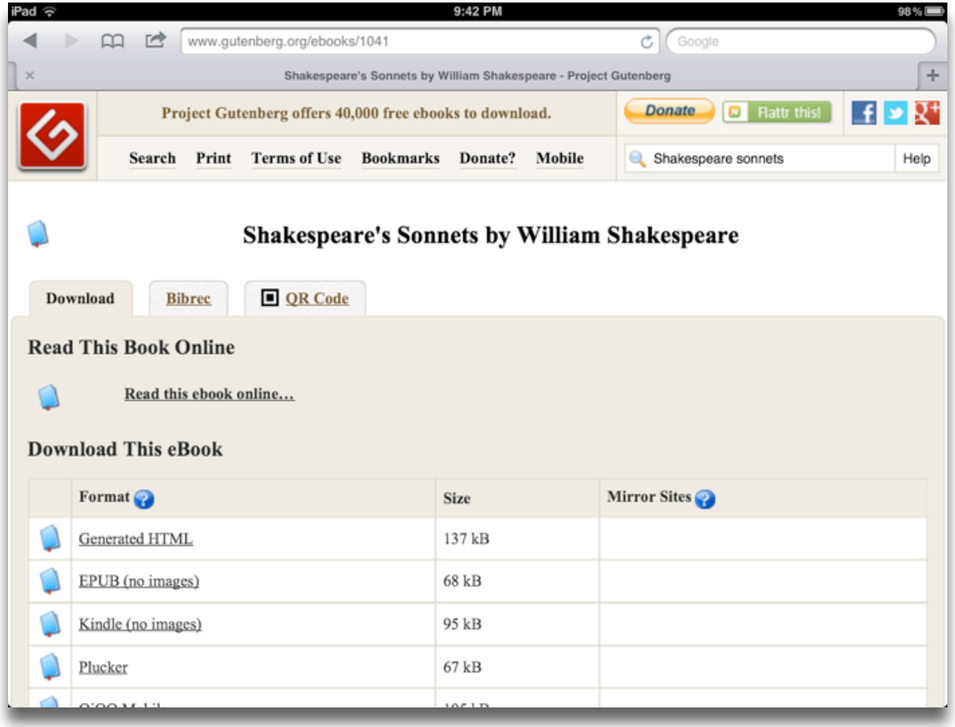

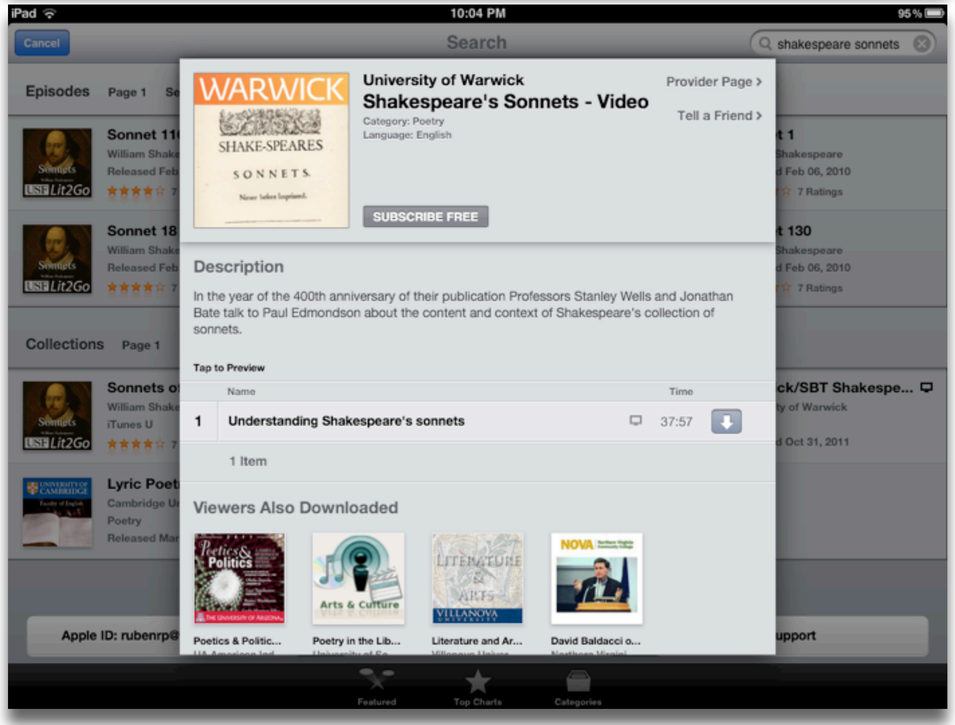

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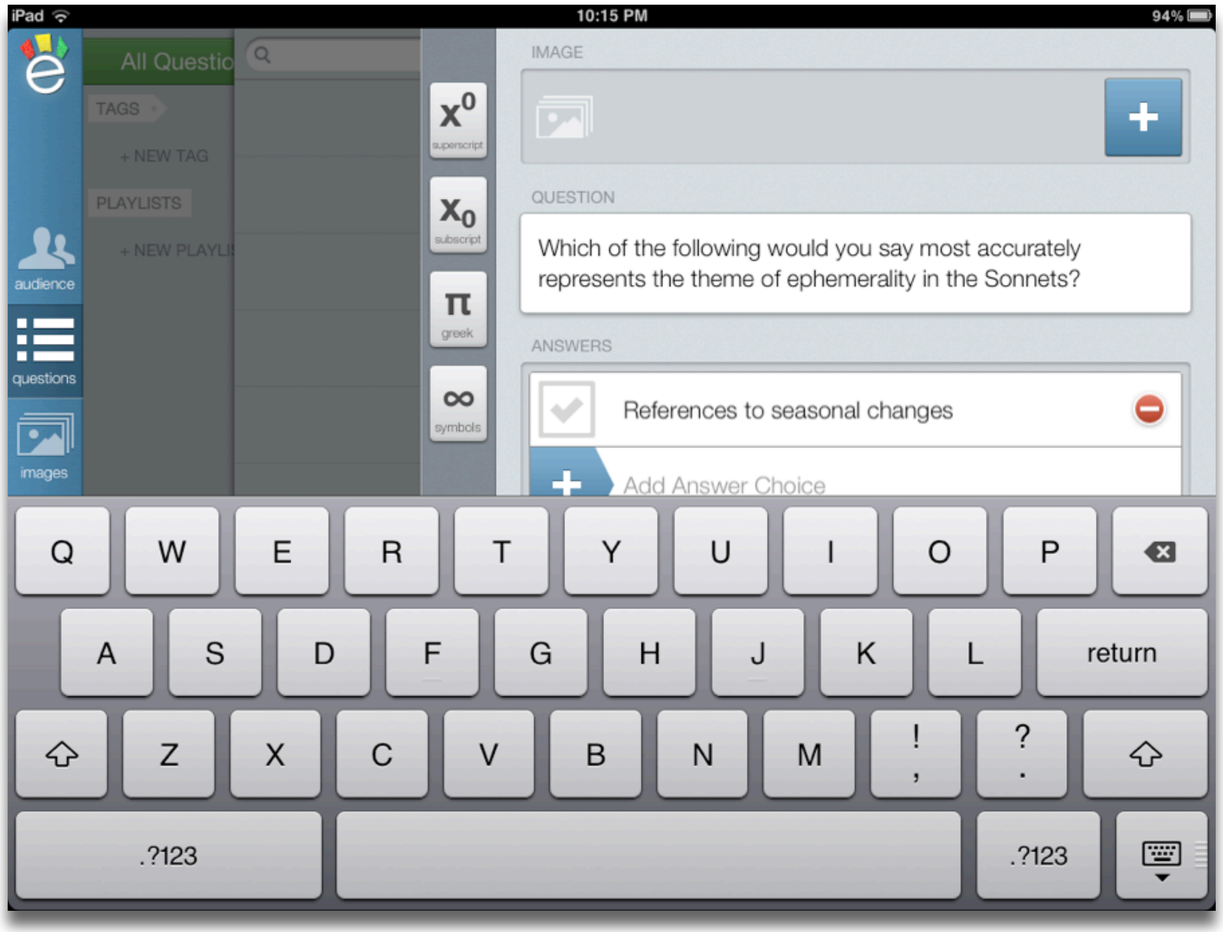

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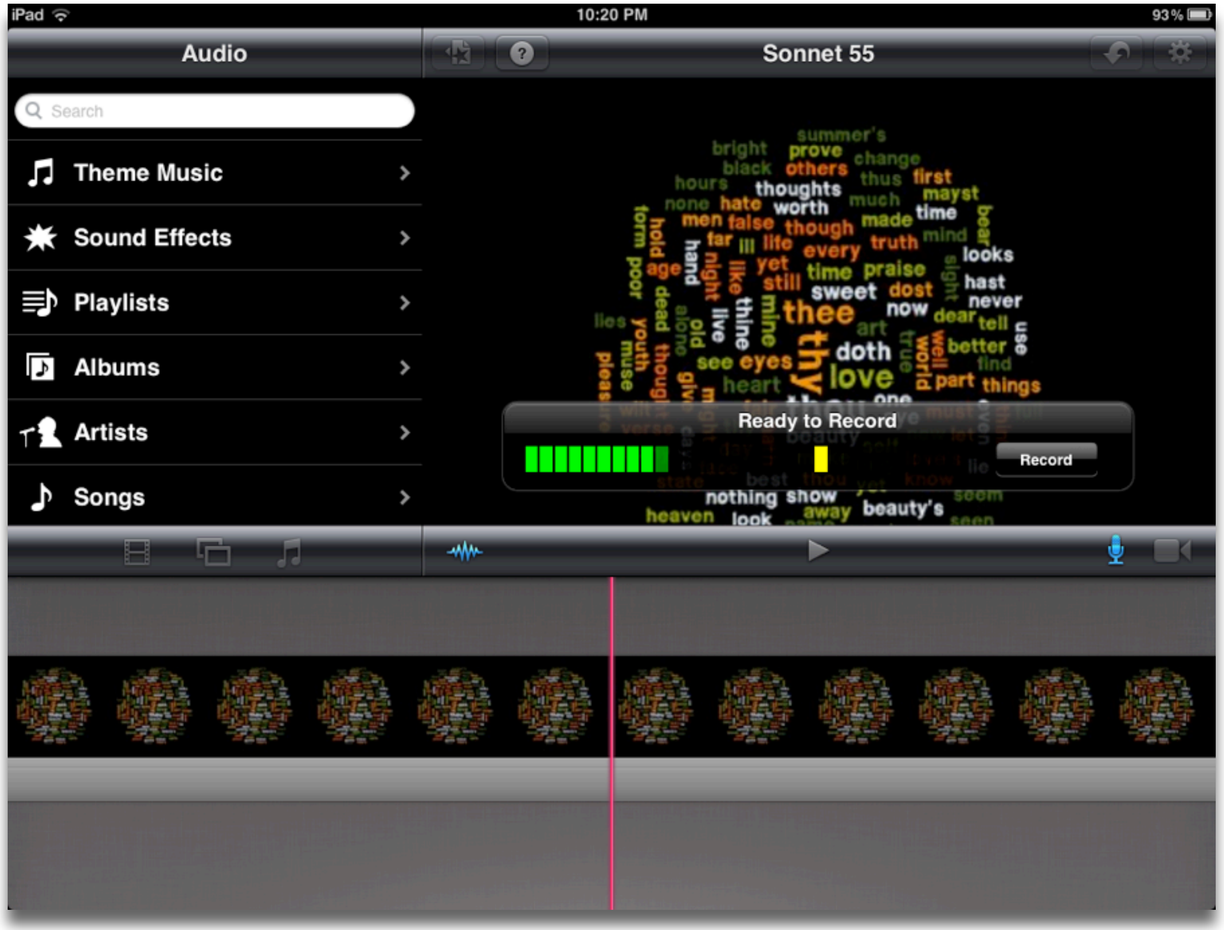

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1. Clarifying, Sharing, & Understanding Learning Intentions & Success Criteria

- Task-specific *vs.* generic rubrics
    - Task-specific: best for summative
    - Generic: best for formative
- Product-focused vs. Process-focused
- Official vs. Student-Friendly Language

Approaches to 1.

- Look at samples of other students' work, then rank them by quality
  - Engage students in quality process
  - Students frequently better at seeing issues in others' work
  - Not a "somebody wins" exercise, but a quality exercise
  - Consider using ranked voting, e.g. Condorcet
- Make explicit progressions within rubrics, and progressions across rubrics
- Have students design test items
- Presenting learning intentions and success criteria to students:
  - WALT: we are learning to
  - WILF: what I'm looking for
  - TIB: this is because

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

- Asking questions in class:
  - Discussion/thinking trigger
  - Examples: ConcepTest, POE, Virtual Whiteboard
    - Incorrect answers have to be "interesting"
    - Can allow for:
      - Multiple correct answers
      - Varying degrees of correctness
    - Should provide info for varying instruction on the fly and long term
- Make sure that answers cannot be constructed by accident

3. Providing Feedback that Moves Learning Forward

- **Feedback must provide a recipe for future action**
- **Feedback should:**
  - Be more work for the recipient than the donor
    - Not just right/wrong - make them think about what did not work
  - Be focused: less is more
  - Relate explicitly to goals/rubrics

Characteristics and Models for Feedback that Satisfies 3.

- When:
  - Provide feedback post-problem engagement
    - More "mindfulness" = more learning
- How:
  - Scores or praise alone do not provide this; comments do
  - Supplying minimal scaffolded responses (i.e., addressing 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
- 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)
    - Better viewed as an outcome:
    - Flow: the result of a match between capability and challenge
      - Students are motivated to reach goals that are:
        - Specific
        - Within reach
        - Offer some degree of challenge

Student Sources for 5.

- 3 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
- Crucial Tools:
  - Learning logs
  - Learning portfolios

Resources

- Ruben R. Puentedura, *Transformation, Technology, and Education*. (2006) Online at: http://hippasus.com/resources/tte/
- Ruben R. Puentedura, *As We May Teach: Educational Technology, From Theory Into Practice*. (2009) Online at: http://tinyurl.com/aswemayteach
- Punya Mishra & Matthew J. Koehler, “Technological pedagogical content knowledge: A framework for teacher knowledge”. *Teachers College Record, 108*(6). (2006) Online at: http://mkoehler.educ.msu.edu/OtherPages/Koehler_Pubs/TECH_BY_DESIGN/TCRecord/mishra_koehler_tcr2006.pdf
- *TPCK - Technological Pedagogical Content Knowledge*. Online at: http://tpack.org
- AACTE (Eds.) *The Handbook of Technological Pedagogical Content Knowledge for Educators*. Routledge. (2008)
- Ruben R. Puentedura, “Technology In Education: The First 200,000 Years” *The NMC Perspective Series: Ideas that Matter*. NMC Summer Conference. (2012) Online at: http://www.youtube.com/watch?v=NemBarqD6qA
- Punya Mishra and Kristen Kereluik, “What is 21st Century Learning? A review and synthesis.” Paper submitted to the SITE2011 Conference. (2011) Online at: http://punya.educ.msu.edu/publications/21stCenturyKnowledge_PM_KK.pdf
- Punya Mishra and Kristen Kereluik, “What is 21st Century Learning? A review and synthesis.” SITE2011 Conference Presentation. (2011) Online at: http://punya.educ.msu.edu/presentations/site2011/SITE_2011_21st_Century.pdf

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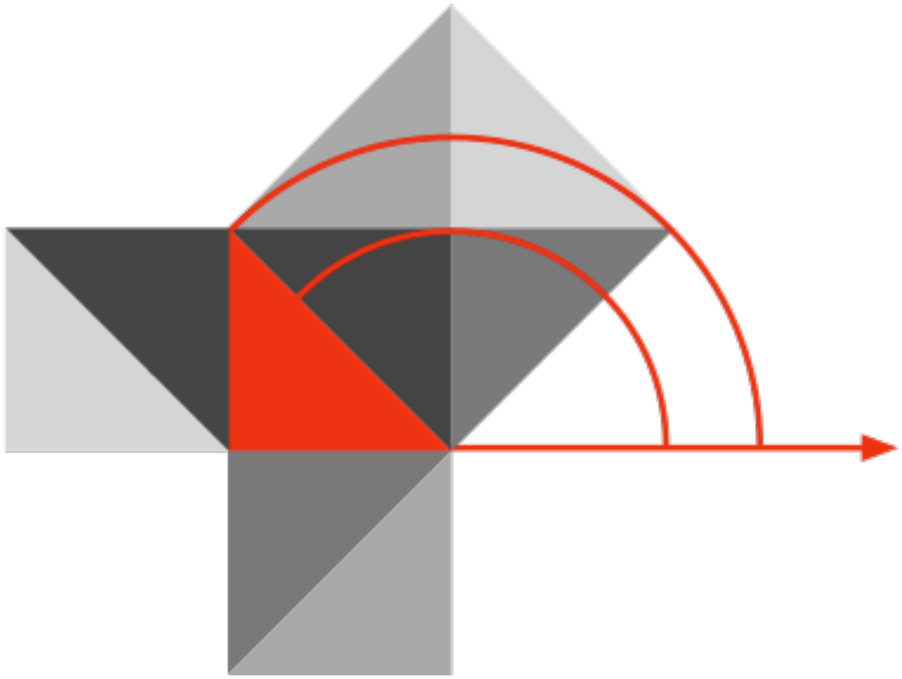

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