Technology In Education: An Integrated Approach

Ruben R. Puentedura, Ph.D.

1. SAMR & TPCK

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

Modification
Tech allows for significant task redesign

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

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

Transformation

Enhancement

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

Redefinition

Tech allows for the creation of new tasks, previously inconceivable

Modification

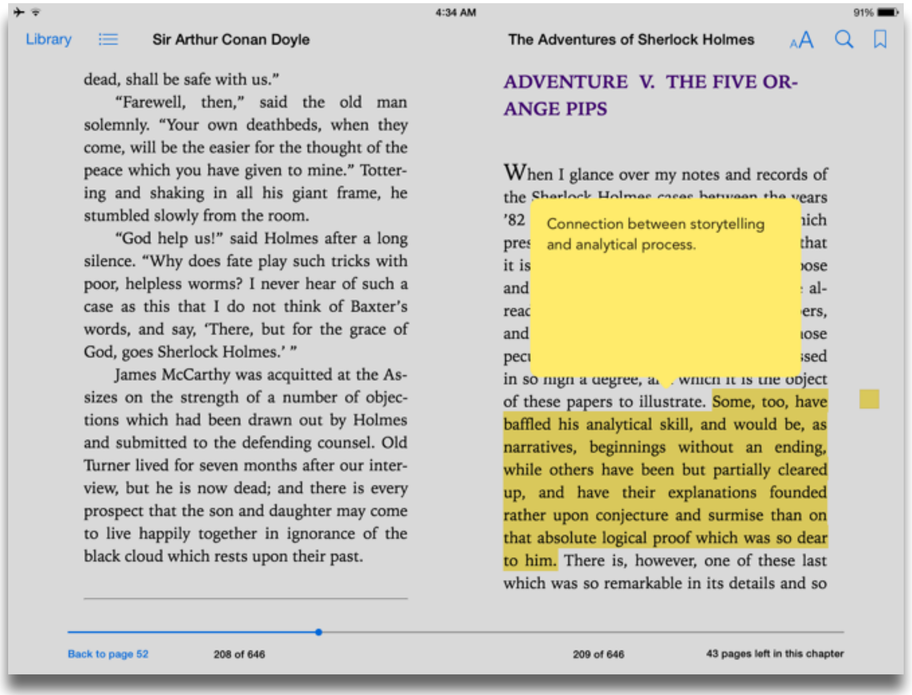
Tech allows for significant task redesign

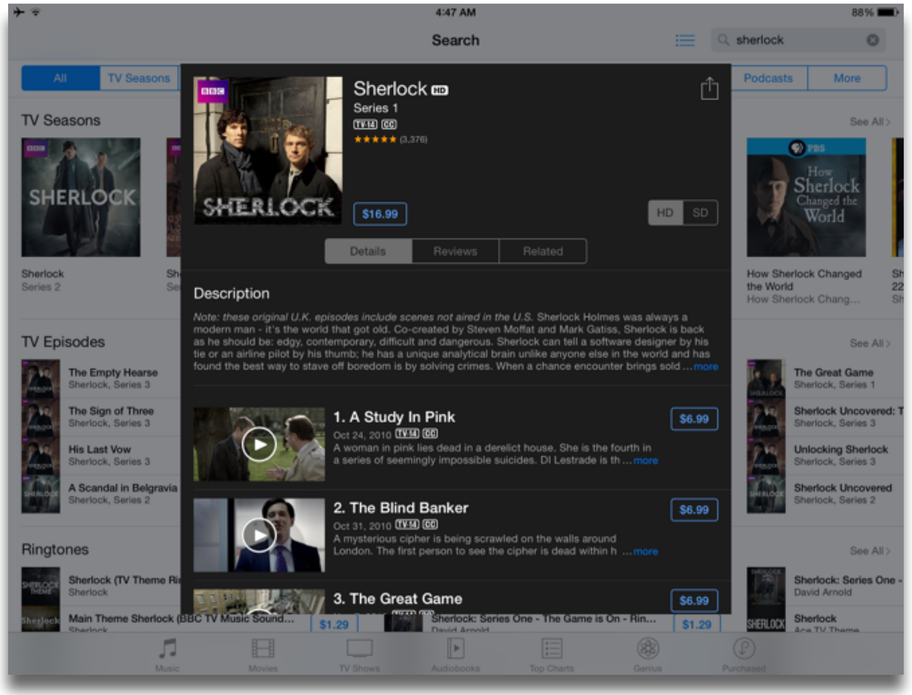
Augmentation

Tech acts as a direct tool substitute, with functional improvement

Substitution

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



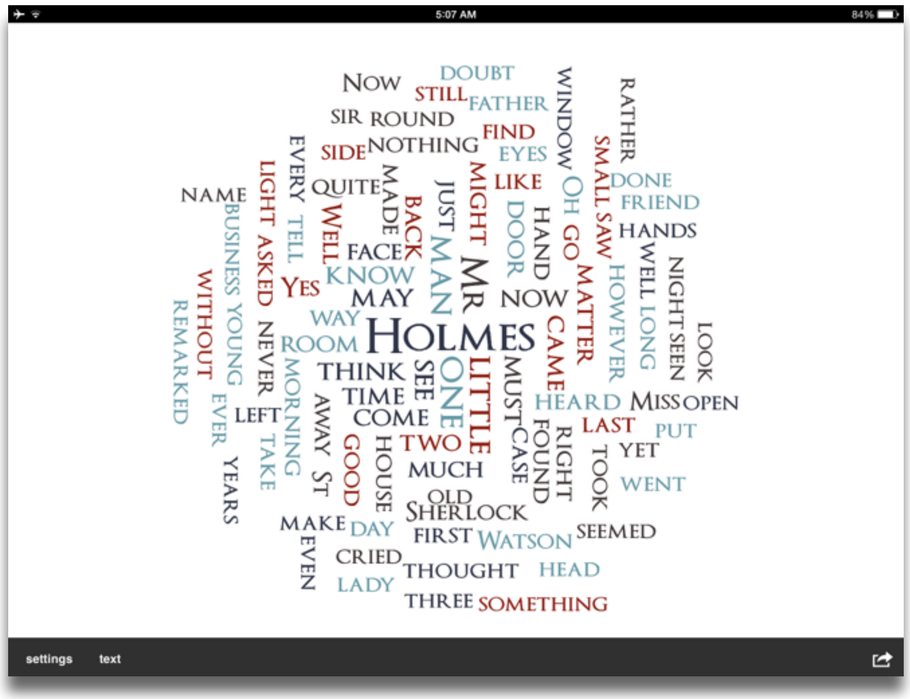


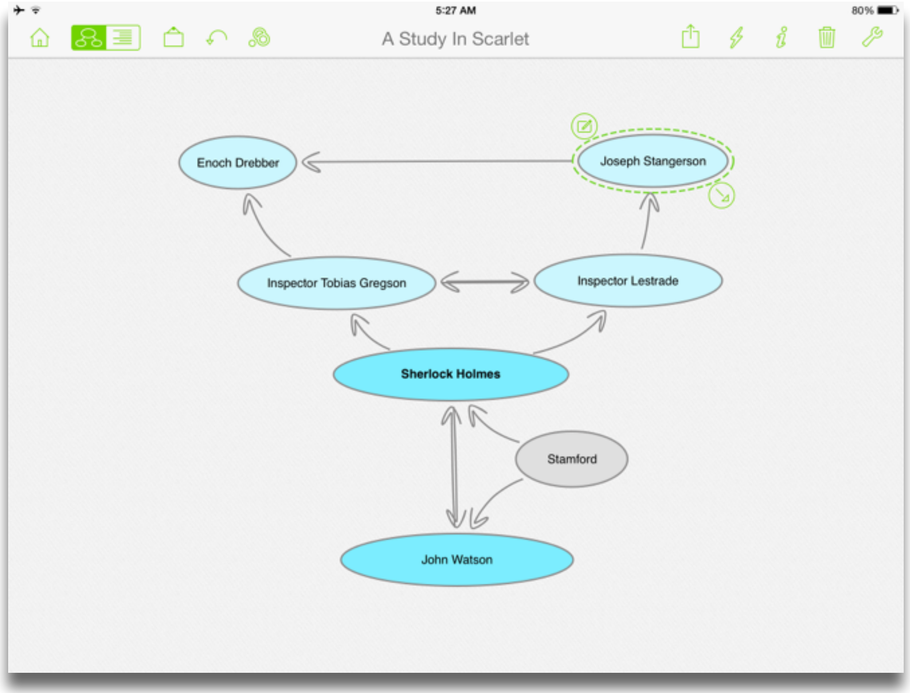
Redefinition
Tech allows for the creation of new tasks, previously inconceivable

Modification
Tech allows for significant task redesign

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

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



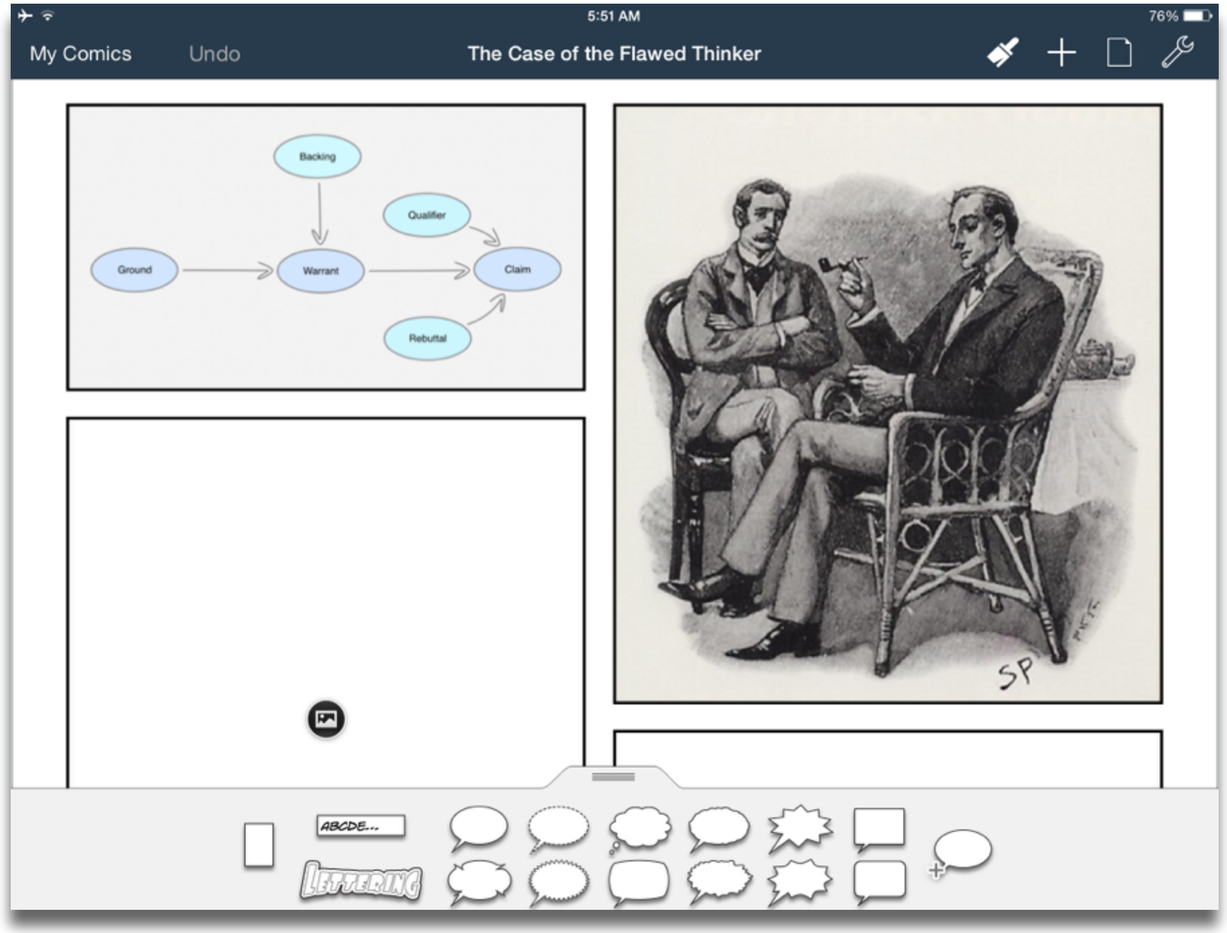


Redefinition
Tech allows for the creation of new tasks, previously inconceivable

Modification
Tech allows for significant task redesign

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

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

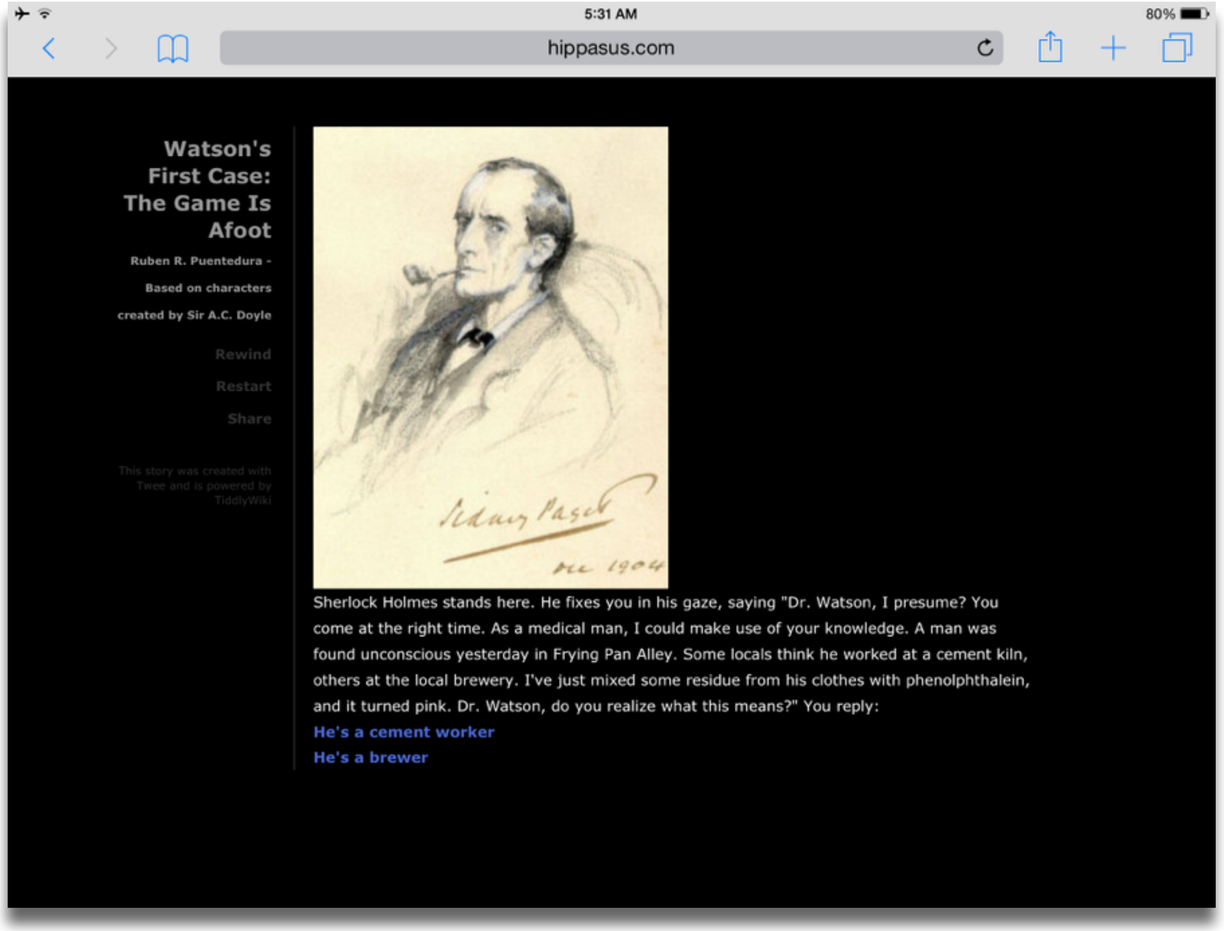


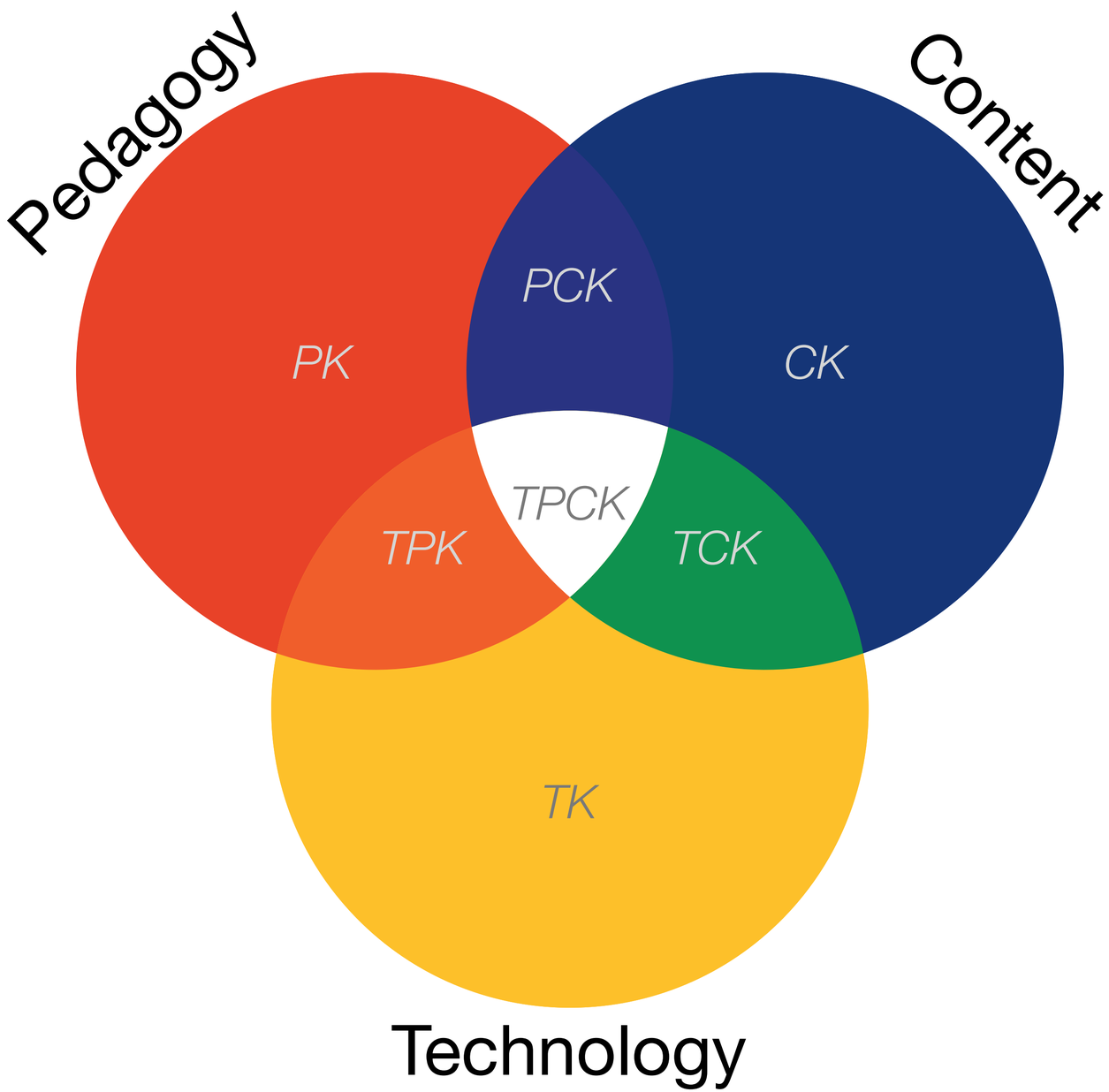
Redefinition
Tech allows for the creation of new tasks, previously inconceivable

Modification
Tech allows for significant task redesign

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

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





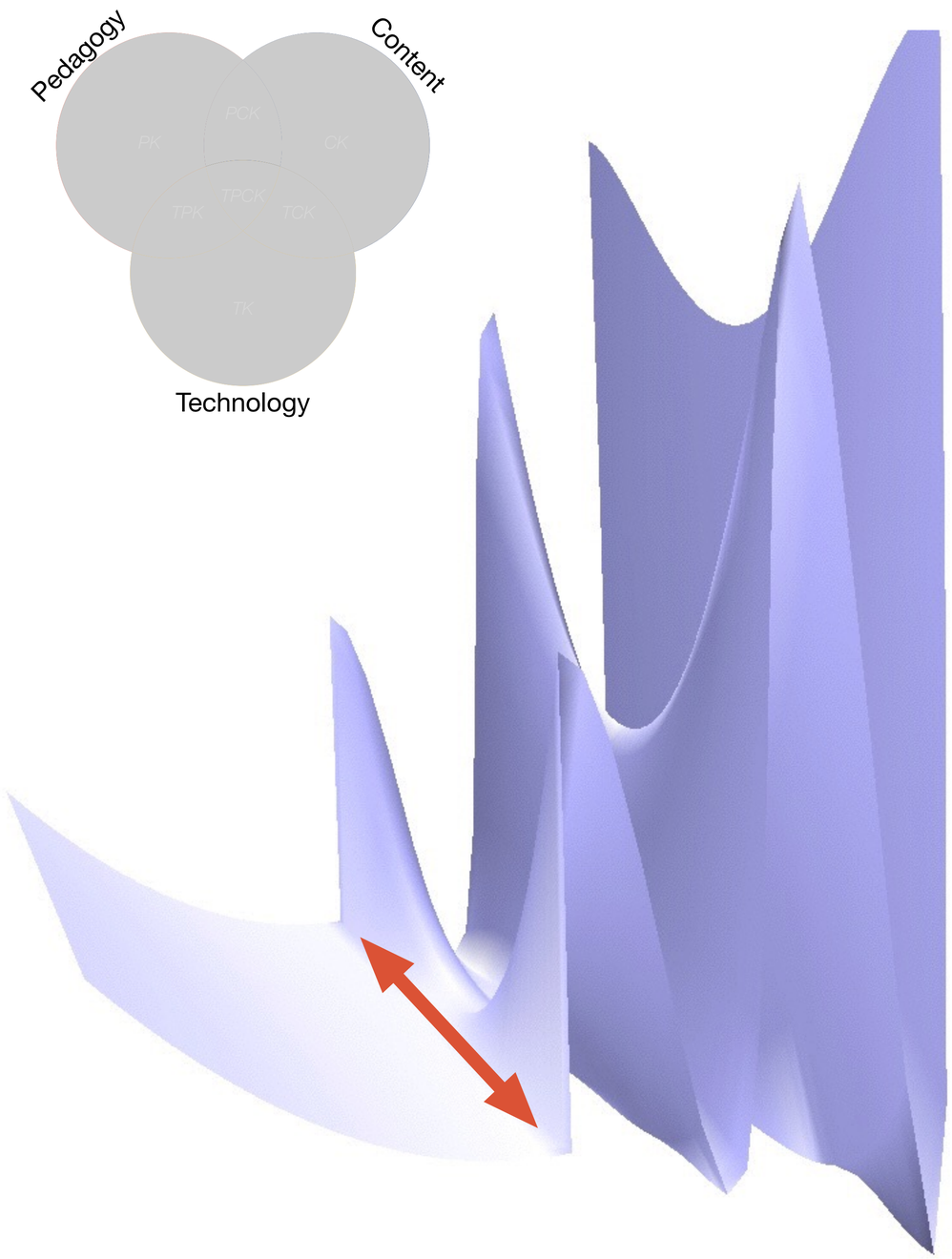
Punya Mishra & Matthew J. Koehler, “Technological pedagogical content knowledge: A framework for teacher knowledge”. *Teachers College Record, 108*(6). (2006)

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

Modification
Tech allows for significant task redesign

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

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

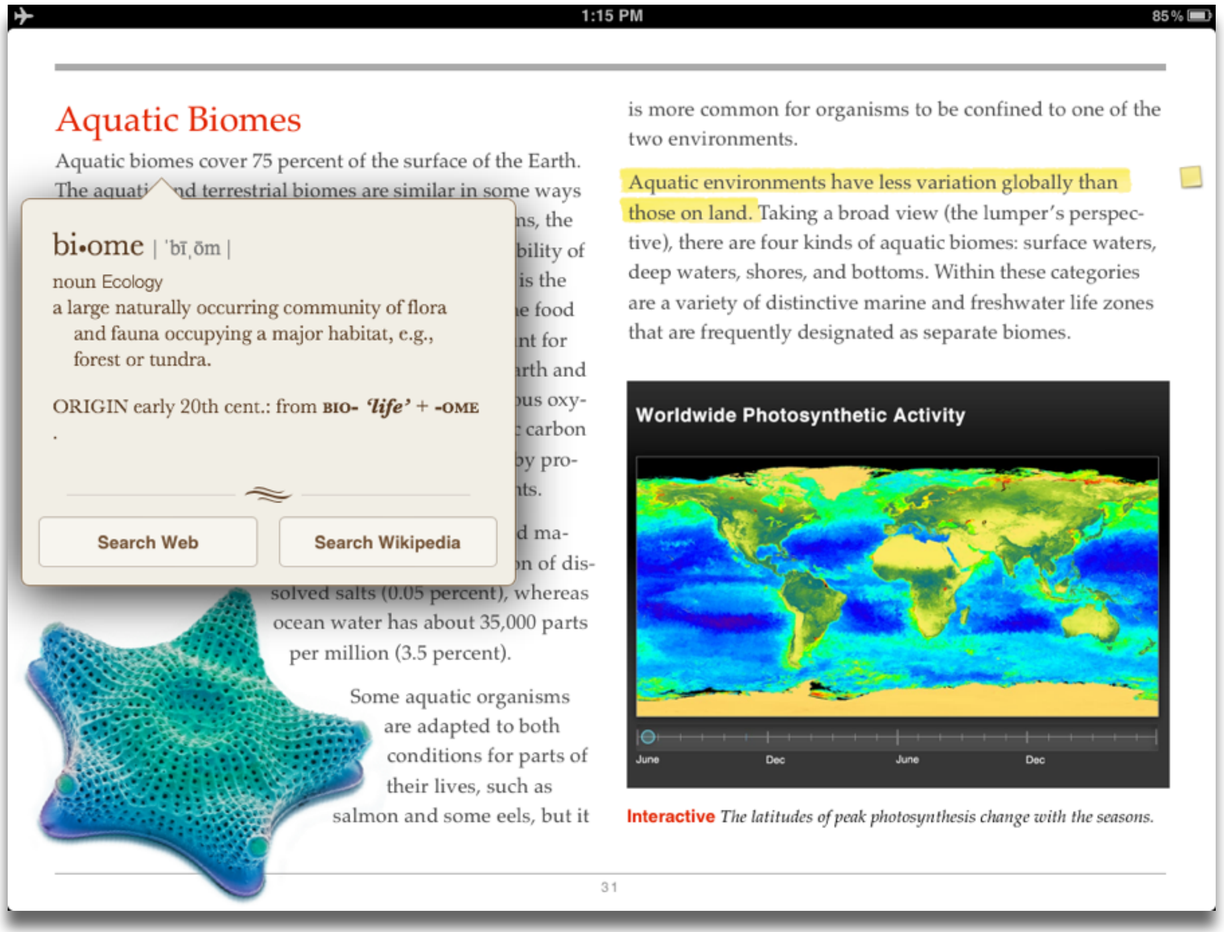


Redefinition
Tech allows for the creation of new tasks, previously inconceivable

Modification
Tech allows for significant task redesign

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

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

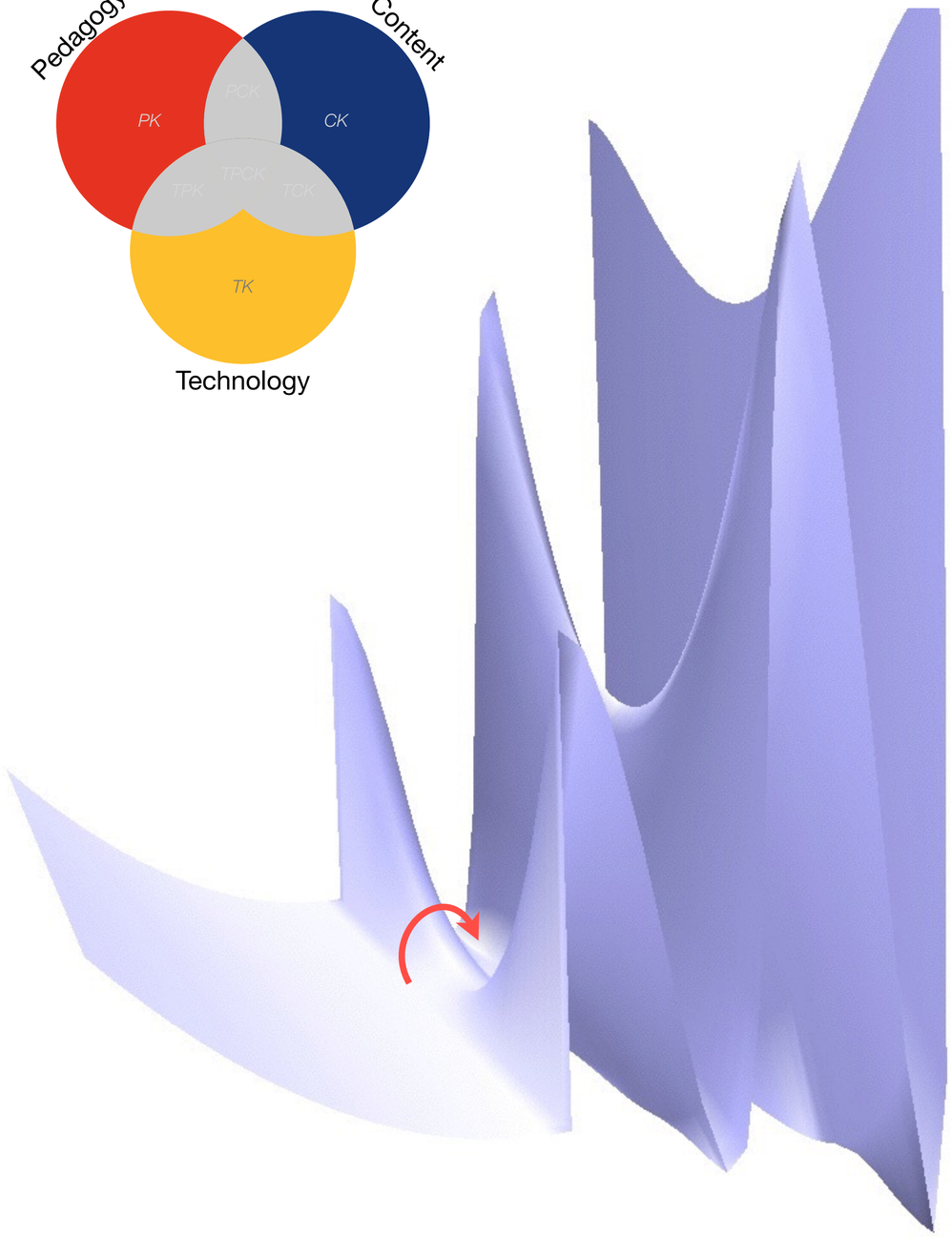


Redefinition
Tech allows for the creation of new tasks, previously inconceivable

Modification
Tech allows for significant task redesign

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

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

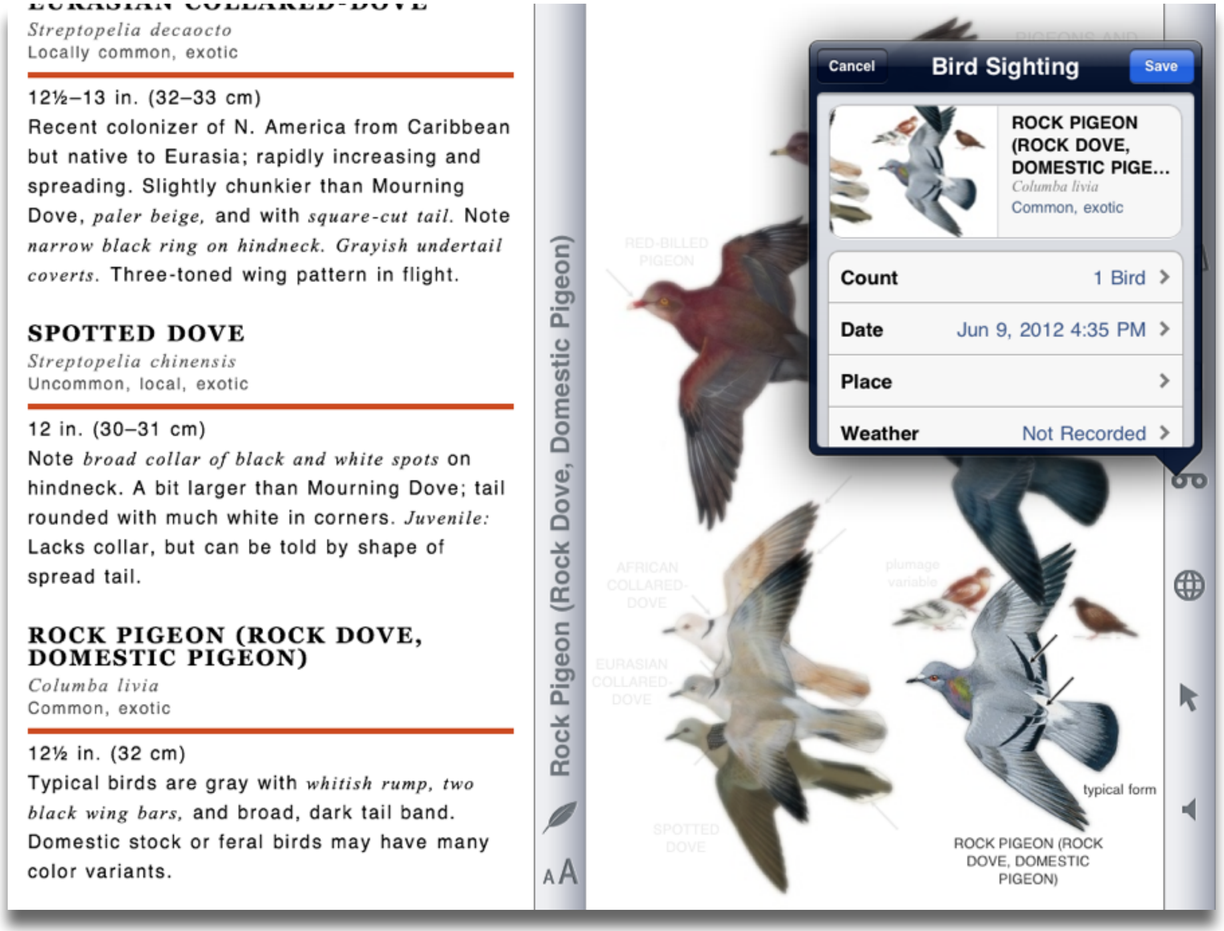


Redefinition
Tech allows for the creation of new tasks, previously inconceivable

Modification
Tech allows for significant task redesign

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

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

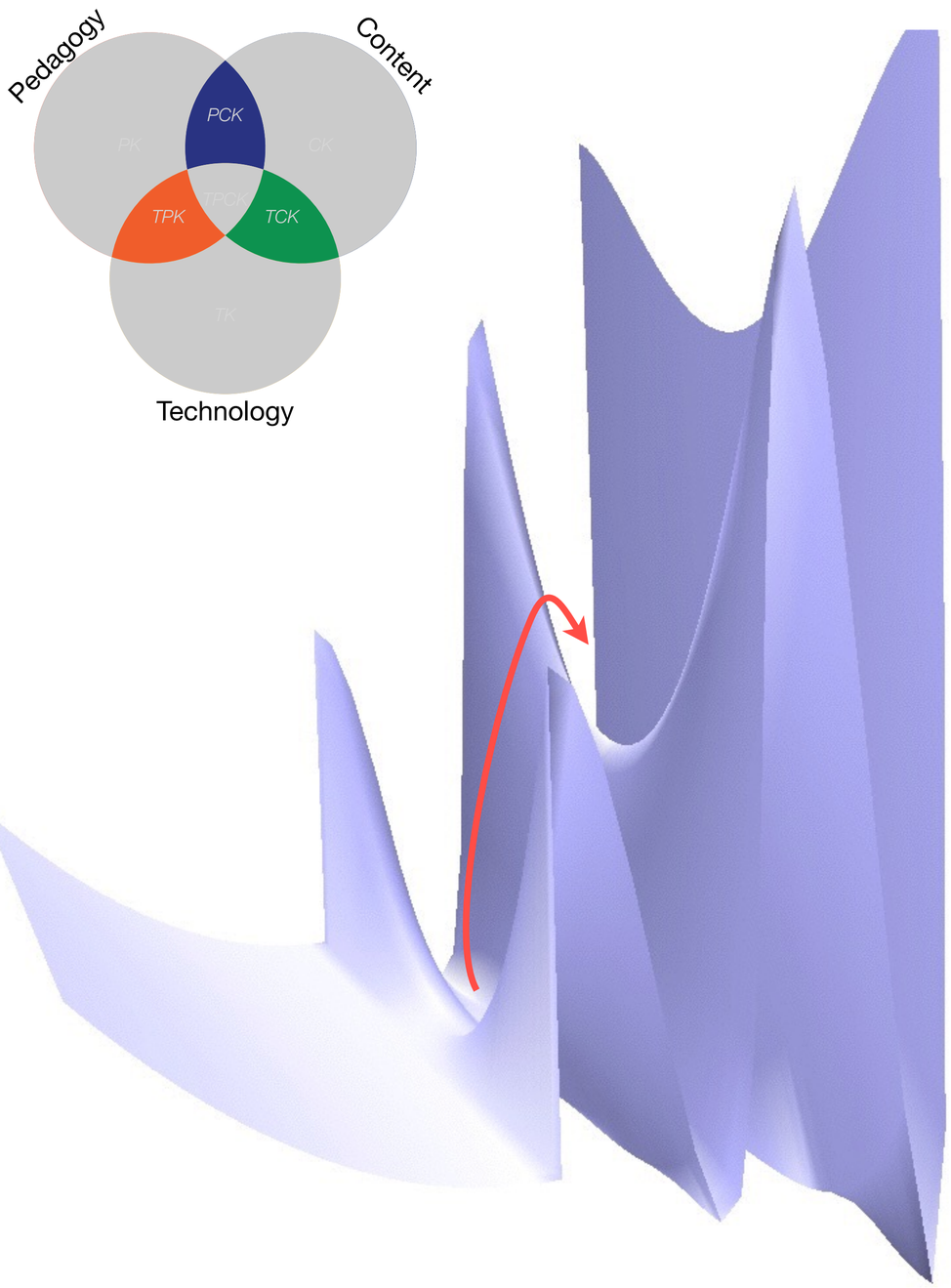


Redefinition
Tech allows for the creation of new tasks, previously inconceivable

Modification
Tech allows for significant task redesign

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

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

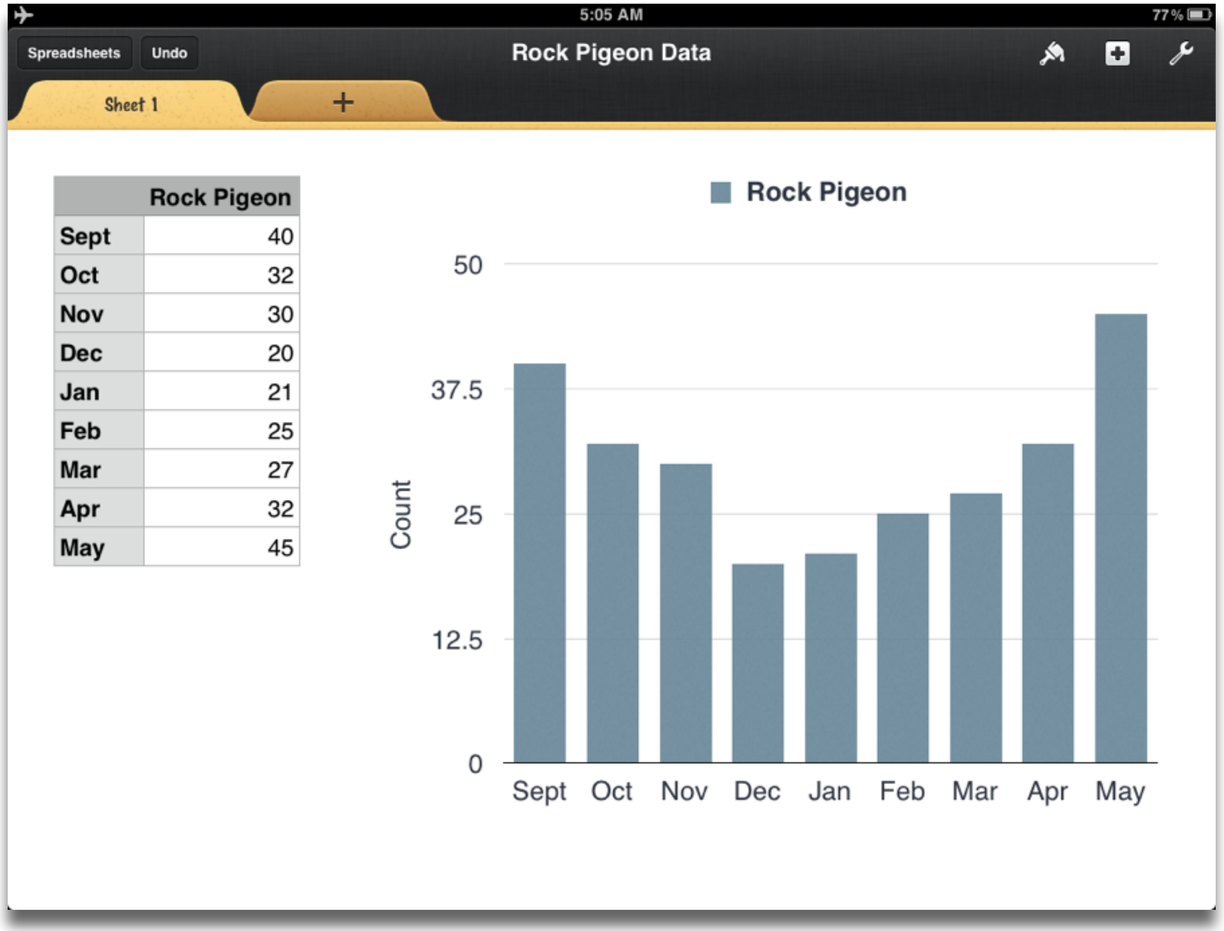


Redefinition
Tech allows for the creation of new tasks, previously inconceivable

Modification
Tech allows for significant task redesign

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

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



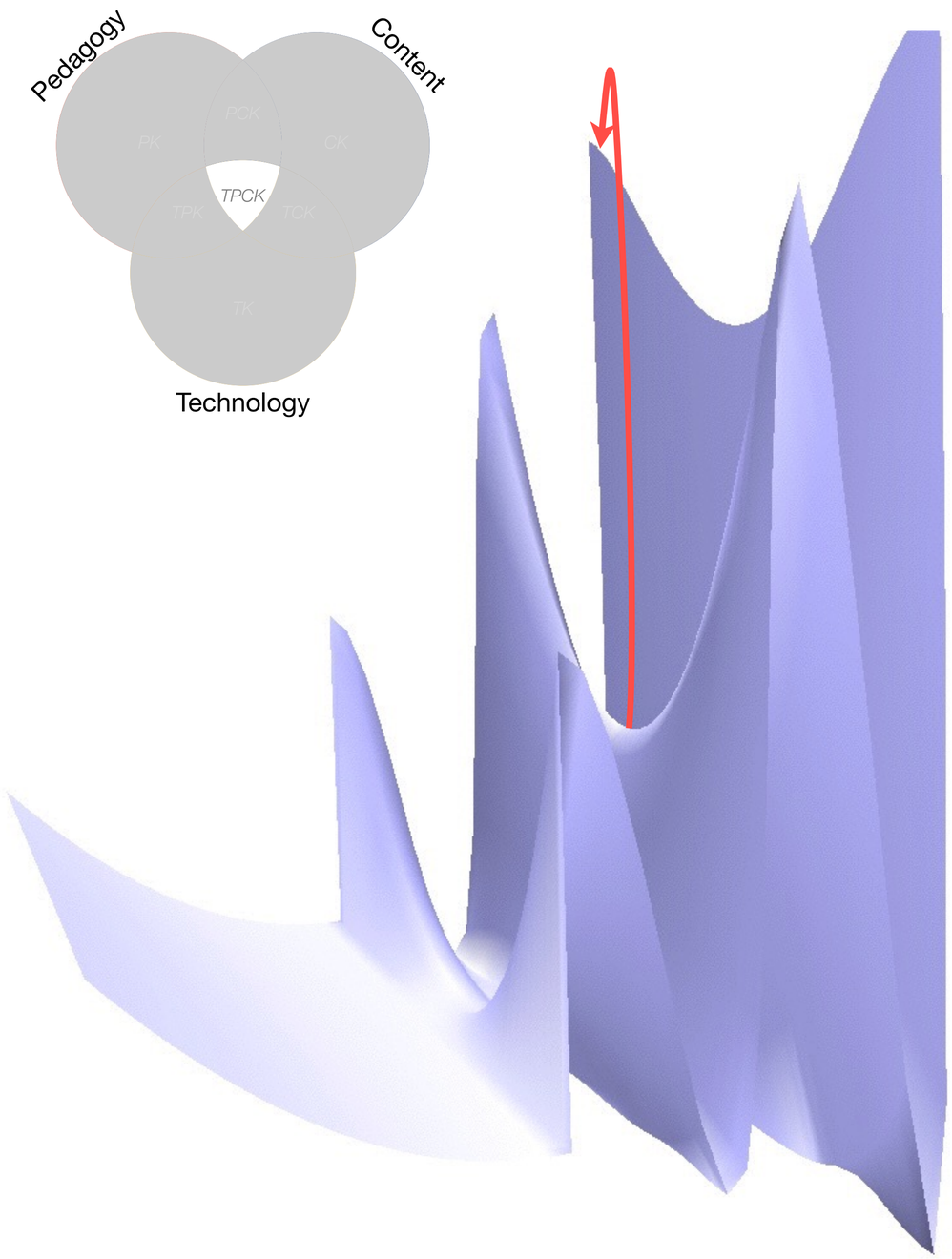
	Rock Pigeon
Sept	40
Oct	32
Nov	30
Dec	20
Jan	21
Feb	25
Mar	27
Apr	32
May	45

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

Modification
Tech allows for significant task redesign

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

Substitution
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

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

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

2. Educational Technology and Outcomes

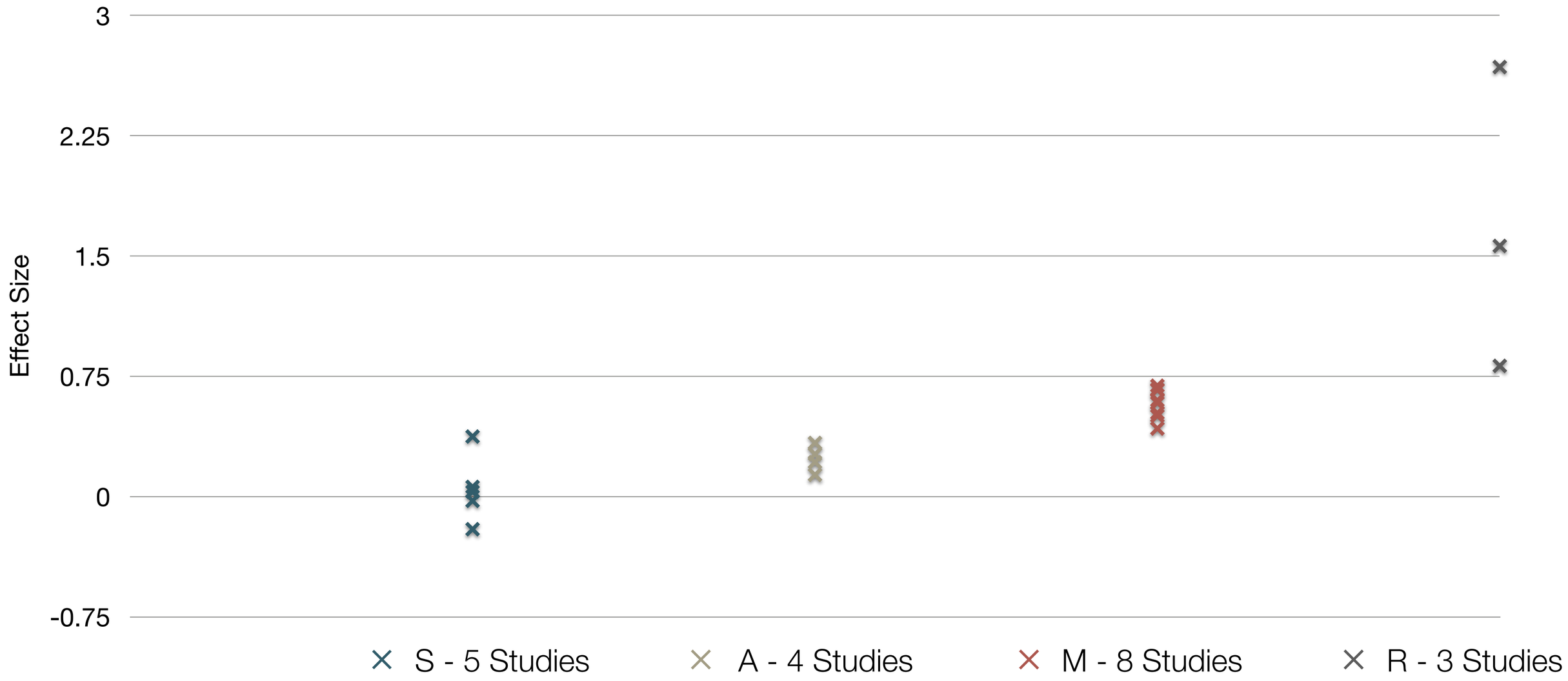
Meta-analysis	Number of studies	*ES* type	Mean *ES*	*SE*
Bangert-Drowns (1993)	19	Missing	0.27	0.11
Bayraktar (2000)	42	Cohen's *d*	0.27	0.05
Blok, Oostdam, Otter, and Overmaat (2002)	25	Hedges's *g*	0.25	0.06
Christmann and Badgett (2000)	16	Missing	0.13	0.05
Fletcher-Flinn and Gravatt (1995)	120	Glass's 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.

Study	SAMR Level	Description	Effect Size
Ligas (2002)	**S**	CAI system used to support direct instruction approach for at-risk students.	**0.029**
Xin & Reith (2001)	**A**	Multimedia resources provided to contextualize learning of word meanings and concepts.	**0.264**
Higgins & Raskind (2005)	**M**	Software/hardware used for text-to-speech, definitions, pronunciation guide for children with reading disabilities.	**0.600**
Salomon, Globerson & Guterman (1989)	**R**	Software presents students with reading principles and metacognitive questions as part of the reading process.	**1.563**

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).

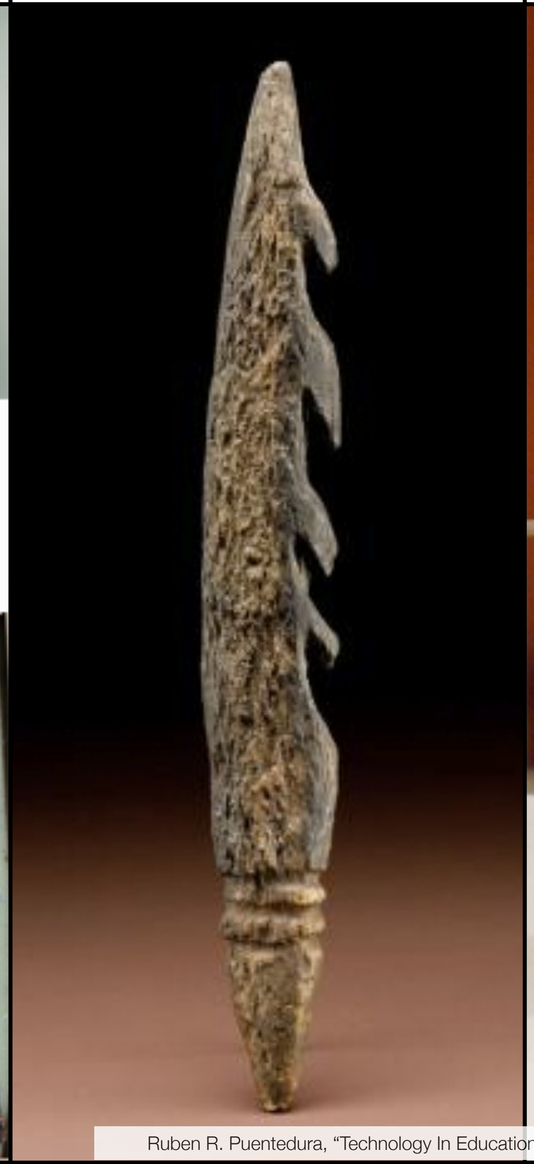


Pearson, P.D., Ferdig, R.E., Blomeyer Jr, R.L., & Moran, J. "The Effects of Technology on Reading Performance in the Middle-School Grades: A Meta-Analysis With Recommendations for Policy." *Learning Point Associates/North Central Regional Educational Laboratory (NCREL)* (2005).

Study	SAMR Classification	Description	Effect Size
Algebra I *Effectiveness of Cognitive Tutor Algebra I at Scale*, by John F. Pane, Beth Ann Griffin, Daniel F. McCaffrey, Rita Karam	**S to A**	**S:** Computerized algebra drills, some tied to real-world scenarios **A:** Tools for basic visualization; adaptive response to student progress	**≈ 0.2** 50th perc. → 58th perc.
Earth Science *Using Laptops to Facilitate Middle School Science Learning: The Results of Hard Fun*, by Alexis M. Berry, Sarah E. Wintle	**A to M**	**A:** Interactive tools for concept exploration and visualization **M:** Narrated animation as final project	**≈ 0.6** 50th perc. → 73rd perc. (≈ 1.4 a month later) (50th perc. → 92nd perc.)

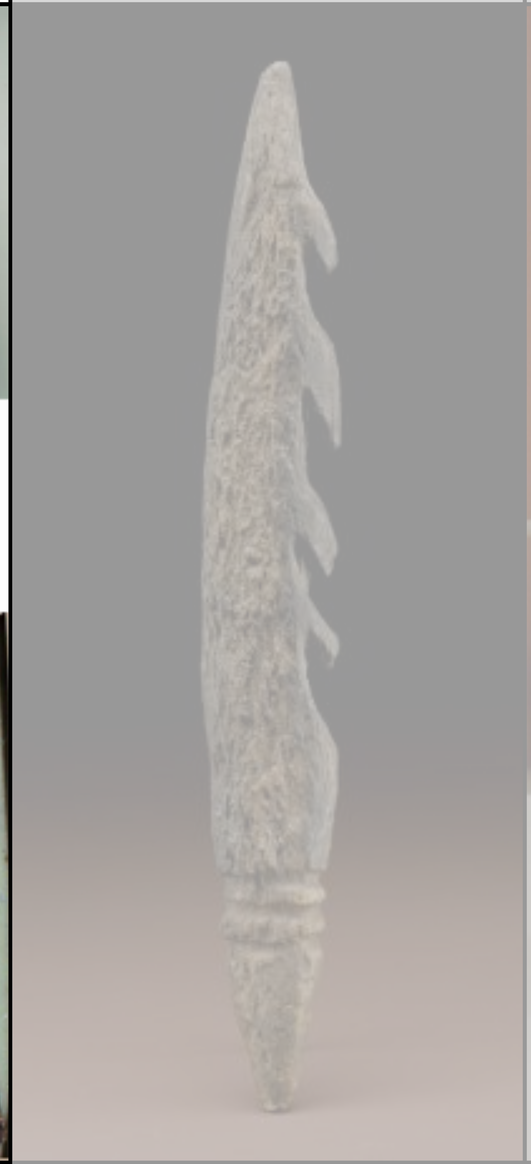
3. The EdTech Quintet

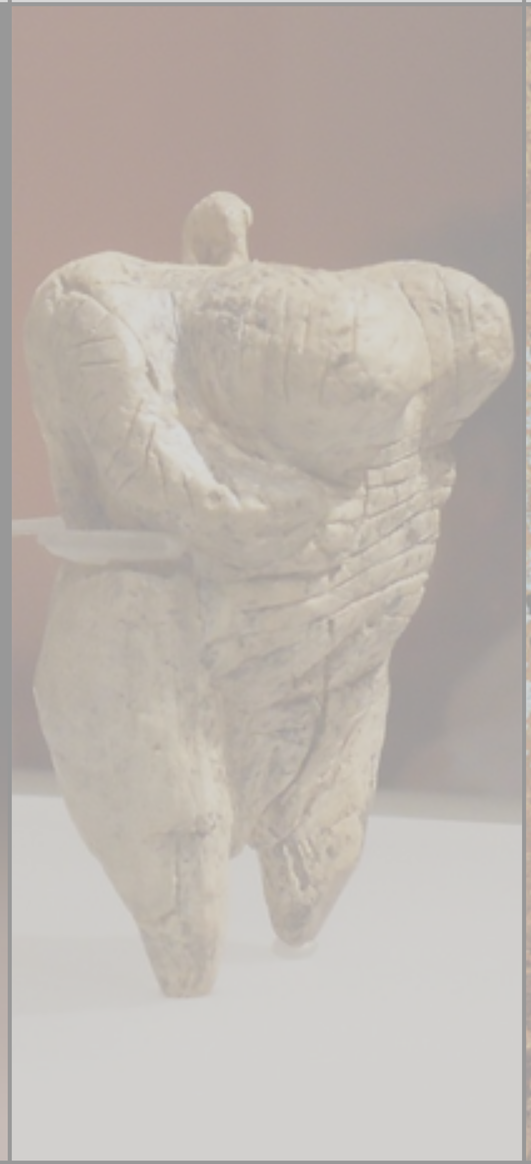
Social	Mobility	Visualization	Storytelling	Gaming
200,000 years	70,000 years	40,000 years	17,000 years	8,000 years



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

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





Bookmarks

RSS Feeds

Discussions

Microblogging

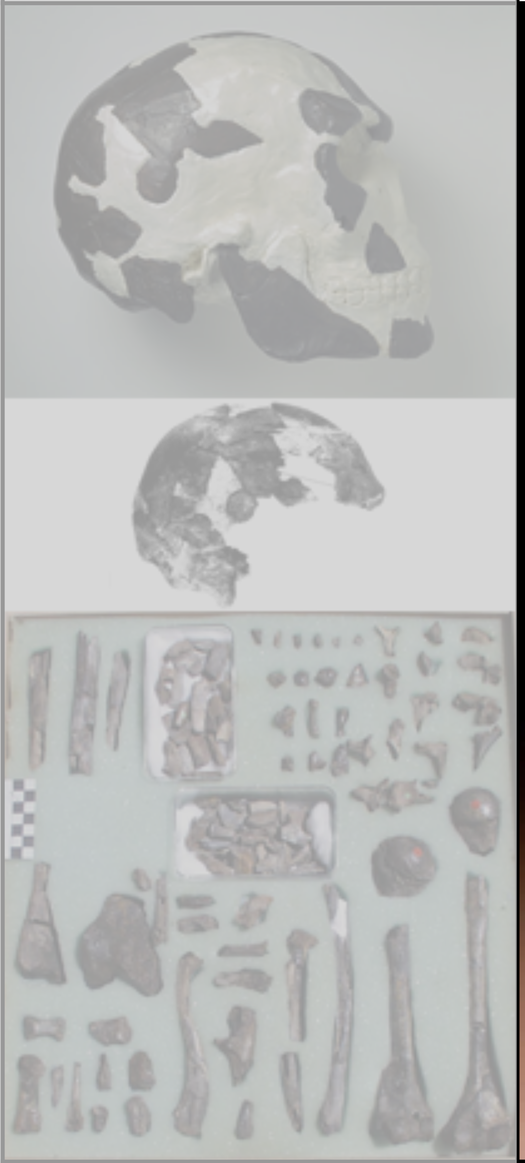
Blogging

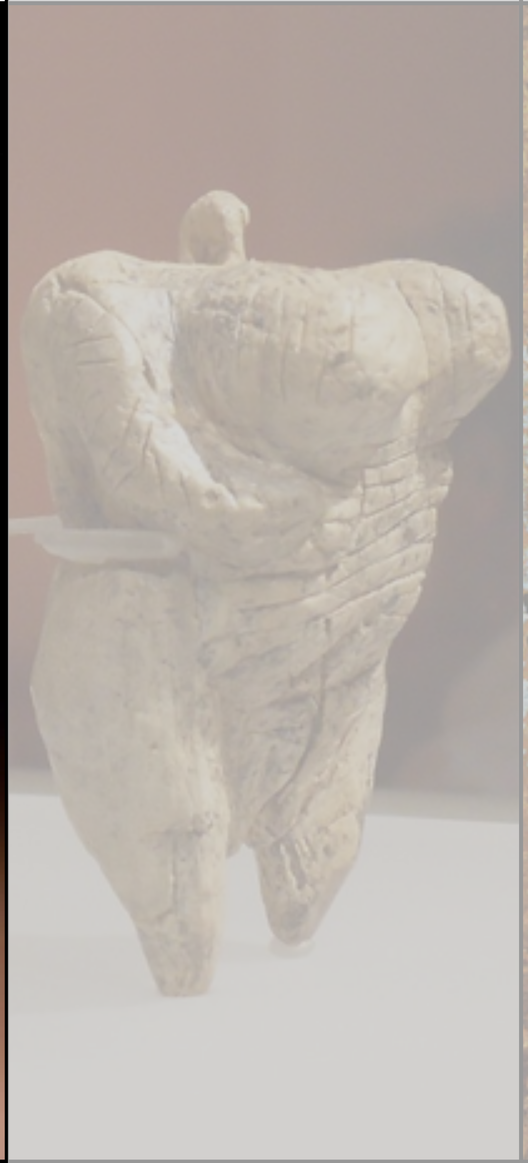
Wikis

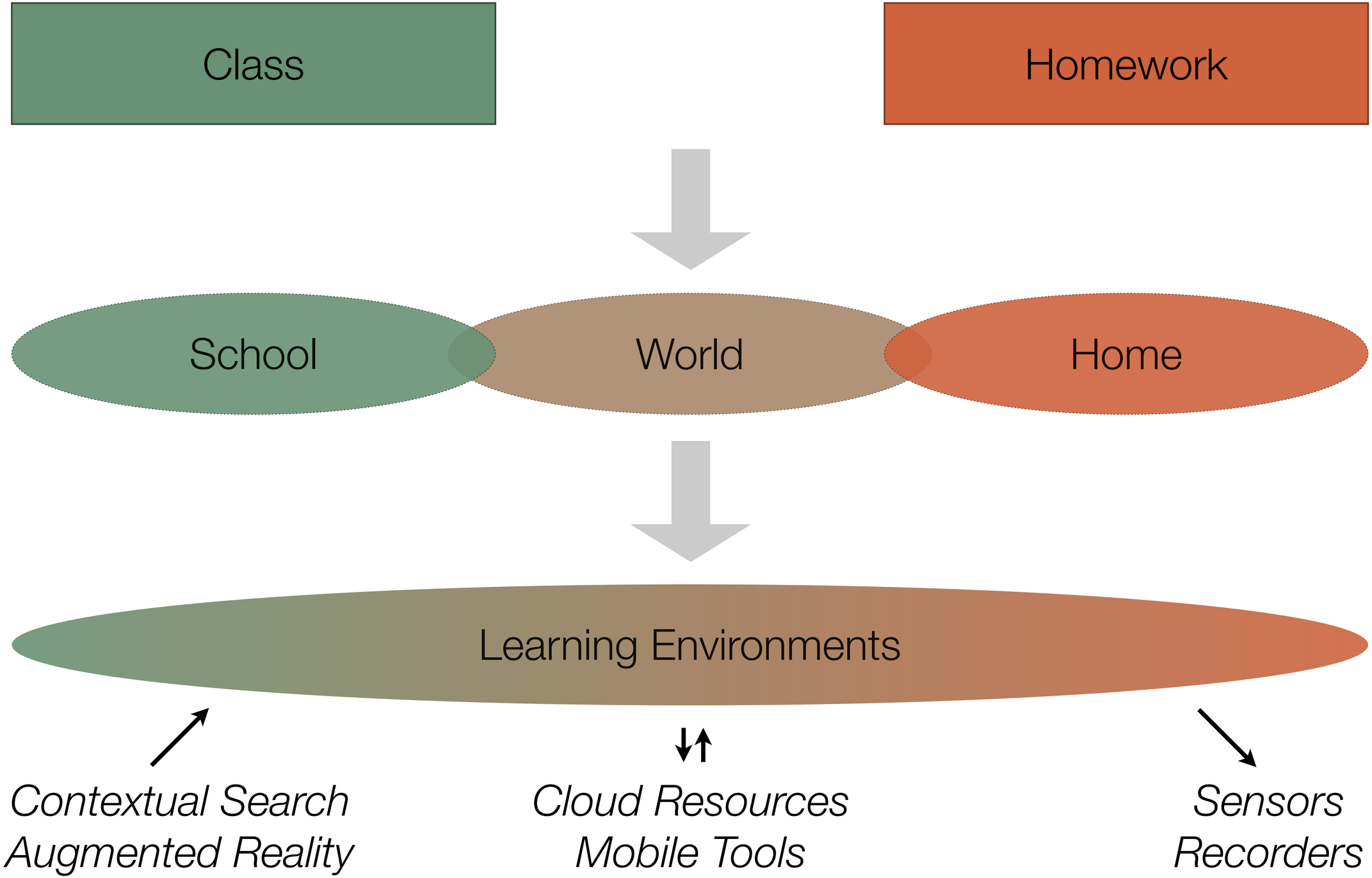
Telepresence

File Sharing

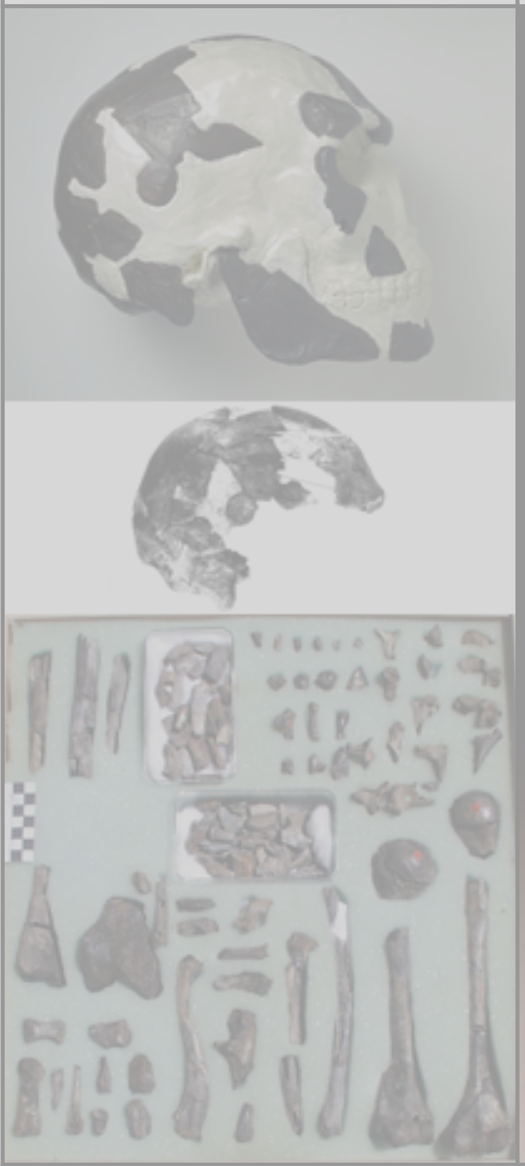
Social	Mobility	Visualization	Storytelling	Gaming
200,000 years	70,000 years	40,000 years	17,000 years	8,000 years

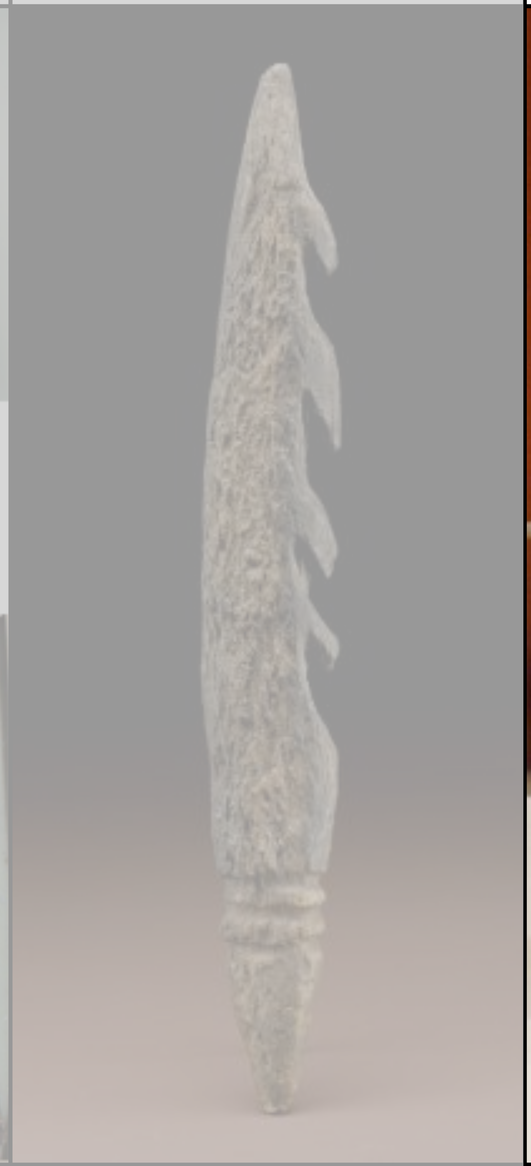





Class
Homework
School
World
Home
Learning Environments
Contextual Search
Augmented Reality
Cloud Resources
Mobile Tools
Sensors
Recorders

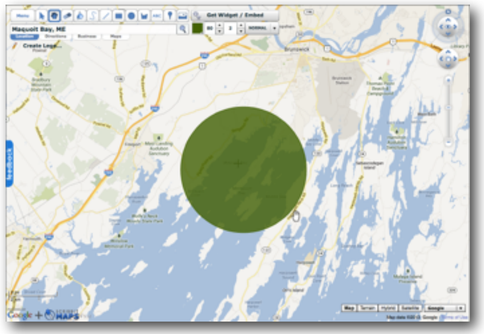
Social	Mobility	Visualization	Storytelling	Gaming
200,000 years	70,000 years	40,000 years	17,000 years	8,000 years






Timeline JS
Beautifully crafted timelines that are easy, and intuitive to use.
Website


3D



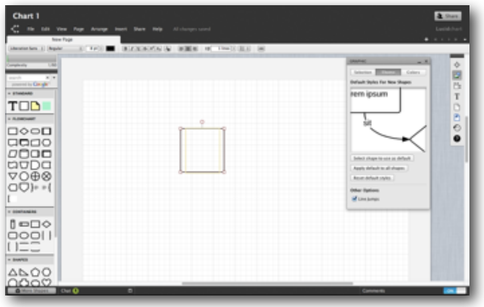
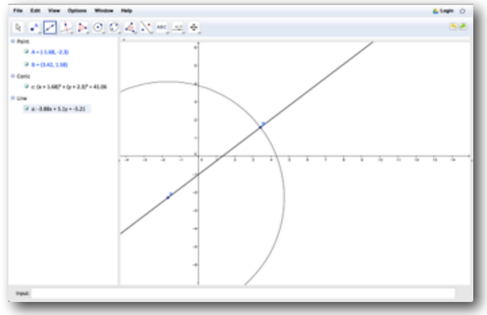


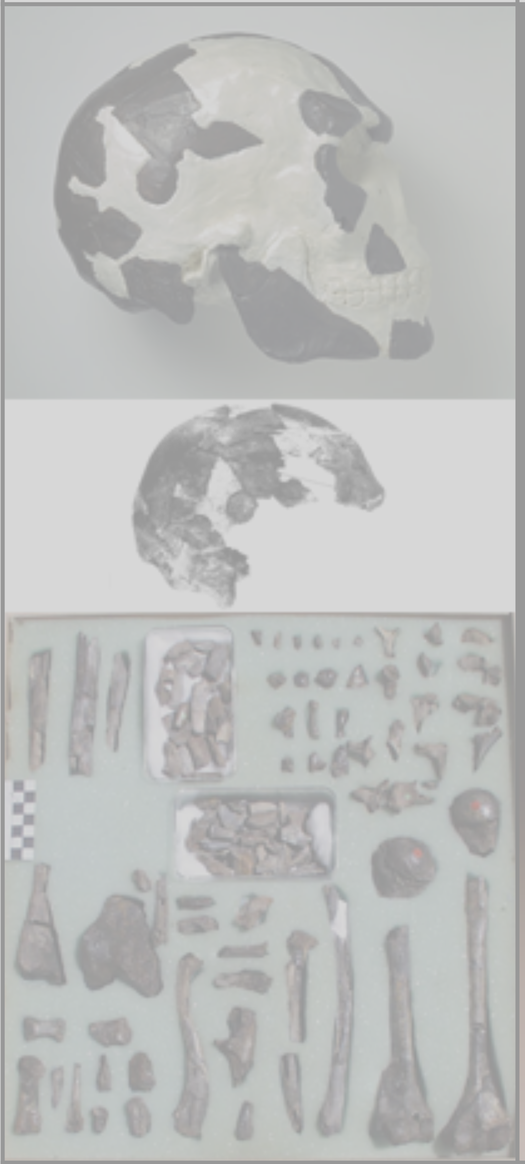
Chart 1

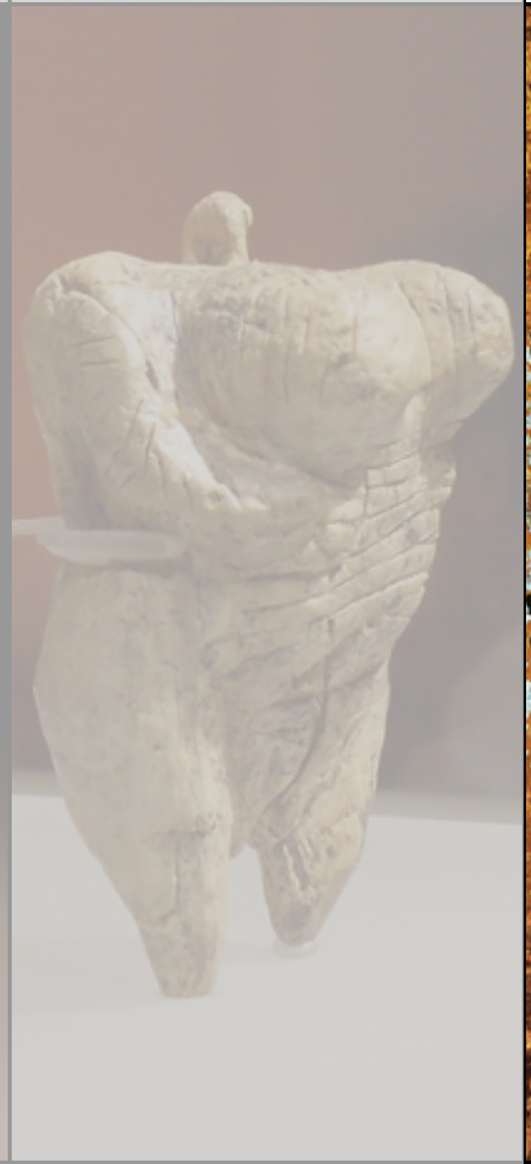

word tree
am
have
do
love
I

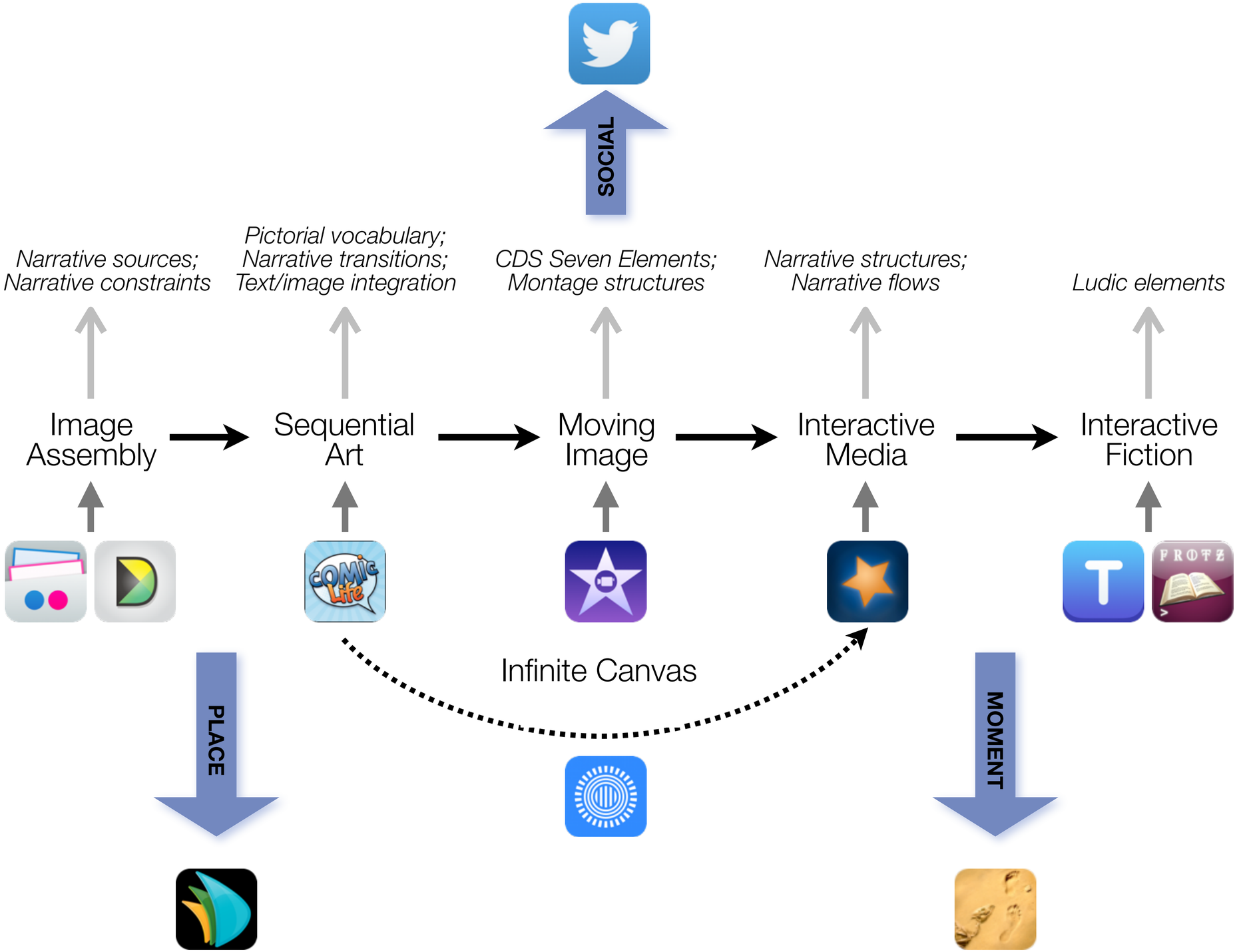

Word
Collage



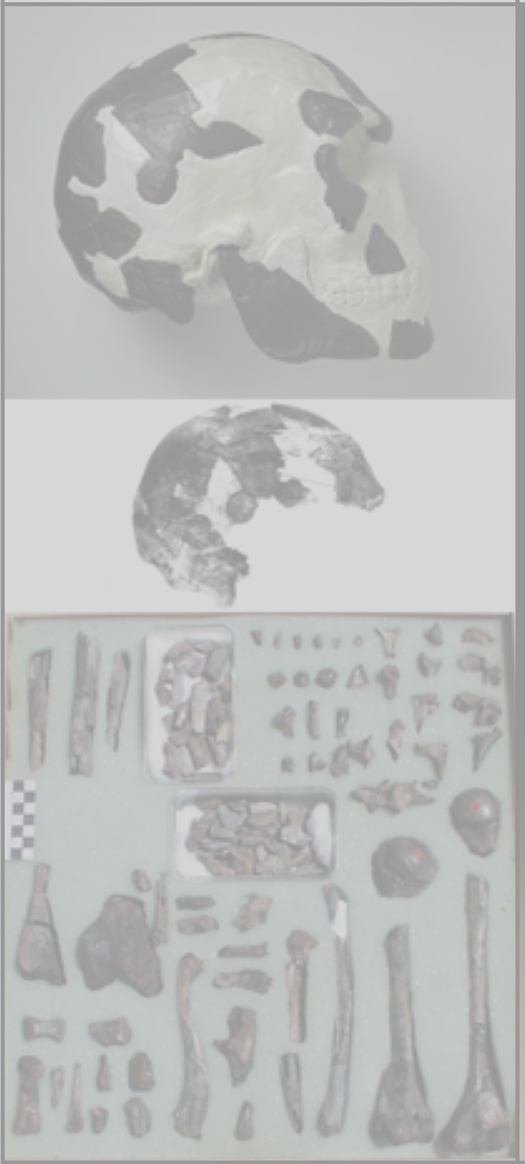
Social	Mobility	Visualization	Storytelling	Gaming
200,000 years	70,000 years	40,000 years	17,000 years	8,000 years

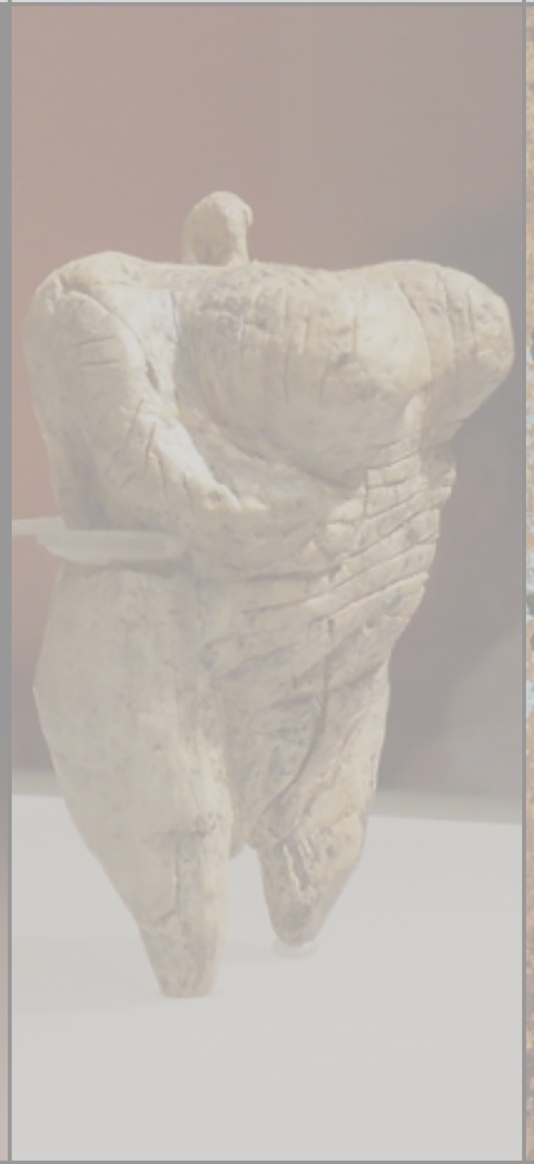





SOCIAL
Narrative sources;
Narrative constraints
Pictorial vocabulary;
Narrative transitions;
Text/image integration
CDS Seven Elements;
Montage structures
Narrative structures;
Narrative flows
Ludic elements
Image Assembly
Sequential Art
Moving Image
Interactive Media
Interactive Fiction
Infinite Canvas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

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



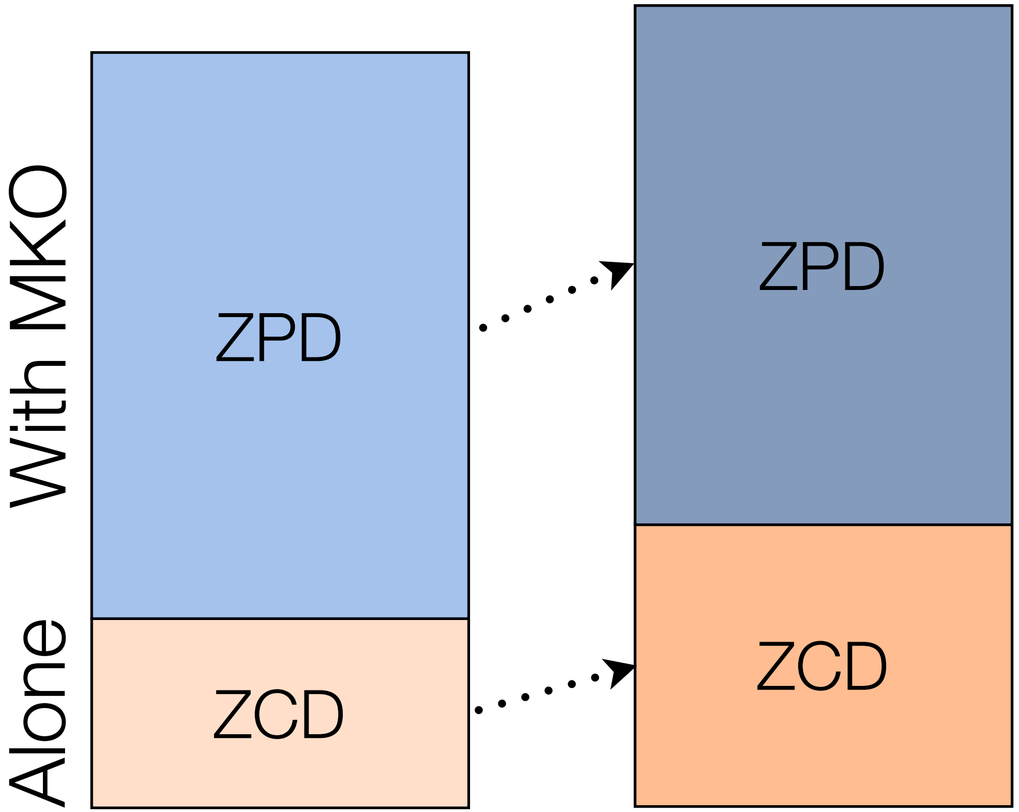


Formal Definition of **Game** (Salen & Zimmerman)

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

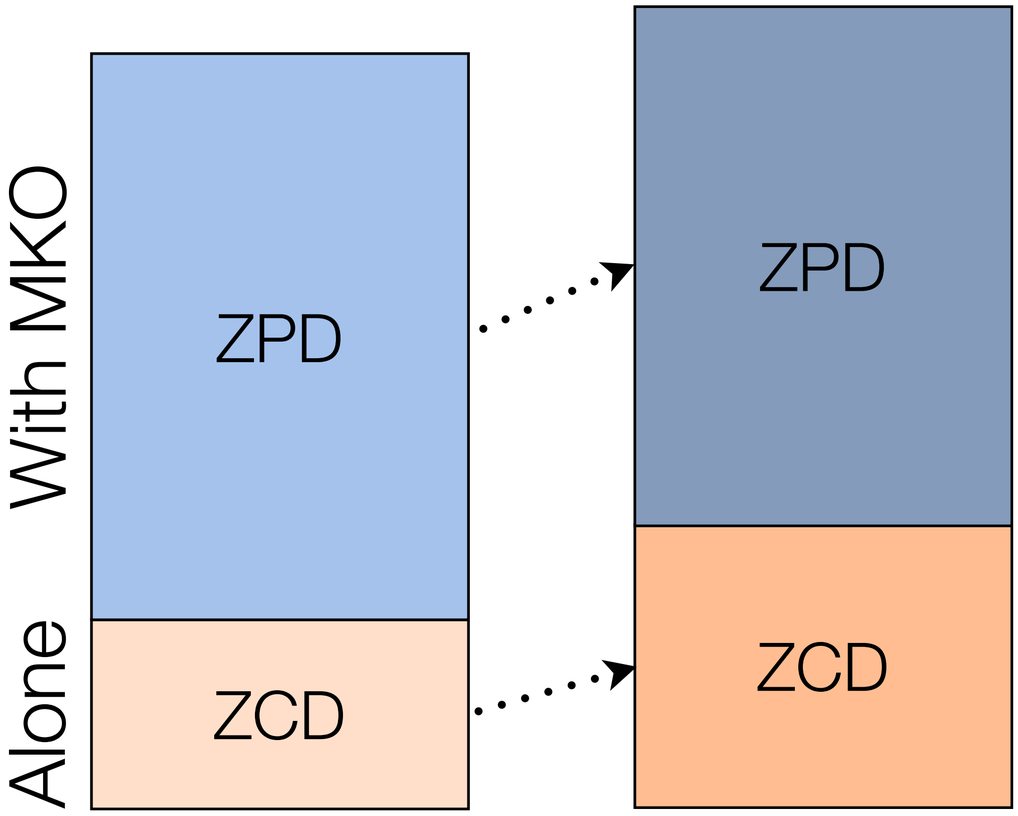
Salen, K. and E. Zimmerman. *Rules of Play : Game Design Fundamentals*. The MIT Press. (2003)

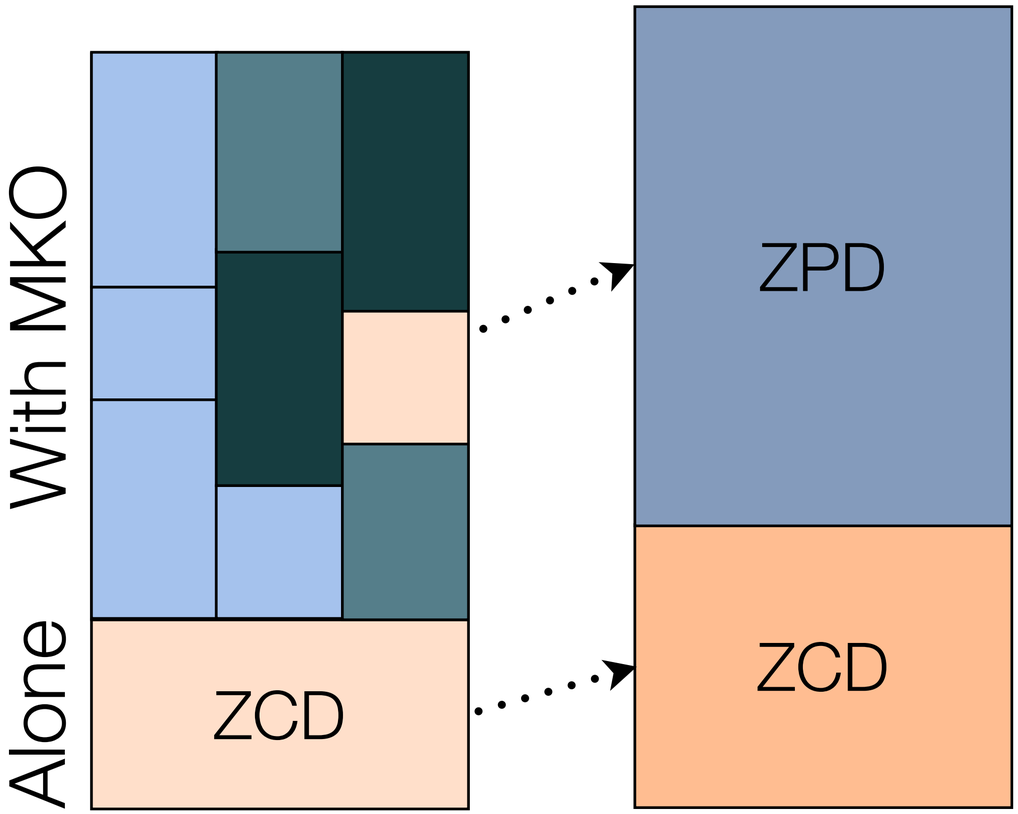
4. A Vygotskyan Connection



- Zone of Proximal Development (ZPD):
  - Region between:
    - what a learner can accomplish independently (the Zone of Current Development, ZCD)
    - what they can accomplish with assistance from a “more knowledgeable other” (MKO)
- *“…what a child can do with assistance today she will be able to do by herself tomorrow.”*
- This is an iterative process:
  - The ZCD and ZPD change over time;
  - Independent practice is required to close the loop.

Lev Vygotsky, *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press. (1978)


With MKO
Alone
ZPD
ZCD
ZPD
ZCD

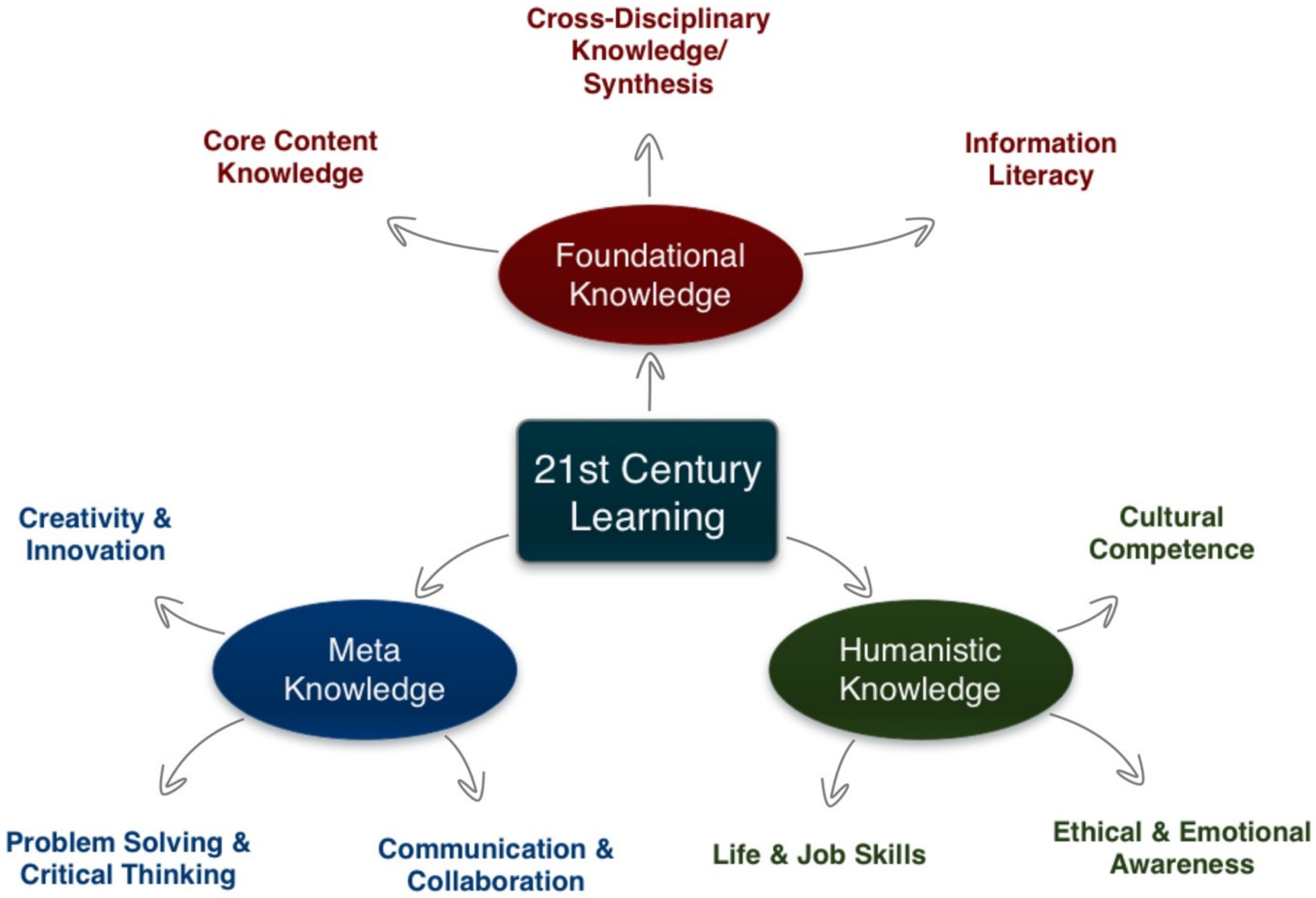


Galperin, P.Ia. “Stage by Stage formation as a method of psychological investigation”. *Journal of Russian and East European Psychology, 30*(4), 61-80 (1992)
Van Geert, Paul. "Vygotsky’s dynamic systems." *Lev Vygotsky: Critical assessments* 4 (1997): 3-21.

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

The EdTech Quintet – Associated Practices	
Social	Provides diversity to the ZPD
Mobility	Creates the context for the process
Visualization	Aids in the creation of ZPD “leaps”
Storytelling	Aids in the integration of the ZPD
Gaming	Provides frameworks for independent practice

5. The Shape of Things to Come



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)


ibm.com
Menu
Say hello to Watson
Meet IBM Watson, a cognitive system that enables a new partnership between people and computers that enhances and scales human expertise.
How Watson Works
Developer Cloud, your gateway to cognitive computing
Read more about how Watson is transforming travel
Explore Watson
Display a menu

ARTS

Museums Morph Digitally

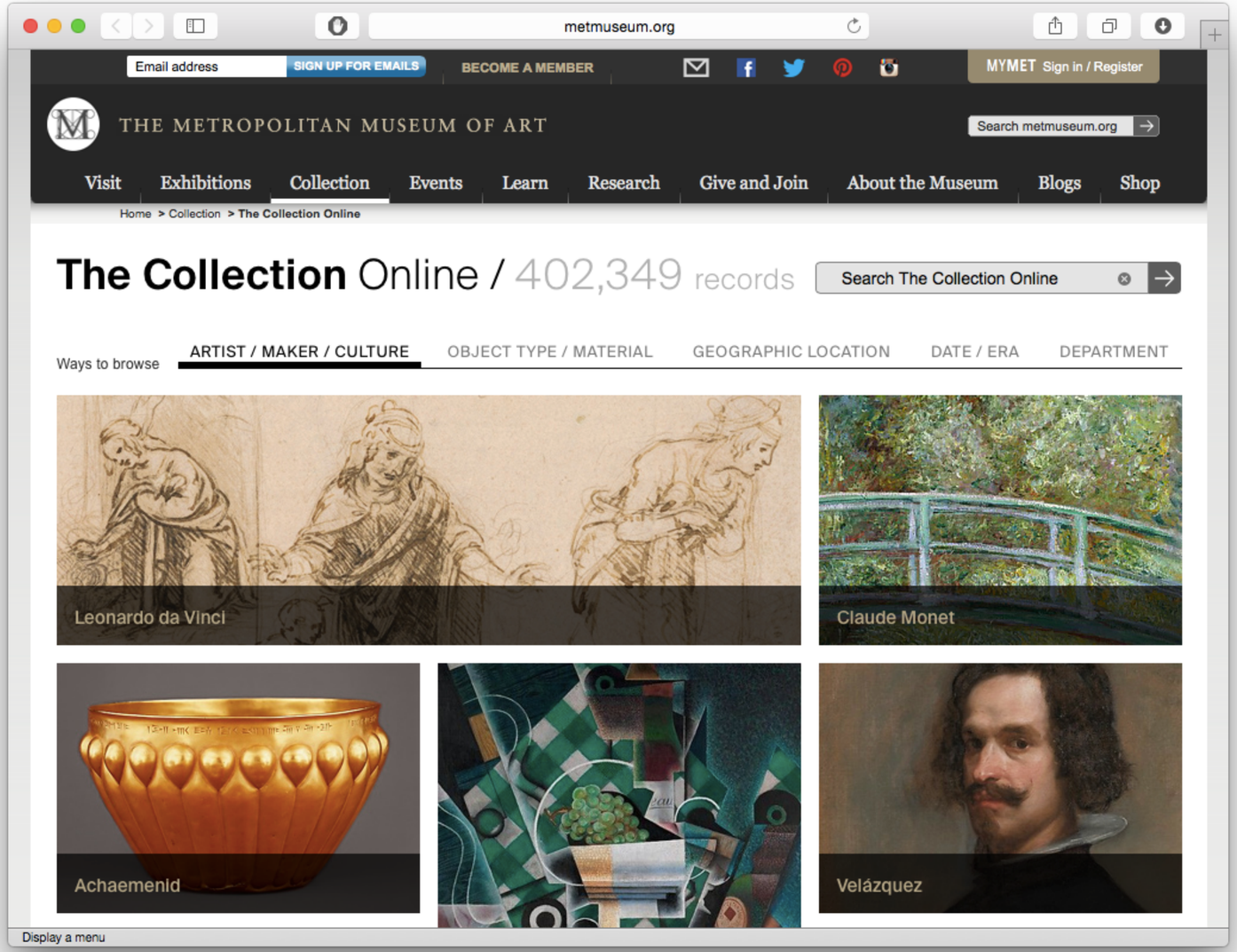
The Met and Other Museums Adapt to the Digital Age

By STEVE LOHR OCT. 23, 2014

For the Metropolitan Museum of Art, a turning point came in 2011. Down went the signs imploring visitors to stow their cellphones. The Met revamped its website, tailoring it for viewing on smartphone screens. The museum was not only allowing visitors to use their mobile phones while browsing the artworks, but encouraging it.

Museums Plug In
Max Whittaker for The New York Times

The digital experience was embraced and meant to enhance the physical experience of exploring the museum. The trend has only accelerated since, at the Met and across the museum world. At first glance, it might seem like a capitulation, giving in to the virtual enemy when museums are so essentially physical spaces.


metmuseum.org
Email address
SIGN UP FOR EMAILS
BECOME A MEMBER
MYMET Sign in / Register
THE METROPOLITAN MUSEUM OF ART
Search metmuseum.org
Visit
Exhibitions
Collection
Events
Learn
Research
Give and Join
About the Museum
Blogs
Shop
Home > Collection > The Collection Online
The Collection Online / 402,349 records
Search The Collection Online
Ways to browse
ARTIST / MAKER / CULTURE
OBJECT TYPE / MATERIAL
GEOGRAPHIC LOCATION
DATE / ERA
DEPARTMENT
Leonardo da Vinci
Claude Monet
Achaemenid
Velázquez
Display a menu

futureofmuseums.com

Sign Up Sign In Search The Future of Museums Co

THE FUTURE OF MUSEUMS CONFERENCE

Main | 2014 Conference | Attending + Schedule | Presenters | Volunteers | Sponsors + Partners | Advisory Board | Members | My Page |

/// 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

Welcome to
The Future of Museums Conference
Sign Up
or Sign In

/// SUPPORT FREE PD!

/// 2014 CONFERENCE

Conference

- Welcome + Information
- Attending + Schedule
- Con

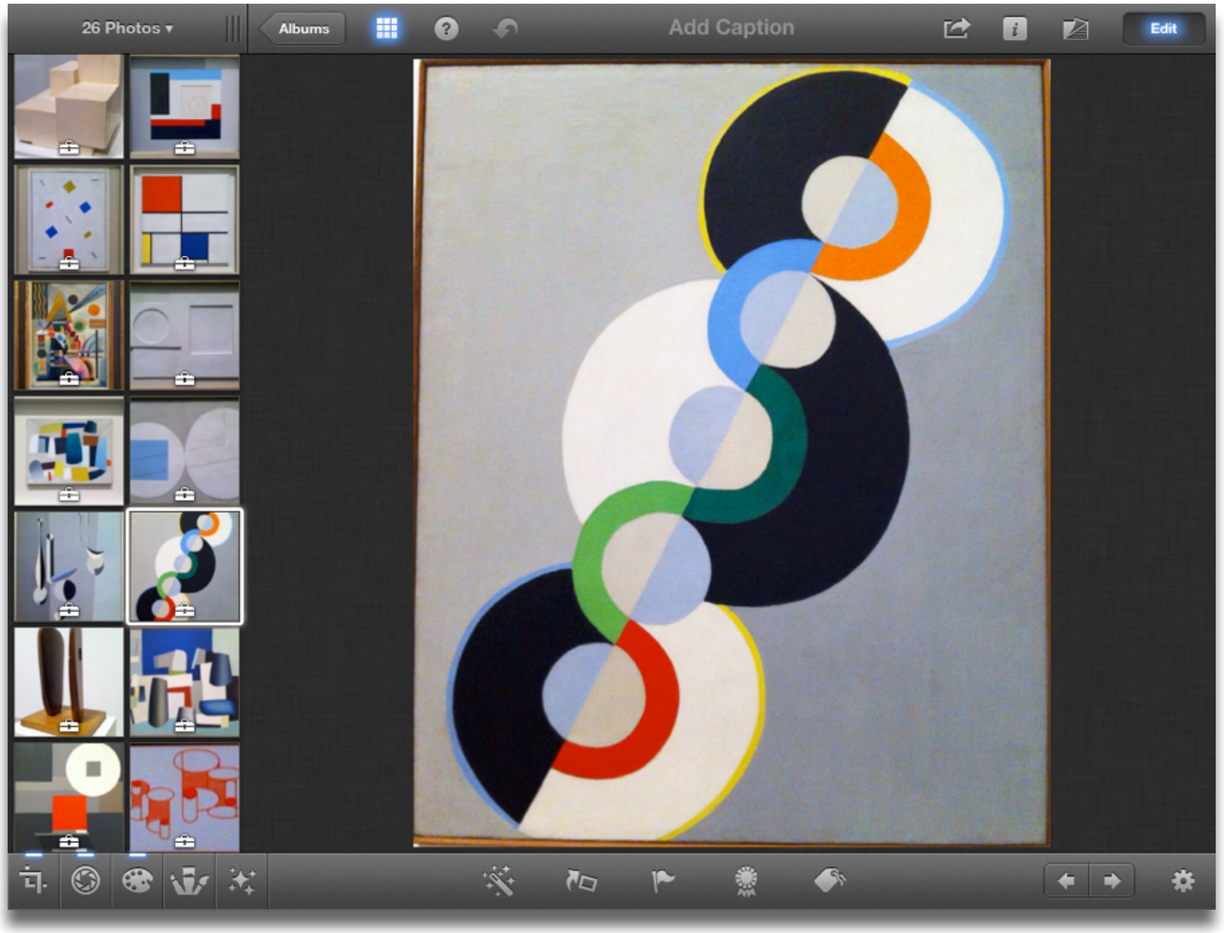
Sign in to chat!

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

Modification
Tech allows for significant task redesign

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

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

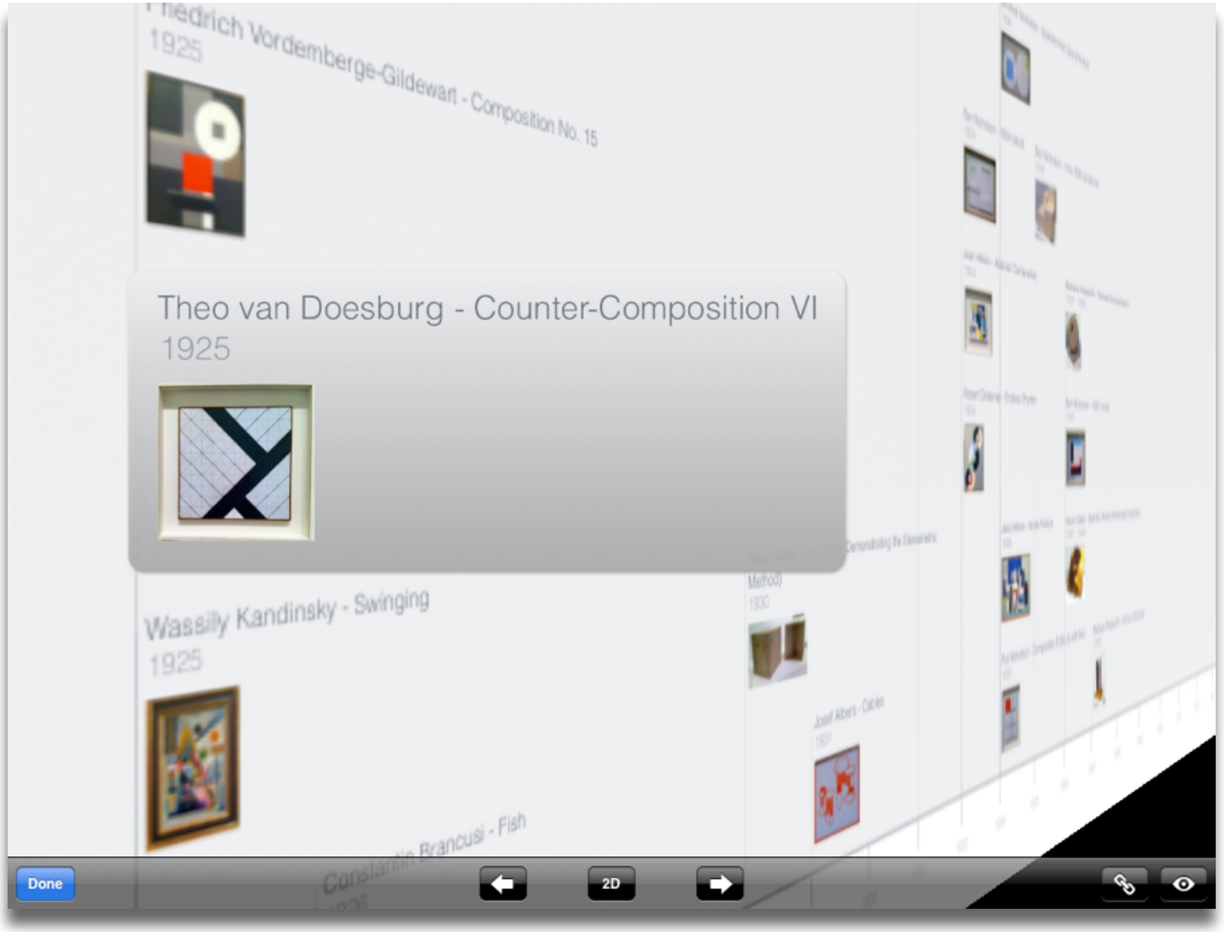


Redefinition
Tech allows for the creation of new tasks, previously inconceivable

Modification
Tech allows for significant task redesign

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

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

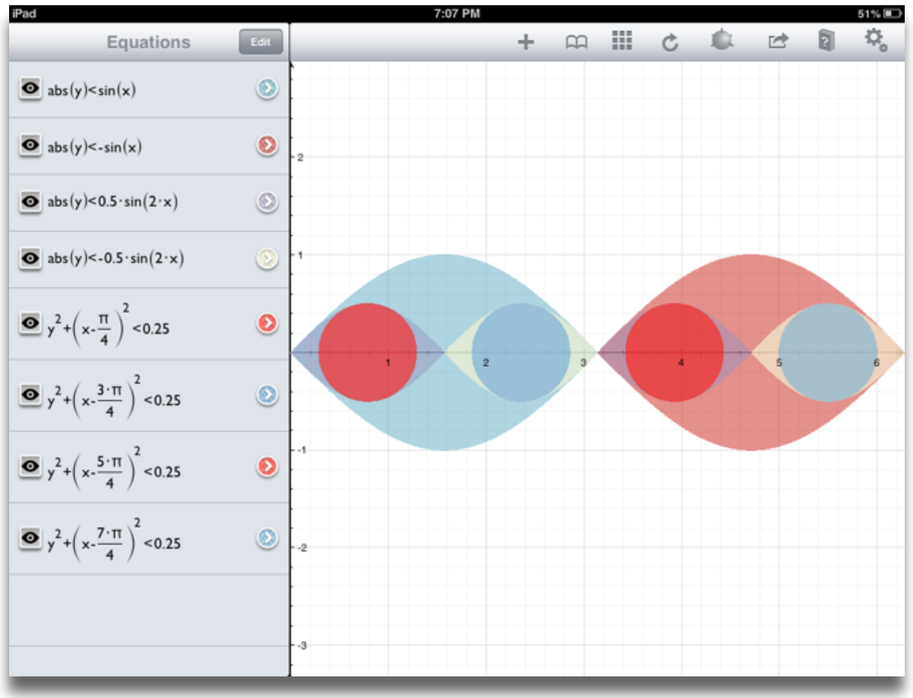


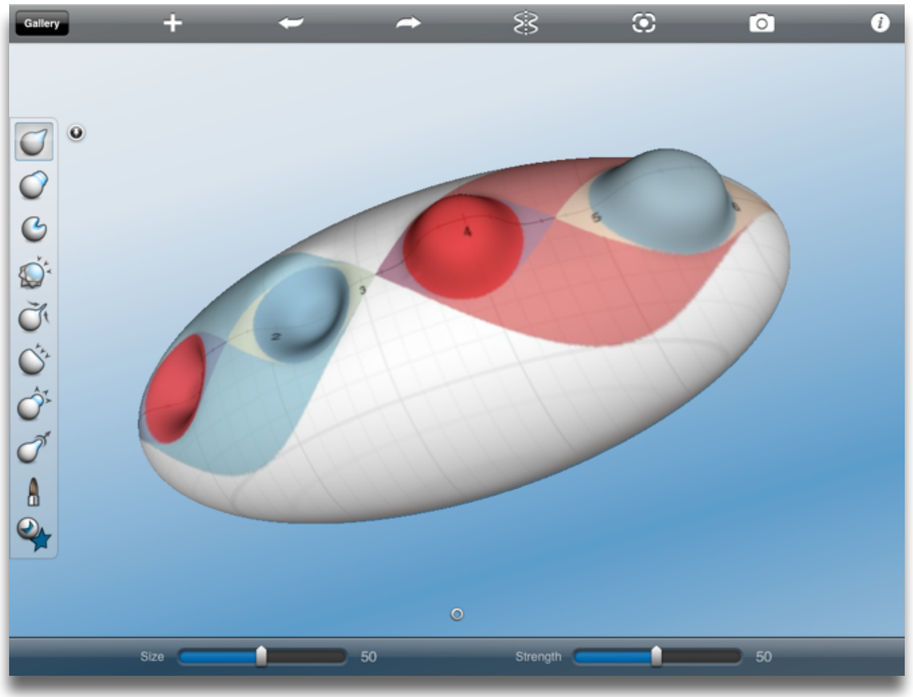
Redefinition
Tech allows for the creation of new tasks, previously inconceivable

Modification
Tech allows for significant task redesign

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

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



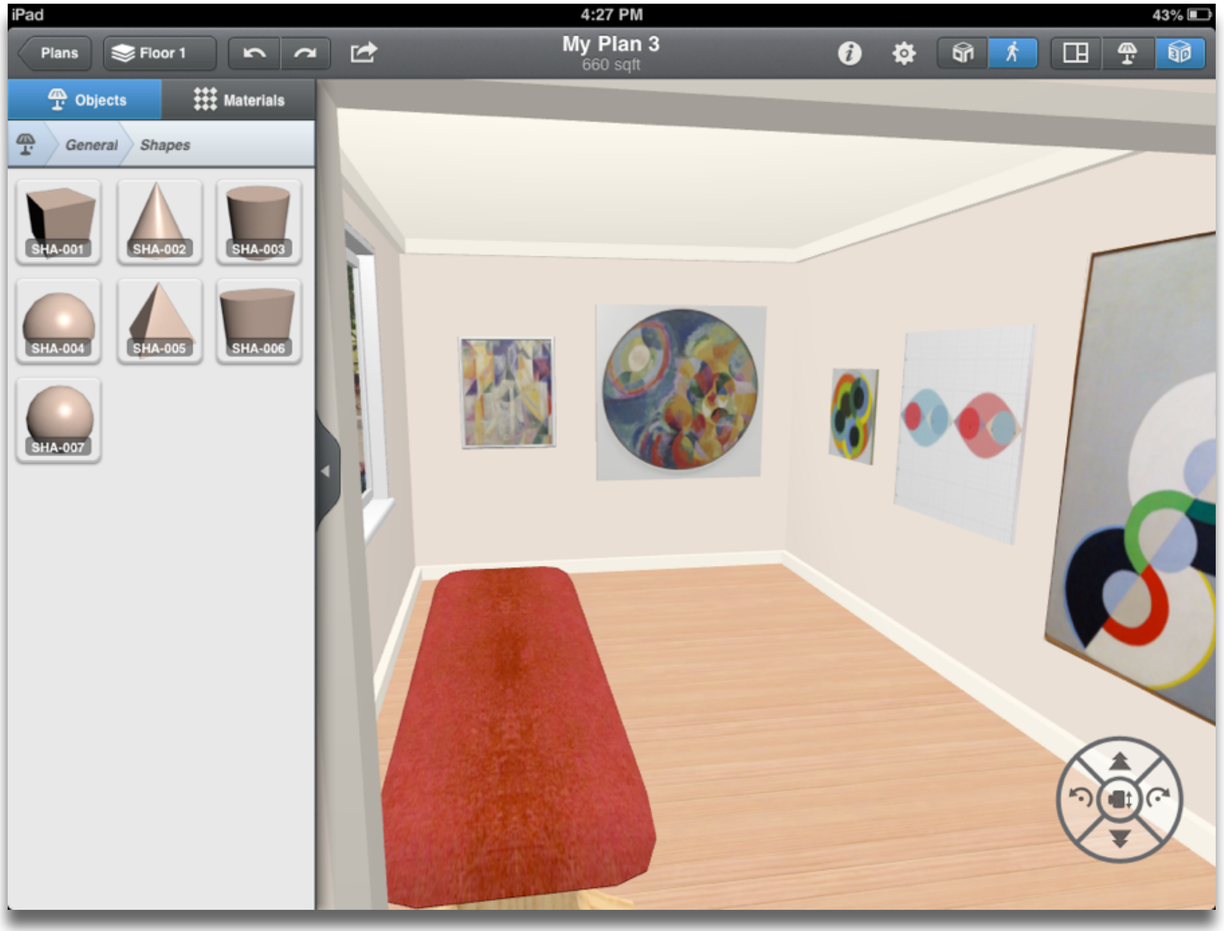


Redefinition
Tech allows for the creation of new tasks, previously inconceivable

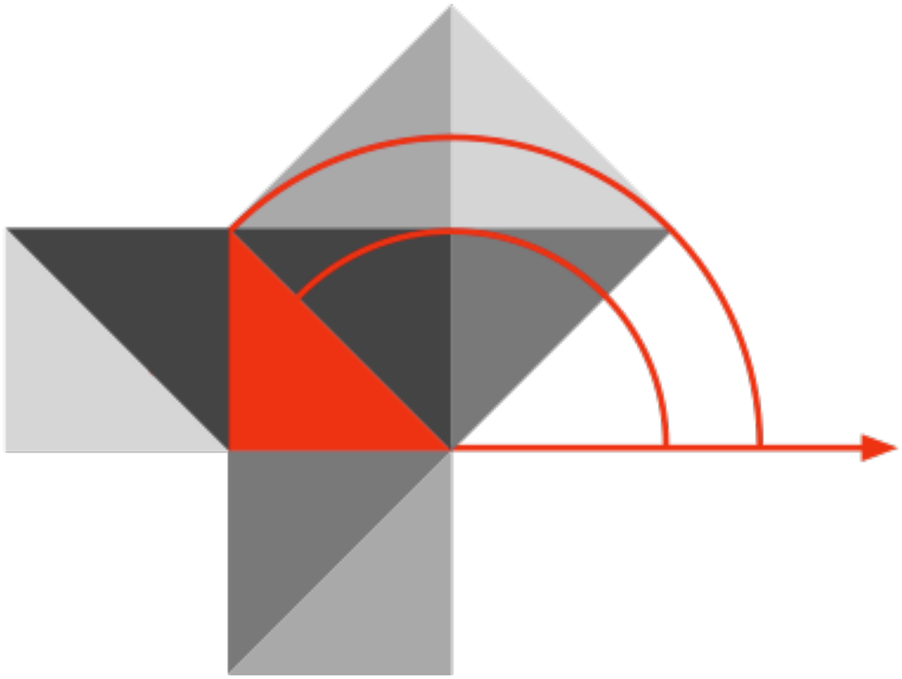
Modification
Tech allows for significant task redesign

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

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



Hippasus



Blog: http://hippasus.com/rrpweblog/
Email: rubenrp@hippasus.com
Twitter: @rubenrp