Visualizations for Critical and Creative Thinking
Visualization Workshop Objectives

Explore 3 Uses of Visualizations:

• To Organize and Highlight Relationships
• To Synthesize and Create New Knowledge
• To Persuade or Argue a Point

Introduce the Basics of Visual Communication
Visualizations to Organize

Visualizations can be used to organize thoughts or existing knowledge.

Visualizations can be used to internally process and evaluate information as well as externalize findings to others.

Visualizations generally organize elements/information in relationship to other elements or according to larger orienting devices such as X,Y, X axis, time, geographic space, etc.
Pie Charts: Parts to Whole
Daily Rituals: How Artists Work by Info We Trust
Research by Mason Currey
Tree Diagrams: Proportion

The BBC-o-Gram
Selected highlights of the BBC budget 08/09 (£million)

source: BBC, Guardian. Numbers rounded up
date: http://www.lytho.org
slight visual cheating to make boxes fit

BBC Programming
Proportional Diagrams: Scale
The Water Footprint of Humanity, Arjen Y Hoeskstra and Mesfin Mekonnen
President Obama’s 2011 State of the Union speech, Whitehouse.gov
President Obama’s 2014 State of the Union speech, USA Today
Line Graphs: Relationships

Average Household Size

Sources: ABS; Office for National Statistics; RBA; Statistics Canada; Statistics New Zealand; Thomson Reuters; US Census Bureau

US Census Bureau, Average Household Size
Quadrant Maps: Across Spectrums

Relationship Trees / Flow Chart

from SQUEAL to MEAL
The U.S. Pork Industry Value Chain:

INPUTS

PRODUCTION

PROCESSING / DISTRIBUTION

MARKETING

CONSUMPTION

FEED GENETICS VETERINARY SERVICES

FEED TO FEEDER (Provides feeder pigs to other farms)
5% of Hogs 45% by contact

FEEDER TO FINISH (Purchases feeder pigs as input)
77% of Hogs 73% by contact

SLAUGHTER INTERMEDIATE PROCESSING FINAL PROCESSING PACKAGING WHOLESALERS

SUPERMARKETS (78% of US Pork consumption)

RESTAURANTS (12% of US Pork Consumption)

FOOD SUPPLIERS TO INSTITUTIONS (5% of US Pork Consumption)

Pork accounts for about one-fourth of U.S. domestic meat consumption

Value added 2007
$14.79 billion

$7.13 billion

$29.78 billion

$51.70 billion total

Allison Cave, Student in ARC 572 Regional Infrastructures
Timelines

Children / First Men

Dawn Age
13,000
12,000
11,000
10,000

Age of Heroes
9,000
8,000
7,000
6,000

Starks Rule North
7 Kingdoms in Westeros

Age of Valyria
5,000
4,000
3,000
2,000
1,000

Age of the Dragons
300 years ago

The Old Gods

The Faith of the Seven

The Old Gods (North)
Rhoynar (South)

Civil Wars between Targaryens
~170 years ago death of last dragon

Robert Baratheon Rules Westeros

~38 years ago Aerys II “Mad King” takes the Iron Throne
Rhaegar Targaryen weds Elia Martell

~15 years ago Robert’s Rebellion
Robert Baratheon takes the Iron Throne

~9 years ago Grayjoy Rebellion unsuccessful

Targaryens’ Rule Westeros
Martells Rule South [Dorne]

~300 years ago Aegon’s Conquest
Takes over 6 of 7 kingdoms with the help of the last 3 dragons

Targaryens Begin Rule Over Westeros

~700 years ago Queen Nymeria finds refuge with Martells
7th kingdom established

~6,000 years ago Andal Invasion
6 kingdoms established

~2,000 year war Children of The Forest Exterminated/Exciled

~500 years ago Targaryens (of Valyria) settle in Dragonstone

Targaryens only remaining Valyrians

~7,000 years ago
Extermination of Children of the Forest

~8,000 years ago Long Night
White Walkers invade from North
- Northern ice wall erected
- Night Watch established

~10,000 years ago Arrival of First Men

~12,000 years ago
Pact between Children of Forest and First Men

Westeros

Essos

Andals See Miracle
Faith of the Seven Emerges

~5,000 years ago Rise of Valyria

- Valyrians discover dragons in a volcano
- become a powerful & advanced civilization

~400 years ago Doom of Valyria

Darthraki emerge and ravage Essos

Targaryens’ siblings
Vinerys & Daenerys exiled to Essos

Source: http://www.hbo.com/game-of-thrones/

Created by Magdalena Maslowska http://hauteslides.com

Game of Thrones Infographic: History and Lore Timeline v1.0, HBO
Timeline of TH!NK Course

TH!NK Course Timeline
Fall Semester 2015

wk_6  wk_7  wk_8  wk_9  wk_10  wk_11  wk_12  wk_13  wk_14  wk_15  wk_16  wk_1
wk_2  wk_3  wk_4  wk_5

OCTOBER  NOVEMBER  DECEMBER  AUGUST  SEPTEMBER
THINK Course Timeline
Fall Semester 2015

wk_1  wk_2  wk_3  wk_4  wk_5  wk_6  wk_7  wk_8  wk_9  wk_10  wk_11  wk_12  wk_13  wk_14  wk_15  wk_16
AUGUST  SEPTEMBER  OCTOBER  NOVEMBER  DECEMBER

Composition  Stereotomic  Tectonic  Light  Portfolio

Primary Topics:

Sub-Topics:

- Observe
- 2D-3D

Projects/Assignments:

- Photos
- Videos
- Diagrams
- Models
### THINK Course Skills and Behaviors

**Fall Semester 2015**

<table>
<thead>
<tr>
<th>Raising Questions, Formulating Problems</th>
<th>Gathering and Assessing Relevant Information</th>
<th>Synthesizing and Generating Ideas</th>
<th>Considering Alternatives</th>
<th>Reaching Reasoned Conclusions</th>
<th>Effectively Communicating</th>
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<tbody>
<tr>
<td><img src="image1" alt="Project 1" /> Research comp. principal precedent</td>
<td><img src="image2" alt="Project 2" /></td>
<td><img src="image3" alt="Project 3" /> Scenarios examine</td>
<td><img src="image4" alt="Project 4" /></td>
<td><img src="image5" alt="Project 5" /></td>
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Ideas for the Classroom

- Exercises which connect different topics in the course (great for exam reviews!)
- Diagram to organize supporting arguments in a paper.
- Textual Analysis
- Reading Reflection
- Scaffold visual thinking exercises: Concept map → Pie chart → Line graph → Conclusions

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<tr>
<th>Type of C/O</th>
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Visualizations to Synthesize & Create New Knowledge

Visualizations can be used to synthesize information towards understanding new patterns and identifying new possible relationships.

They can be used to show the relationship between different co-variable data sets through overlay (combining) or editing / isolating information sets.
London, mid-late 1800's during the time of Cholera Outbreaks
Narrative Mapping

Carte Figurative des perte successives en hommes de l'Armée Française dans la campagne de Russie 1812-1813.

Napoleon’s March on Moscow, Minard
Napoleon’s March on Moscow, Minard overlaid on Google Earth
Carte Figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812-1813.

Paris, le 20 Noverbre 1869

Les nombres d'hommes primitifs sont représentés par les lignes des gris clairs, à raison d'une millimètre pour six mille hommes; ils sont de plus étroits en travers des années. Le roux indique les hommes qui quittèrent la Russie; le noir ceux qui se tuèrent. Les engagements qui mirent à terre la carte ont été pris dans les vagues de M. Ohiro, de Marigny, de Confronter, de Saint-Dié, de Boursier, phénomène de l'Armée depuis le 28 Octobre.

Le mat, faute d'usage, l'attaque de l'anse, salle supposée que les corps du Prince Tromp et du Marshall Weller, qui sont de l'officier de Saint-Dié sur Montevideo en sa région vers Octobre à Weilheim, avancèrent toujours avec l'Armée.

Napoleon's March on Moscow, Minard
Concept Maps: A Tool to Uncover Relationships

A concept map is a type of graphic organizer used to help students organize and represent knowledge of a subject. Concept maps begin with a main idea (or concept) and then branch out to show how that main idea can be broken down into specific topics.

Concept Mapping in 3 Main Steps:

1. Start with a main idea, issue, or topic to focus on
2. Determine the key concepts
3. Connect the concepts - using linking words and phrases
Concept Map of Social Media Concepts
Concept Maps: A Tool to Uncover Relationships

Concept mapping serves several purposes for learners:

- Helping students brainstorm and generate new ideas
- Encouraging students to discover new concepts and the propositions that connect them
- Allowing students to more clearly communicate ideas, thoughts and information
- Helping students integrate new concepts with older concepts
- Enabling students to gain enhanced knowledge of any topic and evaluate the information
Concept Map of TH!NK Course: Critical and Creative Thinking Behaviors

TH!NK Course Assignment Concept Map
Fall Semester 2016
Ideas for the Classroom

- Exercises which connect or correlate different data/information sets.
- Diagram how authors/case studies are related to/influenced by one another.
- Exercises which work from analytical diagrams (looking at things in isolation) and build to synthetic diagrams to identify related ideas/forces/ideas.
- Exercises which diagram different contexts (social, economic, ecological, etc) over time or space.

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Visualizations to Persuade

Visualization can be used to persuade or make an argument.

Visual language, like verbal language, should be purposeful and well crafted to make the author’s argument and consider the audience.

Visual Language relies on a set of conventions and rules, similar to verbal language.
Organizing your content intentionally is key to avoid misleading results: Students should ask themselves “What is the Key Takeaway”?
Distortion

Projections of Earth, Bill Rankin
Satellite Imagery based on Buckminster Fuller's One Continent, One Ocean Dymaxion Map Projections
Editing and Isolating Information

Harold Fisk, Alluvial Map of the Lower Mississippi River Valley
Army Corp of Engineers Map of the River
Hans Rosling's 200 Countries, 200 Years, 4 Minutes - The Joy of Stats - BBC
https://www.youtube.com/watch?v=jbkSRLYSoojo
Ideas for the Classroom

- Final Presentations
- Diagram an argument in a reading, final report, or website
- Hypothetical Chart Exercise
Hypothetical Chart: Anticipating the Persuasive Result

Assignment: Ask your students to create a chart or visualization that proves/disproves their hypothesis.

- Students will need to determine the relevant information (for the audience) and identify (clearly) how they will logically unpack this hypothesis.
- A Concept Map can be used as a primer to ensure that they connect the important overarching principles.
- The Hypothetical Chart Exercise supports many of the Critical & Creative Thinking Intellectual Standards.
Standardized test scores are not strong predictors of success in a master’s program.