

Better Graphics

For knowledge transfer

“

... building relationships and partnerships can help make *scientific research* not only decision-relevant, but also *understandable* to key stakeholders - success in itself.

ENQUIST et al., 2017:545



You must unlearn what
you have learned.

—Yoda

garrreynolds

SIMPLICITY

SIMPLY PRESENTING

by kiyomi morino

“

Do only what is necessary to
convey what is essential...

- Richard Powell, Author of *Wabi Sabi Simple*

Visual Saliency in Climate Change Imagery is in the Eye of the Beholder

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Foundational Concepts
Conclusions
Recommendations

1. Visuals play a significant role in transferring knowledge.

“

...the more visual the input becomes,
the more likely it is to be *recognized* --
and *recalled*.

A man with glasses and a beard, wearing a white shirt, is smiling broadly while holding two anatomical models of a human brain. The model in his right hand is a lateral view, showing the outer surface of the brain. The model in his left hand is a sagittal section, revealing the internal structures of the brain, including the cerebellum, brainstem, and ventricles. The background is a plain, dark gray.

johnmedina
Brain Rules

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1. Visuals play a significant role in transferring knowledge.
2. The communication value of these visuals is highly dependent on their design.

1. Visuals play a significant role in transferring knowledge.
2. The communication value of these visuals is highly dependent on their design.
3. Accurate transfer of information is an essential first step to environmental behavior *[for us: co-producing usable science]*.

Seeing \neq Understanding

“

Viewers cannot learn from an image when they do not *focus on the appropriate aspects* of an image that are required to convey a scientific meaning.

How?

1. Select participants

12 participants:

- Novice: 9 undergraduates, non-science majors
- Expert: 1 undergraduate science major, 1 graduate student, 1 science professor

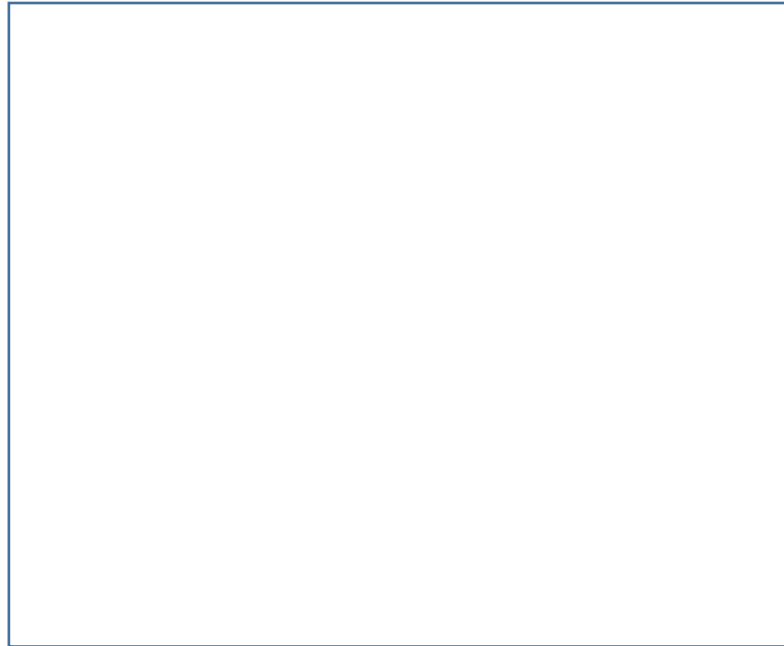
2. Collect data

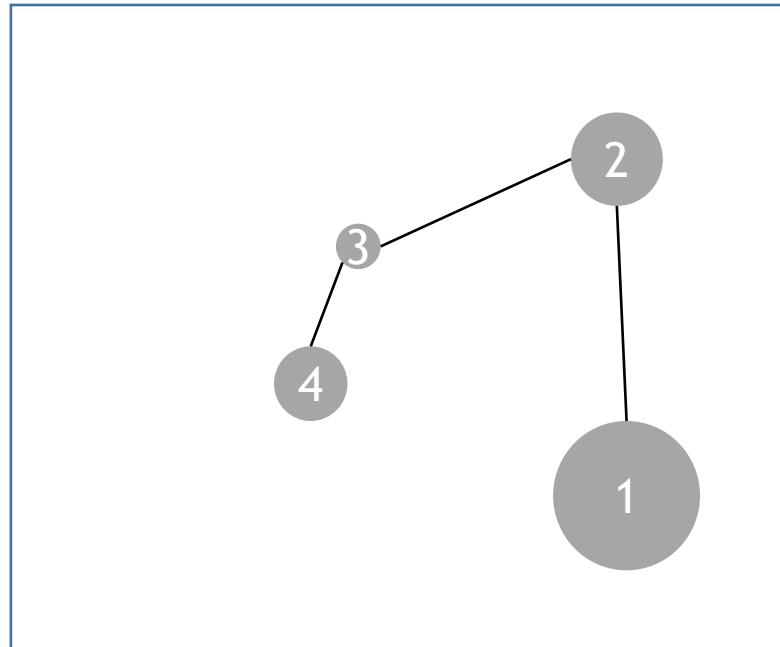
Participants were asked to evaluate 4 common IPCC images: “What was the main message of the image you viewed?”

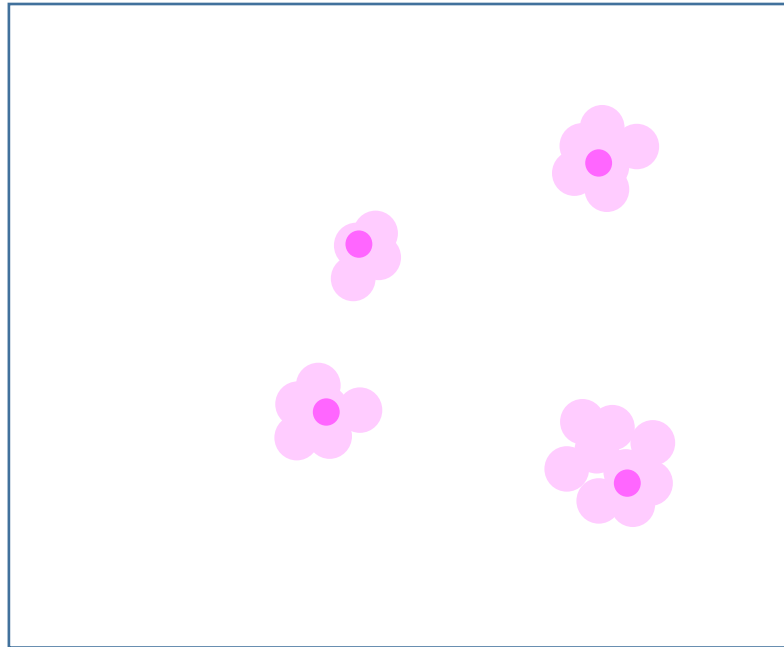
Eye movement as they studied the image was tracked and recorded.

3. Analyze data

4. Revise images and repeat Steps 2&3

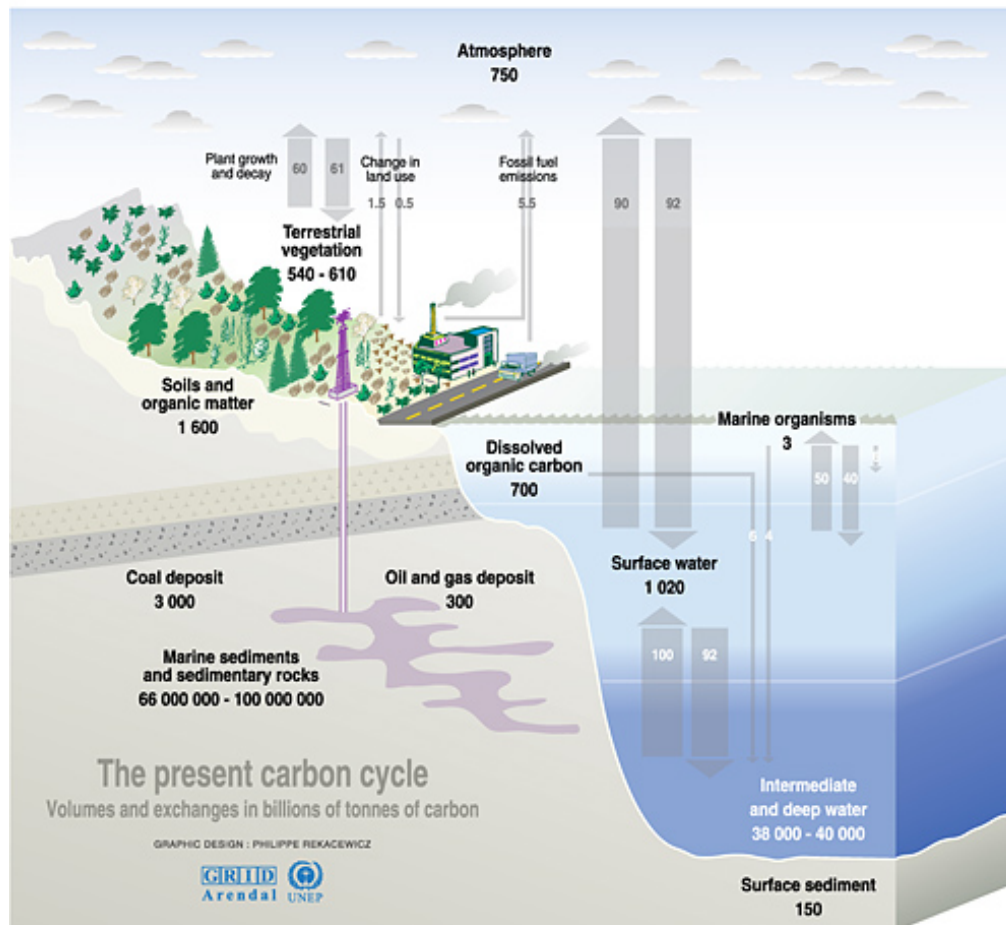






Results: Image 1 - Conceptual

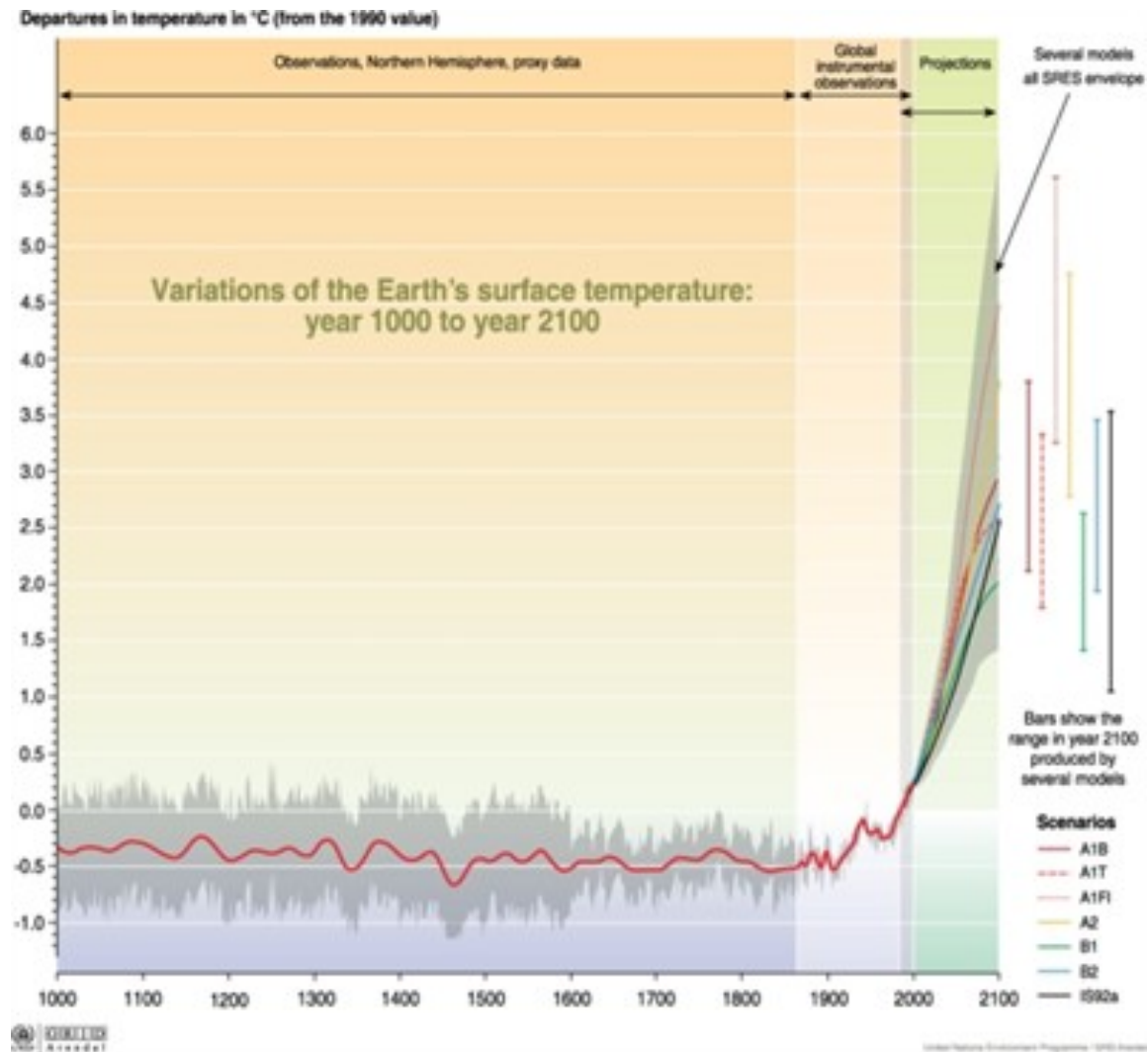
Figure 2. The present carbon cycle



Sources: Center for climatic research, Institute for environmental studies, university of Wisconsin at Madison; Okanagan university college in Canada, Department of geography; World Watch, November-December 1998; Climate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge press university, 1996.

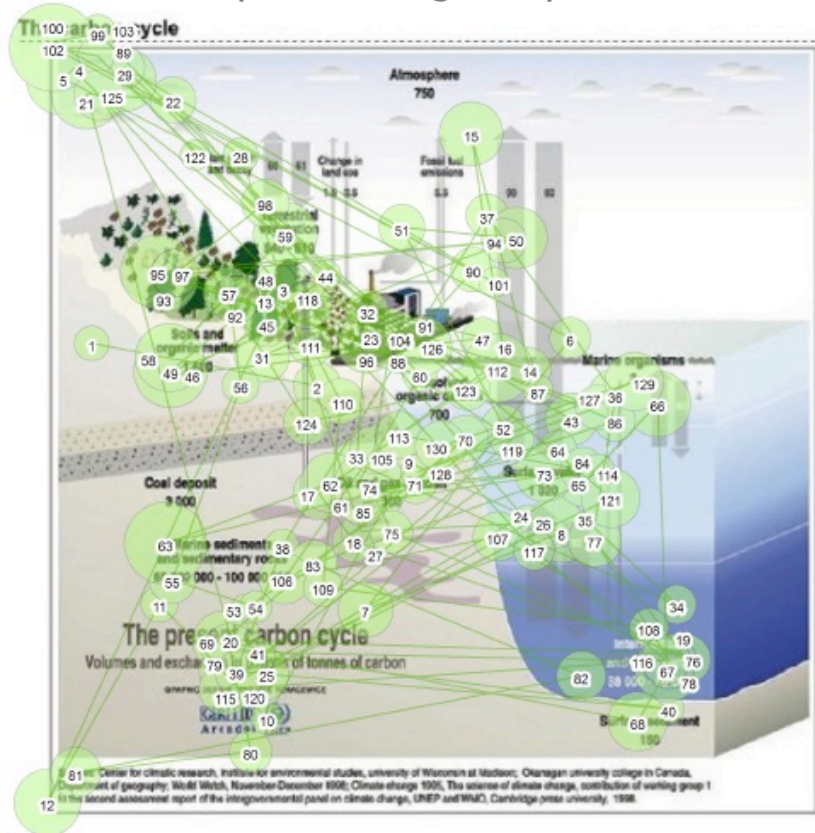
Courtesy of UNEP/GRID-Arendal (<http://maps.grida.no/go/graphic/the-carbon-cycle>)

Results: Image 2 - Data



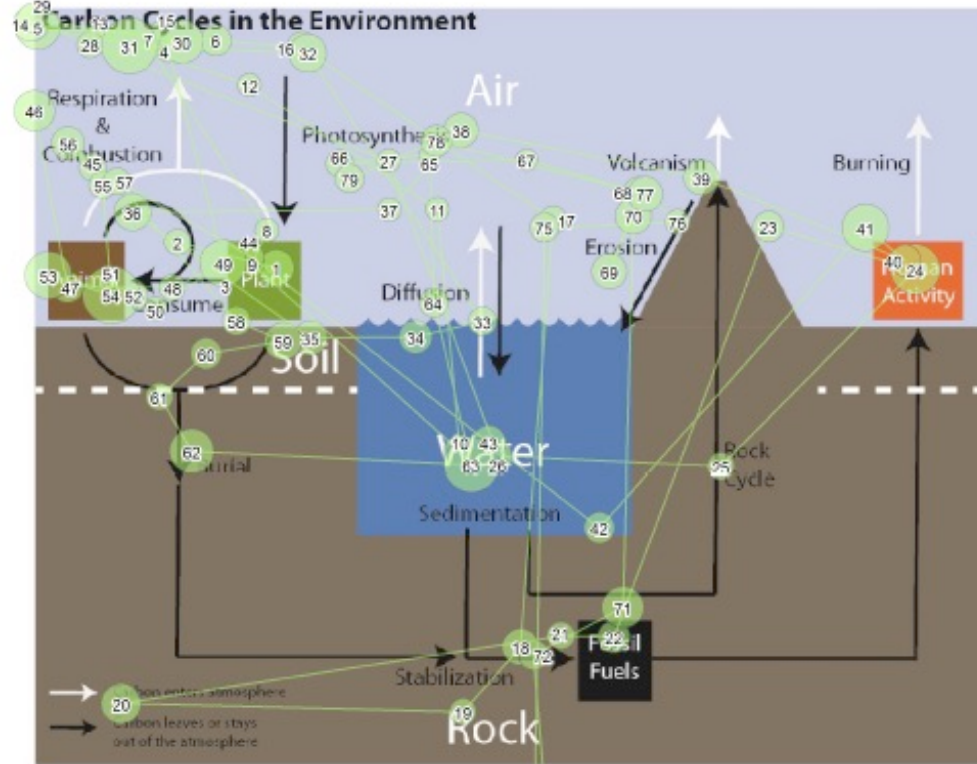
Results: Image 1 - GAZE MAP “What was the main message of the image you viewed?”

Gaze Map for a single Expert viewer



- Both Novice and Experts viewed in a disjointed manner

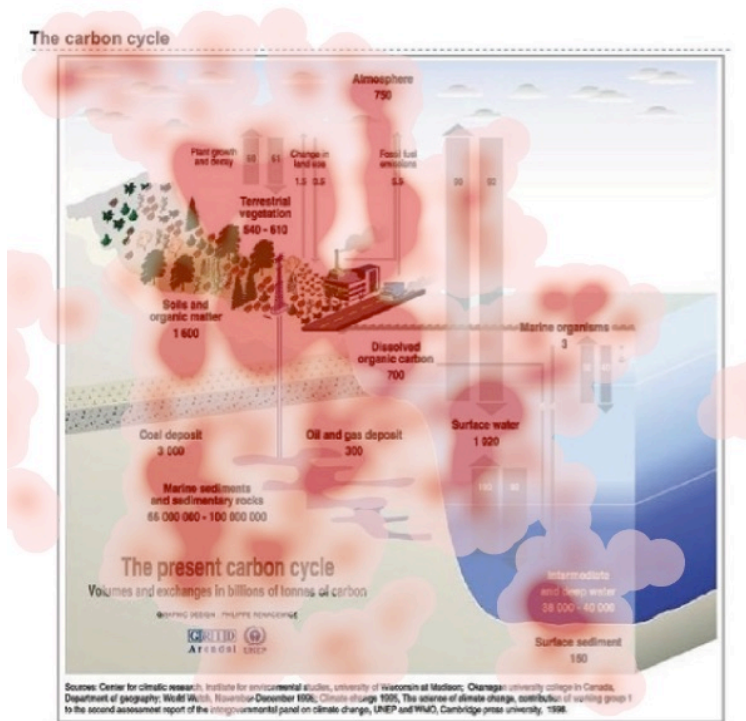
Gaze Map for a single Novice viewer



- Both Novice and Experts in a cyclic, organized manner

Results: Image 1 - HEAT MAP “What was the main message of the image you viewed?”

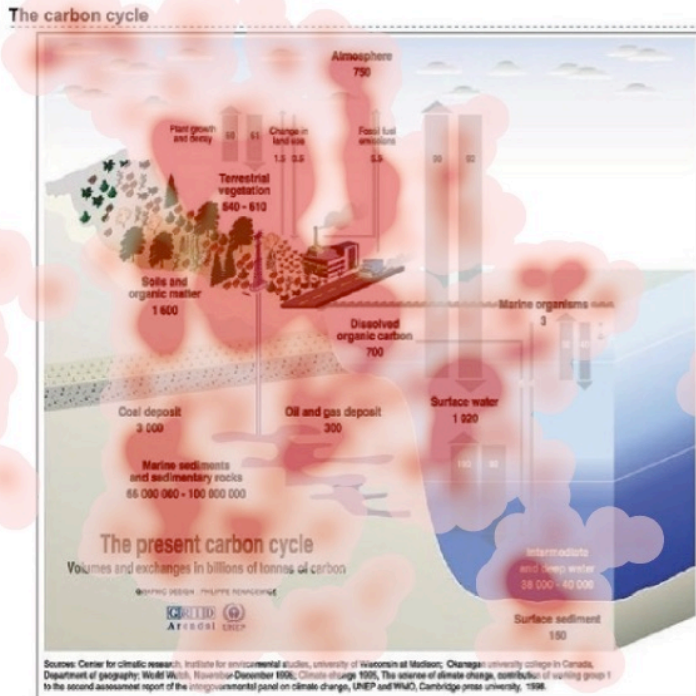
Gaze Map for 4 Novice participants ORIGINAL IMAGE



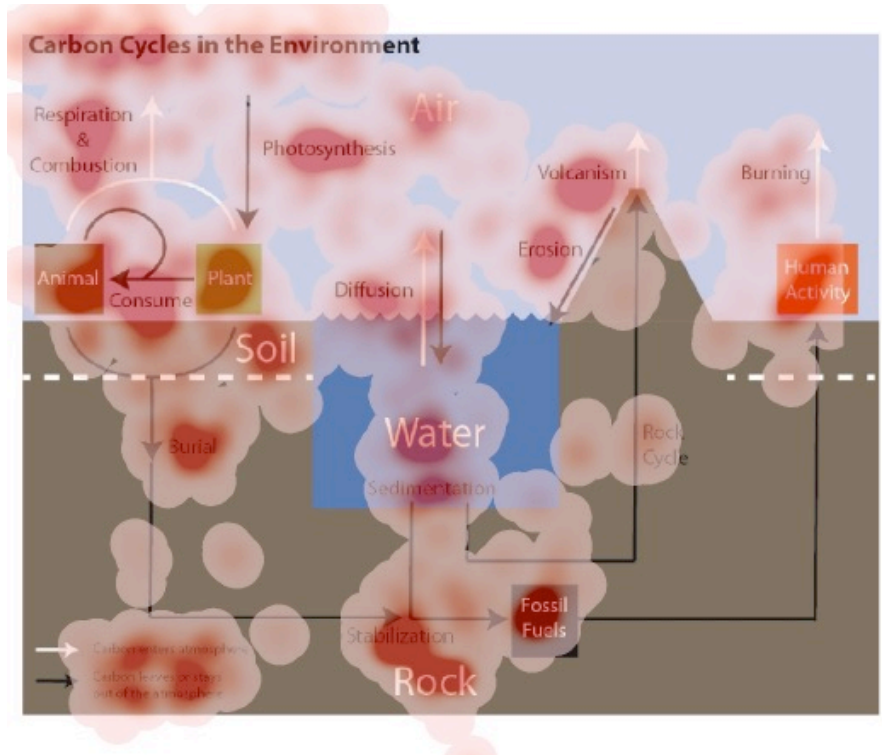
- *Text elements* attract gaze and fixation
- *Artistic elements* attract gaze and fixation

Results: Image 1 - HEAT MAP

Gaze Map for 4 Novice participants
ORIGINAL IMAGE



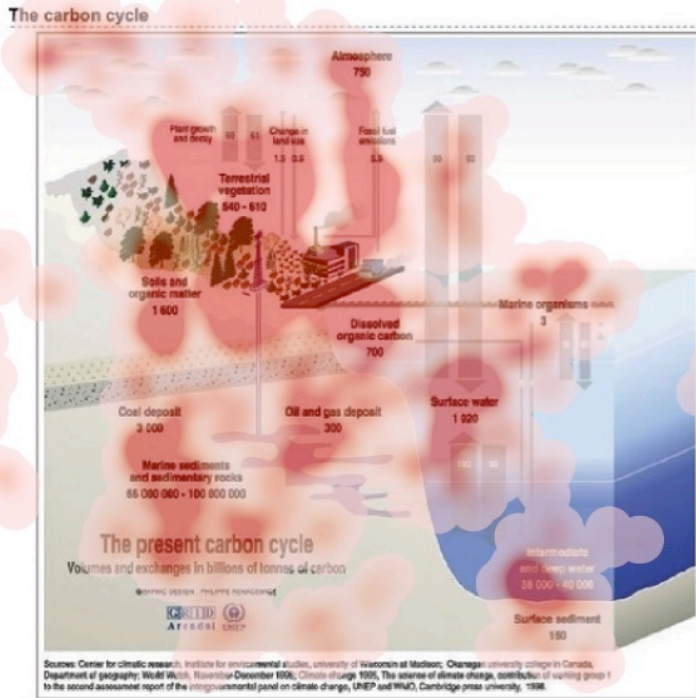
Gaze Map for 4 Novice participants
REVISED IMAGE



- **Text elements** attract gaze and fixation
- **Artistic elements** attract gaze and fixation

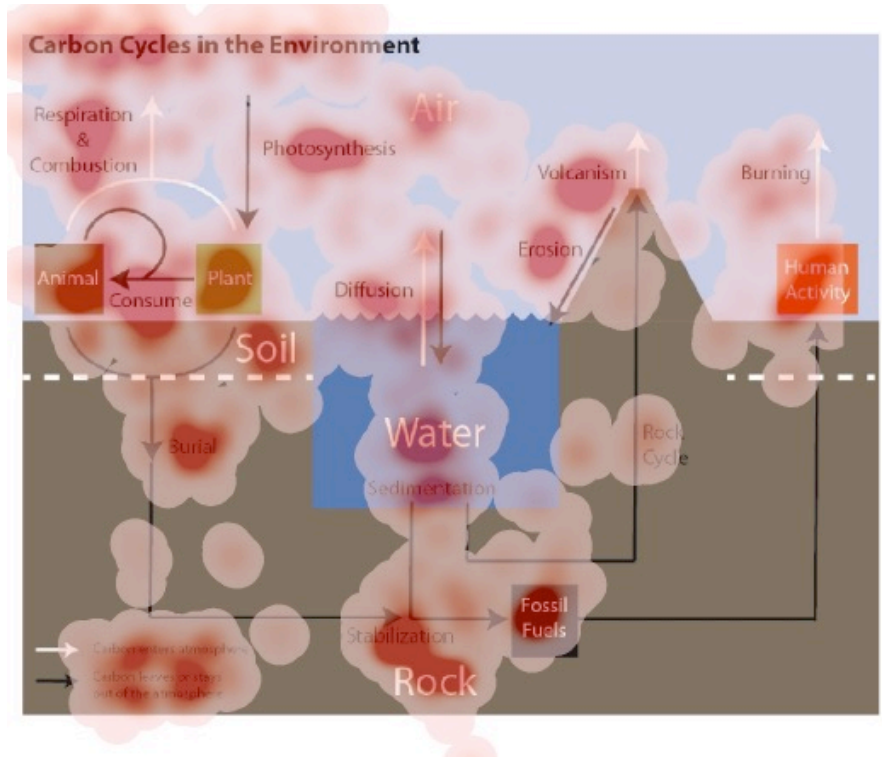
Results: Image 1 - HEAT MAP

Gaze Map for 4 Novice participants
ORIGINAL IMAGE



- *Text elements* attract gaze and fixation
- *Artistic elements* attract gaze and fixation

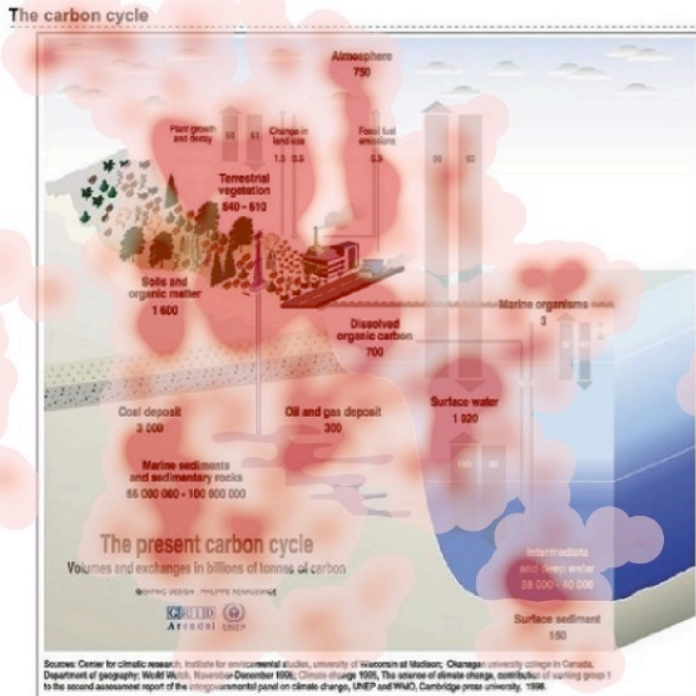
Gaze Map for 4 Novice participants
REVISED IMAGE



- *Text elements* attract gaze and fixation
- BUT...

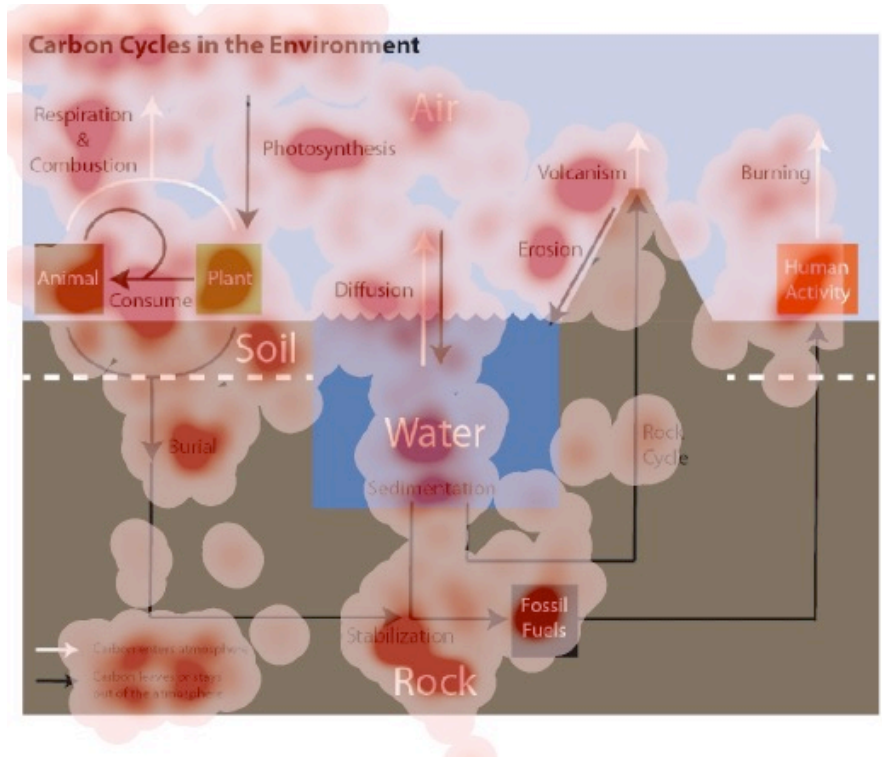
Results: Image 1 - HEAT MAP

Gaze Map for 4 Novice participants ORIGINAL IMAGE



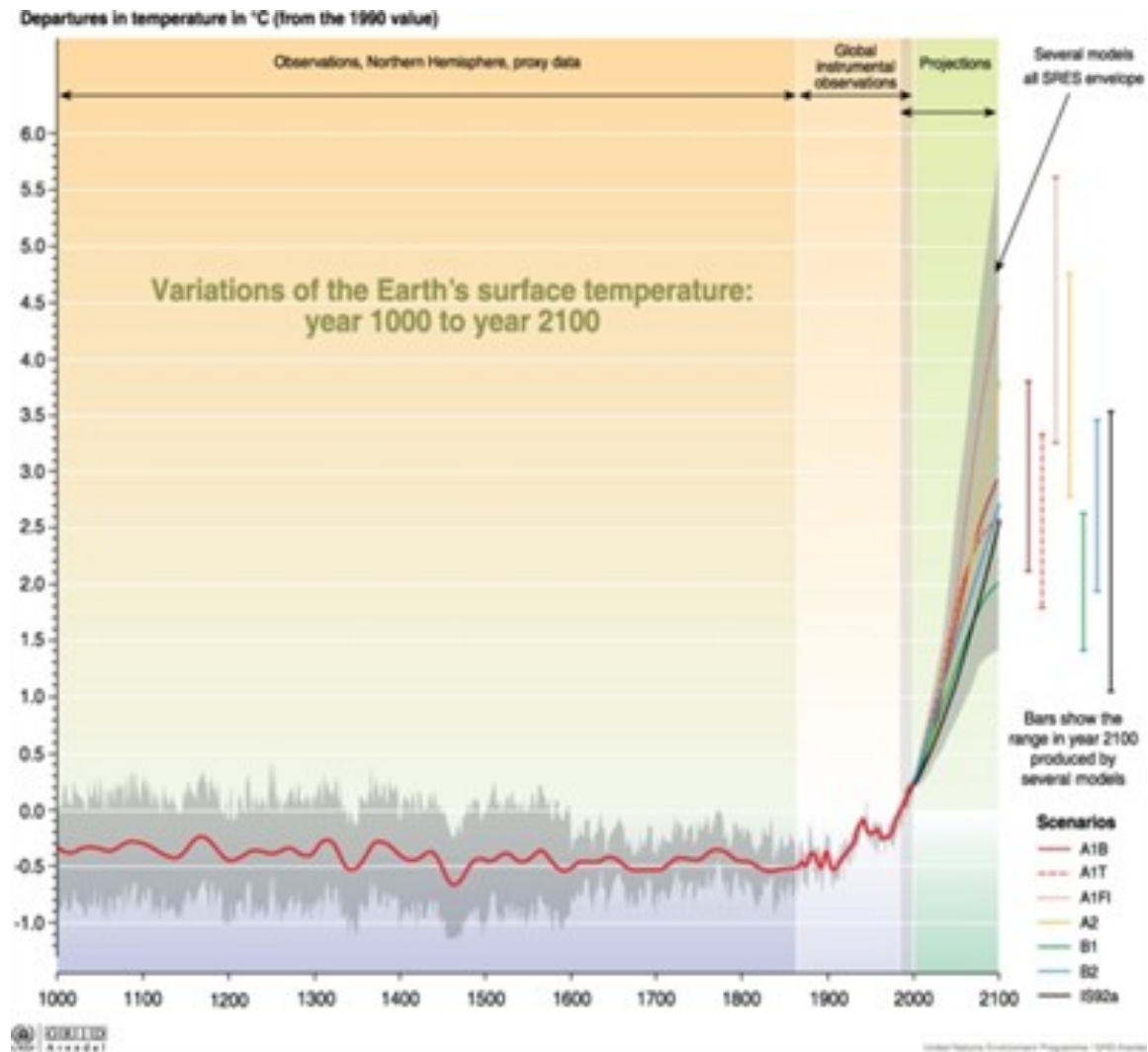
- **Text elements** attract gaze and fixation
- **Artistic elements** attract gaze and fixation

Gaze Map for 4 Novice participants REVISED IMAGE



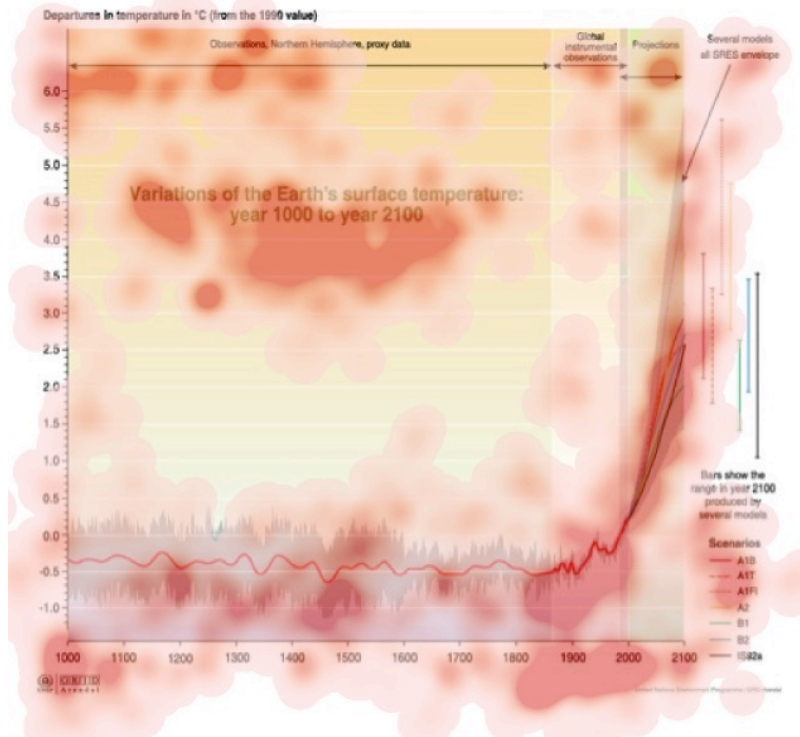
- **Text elements** attract gaze and fixation
- BUT... more uniform viewing among participants

Results: Image 2 - Data



Results: Image 2 - HEAT MAP

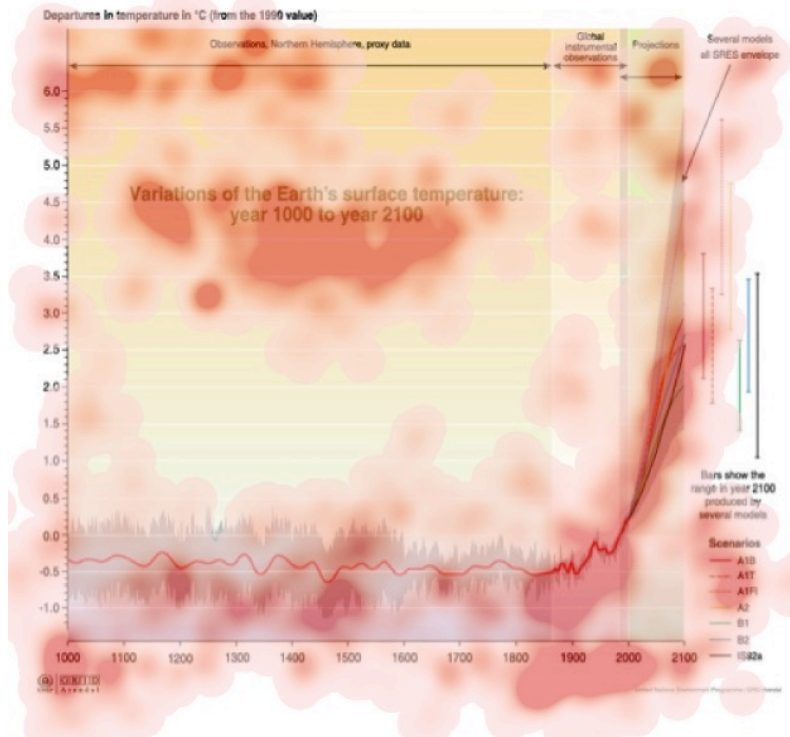
Gaze Map for 4 Novice participants ORIGINAL IMAGE



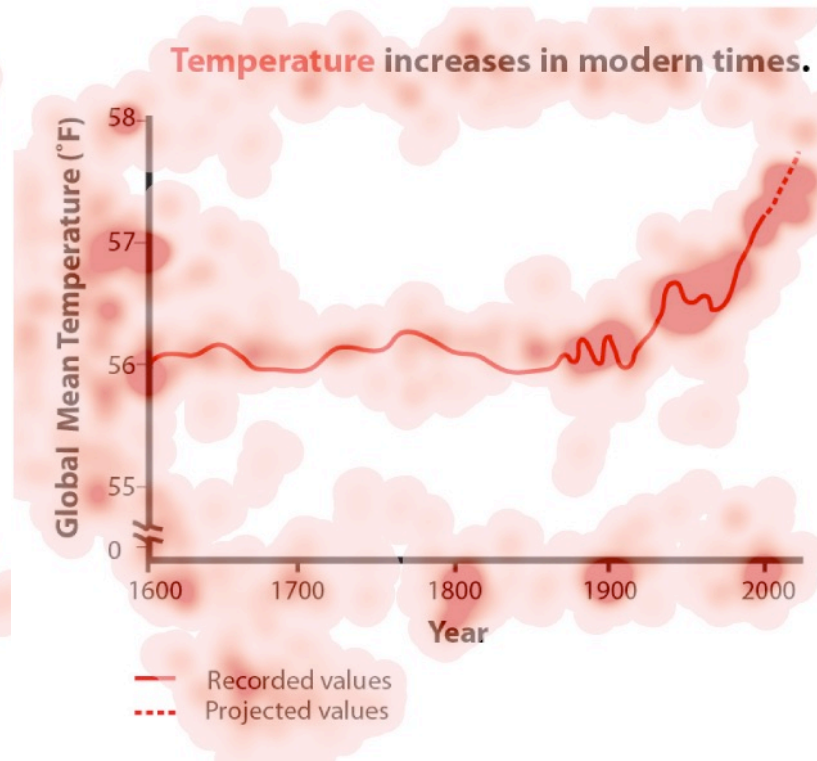
- *Text elements* attract gaze and fixation
- *Increase and projection* attract gaze and fixation

Results: Image 2 - HEAT MAP

Gaze Map for 4 Novice participants
ORIGINAL IMAGE



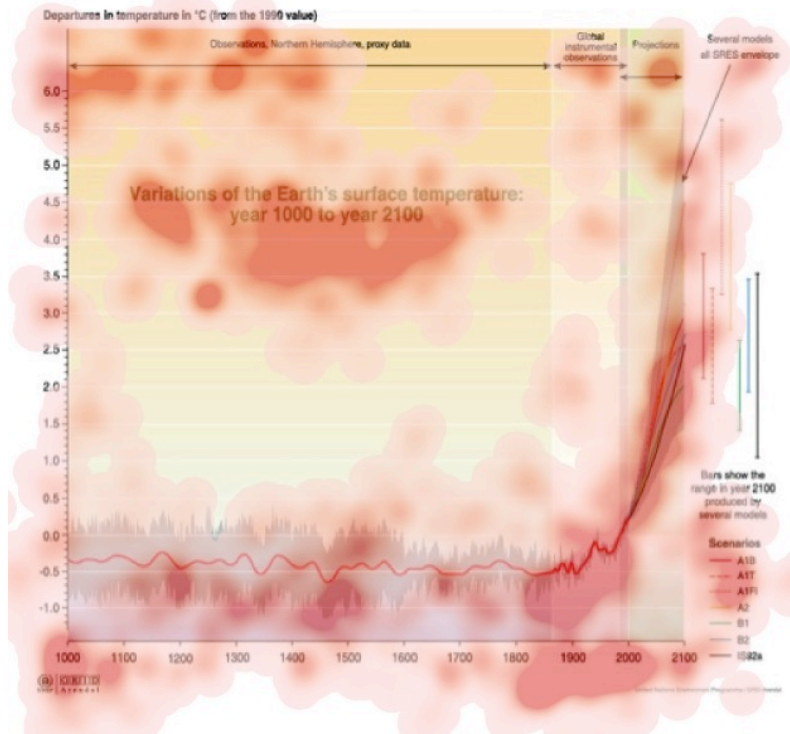
Gaze Map for 4 Novice participants
REVISED IMAGE



- *Text elements* attract gaze and fixation
- *Increase and projection* attract gaze and fixation

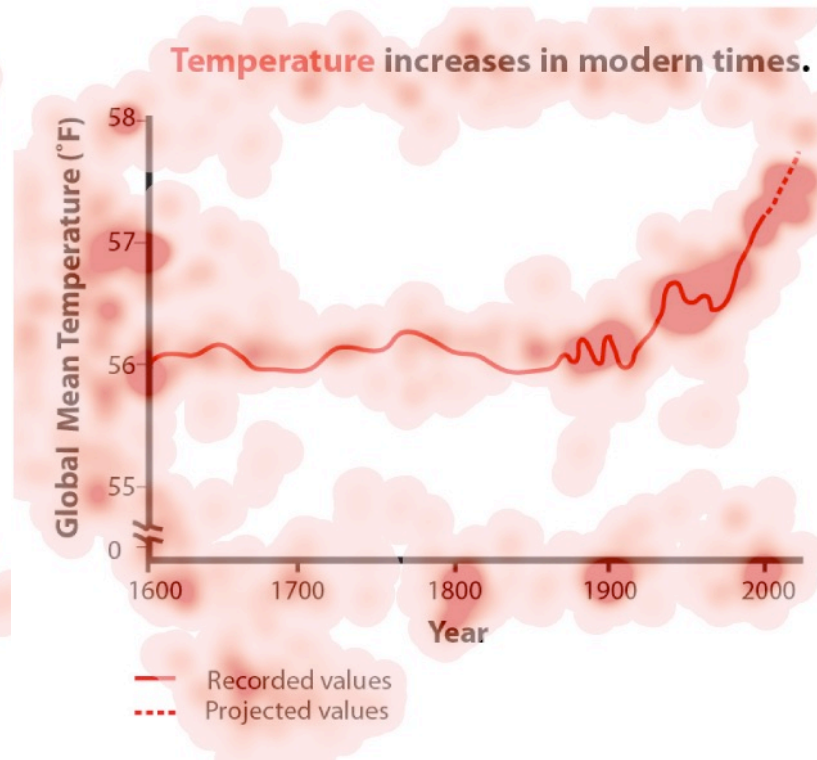
Results: Image 2 - HEAT MAP

Gaze Map for 4 Novice participants
ORIGINAL IMAGE



- *Text elements* attract gaze and fixation
- *Increase and projection* attract gaze and fixation

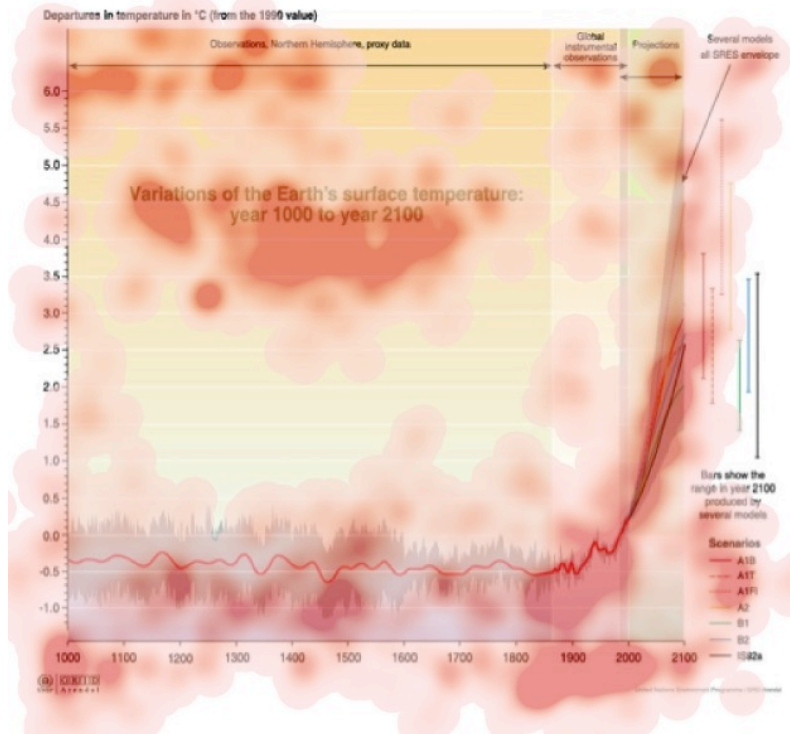
Gaze Map for 4 Novice participants
REVISED IMAGE



- *Text elements* attract gaze and fixation
- *Increase and projection* attract gaze and fixation
- BUT...

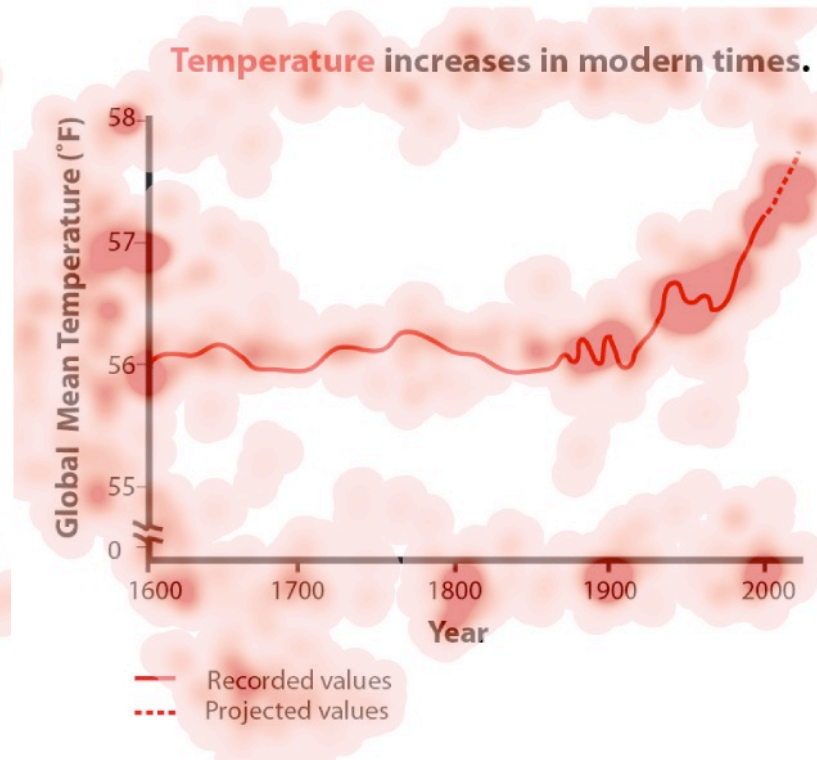
Results: Image 2 - HEAT MAP - Novice

Gaze Map for 4 Novice participants
ORIGINAL IMAGE



- *Text elements* attract gaze and fixation
- *Increase and projection* attract gaze and fixation

Gaze Map for 4 Novice participants
REVISED IMAGE



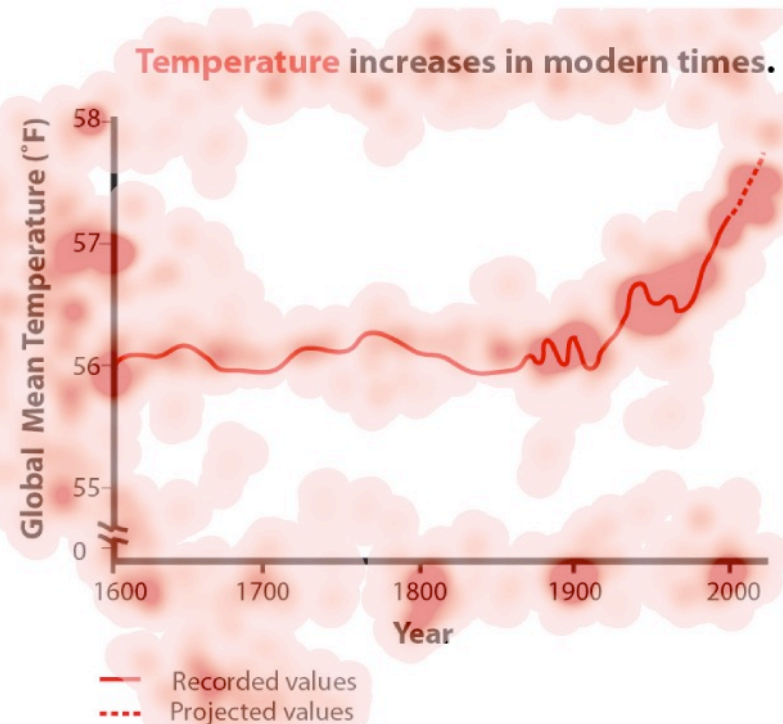
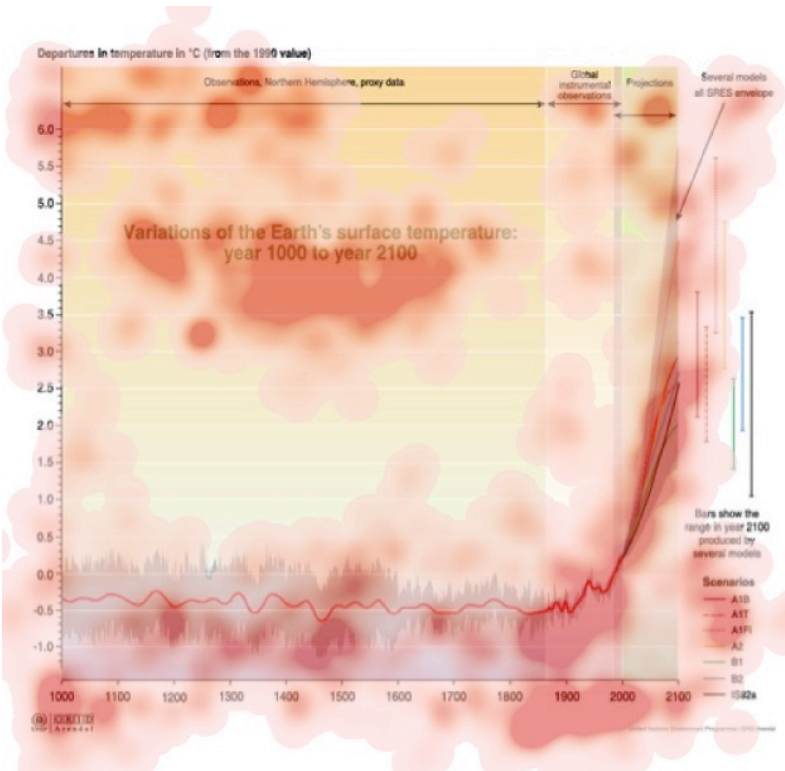
- *Text elements* attract gaze and fixation
- *Increase and projection* attract gaze and fixation
- BUT... more focused viewing of axes

3

Conclusions

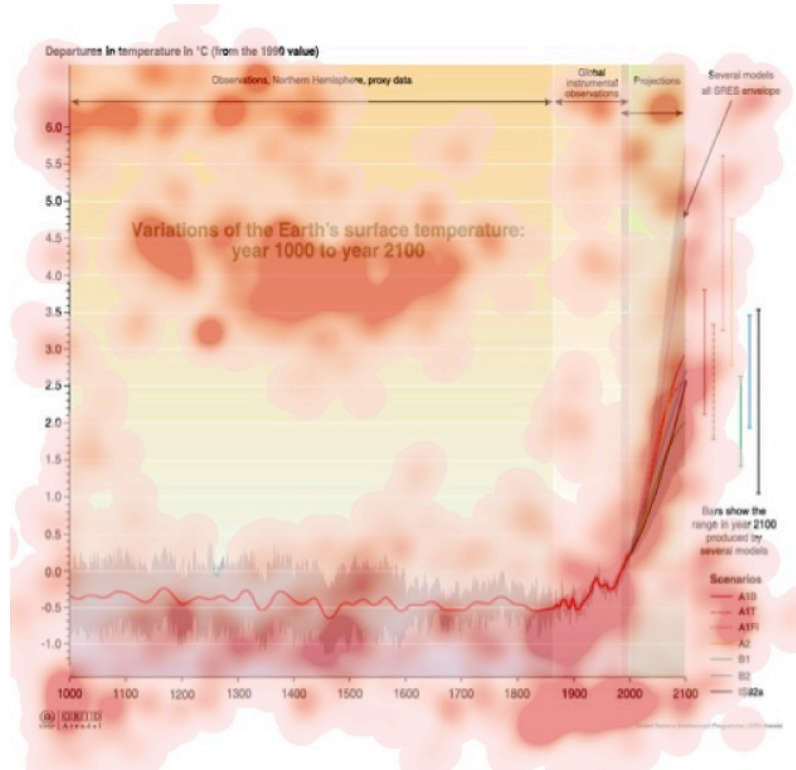
Conclusion #1

- Experts had a more purposeful* gaze
- Expert-like gaze could be induced in Novices by revising the image



Conclusion #2

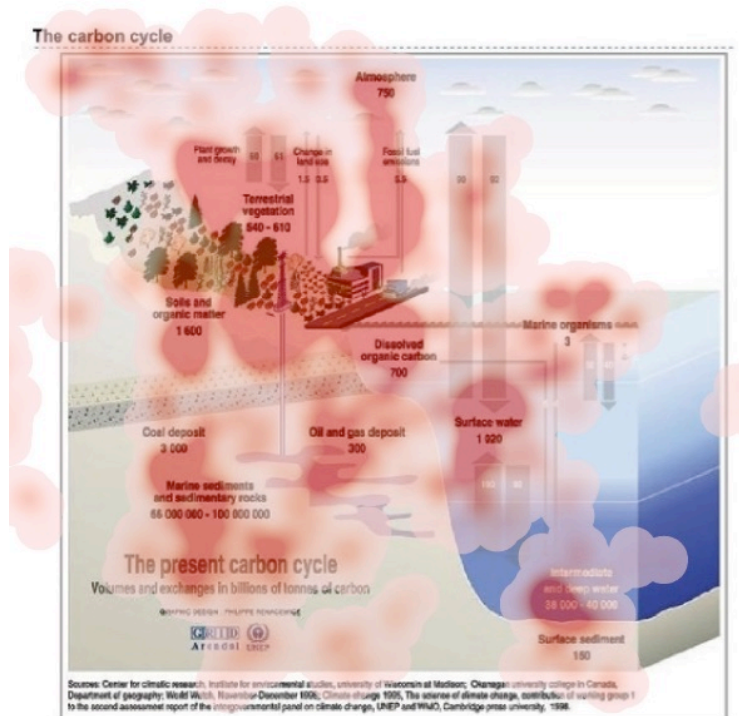
- Text attracts the eye
- Visuals should reinforce text and vice versa



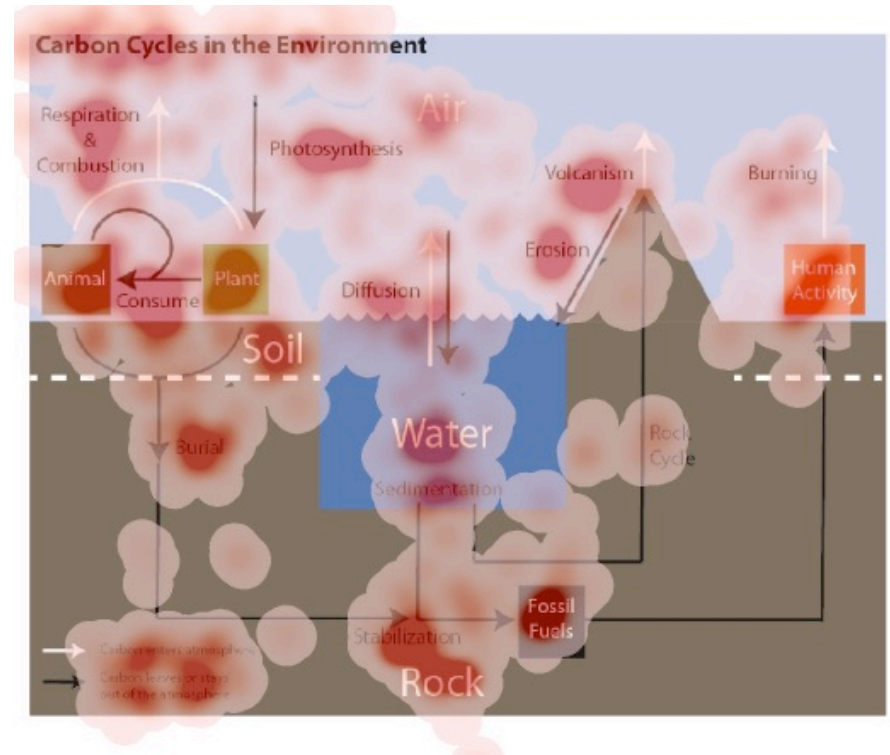
- *Text elements* attract gaze and fixation

Conclusion #3

- Pictorial elements attract the eye



- In describing the carbon cycle, more emphasis was placed on *sources/sinks* vs processes



- In describing the carbon cycle, more balanced recognition of *sources/sinks* AND *processes*

3

Recommendations

Establish the objectives behind creating a visual

Communicators must identify the VALUE of the information:

For the image presented, what information is necessary for novice understanding of the phenomenon/process?

Establish the objectives behind creating a visual

Communicators must identify the VALUE of the information:

For the image presented, what information is necessary for novice understanding of the phenomenon/process?

Which phenomena and processes are necessary for transferring usable knowledge?

Create purposeful images by considering design elements

What level of abstraction is optimal?

Create purposeful images by considering design elements

What level of abstraction is optimal?

What is the required background knowledge needed to correctly Interpret image?

Create purposeful images by considering design elements

What level of abstraction is optimal?

What is the required background knowledge needed to correctly Interpret image?

Which graphic elements should be included?

Is the information correctly getting through?

- Think-aloud discussion
- Eye tracking
- Focus groups

Thank-you!

