Interactive/Experiential Workshop | Breakout | Friday, October 30, 10:45-12:00

Learning to Look at Climate Data: Using *Visual Thinking Strategies* in Science to Build Observation, Inquiry, and Engagement

Kerri Ziemann, Program Director, The Wild Center, kziemann@wildcenter.org
Tara Geer, Visual Thinking Strategies Institute, tgeer@vtshome.org

PHIPPS Duke Farms THE WILD CENTER vts Visual Thinking Strategies INSTITUTE

“Science is a way of thinking much more than it is a body of knowledge”

–Carl Sagan, *Cosmos* (1980)

Learning objectives

1. **Experience a Visual Thinking Strategies (VTS) discussion** using art, and ways to connect climate-related information.

2. **Identify a participant-centered facilitation practice you might want to try** – including close listening, group discussion, allowing silence, practicing uncertainty, authentic inquiry, and withholding evaluation.

3. **Implement practices that strengthen participant-centered learning** in your spaces—and figure out what training would be needed to build inclusive participation

How do we help public audiences engage meaningfully with climate information?

Hint: We cannot only cram facts into people

–especially kids–

and expect those facts to be used.

Agenda

10:45 Brief introductions (5 mins)

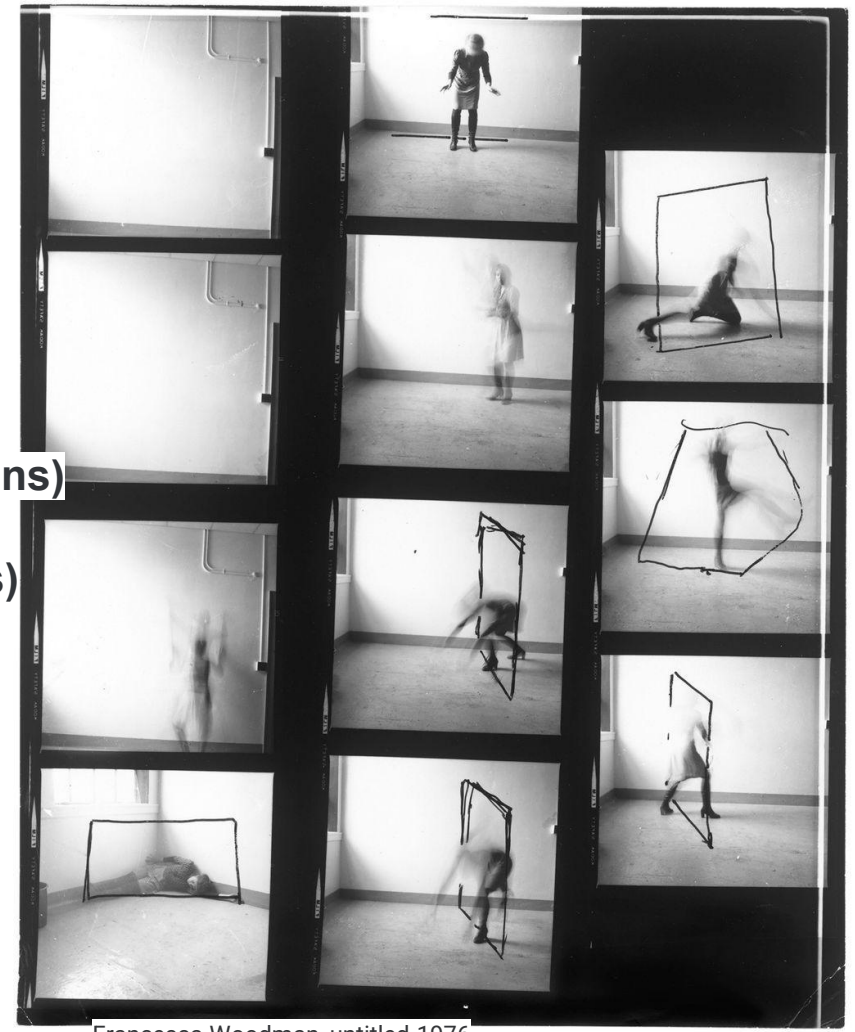
10:50 VTS Image Discussion (20 mins)

11:10 Reflection–what were we doing? (10 Mins)

11:20 Intro VTS/research foundation (10 mins)

11:35 How this works in science (20 mins)

11:50 Questions & Take-aways (10 mins)



Francesca Woodman, untitled 1976

Using art discussions for science



Kerri Ziemann
(she/her)
Program Director at
The Wild Center
Tupper Lake, NY

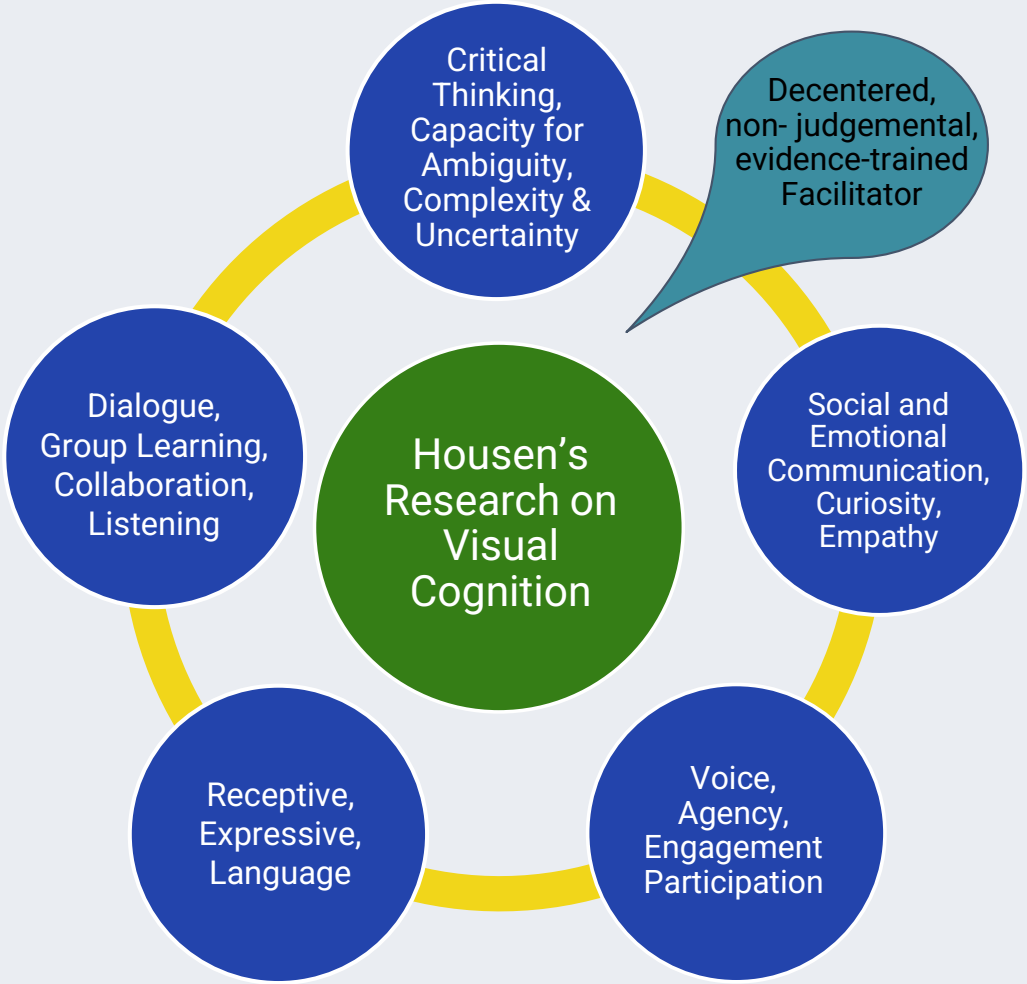


Tara Geer
Director Visual Thinking
Strategies Institute
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The VTS Institute is the original nonprofit devoted to Visual Thinking Strategies.

For three decades, we've trained people how to turn diverse group discussions into meaningful, measurable learning.



What is Visual Thinking Strategies -VTS?



Professional Development:

Educators & other Professionals learn how to shift from traditional content-based teaching to facilitating open, participant-centered learning.

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What is VTS? For the participants...

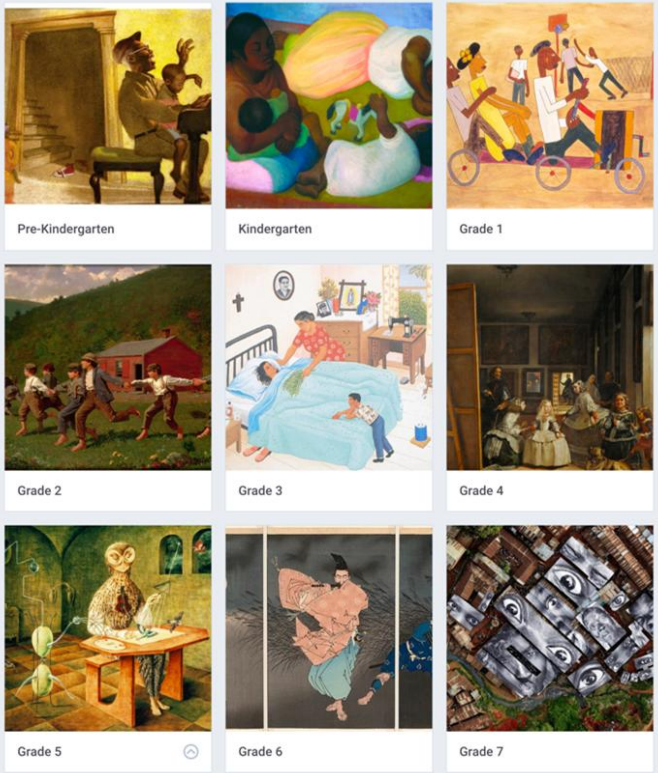


Group Learning-- Participants practice making sense of what they see *together,* from where they are individually. Decades of research shows these skills last, and transfer to other content areas.

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The Visual Thinking Strategies Institute offers

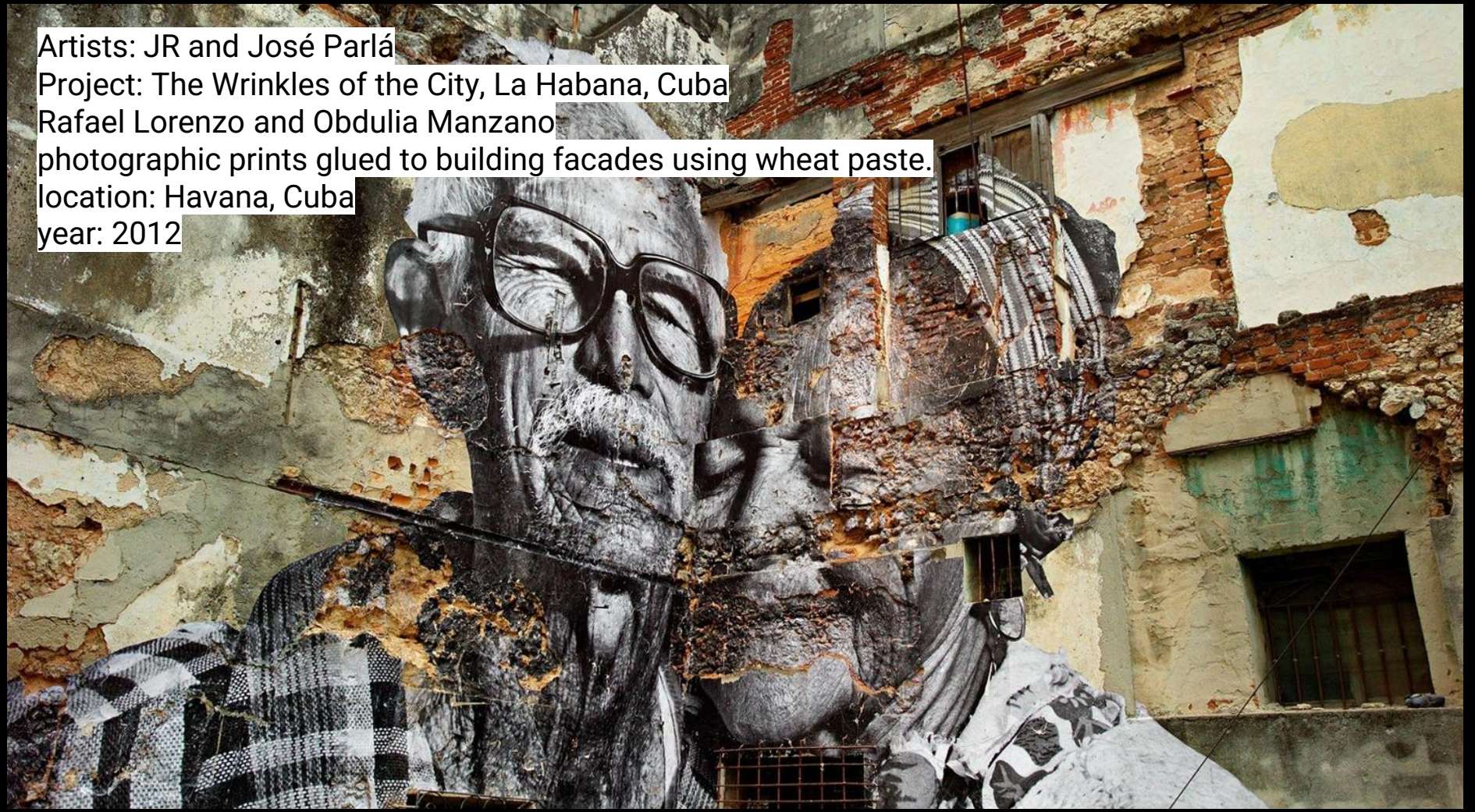
- **Online monthly public facilitator training at cost**
- **Consultation** & staffing, tailored training, research design and program implementation
- Multiple **image curriculums,** including customized medical/scientific ones
- Live in-person & online **experiences** of VTS at museums, institutions & ***The New York Times*** weekly
- Searchable **Bibliography** of over 200 articles and studies about VTS: https://vtshome.org/bibliography/
- **Supporting materials** at VTShome.org



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Let’s jump in




Artists: JR and José Parlá
Project: The Wrinkles of the City, La Habana, Cuba
Rafael Lorenzo and Obdulia Manzano
photographic prints glued to building facades using wheat paste.
location: Havana, Cuba
year: 2012

What were we doing?
What kind of learning might be happening in this kind of discussion?
Why practice so much not knowing?

Visual Thinking Strategies is a few simple core moves, rigorous training to meet your audience, facilitated group discussion, and learning by doing.

The environment of VTS

collaborative

participant centered

developmentally appropriate

Non judgemental

full participation

engaging

encourages taking risks

clearly structured

research-based

+

The core elements of VTS facilitation

SILENT MOMENT

Q1 WHAT'S GOING ON IN THIS PICTURE?

Q2 WHAT DO YOU SEE THAT MAKES YOU SAY…?

Q3 WHAT MORE CAN WE FIND?

PARAPHRASE
POINT
THANK YOU

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Scientific literacy in an information saturated world



Knowing scientific facts is important, but so is knowing how to evaluate claims, identify supporting evidence, recognize uncertainty and ask what additional information is needed.

“What do you see that makes you say…?” makes the relationship between a claim and its evidence explicit.

Learning across political and social differences



Climate conversations can involve competing values, identities, lived experiences, and levels of trust. When people feel judged or dismissed, they may disengage rather than explore an idea. A structured, nonjudgmental discussion creates more room for curiosity, careful listening, and consideration of different perspectives without requiring everyone to agree.

Paraphrasing, not-judging, thanking participants, and inviting **multiple interpretations** help establish respectful dialogue while keeping attention on evidence.

Navigating complexity and uncertainty



Climate science involves interconnected systems, long-term trends, probabilities, and evolving evidence. Learners need opportunities to work through questions without expecting an immediate or simple answer. They also need to distinguish uncertainty about specific outcomes from the broader scientific evidence supporting climate change.

The **silent moment** and **“What more can we find?”** encourage patience, sustained attention, intellectual humility, and continued investigation.

Moving from information toward informed participation



Climate challenges require people to connect scientific understanding with local conditions, community priorities, and possible responses. Collaborative group discussions help people build shared understanding and confidence to engage with complex problems and explore solutions together.

Full **participation** and **collaborative meaning-making** allow people to contribute their knowledge, encounter other viewpoints, and identify questions that can guide further learning and action.

Why do we have discussions like this?

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VTS started with Dr. Abigail Housens' questions

Housen was curious about the people wandering around museums in the 1970s – *what were they doing? Why were there so few kinds of people there?*

This was **the seeds of VTS** which has spread from museums to K-12 to medical schools and science centers.

Her research, initially at the Harvard Graduate School of Education, overturned assumptions about learning.

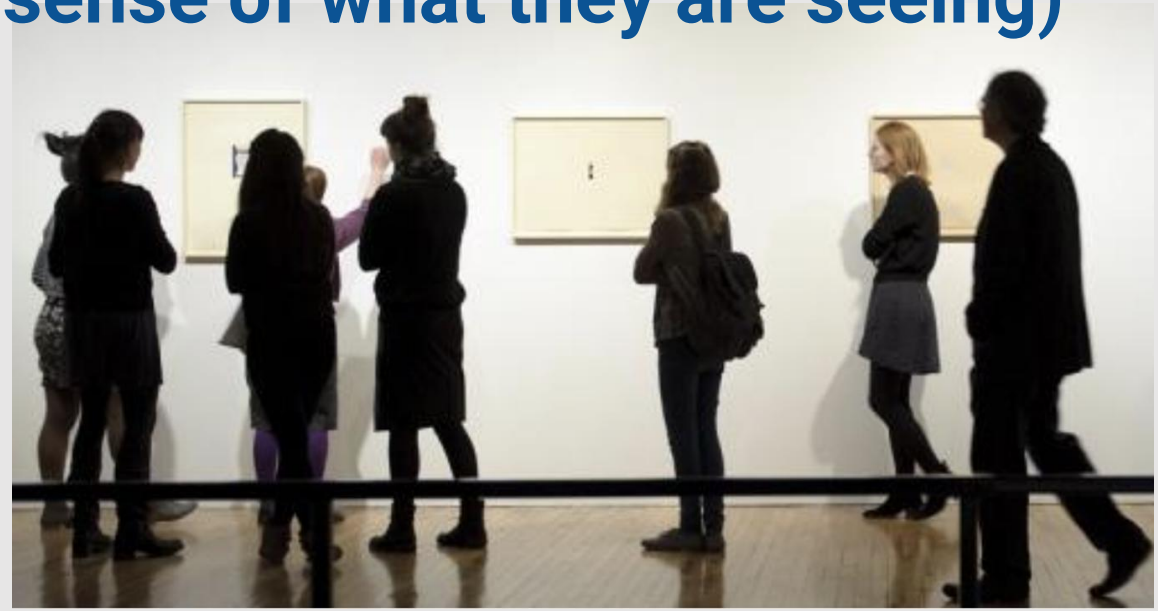
(She is also my **mom**.)



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Housen's Research Question:

What is happening, in a regular person, when they look at art? (When they are trying to make sense of what they are seeing)

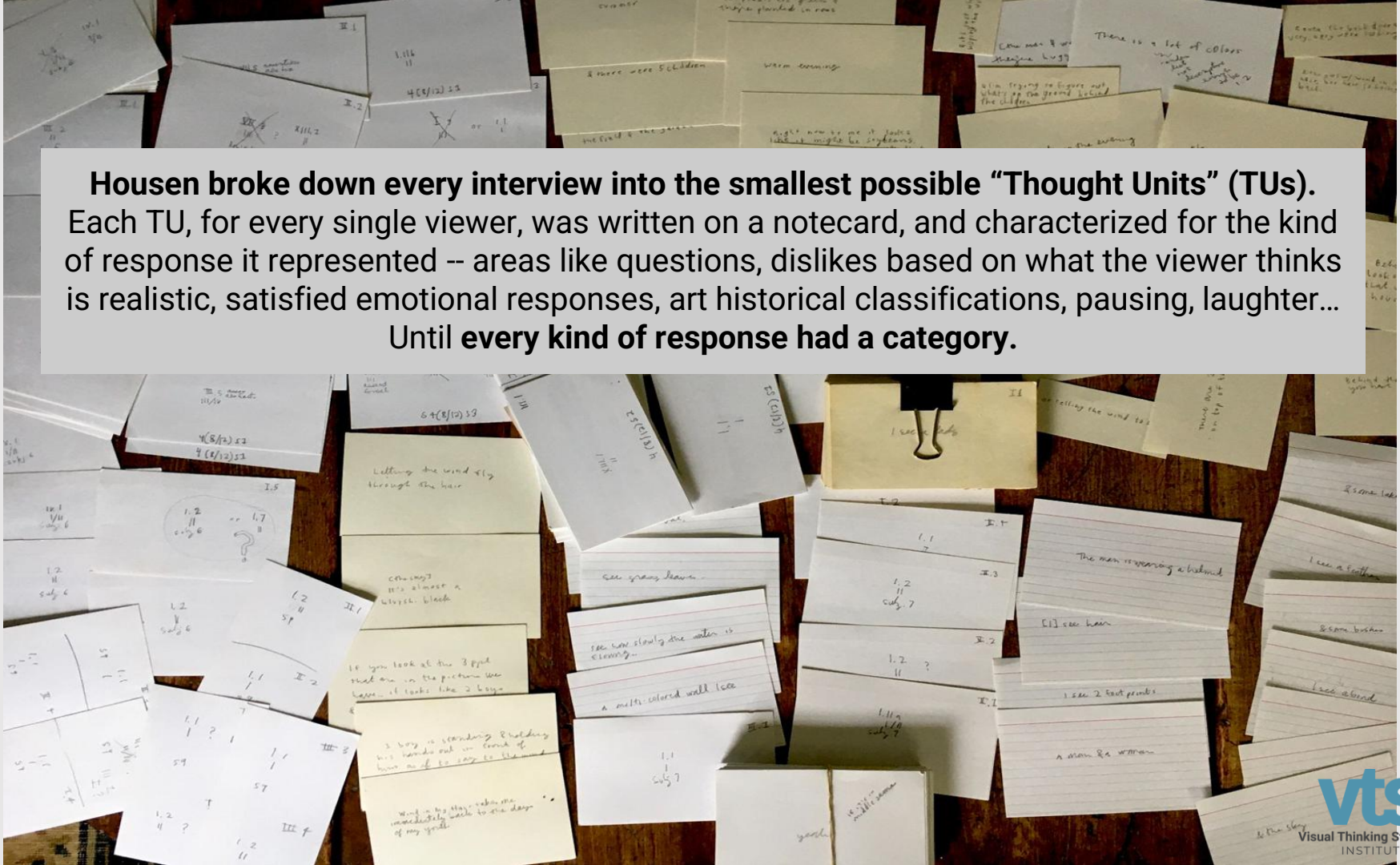


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Housen’s Interview Method:

Interviewer instructions: Tell me what you are looking at, where your eyes are moving, what do you happen to be thinking about? It’s as if you were thinking out loud.

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Housen broke down every interview into the smallest possible “Thought Units” (TUs). Each TU, for every single viewer, was written on a notecard, and characterized for the kind of response it represented -- areas like questions, dislikes based on what the viewer thinks is realistic, satisfied emotional responses, art historical classifications, pausing, laughter… Until **every kind of response had a category.**

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Aesthetic Development Coding Manual INDEX

Domain I: Observation

I/1: of things, objects, shapes, colors, people noted singly; appearing to be randomly chosen (Stage I). (226)
I/2: of general descriptions which characterize what is happening within the work to a particular object, form, shape. A clearer, more exact pinpointing of the object, form, shape (Stage II). (228)
I/3: of descriptions based on the viewer's concept of "reality" guided by his/her personal criteria (Stage II). (231)
I/4: of descriptions based on the viewer's concept of "reality," guided by the criteria seen through a photographic lens. (Stage II). (233)
I/5: of groupings of like or similar things in an effort to place things within a niche (Stage III). (235)
I/6: of discriminations which characterize and define particular aspects of details within the art work (Stage IV). (236)
I/7: of what is happening in a work. The placement, direction, formal issues taken singly and given a very concrete cast (Stage II). (237)
I/8: of what is happening in a work. The placement, direction, formal elements noted in terms of relationships and connections (Stage IV). (238)
I/9: of what the cognitive effect is of what is happening to the viewer by looking at aspects of the work, within the work (Stage III). (240)
I/10: of what the affective or the emotional effect of the work is on the viewer (Stage IV). (242)
I/11a: Animate—personal, idiosyncratic. (Stage II). I/11b: Animate—based on painting. (Stage II). (243)
I/12: Expressive (Stage IV). (246)

Domain II: Preference

II/1: general likes/dislikes. Global statements. Statements which straddle the fence (Stage II). (248)
II/2: likes/dislikes which are connected or refer to objects, particulars, specifics within the art work (Stage I). (250)
II/3: likes/dislikes based on personal internal criteria which is defined by viewer-reality, what is self-programmed (Stage II/III). (251)
II/4: likes/dislikes based on the style, the rendition, the formal elements, looked at one at a time (Stage II). (253)
II/5: likes/dislikes based on reacting to the interrelationships of the formal elements, schools, styles, artists (Stage III). (254)
II/6: likes/dislikes based on a concept or a meaning (Stage IV). (256)
II/7: satisfaction reaction, emotional response (Stage IV). (257)

Domain III: Association

III/1: "looks like" remarks which are random, idiosyncratic, personal associations, recollections, memories of objects or things (Stage I). (258)
III/2: reminds the viewer of personal events, personal history (Stage II). (260)
III/3: reminds the viewer of personal aesthetic history (Stages III/IV). (261)
III/4: "looks like" category within the public domain (Stages II/III). (262)
III/5: recollects or remembers aesthetic or art historical facts (Stage III/IV). (263)
III/6: triggers feelings of personal events and history (Stage IV). (265)
III/7: triggers universal feelings (Stage IV). (266)
III/8: reminds viewer of universal states or conditions (Stage V). (267)
III/9: triggers viewer to associate to an activity; in-dwelling/active (Stage II/IV). (268)
III/10: triggers viewer to enter the scene, empathize, feel, be in a reverie; in-dwelling/passive (Stage IV). (269)

Domain IV: Evaluation

IV/1: qualitative judgments based on personal, internalized criteria about the normal, the real, the ideal (Stage I/II). (270)
IV/2: qualitative judgments relating to the skill, proficiency, technical ability, expertise, know-how, or knowledge of the artist (Stage II). (272)
IV/3: qualitative judgments on a single formal property (Stage II). (273)
IV/4: qualitative judgments about formal properties (Stage III). (274)
IV/5: qualitative judgments about the work's meaning (Stage IV). (275)
IV/6: qualitative judgments incorporating an emotional response or reaction to the work (Stage IV). (276)

Domain V: Negative or Positive Comprehension

V/1: negative statement about self-worth, understanding (Stage I/II). (277)
V/2: positive statement about comprehension (Stage II). (279)

Domain VI: Questioning

VI/1: wondering about the presence or absence, or placement of elements (Stage I). (280)
VI/2: wondering about technique, craftsmanship, artist (Stage II). (281)
VI/3: wondering about the function (Stage II). (282)
VI/4: rhetorical question addressing listener, often about authorship or medium (Stage II (283)
VI/5: rhetorical questions addressing listener about presentation (Stage II). (284)
VI/6: wondering about the meaning (Stage IV). (285)

Domain VII: Assertion

VII/1: personal statements which are uncontestable (Stage II). (286)
VII/2: statements about assumed facts or perceived reality (Stage II). (287)
VII/3: assertions about interpreted form
VII/4: assertions about interpreted form
VII/5: personal statements about the vi
VII/6: assertions about the meaning or
VII/7: intentional statements which tell
(295)

Domain VIII: Comparison

VIII/1: generalized comparisons, like/u
presence/absence, more/less,
VIII/2: contrasting of a single formal pr
VIII/3: contrasting of formal properties
VIII/4: dichotomies and paradoxes bas
VIII/5: dichotomies and paradoxes (Sta
VIII/6: contrasting of classifications (S
VIII/7: contrasting of meanings (Stage I
VIII/8: contrasting of feelings (Stage I

Domain IX: Interpretation-Metaph

IX/1 how the object signifies (Stage IV). (306)
IX/2: what the objects signifies (Stage III/IV). (307)
IX/3: the significance of suppositions which involve contrasting or complementary elements (Stage IV/V). (308)
IX/4: synthesis or summation of metaphoric suppositions (Stage V). (310)

Domain X: Conclusion

X/1: brief conclusions (Stage II). (311)

Domain XI: Physical Reaction

XI/1: laughter (Stage II). (312)
XI/2: gestures (Stage III). (313)

Domain XII: Prompted Remarks

XII/1: prompted remarks which clarify a prior statement (Stage II). (314)
XII/2: reply to prompt, "Is there anything more...?" (Stage I). (315)
XII/3: reply to question about a change in preference (Stage I). (316)

Domain XIII: Incomplete or incoherent remarks

XIII/1: incomplete or incoherent remarks (Stage II). (317)

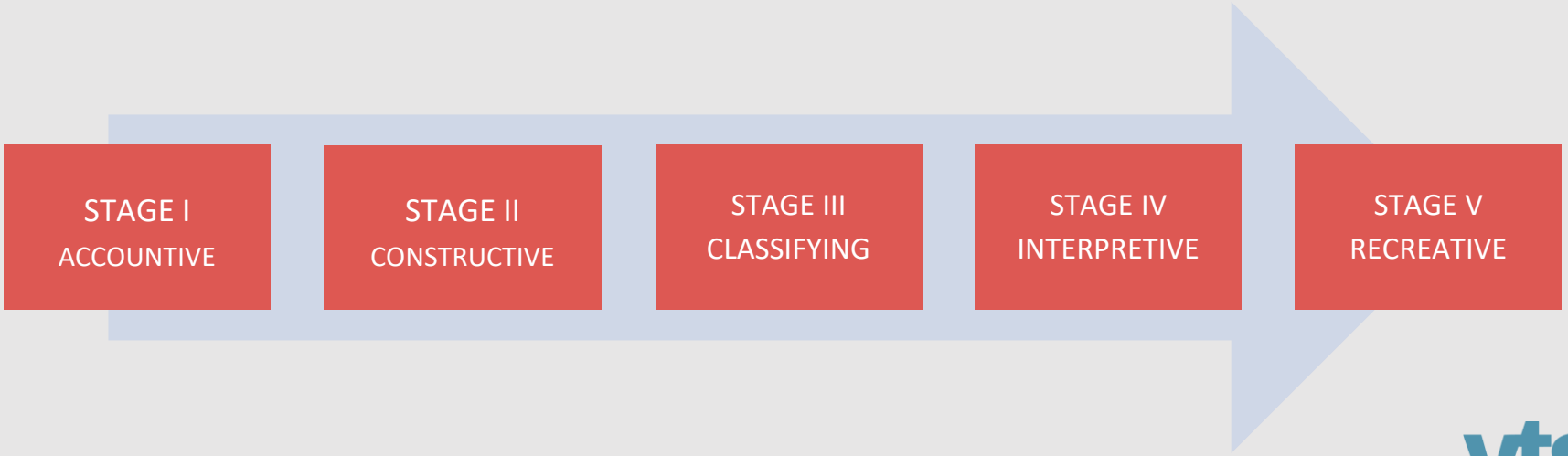
Once Housen could categorize the kinds of comments, she started mapping their development

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The LANDSCAPE

5 STAGES OF DEVELOPMENT:

A map of how visual cognition changes with experience.



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Understanding what we see is not Innate



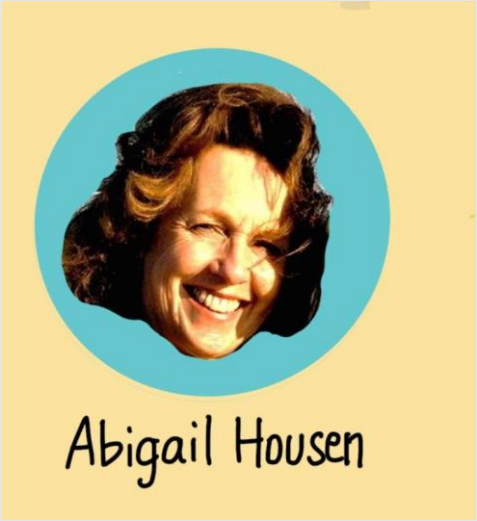
Kirin Young / Mineheart, Blindfold 5 (after Frans Hals Portrait of a Gentleman in White c. 1637) 2019

From Housen's data, it became clear:

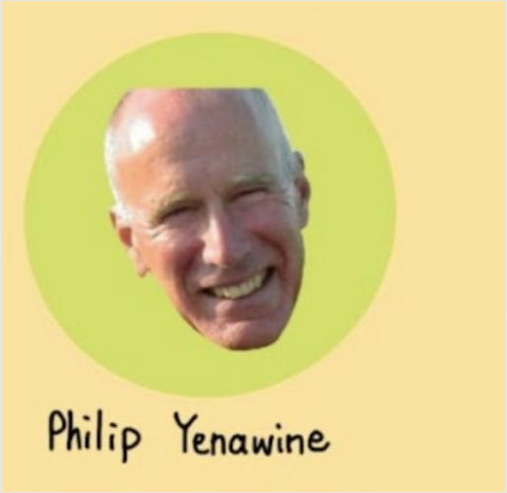
- Viewers have different interests, behavior and entry points.
- Visual understanding doesn't come with eyesight—it depends on **learned cognitive skills that take years to develop.**
- All our daily looking doesn't make us better at understanding.It takes **meaningful practice**–like reading, or soccer, or piano.
- Without that practice, most of us stay beginner viewers for our whole lives.
- Also, looking is ***not just looking.***

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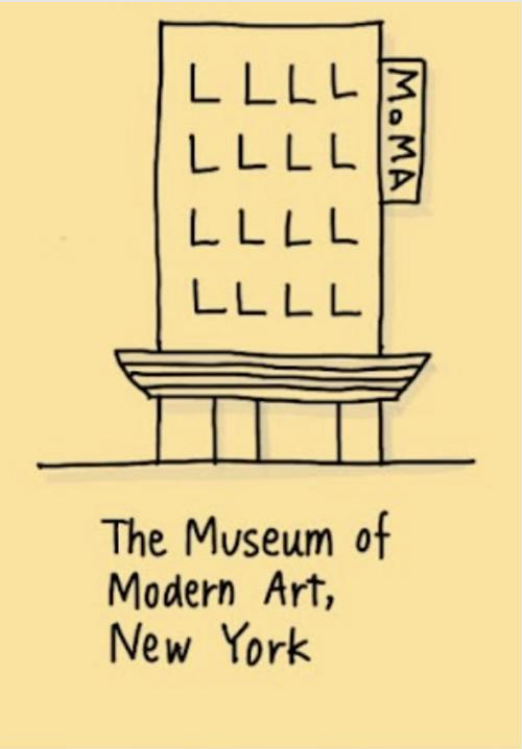
MoMA– shifting from research to practice



In 1988, MoMA hired Housen to assess their school programs.



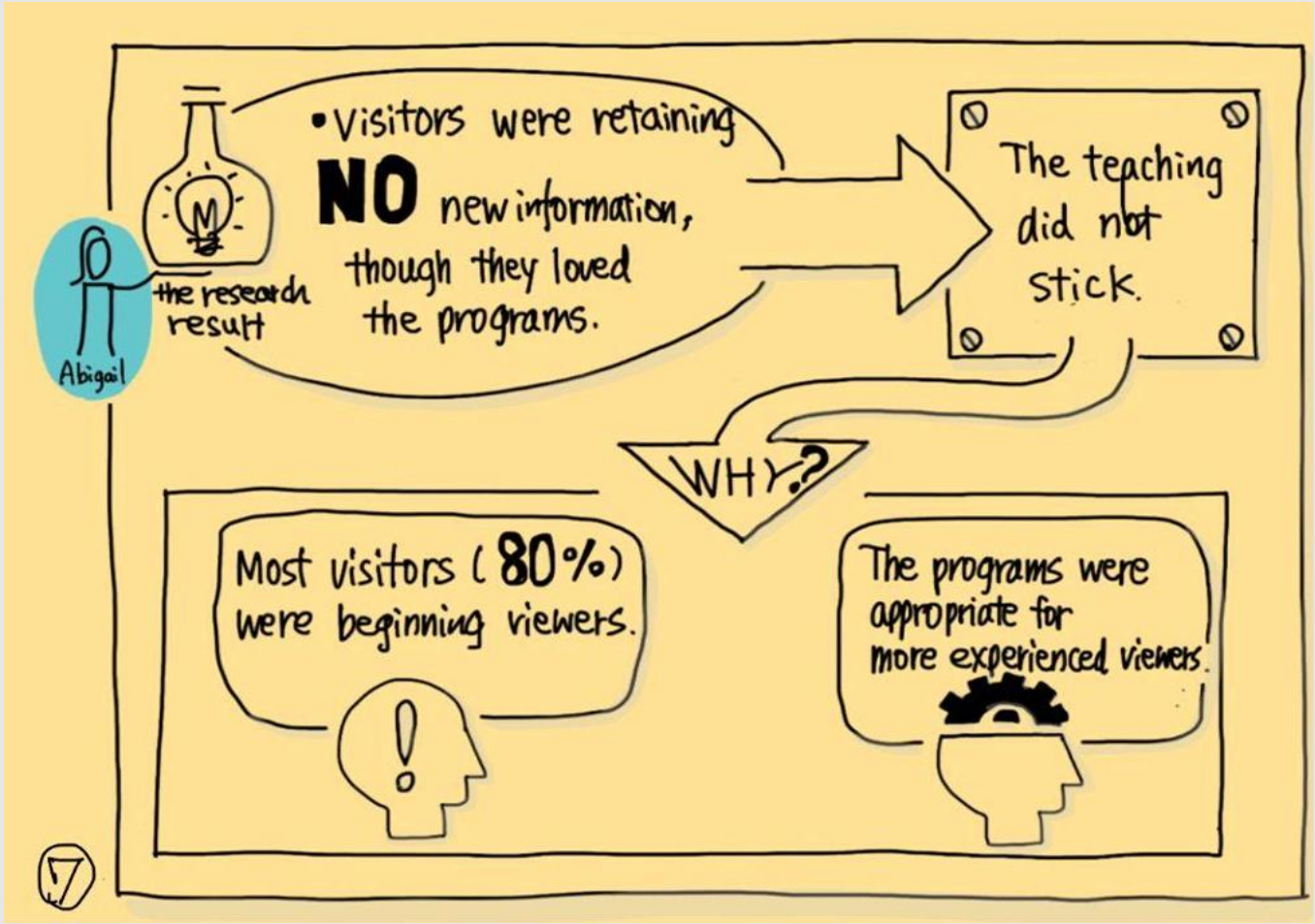
Director of Education, MoMA



The MoMA Board asked, ***"What are people learning?"***

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The answer Housen found in 6 years of studies at MoMA…



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(In 1996 Yenawine quit MoMA to start the nonprofit with Housen that I now run.)

Housen and Yenawine's mission was to create more effective teaching & learning.

VTS is now used to facilitate open discussions all over the world, in museums, boardrooms, K-12 schools, Universities, libraries, offices, medical schools and healthcare settings.

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Humbling Lessons from the MoMA (*that apply now*)



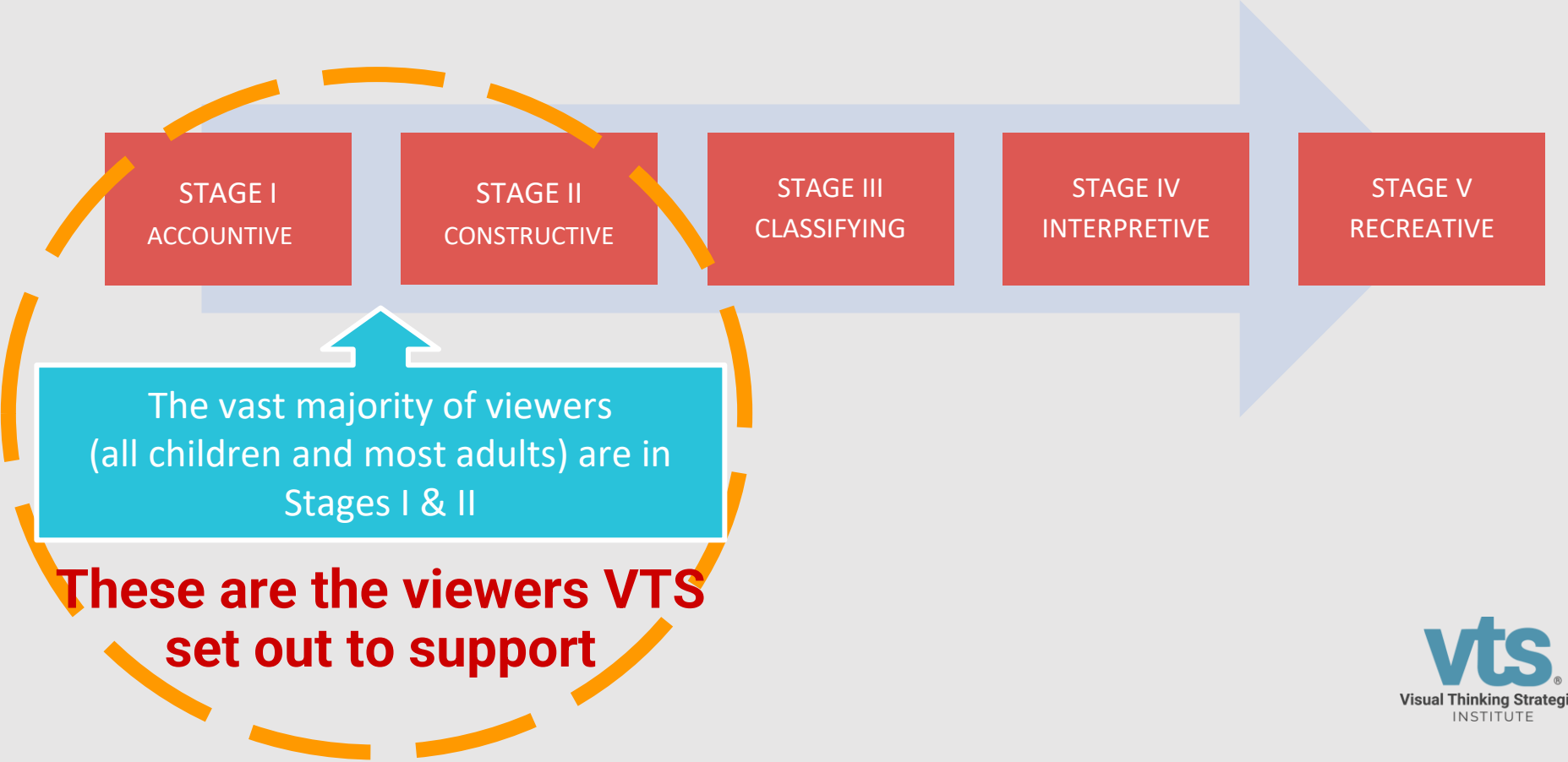
William Merritt Chase, The Mirror, c. 1900, Cincinnati Art Museum

- Experts can't share what they find important and assume it results in learning.
- Learning requires listening very closely to the people in front of us.
- It means creating conditions for discovery.
- It takes **skills many educators were never taught.**

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Who is your audience?

STAGES OF AESTHETIC DEVELOPMENT

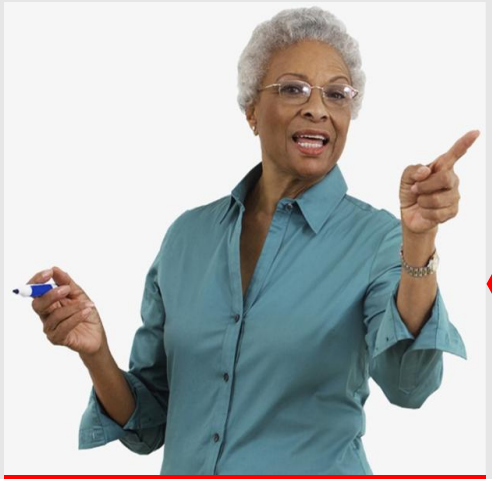


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VTS TRAINING DESIGNED BACKWARDS

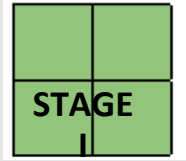
Housen:

1. Identified evidence of learning.
2. Identified the learners.
3. Worked ***backwards*** **to what made learning happen.**

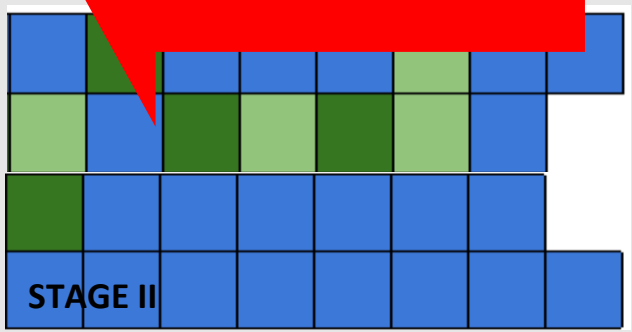


3. Visual Thinking Strategies Methodology

2. What is she doing?



1.Evidence of Learning



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VTS is 3 questions, training, group discussions, and learning by doing.

The environment of VTS

collaborative

participant centered

developmentally appropriate

Non judgemental

full participation

engaging

encourages taking risks

clearly structured

research-based

+

The core elements of VTS facilitation

SILENT MOMENT

Q1 WHAT'S GOING ON IN THIS PICTURE?

Q2 WHAT DO YOU SEE THAT MAKES YOU SAY…?

Q3 WHAT MORE CAN WE FIND?

PARAPHRASE
POINT
THANK YOU

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30+ years of research shows

Participants who engage in VTS discussions over time build skills that transfer across fields, and last over time, in the following areas:

- **Critical Thinking and Evidence-based Reasoning**
- **Writing Proficiency**
- **Observation & Visual Literacy** (including scientific observation, data visualization and medical competency)
- **Social-Emotional Learning**
- **Communication, Collaboration and Curiosity**
- **Higher standardized Test Scores** in Language Arts, and Math.

VTS demonstrates particularly strong outcomes for participants who are disengaged and/or struggling.

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We are visual and social natives.
A group discussion about what we see is not just about seeing.
It is using what we see, hear, know, feel, question, recollect, build and learn — together.



Sulawesi, Indonesia. Dated from at least 67,800 years ago

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Why might VTS be useful in science education?

- starts with your learners/ your specific audience
- offers a next step they can do/real learning
- fosters discovery, inquiry, possibility, multiple perspectives
- practices uncertainty/complexity and difference
- deepens observation, use of evidence
- Inclusive participation, multiple voices, accessible entry points
- Quiet, slowed time to reflect
- group discovery, discussion, and problem-solving together



“Science—and therefore science education—is central to the lives of all Americans. A high-quality science education means that students will develop an in-depth understanding of content **and develop key skills—communication, collaboration, inquiry, problem solving, and flexibility**—that will serve them throughout their educational and professional lives.”



Science and Engineering Practices

SCIENCE EDUCATION WILL INVOLVE LESS:	SCIENCE EDUCATION WILL INVOLVE MORE:
Rote memorization of facts and terminology	Facts and terminology learned as needed while developing explanations and designing solutions supported by evidence-based arguments and reasoning.
Learning of ideas disconnected from questions about phenomena	Systems thinking and modeling to explain phenomena and to give a context for the ideas to be learned
Teachers providing information to the whole class	Students conducting investigations, solving problems, and engaging in discussions with teachers' guidance
Teachers posing questions with only one right answer	Students discussing open-ended questions that focus on the strength of the evidence used to generate claims
Students reading textbooks and answering questions at the end of the chapter	Students reading multiple sources, including science-related magazine and journal articles and web-based resources; students developing summaries of information.
Pre-planned outcome for "cookbook" laboratories or hands-on activities	Multiple investigations driven by students' questions with a range of possible outcomes that collectively lead to a deep understanding of established core scientific ideas
Worksheets	Student writing of journals, reports, posters, and media presentations that explain and argue
Oversimplification of activities for students who are perceived to be less able to do science and engineering	Provision of supports so that all students can engage in sophisticated science and engineering practices

Engaging in argument from evidence

Developing/using models, visual representations

Asking ?'s and Defining Problems

Obtaining, evaluating and communicating information

Analysing and Interpreting Data

The Wild Center VTS

VTS in Science

Animals, objects, exhibits and behavior

Science on a Sphere Climate Data

Teacher / Interpreter Training









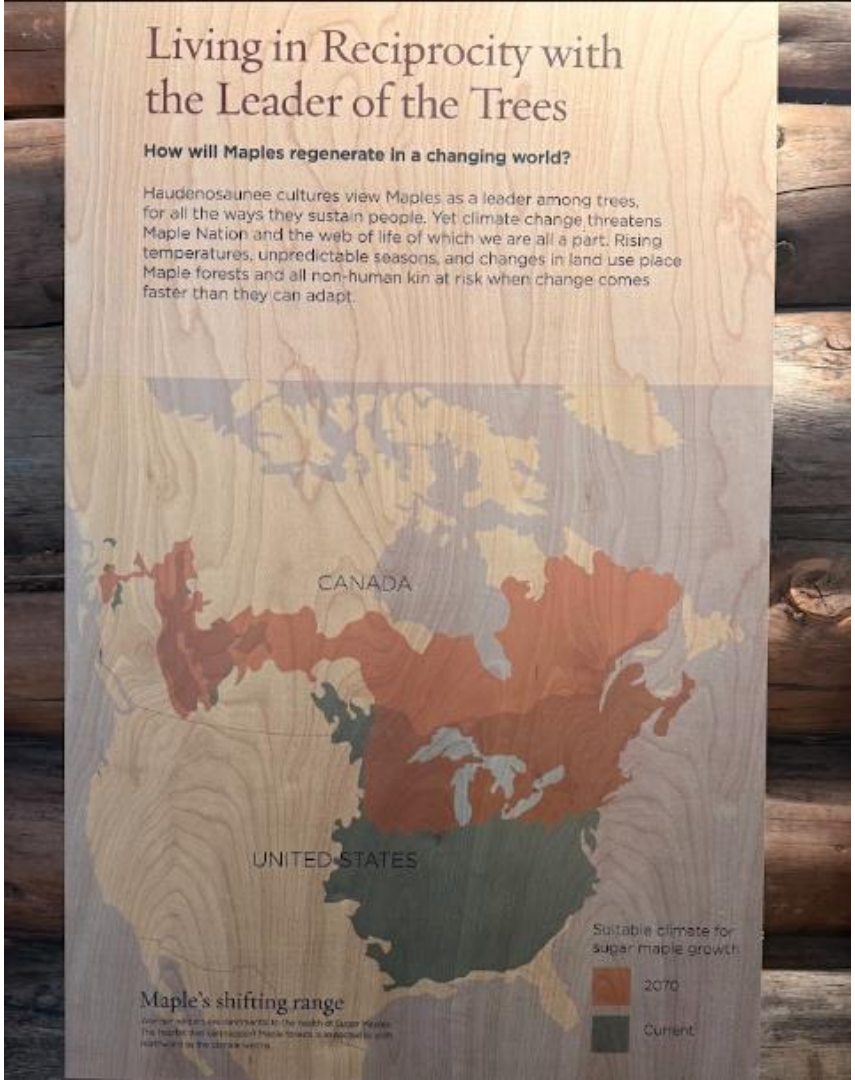
Maple Sugar Time

Patrick DesJarlait Anishinaabe (Ojibwe), 1921 - 1972

1946

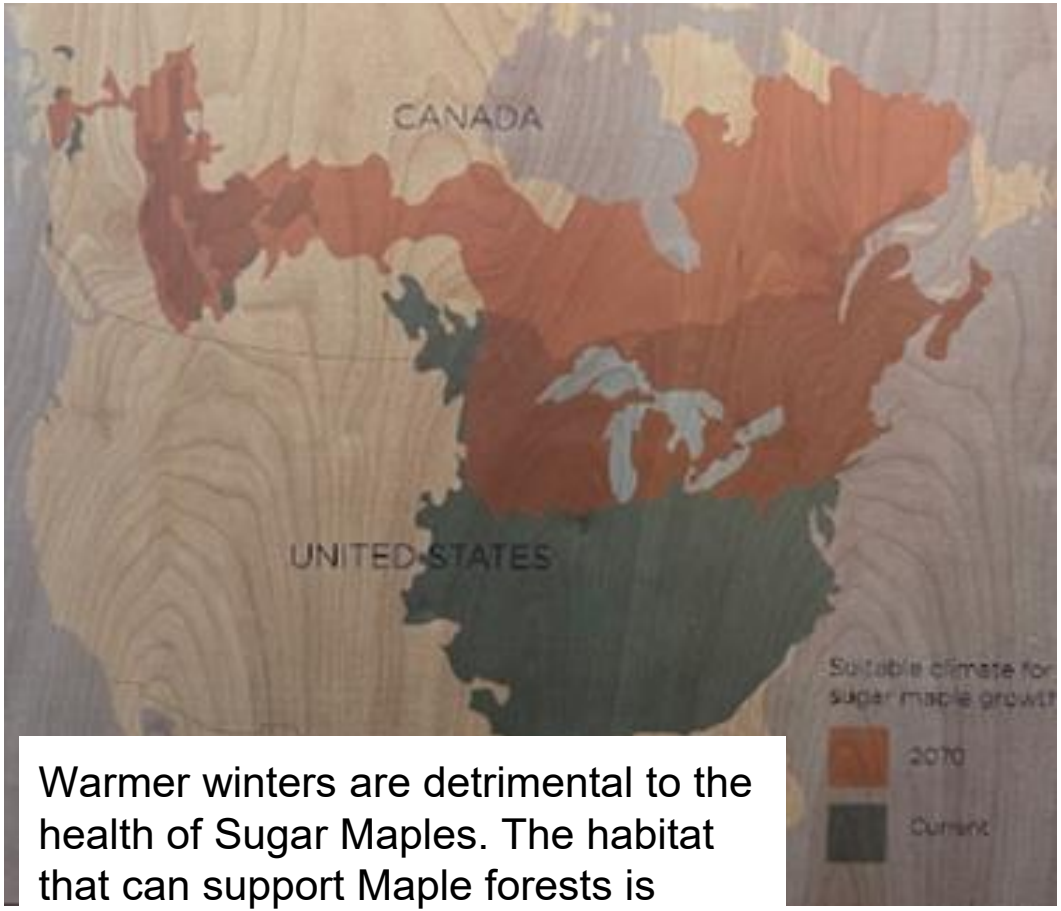
Watercolor on paper




Living in Reciprocity with the Leader of the Trees
How will Maples regenerate in a changing world?
Haudenosaunee cultures view Maples as a leader among trees, for all the ways they sustain people. Yet climate change threatens Maple Nation and the web of life of which we are all a part. Rising temperatures, unpredictable seasons, and changes in land use place Maple forests and all non-human kin at risk when change comes faster than they can adapt.
CANADA
UNITED STATES
Suitable climate for sugar maple growth
2070
Current
Maple's shifting range

Living in Reciprocity with the Leader of the Trees

Haudenosaunee cultures view Maples as a leader among trees, for all the ways they sustain people. Yet climate change threatens Maple Nation and the web of life of which we are all a part. Rising temperatures, unpredictable seasons and changes in land use place Maple forest and all non-human kin at risk when change comes faster than they can adapt.



Warmer winters are detrimental to the health of Sugar Maples. The habitat that can support Maple forests is expected to shift northward as the climate warms.


112
DAF



One of dozens of animals to have escaped amid flooding in the main zoo in Tbilisi, Georgia, a hippopotamus was coaxed away from dangerous waters on Sunday. 2015

“About 60% of the land mass remains on the hillside,” Agulashvili tells me. A lawyer by education, the minister of the environment has become intimately familiar with the geology of the city since the disaster struck. “In heavy rains it could start to move again





The Broad Street Bridge in Moriah collapsed during Tropical Storm Irene in 2011, as Mill Brook below ran wild with flood waters. Anna Mayhood of Mineville narrowly escaped her SUV as it was left dangling on the edge of the abyss.

VTS in Science

Building Insights Through Observation

Core Methodologies

1. Visual Thinking Strategies

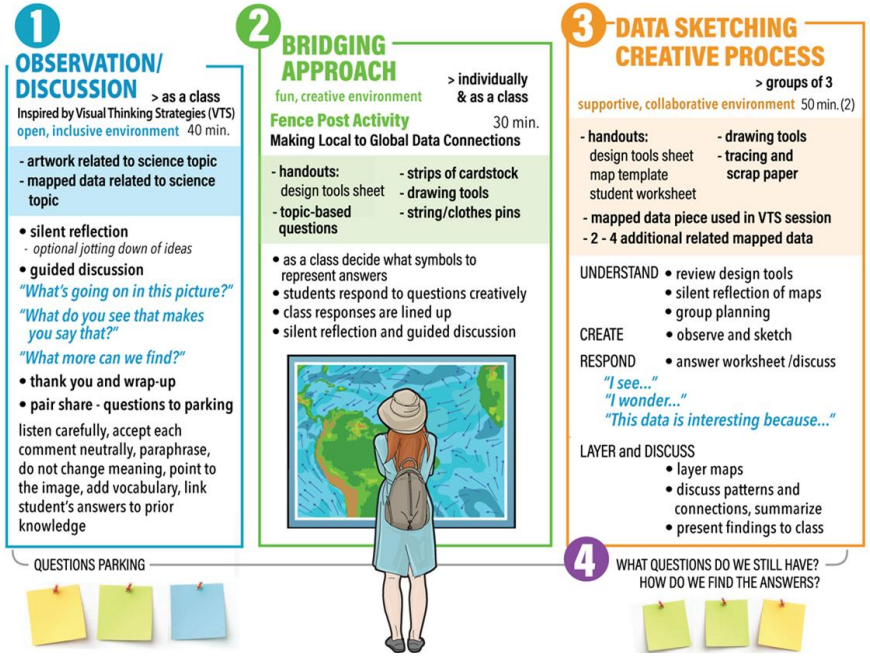
A learner-centered facilitation method designed to spark inclusive, collaborative, and deeply thoughtful group discussions.

2. Design Thinking Process

A solution-based, hands-on approach to solving complex problems built upon 5 iterative stages:

- Empathize
- Define
- Ideate
- Prototype
- Test

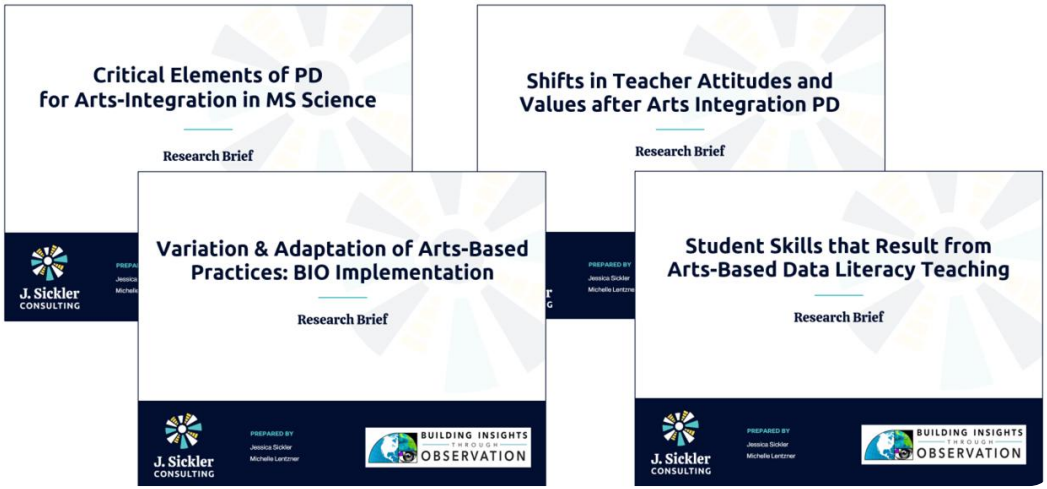
Interactive Workflow & Activity Stages



RESEARCH & RESOURCES

Explore the Project Findings & Toolbox

Research Briefs Summary



CHECK OUT THE TOOLBOX!

Scan the QR code to access research briefs & classroom materials.

Data Sensemaking with Data

and Visual Thinking Strategies (VTS)

Slow, engaging, enlightening observation & discussion creating thoughtful Earth Stewards.



Brought to you by NOAA's Science On a Sphere team at CIRES CEEE/CU Boulder

Data Lens

- Art → global mapped data → scientific literacy
- **Short exercises** on timely relevant topics
- Includes **supplemental reading** exercises and link to topic extension content lessons
- Consistent, predictable format each week
- When practiced regularly can lead to better data literacy.

Scan to Sign Up

Get Data Lens delivered straight to your email ~monthly.

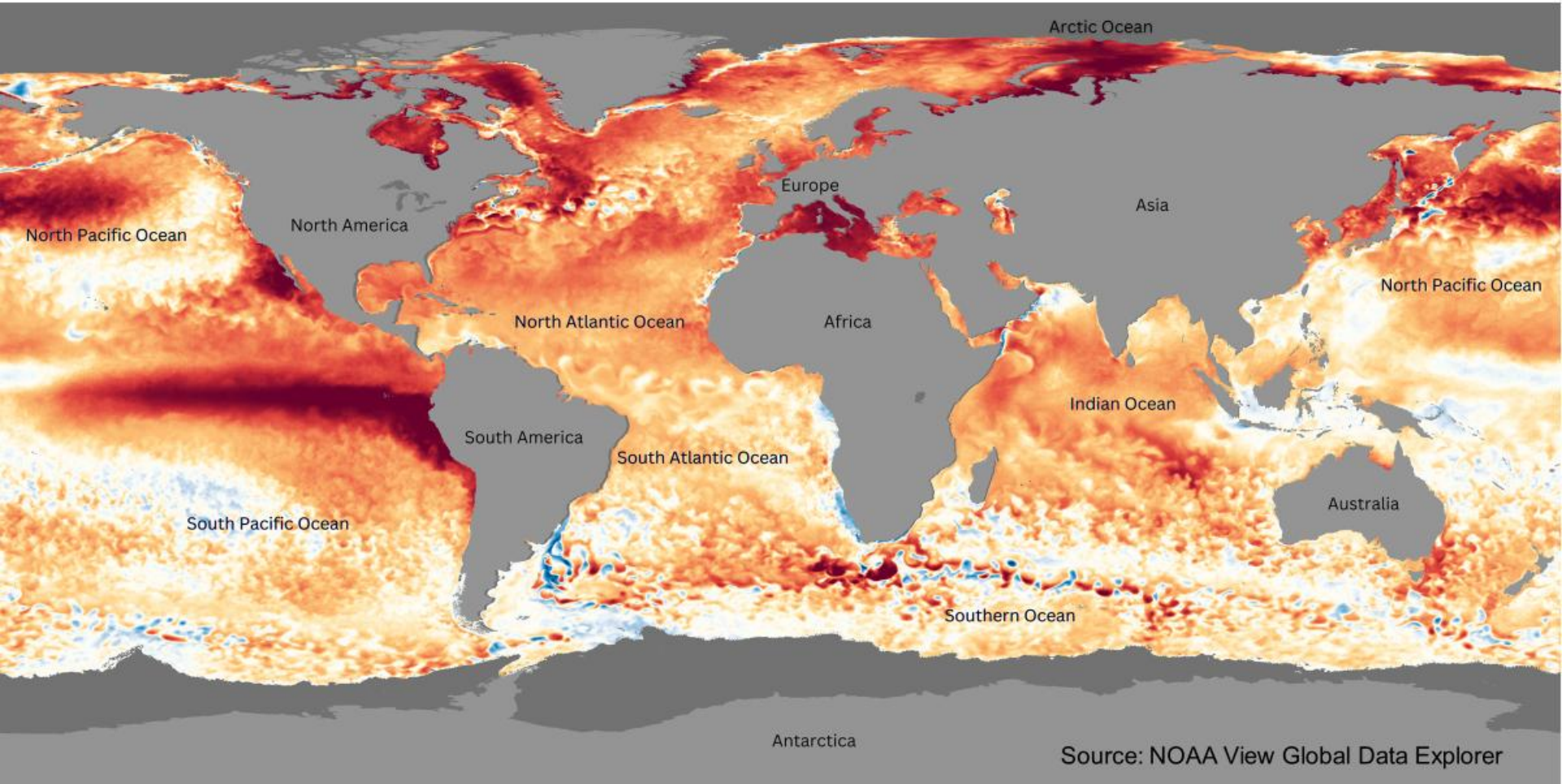
You can unsubscribe anytime!

https://sos.noaa.gov/education/data-lens/

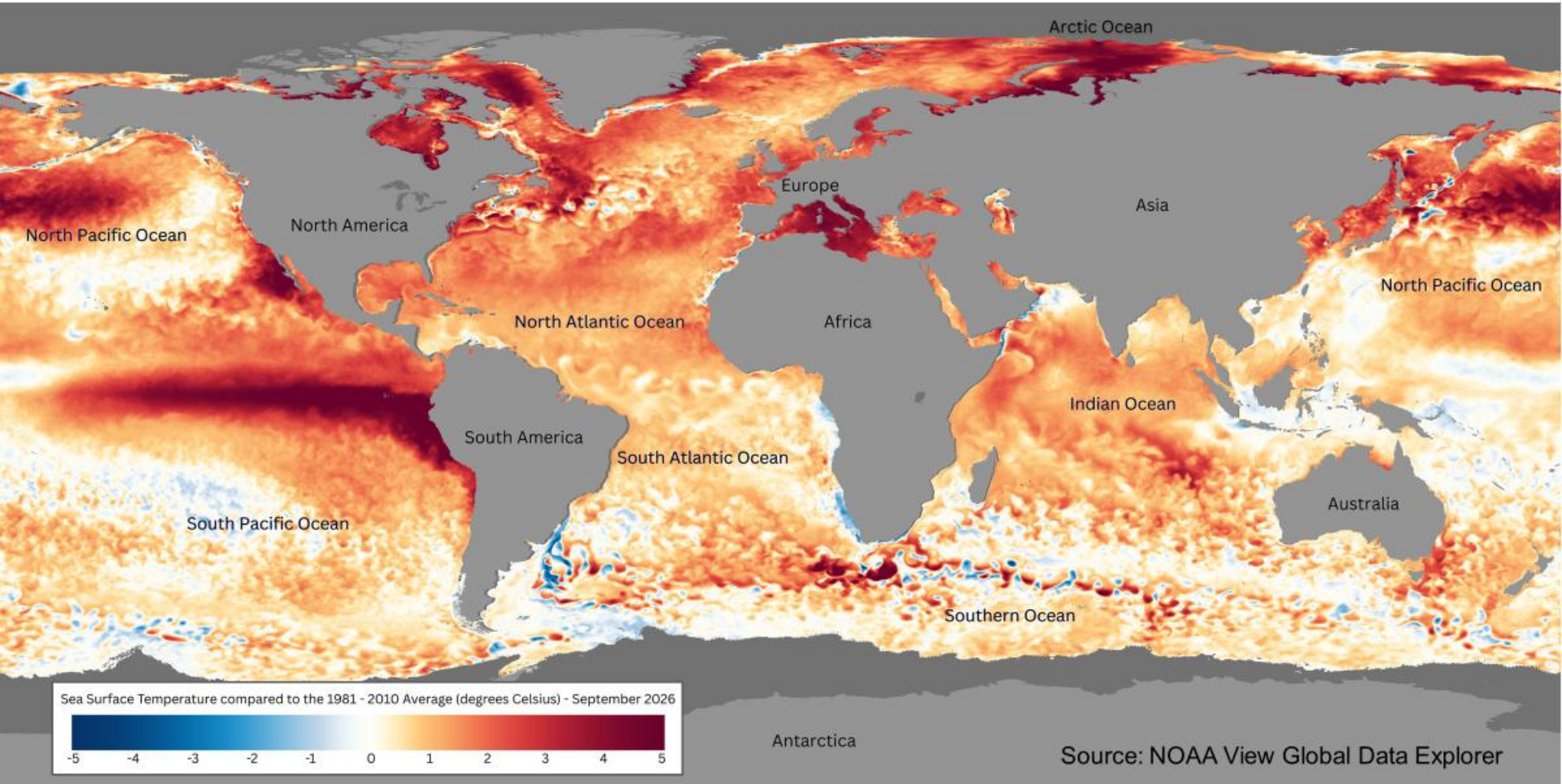


Yuko Shimizu

What's going on in this image?



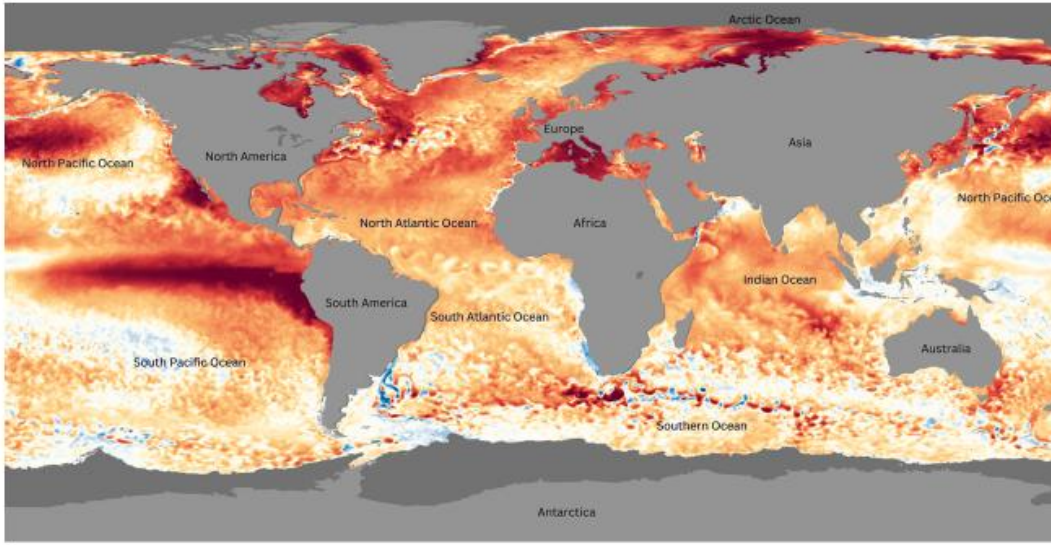
What's going on in this image?



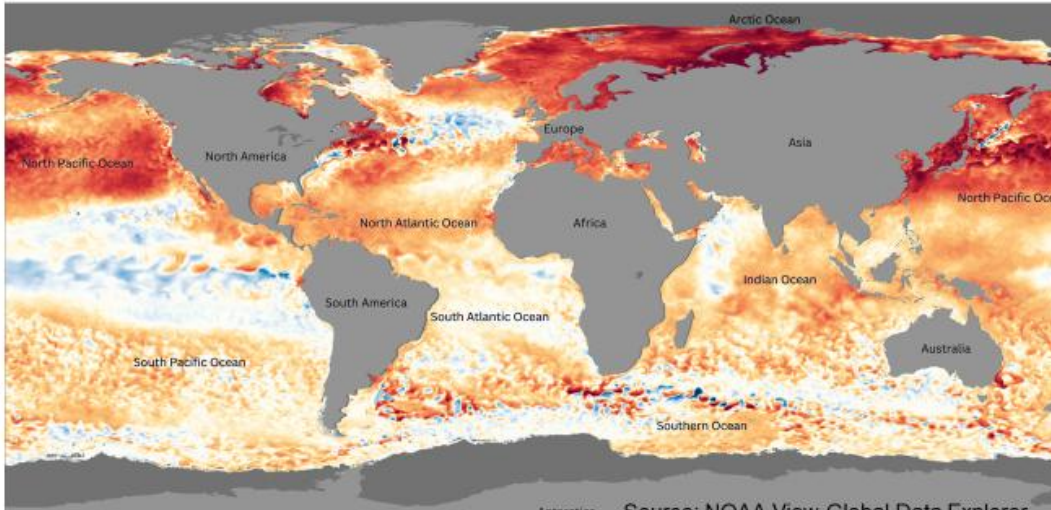
What is different and what is similar about these two different time periods of the same mapped data?

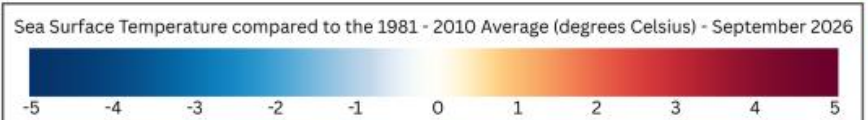
Fill out the Venn diagram with your answers.

Map A:
September 2026



Map B:
September 2025





How in your particular context could you shift to learner-centered approach?

How might you apply this in your institution?
Where does this fit into your climate world?
What moves might you try?

Questions?

WHAT'S GOING ON IN THIS PICTURE? The New York Times SUBSCRIBE FOR $1/WEEK LOG IN

THE LEARNING NETWORK

What's Going On in This Picture?

Intriguing Times images stripped of their captions — and an invitation to students to discuss them live.



SAUMYA KHANDELWAL FOR THE NEW YORK TIMES

What's Going On in This Picture? | Oct. 16, 2023

Look closely at this image, stripped of its caption, and join the moderated conversation about what you and other students see.

October 8, 2023 · By THE LEARNING NETWORK

40 More Intriguing Photos to Make Students Think



A new slide show of some of our favorite "What's Going On in This Picture?" posts, culled from the last four years of images.

October 1, 2020 · By THE LEARNING NETWORK

How to Teach With 'What's Going On in This Picture?'



Want to use intriguing photographs to help students practice visual thinking and close reading skills? This guide can help you get started.

September 27, 2022 · By THE LEARNING NETWORK

Introduction to 'What's Going On in This Picture?'

Want to learn more about this popular student activity? Watch this short introduction video and start using this multimedia feature in your classroom.

July 28, 2021 · By THE LEARNING NETWORK

New York Times Learning Network

Join us Mondays for live, moderated text-based image discussions

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Resources and contact

- New York TImes - The Learning Network
- VTS Look Club Online - www.vtshome.org
- Tara Geer, Director, Visual Thinking Strategies Institute tgeer@VTShome.org
- Kerri Ziemann, The Wild Center kziemann@wildcenter.org
- Hilary Peddicord, Education Lead, NOAA's Science On a Sphere, CIRES, hilary.peddicord@noaa.gov



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