High-Adventure Science

Free, online, simulation-based curricula

Amy Pallant
apallant@concord.org

Amy Pallant - Principal Investigator; Concord Consortium

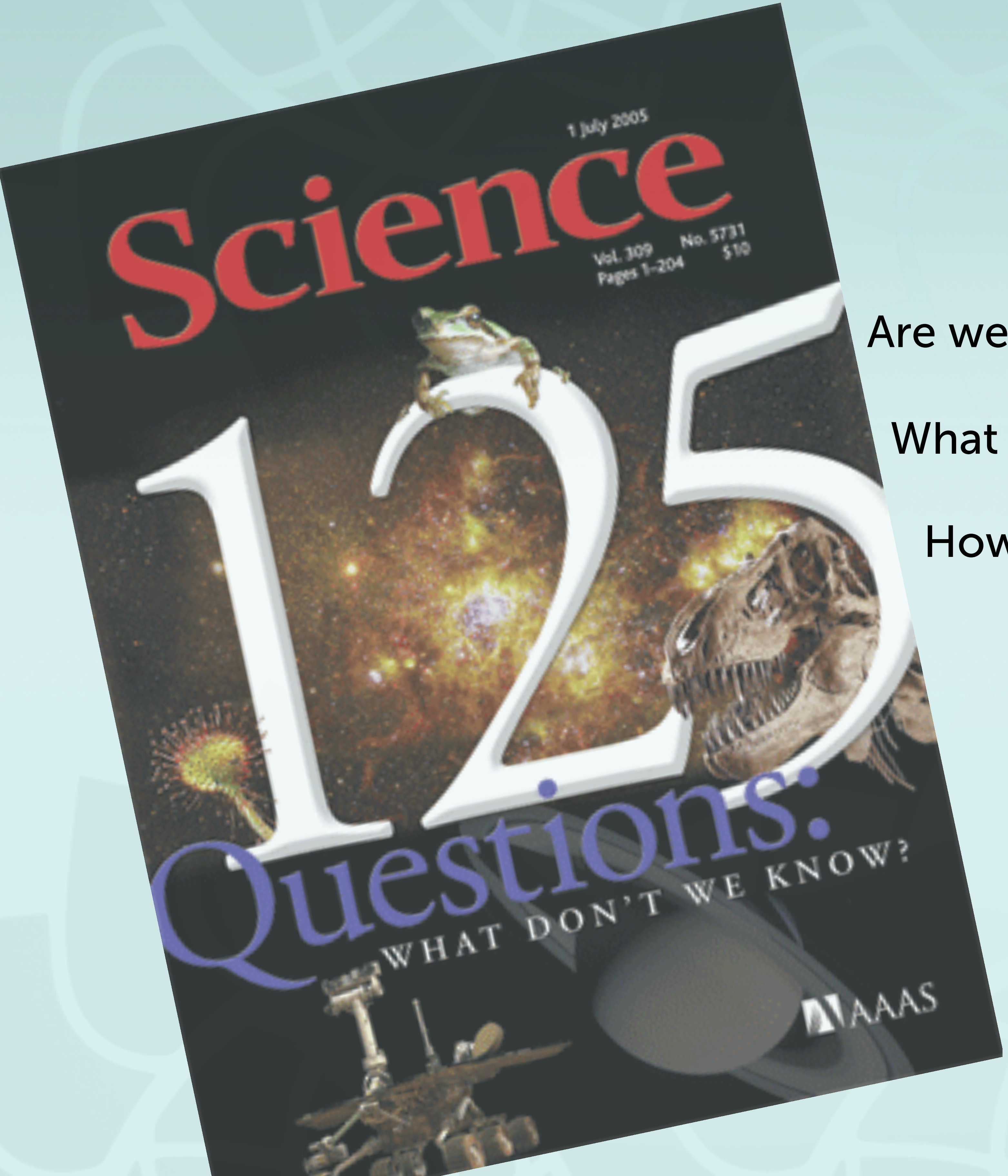
Hee-Sun Lee- co-PI; Concord Consortium

Elaine Larson- co-PI; National Geographic Society

Sarah Pryputniewicz- Curriculum Developer; Concord Consortium

Very few see science as the high adventure it really is, the wildest of all explorations ever taken by human beings, the change to catch close views of things never seen before, the shrewdest maneuver for discovering how the world works. Instead, they become baffled early on, and they are misled into thinking that bafflement is simply the result of not having learned all the facts. —*Lewis Thomas*

Our Inspiration



Are we alone in the universe?

What can replace cheap oil? When?

How hot will the greenhouse world be?

Can we excite students?

Can we leverage the unknown in education?

Curriculum Design Principles

Use open-ended, authentic frontier science topics to frame the modules.

Acquaint students with real-world scientific data.

Use model-based experimentation as a means for students to acquire content.

Engage students in system dynamics reasoning.

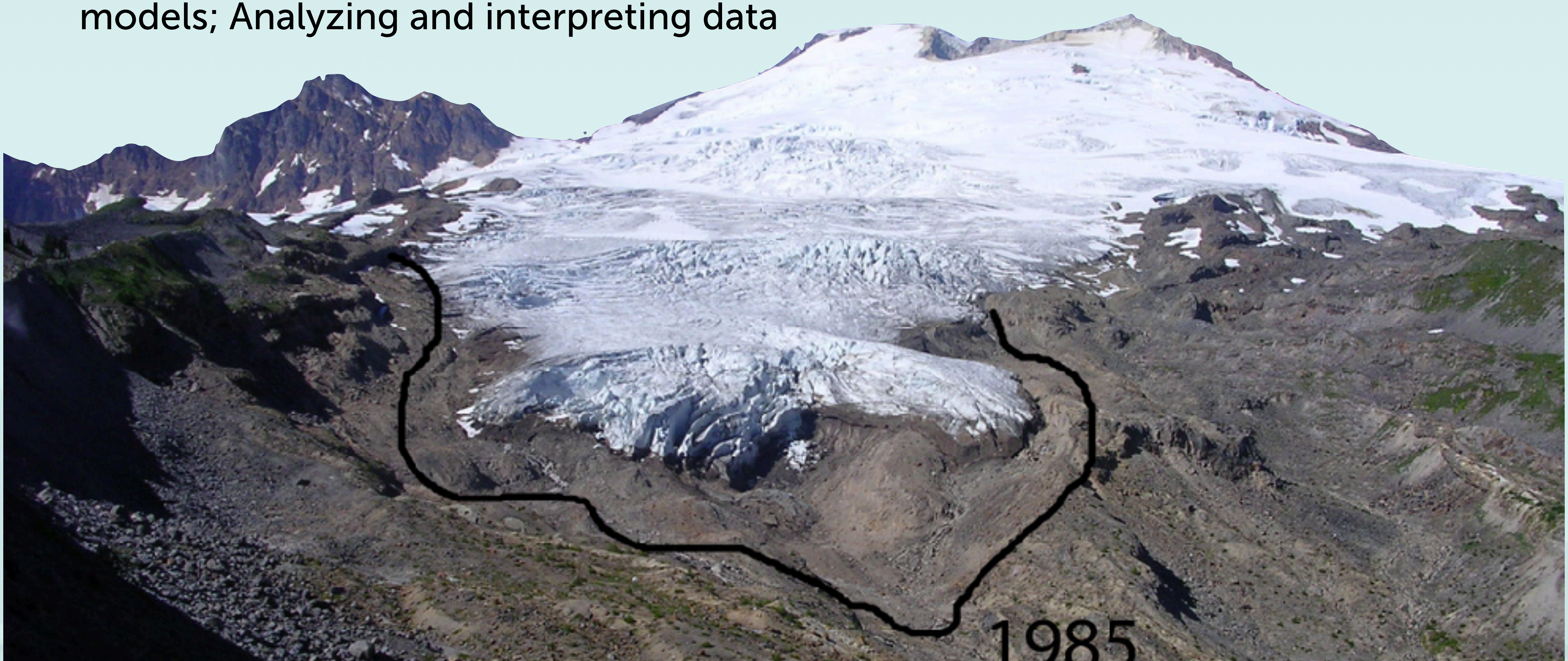
Support evidence-based scientific argumentation.

Alignment to NGSS

Core Ideas: Earth Materials and Systems; The roles of water in Earth's surface processes; Weather and climate, Natural hazards, Human impacts on Earth systems, Global climate change, The universe and its stars

Crosscutting concepts: Cause and effect; Systems and system models

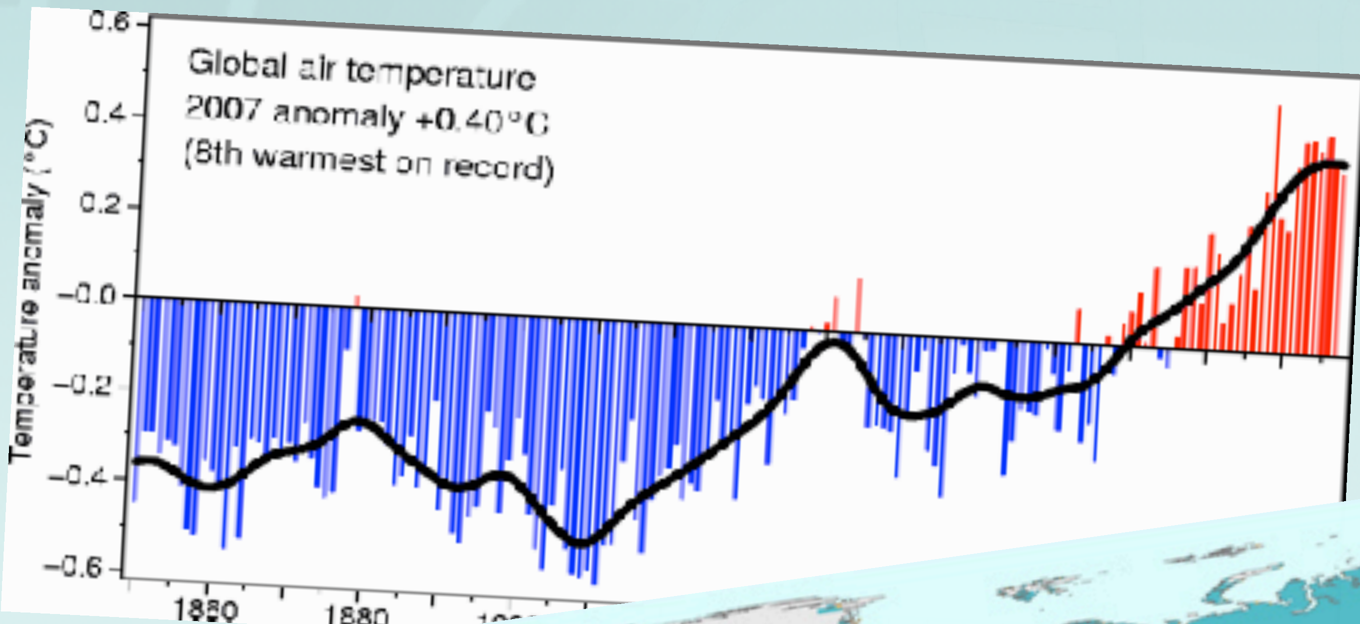
Science practices: Engaging in argument from evidence; Developing and using models; Analyzing and interpreting data

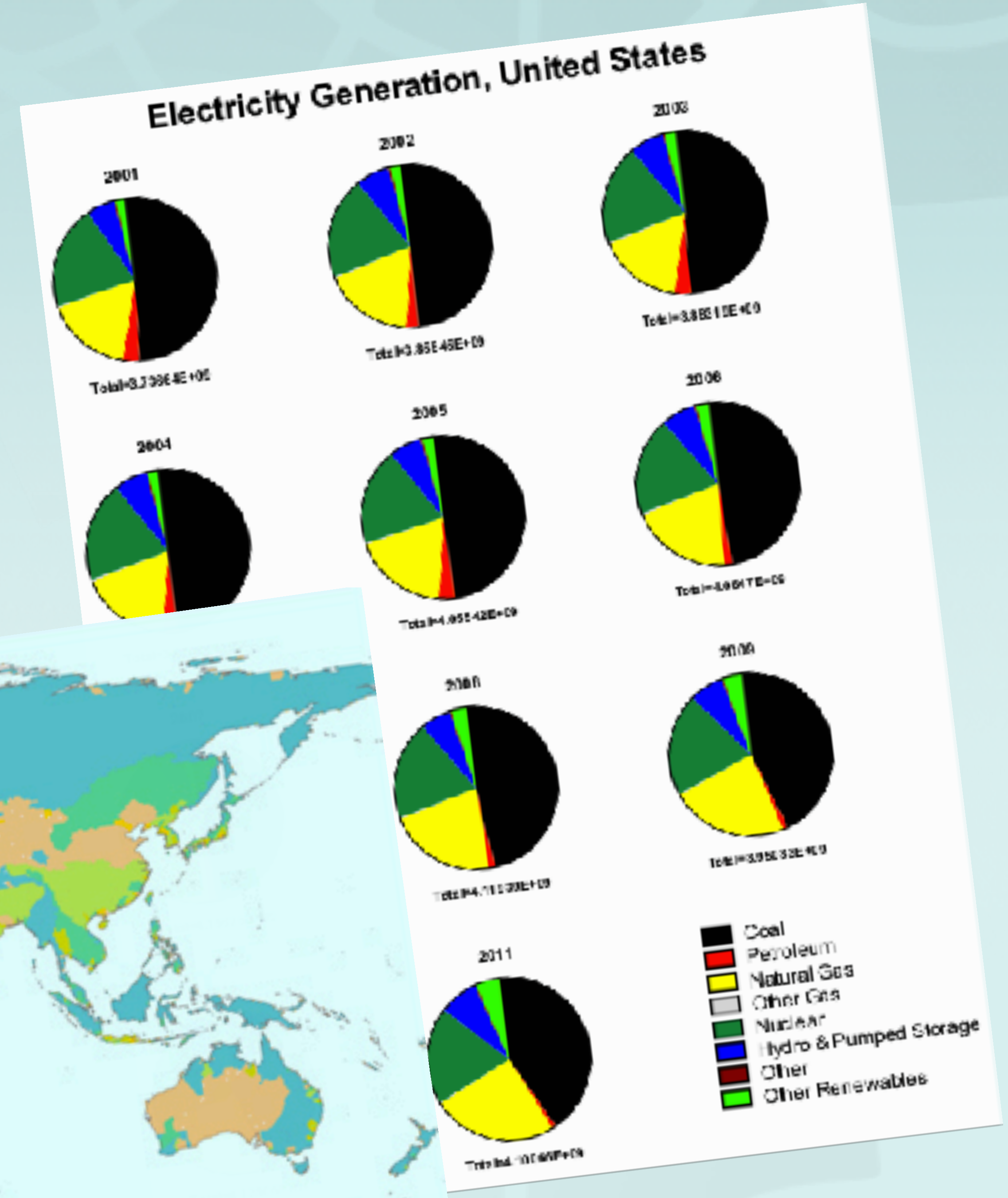


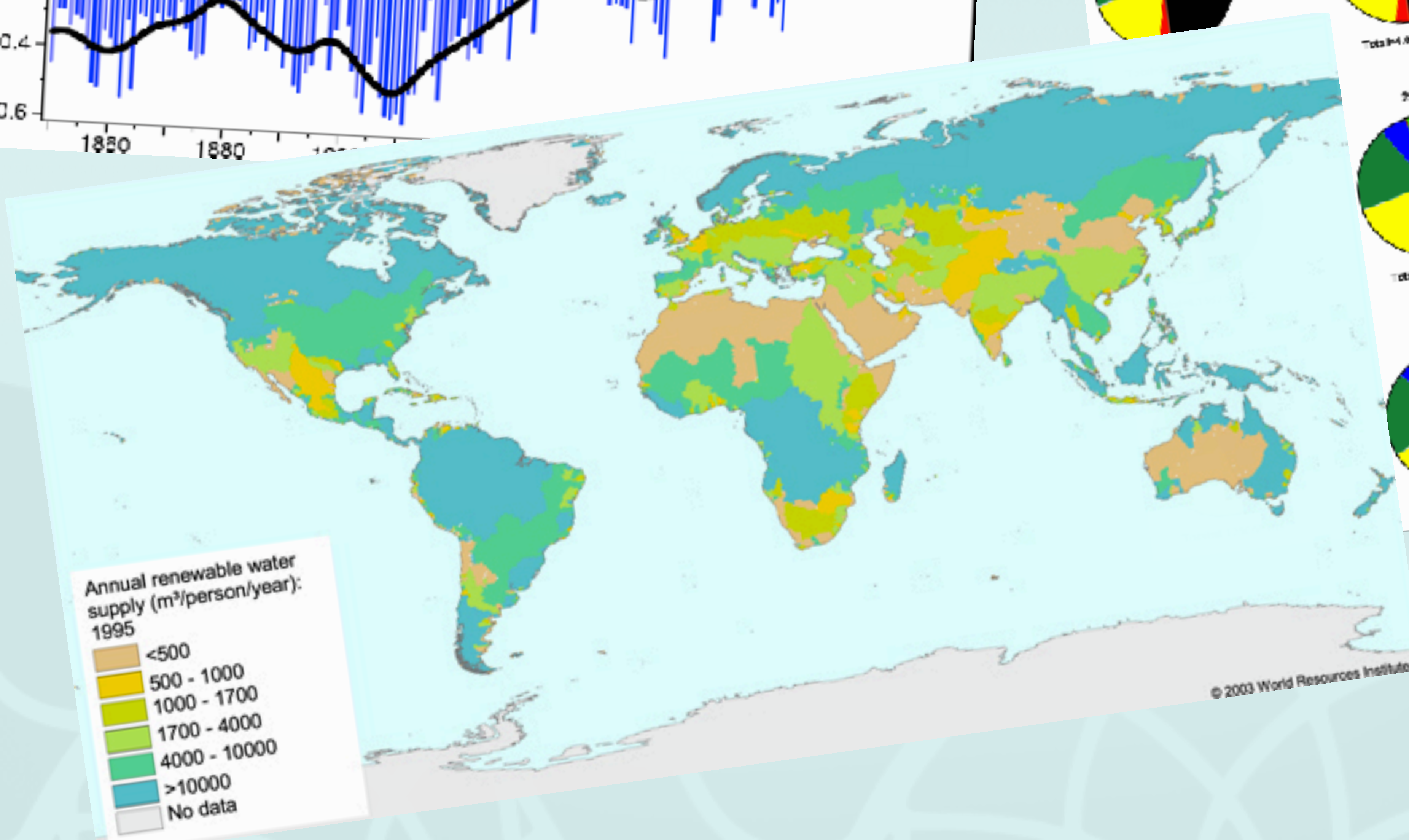
Six Online Modules

Will there be enough fresh water?
Is there life in outer space?
Will the air be clean enough to breathe?
What is the future of Earth's climate?
Can we feed the growing population?
What are our energy choices?

Acquaint students with real-world scientific data





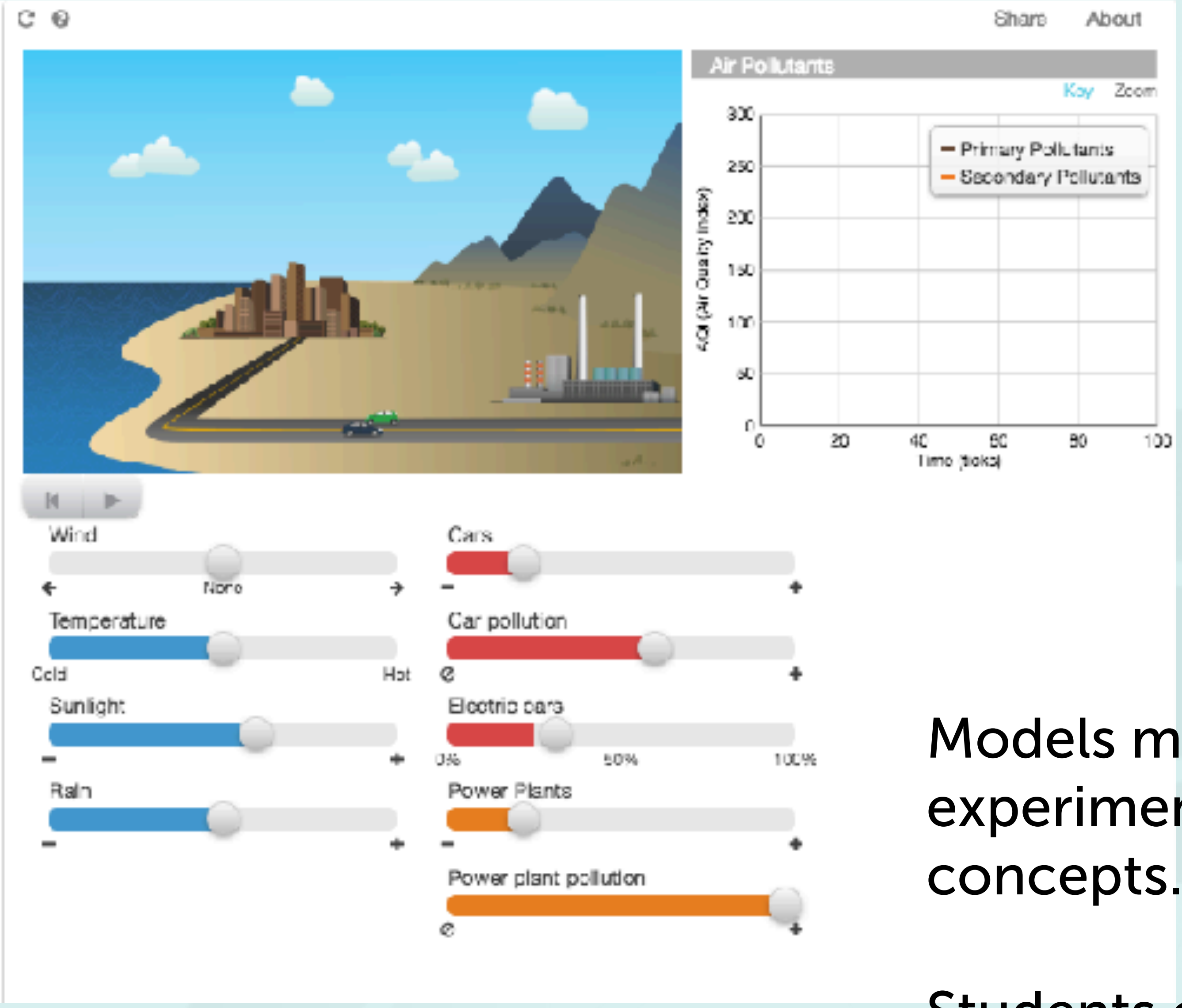


Use model-based experimentation as a means for students to acquire content.

Provide ways of understanding the mechanisms and physical processes that shape Earth’s surface.

Help gain insights about the causal mechanisms responsible for changes because the behavior of these models emerge from properties built into them.

High-Adventure Science Models



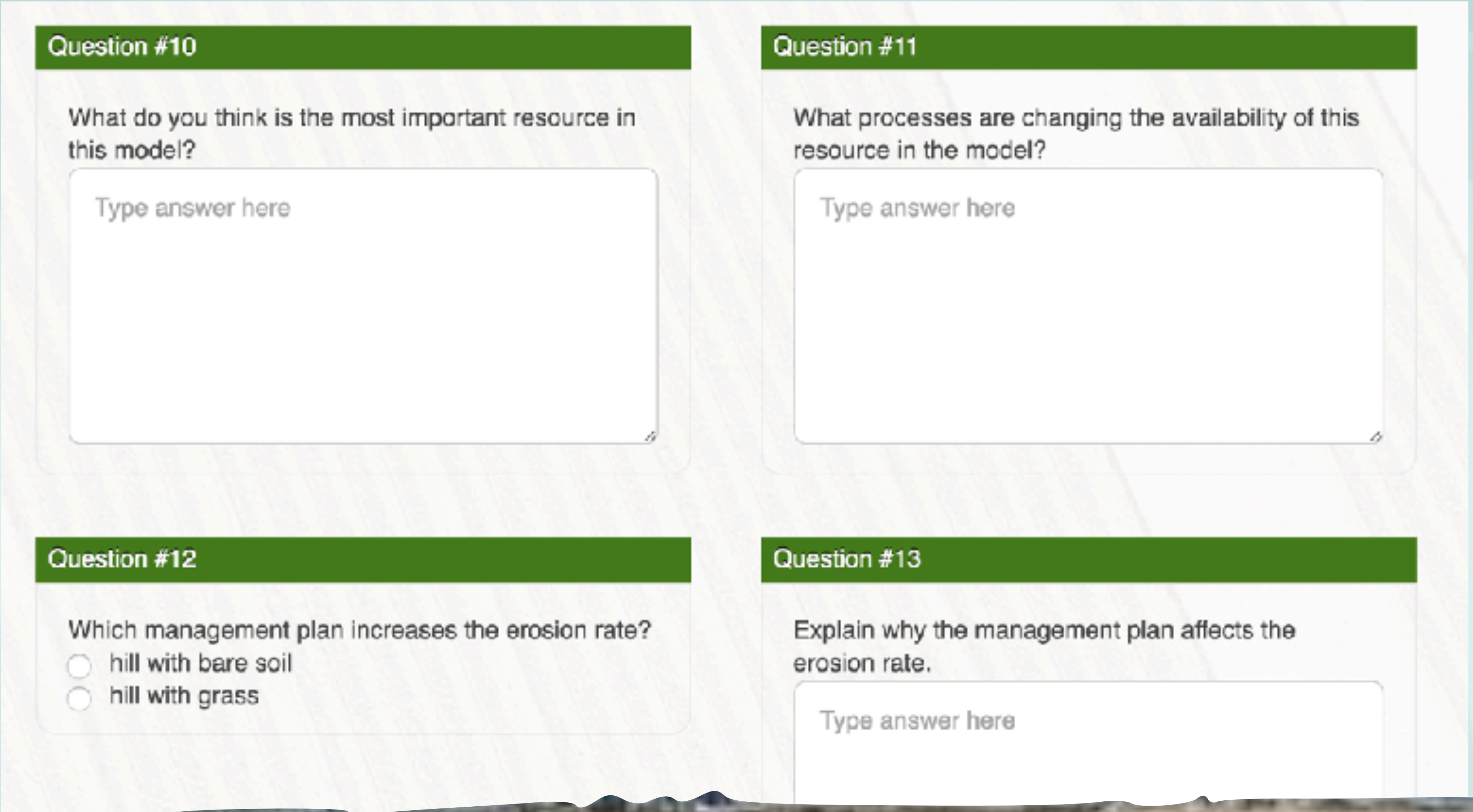
Models make it possible for students to experiment with otherwise inaccessible concepts.

Students can gain insight into causal mechanisms.

Students can explore emergent phenomena.

Students can use their experimentation with the models as evidence for understanding the real world.

Engage students in system dynamics thinking



Question #10

What do you think is the most important resource in this model?

Type answer here

Question #11

What processes are changing the availability of this resource in the model?

Type answer here

Question #12

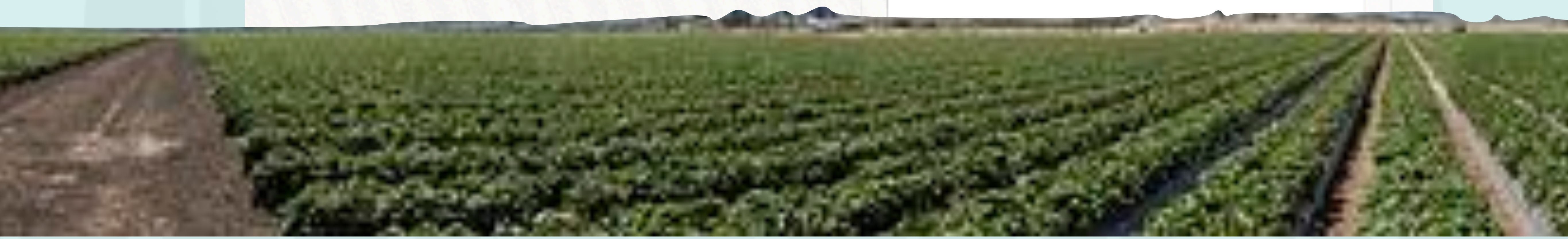
Which management plan increases the erosion rate?

- ◯ hill with bare soil
- ◯ hill with grass

Question #13

Explain why the management plan affects the erosion rate.

Type answer here



Support evidence-based scientific argumentation.

Scientific argumentation in educational settings has focused on the reasoning necessary to coordinate evidence with scientific knowledge.

However, critical reasoning that embodies uncertainties—expressed to reflect the argument's strength—has largely been neglected.

Introducing uncertainty

Uncertainty is a great tool for teaching about the nature of science

Question #28

Which type of aquifer could potentially provide a sustainable source of water (a water source that will not run out and will consistently supply usable amounts of water)?

- confined aquifer
- unconfined aquifer

Question #29

Explain your answer.

Type answer here

Question #30

How certain are you about your claim based on your explanation?

Pick one

Question #31

Explain what influenced your certainty rating.

Type answer here

Research

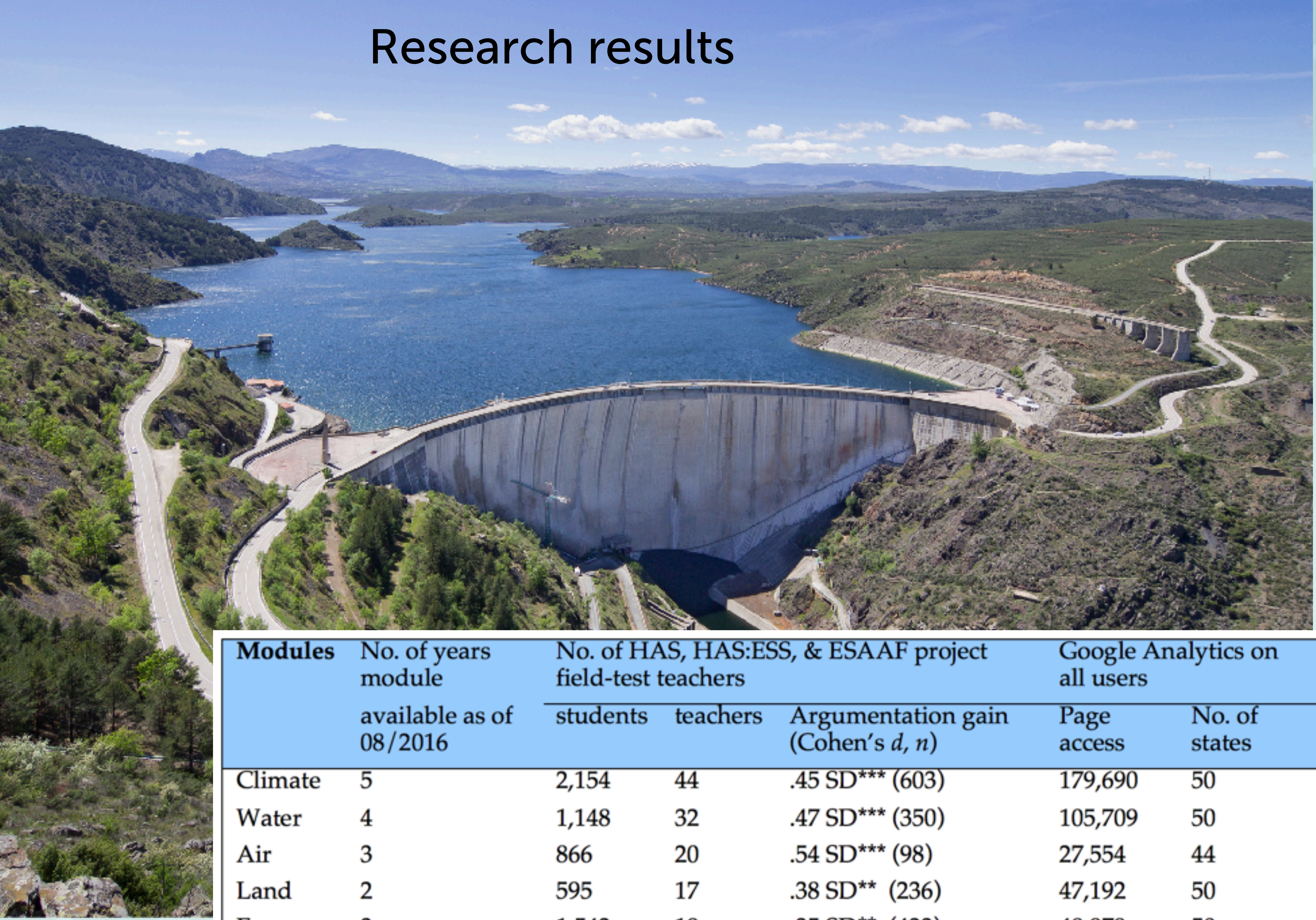
We conducted research in the classrooms of 53 field test teachers with over 4,500 students.

We defined a scientific argumentation construct and validated that this can measure students ability to engage in uncertainty-infused argumentation.

We found students used models and model-based data as evidence when constructing an argument, and more frequently relied on personal evaluation of personal knowledge when evaluating evidence.

We found that exposing students to Earth systems models and embedded prompts helped students identify important resources and explain the processes changing the availability of the resources.

Research results



Modules	No. of years module available as of 08/2016	No. of HAS, HAS:ESS, & ESAAF project field-test teachers			Google Analytics on all users	
		students	teachers	Argumentation gain (Cohen's *d*, *n*)	Page access	No. of states
Climate	5	2,154	44	.45 SD*** (603)	179,690	50
Water	4	1,148	32	.47 SD*** (350)	105,709	50
Air	3	866	20	.54 SD*** (98)	27,554	44
Land	2	595	17	.38 SD** (236)	47,192	50
Energy	3	1,543	19	.35 SD** (433)	48,979	50
Total	-	6,306	132		409,124	50

has.concord.org

High-Adventure Science

Lessons Interactives About Partners Contact

The Concord Consortium

High-Adventure Science

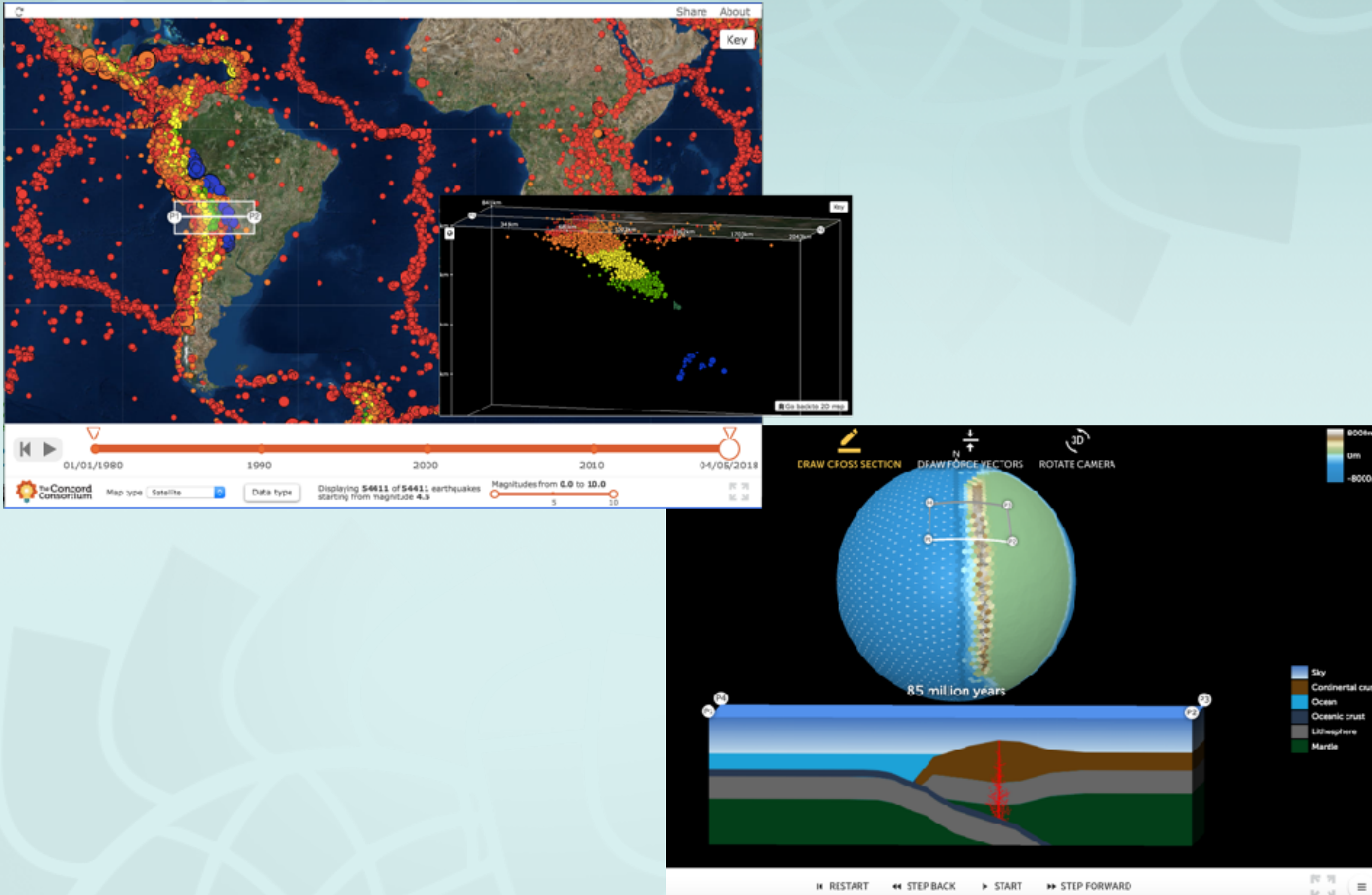
Exploring Evidence, Models and Uncertainty Related to Questions Facing Scientists Today

High-Adventure Science brings several of the big unanswered questions in Earth and space science — think climate change, the availability of freshwater, land management and more — to middle and high school science classrooms.

Each module includes interactive computer-based systems models and real-world data on unanswered questions scientists are facing today. Students explore evidence and discuss the issues of certainty — and uncertainty — with the models and data.

Scroll for more

GEODE
Geologic models for Exploration of Dynamic Earth



Other important links:

Register to use High-Adventure Science modules:
https://learn.concord.org/has

National Geographic materials:
https://www.nationalgeographic.org/education/high-adventure-science/

Learn more about our research results:
https://concord.org/our-work/publications/amy-pallant/

Geode:
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Amy Pallant
apallant@concord.org

Questions?