



May 1st, 1:30 PM - 3:00 PM

Ocean acidification and changing science standards: a prime opportunity to promote large scale behavioral change.

Paul Williams

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<https://cedar.wvu.edu/ssec/2014ssec/Day2/175>

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Ocean acidification education and changing science standards: an opportunity to promote large scale behavioral change

Paul Williams
Alexis Valauri-Orton
Caitlin Roberts
Meg Chadsey



The Suquamish Tribe

Identify the problem

Suggest a direction

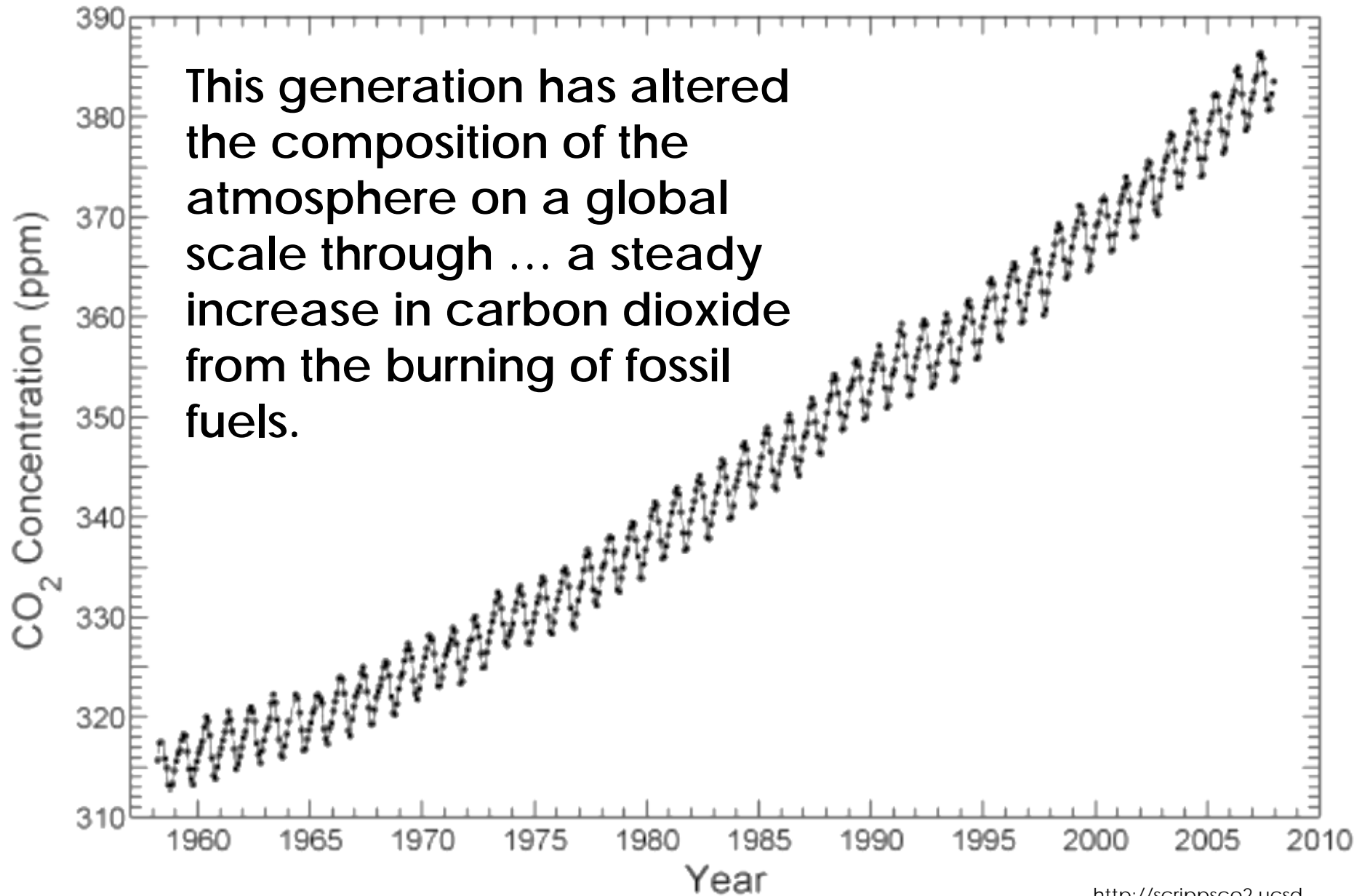
Why act now

What we are doing

What you can do

Mauna Loa Record

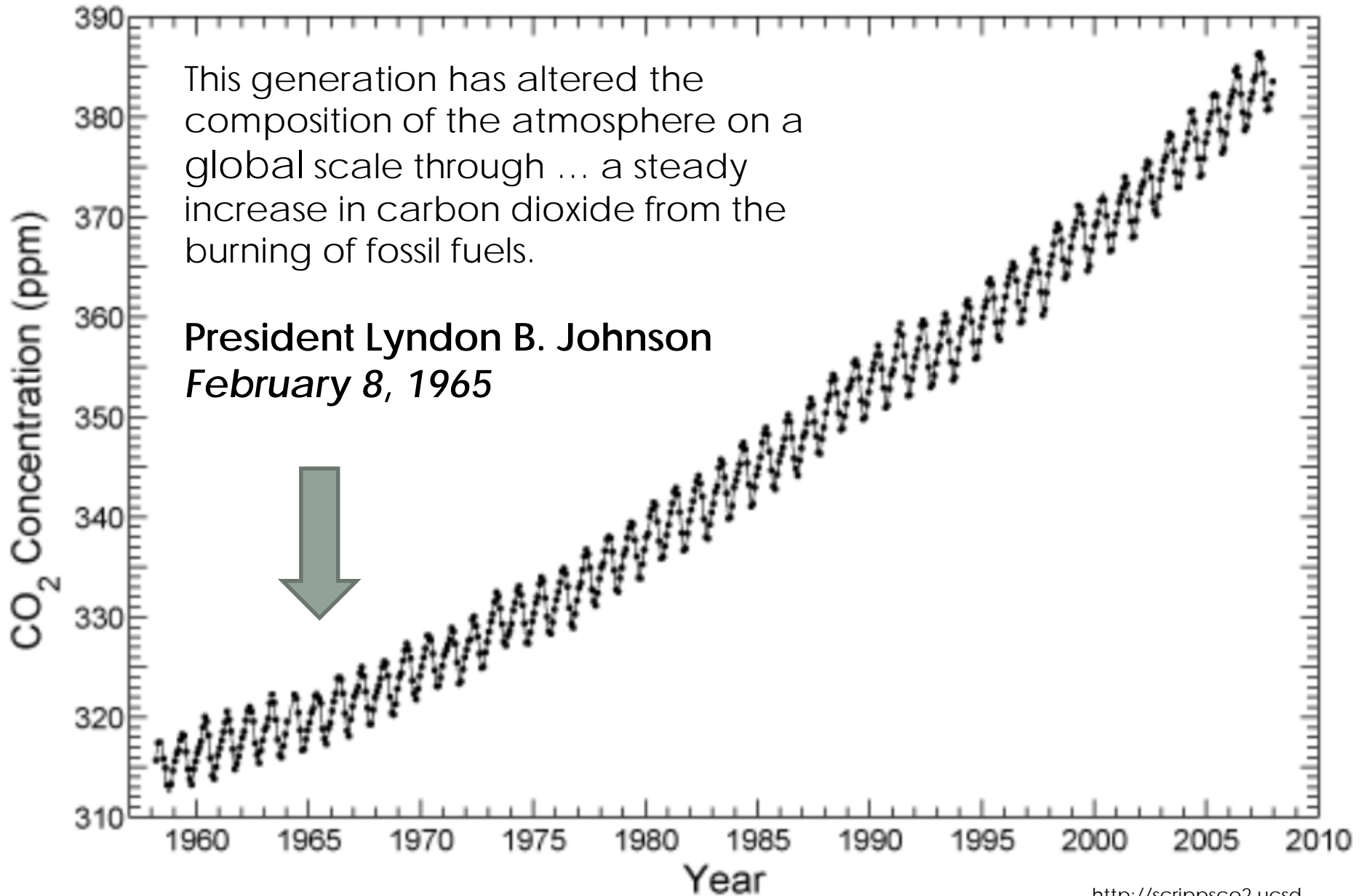
This generation has altered the composition of the atmosphere on a global scale through ... a steady increase in carbon dioxide from the burning of fossil fuels.



Mauna Loa Record

This generation has altered the composition of the atmosphere on a global scale through ... a steady increase in carbon dioxide from the burning of fossil fuels.

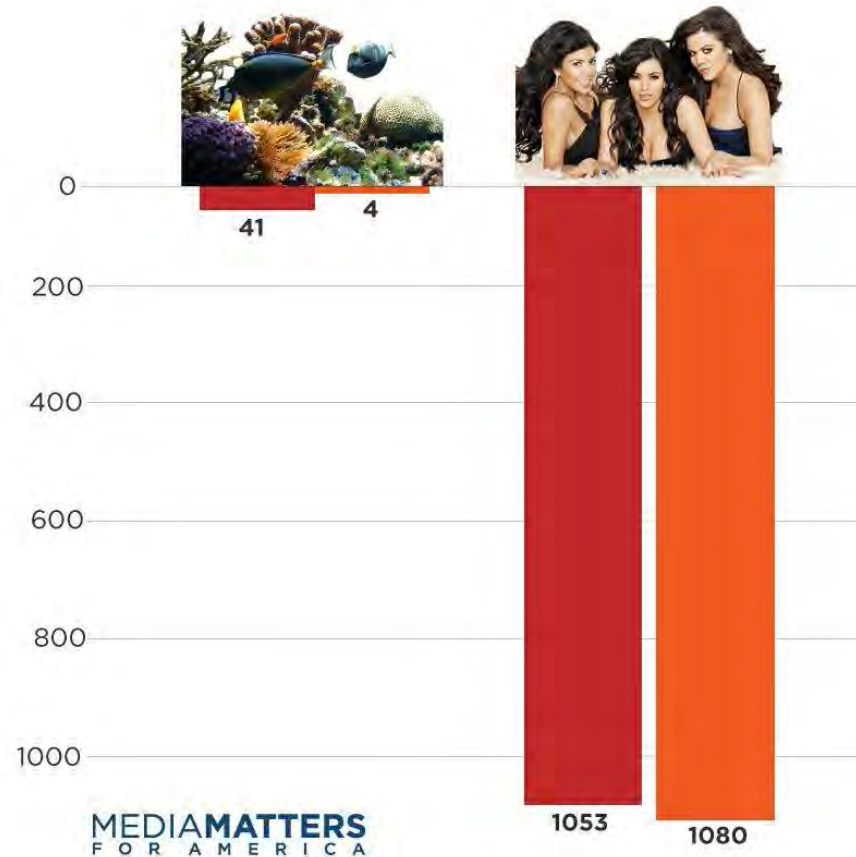
President Lyndon B. Johnson
February 8, 1965



THE KARDASHIANS VS. OCEAN ACIDIFICATION

News Coverage Between Jan. 1, 2011 - June 26, 2012

■ NEWSPAPERS ■ TELEVISION



Newspapers: New York Times, Washington Post, Associated Press, Wall Street Journal, Los Angeles Times, USA Today. TV Channels: MSNBC, CNN, Fox News, ABC, CBS, NBC

A third of Americans don't believe in the theory of evolution

AFP- JIJ

Poll: 3 in 8 Americans Believe Global Warming A Hoax

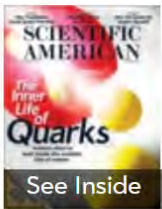
By: Nick Wiltgen

Published: April 4, 2013

Despite overwhelming evidence and scientific consensus, nearly three of every

'Global Warming Isn't Happening': Americans' Beliefs In Climate Change Are Becoming Increasingly Skeptical

By [Rhonda J. Miller](#) on January 19, 2014 10:19 PM EST



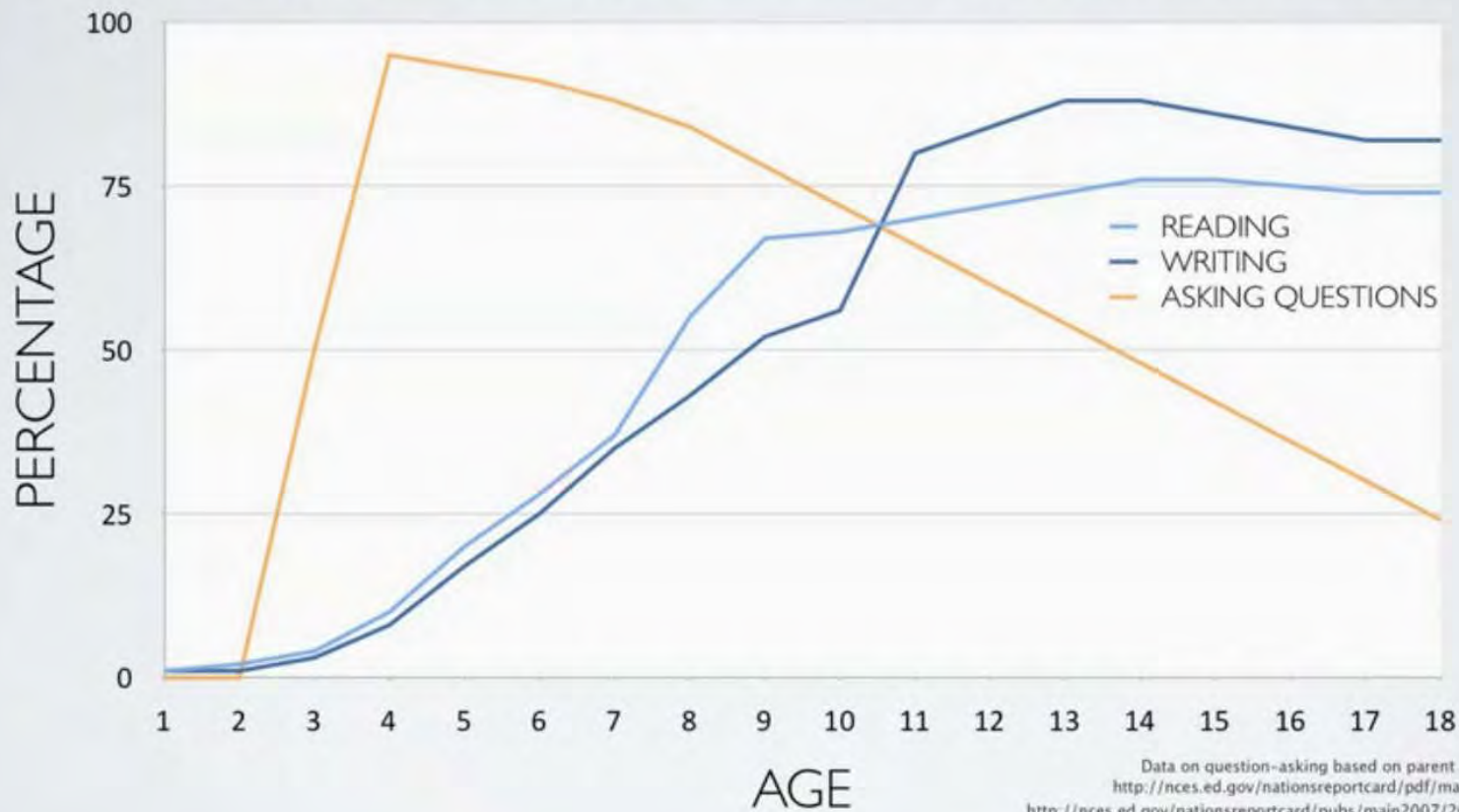
Antiscience Beliefs Jeopardize U.S. Democracy

The United States faced down authoritarian governments on the left and right. Now it may be facing an even greater challenge from within

Oct 16, 2012 | By Shawn Lawrence Otto



PERCENTAGE OF CHILDREN WITH BASIC SKILLS ATTAINMENT



Dan Rothstein: Did Socrates Get it Wrong? http://www.youtube.com/watch?v=_JdczdsYBNA

THE SUPREME COURT OF WASHINGTON

FILED
STATE OF WASHINGTON
JAN 15 2013
BY RONALD R. CALVERT

CLERK

MATHEW and STEPHANIE)
McCLEARY, et al.,)
)
Respondents/Cross-Appellants,)
)
v.)
)
STATE OF WASHINGTON,)
)
Appellant/Cross-Respondent.)
_____)

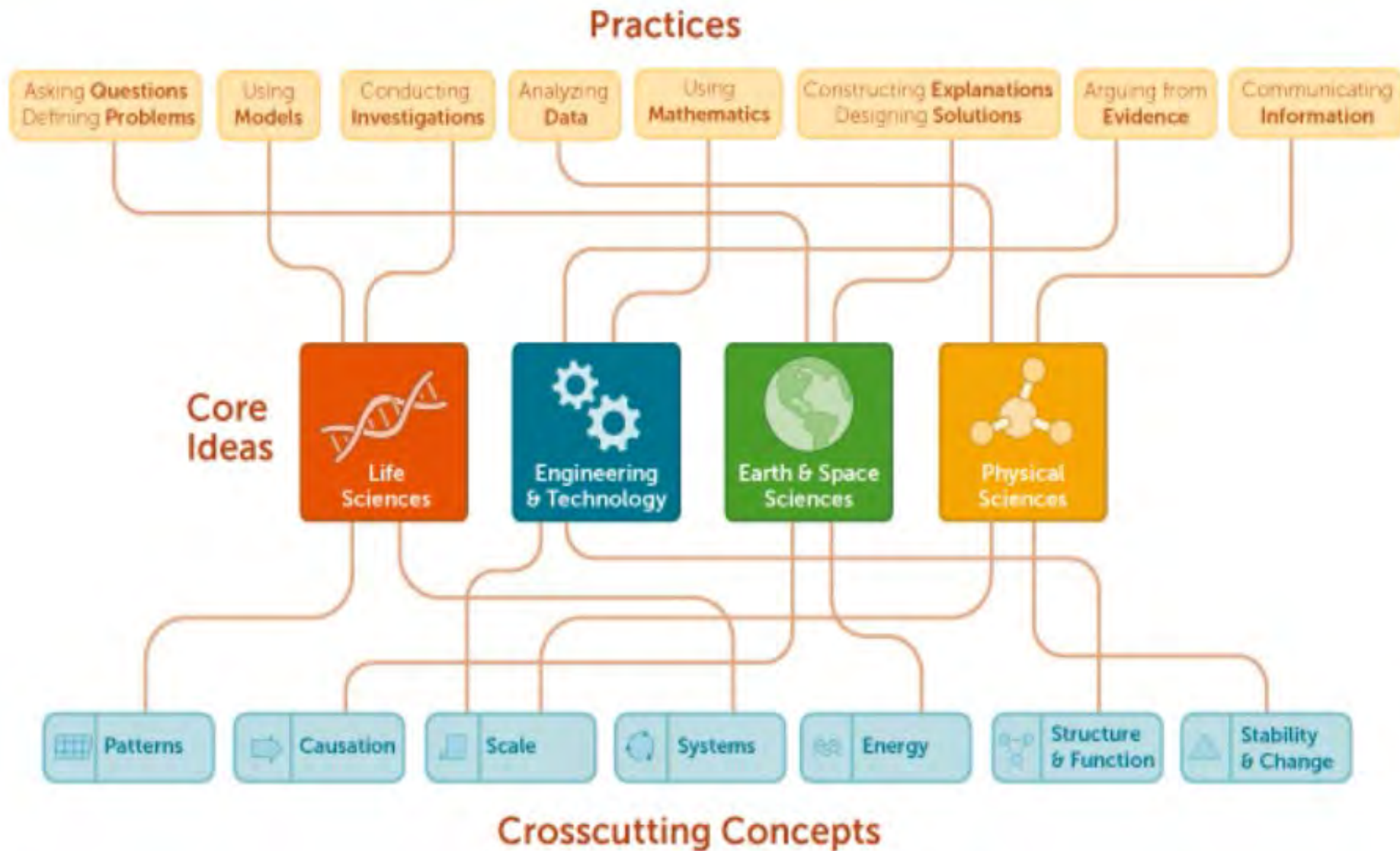
ORDER

Supreme Court No.
84362-7

King County No.
07-2-02323-2 SEA

“It is the paramount duty of the state to make ample provision for the education of all children residing within its borders.” WASH. CONST. art. IX, § 1. This is the only “paramount duty” our founders inscribed in our constitution. ROBERT F. UTTER & HUGH D. SPITZER, THE WASHINGTON STATE CONSTITUTION, A REFERENCE GUIDE 169 (2d ed. 2013). Two years ago, this court held

Next Generation Science Standards



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Labs, Activities, and Lessons for Classroom Education and Public Outreach

Showing all 5 results

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[A Critical and Systems Evaluation of News Articles](#)



[Combustion Lab - Institute for Systems Biology](#)

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| 8-12 | 4 |
| K-2 | 1 |

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| Discussion | 1 |
| Lab Activity | 1 |
| Mixed | 1 |
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- [Writing](#) 1
- [Environmental Studies](#) 3

FILTER BY LEARNING TARGET

- [1 - Chemistry of OA](#) 2
- [2 - Carbon Balance](#) 1
- [3 - Physiology](#) 1
- [4 - Ecosystems](#) 1
- [5 - Ecosystem Services](#) 1
- [6 - Solutions](#) 1

KEYWORDS

Bay Side

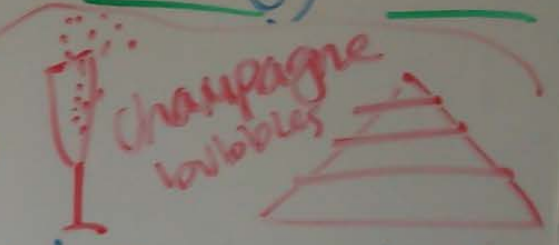
diatom Lab

MITIMES
Tatooish island

- evolution
- adaptation
- Physiology's development

5

Ocean acidification Δ
biotic responses for survival



CO2 atmosphere

of critical components
of Marine ecosystem

Virtual Urchin

Chem & bio affect each other

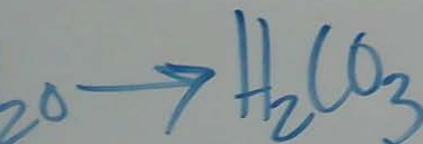
HOLD YOUR BREATH

Key Stone species - food web

Measure of acidity

pH scale lessons

oysters
salmon



is less available for
skeleton formation

- habitat
- eel grass!
- predator / prey

MACRO systems ecosystems

dissolve / mass LAB
science buddies

100
multitray bay curriculum photo

powers of ten

Maintainance

How does the shifting carbon balance affect ocean systems?

How does the shifting carbon balance affect ocean systems?

LT 1: Explore the carbon cycle and the relationship between atmospheric CO₂ and the pH of seawater.

How does the shifting carbon cycle affect ocean systems?

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LT 2: Investigate how the rate of ocean acidification has changed over time.

How does the shifting carbon cycle affect ocean systems?

LT 1: Explore the carbon cycle and the relationship between atmospheric CO₂ and the pH of seawater.

LT 2: Investigate why the rate of ocean acidification has changed over time.

LT 3: Explore the physiological responses of marine organisms to changes in temperature, pH and O₂.

How does the shifting carbon cycle affect ocean systems?

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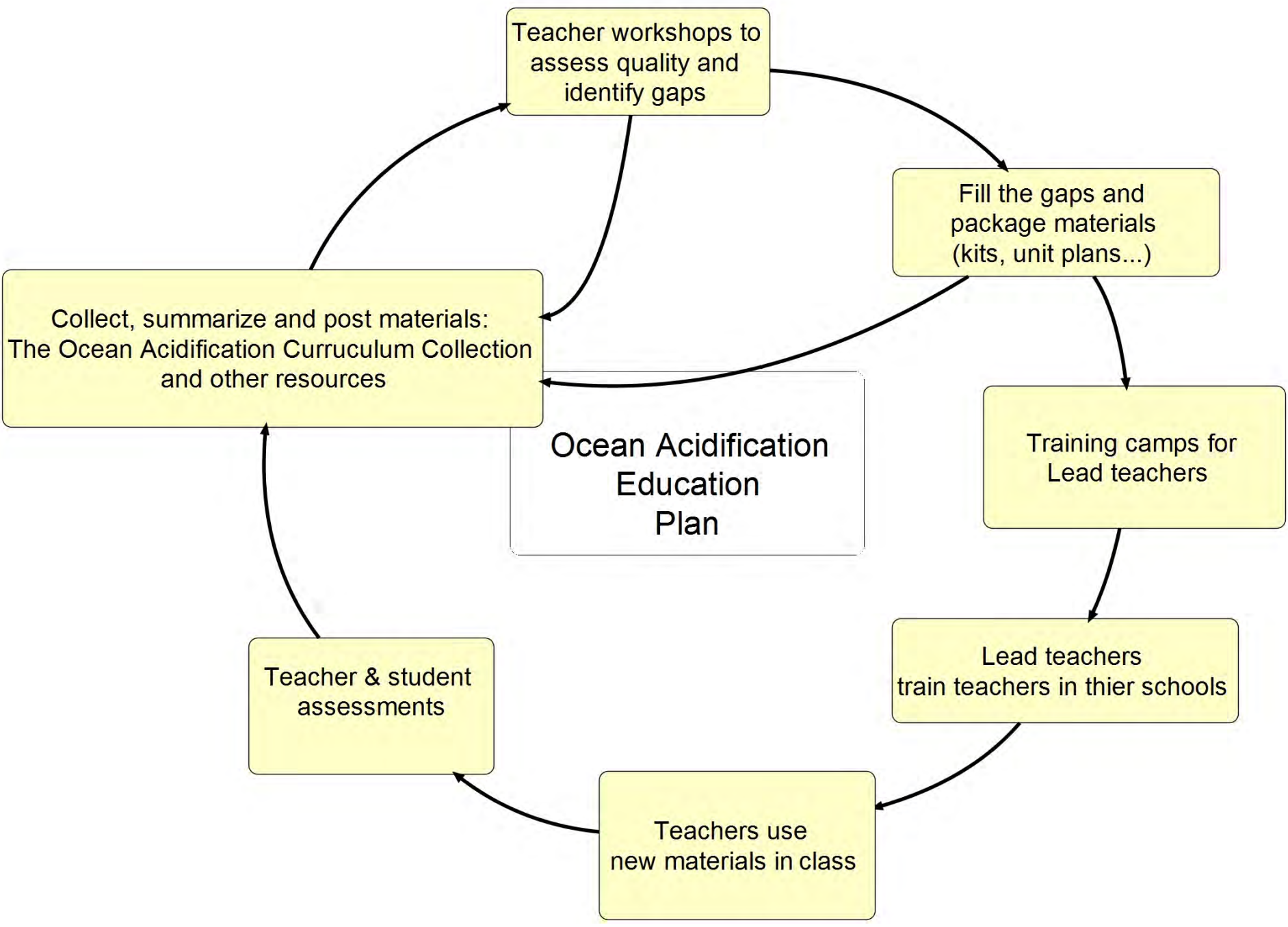
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LT 3: Explore the physiological responses of marine organisms to changes in temperature, pH and O₂.

LT 4: What are the potential ecosystem level impacts of these environmental changes?

LT5: How could ecosystem services to human communities be affected?



Teacher workshops to assess quality and identify gaps

Fill the gaps and package materials (kits, unit plans...)

Training camps for Lead teachers

Lead teachers train teachers in thier schools

Teachers use new materials in class

Teacher & student assessments

Collect, summarize and post materials: The Ocean Acidification Curruculum Collection and other resources

Ocean Acidification Education Plan

Greenhouse gases don't just cause **GLOBAL WARMING...**

Meet a new threat:

OCEAN ACIDIFICATION



Scientists were thrilled when they realized that the ocean absorbs the greenhouse gas CO₂.

SCIENCE BOAT

Unfortunately, CO₂ mixed with water makes ACID.

SCIENCE BOAT

As the ocean becomes more acidic, the shells of sea animals dissolve.

oyster coral sea urchin

The acid also damages some animals' senses.

clownfish

This is very bad for ocean creatures

including us.

Since the 18th century, the ocean's surface waters have become 30% more acidic.

And the process is accelerating...
In the coming decades it'll reach deeper into the sea,
changing life as we know it.

So what can you do?

1 Throw an antacid into the sea.

Tasty but ineffective.

X

2 Do nothing. Years later, regale children with your memories of the sea.

It was full of fish! what!

X

3 Write a letter or email to a politician and express your concern.

Easy Lazy Surprisingly effective

✓