Mixed Messages: Climate change in America’s classrooms

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**Climate confusion among U.S. teachers**

Teachers’ knowledge and values can hinder climate education

By Eric Puffer, Mark McCaffrey, A. Lori Hannah, Joshua Rosenman, Minda Berbeco, Ann H. Reid

Although more than 95% of active climate scientists attribute recent global warming to human causes (1, 2) and most of the general public accepts that climate change is occurring, only about half of U.S. adults believe that human activity is the predominant cause (3), which is the lowest among 20 nations polled in 2014 (4). We examine how this societal debate affects science classrooms and find that, whereas most U.S. science teachers include climate science in their courses, their insufficient grasp of the science may hinder effective teaching. Misrepresenting some actors in the societal debate over climate change, many teachers repeat scientifically unsupported claims in class. Greater climate change, many teachers repeat scientific claims in class. Greater climate change, many teachers repeat scientific claims in class.

Mixing Messages. Notably, 30% of teachers emphasize that recent global warming “is likely due to natural causes,” and 12% do not emphasize any explanation and thereby avoid the topic altogether. Of teachers who teach climate change, 31% report sending explicitly contradictory messages, emphasizing both the scientific consensus that recent global warming is due to human activity and that many scientists believe recent increases in temperature are due to natural causes (see the first chart). Why might this be the case? Some teachers may wish to teach “both sides” to accommodate values and perspectives that students bring to the classroom (6, 10). Beyond that, the survey data allow us to evaluate three explanations.

First, teachers might experience overt pressure from parents, community leaders, or school administrators not to teach climate change. Only 4% of teachers reported such pressure (4.4% self-reporting pressure to teach it, mostly from fellow teachers). This is less than the 15% reporting pressure in Wise’s pioneering survey (6), and far less than biology teachers reported in a survey on teaching evolution (50).

Second, teachers also may not be very knowledgeable about a wide range of evidence—e.g., CO₂ measurements from ice cores and direct measures at Mauna Loa—and how climate models work. Given the relative novelty of the topic in classrooms, instructional materials, and preserve training, this would not be surprising, and nearly 50% said that they would prioritize one or

INTELLIGENCE AHEAD | PERSPECTIVES

### Science Education

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A recent survey found that many teachers are inadvertently instilling climate change denial in students by suggesting global warming is equally the result of human activities and natural causes. What do you think?

“Well, now their colleges will have something useful to teach them.”

Beau Rafferty  ·  PROGRAM NAME

“It’s so hard for teachers to know what’s right, what with the overwhelming abundance of scientists saying the exact same thing.”

Adrian Baird  ·  UNEMPLOYED

“But surely our students are still being given a proper overview of the Treaty of Tordesillas?”

Gladys Pullman  ·  SYSTEMS ANALYST
1500 Teachers
1500 Teachers

All 50 states
Mail and online response options
37% response rate
1500 Teachers
1500 Teachers

Actual distribution of teachers
Hours spent teaching recent climate change

Don't teach recent climate change

ncse.com
Don't teach recent climate change
Many emphasize human causes...

When I do teach about climate change:
- I emphasize the scientific consensus that recent global warming is primarily being caused by human release of greenhouse gases from fossil fuels.
Many emphasize natural causes…

When I do teach about climate change: I emphasize that many scientists believe that recent increases in temperature is likely due to natural causes.

43%
<table>
<thead>
<tr>
<th>“scientific consensus”</th>
<th>“natural causes”</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agree or strongly agree</strong></td>
<td><strong>Disagree or strongly disagree</strong></td>
</tr>
<tr>
<td>31% (mixed messages)</td>
<td>54% (scientific consensus)</td>
</tr>
<tr>
<td>10% (denial)</td>
<td>5% (avoidance)</td>
</tr>
</tbody>
</table>
Less Pressure than for Evolution

Pressure not to teach CC

% reporting pressure

Middle School  Earth Science  Biology  Chem.  Phys.
Less Pressure than for Evolution

Pressure not to teach CC
Pressure to teach CC
Less Pressure than for Evolution

- Pressure not to teach evo
- Pressure not to teach CC
- Pressure to teach CC

Middle School  Earth Science  Biology  Chem.  Phys.
Less Pressure than for Evolution

Middle School  Earth Science  Biology  Chem.  Phys.
But Teachers Feel Pressure

Tactics: Discuss w/o taking a stand, Equal time, Meet students, Letter to parents, Opt out, Avoid entirely

% using problematic tactics

- Middle School
- Earth Science
- Biology
- Chem.
- Phys.
Most teachers don’t know the size of the consensus

- 81-100%
- 61-80%
- 41-60%
- 21-40%
- 0-20%

Middle school
Earth sci.
Biol.
Chem.
Physics

Don’t know
Perceived consensus shapes pedagogy

% that does NOT present "natural causes"

Perceived Consensus

0-20%
21-40%
41-60%
61-80%
81-100%

Don’t know
Politics shapes pedagogy
Politics shapes pedagogy

Disagrees w/ emphasizing natural causes

Democrats  Independent  Republicans
Politics shapes pedagogy

Disagrees w/ emphasizing natural causes

Haven’t, wouldn’t give equal time

- Democrat
- Independent
- Republican
Politics shapes pedagogy

- Disagrees w/ emphasizing natural causes
- Haven’t, wouldn’t give equal time
- Have discouraged debate
Politics shapes perceived consensus

Average perceived consensus %

Information deficit

Cultural bias

More liberal
Bigger government

More conservative
Smaller government

97% consensus
Training shapes perceived consensus

Average perceived consensus %

Most trained

Least trained

More liberal
Bigger government

More conservative
Smaller government

97% consensus
Communities shape perceived consensus

Average perceived consensus %

Personal view on the ideal size of government

Bigger
More liberal

Smaller
More conservative

Most Democratic counties

97% consensus

Most Republican counties

More liberal
Bigger government

More conservative
Smaller government
Many took courses
Many willing to take courses

% interested in climate continuing ed.

- course
- section
- anything

- Middle School
- Earth Science
- Biology
- Chem.
- Phys.
But is it preaching to the converted?

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours spent on climate change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle School</td>
<td>2</td>
</tr>
<tr>
<td>Earth Science</td>
<td>6</td>
</tr>
<tr>
<td>Biology</td>
<td>4</td>
</tr>
<tr>
<td>Chem.</td>
<td>2</td>
</tr>
<tr>
<td>Phys.</td>
<td>2</td>
</tr>
</tbody>
</table>

Interested in more training
Not interested in more training
Imagine that you were asked to teach a 2-3 day unit on greenhouse gases and recent global warming. What priority would you give to including each of the following possible topics?

- The impact of launching rockets into space
- Depletion of ozone in the upper atmosphere
- Use of chemicals to destroy insect pests
- Use of aerosol spray cans

Misconceptions abound