PENNSTATE

Global Changes / Educational Challenges

The challenges facing science teachers have never been greater.

Tell us how you are meeting them in your classroom.

Your name was selected from a database of high school science teachers from all 50 states and the District of Columbia. Your answers are very important to the success of this project. Our random sample has been generated scientifically and without your participation we will not be able to accurately describe the opinions and experiences of teachers in schools and communities such as yours.

Please use a blue or black ink pen to answer the questions and mail your completed questionnaire back to us in the postage-paid envelope provided.

The National Survey of American Science Teachers

A Confidential Survey of High School Science Teachers

Conducted by the Survey Research Center at Penn State

National Survey of Science Educators

Thank you for participating in this survey!

We begin with some questions on teaching and curriculum. If you teach different kinds of chemistry classes (such as AP chemistry), please give answers that refer to the class with the largest enrollment at your high school.

1. Thinking about how you lay out your Chemistry course for the year, please indicate how many class hours (40-50 minutes) you typically spend on each of the following broad topic areas.

	Not Covered	1 - 2 hours	3 - 5 hours	6 - 10 hours	11 - 15 hours	16 - 20 hours	20 hours or more
Scientific method and nature of science	○	○	○	○	○	○	○
Atomic structure	○	○	○	○	○	○	○
Periodic table	○	○	○	○	○	○	○
Carbon cycle (or geochemical cycles)	○	○	○	○	○	○	○
Nuclear chemistry and radioactivity	○	○	○	○	○	○	○
Organic chemistry	○	○	○	○	○	○	○
Recent global warming (last 150 years)	○	○	○	○	○	○	○
Biblical approaches to the origins of matter	○	○	○	○	○	○	○

2. Whether or not you selected "Recent global warming" above, please tell us if this topic is covered in any of the following classes at your school.

	General or college prep	AP or elective	Not taught, to my knowledge
Biology	○	○	○
Earth Science	○	○	○
Environmental science	○	○	○
Social studies	○	○	○

3. **Below is a list of more specific topics related to climate change. Did any of these come up in class? In answering, think about the *entire last year* that you offered this class.**

	Covered as part of my lesson plan		Covered in response to student questions	
	Yes	**No**	**Yes**	**No**
Greenhouse effect	○	○	○	○
Carbon cycle	○	○	○	○
Ice ages	○	○	○	○
The medieval warming period	○	○	○	○
Solar variability	○	○	○	○
Ocean acidification	○	○	○	○
Sea level change	○	○	○	○
Seasonal plant/animal life events (i.e., plant flowering, migration) that respond to climate	○	○	○	○
Changes in water quantity and quality	○	○	○	○
Changes in ice and snow cover	○	○	○	○
Changes in precipitation	○	○	○	○
Events described in the Bible such as Judgment Day or Noah's flood	○	○	○	○

4. **Please indicate your level of agreement with each of the following statements if they apply to your classes in chemistry (otherwise select "Not applicable").**

When I do teach about climate change...	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**	**Not applicable**
I emphasize that average global temperatures have risen in the last 150 years.	○	○	○	○	○
I emphasize that natural cycles have produced warming events throughout Earth's history.	○	○	○	○	○
I emphasize the scientific consensus that recent global warming is primarily being caused by human release of greenhouse gases from fossil fuels.	○	○	○	○	○
I emphasize that many scientists believe that recent increases in temperature is likely due to *natural* causes.	○	○	○	○	○
I encourage students to debate the likely causes of global warming.	○	○	○	○	○
I encourage students to come to their own conclusions about the causes of global warming.	○	○	○	○	○

5. **Some curricula also include discussions about potential solutions or steps students can take to address challenges of climate change. Please indicate whether or not you discussed any of the following.**

	Discussed in Class	
	Yes	**No**
Policy solutions to address change incentives such as cap and trade or carbon taxes.	○	○
Efforts to make current technologies more efficient such as hybrid cars or alternative energy sources.	○	○
Technologies to mitigate and adapt to the effects of climate change such as geo-engineering.	○	○
Things students can do themselves such as walking to school, or turning off lights.	○	○
Potential career opportunities related to conservation, new energy technologies or environmental policy.	○	○

6. **Please indicate your level of agreement with each of the following statements as they apply to your classes in chemistry (otherwise select "Not applicable").**

When I teach about organic molecules (including answering student questions). . .	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**	**Not applicable**
I emphasize the scientific consensus that the Earth is roughly 4.5 billion years old.	○	○	○	○	○
I emphasize theories describing how the first organic molecules formed naturally on the early Earth, for instance in a "primordial soup" or using Miller-Urey experiments.	○	○	○	○	○
I emphasize the statistical unlikelihood of complex organic polymers molecules forming spontaneously.	○	○	○	○	○
I emphasize that radiometric dating techniques are based on faulty assumptions.	○	○	○	○	○
My choices of what topics to emphasize are heavily constrained by my state's content standards.	○	○	○	○	○

7. Some teachers tell us that they acknowledge that human-caused climate change is controversial and adopt particular strategies to do so. Tell us about your approach to each of the following.

	I have done this	I have not done this, but might if the situation were to arise	I would not do this
Give equal time to perspectives that raise doubt that humans are causing climate change.	○	○	○
Allow students to discuss the controversy without me taking a position.	○	○	○
Discuss the controversy in the context of the nature of science.	○	○	○
Discourage debate because I believe most climate skepticism is not based on sound science.	○	○	○
Offer to meet with students after class.	○	○	○
Send an explanatory letter to parents.	○	○	○
Allow students to opt out of portions of the class.	○	○	○
Adhere strictly to standards and not allow discussion that might become controversial.	○	○	○
Avoid all discussion of climate change.	○	○	○

8. 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?

	A high priority	A medium priority	It is not necessary to cover this topic	This topic <u>should not</u> be covered	I do not have an opinion
Destruction of forests	○	○	○	○	○
Carbon dioxide trapping heat in the atmosphere	○	○	○	○	○
Use of aerosol spray cans	○	○	○	○	○
People heating and cooling their homes	○	○	○	○	○
Depletion of ozone in the upper atmosphere	○	○	○	○	○
Use of coal and oil by utility and electric companies	○	○	○	○	○
Use of chemicals to destroy insect pests	○	○	○	○	○
Incoming shortwave and outgoing longwave energy	○	○	○	○	○
Emissions from industry	○	○	○	○	○
The impact of launching rockets into space	○	○	○	○	○

9. Some topics can be controversial enough that teachers get pressured or lobbied to either emphasize or de-emphasize it. For each of the following, select all that apply.

	No one	School adminis-trators	Local religious or community leaders	Parents	School board members	Fellow teachers	Other
I have received pressure to teach about human causes of global warming from:	○	○	○	○	○	○	○
I have received pressure to NOT teach about human causes of global warming from:	○	○	○	○	○	○	○

Now we have some questions on your state's standards and assessments, and textbooks that you use.

10. So far as you know, do your state's science standards include climate change? (Select all that apply.)

- ○ Yes, but it does not include human causes
- ○ Yes, it includes human causes
- ○ Yes, it includes an expectation that students are exposed to "both sides"
- ○ Yes, but human causes of climate change must be taught as a "theory"
- ○ No, but my local school or school district expects me to teach it
- ○ No, nobody expects me to teach it
- ○ I am not sure

11. Does your state currently have an assessment test covering chemistry? (Select all that apply.)

- ○ No
- ○ Yes, a test where scores are reported for school districts but not individual schools
- ○ Yes, a test where scores are reported for individual schools
- ○ Yes, a test that students must pass to graduate

12. Regardless of whether your state has adopted the Next Generation Science Standards (NGSS), do you think the NGSS would:

- ○ Be better for student learning
- ○ Be worse for student learning
- ○ Would not make any difference

} → **Why?**

- ○ I am not familiar enough with NGSS to have an opinion

13. What is the primary textbook that you use in your chemistry class? Please print your responses.

Title: _____

Author: _____

Publisher: _____

14. Many teachers find they need to go beyond their textbook for content and exercises on the topic of climate change. Please list up to three additional sources you rely on for teaching materials. A brief description is all that is necessary, you do not need to give a full Web address or citation.

_____

_____

_____

15. Have you, personally, ever had a controversy in your classroom involving topics like evolution, sex education, vaccines, climate change, or genetically modified organisms?

- ○ No → **Skip to Question 16 on the next page**
- ○ Yes → **Please tell us a little about what happened.**

Did you learn any lessons from this that you would pass on to a new teacher entering the profession?

Regardless of what you do in the classroom, we would like to ask you a few questions about your own personal views.

16. Which of the following comes closest to your view?

- ○ Global warming is caused mostly by human activities
- ○ Global warming is caused mostly by natural changes in the environment → **Skip to Question 18**
- ○ Global warming is not happening → **Skip to Question 18**
- ○ Other (specify): _____

17. Which of the following statements comes closest to your view?

- ○ Humans can't reduce global warming even if it is happening.
- ○ Humans could reduce global warming, but people aren't willing to change their behavior so we're not going to.
- ○ Humans could reduce global warming, but it's unclear at this point whether we will do what's needed.
- ○ Humans can reduce global warming, and we are going to do so successfully.

18. To the best of your knowledge, what proportion of climate scientists think that global warming is caused mostly by human activities?

- ○ 0 - 20%
- ○ 21% - 40%
- ○ 41% - 60%
- ○ 61% - 80%
- ○ 81% - 100%
- ○ I don't know

19. Where would you place yourself on each of the following 7-point scales?

It's not the government's business to try to protect people from themselves						**Sometimes government needs to make laws that keep people from harming themselves**
○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7

I could easily change my mind about the causes of global warming						**I am extremely confident in my beliefs about the causes of global warming**
○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7

20. Please tell us about your formal education background.

	Select all that apply	Your major	Name of college or university
Associate Degree	○		
Bachelor of Arts	○		
Bachelor of Science	○		
Master's Degree in Education	○		
Master's Degree in Science	○		
D.Ed. or Ph.D. in Education	○		
Ph.D. in Science	○		
Other (specify):	○		

21. Please tell us about your coursework and continuing education in the sciences. Select "4" for four or more courses.

	Total Number of Semester/Quarter Length College Classes					Total Number of Continuing Ed Courses or Workshops					I would take advantage of such an opportunity in the future	
	0	1	2	3	4	0	1	2	3	4	Yes	No
Biological and life sciences	○	○	○	○	○	○	○	○	○	○	○	○
Earth and space sciences	○	○	○	○	○	○	○	○	○	○	○	○
Chemistry and physics	○	○	○	○	○	○	○	○	○	○	○	○
Courses that devoted one or more class sessions to climate change	○	○	○	○	○	○	○	○	○	○	○	○
Courses entirely focused on climate change	○	○	○	○	○	○	○	○	○	○	○	○
Courses entirely focused on evolution	○	○	○	○	○	○	○	○	○	○	○	○

22. In what ways do you keep up with scientific debates and advances? Select all that apply.

○	I keep up by noting additions and changes to the textbooks I use.
○	I keep up through science journalism such as television programs like NOVA, magazines like *National Geographic*, and the science sections of daily newspapers.
○	I keep up through browsing scientific journals such as *Nature*, *Cell*, etc.
○	I keep up by visiting climate science Web sites sponsored by government, academic or non-profit organizations.
○	I keep up by visiting Web sites sponsored by groups or individuals who are skeptical about human causes of climate change.
○	I keep up by following links that I receive through social media such as Facebook or Twitter.
○	I keep up by taking science courses (not science education) as part of my continuing education.
○	I keep up by visiting science education Web sites such as the NSTA, and the National Academy of Sciences.

23. How would you rate your knowledge on each of the following topics:

	I know less about this topic than many other high school science teachers	**Typical of most high school science teachers**	**Very good compared to most high school science teachers**	**Exceptional: On par with many college-level instructors**
Ecology	○	○	○	○
Climate change models	○	○	○	○
Modern genetics	○	○	○	○
Weather forecasting models	○	○	○	○
Health and nutrition	○	○	○	○
Evolutionary theory	○	○	○	○

Finally, we have some background questions.

24. How many years have you taught at *this school*? ☐☐ years

25. What is the *total number of years* you have been teaching? ☐☐ years

26. What type(s) of teaching certificate(s) do you hold? (Select all that apply.)

- ○ Regular or standard state certificate
- ○ Certificate issued after satisfying all requirements except the completion of a probationary period
- ○ Certificate that requires some additional college course work, student teaching, or passage of a test before regular certification can be obtained
- ○ Certificate issued to persons who must complete a regular certification program in order to continue teaching
- ○ Advanced professional certificate (specify): _____
- ○ Other (specify): _____

27. What is your gender? ○ Male ○ Female

28. Which of the following best describes you? (Select one or more.)

- ○ Hispanic heritage
- ○ White
- ○ Black/African American
- ○ East Asian
- ○ American Indian or Alaska Native
- ○ Pacific Islander
- ○ South Asian
- ○ Other (specify): _____

29. What is your present religion?

- ○ Protestant
- ○ Roman Catholic
- ○ Mormon
- ○ Orthodox (Greek or Russian)
- ○ Jewish
- ○ Muslim
- ○ Hindu
- ○ Buddhist
- ○ Atheist
- ○ Agnostic
- ○ Spiritual, but not religious
- ○ Nothing in particular
- ○ Other (specify): _____

30. Which of these statements comes closest to describing your feelings about the Bible?

- ○ The Bible is the actual word of God and is to be taken literally, word-for-word.
- ○ The Bible is the inspired word of God, but not everything should be taken literally, word-for-word.
- ○ The Bible is an ancient book of fables, legends, history, and moral precepts recorded by man.

31. Politically, I usually identify myself as a:

- O Democrat
- O Independent
- O Republican
- O Green Party
- O Tea Party
- O Libertarian
- O Other (please specify): _____

32. Would you be willing to participate in a follow-up survey?

- O Yes
- O No

33. Would you like us to e-mail you a report of the results of this study?

- O Yes → **Please clearly print your e-mail address:** _____
- O No

Thank you for completing this survey. Please return it in the envelope provided or mail to:

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