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CLIMATE CHANGE AND PENNSYLVANIA SOCIAL STUDIES TEACHING

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"I think it is extremely important that social studies educators realize their role in the climate change conversation." -- A Pennsylvania secondary social studies teacher (Fall, 2017)

"That is an area I leave for the Science teacher on my academic team." -- A Pennsylvania secondary social studies teacher (Fall, 2017)

In early January of this year, a report (Plumer, 2019) was released noting that U.S. carbon dioxide emissions increased in 2018 by 3.4%, the largest increase in eight years. For people concerned about destabilization of the Earth's climate, this was worrisome news as increased carbon dioxide emissions accelerate global climate change. The next day, Pennsylvania Governor Tom Wolf signed an executive order calling on the Commonwealth of Pennsylvania to take action to address climate change, including establishing the first statewide goal for reducing carbon pollution. In his statement, the Governor referred to climate change as "the most critical environmental threat facing the world" (Pennsylvania Governor's Office, 2019, paragraph 2).

We, too, are deeply concerned about climate change. As educational researchers and teacher educators who work at the intersection of social and scientific issues, we believe it is imperative that *all* teachers teach about climate change. Yet a survey of U.S. science teachers found that many high school students only receive 1-2 hours of instruction related to climate change each

year (Plutzer et al., 2016). In social studies, we suspect the corresponding numbers are even smaller as climate change has received relatively little attention in the literature of the field (Kissling, Bell, Díaz Beltrán, & Myler, 2017). There are various reasons for this silence, including the widely held perception that climate change is solely a scientific issue, that there is already much other social studies content with which to engage, and that climate change is politically controversial in the United States.

On closer inspection, though, each of these reasons falls apart quickly. First, scientific issues are never separate from their social contexts, particularly issues like climate change, which 97% of scientists agree is caused by human activity (Cook et al., 2016). Thus, the current trends of climate change are a product of social living, not separate from it, and they stand to impact all organisms of the Earth, human and other-than-human. Second, the purpose of social studies education, as articulated by the National Council for the Social Studies (2010) (and affirmed by the Pennsylvania Council for the Social Studies), is for students to learn to become effective citizens. With dire forecasts for (and, in some places, present realities of) climate change (Wallace-Wells, 2019), it is hard to envision many citizenship issues that are more salient. Third, as we discuss below, climate change *is* politically controversial (though, importantly, not scientifically controversial) *but* social studies is predicated on critical inquiry into the

problems of social living (e.g., Hess, 2009; Ho & Seow, 2015; Journell, 2016; Oliver & Shaver, 1974; Rugg, 1923). If we don't dialogue about climate change (and other politically controversial issues) in social studies, where will we?

The State of Climate Change

Governor Wolf is not alone in his assessment of climate change:

The United Nations has declared that climate change is the defining issue of our time and we are at a defining moment. From shifting weather patterns that threaten food production, to rising sea levels that increase the risk of catastrophic flooding, the impacts of climate change are global in scope and unprecedented in scale. Without drastic action today, adapting to these impacts in the future will be more difficult and costly. (n.d., paragraph 1)

Statements like these are founded on science firmly established long ago (Rich, 2019) and reaffirmed in every single major study that has come out about it in the past decade, from a range of different governmental and nongovernmental bodies, including the most recent assessments (e.g., Intergovernmental Panel on Climate Change, 2018; U.S. Global Change Research Program, 2018).

In 2008, the Pennsylvania legislature passed the "Pennsylvania Climate Change Act" (Act 70), which, among other things, required periodic reports on the impacts of climate change in

the state. The draft of the fourth and latest report (ICF, 2018), from last November, stated:

In recent years, extreme weather and catastrophic natural disasters have become more frequent and more intense. Like many parts of the United States, Pennsylvania is expected to experience higher temperatures, changes in precipitation, sea level rise, and more frequent extreme events and flooding because of climate change in the coming decades. Climate impacts in Pennsylvania are real and continue to put Pennsylvanians at risk. (p. 12)

The assessments in Pennsylvania and beyond are conclusive: climate change poses serious threats to contemporary ways of living.

While public opinion polls show that there is less consensus among the U.S. public than climate scientists, sizable majorities of respondents believe climate change is human-driven and a major threat. In a nationally representative survey of registered U.S. voters in March of 2018 (Leiserowitz et al., 2018), the Yale Program on Climate Change Communication and the George Mason University Center for Climate Change Communication found that 73% of the citizens polled think global warming³ is happening, 63% are worried about it, and 59% think it is caused mostly by human activities. A separate Gallup poll (Brenan & Saad, 2018) from the same month found similar results: 64% of respondents believe that global warming is caused by human

³ While 'climate change' and 'global warming' are not exactly the same—global warming is a form of climate change—they are often used synonymously, both in public and scientific discourses. When we write about this topic, we prefer to use 'climate change' because 'global warming' can be confusing for some people, especially when they have endured cold winters and

other weather events that seem at odds with warming of the planet. We use 'global warming' in this instance because it was the term used in the survey that we are referencing. Additionally, when we write of 'climate change,' we always imply 'global climate change' as the issue is not specific to any one country or state, even though local impacts can vary widely.

activities, 60% believe the effects of global warming have already begun, and 43% worry a “great deal” about it while another 20% worry about it a “fair amount.” Both of these polls found significant gaps between Democrats and Republicans—and climate change has been found to be one of the most polarizing issues in the United States (Borenstein, 2016; Cama, 2016)—yet there is still ample and growing concern from a majority of the public about the destabilization of the Earth’s climate.

U.S. federal officials—elected and appointed—appear to be far more divided than the public over climate change, even though U.S. federal agencies such as the Department of Defense (2014, 2015) have issued clear warnings. While Barack Obama’s administration named climate change a major threat and took some action to impede it (Hirschfeld Davis et al., 2016; Lavelle, 2016), Donald Trump’s administration has largely equivocated about the threat of climate change or outright denied its existence (Baker, 2017; Davenport, 2017; Holden, 2018). Perhaps the most glaring action by the Trump administration was the President’s 2017 announcement (Trump, 2017) that he would seek to pull the United States out of the 2015 Paris Climate Accord. The agreement, signed by nearly every country in the world, aimed to reduce carbon emissions significantly in the coming years in order to limit a devastating rise of the average global temperature (Harvey, 2015). Yet, when Trump signaled a U.S. withdrawal (which cannot technically happen until November 5, 2020), the majority of U.S. citizens in every state supported U.S. participation in the accord (Marlon, Fine, & Leiserowitz, 2017).

In the Yale and George Mason study from last year, respondents were asked how much they agreed with the statement: “Schools should teach our children about the causes, consequences, and potential solutions to global warming” (Leiserowitz et al., 2018, p. 21), and 81% agreed “strongly” or “some-what.” A more recent poll from National Public Radio and Ipsos (Kamenetz, 2019), released this past Earth Day (April 22), found that 66% of U.S. adults believed that “schools should teach about climate change and its impacts on our environment, economy and society” and 12% believed “schools should teach that climate change exists, but not the potential impacts.” For these same statements, 74% of teachers agreed with the former and 12% with the latter. These high public-opinion percentages indicate that the public both recognizes the threat of climate change and a role for schools to play in addressing it.

Climate Change and Pennsylvania’s Secondary Social Studies Teachers

In the fall of 2017, as nearly all climate scientists and world governments were sounding an alarm about the catastrophic implications of a rapidly changing climate, we wondered how Pennsylvania social studies teachers were thinking and teaching about environmental issues, which we defined as “topics having to do with the wellbeing of the Earth, including people, other living beings, air, water, and so forth.” We conducted an online survey of teachers’ beliefs and teaching about environmental issues and some of the survey questions were specific to climate change (see Appendix for these questions).

Via email we shared a survey link with 7,456 public-school secondary social studies teachers across the Commonwealth. As 1,174 teachers responded, we had a response rate of 15.8%, and those responses came from 440 (or 55.8%) of Pennsylvania's 788 public-school districts, including 367 (or 73.4%) of 500 geographic school districts (see Figure 1).⁴

While we are in the process of reporting on the larger study in various publishing outlets, here we present findings related to the respondents' personal beliefs and teaching about climate change. After considering their personal beliefs and teaching practices, we look at associations between various teacher characteristics and teaching about climate change often during the 2017-8 school year. We conclude this section with consideration of some of the comments that the teachers shared on the open-ended questions of the survey.

Personal Beliefs. The teachers that responded to our survey showed an overwhelming belief in the existence and threat of climate change (see Table 1), as 90% agreed that climate change is occurring and nearly as many responded that climate change is a significant issue for human society and the wellbeing of the Earth. The percentages of teachers who saw climate change as an immediate threat and human activity as its primary cause dropped but still showed a clear majority.

Teaching Practices. Climate change was taught by a substantial majority of the responding teachers, as 77.6% reported that they would teach about climate change during the 2017-8 school year (see Table 2). Of these

teachers, though, only 12.9% said they would teach about climate change "often" while 64.7% said "occasionally." Thus, it was taught but not with great frequency. With respect to other environmental issues (EI) that we asked about, the teachers said they would teach about climate change more than all except for food shortages.

Characteristics of Teachers Who Teach about Climate Change Often.

Curious about potential indicators of teaching about climate change often, we identified teacher characteristics with the highest associations to teaching about climate change often during the 2017-8 year (see Table 3). That is, for each teacher characteristic in our survey (e.g., is female, teaches about coal extraction in Pennsylvania, believes it is very important to teach students to be good citizens, etc.), we looked at the corresponding percentages of how often those teachers would teach about climate change in 2017-8. Perhaps unsurprisingly, the teachers who reported that they would teach often about specific environmental issues during 2017-8, as well as the ones who said that they generally teach about environmental issues often, were most likely to teach about climate change often in 2017-8. The next characteristics with the strongest associations were teachers who connect environmental issues to racism and poverty and teachers who would teach about hydraulic fracturing (or fracking) in Pennsylvania in 2017-8.

While all of the teacher characteristics in Table 3 were associated with teaching about climate change often at a rate of at least two times the overall

⁴ The 288 non-geographic school districts are other educational agencies like charter schools, cyber schools, and career centers.

respondent population (which was 12.9%), some other characteristics are noteworthy to us. Over one in five (21.2%) of teachers who believe that it is “very important” to teach about environmental issues in social studies would teach about climate change often in the 2017-8 school year. A small bit more (21.9%) who said that they are “very comfortable” teaching about environmental issues would teach about climate change often. For teachers who actively seek to connect teaching about environmental issues to democracy and citizenship, 23.9% and 22.5% of them, respectively, would teach about climate change often in 2017-8. Several percentage points less, but still higher than the overall respondent population, 18.8% of teachers who reported that they are familiar with Article 1, Section 27 of the Pennsylvania Constitution, which enshrined into law environmental responsibility of the Pennsylvania government, reported that they would teach about climate change often.⁵

For characteristics that were not explicitly tied to environmental issues in some form, the highest associations for teaching about climate change often were teaching about gender discrimination often (23.1%), teaching about class inequality often (21.5%), and teaching about racism often (19.5%). A few other noteworthy associations involve teacher characteristics related to years teaching, gender, and political party affiliation. Teachers who had been in the classroom 1-10 years reported that they would teach about climate change often in 2017-8 at a rate of 16.1%, which was noticeably higher

than teachers of 11-19 years (11.9%) and 20 or more years (10.7%). Female teachers (14.0%) were slightly more likely to teach about climate change often than male teachers (12.3%). Teachers who were registered Democrats would teach about climate change in 2017-8 often at a rate of 16.1% while 6.8% of registered Republicans would do so. Registered Independents, teachers who preferred to self-describe their party affiliation, and teachers who preferred not to disclose their party affiliation all would teach about climate change often between 11.1%-11.9%.

Teachers’ Open-Ended Comments about Climate Change. Our survey included six open-ended questions. Although none of the questions explicitly addressed climate change, respondents wrote often about it. Many teachers described how they already bring environmental issues, including climate change, into their social studies classes. One noted, “I have focused lessons on the current debate over fracking and environmental issues in PA. In my AP U.S. History and Geography classes, I have taught about the [Environmental Protection Agency] (why it was created, who was president, and its influence) and explained the evidence associated with climate change.” Another said, “I teach my students on how human actions impact PA environment. I focus on effects of climate change on large natural disasters and international conflicts.” Some teachers still wondered, though, if climate change has a place in their

⁵ Article 1, Section 27 of the Pennsylvania Constitution reads: “The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and esthetic values of the environment. Pennsylvania’s public natural resources are the common property of all

the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people.”

curriculum: “If I taught 20th century world history, these modern issues might come up more...but because I teach early world history and adhere to the AP curriculum guidelines, my half of the course ends around 1500 AD...so climate change issues are simply not on my radar in the classroom.”

As reflected in teachers’ responses to our multiple-choice questions about climate change, there were some who disagreed strongly with the inclusion of climate change and other environmental issues in social studies as well as about the science of climate change. For example, one teacher began a comment by offering that “Early social studies education has already been reduced almost exclusively to global warming fear-mongering.” They then suggested that the survey questions revealed “an inherent bias in the researchers” and concluded by saying “I hope you are honest about that in your analysis of the data. I guess this is the best we can expect from a generation that has not been taught how to gather information and think critically rather than buying into a theory and looking only for confirmation.”⁶ Although we had very few comments such as this one, where the respondent was seemingly upset by the survey’s implicit suggestion that climate change and other environmental issues have a place in the social studies curriculum, we feel it is important to acknowledge voices across the spectrum of responses. Another teacher, thinking about the social studies curriculum, observed the opposite, explaining, “We

need to teach kids about climate change...Not many teachers are teaching this stuff. I know this because when we bring up climate change in class, the kids are shocked by it.”

Also in the comments is that the political controversy surrounding climate change is impacting teachers. One teacher wrote:

The environment will most likely become one of the main issues of my students’ lives. It is unfortunate that it doesn’t make up a larger portion of our educational time but the public perception towards issues like climate change prevent schools from taking it more seriously. Teaching environmental issues in a Social Studies class would probably be perceived as a ‘liberal agenda.’

Others echoed this sentiment, indicating that they felt limited in their ability to address climate change because of the controversy. When considering climate change as a factor that many scientists believe contributes to an increase in frequency and intensity of hurricanes, one respondent said, “I mainly stick to the basics like when, where, destruction, relief efforts, etc. I have not brought up climate change as a possible factor. The main reason is politics and we cover enough controversial topics in class. I hope that global warming concerns are covered in science.” Another said they would like to learn “How to teach that climate change and environmental concerns are important without parent push back.” A third asked for support “on how to handle what have become very political topics.” Yet,

⁶ In light of this comment we, as researchers and authors, would like to note that we do both strongly believe that the science of climate change is accurate. This is not a political choice on our part; it is because most, if not all, of the best scientists of our generation

have gathered and analyzed mass quantities of data and have repeatedly come to the conclusion that climate change is occurring, a result of human activity, and a major threat that must be addressed immediately (Doyle, 2019).

despite the politics, many teachers thought this was necessary to bring into the social studies classroom. As one teacher said, “hopefully the majority of our Social Studies teachers believe climate change and environmental issues are important.”

As noted above, the social studies classroom is an important place in schooling *because* controversial social issues need to be considered in order to help students become informed and engaged citizens. Many teachers wrote of the important role of controversy in their classrooms, for example:

I often teach about current events in my classroom that some people may deem ‘controversial.’ An issue like climate change is only a politically controversial subject. In the field of science it is far less controversial. With issues like Black Lives Matter, again, this is only a politically controversial topic. To claim that Black lives matter is by no means controversial. Additionally, my Black students need to know that their lives matter in a society where the opposite can feel true.

It is clear that climate change is of significant personal concern for many of the Pennsylvania secondary social studies teachers that responded to our survey. Further, a significant percentage of those teachers said that they had already, or would, teach about climate change often or occasionally during the 2017-8 school year. Yet many teachers noted challenges to doing such teaching, including feeling a lack of needed knowledge about climate change and concern about political controversy surrounding the topic.

Resources and Ideas for Teaching about Climate Change in Social Studies

While the literature of social studies education is not steeped in attention to climate change, there is a growing focus on it (e.g., Chandler & Marri, 2012; Ho & Seow, 2015), including writings by and for teachers. There have been articles with teaching suggestions and materials in the NCSS publications *Social Education* (Choices Program at Brown University, 2015; Kumler, & Vosburg-Bluem, 2014) and *Social Studies and the Young Learner* (Harris, Kharecha, Goble, & Goble, 2016). The educational organization Rethinking Schools, both in its quarterly magazine of the same name and book resources such as *A People’s Curriculum for the Earth* (Bigelow & Swinehart, 2014), has published numerous articles about how social studies teachers are teaching about climate change and how others can do so. There are also various online resources, including from the educational organization Climate Generation (e.g., Totz, 2016), which also leads an annual summer institute for teachers on climate change education. (For more information on this year’s summer institute held in Washington, D.C. in August, see: <https://www.climategen.org/take-action/teach-climate-change/professional-development/summer-institute/>)

Undeniably, climate change is a massive topic so thinking about where to start with teaching about it can be a daunting task. Out of many possibilities, we offer a few suggestions:

- Learn more about the scientific and social dimensions of climate change. In our survey, many teachers spoke to unease with the content and political controversy of climate change. There are ample resources for gaining a better grasp of the issue, including

many that don't require significant scientific expertise to understand them (e.g., Rich, 2019; Wallace-Wells, 2019). There are also accessible-to-the-public texts by Pennsylvania scientists (e.g., Alley, 2011; Mann & Toles, 2016).

- Make curricular connections. Climate change is rarely specified in social studies standards but it connects to almost everything. The Five Themes of Geography (including human-environment interaction) provide a clear conduit for talking about climate issues. In history classes, attention to industrialization should include consideration of the impacts on climate. If teaching about human-justice issues, why not connect climate justice? Questions such as *Who is feeling the impacts of climate change now, and why?* implicate various forms of discrimination.
- Whether you have dedicated curricular time for current events or not, bring in the news. Climate change is being covered and written about by journalists more and more. For example, a recent Associated Press article (i.e., Levy, 2019) reported that Pennsylvania lawmakers may enact legislation to support nuclear power plants in the state if provisions are included that seek to "impose limits and fees on carbon emissions, or expand on 15-year-old requirements to subsidize renewable energies, such as wind and solar power" (paragraph 4). Lawmakers are quoted in the article stating that their thinking is shaped by the crisis of climate change.
- Collaborate with colleagues, including outside of social studies, to plan and teach integrated units and lessons. (Even before this, simply talk with colleagues about climate change, its impacts, and its ties to any and all subject areas.)
- Friday in order to protest inaction on climate change in front of the United Nations (Kaplan, 2019). Thunberg and Villasenor are joined by youth around the world in movements such as
 - Study the 2017 Pennsylvania Supreme Court case *Pennsylvania Environmental Defense Foundation v. Commonwealth*, in which the Court upheld a broad interpretation of the environmental rights amendment (i.e., Article 1, Section 27) of the Pennsylvania Constitution (Phillips, 2017).
 - Explore public opinion polling about climate change (e.g., Brenan & Saad, 2018; Borenstein, 2016; Cama, 2016; Kamenetz, 2019; Mildenerger, et al., 2018).
 - Consider how some legislators in other U.S. states are seeking to prevent teachers and students from studying climate change in schools (Czajka, 2019).
 - Follow the case of *Juliana v. United States* (Our Children's Trust, 2019), in which 21 youth plaintiffs have brought a constitutional lawsuit against the U.S. federal government for its role in acerbating climate change. A recent segment on *60 Minutes* about the lawsuit provides an accessible audiovisual overview of the case as it works its way through the legal system (Kroft, 2019).
 - Examine other forms of youth activism related to climate change. Greta Thunberg, of Sweden, and Alexandria Villasenor, of the United States, are two of many youths around the world who are speaking out about, and taking action against, the crisis of climate change. Thunberg, as a 15-year-old, addressed government ministers from countries around the world at the 24th annual United Nations climate summit in Poland after, among other things, repeatedly skipping school to protest governmental inaction in front of the Swedish Parliament (Democracy Now!, 2018). The 13-year-old Villasenor began missing school each #FridaysForFuture and School Strike 4 Climate (Irfan, 2019). Perhaps host a classroom deliberation: Should students skip school to advocate for climate action?

Conclusion

Although global climate change is an immense problem that no single student, teacher, school, or district (or even state or country) will solve, it must be present in the social studies curriculum for students – citizens – to develop the capacity to work with others to address it. We fully acknowledge that social studies

teaching about climate change isn't easy, particularly as it is politically controversial as well as often framed solely as a science issue. However, social studies is founded on taking up the challenges of citizenship and democracy, including controversial issues, and this places attention to climate change (and climate justice) squarely in the midst of the social studies curriculum.

Figure 1

Map of Pennsylvania geographic school districts (shaded) with at least one teacher response to the survey.

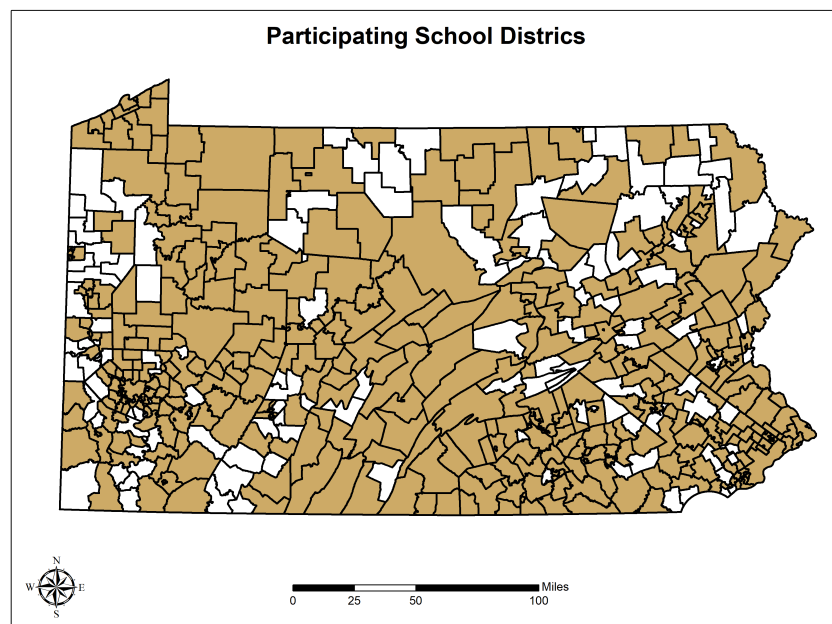


Table 1

Responses to statements about climate change.

	I agree	I disagree	I'm unsure	Number of responses
Climate change is occurring.	90.0%	3.1%	7.0%	1007
Climate change is a significant issue for human society.	85.6%	5.7%	8.7%	1008
Climate change is a significant issue for the wellbeing of the Earth.	85.9%	5.5%	8.6%	1009
Climate change is not an immediate threat.	12.7%	70.2%	17.1%	1007
Human activity is not the primary cause of climate change.	11.8%	69.2%	19.0%	1011

Note: Totals may not sum to 100% due to rounding.

Table 2

Frequency with which teachers said they would teach EI topics during the 2017-8 school year.

	Often	Occasionally	Never	Number of responses
Air and water pollution	9.0%	65.2%	25.9%	1025
Climate change	12.9%	64.7%	22.5%	1027
Food shortages	20.5%	62.0%	17.5%	1026
Fossil fuel extraction	11.0%	56.4%	32.6%	1026
Species extinction	5.4%	42.9%	51.8%	1026

Note: Totals may not sum to 100% due to rounding.

Table 3

Strongest associations between teacher characteristics and teaching about climate change often.

Teacher Characteristic	Percentage who would teach about climate change often*
Would teach about air and water pollution often*	70.7
Would teach about species extinction often*	65.5
Would teach about fossil fuel extraction often*	54.9
Teaches about environmental issues often	45.8
Would teach about food shortages often*	37.1
Connects teaching about environmental issues with racism often	31.5
Connects teaching about environmental issues with poverty often	26.4
Would teach about fracking in Pennsylvania*	25.8

Note: An asterisk () denotes teaching in the 2017-8 school year.*

Appendix: Climate Change Survey Questions

1. In my Social Studies teaching **this year**, I plan to teach about:

	Often	Occasionally	Never
Air and water pollution	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Class inequality	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climate change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food shortages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fossil fuel extraction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gender discrimination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Racism	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Species extinction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Please respond to each of the following statements:

	I agree	I disagree	I'm unsure
Climate change is occurring.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climate change is not an immediate threat.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Human activity is not the primary cause of climate change.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climate change is a significant issue for human society.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Climate change is a significant issue for the wellbeing of the Earth.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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