Unit 4 Culminating Project: Scientific Evidence for Anthropogenic Climate Change

Introduction

Your goal is to research a climate change topic and how scientific understanding of that topic has changed over time. You will work with a group to write a research paper about your topic and create a poster presentation similar to the posters that scientists prepare for research conferences. You will present your poster to the rest of the class and then lead a discussion about your topic. You will use the results of this discussion to write a summary of your topic that will be included in a class consensus report on climate change.

Research Paper Instructions

The research topic list includes required reading for each topic. The required reading includes background information on your topic as well as excerpts from the four Intergovernmental Panel on Climate Change (IPCC) assessment reports, which are known as AR1, AR2, AR3, AR4, and AR5. Each of the assessment reports summarizes the scientific consensus on climate change at the time the report was written. The reports were written in 1990 (AR1), 1995 (AR2), 2001 (AR3), 2007 (AR4), and 2014(AR5). The sixth assessment report, AR6, is scheduled to be completed in 2022. By reading the portions of each assessment report that focus on your topic, you will be able to explore how the scientific consensus on your topic has changed over time.

Each member of your group should read all of the assigned reading materials. You will probably need to read all of the materials more than once in order to fully investigate the differences between the four assessment reports. You can also choose to read additional documents related to your topic that you find in the library or online. Be careful with information you find online. It is important to only consult websites from reputable sources, such as government agencies or universities. There may be abbreviations or words that you do not understand in the documents that you are reading. Take time to look up the definitions online or in the IPCC AR5 glossary (https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_AnnexIII_FINAL.pdf). If you don’t know what an abbreviation stands for, look at the pages before your assigned reading section to find the meaning of the abbreviation.

Your group will write an 8-10 page double-spaced paper on your topic. This is a research paper, which means that it should include scientific citations. This means that every fact or statistic you write should be attributed to the source where you found the information. You’ll notice that the IPCC reports contain citations; use these reports as an example of how frequently you should be citing sources in your own paper. In your paper, cite only the four IPCC assessment reports (not the papers that are cited in these reports) and the other websites or documents that you have read. You will be using the APA citation style (http://owl.english.purdue.edu/owl/resource/560/1/). You don’t need to follow all of the paper formatting requirements listed on this website, but you do need to follow the guidelines for in-text citations (http://owl.english.purdue.edu/owl/resource/560/03/) and writing out the reference list at the end of your paper (http://owl.english.purdue.edu/owl/resource/560/08/) or
http://owl.english.purdue.edu/owl/resource/560/10/. Hint: treat the IPCC assessment reports as books with ‘IPCC’ as the author.

You can use abbreviations in your paper, but you have to define them the first time you use the abbreviation. For example:

“There are no ice shelves in the mainland United States (US), but there are ice shelves in the Arctic and Antarctica. The US assists other countries with research on these ice shelves. This research is documented in the Intergovernmental Panel on Climate Change (IPCC) assessment reports. The IPCC reports are written by US scientists in collaboration with scientists of other nationalities.”

Your paper should have five sections in the following order:

1. Abstract
   The abstract is a one paragraph summary of your entire paper. Even though it is located at the beginning of your paper, you should write this section last. The abstract should include: (1) 1-2 sentences introducing your topic and why it’s related to climate change, (2) 1 sentence describing each of the results detailed in the ‘Scientific Consensus Over Time’ section, (3) 1-2 sentences explaining the main results in the ‘Scientific Certainty’ section, and (4) 1-2 sentences describing your main conclusions. The abstract should be no more than 1000 words long.

2. Introduction
   The introduction should provide background information on your topic. When writing this section, pretend that your audience doesn’t know anything about your topic. Provide a lot of details about your topic and explain why it is related to anthropogenic climate change. This section should be 2-4 paragraphs.

3. Scientific Consensus Over Time
   This should be the longest section of your report, covering 4-6 pages. Show in detail how the scientific consensus on your topic has changed over time by describing the differences between the information in the four IPCC assessment reports.

   To do this, make a list of main concepts related to your topic. For example, if your topic is stratospheric ozone, your list of main concepts could be: (1) Arctic stratospheric ozone, (2) Antarctic stratospheric ozone, (3) seasonal variations in stratospheric ozone, (4) stratospheric ozone concentrations in the future, and (5) methods for measuring stratospheric ozone. Next, write a paragraph about each of these concepts explaining how the scientific consensus changed over time. For some of the concepts you choose, the earlier assessment reports will have no information about the concepts. This is not a problem; just make sure to document in your paper that the scientific community didn’t have a consensus on the topic until the later assessment reports.
4. Scientific Certainty

In this section of your report, describe the amount of scientific certainty about your subject, focusing on the information in the IPCC AR5 report. For example, you could focus on answering some of the following questions:

- How sure is the scientific community about the future trends related to your topic?
- Are there multiple explanations for what is occurring now or what will occur in the future?
- When you look at the graphs of data related to your topic, how large are the error bars?
- When statistics are quoted in AR5, what is the uncertainty in these numbers (what is the number after the ± sign)?

5. Conclusions

This 1-2 paragraph section should provide a broad overview of the main ideas detailed in your paper. For example, you could focus on answering some of the following questions:

- In general, how has scientific consensus on your topic changed over time?
- Is there more information on your topic now than there was in the past?
- In general, what are the future trends related to your topic and what is the uncertainty in those predictions?
- Are there areas where further research is needed?

6. References

This section should include the full citations for all of the sources you cited in your paper. See: http://owl.english.purdue.edu/owl/resource/560/08/ and http://owl.english.purdue.edu/owl/resource/560/10/). There should be a citation for each of the IPCC reports and for each of the other documents or websites you read.

Poster Instructions

After you finish the research paper, your group should prepare a poster summarizing the main points of your paper. You will use the poster to present your topic to the rest of the class. Be creative in how you present the information and make sure to include lots of pictures and graphs. If you include any of the graphs or pictures from the IPCC reports or other online sources, make sure to cite the source of those graphics on the poster. (For example, write (IPCC AR4, 2007) next to a plot copied from the fourth IPCC assessment report.) At a minimum, your poster should contain: a title, your names, background information on your topic, the main points from the ‘Scientific Consensus Over Time’ and ‘Scientific Certainty’ sections of the report, and the main points from your ‘Conclusions’ section.

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**Presentation Instructions**

Your group will have approximately 30 minutes to present your topic to the rest of the class. During the first 20 minutes, describe your topic to the class and point to the relevant graphs or pictures on your poster as you describe them. During the final 10 minutes, you must lead the class in a discussion about what concepts around your topic need further research in the future. Ask the class questions like, “what concepts are least clear or least certain about this topic?” or “do you have ideas about what other information scientists need to better understand this topic?”. There are no wrong answers! Take notes on the ideas that the class comes up with, because you’ll need these to write your section of the class consensus report.

**Consensus Report Instructions**

Each group will contribute a 1-2 page summary of their topic for the class consensus report. Use the provided template to create your summary for the consensus report. There are two main sections of the summary: (1) the abstract, which is exactly the same as the abstract in your research report, and (2) a bulleted list of areas of future research on your topic, which should be a summary of the ideas brainstormed by the class during your presentation. Each bullet should be 1-2 sentences describing the area of future research and why it is important.