Connecting Cultures, Exploring Science:

Webcast Lesson Plans

QATAR FOUNDATION INTERNATIONAL, LLC
Member of Qatar Foundation عضو في مؤسسة قطر

GLOBAL NOMADS GROUP

Lesson Plan Overview	
TIME 2.5 Hours of Activity Time; 1 Hour Webcast	**GRADE LEVEL** 9-12
MATERIALS: Blank white paper, Internet access, copies of readings and worksheets for students, posters, addresses of decision makers	
STANDARDS: Refer to the GNG website (www.gng.org) for standards covered by GNG curricula.	
Lesson Overview	
In **Learn**, students review causes and effects of climate change and become interactive online participants of the Connecting Cultures, Exploring Science: Road to Doha webcast. In **Act**, students work together to create an international climate change proposal to present at the 2014 United Nations Climate Summit. In **Reflect**, students write a position statement on climate change to mail to a government official.	
Background	
The Environmental Protection Agency (EPA) defines climate change as any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, wind patterns, or weather events that occur over several decades or longer. [1] According to the World Meteorological Organization (WMO), 2013 was among the top ten warmest years since 1850 when modern records began. It tied with 2007 as the sixth warmest year, with a global land and ocean surface temperature that was .85°F higher than average. [2] ***How does global warming affect humans?***	
Learning Objectives and Outcomes	
Learning Objectives ▪ Students make predictions about how climate change will affect humans ▪ Students participate in a cross-cultural communication, sharing thoughts with international peers regarding how climate changes affect humans ▪ Students research adaptations and mitigation strategies to present a viable solution to climate change ▪ Students express personal position on climate change to a public official	**Learning Outcomes** ▪ Students understand the complex relationship between humans and the environment ▪ Students have a well-rounded knowledge of the science and politics of climate change, and are able to actively engage in conversations on climate change. ▪ Students analyze various solutions to a multifaceted problem ▪ Students evaluate their own views of a global issue

	Activity	Pages	Estimated Time
Learn	Jigsaw and Quiz Webcast	Pg. 3-9 Pg. 10	60 minutes 60 minutes
Act	International Climate Change Proposals	Pg. 11-15	60 minutes
Reflect	Position Statement on Climate Change	Pg. 16	30 minutes

[1] Environmental Protection Agency. 2010. Climate Change Indicators in the United States, Washington, DC. EPA 430-R-10-007. pp. 74.
Accessed on March 7, 2014 at http://www.epa.gov/climatechange/indicators.html.
[2] World Meteorological Organization. N.d. Causes of Climate Change. Accessed on March 20, 2014 at http://www.wmo.int/pages/themes/climate/causes_of_climate_change.php

Learn

Part 1: Effects of Climate Change

TIME:	MATERIALS
60 Minutes- Jigsaw	Blank white paper; Copies or readings for students; Internet access

OVERVIEW

Students assess their climate change knowledge by taking a brief quiz, then partner to participate in a jigsaw activity to learn more about climate change impacts. They then teach mini-lessons to a group of their peers.

INSTRUCTIONS

Introduction: The Environmental Protection Agency defines climate change as any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, wind patterns, or weather events that occur over several decades or longer.[3] According to the World Meteorological Organization (WMO), 2013 was among the top ten warmest years since 1850 when modern records began.[4] How does climate change affect you?

Activity 1: Climate Change Quiz on page 4 *(Answers: 1. C 2. B 3. D 4. C 5. D)*

Activity 2: Jigsaw Activity[5]

a. Students count off from one to five and then find one other partner with the same number.

b. Teacher will distribute one reading for each pair. Readings on pages 5-9.

c. Partners will cooperatively review their reading and identify ways to teach a mini-lesson on the reading topic to their classmates. The mini-lesson should include an explanation of the visuals that accompany their reading. Students will also need to include in their lesson a prediction and an original visual that will be used to help explain the concepts of their reading.

d. Upon reviewing the material, each pair will draw a prediction on 1) how their given topic will impact humans and 2) how humans will need to adapt as a result. For example, students who read the passage about rising sea levels may predict that coastal regions and cities will flood and populations living in those areas will have to relocate.

e. Pairs split and students will find a new partner with the same number to work with. These new pairs share with each other the lesson they prepared with their first partner, including the prediction and original visual. These new partners will then give each other feedback on aspects of their lesson that were especially good. Each can then decide to incorporate certain aspects of the partner's lesson into his/her lesson to strengthen it.

f. Next, students will sit in groups that comprise of one student with each number (There should be one student from each of the five readings in each group). Starting with the student who completed reading 1, students will teach their lessons to the other students in their group.

g. The teacher will pick one student from each group to share his or her prediction and visual with the class.

h. Teacher will wrap up the activity by reviewing topics using interesting facts and additional visuals, and asking questions that require a whole group discussion.

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[3] Environmental Protection Agency. 2010. Climate Change Indicators in the United States, Washington, DC. EPA 430-R-10-007. pp. 74. Accessed on March 7, 2014 at http://www.epa.gov/climatechange/indicators.html.

[4] World Meteorological Organization. N.d. Causes of Climate Change. Accessed on March 20, 2014 at http://www.wmo.int/pages/themes/climate/causes_of_climate_change.php.

[5] Adapted from Andre, E. (2009). *Citizen climate lesson plans grades 9-12*. Will Steger Foundation.

Climate Change Quiz[6]

1. Scientists think that in the next 100 years global warming will cause water levels in oceans to:

A. Decrease at least 100 cm
B. Stay the same
C. Increase by between 15 and 95 cm

2. Kenya is the world's fourth largest tea producer and its second biggest exporter. If temperatures rise by 2°C, what would happen to tea growers in Kenya?

A. They would be able to grow more tea in more parts of the country
B. Many of the areas where they grow tea would become unsuitable for tea growing
C. They would be able to grow better quality tea

3. What are scientists warning might become a bigger worldwide problem in the next 50 years, as the climate warms?

A. Increase in annual average precipitation
B. Melting polar ice caps
C. West Nile Virus (a disease spread by the bite of a mosquito)
D. All of the above

4. How many people are killed by weather related natural disasters each year?

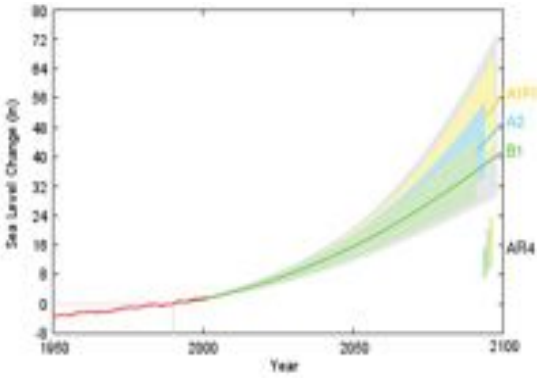
A. 5,000
B. 10,000
C. 60,000
D. 100,000

5. How can climate change potentially affect international relations?

A. The area where malaria can develop will double
B. Nations will work together collaboratively to reduce the effects of pollution on climate change
C. Conflict will emerge over natural resources such as water
D. Both B and C are correct

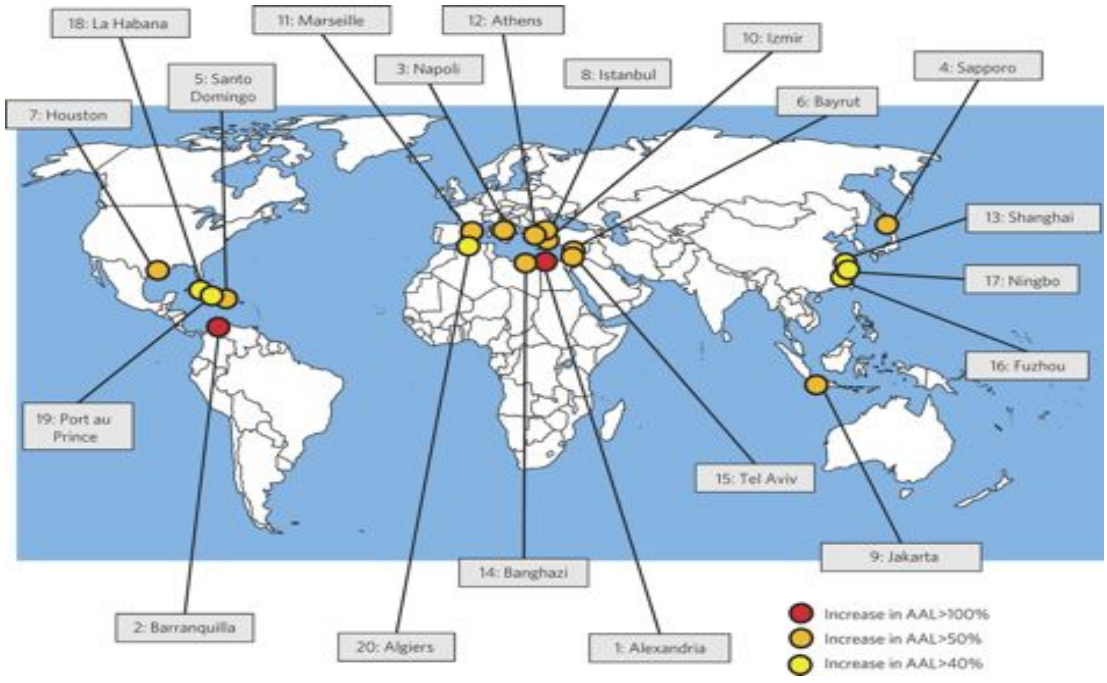
[6] Adapted from Oxfam, (n.d.). Climate Change: The Human Impact. Accessed on March 7, 2014 at http://www.oxfam.org.uk/education/resources/climate-change-the-human-impact.

Reading 1: Rising Sea Levels[7]



Since 1870, global sea level has risen by about 45.72 cm (eight inches). Scientists believe that global warming in the next 100 years will cause water levels in oceans to continue to rise between 15 and 95 cm (that's more than three feet!) as a result of the melting of the Earth's ice. This would mean serious habitat loss and upheaval for coastal people, some islands and low-lying countries would even disappear. Warming temperatures contribute to sea level rise by: expanding ocean water; melting mountain glaciers and ice caps; and causing portions of the Greenland and Antarctic ice sheets to melt or flow into the ocean. The graph above shows a Projection of sea level rise from 1990 to 2100, based on three different emissions scenarios. Also shown: observations of annual global sea level rise over the past half century (red line), relative to 1990. Source: NRC 2010

Ice loss from the Greenland and Antarctic ice sheets could contribute an additional foot of sea level rise. Regional and local factors will influence future relative sea level rise for specific coastlines around the world. For example, relative sea level rise depends on land elevation changes that occur as a result of subsidence (sinking) or uplift (rising). Assuming that these historical geological forces continue, a 2-foot rise in global sea level by 2100 would put the following cities at risk for flooding or complete submersion. Source: Washington Post



[7] Environmental Protection Agency. 2010. Coastal Areas. Accessed on March 7, 2014 at http://www.epa.gov/climatechange/impacts-adaptation/coasts.html.

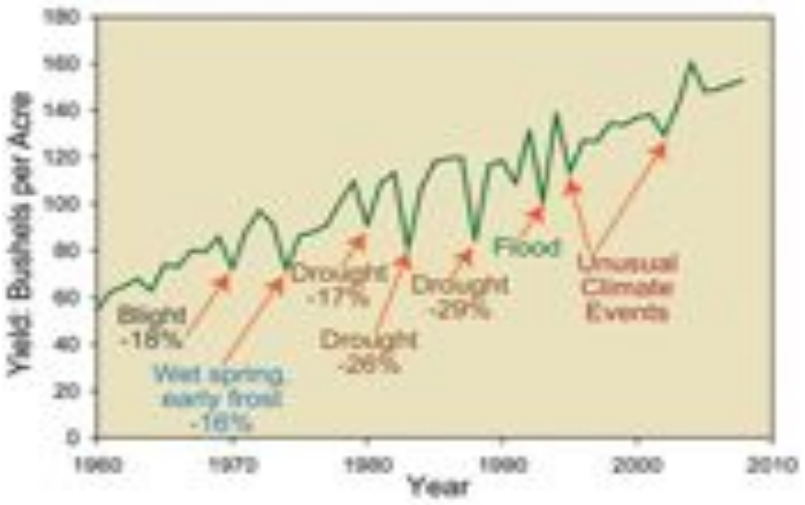
Reading 2: Economic Impact[8]

Sea level rise, floods, droughts, wildfires and extreme storms caused by climate change require extensive repair of essential infrastructure such as homes, roads, bridges, railroads, airports, power lines, dams, levees and sea walls. Coping with these events and rebuilding after a disaster is extremely costly for governments and many of the consequences are irreversible.

Climate change can also lead to a disruption of daily life including work, school, trade, transportation, agriculture, fisheries, energy production and tourism. Agriculture and fisheries are highly dependent on specific climate conditions. Increases in temperature and carbon dioxide (CO_2) can be beneficial for some crops in some places. But to realize these benefits, nutrient levels, soil moisture, water availability, and other conditions must also be met. Changes in the frequency and severity of droughts and floods could pose challenges for farmers and ranchers. Meanwhile, warmer water temperatures are likely to cause the habitat ranges of many fish and shellfish species to shift, which could disrupt ecosystems. Overall, climate change could make it more difficult to grow crops, raise animals, and catch fish in the same ways and same places as we have done in the past.

If temperatures rise by 2 degrees C, many areas of the world would become drier and hotter making conditions unsuitable for growing crops. In Kenya, for example, over 400,000 small farmers grow 60 percent of the tea that is produced by the country. These farmers would not be able to pay for new irrigation systems to adapt to climate change. Their source of income would disappear if they were unable to continue farming.

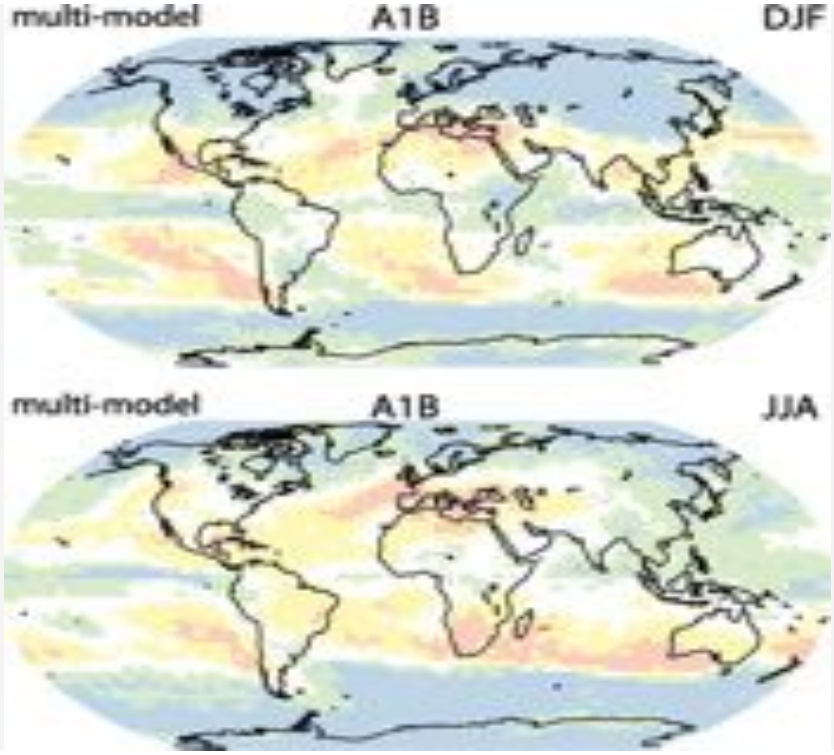
The graph below illustrates that despite technological improvements that increase corn yields, extreme weather events have caused significant yield reductions in some years.
Source: USGCRP (2009)



[8] Environmental Protection Agency. 2010. Climate Change Indicators in the United States, Washington, DC. EPA 430-R-10-007. pp. 74. Accessed on March 7, 2014 at http://www.epa.gov/climatechange/indicators.html.

Reading 3: Extreme Weather[9]

Patterns of precipitation and storm events, including both rain and snowfall are likely to change and vary by season and region. Some regions may have less precipitation, some may have more precipitation, and some may have little or no change. Climate models project the following precipitation and storm changes. Global precipitation projections for December, January, and February (top map) and June, July, and August (bottom map.) Blue and green areas are projected to experience increases in precipitation by the end of the century, while yellow and pink areas are projected to experience decreases. Source: Christensen et al. 2007



Key Global Projections

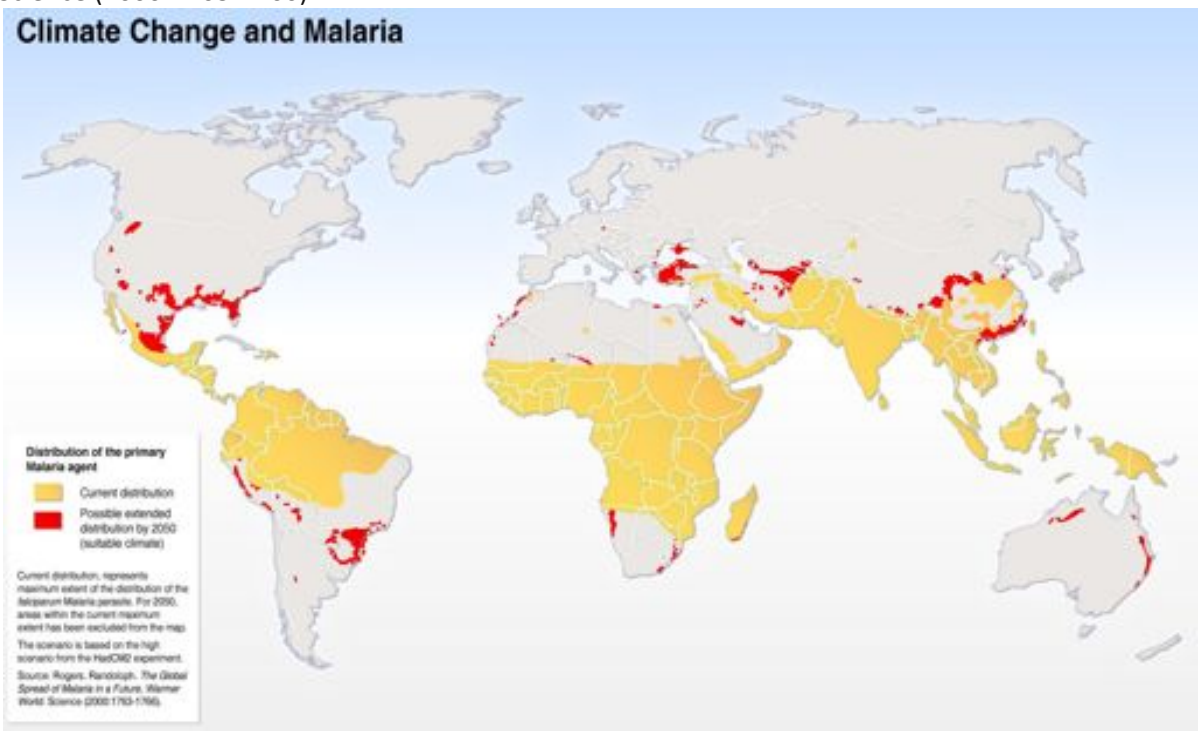
- Global average annual precipitation through the end of the century is expected to increase.
- The intensity of precipitation events will likely increase on average in tropical and high-latitude regions.
- The strength of the winds and amount of precipitation associated with tropical storms is likely to increase.
- The intensity and frequency of cyclones is likely to increase as the ocean warms. Climate models project that for each 1.8°F increase in tropical sea surface temperatures the rainfall rates of hurricanes could increase by 6-18% and the wind speeds of the strongest hurricanes could increase by about 1-8%. [1]
- The strongest cold-season storms are projected to become stronger and more frequent.

[9] Environmental Protection Agency. 2010. Weather and Climate. Accessed on March 7, 2014 at http://www.epa.gov/climatechange/science/indicators/weather-climate/index.html.

Reading 4: Health Impact[10]

Global warming will increase the number of floods, rising temperatures and drought, all of which are factors in disease transmission. Climate change could also potentially affect disease-causing agents, called pathogens, which can be transmitted through food, water, and animals such as deer, birds, mice, and insects.

Higher air temperatures can increase cases of salmonella and other bacteria-related food poisoning because bacteria grow more rapidly in warm environments. Flooding and heavy rainfall can cause overflows that contaminate freshwater sources and certain food crops. Mosquitoes and other vectors (disease carriers) favor warm, wet climates and can spread diseases such as Malaria and the West Nile virus. The map below illustrates the potential distribution of Malaria across the globe both now and in the year 2050. Source: Rogers, Randolph. The Global Spread of Malaria in a Future, Warmer World Science (2000-1763-1766).



[11]Other linkages exist between climate change and human health. For example, changes in temperature and precipitation, as well as droughts and floods, will likely affect agricultural yields and production. In some regions of the world, these impacts may compromise food security and threaten human health through malnutrition. The worst of these effects are projected to occur in developing countries, among vulnerable populations.

[10] World Health Organization. (2013). Climate Change and Health. Accessed on March 14, 2014 at http://www.who.int/mediacentre/factsheets/fs266/en/.
[11] United States Environmental Protection Agency. (n.d.). *Climate Impacts on Human Health.* Accessed March 17, 2014. http://www.epa.gov/climatechange/impacts-adaptation/health.html.

Reading 5: International Relations[12]

Although climate change is an inherently global issue, the impacts are not felt equally across the planet. Impacts are likely to differ in both size and rate of change in different continents, countries and regions. Some nations will likely experience more adverse effects than others. Other nations may benefit from climate changes. The capacity to adapt to climate change can influence how climate change affects individuals, communities, countries and the global population. Climate change will also affect individuals and groups differently. Certain groups of people are particularly sensitive to climate change impacts such as the elderly, sick, children and low-income populations.

Climate change has the potential to exacerbate national security issues and increase the number of international conflicts. Many concerns revolve around the use of natural resources, such as water. In many parts of the world water issues cross national borders. Access to consistent and reliable sources of water in these regions is greatly valued. Changes in the timing and intensity of rainfall would threaten already limited water sources and potentially cause future conflicts. Threatened food security in parts of Asia and sub-Saharan Africa could also lead to conflict. Rapid population growth and changes in precipitation and temperature, among other factors, are already affecting crop yields. Resulting food shortages could increase the risk of humanitarian crises and trigger population migration across national borders, ultimately sparking political instability. Water scarcity led to tensions in southern Kazakhstan. Aid organizations responded by increasing access to drinking water and irrigation. Source: USAID

Global environmental change issues raise the question of international cooperation and collaboration to overcome the problems associate with them. Since no country, by itself, would be able to substantially influence the climate system, international cooperation is sought to overcome this collective goods problem, however, many countries disagree about how to reduce pollution. [13]

[12] United States Environmental Protection Agency. (n.d.). *Climate Impacts on Global Issues.* Accessed March 17, 2014. http://www.epa.gov/climatechange/impacts-adaptation/international.html.
[13] Sprinz and Luterbacher. (n.d.). International Relations and Global Climate Change. *Postdam Institute For Global Climate Change*. . https://www.pik-potsdam.de/research/publications/pikreports/.files/pr21.pdf (accessed March 17, 2014).

Part II: Webcast	
TIME 60 minutes	**MATERIALS** Internet Connection; Google + Account; Projector; Speakers

OVERVIEW
Students participate as an active audience for the Connecting Cultures, Exploring Science: Road to Doha webcast.

Introduction: The Connecting Cultures, Exploring Science webcast series connects both a live and virtual youth audience to a panel of guest experts to explore a variety of climate change related topics. In these sixty-minute, live-streamed events produced and hosted by students, a diverse panel is brought together to deliberate some of the most pressing environmental issues of our time. Virtual audience members can pose questions to the panel– in real-time– as they view the program through the live-stream. In addition, the virtual audience can interact with one another through a chat room forum, moderated by GNG staff.

Preparing for the webcast: New to Google+? If this is your first time viewing a Google Hangout On Air program, please review the official Google Welcome Guide: Connected Classroom educators. Be sure you have the following technology:

- Google+ Account
- Reliable high-speed internet connection
- Projection system to display the Hangout On Air for students or individual tablet with G+ Hangout on Air App installed
- Speakers

Tentative Program Outline:

- Segment 1: Introduction
- Segment 2: Health
- Segment 3: Weather
- Segment 4: Conclusion

While Participating in the Webcast:

- Have students share the questions they have for the panel on the Google+ page
- Have students interact with other webcast viewers in the chat room forum

Following the Webcast:

- Debrief with students on the conversation and share reflections on the Google+ page

Act

International Climate Change Proposal

TIME	MATERIALS
60 minutes	International Climate Change Proposal Guide; Posters; Internet access

OVERVIEW

Students work together to create a proposal to present for the United Nations Climate Summit planned to take place in September 2014 in New York City, United States.

INSTRUCTIONS

Introduction: The 1997 Kyoto Protocol was the most recent effort at international agreements to slow climate change. The treaty aimed to reduce global greenhouse gas emissions to safe levels using reduction targets that were legally binding for developed nations. The United States and many other countries refused to sign the treaty because it would negatively affect economic productivity. [14]

As part of a global effort to mobilize action on climate change, United Nations Secretary-General Ban Ki-moon is inviting Heads of State and Government along with business, finance, civil society and local leaders to a Climate Summit in September 2014 in New York City. The purpose of the summit is to collaborate on substantial, scalable, and replicable solutions that would help the world shift towards a low-carbon economy. [15]

The Summit will take place one year before countries aim to conclude a global climate agreement in 2015 through the United Nations Framework Convention on Climate Change. Although the 2014 Climate Summit is not part of the negotiating process the Secretary General hopes to use the summit to build a strong consensus to anchor successful negotiations and sustained progress on the road to reducing emissions and strengthening adaptation strategies.

Today you are going to plan a presentation for the Global Climate Summit.

Activity: International climate negotiations

a. Students will work independently to summarize the issue they read about in the Learn activity (Rising Sea Levels, Economic Impact, Extreme Weather, Health Impact, International Relations) and to predict what will happen if their issue is not addressed.

b. Students will work together in groups according to the readings they completed in the Learn activity (Rising Sea Levels, Economic Impact, Extreme Weather, Health Impact, International Relations) to research ways to adapt to and mitigate their issue.

Sources:

- Gateway to United Nations Systems Work on Climate Change: http://www.un.org/climatechange/
- United States Environmental Protection Agency: http://www.epa.gov/climatechange/impacts-

[14] PIK. (n.d.). International Relations and Global Climate Change. *Potsdam Institute for Climate Impact Research*. https://www.pik-potsdam.de/research/publications/pikreports/.files/pr21.pdf.

[15] United Nations. (n.d.). *Gateway to the United Nations System Work on Climate Change*. Accessed March 17, 2014. http://www.un.org/climatechange/.

adaptation/
- United Nations Framework Convention on Climate Change: https://unfccc.int/2860.php
- United Nations Environment Program: http://www.unep.org/climatechange/mitigation/

c. Students will combine their knowledge of mitigation and adaptation strategies to create a presentation for the 2014 United Nations Climate Summit in New York City. Students will use a power point or poster to present their information. Groups should be prepared to answer questions at the end of their presentation.
Presentations must include:

- A description of your issue
- A proposal for an adaptation to the issue
- A proposal for a mitigation strategy
- Visuals (Pictures, graphs, charts, etc)

d. Group Presentations should be made to the class. Students are encouraged to ask thoughtful questions about the content of each presentation

Closing: Close lesson with a discussion of the following questions.
1. Are adaptations more beneficial or harmful?
2. Can global warming be stopped?
3. What can you do to influence your government to commit to a low-carbon economy?

International Climate Change Proposal Guide

Issue

Work independently to complete this section.

1. What issue did you read about in the Learn activity? *(Rising Sea Levels, Economic Impact, Extreme Weather, Health Impact, International Relations)*

2. In 5 to 8 sentences summarize your issue:

_____
_____
_____
_____
_____
_____
_____
_____
_____

3. Predict what will happen if this issue is not addressed:

_____
_____
_____
_____
_____

Research

Work with a group to research potential **adaptations** and **mitigations** for your issue. You will work together in groups according to the issue you read about during the Learn activity (Rising Sea Levels, Economic Impact, Extreme Weather, Health Impact, International Relations)

Adaptation[16]**:** The process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. Efforts around the world range from building dams to storm early warning systems.

Mitigation[17]**:** The efforts to reduce or prevent emission of greenhouse gases. Mitigation can mean using new technologies and renewable energies, making older equipment more energy efficient, or changing management practices or consumer behavior. Efforts around the world range from high-tech subway systems to bicycling paths and walkways.

Here are some helpful resources to get you started:
-Gateway to United Nations Systems Work on Climate Change: http://www.un.org/climatechange/
-United States Environmental Protection Agency: http://www.epa.gov/climatechange/impacts-adaptation/
-United Nations Framework Convention on Climate Change: https://unfccc.int/2860.php
-United Nations Environment Program: http://www.unep.org/climatechange/mitigation/

[16] Intergovernmental Panel on Climate Change. (2012). Summary for Policymakers. *Managing the Risks of Extreme Events and Disasters to Advance*. Accessed March 17, 2014. http://ipcc-wg2.gov/SREX/report/.

[17] Climate Change Adaptation [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK, and New York, NY, USA, pp. 1-19.

Adaptation

1. Identify one adaptation humans can use to deal with your issue (EX: Extreme Weather-building dams to adapt to floods).
2. Explain how this adaptation will benefit humans:

_____
_____
_____

3. Explain the possible negative impacts this adaptation could have:

_____
_____
_____

4. Is there an alternative adaptation humans could use that would be more beneficial? If no, explain why this is the best adaptation. If yes, what is the alternative and why is it better?

_____

Mitigation

1. Identify one mitigation strategy that is a viable solution to climate change.

2. Explain why you chose this mitigation strategy. What are the advantages?

_____
_____
_____

3. Identify a potential objection to this mitigation strategy. Explain.

_____
_____
_____

4. Do adaptations OR mitigation strategies have a positive effect on climate change? Explain.

_____
_____

Presentation

Based on your research, work with your group to create a proposal to present at the United Nations Climate Summit. You will use a power point or poster to present your information. Be prepared to answer questions at the end of your presentation.

Presentations must include:

- A description of your issue and how it negatively impacts humans
- A proposal for an adaptation to the issue
- A proposal for a mitigation strategy
- Visuals (Pictures, graphs, charts, etc)

Reflect

Position Statement on Climate Change

TIME:	**MATERIALS:**
30 Minutes	Addresses of decision-makers

OVERVIEW:
Students will create a position statement on climate change.

INSTRUCTIONS

Introduction:
In a democratic society, our elected representatives have a duty to listen to their constituents' opinions. One of the most effective ways to make your opinion heard is to write a letter. Students in this class have a powerful voice in the issue of climate change. After completing the previous activities and webcast on climate change, you know more about the issue than most people. Your knowledge of the issue will allow you to write a well-informed and persuasive letter. You are young, and climate change mitigation decisions being made right now will affect the rest of your life. [18]

Activity: Writing a Position Statement on Climate Change

Your position can be based on personal opinion but it must be supported with specific evidence as examples. Examples can come from the webcast, past lessons, or your own research. Use at least three pieces of supporting evidence for each point. This indicates that you have a good understanding of the topic.

The following tips will help you write a powerful letter to a decision maker:

- Keep it short. Limit your letter to one page and one issue
- Identify yourself and the issue. In the first paragraph of your letter state who you are and what issue you are writing about.
- Focus on your main points. Choose the three strongest points to support your argument and develop them clearly. Too much information can distract from your position.
- Make it personal. Tell your decision maker why the issue matters to you and how it affects you, your family, and your community.
- Ask for a reply. Include your name and address on both your letter and envelope. Be polite and take a firm position in your letter.

[18] Adapted from Andre, E. (2009). *Citizen climate lesson plans grades 9-12*. Will Steger Foundation.