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CLIMATE CHANGE SOLUTIONS

6th-12th Grade Discussion Guide

Developed by: Joseph Kanke

SCIENCE CATEGORIES
Technology, Environmental Science

TIMEFRAME
4-6 classes if writing is done in class

MATERIALS
Laptops for research, chart paper

KEY WORDS
Energy Efficiency, Carbon Emissions, Clean Energy, Fossil Fuels, Built-In Environment, Evaporation, Condensation

LEARNING OBJECTIVES

Students will be able to:

• Identify causes and possible solutions for climate change;

• Write explanatory/Informative text about possible climate solutions;

• Determine how they, as individuals, can do to slow climate change.

ACTIVITY SUMMARY

This lesson will look at the causes of climate change and what solutions currently exist to slow or stop it. Students will also consider what role they can play to reduce their own effects on climate change.

Students will generate a comprehensive list of causes of climate change as well as solutions to climate change. Collaboratively, students will dig into climate change and consider the border spectrum of implementing climate solutions.

Students will then choose a climate solution to investigate more deeply and construct an informative/explanatory text. Finally, students will summarize their findings in a digital media presentation of their choosing.

Into the Outdoors

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VOCABULARY

ENERGY EFFICIENCY: used to describe things that use only as much energy as is needed without wasting any.

CARBON EMISSIONS: carbon dioxide that planes, cars, factories, etc. produce, thought to be harmful to the environment

CLEAN ENERGY: energy derived from renewable, zero-emissions sources ("renewables"), as well as energy saved through energy efficiency measures.

FOSSIL FUELS: a natural fuel such as coal or gas, formed in the geological past from the remains of living organisms.

PHOTOVALTAIC: is an electrical device that converts the energy of light directly into electricity

BUILT-IN ENVIRONMENT: the man-made or modified structures that provide people with living, working, and recreational spaces.

CONDENSATION: the conversion of a vapor or gas to a liquid.

EVAPORATION: the process by which a liquid turns into a gas.

BACKGROUND INFORMATION

Global climate change is a concern of highest importance shared by everyone. In part, global climate change, and specifically global warming are due to carbon emissions and other greenhouse gases in the atmosphere which trap solar rays and cause the climate to heat up. In an attempt to mitigate a warming globe many countries have set goals to reduce carbon emissions to 0 by 2050 (Paris Climate Agreement).

Businesses, educators, scientists and citizens can all play a role in reducing emissions and slowing climate change. By switching to more clean energy, renewable resources including solar, wind and hydroelectric power, less waste and carbon emissions will be generated. Another action is to use less energy by switching ot energy efficient innovations which use less electricity such as LED lightbulbs, faucet aerators and Energy Star appliances.

There are also many new technologies that are developed and being developed to reduce or eliminate the use of fossil fuels. Some examples include: electric vehicles, electric lawnmowers and Air Source Heat Pumps.

LEARNING PROCEDURE

INTRODUCTION:

Introduction: (1-3 short paragraphs directing educators to introduce students to the concept/subject by leading a discussion or brainstorming session related to the critical question)

Critical Questions: What solutions currently exist to stop or slow climate change? What can you do?

Round Robin Activity: Instruct students that they will have one minute to write as many examples as they can of what contributes to global climate change. These examples can come from both the video and prior knowledge. At the end of the minute, begin at one side of the room and ask a student to share one unique example from their list. Instruct students that if they have the same example on their list they should place a star by it, and if they don't have it on their list, they should add it. Continue around the room and allow students to add UNIQUE examples. If a student doesn't have a unique example to share, they may pass.

As students read their examples the educator may want to capture them on a large chart paper or the board to act as anchor charts.

Repeat the same activity and process as above but this time instruct students to write examples of climate solutions.

Again, the educator will want to capture responses on an anchor chart. It will be used in the concluding activity.

ACTIVITY 1:

Start to get students thinking deeply about climate change solutions. Ask students to make groups of four and assigning each group a different example from the class-generated list of possible climate change solutions. Students will collaboratively propose answers to the following:

1. What are some potential unintended benefits beyond slowing/stopping climate change to enacting these solutions?

2. What are some potential barriers to people pursuing these solutions more broadly?

3. Is this solution something your family could realistically commit to? Why or why not? Could the school commit to this? Why or why not? Could the broader community commit to this? Why or why not?

Ask a group representative(s) to briefly share.

ACTIVITY 2: Interpretive Panel Review

Students will choose a climate change solution to explore deeper. Students should be instructed to write an informative/explanatory text to examine a climate soloution and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

Students may also include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

Additionally, following the completion of their written text. Instruct students to formulate a summary of their findings. The summary may take any form (poster, PowerPoint, Video, Podcast, etc) but should be no longer than five minutes in length.

Have students share their projects with their classmates and families.

CONCLUSION:

Revisit the list of climate solutions that was generated at the start of the unit. Ask if there are any additions to make. Work through the list and ask students to consider which of the things on the list are within their own control of doing (turing of lights/video games when not in use). Mark these with a capital C. Ask students which might be in the sphere of control, meaning they couldn't do them on their own (example having a discussion with their guardians regarding switching to an energy efficient appliance). Mark these with a capital I. Ask students to choose one example marked with a C and one marked with an I and write in their journals how they will commit to changing one act and influencing another.

EXTENDING THE LESSON (Options for extended/additional activities and lessons)

- Have students take inventory of what their families are already doing to reduce their energy use and what more they could do. Students write proposals to present to their families.

- Students develop commercials which explore climate change and attempt to persuade people to change their habits.

- Students research climate change jobs that exist (or may exist in the future) and present a mock job fair representing their chosen career.

- Present the idea of carbon footprint and ask students to roughly calculate their current carbon footprint and what they could do reduce it.

- Groups of students use their knowledge of narrative text to develop children's books on climate change. Schedule a visit to the nearest elementary to share stories.

RELATED LINKS

- Wiscsonin Initiative on Climate Change Impacts: wicci.wisc.edu/wisconsin-climate-trends-and-projections/

- Climate Impact Changes in Wisconsin DNR: dnr.wisconsin.gov/climatechange/impacts

- Carbon Footprint Calculator: carbonfootprint.com/calculator.aspx

- Tackle Climate Change: nature.org/en-us/what-we-do/our-priorities/tackle-climate-change/

The following National Common Core Standards can be met teaching;

CLIMATE CHANGE SOLUTIONS

6TH GRADE:

CCSS.ELA-LITERACY.RI.6.1	Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-LITERACY.RI.6.2	Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
CCSS.ELA-LITERACY.RI.6.3	Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).
CCSS.ELA-LITERACY.RI.6.7	Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
CCSS.ELA-LITERACY.W.6.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
CCSS.ELA-LITERACY.W.6.2.A	Introduce a topic; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
CCSS.ELA-LITERACY.W.6.2.B	Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.
CCSS.ELA-LITERACY.W.6.2.C	Use appropriate transitions to clarify the relationships among ideas and concepts.
CCSS.ELA-LITERACY.W.6.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.
CCSS.ELA-LITERACY.W.6.2.E	Establish and maintain a formal style.
CCSS.ELA-LITERACY.W.6.2.F	Provide a concluding statement or section that follows from the information or explanation presented.
CCSS.ELA-LITERACY.SL.6.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.
CCSS.ELA-LITERACY.SL.6.2	Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.
CCSS.ELA-LITERACY.SL.6.4	Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.
CCSS.ELA-LITERACY.SL.6.5	Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.

7TH GRADE:

CCSS.ELA-LITERACY.RI.7.1	Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-LITERACY.RI.7.2	Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text.

CCSS.ELA-LITERACY.RI.7.3	Analyze the interactions between individuals, events, and ideas in a text (e.g., how ideas influence individuals or events, or how individuals influence ideas or events).
CCSS.ELA-LITERACY.W.7.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
CCSS.ELA-LITERACY.W.7.2.A	Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
CCSS.ELA-LITERACY.W.7.2.B	Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.
CCSS.ELA-LITERACY.W.7.2.C	Use appropriate transitions to create cohesion and clarify the relationships among ideas and concepts.
CCSS.ELA-LITERACY.W.7.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.
CCSS.ELA-LITERACY.W.7.2.E	Establish and maintain a formal style.
CCSS.ELA-LITERACY.W.7.2.F	Provide a concluding statement or section that follows from and supports the information or explanation presented.
CCSS.ELA-LITERACY.SL.7.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
CCSS.ELA-LITERACY.SL.7.4	Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
CCSS.ELA-LITERACY.SL.7.5	Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.

8TH GRADE:

CCSS.ELA-LITERACY.RI.8.1	Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-LITERACY.RI.8.2	Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.
CCSS.ELA-LITERACY.RI.8.3	Analyze how a text makes connections among and distinctions between individuals, ideas, or events (e.g., through comparisons, analogies, or categories).
CCSS.ELA-LITERACY.W.8.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
CCSS.ELA-LITERACY.W.8.2.A	Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
CCSS.ELA-LITERACY.W.8.2.B	Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
CCSS.ELA-LITERACY.W.8.2.C	Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
CCSS.ELA-LITERACY.W.8.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.

CCSS.ELA-LITERACY.W.8.2.E	Establish and maintain a formal style.
CCSS.ELA-LITERACY.W.8.2.F	Provide a concluding statement or section that follows from and supports the information or explanation presented.
CCSS.ELA-LITERACY.W.8.3	Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.
CCSS.ELA-LITERACY.W.8.3.A	Engage and orient the reader by establishing a context and point of view and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically.
CCSS.ELA-LITERACY.W.8.3.B	Use narrative techniques, such as dialogue, pacing, description, and reflection, to develop experiences, events, and/or characters.
CCSS.ELA-LITERACY.W.8.3.C	Use a variety of transition words, phrases, and clauses to convey sequence, signal shifts from one time frame or setting to another, and show the relationships among experiences and events.
CCSS.ELA-LITERACY.W.8.3.D	Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events.
CCSS.ELA-LITERACY.W.8.3.E	Provide a conclusion that follows from and reflects on the narrated experiences or events.
CCSS.ELA-LITERACY.SL.8.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
CCSS.ELA-LITERACY.SL.8.4	Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.
CCSS.ELA-LITERACY.SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

9TH-10TH GRADE:

CCSS.ELA-LITERACY.RI.9-10.1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-LITERACY.RI.9-10.2	Determine a central idea of a text and analyze its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.
CCSS.ELA-LITERACY.RI.9-10.3	Analyze how the author unfolds an analysis or series of ideas or events, including the order in which the points are made, how they are introduced and developed, and the connections that are drawn between them.
CCSS.ELA-LITERACY.W.9-10.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
CCSS.ELA-LITERACY.W.9-10.2.A	Introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
CCSS.ELA-LITERACY.W.9-10.2.B	Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
CCSS.ELA-LITERACY.W.9-10.2.C	Use appropriate and varied transitions to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

CCSS.ELA-LITERACY.W.9-10.2.D	Use precise language and domain-specific vocabulary to manage the complexity of the topic.
CCSS.ELA-LITERACY.W.9-10.2.E	Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
CCSS.ELA-LITERACY.W.9-10.2.F	Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
CCSS.ELA-LITERACY.SL.9-10.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
CCSS.ELA-LITERACY.SL.9-10.4	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
CCSS.ELA-LITERACY.SL.9-10.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

11TH-12TH GRADE:

CCSS.ELA-LITERACY.RI.11-12.1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
CCSS.ELA-LITERACY.RI.11-12.2	Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.
CCSS.ELA-LITERACY.RI.11-12.3	Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.
CCSS.ELA-LITERACY.W.11-12.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
CCSS.ELA-LITERACY.W.11-12.2.A	Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
CCSS.ELA-LITERACY.W.11-12.2.B	Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
CCSS.ELA-LITERACY.W.11-12.2.C	Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
CCSS.ELA-LITERACY.W.11-12.2.D	Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.
CCSS.ELA-LITERACY.W.11-12.2.E	Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
CCSS.ELA-LITERACY.W.11-12.2.F	Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
CCSS.ELA-LITERACY.SL.11-12.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

CCSS.ELA-LITERACY.SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

CCSS.ELA-LITERACY.SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

NEXT GENERATION SCIENCE STANDARDS:

6TH-8TH GRADE

MS-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. Performance Expectation Grade: Middle School (6-8)

MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. Performance Expectation Grade: Middle School (6-8)

MS-ESS3-5 Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

9TH-12TH GRADE

4-ESS3-1 Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. Performance Expectation Grade: 3-5 4

4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. Performance Expectation Grade: 3-5 4