Insulating You, Insulating Earth

Examining the Enhanced Greenhouse Effect

Description

To model the enhanced greenhouse effect, students conduct an experiment using their own thermal energy, thermometers, towels, and space blankets.

Grade Level

5 – 12

Objectives

Students will:

- Make a prediction using prior knowledge and experience
- Model the greenhouse effect
- Synthesize the results of an experiment
- Use data and models to forecast the rate of climate change and impacts on Earth
- Apply understanding of climate change causes to determine solutions

Time

1 Hour

Common Core State Standards

English Language Arts Standards >> Reading: Informational Texts >> Grade 5
CCSS.ELA-LITERACY.RI.5.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.

English Language Arts Standards >> Speaking & Listening >> Grade 5
CCSS.ELA-LITERACY.SL.5.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

English Language Arts Standards >> Science & Technical Subjects >> Grade 6-8
CCSS.ELA-LITERACY.RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
CCSS.ELA-LITERACY.RST.6-8.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

English Language Arts Standards >> Science & Technical Subjects >> Grade 9-10
CCSS.ELA-LITERACY.RST.9-10.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
CCSS.ELA-LITERACY.RST.9-10.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

English Language Arts Standards >> Science & Technical Subjects >> Grade 11-12
CCSS.ELA-LITERACY.RST.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CCSS.ELA-LITERACY.RST.11-12.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

Mathematics Standards >> Statistics & Probability >> Grade 6
CCSS.MATH.CONTENT.6.SP.B.5: Summarize numerical data sets in relation to their context, such as by: C. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.

New Mexico State Science Standards

(Strand – Standard – Benchmark – Performance Standard)
5th Grade
1-1-1-1: Plan and conduct investigations, including formulating testable questions, making systematic observations, developing logical conclusions, and communicating findings.
1-1-1-2: Use appropriate technologies (e.g., calculators, computers, balances, spring scales, microscopes) to perform scientific tests and to collect and display data.
1-1-1-3: Use graphic representations (e.g., charts, graphs, tables, labeled diagrams) to present data and produce explanations for investigations.
1-1-3-2: Use mathematical skills to analyze data.
2-2-1-4: Describe how human activity impacts the environment.
3-1-1-1: Describe the contributions of science to understanding local or current issues (e.g., watershed and community decisions regarding water use).

6th Grade
1-1-1-2: Examine the reasonableness of data supporting a proposed scientific explanation.
1-1-1-3: Justify predictions and conclusions based on data.
1-1-3-2: Use probabilities, patterns, and relationships to explain data and observations.
2-1-2-4: Understand that some energy travels as waves (e.g., seismic, light, sound), including: the sun as source of energy for many processes on Earth.

Developed by the Asombro Institute for Science Education (www.asombro.org)

2-3-2-4: Describe the composition (i.e., nitrogen, oxygen, water vapor) and strata of Earth's atmosphere, and differences between the atmosphere of Earth and those of other planets.

7th Grade
1-1-1-2: Use models to explain the relationships between variables being investigated.
1-1-3-2: Use mathematical expressions to represent data and observations collected in scientific investigations.
1-1-3-3: Select and use an appropriate model to examine a phenomenon.
2-1-2-1: Know how various forms of energy are transformed through organisms and ecosystems, including: effect of mankind's use of energy and other activities on living systems (e.g., global warming, water quality).
2-3-1-1: Explain why Earth is unique in our solar system in its ability to support life.

8th Grade
1-1-1-2: Use a variety of technologies to gather, analyze and interpret scientific data.
1-1-3-1: Use mathematical expressions and techniques to explain data and observations and to communicate findings (e.g., formulas and equations, significant figures, graphing, sampling, estimation, mean).
1-1-3-2: Create models to describe phenomena.
3-1-1-2: Describe how scientific information can help to explain environmental phenomena (e.g., floods, earthquakes, volcanoes, fire, extreme weather).
3-1-1-4: Critically analyze risks and benefits associated with technologies related to energy production.

9th – 12th Grade
1-1-1-3: Use appropriate technologies to collect, analyze, and communicate scientific data (e.g., computers, calculators, balances, microscopes).
1-1-1-4: Convey results of investigations using scientific concepts, methodologies, and expressions, including: scientific language and symbols, diagrams, charts, and other data displays, mathematical expressions and processes (e.g., mean, median, slope, proportionality, clear, logical, and concise communication, reasoned arguments.
2-3-2-8: Describe the patterns and relationships in the circulation of air and water driven by the sun's radiant energy, including: differences between climate and weather, global climate, global warming, and the greenhouse effect.
2-3-2-11: Explain how layers of the atmosphere (e.g., ozone, ionosphere) change naturally and artificially.
3-1-1-3: Evaluate the influences of technology on society (e.g., communications, petroleum, transportation, nuclear energy, computers, medicine, genetic engineering) including both desired and undesired effects, and including some historical examples (e.g., the wheel, the plow, the printing press, the lightning rod).
3-1-1-9: Describe how scientific knowledge helps decision makers with local, national, and global challenges (e.g., Waste Isolation Pilot Project [WIPP], mining, drought, population growth, alternative energy, climate change).

Next Generation Science Standards

5th Grade
5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

Middle School
MS-PS3-3: Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

High School
HS-ESS2-2: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
HS-ESS3-5: Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

Materials

- *Insulating You, Insulating Earth* handout [1 per student]
- PowerPoint presentation
- Computer and projector*
- Binder clips, size small (¾" wide) [1 per every four students]
- Calculators* [1 per every four students or more if available, optional]
- Hand towels [1 per every four students]
- Mylar space/emergency blanket cut into rectangles of approximately 20" x 26" or larger if needed [1 per every four students]
- Stopwatches [1 per every four students]
- Thermometers [1 per every four students]

* Not included in kit

Background

Earth is surrounded by an atmosphere of gases, which remains near the planet because of gravitational force. The atmosphere is composed mostly of nitrogen, oxygen, argon, and carbon dioxide, and it functions to moderate the climate of Earth.

The greenhouse effect describes the process by which the climate is regulated by greenhouse gases: carbon dioxide, water vapor, ozone, methane, nitrous oxide, and fluorinated gases. Electromagnetic radiation from the sun, mostly at short wavelengths in the form of light, is able to pass through the atmosphere and is absorbed by Earth. Electromagnetic radiation at longer wavelengths, often called thermal energy, infrared radiation, or heat, is re-radiated from Earth up to space. Unlike solar radiation, most long-wave radiation is absorbed by greenhouse gases (or clouds) and re-emitted in all directions. The long-wave radiation re-emitted downward warms the surface. The greenhouse effect effectively traps thermal energy near Earth and ensures that the planet is warm enough to sustain life.

Since the Industrial Revolution, humans have been emitting increasing amounts of greenhouse gases into the atmosphere, especially carbon dioxide, methane, and nitrous oxide. The burning of fossil fuels to produce the energy used for transportation, industry, and electricity releases greenhouse gases into the atmosphere. This causes more of the re-radiated thermal energy from Earth to be re-emitted back to the planet instead of escaping into space. This enhanced greenhouse effect is causing average global temperatures to increase. With this increase in temperature, Earth is experiencing changes in weather, climate, and ocean systems. The effects include increased droughts in some areas, increased flooding in other areas, melting glaciers and ice, rising sea levels, altered timing of stream flows, and ocean acidification. As the global climate changes, humans need to develop alternative methods of energy production.

Tips for Entire Class Participation

- Have students work in small groups so each student is participating directly in the experiment. Groups of four are ideal, but groups of three or five will work. Small group size is dependent on your class size; there are eight experimental setups in your kit.
- Highlight student roles during the experiment to ensure each student feels they are contributing.

Preparation

1. Plan to divide students into teams of four. If necessary, teams of three or five would also be acceptable, as activity tasks can be combined or divided.
2. Plan locations for the appropriate number of stations needed to accommodate the number of student teams in the group. Stations can be simple tables and chairs with enough space for three to five students, and no power source is needed.
3. Place a small binder clip, calculator, stopwatch, thermometer, towel, and rectangle of space blanket at each station.
4. Draw the "Whole Class" table from page 3 of the *Insulating You, Insulating Earth* handout on the board or prepare to show it with a document camera.
5. Set up a computer and projector and display the PowerPoint presentation.

Teaching Guide

Introduction to New Mexico Climate Champions (~5 minutes)

1. Give students a brief introduction to New Mexico Climate Champions explaining the format and purpose of the program.
2. Slide 2: Tell students that they will have an opportunity to learn about climate change: what is causing it, what are the impacts, and what they can do to help.

3. NMCC has two parts: content [water or energy] and action.
    a. These two parts are divided evenly (1st half content, 2nd half action).
    b. Explain that during content, students will participate in hands-on activities that will give them background knowledge, motivation and ideas for their action projects as they learn more about climate change through a specific lens [water or energy].
    c. After each activity, the whole class will brainstorm two actions that could be turned into action projects for the second half of NMCC. Action projects will be chosen from this list.
    d. During the action module, students will work in groups (action teams) to plan and implement a New Mexico Climate Champion action project in their school or community.
4. At the end of NMCC, students will present their projects at the Climate Summit for community members to learn more about climate change and how they can take action against it.

Introduction: Greenhouse Effect (~15 minutes)

1. Divide students into teams of four and place students at stations.
2. Pass out an *Insulating You, Insulating Earth* handout to each student.
3. Instruct students to read the team member roles on the front page of the handout and choose one role for each student in the group.
4. Slide 3: Display this "Setting Up the Experiment" slide in the PowerPoint presentation as reference.
    a. The test subject will use a binder clip to attach the wire of the meat thermometer to the clothing on their lap. Instruct the student to point the metal probe toward their hip, and attach the binder clip approximately halfway down the length of their thigh (Figure 1).
    b. Ensure that the thermometer probe is contacting the student's thigh as much as possible. The probe should not be pointed sideways or hanging off of the student's lap.
    c. Have students be sure that the thermometer is reading in °C. To switch to °C, flip toggle on back of thermometer.

Figure 1. Meat thermometer set up

5. The meat thermometer can take up to five minutes to accurately display the initial temperature of students' laps. Instruct students to watch the temperature casually and note whether it increases, decreases, or stays the same. Now that students have their thermometers in place, take some time to explain the experiment, have students make a prediction, and give a short introduction to the greenhouse effect.
6. Explain to the class that they will be conducting an experiment to determine which will insulate better: a single towel or a towel with a space blanket on top. Tell students that they will first place a towel over the thermometer and perpendicular to their thighs while demonstrating with one of the towels. They will record the temperature every minute for five minutes. Then say that they will place the towel back on their lap and put a rectangle of space blanket on top while demonstrating with a towel and space blanket. They will record the temperature with the towel plus a space blanket every minute for five minutes. Explain that the space blanket is made of Mylar, which is a good insulator (and also used for balloons), and it can be used as a blanket in emergencies.
7. Ask students to make a prediction about which trial will result in warmer temperatures and then fill in the blank of the prediction statement on the front page of the handout.
8. Give a short introduction to the greenhouse effect using the PowerPoint presentation.
    a. Slide 4: We have gases in our atmosphere (called greenhouse gases) that trap thermal energy, and they are: carbon dioxide, water vapor, ozone, methane, nitrous oxide, and fluorinated gases.

b. Slide 5 (a): Begin with the diagram on the left. The greenhouse effect ensures that Earth is warm enough for us to inhabit. Our atmosphere contains greenhouse gases, like carbon dioxide, methane, and nitrous oxide. Electromagnetic radiation from the sun, mostly at short wavelengths in the form of light, is able to pass through the atmosphere and is absorbed by Earth. Earth re-radiates some of this energy back toward space as thermal energy, which is long-wave radiation. Most of the thermal energy is able to pass through the atmosphere and escape into space, but some is absorbed by the atmosphere and then re-emitted back to Earth.
c. Slide 5 (b): Now explain the diagram on the right. This is the enhanced greenhouse effect, which is caused by increased greenhouse gases in our atmosphere. As more greenhouse gases are released into the atmosphere, more of the re-radiated thermal energy from Earth is re-emitted back to Earth instead of escaping to space. This is causing the average global temperature to increase.
d. Slide 6: Ask students which is the closest planet to the sun in our solar system [answer: Mercury]. Ask students which is the hottest planet in our solar system [answer: Venus]. Ask students if they know why Venus is the hottest planet even though it is not the closest to the sun. Venus has a very thick atmosphere, comprised mostly of carbon dioxide. Carbon dioxide is a greenhouse gas, which effectively traps thermal energy within the atmosphere of Venus. High temperatures on the surface of Venus can reach almost 480˚C. Venus serves as a natural experiment of the runaway greenhouse effect, demonstrating how high levels of greenhouse gases in the atmosphere result in high temperatures.
e. Slide 7: This pie chart shows the percentage of each of the greenhouse gases that humans emit through our activities. Carbon dioxide accounts for more than 75% of the greenhouse gases that we release.
f. Slide 8: Humans emit carbon dioxide mostly through fossil fuel combustion, i.e. the burning of coal, natural gas, and oil, for the production of electricity and transportation. Many industrial processes rely on fossil fuel combustion as well, and the production of mineral products, such as cement, the production of metals, and the production of chemicals can all result in carbon dioxide emissions.
g. Slide 9: Since 1958, scientists at Mauna Loa, on a Hawaiian island in the North Pacific, have been collecting atmospheric data. This graph shows the concentration of carbon dioxide in the atmosphere as measured at Mauna Loa. Ask students to describe the trend of this graph [answer: carbon dioxide is increasing]. Ask students why they think scientists would choose to take this measurement at Mauna Loa [answer: to minimize the effects of local surface CO_2 emissions and air pollution so that the measurement is representative of the global atmosphere.]
h. Stop the presentation here to conduct the experiment.

Procedures: Towel Trial (~10 minutes)

1. Ask students to read the current temperature of their thermometers and tell you whether it has increased, decreased, or stayed the same since they clipped it to their clothing. The temperature should have increased initially and then mostly stabilized.
2. Once the temperature has stabilized, direct each team's data recorder to record the temperature in the lap row of the towel temperature column. The data recorder is the team member who is responsible for writing down all of the data, but all students must complete the data table as well.
3. Instruct the materials manager to give the towel to the test subject. The test subject lays the towel over the thermometer and across their lap so that its long side is perpendicular to their thighs. Then they tuck the ends of the towel under their legs if possible; if it will not tuck under, just ensure that it is covering the thermometer.
4. As soon as the towel is in place, instruct the timer to press the start button on the stopwatch.

5. Explain to the timer that for each minute that passes, they are to call out the time to the data recorder. Tell students that they should not stop the stopwatch at each minute, but rather let the stopwatch continue to time as data is being collected.
6. Explain to the data recorder that when the timer calls out the time, they are to read the temperature on the thermometer, and record it in the corresponding row of the towel temperature column.
7. Tell students to stop recording after 5 minutes. If you would like to extend the data collection time for this activity, have students continue to write temperature data on a separate piece of paper (see the Extensions section).
8. At the conclusion of the measurements, instruct the timer to reset the stopwatch.
9. Quickly ask the test subject to remove the towel from their lap but leave the thermometer attached. The goal is to return the thermometer to approximately the same temperature as the beginning lap temperature in the towel only trial. This can take 2-3 minutes. If it takes too long, you can instruct students to fan the metal probe with a piece of paper to speed up the cooling, but be cautious of fanning it for more than 20-30 seconds, which could result in the temperature decreasing too much.
10. While waiting for the thermometer to stabilize and return to the beginning lap temperature in the towel-only trial, ask students to complete the subtraction problem on the third page of the handout (in-between the tables). They fill in the blanks with the temperature of their final measurement (5 min., unless you choose to take measurements for longer) and the temperature of the test subject's lap at the beginning of the trial. They then calculate the difference by subtracting lap temperature from the 5 min. temperature.

Procedures: Towel + Space Blanket Trial (~15 minutes)

1. When the thermometer stabilizes at approximately the same as the beginning lap temperature in the towel trial, begin the second trial. Instruct the data recorder to record the beginning lap temperature in the towel and space blanket temperature in the lap row.
2. Ask the materials manager to give the towel and then the space blanket rectangle to the test subject.
3. Instruct the test subject to, first, lay the towel over the thermometer and across their lap, and then place the space blanket rectangle on top. Both should be oriented so that the long side is perpendicular to their thighs. Have them tuck both the towel and the space blanket under their legs together if possible. If they will not tuck under, just ensure that they are covering the thermometer.
4. As soon as the towel and space blanket are in place, the timer starts the stopwatch.
5. Explain to the timer that for each minute that passes, they call out the time to the data recorder.
6. Explain to the data recorder that when the timer calls out the time, they read the temperature on the thermometer, and record it in the corresponding row of the towel and space blanket temperature column.
7. Tell students to stop recording after 5 minutes (unless you would like to extend the data collection time for this activity).
8. The test subject can remove the space blanket, towel, and thermometer.
9. Instruct students to calculate the difference in towel and space blanket temperatures.
10. Ask students to report the temperature differences in the towel trial and the towel and space blanket trials to the class. Have students record their differences in the table on the board, or they can call them out to you while you write them on the board. Students must then record them in their "Whole Class" table on their handout and calculate the mean.

Results and Conclusions (~15 minutes)

1. Have students answer the results and conclusions questions.

2. If you would like to discuss evaluation question number 1 with students, return to the PowerPoint presentation.
    a. Slide 10: Quickly review the left and right sides of the diagram, explaining the natural greenhouse effect and the enhanced greenhouse effect.
        i. The experiment that students just conducted was a model of the natural greenhouse effect and the enhanced greenhouse effect.
        ii. Ask students to determine which item in the experiment modeled the earth and discuss how it is like the earth [answer: the student's lap modeled the earth because it emits thermal energy].
        iii. Ask students to determine which item in the experiment modeled the atmosphere and discuss how it is like the atmosphere [answer: the towel modeled the atmosphere because the towel absorbed some of the thermal energy and re-emitted it back toward the lap, effectively trapping it and keeping the lap warmer].
        iv. Ask students to determine which item in the experiment modeled the additional greenhouse gases and discuss how it is like additional greenhouse gases [answer: the space blanket because, once it was added, more of the thermal energy from the lap was re-emitted back to the lap instead of escaping to into the room].
3. Use the PowerPoint presentation to explain the concept of climate change and wrap up the activity.
    a. Slide 11: The atmosphere influences our climate, and we conducted the experiment to model one aspect of how our climate is changing. Explain that climate is the description of the long-term pattern of weather in a particular area. Long-term usually means approximately 30 years. Make sure that students understand that in order to be considered climate, conditions must be averaged over a long time period. Today's (or even this month's or this year's) weather in your area is not the same as the climate.
    b. Slide 12: The climate of Earth is changing. Read the definition for climate change. Tell students that climate change includes global warming (the temperature of Earth is increasing), changes in precipitation patterns, and more severe storms.
    c. Slide 13: We have recorded data on Earth temperatures since 1880. Ask students to describe the trend of this graph [answer: temperature is increasing].
    d. Slide 14: Remind students that you discussed carbon dioxide levels in the atmosphere earlier and that these are shown in the top graph. Temperature is shown in the bottom graph. Ask students to describe the relationship between CO_2 and global temperature [answer: as carbon dioxide increases, global temperature increases].
    e. Slide 15: Our atmosphere acts like one blanket around the earth and keeps our planet warm enough for us to inhabit. However, when we add greenhouse gases to our atmosphere, we are putting on an additional blanket (click slide forward to display second blanket). This extra blanket results in temperatures that are too warm for species that are adapted for recent historic local temperatures, and is causing changes to atmospheric conditions and weather patterns, which will have large impacts on humans.
4. If you would like to discuss evaluation question numbers 2 – 4 with students, display slide 16.
    a. Slide 16: Scientists used several models to predict global temperatures by the end of the century, in the year 2100. This graph displays three global temperature projections, shown by the colored lines. The three lines represent different scenarios for the amount of warming that will occur, which depends on the activities of humans. The amount that the temperature will increase depends greatly on human population growth and the amount of greenhouse gases emitted in this century.
    b. Direct students to look at evaluation question 2 and at the scenario with the highest emissions, shown by the top (red) line of the graph. Emphasize that they should only be considering the top line of the graph. Ask them to estimate the approximate number of

degrees Celsius by which the average temperature is projected to increase by 2100 in the highest emissions scenario [answer: approximately 4 °C].

c. Direct students to look at evaluation question 3 and at the scenario with the lowest emissions, shown by the bottom (blue) line of the graph. Emphasize that they should only be considering the bottom line of the graph. Ask them to estimate the approximate number of degrees Celsius by which the average temperature is projected to increase by 2100 in the lowest emissions scenario [answer: approximately 2 °C].
d. Ask students to consider question 4 and solicit answers. Although temperature increases of 2 – 4 °C may not sound like much, the impacts are likely to be great. We will continue to experience increases in snow and glacial melt; increased sea levels; less rainfall in the Mediterranean, southwest North America, and southern Africa; and more precipitation in Alaska and other high latitudes of the Northern Hemisphere. These changes will impact humans through increased droughts and wildfires in some areas, increased severe storms and flooding in other areas, and reduction in food production.
e. Ask students to consider question 5 and solicit answers. There are different approaches to taking action in regards to climate change. Ask students to consider what human actions led to the increased greenhouse effect and ultimately global warming. Tell students that they will learn more about climate change and its relation to [energy or water] and will brainstorm ways to mitigate or adapt to the impacts of climate change. As a class, choose two actions against climate change that students could potentially complete as their action project. For example, walk or bike to school. Or, unplug electronics when they leave for the day.

Extensions

1. After students conduct the experiment as outlined, they may have ideas for further research. Students are often interested in what happens under different scenarios. Here are some ideas for additional student-directed inquiry, but feel free to encourage your students to think of more:
    a. Conduct the experiment for a longer time period. The temperature differences are greater and there is a more pronounced difference between the two trials if you allow the experiment to continue for up to 15 minutes.
        i. Record the results on a separate piece of paper. Ask students to determine which variables they will be measuring and how they need to construct their data table.
    b. Add more layers of insulating materials, such as additional towels and space blankets, small blankets, jackets, etc., and conduct the experiment again.
        i. Record the results on a separate piece of paper. Ask students to determine which variables they will be measuring and how they need to construct their data table.
        ii. Ask students to reflect on how their extension experiment relates to the natural and enhanced greenhouse effect. For example, some additional insulating materials may not result in increased temperatures because they are not as efficient at insulating as space blankets. This is analogous to adding non-greenhouse gases, such as O_2, to the atmosphere.
    c. Carry out the experiment on an object that does not generate thermal energy, such as a rock.
        i. Ask students to hypothesize about the temperature change [answer: insulating a rock will not change its temperature because the rock does not have an internal temperature source like a person does. The rock is in energy balance with the surrounding air.].
        ii. Record the results on a separate piece of paper. Ask students to determine which variables they will be measuring and how they need to construct their data table.

This lesson has been adapted for New Mexico Climate Champions from "Insulating You, Insulating Earth" by the Asombro Institute for Science Education and the Southwest Climate Hub. <https://swclimatehub.info/education/download/climate-change-and-water-cycle/day1>