



Education and Research: Testing Hypotheses

## Carbon Cacophony

*Bekah Cordell, Christiana Galea 'I, Carly Norris*

### Summary

Students will collaborate to produce a musical piece depicting key concepts from previous lessons on climate change's effects on the earth and the carbon cycle. Students will show knowledge of causes and effects of climate change on the ocean using abstract musical notation and instrumentation. Students will be exploring the topic of interconnected systems while developing their communication and critical thinking skills.

*TAGS: Music, data visualization, ocean acidification, carbon cycles, weather, climate, climate change, cause and effect, systems thinking*

### Key Concepts

- Climate Change
- Cause and Effect
- Music
- Multidisciplinary approach
- Systems thinking

### Objectives

- **Articulate** observable concepts of climate change in local region
- **Demonstrate** knowledge of science behind climate change and the carbon cycle
- **Communicate** cause and effect and systems functioning
- **Produce** a collaborative musical composition
- Students will be able to take the big picture concept of climate change causes and effects and communicate them in a musical piece, understanding how different concepts/processes culminate together.
- Students will be able to contribute to the class final product of dynamic/innovative sound.

### Materials

- Musical Instruments (Get creative!)
  - Place based instruments (coral sand rain stick, pebble shaker, wooden drums)
- AND/OR
  - Desks, pencils, your body,
  - Drums, xylophone, flute,
- Poster board, sheet music

- Pencils, pens, markers
- Videos
  - Sasa Samoan dance: <https://www.youtube.com/watch?v=oNodJ7z-1hU>
  - Hands Clap: <https://www.youtube.com/watch?v=F84fhFEypW0>
- Handouts:
  - Portions of the carbon cycle
  - Examples musical sounds

## Procedure

1. Introduction: Hurricane Game!
  - a. Begin class with cacophonous music playing (ex: Thunderstorm or Eric Whitacre Water Night)
  - b. Bring everyone in a close circle
  - c. “Do as I do” and silently point to students to begin making sound
    - i. Rubbing hands
    - ii. Snapping
    - iii. Hitting legs etc.
2. Explain!
  - a. Debrief Hurricane exercise
  - b. Review what we have previously discussed on climate change and the carbon cycle. Pass out handouts and draw components on the board.
  - c. Transition to Orchestra exercise. Ask if anyone knows what an orchestra is.
  - d. Share musical example of orchestra piece or chart showing different instruments come together to make collective music.
3. Model examples!
  - a. Video examples of cycles or music data visualization
  - b. Rhythm ideas
  - c. Model with a volunteer
4. Make the orchestra! The teacher is the conductor, the students are the section players.
  - a. Divide class into smaller groups of 2-3 students, and assign factors of the carbon cycle to each group. Topics can include: burning of fossil fuels, ocean CO<sub>2</sub> uptake, shell making/decomposition, photosynthesis, plant/animal decomposition, fossil fuel production.
  - b. Allow time for students to compose sounds that express their specific topic as well as how disruptions (burning trees, increased CO<sub>2</sub> in the atmosphere, burning fossil fuels) in the cycle affect their portion of the carbon cycle. Hand out a sheet music/poster board and markers to have students depict and explain in some way what their music symbolizes.
  - c. Make sure to walk around and answer any questions.
5. Gather the orchestra!
  - a. Ask each group to perform their sounds and explain how the sounds represent their factor of the carbon cycle and how they are affected by external changes.
  - b. “Play” the composition.
  - c. Have the teacher be the conductor and play together. First the teacher will go through the carbon cycle making it clear that it is a system that is all connected,

pointing to each group to perform their portion. Then the teacher will add disturbances ie burning fossil fuels, forest fires and point to different groups to perform their responses to these disturbances.

6. Class discussion.
  - a. Discuss cause and effect (inputs and outputs) in the carbon cycle. What happened when a disturbance affected one portion of the cycle? Could something happen to one part and not the other? What do you still want to learn about the carbon cycle and climate change? Is there anything we forgot to address?
  - b. Discuss what they thought about the activity. What surprised them? What was difficult? Did they think of all the connections we made? Did using music to portray a scientific concept help them think about it differently or understand it better? Why do the sounds change during a disruption?
    - i. Could discuss in groups first, then talk with the whole class or have a more informal class discussion depending on time.
  - c. Have students hang up all their “written music” in the classroom in the order that they think best represents the carbon cycle and climate change.

## Assessment

- **Product**— students will collaborate to create a musical piece (performed and written) representing their understanding of the carbon cycle in relation to climate change.
- **Performance**—students will gather, discuss, draw and model musically key concepts identified above
- **Assessment**— Following the culminating musical performance students will engage in partner and group discussion to share their understanding and experience. Could turn questions into a formal worksheet to turn in.

## Additional Resources

- Sasa Samoan dance: <https://www.youtube.com/watch?v=oNodJ7z-1hU>
- Using your body to make music: <https://www.youtube.com/watch?v=gKzko9z8jU8>
- This source provides visualization and teaching materials to represent **carbon on the move** and carbon in the atmosphere. <https://www.climate.gov/taxonomy/term/3413>
- Geosphere and biosphere impacts by carbon through carbon cycle. <https://serc.carleton.edu/eslabs/carbon/lab2.html>
- This sources gives some interactive science lessons on how to teach the carbon cycle to 5th and 6th graders. <http://teachingsciencerocks.weebly.com/blog/carbon-cycle-lab-photosynthesis-and-respiration>
- Additional carbon cycle lessons and ideas [https://www.calacademy.org/sites/default/files/assets/docs/pdf/048\\_carboncycleroleplayr edesign10nov2014mks.pdf](https://www.calacademy.org/sites/default/files/assets/docs/pdf/048_carboncycleroleplayr edesign10nov2014mks.pdf)
- Hurricane science overview and lesson ideas as background. <https://serc.carleton.edu/eslabs/hurricanes/index.html>
- Hurricane lesson ideas and teaching tools. <https://serc.carleton.edu/eslabs/hurricanes/2.html>

## **Extensions or adaptations**

The whole activity can be adapted to a level of detail that is appropriate for what the class already knows and understands.

The introduction can be tailored to what kind of storm is familiar to the audience. If students are more familiar with rainstorms, explain the game using terms describing water sounds.

### **Materials**

- Musical instruments can be adapted based on geographical location of the class. Musical instruments can be made of natural resources near the school. For example, if the school is near a tropical beach, instruments can be made of crushed coral or sand shakers. If the school is inland, instruments can consist of different sized rocks or branches.
- Handouts may be substituted by verbal explanation or writing on a chalk board. Since this is a culmination class, maybe students have already created a reference sheet in previous classes.

### **Music**

- Musical examples can be related to something that may be relevant to the students culturally.
- Musical styles can be adapted culturally and inclusive of different styles and abilities. Through directional cues and drawing

### **Language learners**

- Using common symbols with your hands.
- Diagrams on the board with pictures and few key words

### **Inclusion**

- Exercises can be done seated or in a wheelchair.
- For students with students with hearing challenges, communication is shared using gestures and symbols with hands.
- Teacher will have ability to use appropriate sign language.
- For students who are visually impaired, teachers will be communicating through music and clear instructions
- Conducting will be done with a steady drum beat instead of a silent wand