Climate change and global warming are subjects of great concern and interest to scientists, politicians and the general public. Today’s class will provide several examples for activities that can be used to address different aspects of heat, temperature and their links to climate change and global warming.

I. Class demonstration and discussion: absorption of radiation
Goal: get the wheels spinning

Observe the two thermometers; one immersed in a shiny tin can the other in a black one. The same light source shines on both. Why is there a difference in temperature between the cans?

Will the temperature increase forever or will a steady state in temperature be eventually reached?
II. Group activity: heat properties of water and soils

Goal: get your hands wet and your head in a ‘teacher’ mode. Use your notebook to record thoughts and notes as you do this activity.

The following material is provided to you:
Cups, sand, water, soil, a heat lamp, food coloring and a thermometer

1. Discuss in your group questions about heat and temperature in the Earth-Ocean system that can be investigated using the materials provided to you.
2. Set up an experiment (student activity) that will address one or some of these questions.
3. Predict what you think will be the result of the experiment and test your prediction.
**Homework:** summarize your results and write an explanation (or a follow up discussion) that will solidify concepts demonstrated by your activity with students.

**IV. Class demonstration and discussion: The greenhouse effect**

Goal: discuss common misconceptions about the greenhouse effect and provide an example for a hands-on activity that can be used in class to demonstrate the concept

Based on what you have learned in previous classes or read elsewhere- what is the greenhouse effect? What causes it? Is the greenhouse effect good or bad for the planet?

Demonstration: (*Warning: this demonstration yields variable results. While we got good results when testing it before class, we had difficulties to repeat these results during class, partially due to uneven heating of the bottles. We tried to refine the experimental set-up, but were unsuccessful in getting consistent results.)*
1. Place the bottles under a heat source (lamp).
2. Place 4 tablets of Alka Seltzer in bottle # 3 and immediately record the temperature in each of the bottles.
3. Continue recording the change in temperature every 2 minutes for 10 minutes.

Homework:
1. Use the data we have recorded to plot temperature (X-axis) as a function of time for each of the bottles (on the same plot).
2. What was the maximal temperature at each of the bottles by the end of the experiment?
3. How does the rate of change of temperature compare among the 3 bottles?
4. Write an explanation for this experiment, including explanation of the results and a short discussion that solidifies the concept of greenhouse effect. Where does the analogy of this experiment break down?