



1

the albedo effect

module 1

Activity presentation

In this activity, students will explore how light and dark colours impact temperature. The ability of surfaces to absorb and reflect light known as the albedo effect, is an essential part of beginning to understand climate change. At a global level, the albedo effect is involved in decreasing ice and snow cover, increasing temperatures in the Arctic and impacting global climate.

Materials

-  2 containers or shoeboxes
-  2 Heat lamps or lamps with non-LED (for adaptation see activity breakdown)
-  2 oven thermometers
-  Ice cubes
-  Appendix Ia: Albedo sheet
-  2 small transparent plastic containers
-  Sheets of black paper
-  Sheets of white paper to cover the inside of the boxes

Activity breakdown

1

Let students know you will be looking at colours and how they relate to temperature. *Ask students to describe what the seasons are like in Quebec. Is it warm? Is it cold, and is there snow?* Across Quebec in 2024, temperatures ranged from below -20 degrees Celsius to above 30 degrees Celsius!

2

Ask the students to reflect on the colours they associate with winter, drawing special attention to the colour of snow, and the colour of the coats they see most often in the winter. Students may point out that snow is white and that many people wear dark colours in the winter. *Ask students why they think lots of people wear dark colours in the winter.*

- 3 Cut the white and black sheets of paper to fit inside the cardboard boxes. Place the white sheets in one box (box 1) and the black sheets in the other (box 2) to cover the inside of the boxes. In each box, put one small transparent container with equal amounts of ice. *Note For a quicker activity, place only one ice cube.* If available, place a thermometer in each of the two boxes, next to the plastic container. Finally, secure the heat lamps around 12 inches above the boxes, reminding students to avoid touching the lamps. *Note If you do not have access to heat lamps and temperatures allow, conduct the activity outdoors.*

- 4 Explain to the students that you are going to observe how light and dark colours impact temperature. *Ask students to make guesses on whether the ice in box 1 or box 2 will melt more quickly and why.*

- 5 Observe the boxes every 10-20 minutes for a period of one hour, depending on the room temperature and how much ice you put in the container. Each time, record the temperature on the thermometer using the accompanying sheet. *Note If you have light sensors, you can also measure the amount of light(lux) reflected in each box.*

- 6 Students will see that the overall temperature was slightly higher in box 2 (the black box) than in box 1 (the white box), and that the ice in box 2 will have melted more quickly. *Ask students why they think that is, thinking back to the colour of winter coats.*

Conclusion

Explain to students that darker colours such as blacks, grays and browns (colours that feature prominently in our cities) **absorb** light, which then becomes heat. Light colours (such as white snow) **reflect** light, and therefore do not get as warm as dark colours. This is called **albedo**. Dark colours are said to have a **low albedo** and light colours a **high albedo**. At a global level, the decrease of ice sheets and snow over ocean water in the arctic means less light is being reflected. Simultaneously, the exposed ocean and ground has a lower albedo, absorbing heat and contributing to further rising temperatures. In the next activity, students will continue exploring albedo and discover its role in rising temperatures in their hometowns and cities.

