
Activity
Appendix

Important Standards Netted by Teaching These Activities

SCIENCE

	Fourth Grade	Fifth Grade	Sixth Grade
	SA 1.1	SA 1.1	SA 1.1
	SA 1.2	SA 1.2	SA 1.2
	SA 3.1	SA 3.1	SB 2.1
	SE 1.1	SC 2.1	SC 2.1
	SE 3.1	SE 1.1	SC 2.2
		SE 3.1	SE 1.1
			SE 3.1

MATH	Third Grade	Fourth Grade	Fifth Grade	Sixth Grade
Thermal Map	M 7.1.2	M7 .2.2	M 7.2.2	M 7.2.2
	M 5.1.6	M 5.2.6	M 5.2.6	M 5.2.6
	M 2.1.1	M 2.2.1	M 2.2.1	M 2.2.1
		M 2.2.3	M 2.2.3	M 2.2.3

READING

A Thermal Map	R 1.1	R 1.2
	R 1.6	R 2.6

WRITING	Fourth Grade	Fifth Grade	Sixth Grade

A Thermal Map [demonstration]

Adapted from Jim Wiese, Salmon Below the Surface, pages 67-74

Materials:

- One copy of a weather map showing isotherms

For each student or pair of students:

- One thermometer
- One ruler
- Tape
- Blank paper or three copies of an outline map of the classroom
- Colored pencils or felt tip markers
- One copy of Handout A (Parts 1, 2 & 3), "A Classroom Thermal Map," for each student
- Writing supplies

Time Required:
60 to 90 Minutes

Level of Conceptual Difficulty:
Challenging

PREPARATION

- To save time and ensure consistency, you may wish to draw an outline map of the classroom and make three copies for each student or pair of students.

INTRODUCTION

Although Scientists do not believe salmon use water temperature to help them navigate, water temperature affects their food source.

Explain that special maps show other information that is important for other purposes.

- Ask the class what an ocean map for salmon would show.

  Locations, food sources, temperature, etc.

- Have students look at a weather map showing isotherms and discuss how they link areas of similar temperatures. Ask the class to suggest ways that scientists create the weather maps.

  They take temperature readings from various locations over land and water using weather balloons, ground stations, weather ships, etc., then plot them on maps and link places with similar values.

- Ask the class to suggest a way to make a temperature map of the classroom. Use thermometers to take temperature readings at fixed locations in the room and at different levels above the floor. (Hint: This may be easiest in winter when the heat is on or with an open window.)

EXPERIMENT

- Divide the students into six groups and have them follow the procedure in Handout A, "A Classroom Thermal Map," to create an isotherm map of the classroom (i.e., readings at each level will be done by two groups). Model each step of the procedure as the class does it.

Evidence for Assessment:
Monitor the class discussion and review the students' maps and conclusions to ensure that the students can make an isotherm map from data, draw conclusions based on the map, and recognize ways in which salmon respond to temperature in the ocean.

- ☞ Note: Depending on the time you have available, and the ability of your students, you may prefer to skip steps 6 and 7 in the procedure and make a single map instead of three maps.

- ☞ Option: Have students use a computer-graphing program to create a 3-D graph representing the room's isotherms.

- ☞ Option: If the school has a classroom salmon incubation tank, have students create isotherm maps of the incubation tank.

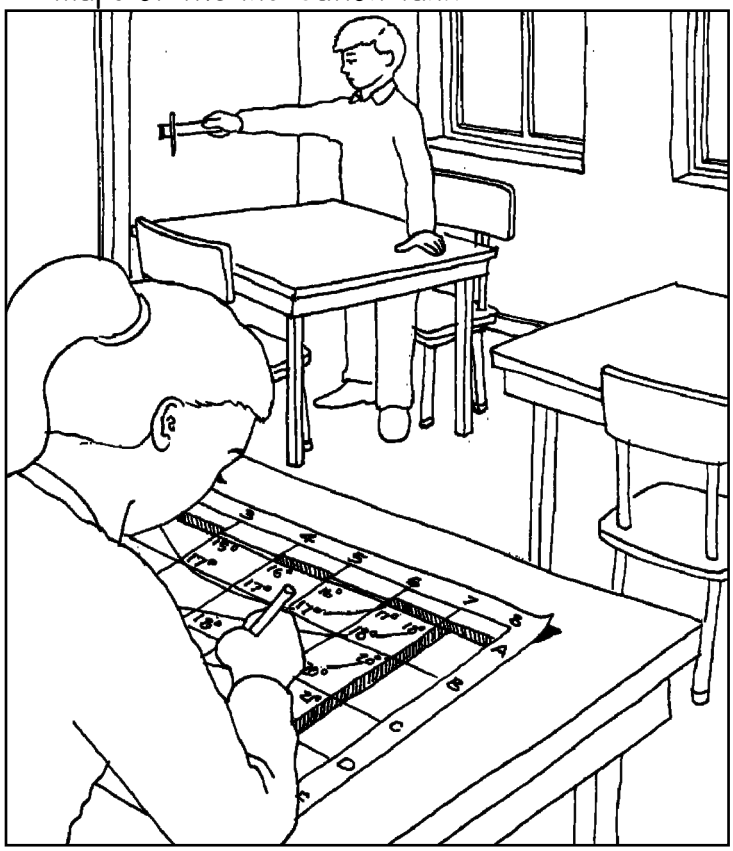

Illustration: Donald Gunn

DISCUSSION

- ☞ Discuss with the class whether or not their data supported their hypothesis, and any other observations they draw from their data. If necessary, prompt them with questions, such as:

- What did the maps or the data show you that you did not know before the investigation?
  Temperature variations at different levels, sources of heat or cold drafts, the most comfortable place to sit, etc.
- What differences did you observe between the ceiling, middle and floor maps?
  Usually the temperatures will be warmer at the ceiling and cooler near the floor.
- How did the data compare with what your senses told you about the room?
- If you knew that animals preferred cool temperatures, how could you use isotherm maps to help locate them?

☞ Discuss with the class how to make an isotherm map of the ocean, and what it might indicate about salmon. If necessary, prompt them with questions, such as:

- How could you adapt the procedure to make an isotherm map of the ocean?
  Take temperature measurements at various depths and locations to plot a 3-D ocean isotherm map.
- How would an ocean isotherm map differ from the classroom map or an atmospheric map?
  Water temperature changes less frequently and by smaller amounts, so the maps use smaller differences and do not change so quickly.
- How could people use ocean isotherm maps?
  To track ocean currents, and changes such as El Nino/ La Nina; to predict climate changes that are affected by ocean temperature; to track fish populations that prefer certain temperatures, etc.
- How could you use an ocean isotherm map to keep track of salmon?
  Look for the temperatures they prefer to predict where they will be, where they will go, or where their food species will be, etc.
- Salmon do not use isothermal maps. How do temperature differences in the ocean affect them?
  They are very sensitive to temperature changes. Temperature differences affect how fast they grow and the availability of food species.

A Classroom Thermal Map

Handout A (Part 1)

The temperature varies from place to place. Some areas are warm, while others are cold. Temperature differences can be very important. Salmon bodies develop faster in warmer water. They "live faster", but they may gain less weight and die sooner.

Also, salmon predators, like tuna and mackerel, follow warm currents and kill more salmon when warm currents move north.

Even within a room you can record differences in temperature. If you take careful measurements and plot them on a map, you can make a thermal map showing the temperature in each area.

When you draw a line connecting the points with the same temperature, the line is called an isotherm. ("Iso" means equal; "therm" means temperature.) You can use the procedure below to make an isothermal map of your classroom. During the investigation, move as little as you can. Movement will create air currents that make it difficult to get accurate temperature readings.

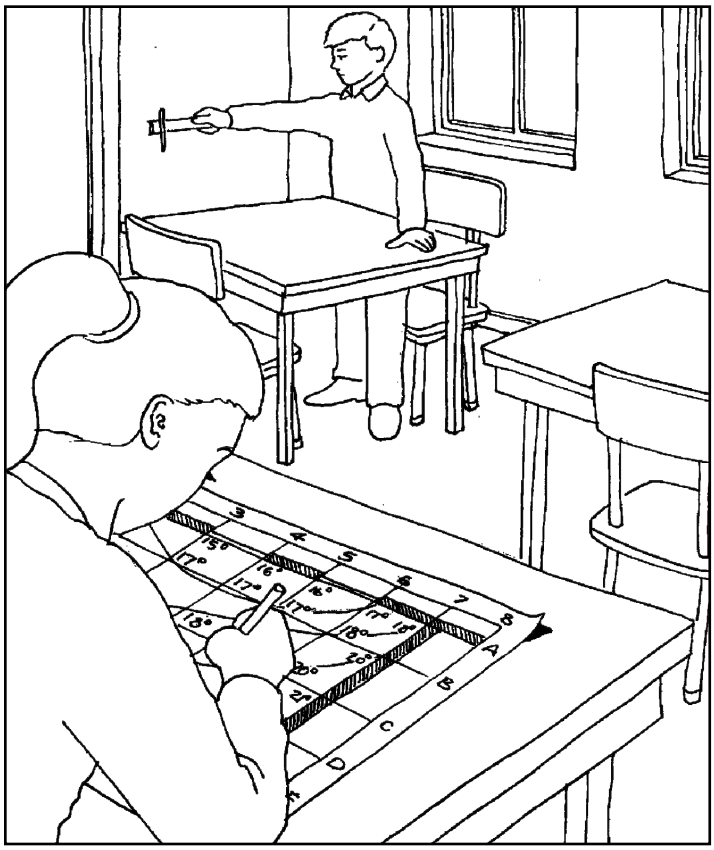

Illustration: Donald Gunn

A Classroom Thermal Map

Handout A (Part 2)

1. Tape a thermometer to a ruler. Use the ruler as a handle so that your hand does not affect the temperature reading.

2. Make a map of the room, including walls, windows, doors, heating vents, desks, etc. (Your teacher may have a map you can use.)

3. Use your knowledge of the room to make a hypothesis about where the warmest and coolest parts of the room will be. Write your hypothesis on the next page.

4. Position yourself through the room in rows, giving each position a row number and letter. (For example, in the first row, the first position is A1, the one beside it is A2, the next is A3. In the second row, the first position is B1, the one beside it is B2, etc.) Draw each position on the map of the room.

5. Hold a thermometer above your head for two minutes. On the data form, record the temperature for each position in the classroom under the title "Ceiling Reading."

6. Hold a thermometer at waist level for two minutes. On the data form, record the temperature for each position in the classroom under the title "Waist Reading."

7. Hold a thermometer about one centimeter from the floor for two minutes. On the data form, record the temperature for each position in the classroom under the title "Floor Reading."

8. Transfer the data from the ceiling readings to the appropriate position on the classroom map. Then transfer the data from the waist readings and the floor readings onto separate maps.

9. Use colored markers to connect the positions with similar temperature readings. The result will be an isothermal map of your classroom. With the three maps, you can compare the temperatures near the ceiling, middle and floor of the room.

A Classroom Thermal Map

Handout A (Part 3)

Name _____

Hypothesis

My hypothesis is that the warmest area of the classroom will be: _____

And the coolest areas of the classroom will be: _____

Data Form

Ceiling Reading

Position	1	2	3	4	5
A					
B					
C					

Waist Reading

Position	1	2	3	4	5
A					
B					
C					

Floor Reading

Position	1	2	3	4	5
A					
B					
C					

Conclusions

State whether or not the data support your hypothesis, and any other conclusions you can draw from the data. _____

_____

_____

_____