

HEAT ISLAND EFFECT

Grades: 3-8

Overview: (communicated by teacher)

Many Rio Grande Valley Communities are experiencing excessive heat known as an heat island effect that has serious health and safety impacts to residents. Have you ever taken a walk down a street with no trees in the middle of summer or gone outside to play at school where there are no trees? It's not pleasant! Planting trees that provide shade combined with other greening strategies can cool our city down as much as 15°F in some places during hot summer days. In this experiment, students will collect temperature data around their school campus to visualize how the urban heat island effect is impacting their community.

What is an Heat Island?

An heat island refers to a local buildup of heat. These areas of high population consist of streets, parking lots, and buildings that are made up of concrete and other materials that absorb solar radiation, trapping warm temperatures in the surrounding atmosphere. Additionally, the large amount of vehicles, buses, and construction in these areas emit pollutants that concentrate, creating a dome effect of hot, pollution-filled air.

Finding the Heat Index

The heat index provides you with a 'feels like' temperature by combining air temperature and relative humidity. When the heat index reaches above 100 degrees, the threat of heat exhaustion or heat stroke rises, putting the elderly, infants, young children, and those with chronic health problems at risk.

Method:

1. Collecting Data: Students will collect temperature data throughout the school day. Ideally, times should be early morning, noon and late afternoon but data can be collected in one class.
2. Students will record data in the chart below, taking 3 temperature readings at each location to find an average for each time of day. For example: students will take a total of 9 temperatures of grass that is in the direct sun—3 in the morning, 3 at noon and 3 in the late afternoon. To achieve this, multiple classes can work together to collect data during different times of the day.
4. Students will make conclusions, answering the questions below.
5. (Optional)- have students make measurements for this lesson twice, once at the beginning of the semester and once at the end. Compare the findings.

At a glance

Skills:

Critical Thinking
Teamwork
Discussion
Urban Forestry

Lesson Delivery:

(Best/Suggested method in bold)

- Whole group
- **Small group**
- **Independent work**

Location:

(Best/Suggested location in bold)

- **Outdoor**
- Indoors

Materials:

Necessary

- Digital Thermometer
- Pencil/Pen
- Paper

Optional

- Markers
- Color Pencils

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Modifications & Extensions

K-2*

Modification: Use Visual Thermometers and Color Codes

Provide color-coded thermometers (e.g., blue = cooler, red = warmer) or digital thermometers with smiley/sun/cloud icons. Instead of averaging numbers, students can match temperatures to picture cards or sort them from coolest to warmest using cut-out visuals. Recording can be done through coloring in simple bar charts.

Extension: Temperature & Comfort Journal

Students can keep a “How it Feels” journal where they draw themselves in each setting at different times of day and describe how the temperature feels (e.g., “It was hot in the sun at lunch!”). Add reflections on which areas feel best and why.

3-5*

Modification: Provide a Pre-Filled Chart Scaffold

Give students a partially filled data chart with example numbers or support boxes for calculating the average (e.g., number boxes + step-by-step guide). Use calculators or peer math buddies for students who need support with division or data entry.

Extension: Compare & Reflect with Satellite Imagery

After graphing their findings, students can compare their warmest and coolest spots to Google Maps satellite images of their school. They can highlight tree-covered vs. paved areas and write a short paragraph suggesting where more shade trees could help reduce heat.

6-8*

Modification: Data Collection Teams with Assigned Roles

Form small groups with assigned roles like timekeeper, thermometer reader, recorder, and calculator. Provide a step-by-step worksheet with formulas and room to show math, supporting students who may struggle with averages or graphing.

Extension: Heat Island Effect Research & Proposal

After analyzing the temperature data, students research the urban heat island effect and create a school improvement plan suggesting changes like planting trees, painting rooftops white, or installing green infrastructure. They present their plan as a slide deck or short report. Let me know if you'd like accompanying worksheets, templates, or Google Slides for any of these ideas!

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If a surface thermometer is available, use the following chart to track surface temperature.

Point #	Time	Temperature	Structure type (grass, concrete,	Shaded (y/n)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

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Using a digital thermometer, complete the chart below. A weather app can be used to find hourly data on temperature and relative humidity.

Location	Morning Air Temperature: Relative Humidity:	Noon Air Temperature: Relative Humidity:	Late Afternoon Air Temperature: Relative Humidity:
Unshaded Grass			
Shaded Grass			
Unshaded Mulched Area			
Shaded Mulch Area			
Unshaded Sidewalk			
Shaded Sidewalk			
Unshaded Road (pavement)			
Shaded Road (pavement)			
Unshaded Bare Soil (dirt)			
Shaded Bare Soil (dirt)			
Unshaded Building			
Shaded Building			
Unshaded Car			
Shaded Car			



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Using the data collected, complete the graph illustrating the difference in temperature between the shaded and unshaded locations. Then answer the following questions.

1. What was the temperature range between the unshaded pavement and shaded grass location? At what time of day was the range between the two largest?
2. What locations resulted in the highest temperatures? Explain why you think that is.
3. How do urban heat islands affect energy usage?
4. What can we do to mitigate the urban heat island effect?

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ELAR and Science TEKS Alignment

Module	Lesson	Science TEKS Alignment
2: Tree Structure and Benefits	5.3 Urban Heat Island Effect	K.1A, K.5A, K.8A, K.9A, K.12A 1.1A, 1.8A, 1.9A, 1.10A, 1.12A 2.1A, 2.8A, 2.9A, 2.10A, 2.12A 3.1A, 3.8A, 3.12A, 3.9A, 3.1F 4.1A, 4.8A, 4.1F, 4.10A, 4.12A 5.1A, 5.8A, 5.10A, 5.12A, 5.13A 6.1A, 6.8A, 6.9A, 6.11A, 6.12A 7.1A, 7.9A, 7.8A, 7.13A, 7.12A 8.1A, 8.8A, 8.11A, 8.12A, 8.13A
		ELAR TEKS Alignment
2: Tree Structure and Benefits	5.3 Urban Heat Island Effect	K.1A, K.2A, K.9A, K.6A, K.7A 1.1A, 1.2A, 1.6A, 1.7A, 1.9A 2.1A, 2.2A, 2.9A, 2.6A, 2.7A 3.1A, 3.2A, 3.5A, 3.6A, 3.7A 4.1A, 4.2A, 4.5A 5.1A, 5.2A, 5.5A 6.1A, 6.2A, 6.5A 7.1A, 7.2A, 7.5A 8.1A, 8.2A, 8.5A