

Too Hot to Handle

(3P1.a,b,c)

Time

1 - 3 45-minute classes

GSES Standard (# and text) Character Count: 1000

S3P1 Obtain, evaluate, and communicate information about the ways heat energy is transferred and measured

- **S3P1.a** Ask questions to identify sources of heat energy.
- **S3P1.b** Plan and carry out an investigation to gather data using thermometers to produce tables and charts that illustrate the effect of sunlight on various objects.
- **S3P1.c** Use tools and every day materials to design and construct a device/structure that will increase/decrease the warming effects of sunlight on various materials.

Phenomenon

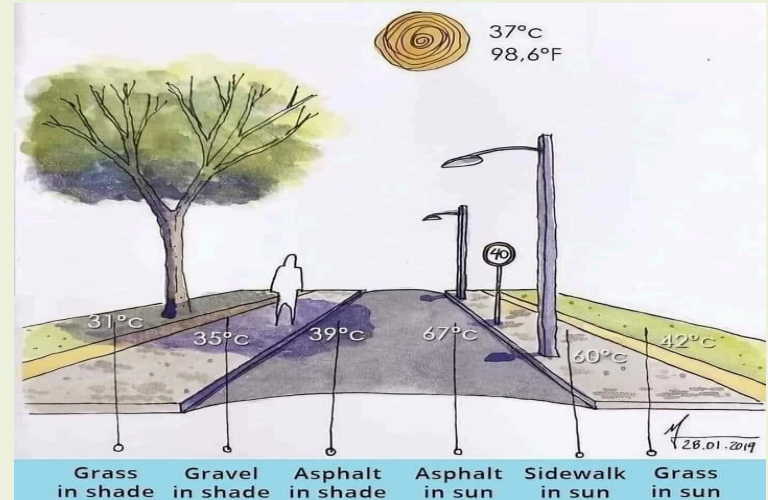


Photo credit: Mona Chalabi, The New York Times

Lesson Overview Character Count: 1000

Students will observe different surface temperatures in an outside setting as shown in the image above; measure temperatures in the schoolyard to determine what materials are hottest; design an experiment to determine whether some colors are hotter and cooler than others when made of the same material; design a device to cool an area of the schoolyard; build and test the design; and evaluate its effectiveness.

Engage Character Count: 900

Show the image above and encourage students to use the Observe / Notice / Wonder protocol. Prompt students to draft tentative explanations for the phenomenon.

Elicit Questions Character Count: 900

Invite students to ask questions about things that make them curious about the phenomenon. Then organize student research teams based on shared curiosity and similar questions.

Explore Character Count: 900

Organize students in research teams according to the similarity of their questions and issues about which they are curious. Summarize these articles for student research, or use Ai to create versions at appropriate reading levels:

- [Learn About Heat Island Effects including What are Heat Islands? and Measuring Heat Islands](#) - EPA
- [Planting Trees in Detroit Reverses Urban Heat Island Effect](#) - Fox 2 News Detroit
- [How Trees Prevent Deaths during Heat Waves](#) - Cool Green Science

Engage small groups of students in measuring and recording surface temperatures at different locations in the schoolyard.

- Consider using this [slide deck](#) to engage students in taking temperatures of various surfaces in the schoolyard using inexpensive infrared thermometers (less than \$10 each); mapping the “hot spots” and cooler areas on a google map of the schoolyard, saved as the background on a google slide or printed out; and analyzing the data to determine what factors may influence the “school heat island effect”.

- Prompt students to design and carry out an investigation to determine whether some colors are hotter than others when made of the same material

Engineer Character Count: 900

Students will design a project to provide shade in a small area of the schoolyard or otherwise lower surface temperatures. The following articles may be summarized by the teacher (or by Ai) to provide inspiration and guidance for student projects.

- [Using Green Infrastructure to Reduce Heat Islands](#) - EPA
- [Urban Heat Island Mitigation](#) - Cool Roofs Council
- [Planting Trees to Reduce the Urban Heat Island Effect](#) - OneTreePlanted
- [Painting Roads and Roofs White to Beat the Heat](#) - ESI Nation and
- [Can White Paint Save the World](#) - PBS video

Explain Character Count: 900

After their investigations and explorations, students will return to their original, tentative explanations and refine them to incorporate new understandings and information.

Environmental Stewardship / PBL Character Count: 900

See the engineering challenge, which may also be an environmental stewardship project.

Extend Character Count: 900

A group of students that finish the lesson early may participate in these projects:

- [Heat Mapping of Urban Heat Islands](#) - Lesley STEAM Learning Lab, Lesley University

Evaluate Character Count: 900

Students revised explanations should show greater understanding of the core ideas for the standard. Third grade students should be able to articulate the following:

- Some surface materials and some colors absorb more heat than others
- Natural surfaces (soil and plants) are typically less hot than pavement
- Lighter colors are typically less hot than darker colors, when comparing the same material or substance
- Temperatures in the schoolyard are lower in areas where sunlight is blocked, trees are planted, light colors are used, and natural surfaces are present

Re-Teach Character Count: 900

This lesson may be re-taught using the following resources

- [The Sun Heats the Earth](#) - PBS video that shows how different areas and surfaces of the Earth are different temperatures
- [What Makes Cities Hot?: An Urban Heat Island activity](#) from NASA

How this Lesson incorporates “Gather / Reason / Explain / Act / Teach” or “Obtain / Evaluate / Communicate” framework

Check relevant sections and add a line that describes specific, related lesson activities on the right. Character Count: 144

Gather / Obtain includes any of the following:

- ☐ Obtaining Information
- ☐ Asking Questions/Defining Problems
- ☐ Planning & Carrying Out Investigations
- ☐ Using Models to Gather Data
- ☐ Using Mathematics / Computational Thinking

Students will gather or obtain data and information by . . .

Answer Here or N/A
 Answer Here or N/A
 Answer Here or N/A
 Answer Here or N/A
 Answer Here or N/A

Reason / Evaluate includes any of the following:

- ☐ Evaluating Information
- ☐ Analyzing Data
- ☐ Using Mathematics / Computational Thinking

Students will reason and evaluate data or other info by . . .

Answer Here or N/A
 Answer Here or N/A
 Answer Here or N/A

- ☐ Developing Evidence
- ☐ Constructing Explanations / Solving Problems
- ☐ Using Models to Predict & Develop Evidence

Answer Here or N/A

Answer Here or N/A

Answer Here or N/A

Explain / Communicate *includes any of the following:*

- ☐ Communicating Information
- ☐ Arguing from Evidence (written & oral)
- ☐ Using Models to Explain or Communicate

Students will explain and communicate by . . .

Answer Here or N/A

Answer Here or N/A

Answer Here or N/A

Act

- ☐ Student-Directed Stewardship Project or Civic Action

Students will solve a real-world problem by . . .

Answer Here or N/A

Teach

- ☐ Presentation of Project to Stakeholders / Reflection

Students will share their findings and reflect by . . .

Answer Here or N/A

How this Learning Experience Integrates 3-D Science *The checked elements are integrated in this lesson:*

Science and Engineering Practice

- ☐ Asking Questions and Defining Problems
- ☐ Developing and Using Models
- ☐ Planning and Carrying Out Investigations
- ☐ Analyzing and Interpreting Data
- ☐ Mathematical and Computational Thinking
- ☐ Constructing Explanations and Designing Solutions
- ☐ Engaging in Argumentation from Evidence
- ☐ Obtaining, Evaluating and Communicating Information

Crosscutting Concepts

- ☐ Patterns
- ☐ Cause and Effect
- ☐ Scale, Proportion and Quantity
- ☐ Systems and System Models
- ☐ Energy and Matter
- ☐ Structure and Function
- ☐ Stability and Change

Core Ideas

Physical Science

- ☐ Matter and Its Interactions
- ☐ Motion and Stability / Forces and Interactions
- ☐ Energy
- ☐ Waves and their Applications in Info Transfer

Life Science

- ☐ Structure and Processes
- ☐ Ecosystem Interactions, Energy and Dynamics
- ☐ Heredity, Inheritance and Variations
- ☐ Biological Evolution, Unity and Diversity

Earth and Space Science

- ☐ Earth's Place in the Universe
- ☐ Earth's Systems
- ☐ Earth and Human Activity

Engineering

- ☐ Engineering Design Process
- ☐ Links among Engineering, Technology, Science and Society

How this Learning Experience integrates STEM: **Character Count: 900**

Students will use technology (infrared thermometers) to measure surface temperatures.

What parts of this lesson are suited for Outdoor Learning and why?: **Character Count: 900**

All of the field investigations and data collection activities take place outdoors so that students can compare temperatures of different surface materials and colors.

Is there a project or series of which this Lesson is a part?

CoOL Schoolyard Lesson Collection

Is another version of this Lesson available?

Choose yes or no.

No

Lesson Name: Character Count: 144