

# The Natural and Built Environment



## Objective:

Students will be able to:

- distinguish between the natural and built environment.
- hypothesize about interactions among biotic and abiotic parts of the environment

## Author:

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Education team

## Time:

50 min. class period

## Grade Level:

6-9

## Standards:

### AZ Science Strands and Concepts:

Inquiry, Nature of Science, Changes in Environments, and Organisms

### NGSS -Core Ideas

Interdependent Relationships in Ecosystems; Energy Transfer in Ecosystems; Ecosystem Dynamics, Functioning, and Resilience; Biodiversity & Humans; Human Impacts on Earth Systems

### Practices:

Developing and Using Models, and more

### Crosscutting Concepts

Patterns, Systems & System Models, Cause and Effect, Energy, and more

*Specific AZ, Common Core, and NGSS Standards on page 2.*

## Background:

As cities grow, the natural environment becomes transformed, from the native vegetation into a diverse assemblage of built materials, including buildings, parking lots and roadways. This has impacts on all organisms, native and non-native, including humans. One result is that concrete and asphalt increase mass density and heat-storage capacity, which increase the Urban Heat Island effect.

## Vocabulary:

**environment** - surroundings made up of living and non-living items

**natural** - item not created by people (i.e. insects, soil, plants...)

**built** - item created by people (i.e. railroad, fence, storm drain...)

## Advanced Preparation:

Cut apart the sheets of natural and built photos, keeping each set of four together. Observe school yard or environment where students will be exploring.

## Materials:

- natural/built pictures
- butcher paper
- clipboards
- Student Worksheets: Natural and Built Classroom Photos, Natural and Built Environment Schoolyard Data

## Recommended Procedure:

### Engagement:

- 1) Show pictures of one natural item and one built item. Ask students: Are you familiar with these items? What do you notice about them? How are they different? Discuss students' descriptions and comments. Guide them to identify living and non-living, built and natural items.
- 2) Have students brainstorm: How might these items interact in the environment?

### Exploration:

- 3) Form groups of four students. Give each student one of the Natural and Built Photocards from each sheet of four. Have students identify their card as living or non-living, built or natural. Ask: Are each of the images on the same scale? Solicit explanations.
- 4) Have each student brainstorm how their item might interact with the other four items in their group. Use the Student Worksheets: Natural and Built Model to have students organize their items and interactions.
- 5) Using large sheets of paper, have students arrange their four cards on the paper to represent how the items might interact with each other. After trying a few different configurations, ask them to decide on a permanent arrangement and tape their photos to the paper.

- 6) Guide students to use arrows or other symbols to represent the interactions. Ask them to label each arrow or symbol with a description of the interaction.
- 7) Ask students: Are the interactions positive, negative or neutral from the perspective of each of the four items? Guide them to include symbols representing these relationships next to their interaction symbols.

### Explanation:

- 8) Have each group of four pair up with another group and compare their images and models.
- 9) Have each student swap their image with someone from the other group. Each group should then return to their own model and try to incorporate the new items, including interaction symbols.
- 10) Finally, ask the students to include one more item - the sun. Focusing mostly on infrared radiation (heat), ask the students to draw appropriate arrows or symbols and label interactions between the energy from the sun and the re-radiated energy (heat) from terrestrial surfaces and the items on their model. Share some of these last interactions with the class.
- 11) Prepare to go outdoors. Explain that students will observe built and natural items on the school grounds. Pass out the Student Worksheet: Natural and Built Environment Schoolyard Data and clipboards.

### Elaboration:

- 12) Lead students to explore their environment and notice possible interactions among items. For example, have them list any animals or plants that they see and examine plants for possible indications of insects (like eaten leaves). Encourage them to notice the spatial arrangement of objects and different scales (landscape vs. under a bush). Imagine what would happen if it rained or if the sun were in a different location... what happens at night?
- 13) Have students individually record 10 items and list whether they are natural or built. The interactions column can be completed indoors through further discussion.
- 14) Back indoors, prepare the groups of four to make a new model of the real environment in their school yard using a new sheet of large paper. Have each student choose five unique items from their list for the group model.
- 15) Using a large sheet of paper, ask the group to think of

simple symbols for each of their items. In one corner of their paper have students record their key of symbols. (Built objects could be represented by squares and natural objects by circles. For more complexity, you may choose separate colors for animals, plants, hard surfaces and abiotic items, such as water or wind.)

- 16) Have the group work together to arrange their model symbols on the paper. They may look as they were found spatially outdoors, or they can be more abstract to facilitate drawing interaction symbols.
- 17) Guide students to add interaction arrows or symbols and label the interactions with descriptions as before.
- 18) When the models are complete, again add the sun and interactions with heat. Then ask students to look for new interactions among their items that might occur as a *result* of the heat. These are called indirect effects. For example, would the effect of a concrete block wall on a lizard be different when it is hot? Would the indirect effects be different in summer and winter?

### Evaluation:

- 19) Have each member of each group present one or two interactions in their model. Ask students to summarize the patterns they noticed and the main differences in interactions between built and natural items. Ask: How do natural and built items respond differently to heat? Why?

### Extensions:

Students follow the journal prompts on the two Student Worksheets: Built and Natural Journal Writing.

### Standards

#### Arizona Science Standards

S1-C1-GR5-PO1  
 S1-C1-GR6-PO2  
 S1-C1-GR7-8-PO1  
 S1-C1-GRHS-PO1  
 S1-C2-GR5-HS-PO1, PO5  
 S1-C3-GR5-PO5  
 S1-C3-GR5-PO5  
 S1-C3-GR6-PO2  
 S1-C3-GR7-PO1, PO2, PO7  
 S1-C3-GR8-PO1, PO2, PO8  
 S1-C3-GRHS-PO1  
 S2-C2-GR6-7-PO3  
 S2-C2-GR8-PO1  
 S3-C1-GR5-PO1  
 S3-C1-GR7-PO1  
 S3-C1-GR8-PO1, PO2

## **Arizona Science Standards cont'd**

S4-C4-GR8-PO1

S4-C4-GRHS-PO3, PO4

### **NGSS Core Ideas:**

ESS2.A: Earth materials and systems

ESS2.D: Weather and climate

ESS2.E: Biogeology

ESS3.C: Human impacts on Earth systems

LS2.A: Interdependent relationships in ecosystems

LS2.C: Ecosystem dynamics, functioning, and resilience

PS3.B: Conservation of energy and energy transfer

LS4.D: Biodiversity & Humans

LS2.B: Cycle of Matter and Energy Transfer in Ecosystems

### **NGSS Practices:**

Developing and using models

Planning and carrying out investigations

Constructing explanations

Obtaining, evaluating, and communicating information

### **NGSS Crosscutting Concepts:**

Patterns

Cause and effect

Scale, proportion and quantity

Systems and system models

Energy and matter: Flows, cycles, and conservation

Stability and change

### **Common Core/ELA Literacy**

RST7: Integrate content from diverse formats

WHS1: Write to support claims

WTS2: Write to convey ideas and information

SL1: Participate in collaborations and conversations

SL2: Integrate oral information

SL4: Present effectively to listeners

### **Common Core/Mathematics**

Domains:

Number and Quantity

Measurement and Data

# Student Worksheet

## Natural and Built Environment Model

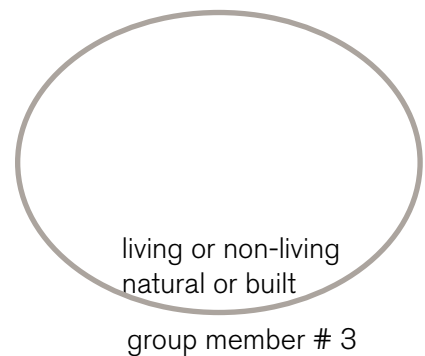
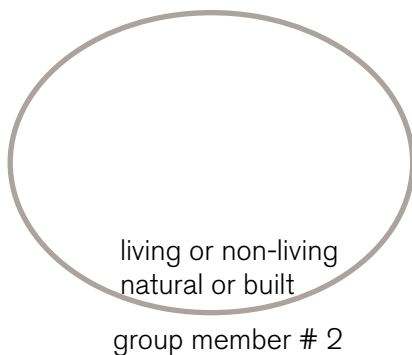
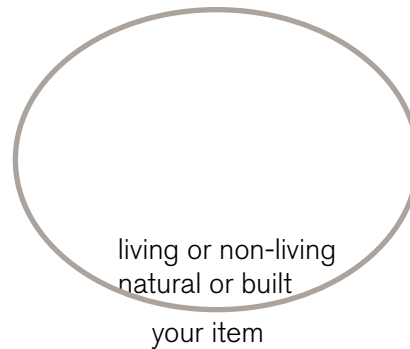
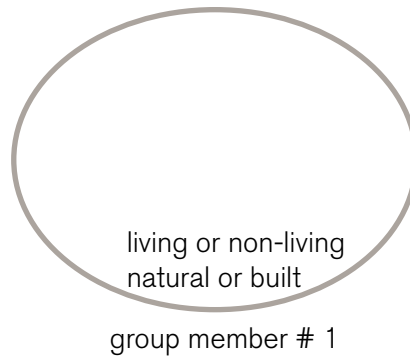


### Learning Objective

Distinguish between the natural and built environment in photos.

### Group Instructions

- 1) Your teacher will give you each a different picture. Identify the items of interest.
- 2) Write your item in the center of the diagram and circle whether it is living or non-living and built or natural.
- 3) Brainstorm with your group members how each of their items might interact with yours.
  - Include the other items and draw arrows or other symbols to represent the interactions.
  - Label each interaction with a description/explanation.



# Student Worksheet

## Natural and Built Schoolyard Data



<b>Item (object or organism)</b> Label and describe the item. <i>Is it living or non-living?</i>	<b>Natural or Built?</b> Identify the item as natural or built	<b>Interactions</b> Describe how the item interacts with other items in the environment
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

# Student Worksheet

## Natural and Built Journal Writing



**Imagine and Explain:**

How do natural and built items respond differently to heat? Why?


# Student Worksheet

## Natural and Built Journal Writing



### Imagine and Explain:

Imagine the an time of your choice is eliminated from your school environment. Describe the possible environmental consequences

### Example

Imagine if ...your school grounds did not have any tree... Consider the following potential consequences.... Lack of shade, less oxygen, a boring schoolyard landscape.....
