

## LESSON 1: CITIES AS SYSTEMS

### OVERVIEW

*This lesson is designed to elicit student preconceptions about cities, introduce the idea of cities as systems, and introduce the driving question for the entire year. The lesson begins with a brainstorm where the teacher leads a “word splash” about the word city. Then in order to encourage students to start thinking of cities as systems, student groups draw up plans (or construct models) of city neighborhoods and work to fit these neighborhoods into a city. To understand the time aspect of systems (and cities), these student groups are provided with imaginary (but possible) events that happen to their constructed city and asked to construct a past or future for their city. Finally, the lesson concludes by introducing the driving question for the entire unit – How do we develop healthy and sustainable cities? This question will be revisited multiple times during the year as students learn more about urban ecosystems.*

### SUB-QUESTION

Is a city a system?

### **Ways of Knowing Urban Ecology:**



*Students will...*

#### Understand

- Understand that a system is a collection of interrelated parts operating on a number of different scales, and exhibiting ongoing and dynamic change over time. (*ecosystem change, forces and drivers, scale, ecosystem state and structure*)
- Recognize that the nature or purpose of the system is different from, and more than, the sum of its unassembled collection of parts. (*ecosystem state and structure*)
- Recognize that a city is a special type of system, an urban ecosystem. (*human impact*)

#### Talk

*No specific goals connected with talking about urban ecology in this lesson.*

#### Do

- Construct a two- or three-dimensional model of a neighborhood.
- Work together to fit these neighborhoods into a city.

#### Act

*No specific goals connected with acting on urban ecology in this lesson.*

### SAFETY GUIDELINES

No specific safety issues are associated with this lesson.

## **PREPARATION**

### Time

### **2-3 class periods**

### Materials

#### **Activity 1.1**

- Student notebooks
- Chalk or white board (optional: butcher paper or poster board and markers)

#### **Activity 1.2**

- Copy or construction paper
- Markers and pencils
- Rulers
- Scotch Tape
- *Optional:*
  - Cardboard
  - Boxes (cereal, cookie, cracker, etc.)
  - Scissors
  - Empty paper towel or toilet paper rolls
  - Masking Tape

#### **Activity 1.3**

- Student models or plans of neighborhoods
- Contingency Cards (at least one for each group, or ideally one past and one future card for each group)
- Student notebooks

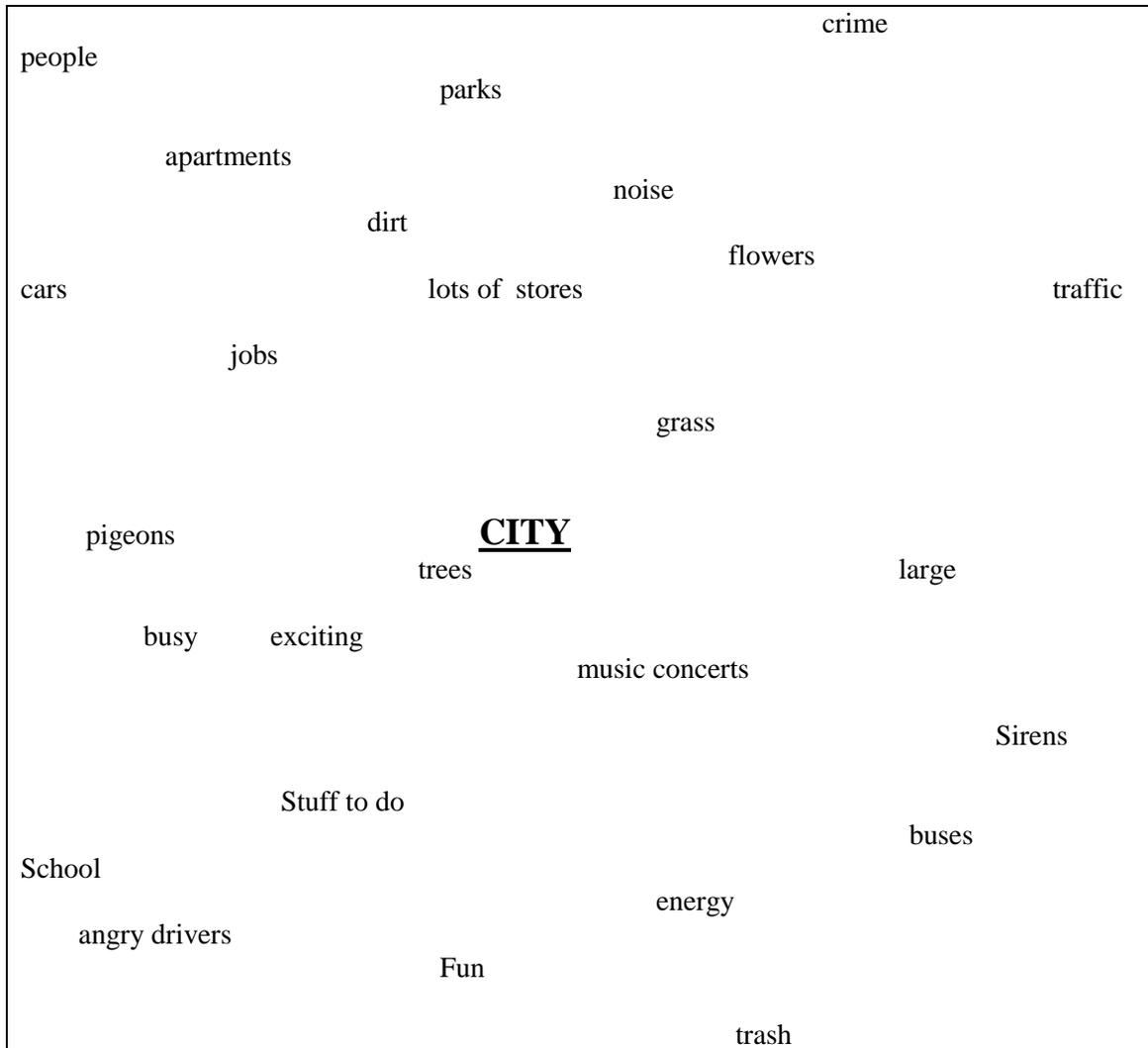
### **Concluding the Lesson**

- Student Notebooks

## **INSTRUCTIONAL SEQUENCE**

### **Activity 1.1: Brainstorm Word splash – What makes a city?**

1. Tell students that their focus in science class this year is going to be around cities. Write “CITY” in the middle of a piece of butcher paper or poster board. Ask students to each think of a word that they associate with the word city. Have students call out the different words they associate with “CITY” and as they call them out write the words randomly around the paper. Write down all answers that are appropriate and on task. Below is an example of what the outcome for the word splash might look like:

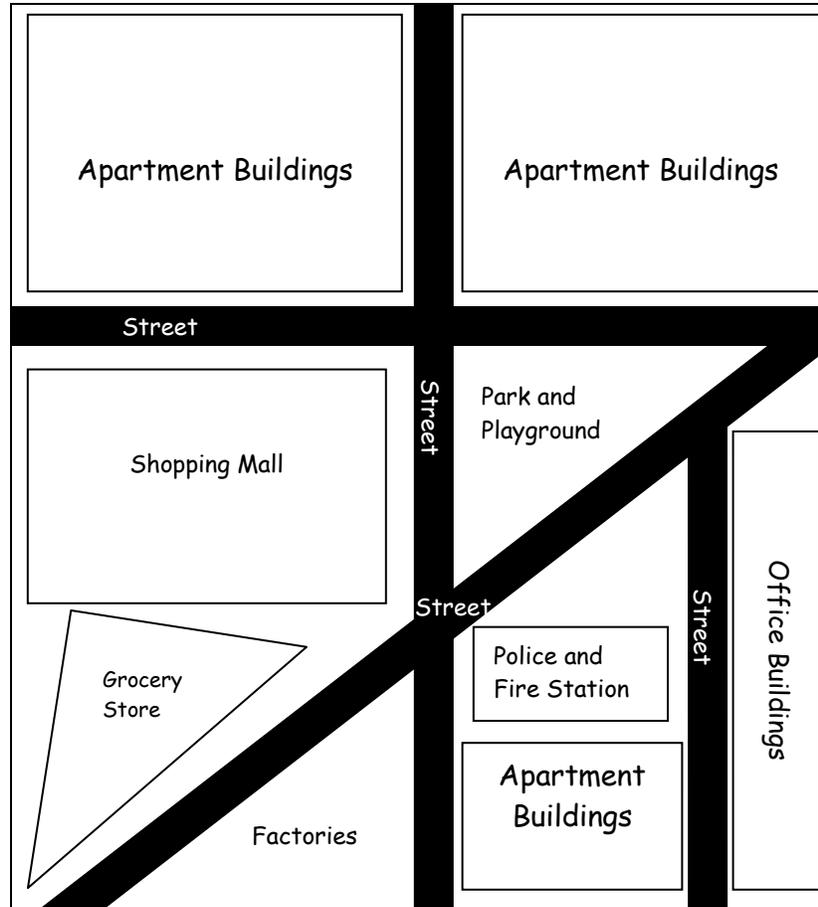


2. Ask your students to identify words and phrases that they typically think of as “science” and words and phrases that they typically think of as “non-science.”
3. Tell them that in urban ecology, we study both the “scientific” and the “social,” with “scientific” referring to interactions in the environment that *are not* exclusively human and the latter referring to interactions that *are* exclusively human.

**Activity 1.2: Building Neighborhoods and Cities**

1. Inform your students that they will be breaking up into groups and building a model of a neighborhood, and that they will be coming together as a whole to join their neighborhoods together to make a complete city.
2. Break your students into smaller groups of 3-4 students each. Depending on the size of your class, your own teaching style, and the needs and preferences of your students, you may want to break your students into curriculum-long “working groups.”

3. Tell your students that each group is responsible for creating a neighborhood of a city. Based on time and material availability, let them know that they will be creating 2-dimensional plans (see example) or three-dimensional models (see photo). Tell them that when every group has completed their neighborhood, the class will come together to join their neighborhoods in a complete city.
4. Review the city word splash from Activity 1.1. These are the elements that need to be represented in the city and in their neighborhoods.
5. Provide your students with guidance in terms of the following questions:
  - a. How will our neighborhoods connect with one another? This is a question of interrelatedness.
    - i. Potential responses: streets, waterways, greenways, bike paths, bus routes, subways or trolleys. More than one response can be appropriate.
    - ii. Follow-up consideration: you may decide as a teacher or as a class that these connections need to “match up” (that is, the streets exiting and entering the neighborhoods need to physically connect with streets from other neighborhoods), creating a greater challenge.
  - b. How will the elements be represented? This is a question of scale.
    - i. Potential responses: the student groups work independently so that each neighborhood has some or all of the elements of a city, or the groups will work together and ensure that the elements are represented across the city as a whole.
    - ii. Follow-up consideration: time and efficiency may be a consideration. If time is very limited, groups can work independently; if more time is available, your class can try it both ways.



6. Distribute the materials and provide students with the time to complete the plans or models.
7. When all the student groups have completed their plans or models, come back together as a class and piece the neighborhoods together. Again, as the teacher, you can decide how “planned” the city will be: someone (e.g., you the teacher) as the central planner directing student groups to place their neighborhoods in specific spots; the class as the whole making decisions; or random placement of neighborhoods.
8. Once the neighborhoods have been placed, lead a discussion about how the neighborhoods fit together, what is represented in each neighborhood, and what is represented in the city as a whole.

**Activity 1.3: Systems, Cities, and Time**

1. Make sure that you print and cut out enough contingency cards so that each group receives at least one card (for one event, in the past or in the future). If time allows, each group may receive two cards: one in the past and one in the future.
2. Tell your students that you will be discussing systems, cities, and change over time.
3. Ask your students if they have noticed how their city has changed over time. Allow time for students to share some experiences in this regard.

4. Inform your students that one of the defining characteristics of systems is that they change over time. Ecological systems, such as cities and urban areas, change in ways that are not always directed with an end goal in mind, and even when change is directed, the end does not always match what was expected.
5. Remind your students of the neighborhood and city models that they constructed in the last activity.
6. Pass out the contingency cards to each group. Ideally each group receives one past card and one future card of a different event. If time allows only one event per group, distribute the cards randomly.
7. Ask your students to consider the events and discuss their responses to the questions. They may simply discuss the questions, write responses in their notebooks, or create a poster with their responses.
8. Allow time for whole class discussion of the groups' responses, especially if two different groups received the same card. Remind them that there is no correct answer.
9. Ask your students if they have seen similar events in their own city, or in other cities in the news, on television, or on the Internet.

### **Concluding the Lesson**

1. Discuss with your students the defining characteristics of a system: interrelatedness of parts, scale, and change over time.
2. Remind them of how these characteristics were discussed in terms of their model city and in terms of the city in which they live.
3. Remind your students of the driving question for the curriculum, *How do we develop healthy and sustainable cities?* (or write it on the board). Remind them this is the big question that they will be exploring over the course of the year. Ask for questions, comments or feedback on this driving question.
4. Let them know that in the next lesson they will be talking in more detail about the pieces that make up an ecological system and the place of people within it.
5. **HOMEWORK:** Hand out the Field Studies Safety Contract. Ask them and a parent or guardian to sign it. On their way to or from school, ask your students to note one item which is living, one item which is not living, and one item which is made by people.