

Introduction to Systems—Part I

Lesson Length: Approximately 1½ hours

Curriculum Alignment Code		GOAL 1	GOAL 2	GOAL 3	GOAL 4	GOAL 5
		X		X		

Instructional Purpose	<ul style="list-style-type: none"> • Demonstrate an understanding of the concept of systems • Identify and understand structure, function, and pattern as key systems concepts
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Assignment Overview

- Introduce the concept of systems.
- Explore an aquarium system.
- Further examine systems.

Materials

- **Student Activity Pages 4A and 4B**
- Chart paper and markers

1. Introduce the Concept of Systems

- Begin the lesson by reviewing and discussing the following vocabulary terms:
 - *system*—a group of interacting elements forming a complete whole that takes in inputs, gives off outputs, and may be described by its structure, function, and patterns
 - *structure*—the elements of a system and how they are put together
 - *function*—the purpose of a system or what it is supposed to do
 - *pattern*—something that happens over and over again in the same way
- Explain to students that during this unit, as they study the civilization of ancient Egypt, they will be looking at some of the different **systems** that are important in civilizations. Ask students if they have heard the word *system* and encourage them to share some examples. Write any examples students give on the board or a sheet of chart paper.
- Next, have students create a concept map, using chart paper and markers, of what a system includes and what it looks like. A concept map is a graphic organizer that helps students organize their thoughts by putting the main idea in the middle and then forming ideas around the main idea.

2. Explore an Aquarium System

- Divide students into small groups. Have students turn to the Aquarium System (**Student Activity Page 4A**) and explain that an aquarium is an example of a system. Ask students to illustrate and label the aquarium and discuss what things are in it, what must go into it regularly, and what comes out of it. (If possible, allow students to examine an actual aquarium as they complete this activity.)

- Bring the students back together as a large group and encourage them to share what they included in their aquarium systems. Explain to students that we can define these five things about systems: **elements, boundaries, inputs, outputs, and interactions**. Ask the following questions to help students understand each of these terms:
 - *What are the parts of the aquarium?* [the tank, water, fish, plants, plastic figures, filter, etc.] *What lives in an aquarium?* [fish, plants, bacteria, tiny insects, etc.] *What other things have to be in the aquarium for the fish to live?* [water, food, oxygen] *All of the things that are parts of the aquarium and what belongs in it are called **elements**.*
 - *What keeps the elements of the aquarium together?* [the sides and bottom of the tank] *What are the edges or **boundaries** of the system?* [the sides and bottom of the tank, the top of the tank or top of the water in an open tank]
 - *What things go into the aquarium from outside?* [food, water, air, more fish, plants, other objects] *What are some things that have to be added to the aquarium regularly to keep the fish alive?* [food, clean water, new filter] *The things that are put into a system to keep it going are called **inputs**.*
 - *What things come out of the aquarium and its elements?* [water evaporates into the air, bubbles pop at the top, more fish may be produced and taken out for other aquariums, the fish poop, dead fish] *The things that a system produces or lets out are called **outputs**.*
 - *What are some of the things that happen in the aquarium to use the inputs and produce the outputs?* [the filter bubbles; the fish eat, grow up, have babies, and die; the plants produce oxygen] *What do the fish do to use the inputs and give off outputs?* [eat, breathe] *The things that happen in a system to use the inputs and give off the outputs are called **interactions**.*

3. Further Examine Systems

- Tell students that there are many different kinds of systems. Some systems are small and it is easy to see their boundaries, elements, inputs, and outputs, while in other systems it is more difficult to see these things. Some systems have living things as a part of them, and others do not. Ask students whether they think their classroom is a system. Have students turn to the Systems Diagram (**Student Activity Page 4B**) and have them work in groups (or as a whole group) to identify some of the elements, boundaries, inputs, outputs, and interactions of the classroom system. Some suggested responses:
 - **elements:** *students, teacher, desks, books, board, pencils, computer. . . .*
 - **boundaries:** *walls, window, door, schedule of school day. . . .*
 - **inputs:** *information, experiences, papers, visitors. . . .*
 - **outputs:** *projects, presentations, test results. . . .*
 - **interactions:** *conversations, learning, teaching, sharing. . . .*
- Wrap up the exploration of Systems by having students respond to the following in their *Systems journals*: *Is your home a system? What are some of the elements, boundaries, inputs, outputs, and interactions in your home system? Draw a Systems Diagram in your journal to show how your home is a system.* Invite students to share their ideas.



Notes to Teacher

- This lesson is an introduction for Lesson 7, which uses a Concept Development Model to help students develop an understanding of systems as a concept. The vocabulary and definitions related to systems will be used throughout the unit to explore different systems within the Egyptian civilization.
- Suggested responses provided in brackets are given only to provide discussion guidelines; they are not meant to be absolute responses that should definitely appear in the discussion.



Homework

The following assignments may be given to students for homework:

- Have students complete their journal entry at home for homework.
- Encourage students to interview family members about systems around them in order to further understand what a system is and is not.



Extensions

The following options may be given to students as extension activities:

- Have students create a diagram of a system using three dimensional materials. They can use any materials they choose (a shoebox, Lego bricks, etc.) and their system can be any example that they decide (they can do the aquarium from class, or a library, whatever they decide).
- Encourage students to create a puzzle based on a system. Tell them to create the pieces based on the various inputs, outputs, and interactions of that specific system. The puzzle can be made using physical materials or on an electronic outlet such as <http://www.dailyjigsawpuzzles.net/puzzle-maker.html>.

Name: _____ Date: _____



Activity 4A

Aquarium System

Directions: Using the following template, illustrate and label the parts of an aquarium. What elements are in this aquarium? What must go in and out of the aquarium daily? What makes this a system?

A large, empty rectangular box with a black border, intended for the student to draw and label an aquarium system.



Activity 4B

Systems Diagram

Directions: Using the Systems Diagram below, identify some of the elements, boundaries, inputs, outputs, and interactions of the classroom system.

Name of System _____

