



## EMERGING OCCUPATIONS SYSTEMS THINKING SKILLS

**Grade Levels:** Grades 6-8

**Duration:** 45 minutes

### Content Areas

Systems Thinking

### Next Generation Science Standards

- SEP-2: Developing and Using Models
- DCI-ETS1B: Developing Possible Solutions
- CC-1: Systems and System Models

### Crosscutting Concepts

Cause and Effect; Scale, Proportion, and Quantity; Science is a Human Endeavor

### Materials

- "Occupation Cards"
- Student worksheets
- PowerPoint presentation

### Learning Objectives/Outcomes

- Define system
- Recognize the basic elements of a system

### Lesson Description

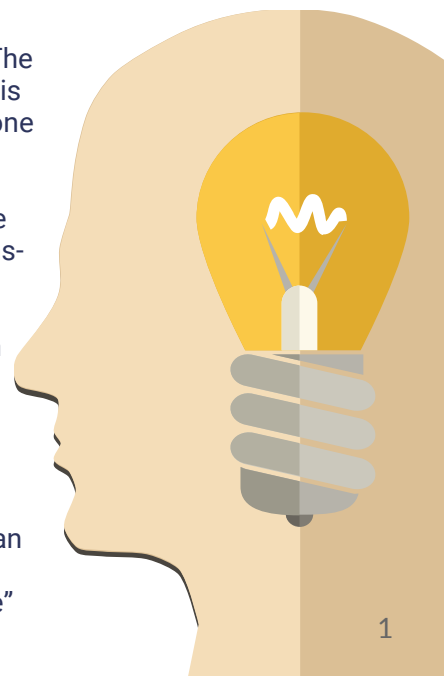
This lesson exposes students to the basic concepts of a system and what a system does. Students are given a scenario in which they are being sent to start a colony on Mars. Each of the students are assigned a unique occupation, and they must figure out how the skill sets of their occupations will benefit the colony. Once they discover how they can help, students form pairs and must list out what kinds of things they can accomplish together as a pair. The goal of this exercise is to show students that people can be more effective if they work together.

### Using This Lesson

This lesson can be used as a part of the Systems Thinking Skills series, utilizing and building upon the skills developed in the other lessons, or it can be taught as a standalone lesson.

### Importance of This Lesson

1. As a society, we are faced with increasingly complex, systemic problems. Systems thinking provides the fundamental basis for all skills related to solving these systemic problems.
2. These lessons teach students a vocabulary to think about their own thinking—metacognition. When one practices metacognition, they are able to monitor their own thinking and find opportunities for developing better or new ways to approach problems.
3. Systems are formed when people or things work together. The outcome of a group of elements is often vastly different than what one element does individually. Understanding the basics of systems allows people to see the world through the lens of systems-thinking and to recognize that systems are at work everywhere. Problems both big and small can be solved by identifying the systems attributed to those problems and then using those systems to find ways to find solutions. Being exposed to this way of thinking at an early age can help students form the habit of always looking at the "big picture" when solving problems.



# EMERGING OCCUPATIONS

## SYSTEMS THINKING SKILLS

### Materials

- “Occupation” activity cards  
(1 card per student. 6 unique cards exist)
- Student worksheets  
(1 copy per student)
- Computer and projector for PowerPoint presentation

### Content Background

#### Systems Thinking Overview

What is systems thinking? Systems thinking is the method of thinking used to think about systems. It is based in four basic rules, described below with their accompanying co-implication:

- Distinctions Rule: Any idea or thing can be distinguished from the other ideas or things it is with (thing-other).
- Systems Rule: Any idea or thing can be split into parts or lumped into a whole (part-whole).
- Relationships Rule: Any idea or thing can relate to other things or ideas (action-reaction).
- Perspectives Rule: Any thing or idea can be the point or the view of a perspective (point-view).

These four rules (abbreviated to DSRP) are applied in parallel in systems thinking and can be found as the basis for practically all forms of thinking and methodologies related to systems.

#### Systems

Systems, the ‘S’ in DSRP, is the concept that things and ideas can be put together to form a broader meaning. Those things and ideas are commonly referred to as “elements”. The ways that systems are organized and the elements they contain will determine the meaning. Furthermore, systems can be broken down into smaller systems and also combined to create a larger system. Every element plays a role in a system. Understanding the systems rule will allow one to determine how elements fit into the big picture of systems.

### Preparation Instructions

1. Print copies of student worksheet for every student in the class
2. Divide the room in such a way that pairs of students can work in pairs
  - a. If the class is not divisible by 2, have one extra student join a pair to make a group of 3
3. Load lesson PowerPoint presentation
4. Have students keep their occupation cards face down until they are instructed to look at them



# EMERGING OCCUPATIONS

## SYSTEMS THINKING SKILLS

### Lesson Outline

#### Introduction (2 min)

- The S.M.I.L.E. Initiative is sending a colony to Mars
  - You have all been chosen to build a civilization there
- You are all “professionals” – people with trained skillsets who can work in special areas
- You have all been given unique pictures, and your picture with its subtitle will show you and tell you what your “profession” is and what that allows you to do
  - Students may now flip over their occupation cards

#### Personal Occupation Skills (12 min)

- Read through your occupation card. Ask your teacher if you don't understand what a word means.
- Now elaborate on your skills. How will you use your skills to help the colony once you get to Mars? Think about how your profession can uniquely help the colony.
  - What are some special things that you can do with your professional skills for the Mars colony that most people can't do? List at least 4 things.
  - If you went on the journey by yourself, how would being alone on Mars make those tasks difficult to accomplish?
    - Answers to this question can range from small problems like “who would the dentist operate on?” to large problems like “where would the oxygen come from?”

#### Pair Occupation Skills A (12 min)

- Research shows that if people put their skills together in a partnership, they will be able to accomplish things that they couldn't do alone.
  - Get together with another person of a different profession and share what your professional skills are.
- What can you accomplish together? Write down at least four things your professional pair can do together.
  - An example might be needed, and in this case, use one of the student pairs and, in front of the class, help them discover their first relationship attribute.
    - Ex. Dentist-Civil Engineer: create a high-rise dentistry office or create the roads that get to the dentist
- What would make those tasks difficult to accomplish if you and your partner went to Mars alone?

#### Lecture (6 min)

- How has the colony gained value now that people are working in pairs?
  - When two or more elements work together, they create a system.
- A system is a body of independent elements working together in relationships to achieve a goal.
  - What are some examples of systems?
    - Computer, computer network, football stadium and stadium operations, solar system, more examples can be added as needed.

Continue to Next Page



# EMERGING OCCUPATIONS

## SYSTEMS THINKING SKILLS



### Discussion (13 min)

- List three ways that the colony is better off when you are working together. Pick one to explain in detail.
- Are the pairs systems?
  - Describe what makes your pair a system.
- Would a group that is larger than two people also be a system?
  - The entire colony is a system!
- Systems are everywhere. Identify two more systems that a colony on Mars will have and explain what makes them systems.
- There are two more spots open on your voyage to Mars, which means that you can invite two more professionals.
  - Write down two new occupations that would help your colony if you were to bring them along. How will their profession contribute to the colony?
- Congratulations! Your group efforts have made you ready for your journey to Mars.
  - The colony is happy to see that you are working together, and you can now board the spaceship!

