

8b.2 What is a Systems Thinker?

Story Extension for This Lesson:

As Sam and Alex learn more about the Great Lakes and the complicated system of human and environmental interactions that now define life around the Lakes, they realize that they need to learn new ways to think about complex systems and how they operate.

Grade: 8

Strand: Systems in Action

- Systems are designed to accomplish tasks. (Overall expectations 1, 2, and 3)
- All systems include an input and an output. (Overall expectations 2 and 3)

Overall Expectations:

2. investigate a working system and the ways in which components of the system contribute to its desired function
3. demonstrate an understanding of different types of systems and the factors that contribute to their safe and efficient operation

Specific Expectations:

3.2 identify the purpose, inputs, and outputs of various systems (e.g., a garden, purpose: to grow things; input: seeds, water, fertilizer; output: flowers, food)

3.3 identify the various processes and components of a system (e.g., robot, front-end loader/backhoe, heating system, transportation system, health care system) that allow it to perform its function efficiently and safely

Inquiry Skills:

Modelling, Analyzing, Explaining

Instructions:

Part 1:

For simple systems, understanding how they work and how changes affect the system are often easy to understand. Have students re-visit the thrift store toys from the introductory activity:

- How can changing the input affect the output?
- Is there any way to modify or change the processes involved in this system?

However, with more complex systems, including political, ecological, and more complicated mechanical systems, more complex thinking and reasoning skills are required to understand how the system works, how changes affect the system, and how inefficiencies can be removed from the system.

Part 2:

Working in pairs, have students examine the **Habits of a Systems Thinker**:

- <http://watersfoundation.org/systems-thinking/habits-of-a-systems-thinker/>

You may wish to project the attached poster on a projector or IWB, or you may choose to have a poster printed. Be sure to record on chart paper some of the questions that a Systems Thinker asks when using the different systems thinking habits.

Part 3:

In pairs, have students look at a system that they understand well: their classroom. Have them map out the components of the system, inputs, and outputs. Then, have the students apply two of the Habits of Systems Thinkers to analyze the classroom system. Encourage them to use the Question Prompts from the Habits of Systems Thinking website to focus their thought processes. The result could be a Systems Flowchart, along with analysis based on the thinking habits.

Materials List:

- Tablets or computers for students to access website for Habits of a Systems Thinker:
<http://watersfoundation.org/systems-thinking/habits-of-a-systems-thinker/>

Connections:

Systems Thinking is a form of higher order thinking that can be applied across the curriculum.

Handouts/Assessments:

- Habits of a Systems Thinker

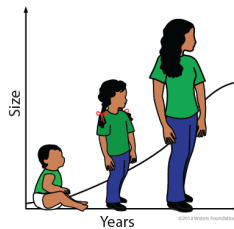
Assessment Strategy:

Formative: Provide students feedback on their Systems Thinking based on their analysis of the classroom system.

Seeks to understand the big picture



Observes how elements within systems change over time, generating patterns and trends



Recognizes that a system's structure generates its behavior



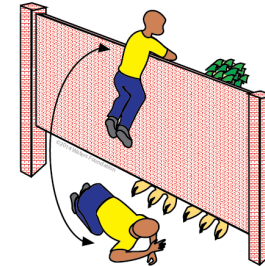
Identifies the circular nature of complex cause and effect relationships



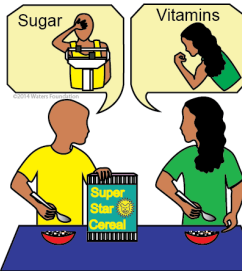
Makes meaningful connections within and between systems



Changes perspectives to increase understanding



Surfaces and tests assumptions



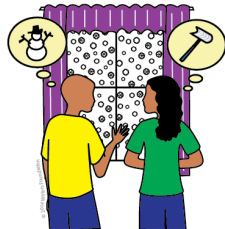
Habits of a Systems Thinker



Considers an issue fully and resists the urge to come to a quick conclusion



Considers how mental models affect current reality and the future



Uses understanding of system structure to identify possible leverage actions



Considers short-term, long-term and unintended consequences of actions



Pays attention to accumulations and their rates of change



Recognizes the impact of time delays when exploring cause and effect relationships



Checks results and changes actions if needed: "successive approximation"

