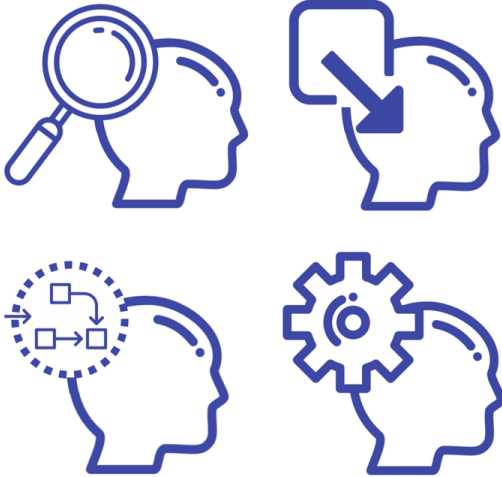
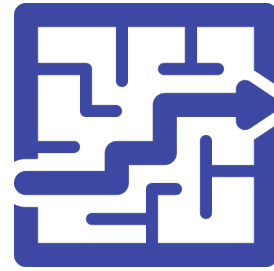


What do you wonder?



## Asking Questions

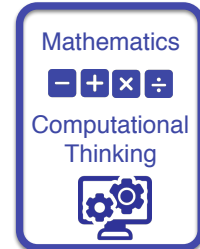
What do you think?



## Constructing Explanations



Developing and Using Models



Mathematics  
Computational Thinking

How do you investigate?



## Planning and Carrying Out Investigations

How do you know?



## Engaging in Argument from Evidence



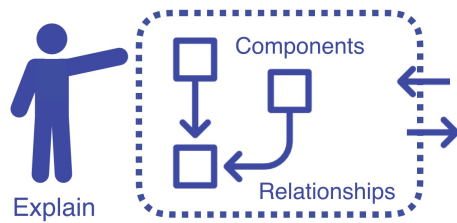
Analyzing and Interpreting Data



Obtaining, Evaluating and Communicating Information

## What do you think?

### Constructing Explanations

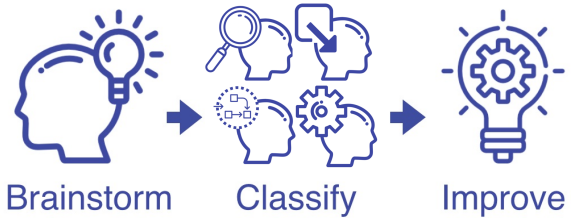


#### Good Explanations:

- Identify a scientific **cause**
- Identify the **components** of the system
- Use connections between the components to **explain**, describe and predict
- Represent the **components** of the system mathematically
- Use **computational thinking**

## What do you wonder?

### Asking Questions



#### Good Questions:

- Address the **phenomenon** or **problem**
- Identify the **nature** of the question
  - Observational - What do I notice?
  - Explanatory - How does it work?
  - Systems - What happens in the system?
  - Engineering - What is the problem?
- Can be empirically **tested**

## How do you know?

### Engaging in Argument From Evidence



Evidence Reasoning Claim

#### Good Arguments:

- Obtain, evaluate** and **organize** the evidence
- Identify **patterns** within and between datasets
- Identify a **claim**
- Link the evidence and claim with a chain of **reasoning**.
- Communicate** information using the appropriate style and format

## How do you investigate?

### Planning and Carrying Out Investigations



Plan Evidence Design

#### Good Investigations:

- Investigate a **phenomenon** or **design**.
- Identify the **evidence** that will be collected
- Have a **plan**
- Collect **evidence**
- Improve** the design of the investigation

What do you notice?

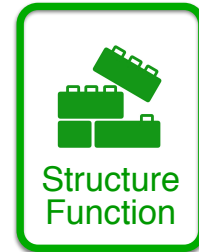


# Patterns

How does it work?



# Cause & Effect



What happens in the system?



# Systems

## System Models



What is happening?

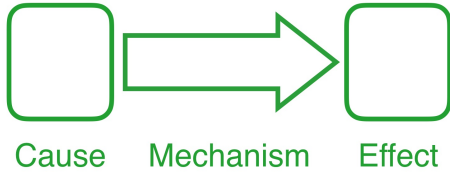


# Phenomenon

Observable events in the real world

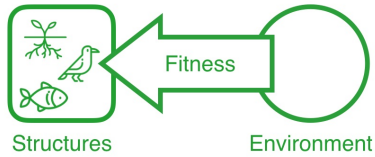
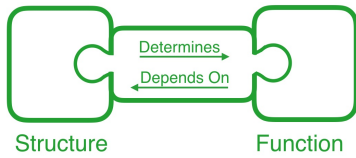
How does it work?

### Cause & Effect



What's the structure?

What's the function?



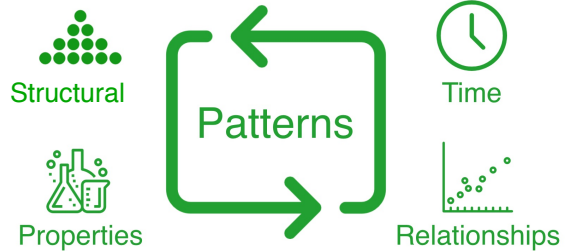
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What do you notice?

### Patterns

See - Hear - Touch - Smell - Taste



What are the parts?  
How does it change?  
What stays the same?  
What is related?

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What is the problem?

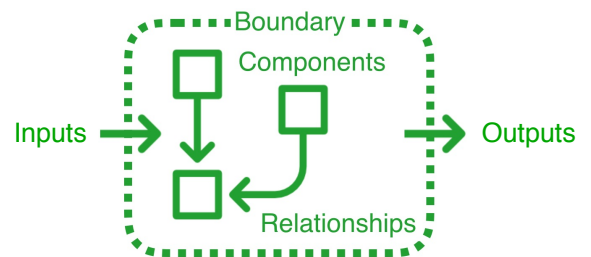


## Problem

Human needs and wants

What happens in the system?

### Systems and System Models



What is the boundary?  
What flows? What cycles?  
What makes it change?  
What keeps it stable?  
What is important?

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