What is happening?

Phenomenon

Observable events in the real world
What is the problem?

Human needs and wants
What do you wonder?

Asking Questions
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**
What do you think?

Constructing Explanations

Developing and Using Models

Mathematics

Computational Thinking
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**
How do you investigate?

Planning and Carrying Out Investigations
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
How do you know?

Engaging in Argument from Evidence

Analyzing and Interpreting Data

Obtaining, Evaluating and Communicating Information
Engaging in Argument From Evidence

How do you know?

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
What do you notice?

Patterns
What do you notice?

Patterns
See - Hear - Touch - Smell - Taste

Structural
Properties
Time
Relationships

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

Cause & Effect

Structure & Function
How does it work?

Cause & Effect

Cause

Mechanism

Effect

What’s the structure?

What’s the function?

Structure

Determines

Depends On

Function

Fitness

Structures

Environment

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What happens in the system?

Systems
System Models

Energy Matter

Scale Proportion Quantity

Stability Change
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?