Lesson: Bio-Bots and Brains - The Secrets of Information Processing

Materials Needed

- Whiteboard or large chart paper
- Dry-erase markers or colored markers
- Science notebook or plain paper
- Pencils, colored pencils, and markers
- "Bio-Bot Design Brief" worksheet (a simple template with prompts)
- Optional: Access to a device to watch short videos (e.g., a Venus flytrap closing, a chameleon changing color)
- Optional: Building materials like LEGOs, modeling clay, or recycled craft supplies

Lesson Plan

Part 1: The Living Computer (50 minutes)

Introduction: The "Simon Says" Reflex Test (10 minutes)

We'll start with a quick game of "Simon Says." This isn't just for fun; it's a model for how all living things process information! As we play, we'll talk about what's happening:

- **Input:** You hear a command (e.g., "Simon says touch your nose"). Your ears are the sensory receptors.
- **Processing:** Your brain has to quickly decide: Did the command start with "Simon says"? This is the processing step.
- **Output:** Based on your brain's decision, you either perform the action or stay still. This is your motor response.

This simple chain of events—**Input -> Processing -> Output**—is the foundation for how every organism, from a plant to a person, interacts with the world.

Core Activity: Deconstructing Nature's Code (30 minutes)

Now, let's be detectives and find this "Input -> Processing -> Output" pattern in other living things. We will map out how they handle information on the whiteboard.

1. **Example 1: The Sensitive Plant (Mimosa pudica).** We'll watch a short video of this plant's leaves folding up when touched.
    - **Input:** Physical touch on a leaf.
    - **Processing:** A signal travels through the plant, causing cells to rapidly lose water pressure.
    - **Output:** The leaves fold inward.
    - **Discussion:** Why would this be a useful response for the plant? (To appear smaller to herbivores, to knock off harmful insects).
2. **Example 2: The Hunting Bat.**
    - **Input:** The bat sends out a high-pitched sound (a click). Its large ears receive the echo.
    - **Processing:** The bat's brain calculates the time it took for the echo to return to determine the location, size, and movement of a moth.
    - **Output:** The bat adjusts its flight path to intercept the moth.
3. **Cora's Turn - Flowchart Challenge:** Cora will choose an organism (e.g., a sunflower turning to the sun, a dog responding to a command, a sea anemone stinging a fish). In her notebook,

she will create a simple flowchart diagram showing the **Input**, the **Processing** (what the organism "thinks" or how it reacts internally), and the **Output**. We'll work through it together to make sure the steps are clear.

Wrap-up & Transition (10 minutes)

We'll review Cora's flowchart. We'll establish that this information processing system is crucial for survival—it helps organisms find food, escape danger, and respond to their environment. This leads us to our next activity: designing a creature with a brand-new information processing system from scratch!

Part 2: Design a Bio-Bot! (50 minutes)

Introduction: The Design Challenge (5 minutes)

Your mission, should you choose to accept it, is to become a bio-engineer! You will design a completely new creature, a "Bio-Bot." The most important part of your design will not be how it looks, but how it **thinks**. You need to invent a unique way for it to process information to survive in a specific environment.

Core Activity: Bio-Bot Invention Lab (35 minutes)

Using the "Bio-Bot Design Brief" worksheet and drawing materials, Cora will create her organism.

1. **Step 1: Choose an Environment.** Where does your Bio-Bot live? A deep-sea volcanic vent? A planet with two suns? A sugary swamp? The environment will determine the challenges it faces.
2. **Step 2: Define a Survival Problem.** Based on the environment, what is the #1 piece of information your Bio-Bot needs to survive?
    - Detecting a hidden, nutritious crystal?
    - Sensing a silent, flying predator?
    - Finding a mate that only glows under specific light?
3. **Step 3: Design the System.** Now, draw the Bio-Bot. Label the parts of its unique information processing system:
    - **The Sensor (Input):** What body part detects the stimulus? Is it a light-sensitive tentacle? A vibration-detecting foot? Chemical-sniffing antennae? Be creative!
    - **The Processor (Processing):** What happens inside? It doesn't need a big brain. Maybe it has a "nerve net" that triggers an instant reaction, or a special organ that changes color when a certain chemical is present.
    - **The Responder (Output):** How does the Bio-Bot act on the information? Does it shoot out a sticky net? Does it perfectly camouflage itself? Does it release a specific sound?
4. **Step 4: Create the Information Flowchart.** Just like we did in Part 1, Cora will create a flowchart for her Bio-Bot's primary survival action. This will explain exactly how it senses, processes, and responds to its world.
5. **Optional Extension:** If time permits, Cora can build a 3D model of her Bio-Bot using LEGOs, clay, or other craft supplies.

Presentation and Review (10 minutes)

Cora will present her Bio-Bot. She'll introduce its name, its environment, and its primary survival challenge. Using her drawing and flowchart, she will explain how her creature's unique information processing system works.

Assessment Focus: The goal is to see if Cora can creatively apply the "Input -> Processing -> Output" model. I will ask questions like:

- "What would happen if its sensors were damaged? How would that affect its survival?"
- "Is the response fast or slow? Why did you design it that way?"
- "How is your Bio-Bot's system different from the way a human processes information?"

This discussion solidifies the concept that information processing is a fundamental, diverse, and fascinating part of life.