Student Model of Neuronal Control

Description of Activity

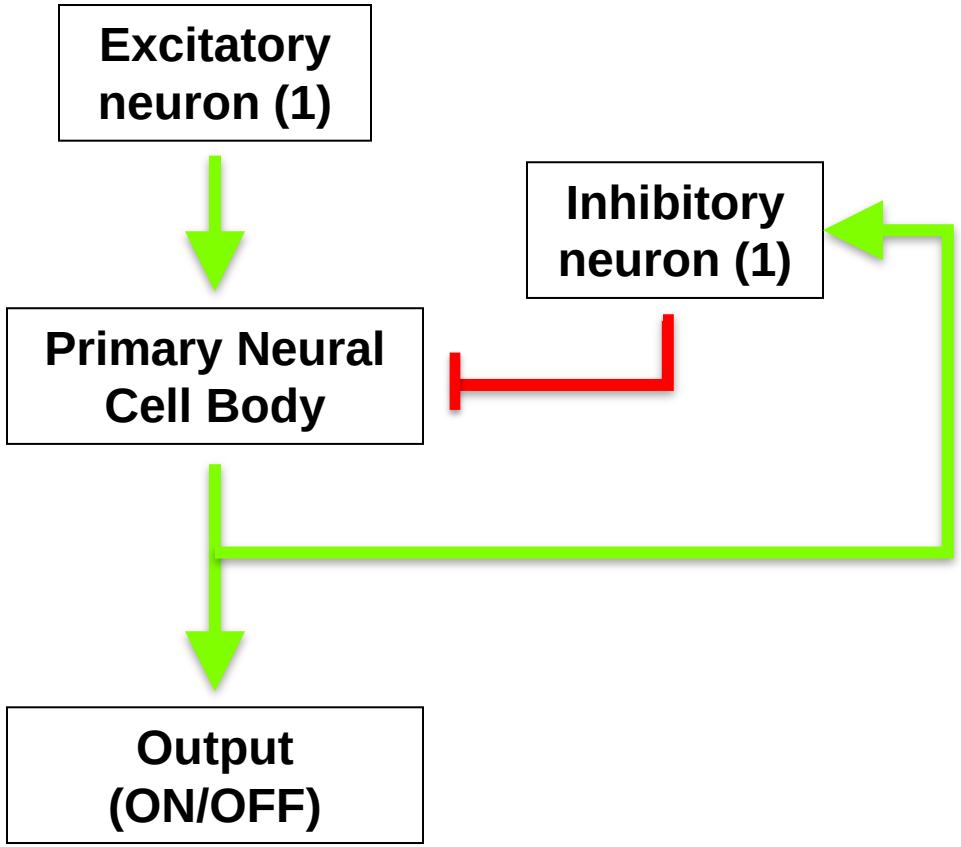
- Students model a neuronal circuit to demonstrate the concepts of feedback and feed-forward inhibition.

- The model involves 6 students positioned across the room:
  - 2 excitatory neurons (get GREEN/BLACK signal cards)
  - 2 inhibitory neurons (get RED/BLACK signal cards)
  - 1 primary neuronal cell body (gets GREEN/BLACK signal card)
  - 1 output (stands near lights so can turn on/off)

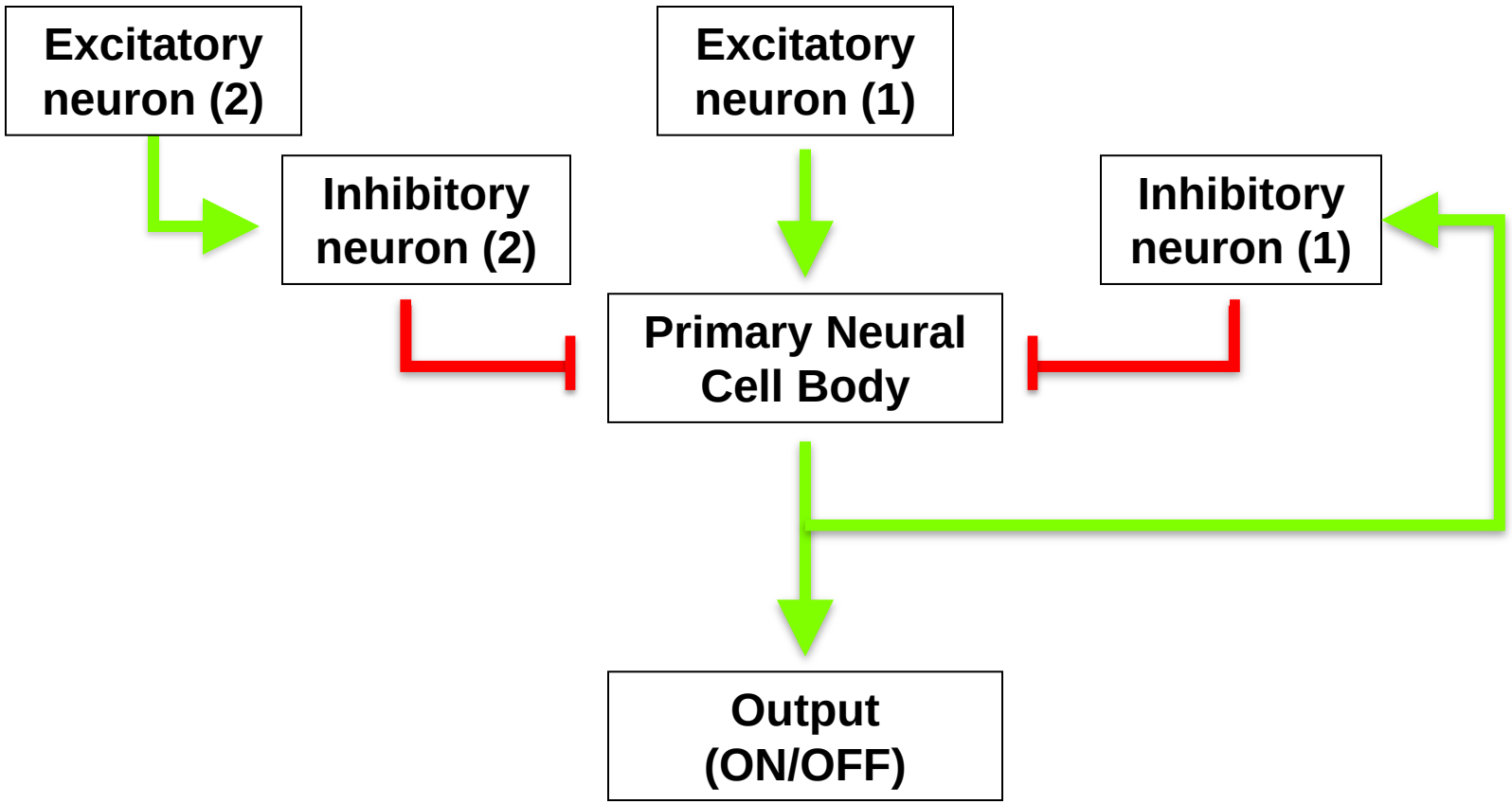
- Give each student:
  - The appropriate instruction card which tells them how to signal.
  - The appropriate signaling card

- Position the students according to the diagrams on the next slides.
- The model results in a student turning the classroom lights on and off.
- While 6 students model this circuit, the rest of the class follows along to describe what is happening and highlight the overall picture.

Model 1: Feedback Control



Model 2: feed-forward Control



Instructions: Excitatory Neuron (1)

- Start signaling BLACK.

- Every 10 seconds, signal GREEN for 20 seconds, then go back to BLACK.

Instructions: Primary Cell Body

- If Excitatory neuron (1) is BLACK, signal BLACK.

- If Excitatory neuron (1) is GREEN, signal GREEN EXCEPT:
  - If Inhibitory neuron 1 is RED, signal BLACK.
  - If Inhibitory neuron 2 is RED, signal BLACK.

Instructions: Inhibitory Neuron 1

- If Primary cell body is BLACK, signal BLACK.
- If Primary cell body is GREEN, signal RED.

Instructions: Output

- If Primary cell body is BLACK, turn the lights OFF.

- If Primary cell body is GREEN, turn the lights ON.

Instructions: Excitatory Neuron (2)

- Start signaling BLACK.

- Every 20 seconds, signal GREEN for 5 seconds, then go back to BLACK.

Instructions: Inhibitory Neuron (2)

- If Excitatory neuron (2) is BLACK, signal BLACK.
- If Excitatory neuron (2) is GREEN, signal RED.

GREEN

BLACK

RED

BLACK