Connection to Characteristics of Complex Systems Project

Lesson Title: *The Systems Thinking Playbook*, Exercise 16: Balancing Tubes

Overview:
Individuals balance a newspaper tube on a flat palm. By looking at different parts of the tube, students are either better or worse at keeping the tube balanced, based on inherent delays. The exercise creates a balancing, and in this case, oscillating system. The oscillation is built into the structure of the system that includes all the parts along with physics (e.g., gravity).

Related Characteristic(s) of Complex Systems:
The cause of the problem is within the system.

Ideas and Examples for Connecting to the Characteristic:
Use a causal loop diagram to help students see beyond individual events to the underlying interdependent structure, in this case, a goal-seeking system with an underlying oscillation. The figures show just one possible mental model of how the system functions. The figure on the left is labeled generically, while the figure on the right shows a specific example. What is another mental model of the parts and interconnections? Where might delays exist within this system?
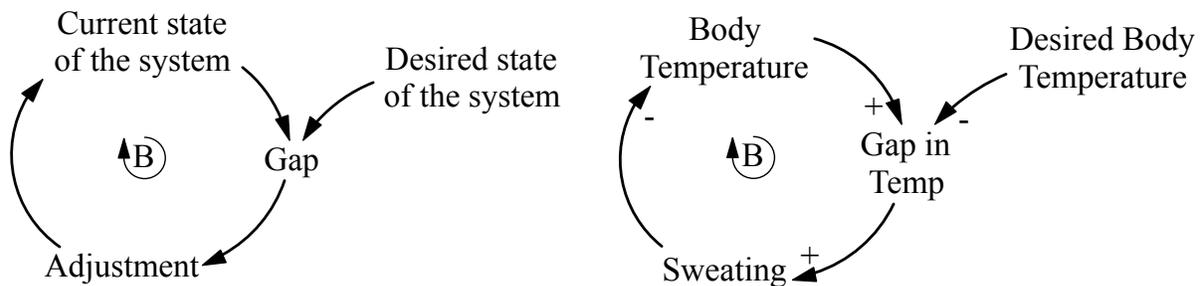
Story of the loops: As the gap between what is and what is desired rises, the adjustment to correct the gap also rises. The action brings the current state closer to the desired, thus closing the gap over time. An up-and-down oscillation occurs if the system overcorrects in a similar way that occurs when trying to balance the tube.

As part of a debrief conversation, examine how the structure of the "balancing tube" system generates specific behaviors over time, while connecting to other systems studied.
- How does the system stay in balance but not stagnant?
- Given the figure, what is the gap in the balancing tube system? What is the adjustment? How do adjustments affect the state of the system?
- How do similar systems seek balance? What happens when a part of a system is "out of balance?"

Resources:
The Systems Thinking Playbook by Linda Booth Sweeney.