Educational Resources from *Phenomenon Science Education*

Student Proficiency Goals for **NGSS HS-LS1-3**

Information about HS-LS1-3

NGSS Performance Expectation HS-LS1-3.

Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Clarification Statement.

Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.

Assessment Limits.

Assessment does not include the cellular processes involved in the feedback mechanism.

Science and Engineering Practice (Planning and Carrying Out Investigations)

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.

Disciplinary Core Idea (LS1.A: Structure and Function)

- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

Crosscutting Concept (Stability and Change)

- Feedback (negative or positive) can stabilize or destabilize a system.

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Student Proficiency Goals for **NGSS HS-LS1-3**

Student Proficiency Goals

SEP (Planning and Carrying Out Investigations):

- Students identify and describe the specific purpose and goals of an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- Students identify and describe the types, amount, and accuracy of data that will be required to produce reliable measurements.
- Students identify and consider limitations on the precision of the data such as number of trials, cost, risk, and time.
- Students describe the tools and methods that will be used in the investigation to collect the data that will serve as evidence.
- Students evaluate their experimental designs and refine them to ensure accurate and precise data showing how feedback mechanisms maintain homeostasis.
- Students conduct an investigation to collect identified data showing how feedback mechanisms maintain homeostasis.
- Students evaluate their data to determine if it provides evidence of how feedback mechanisms maintain homeostasis.

DCI (LS1.A: Structure and Function):

- Students know that feedback systems maintain a living system's internal conditions within certain limits.
- Students know that living systems mediate behaviors and internal conditions to maintain conditions allowing it to remain alive and functional.
- Students know that as external conditions change, a living system changes behaviors and/or internal conditions to maintain conditions allowing it to remain alive and functional within some range.
- Students know that feedback mechanisms can encourage or discourage changes inside the living system.

CCC (Stability and Change):

- Students consider that changes in external conditions result in changes in behaviors or internal conditions to keep a living system alive and functional.
- Students consider that positive or negative feedback mechanisms use change to produce stability in the system.
- Students consider that positive or negative feedback mechanisms can destabilize a system.