Big Idea 2

Content Area: **Template**
Course(s):
Time Period:
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Status: **Published**

State Mandated Topics Addressed in this Unit

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N/A	N/A

Big idea 2: Biological systems utilize free energy and molecular building blocks to grow, to reproduce and to maintain dynamic homeostasis

Learning Objectives

- 2.A Growth, reproduction and maintenance of the organization of living systems require free energy and matter
- 2.B Growth, reproduction, and dynamic homeostasis require that cells create and maintain internal environments that are different from their external environments.
- 2.C Organisms use feedback mechanisms to regulate growth and reproduction, and to maintain dynamic homeostasis.
- 2.D Growth and dynamic homeostasis of biological system are influenced by changes in the system's environment.
- 2.E Many biological processes involved in growth, reproduction and dynamic homeostasis include temporal regulation and coordination.
- LO 2.1 The student is able to explain how biological systems use free energy based on empirical data that all organisms require constant energy input to maintain organization, to grow, and to reproduce. [SP 6]
- LO 2.10 The student is able to use representations and models to pose scientific questions about the properties of cell membranes and selective permeability based on molecular structure. [SP 1, 3]
- LO 2.11 The student is able to construct models that connect the movement of molecules across membranes with membrane structure and function [SP 1, 7]
- LO 2.12 The student is able to use representation and model to analyses situations or solve problems qualitatively and quantitatively to investigate whether dynamic homeostasis is maintained by the active movement of molecules across membranes. [SP 4]
- LO 2.13 The student is able to explain how internal membranes and organelles contribute to cell functions [SP6]
- LO 2.14 The student is able to use representation and models to describe differences in prokaryotic and eukaryotic cells [SP 1]
- LO 2.15 The student can justify a claim made about the effects on a biological system at the molecular,

physiological or organismal level when given a scenario in which one or more components within a negative regulatory system is altered. [SP 6]

- LO 2.16 The student is able to connect how organisms use negative feedback to maintain their internal environments [SP 7]
- LO 2.17 The student is able to evaluate data that show the effects of changes in concentration of key molecules on negative feedback mechanisms. [SP 5]
- LO 2.18 The student can make predictions about how organisms use negative feedback mechanisms to maintain their internal environments. [SP 6]
- LO 2.19 The student is able to make predictions about how positive feedback mechanisms amplify activities and processes in organisms based on scientific theories and models. [SP 6]
- LO 2.2 The student is able to justify a scientific claim that free energy is required for living systems to maintain organization, to grow, or to reproduce, but that multiple strategies for obtaining and using energy exist in different living systems. [SP 6]
- LO 2.20 The student is able to justify that positive feedback mechanisms amplify responses in organisms. [SP 6]
- LO 2.21 The student is able to justify the selection of the kind of data needed to answer scientific questions about the relevant mechanism that organisms use to respond to changes in their external environment [SP 4]
- LO 2.22 The student is able to refine scientific models and questions about the effect of complex biotic and abiotic interactions all biological systems from cells and organisms to population, communities and ecosystems. [SP 1, 3]
- LO 2.23 The student is able to design a plan for collecting data to show that all biological systems (cells, organisms, populations, communities, and ecosystems0 are effected by complex biotic and abiotic interactions [S) 4, 7]
- LO 2.24 The student is able to analyze data to identify possible patterns and relationships between a biotic or abiotic factor and a biological systems [SP 5]
- LO 2.25 The student can construct explanations based on scientific evidence that homeostatic mechanisms reflect continuity due to common ancestry and divergence due to adaptation in different environments. [SP 6]
- LO 2.26 The student is able to analyze data to identify phylogenetic patterns or relationships, showing that homeostatic mechanisms reflect both continuity due to common ancestry and change due to evolution in different environments [SP 5]
- LO 2.27 The student is able to connect differences in the environment with the evolution of homeostatic mechanisms [SP 7]
- LO 2.28 The student is able to use representation or models to analyze quantitatively and qualitatively the effects of disruptions to dynamic homeostasis in biological systems. [SP 1]
- LO 2.29 the student can create representations and models to describe immune responses [SP 1]
- LO 2.30 The student can create representation or models to describe nonspecific immune defenses in plants and animals [SP 1]
- LO 2.31 the student can connect concepts in and across domain to show that timing and coordination of specific events are necessary for normal development in an organism and that these events are regulated by multiple mechanisms [SP 7]
- LO 2.32 The student is able to use a graph or diagram to analyze situations or solve problems that involve timing and coordination of events necessary for normal development on an organism. [SP 1]
- LO 2.33 The student is able to justify scientific claims with scientific evidence to show that timing and coordination of several event are necessary for normal development in an organism and that these events are regulated by multiple mechanisms [SP 6]
- LO 2.34 The student is able to describe the role of programmed cell death in development and differentiation, the ruse of molecules and the maintenance of dynamic homeostasis. [SP 7]

- LO 2.35 The student is able to design a plan for collecting data to support the scientific claim that the timing and coordination of physiology events involve regulation [SP 4]
- LO 2.36 The student is able to justify scientific claims with evidence to show how timing and coordination of physiological events involve regulation [SP 6]
- LO 2.37 the student is able to connect concepts that describe mechanisms that regulate the timing and coordination of physiological events involve regulation [SP 7]
- LO 2.38 The student is able to analyze data to support the claim that responses to information and communication of information affect natural selection [SP 5]
- LO 2.39 The student is able to justify scientific claims, using evidence to describe how timing and coordination of behavioral events in organisms are regulated by several mechanisms[[SP 6]
- LO 2.4 The student is bale to use representations to pose scientific questions about what mechanisms and structural features allow organisms to capture, store, and use free energy. [SP 1, 3]
- LO 2.40 the student is able to connect concepts in and across domains to predict how environmental factors affect responses to information and change behavior. [SP 7]
- LO 2.42 The student is able to pose a scientific question concerning the behavioral physiological response of an organisms to a change in its environment. [SP 3]
- LO 2.43 The student is able to connect the concept of cell communities to functioning of the immune system. [SP 7]
- LO 2.5 The student is able to construct explanations of the mechanisms and structural features of cells that allow organisms to capture, store, or use free energy [6]
- LO 2.6 The student is able to use calculated surface area-to-volume ratios to predict which cells might eliminate wastes or procure nutrients faster by diffusion. [PS 2]
- LO 2.7 Students will be able to explain how cell size and shape affects the overall rate of nutrient intake and the rate of waste elimination. [6]
- LO 2.8 The student is able to justify the selection of data regarding the types of molecules that an animal, plant, or bacterium will take up as necessary building blocks and excrete as waste products. [SP 4]
- LO 2.9 The student is able to represent graphically or model quantitatively the exchange or molecules between an organism and its environment, and the subsequent use of these molecules to build new molecules that facilitate dynamic homeostasis, growth and reproduction. [SP 1]
- LO The student is able to predict how changes in free energy availability affect organisms, populations, and/or ecosystems. [SP 6]
- LO. 2.41 The student is able to evaluate data to show the relationship between photosynthesis and respiration in the flow of free energy through a system. [SP 5, 7]

Essential Skills

- 2. E.2 Timing and coordination of physiological events are regulated by multiple mechanisms.
- 2.A.1 All Living systems require constant input of free energy.
- 2.A.2 organisms capture and store free energy for use in biological processes.
- 2.A.3 Organisms must exchange matter with the environment to grow reproduce and maintain organization
- 2.B. 2 Growth and dynamic homeostasis are maintained by the constant movement of molecules across membranes.
- 2.B. 3 Eukaryotic cells maintain internal membranes that partition the cell into specialized regions.
- 2.B.1 Cell membranes are selectively permeable due to their structure.

- 2.C.1 Organisms use feedback mechanisms to maintain their internal environments and respond to external environmental changes.
- 2.C.2 Organisms respond to changes in their external environments.
- 2.D.1 All biological systems from cells and organisms to populations, communities and ecosystems are affected by complex biotic and abiotic interactions involving exchange of matter and free energy.
- 2.D.2 Homeostatic mechanisms reflect both common ancestry and divergence due to adaption in different environments
- 2.D.3 Biological systems are affected by disruptions to their dynamic homeostasis
- 2.D.4 Plants and animals have a variety of chemical defenses against infections that affect dynamic homeostasis.
- 2.E.1 Timing and coordination of specific events are necessary for the normal development of an organism, and theses events are regulated by a variety of mechanisms.
- 2E.3 Timing and coordination of behavior are regulated by various mechanisms and are important in natural selection.

Standards

Instructional Tasks/Activities

- Activity 1
- Activity 10
- Activity 2
- Activity 3
- Activity 4
- Activity 5
- Activity 6
- Activity 7
- Activity 8
- Activity 9

Assessment Procedure

- Classroom Total Participation Technique
- Classwork
- DBQ
- Essay
- Exit Ticket/Entrance Ticket/Do Now
- Journal / Student Reflection
- Kahoot

- Other named in lesson
- Peer Review
- Performance
- Problem Correction
- Project
- Quiz
- Rubric
- Teacher Collected Data
- Test
- Worksheet

Recommended Technology Activities

- Appropriate Content Specific Online Resource
- Chromebook
- Copy/Paste Content Specific Link Here
- Copy/Paste Content Specific Link Here
- Copy/Paste Content Specific Link Here
- Gimkit
- GoGuardian
- Google Classroom
- Google Docs
- Google Forms
- Google Slides
- Kahoot
- MagicSchool AI
- Other- Specified in Lesson
- Quiziz
- Screencastify

Accommodations & Modifications & Differentiation

Accommodations and Modifications should be used to meet individual needs. Their IEP and 504 plans should be used in addition to the following suggestions.

Gifted and Talented

- Compare & Contrast

- Conferencing
- Debates
- Jigsaw
- Peer Partner Learning
- Problem Solving
- Structured Controversy
- Think, Pair, Share
- Tutorial Groups

Instruction/Materials

- alter format of materials (type/highlight, etc.)
- color code materials
- eliminate answers
- extended time
- extended time
- large print
- modified quiz
- modified test
- Modify Assignments as Needed
- Modify/Repeat/Model directions
- necessary assignments only
- Other (specify in plans)
- other- named in lesson
- provide assistance and cues for transitions
- provide daily assignment list
- read class materials orally
- reduce work load
- shorten assignments
- study guide/outline
- utilize multi-sensory modes to reinforce instruction

Environment

- alter physical room environment
- assign peer tutors/work buddies/note takers
- assign preferential seating
- individualized instruction/small group
- modify student schedule (Describe)

- other- please specify in plans
- provide desktop list/formula

Modifications

1. Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)
2. Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
3. Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures,
illustrations, graphs, charts, data tables, multimedia, modeling).
4. Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple
representation and multimodal experiences).
5. Engage students with a variety of Scientific practices to provide students with multiple entry points and multiple ways to demonstrate their
understandings.
6. Use project-based science learning to connect science with observable phenomena.

7. Structure the learning around explaining or solving a social or community-based issue.
8. Provide ELL students with multiple literacy strategies.
9. Collaborate with after-school programs or clubs to extend learning opportunities.

Resources

- Campbell Biology Chapters: 1, 4, 5, 6, 8, 9, 10, 28, 37, 55
- Campbell Biology Chapters: 1, 5, 6, 7, 11, 36, 40, 44,
- Campbell Biology Chapters: 17, 38, 40, 48, 50, 51, 54
- Campbell Biology Chapters: 5, 25, 28, 36, 39, 40, 43, 44, 45, 49, 50, 52, 53, 54, 55, 56
- Campbell Biology Chapters: 6, 18, 28, 30, 31, 36, 38, 39, 40, 44, 46, 49