Unit 01: Introduction into Biology (Weeks 1-6)

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **6 weeks**
Status: **Published**

Standards Alignment

SCI.HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
SCI.HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

New Jersey Student Learning Standards

Practice 1. Asking questions (for science) and defining problems (for engineering)
Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

Ask questions that arise from examining models or a theory, to clarify and/or seek additional information and relationships.

Ask questions to determine relationships, including quantitative relationships, between independent and dependent variables.

Ask questions that can be investigated within the scope of the school laboratory, research facilities, or field (e.g., outdoor environment) with available resources and, when appropriate, frame a hypothesis based on a model or theory.

Practice 3. Planning and carrying out investigations
Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

Select appropriate tools to collect, record, analyze, and evaluate data.

Make directional hypotheses that specify what happens to a dependent variable when an independent variable is manipulated.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)
Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

Make a quantitative and/or qualitative claim regarding the relationship between dependent and independent variables.

Apply scientific ideas, principles, and/or evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects.

Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.

Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

Practice 8. Obtaining, evaluating, and communicating information
Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs.

Critically read scientific literature adapted for classroom use to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

Compare, integrate and evaluate sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a scientific question or solve a problem.

Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible.

Communicate scientific and/or technical information or ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (i.e., orally, graphically, textually, mathematically).

Connections to the Nature of Science: Most Closely Associated with Practices
Scientific Investigations Use a Variety of Methods

Science investigations use diverse methods and do not always use the same set of procedures to obtain data.

New technologies advance scientific knowledge.

Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

Scientific investigations use a variety of methods, tools, and techniques to revise and produce new knowledge.

Scientific Knowledge is Based on Empirical Evidence

Science knowledge is based on empirical evidence.

Science disciplines share common rules of evidence used to evaluate explanations about natural systems.

Science arguments are strengthened by multiple lines of evidence supporting a single explanation.

Scientific Knowledge is Open to Revision in Light of New Evidence

Most scientific knowledge is quite durable but is, in principle, subject to change based on new evidence and/or reinterpretation of existing evidence.

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Theories and laws provide explanations in science, but theories do not with time become laws or facts.

A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that has been repeatedly confirmed through observation and experiment, and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence.

Models, mechanisms, and explanations collectively serve as tools in the development of a scientific theory.

Laws are statements or descriptions of the relationships among observable phenomena.

Scientists often use hypotheses to develop and test theories and explanations.

Crosscutting Statements
3. Scale, Proportion, and Quantity – In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

Some systems can only be studied indirectly as they are too small, too large, too fast, or too slow to observe directly.

7. Stability and Change – For both designed and natural systems, conditions that affect stability and factors that

control rates of change are critical elements to consider and understand.

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

Connections to the Nature of Science: Most Closely Associated with Crosscutting Concepts
Science is a Human Endeavor

Scientific knowledge is a result of human endeavor, imagination, and creativity.

Individuals and teams from many nations and cultures have contributed to science and to advances in engineering.

Technological advances have influenced the progress of science and science has influenced advances in technology.

Science Addresses Questions About the Natural and Material World.

Not all questions can be answered by science.

LS1: From Molecules to Organisms: Structures and Processes
LS1.A: Structure and Function

Feedback mechanisms maintain a living system's internal conditions withincertain limits and mediate behaviors, allowing it to remain alive andfunctional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) ordiscourage (negative feedback) what is going on inside the living system.(HS-LS1-3)

LS1.C: Organization for Matter and Energy Flow in Organisms

The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (suchas proteins or DNA), used for example to form new cells. (HS-LS1-6)

As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS1-6),(HS-LS1-7)

SCI.HS-LS1	From Molecules to Organisms: Structures and Processes
SCI.HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
SCI.HS-LS1-6	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

Integration of Career Readiness, Life Literacies and Key Skills

CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.
CAEP.9.2.12.C.2	Modify Personalized Student Learning Plans to support declared career goals.
CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.
CAEP.9.2.12.C.4	Analyze how economic conditions and societal changes influence employment trends and future education.
CAEP.9.2.12.C.5	Research career opportunities in the United States and abroad that require knowledge of world languages and diverse cultures.
CAEP.9.2.12.C.6	Investigate entrepreneurship opportunities as options for career planning and identify the knowledge, skills, abilities, and resources required for owning and managing a business.

Technology / Integration of Computer Science and Design Thinking

CS.9-12.8.2.12.EC.3	Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience.

Interdisciplinary Connections: NJSLS for ELA, Social Studies, Science and/or Math Section

LA.RL.9-10.1	Cite strong and thorough textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
LA.RL.9-10.2	Determine a theme or central idea of a text and analyze in detail its development over the course of the text, including how it emerges and is shaped and refined by specific details and provide an objective summary of the text.
LA.RL.9-10.3	Analyze how complex characters (e.g., those with multiple or conflicting motivations) develop over the course of a text, interact with other characters, and advance the plot or develop the theme.
LA.RL.9-10.4	Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone).
LA.RL.9-10.5	Analyze how an author's choices concerning how to structure a text, order events within it (e.g., parallel plots), and manipulate time (e.g., pacing, flashbacks) create specific effects (e.g., mystery, tension, or surprise).
LA.RL.9-10.6	Analyze a particular point of view or cultural experience reflected in a work of literature from outside the United States, drawing on a wide reading of world literature.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media LiteracyNew Section

see Crosswalks

21st Century Life and Careers

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Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale

Unit Rationale

The purpose of this unit…

To lay the foundation of the principles of Biological science, including characteristics of living things, Biochemistry, and the scientific method. Understanding proper laboratory techniques is essential to collecting, analyzing, and describing data. Finally, to fully comprehend Biological organisms as a whole, understanding the building blocks of matter will translate into further units.

Meaning

Essential Questions

Essential Questions

- **What is the Scientific Method and how is it used in Biology?**
- **How does the metric system aid in collecting data?**
- **How is an organism characterized as a living thing?**
- **Why is understanding Biochemistry essential to understanding Biology?**
- **What does a balanced diet look like and how does that affect the survival of a human?**

Enduring Understanding/Indicators of Understanding

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- **The Scientific Method is the universal process used by scientist to propose explanations to inquiry.**
- **In order to study and collect meaningful data, tools such as microscopes are used.**
- **The metric system is the universal system of measurement in science.**

- **There are seven characteristics that all living organisms share that quantify them as living organisms.**
- **The structure of all living things are composed of complex organic molecules, which include carbon, hydrogen, oxygen, and nitrogen.**

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know…

- **The steps of the Scientific Method**
- **The difference between independent and dependent variables, including their placement in a hypothesis**
- **The difference between a scientific theory and law; Both are utilized and accepted in the scientific community**
- **The metric system has seven base units: kilo, hecto, deka, basic unit, deci, centi, milli**
- **There are seven characteristics that all living things share: cells, organization, growth, energy, reproduction, response to stimuli, and homeostasis**
- **The basic unit of matter is an atom, which is made of a nucleus, protons, electrons, and neutrons**
- **How ionic, covalent, and hydrogen bonds form**
- **Solutions are made of solvents and solutes**
- **Water is the universal solvent and is necessary for metabolic processes to occur**
- **pH measure the concentration of hydrogen and hydroxide ions in an aqueous solution and is measured on a scale of 0-6(acid) 7(neutral) 8-14 (neutral)**
- **The cell is the basic unit of life, which is made of organic compounds.**
- **Carbon is the essential to building complex organic macromolecules because of its ability to form four covalent bonds.**
- **The four macromolecules that make up all living things are carbohydrates, lipids, proteins, and nucleic acids**
- **A balanced diet includes a combination of complex carbohydrates, unsaturated fats, and proteins**
- **Carbohydrates are used for energy, cells and tissues are made of lipids and proteins**
- **Carbohydrates are synthesized through the process dehydration synthesis and broken down by hydrolysis**
- **Enzymes are an integral part of a metabolism and speed up the rate of reactions**

Skills

Skills

Student will be skilled at …

- **Design an experiment using the steps of the scientific method**
- **Collect and analyze data**
- **Write a formal lab report**
- **Use the metric system to take accurate measurements**
- **Properly handle and use a microscope**
- **Make a wet mount slide**
- **Create a balanced diet that reflects the recommended daily allowance**
- **Interpret an array of information and synthesize a supported response**

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

- **Teacher derived notes**
- **Powerpoint/Google Slides presentation**
- **Worksheets**
- **Articles**
- **Lab materials**

Formative Assessment Strategies

Formative Assessment Strategies

- **Informal assessments (All call, thumbs up, Kahoot)**
- **Daily Do-Nows**
- **Exit tickets (Short answer responses, feedback forms)**
- **Quizzes**
- **Lab reports**

Learning Activities/Unit of Study

Learning Activities/Unit of Study

- **Lecture and notes on the scientific method, metric system, the compound microscope, chemistry, and biochemistry**
- **Practice and review worksheets**
- **Microscope lab (Advanced; Measuring in Micrometers and math skills required)**
- **Characteristics of living things stations activity**
- **Homeostasis of a goldfish lab (With extended lab questions)**
- **Properties of water lab (With extended lab questions)**
- **pH Lab (With extended lab questions)**
- **Macromolecule composition lab**
- **Apple enzyme lab**
- **Calorie counting and nutrition activity**
- **Body Story (Nutrition) and questions**
- **Nutrition articles**
- **“Supersize Me” movie and questions**
- **Macromolecule and nutrition multi-text research essay**

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, GIfted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy

to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.