

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

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

Standards Alignment

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 careful observation of phenomena, or unexpected results, to clarify and/or seek additional information.

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 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.

Connections to the Nature of Science: Most Closely Associated with Practices **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 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

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.

LS1: From Molecules to Organisms: Structures and Processes

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. (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 (such as 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.1.LS1.A	Structure and Function
SCI.5.LS1.C	Organization for Matter and Energy Flow in Organisms
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

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.

CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology / Integration of Computer Science and Design Thinking

TECH.8.2.12	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.12.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.
TECH.8.2.12.E.1	Demonstrate an understanding of the problem-solving capacity of computers in our world.

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

	Key Ideas and Details
LA.K-12.NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
LA.K-12.NJSLSA.R2	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
LA.RI.9-10	Reading Informational Text
LA.K-12.NJSLSA.W	Writing
LA.RI.9-10.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.) 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.RI.9-10.2	Determine a central idea of a text and analyze how it is developed and refined by specific details; provide an objective summary of the text.
LA.K-12.NJSLSA.W5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
LA.W.9-10.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, trying a new approach, or consulting a style manual (such as MLA or APA Style), focusing on addressing what is most significant for a specific purpose and audience.

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

see Crosswalks

21st Century Life and Careers

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 a Biological organism, 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 do tools, such as microscopes, 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

Enduring Understanding/Indicators of Understanding

- 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.
- 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.
- Carbohydrates, Lipids, and Proteins and types of macromolecules found in foods and are essential to maintaining a healthy lifestyle.

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
- 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
- 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
- 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
- Characteristics of living things stations activity
- Homeostasis of a goldfish lab
- Properties of water lab
- pH Lab
- Apple enzyme lab
- Calorie counting and nutrition activity
- Body Story (Nutrition) and questions
- Nutrition articles
- Nutrition multitext assignment

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.