In High School Biology, instructional time should focus on four core ideas:

**LS1.** From Molecules to Organisms: Structures and Processes
- Using a model to explain the process for building proteins within a cell and the important roles of DNA and RNA communication in regulating cell function.
- Describing the principle structures and functions of the human body systems.
- Using evidence to show how the human body uses both positive and negative feedback mechanisms to maintain a stable internal environment within cells.
- Explaining the life cycle of a cell in multicellular organisms.
- Using a model to explain how plants and other photosynthesizing organisms convert light energy into chemical energy.
- Understanding that large carbon molecules, necessary for life, are primarily composed of six elements.
- Using a model to illustrate the ability of live organisms to convert food into energy.

**LS2.** Ecosystems: Interactions, Energy, and Dynamics
- Analyzing data to explain how living and nonliving factors affect an area’s ability to support life.
- Using math to explain that living and non-living factors affect populations and species within an environment.
- Describing the constant flow of energy throughout an ecosystem and explain how energy affects the individuals living in the environment.

**LS3.** Heredity: Inheritance and Variation of traits
- Using a model to show how DNA passes genetic information from parents to offspring.
- Explaining with evidence that genetic variations in an organism may come from new combinations of genes.
- Apply probability to simulate the passing of gene combinations from a parent organism to their offspring.
- Using scientific information to illustrate how genetic and environmental factors can affect the traits of individuals.

**LS4.** Biological Evolution: Unity and Diversity
- Using scientific evidence to demonstrate biological evolution.
- Constructing an explanation of Darwin’s Theory of Natural Selection.
- Communicating the differences between viruses and bacteria.
- Using models to explain how changes in an environment may result in the modifications of organisms.

### Science Concepts

**Molecules to Organisms (LS1)**
- Using a model to explain the process for building proteins within a cell and the important roles of DNA and RNA communication in regulating cell function.
- Describing the principle structures and functions of the human body systems.
- Using evidence to show how the human body uses both positive and negative feedback mechanisms to maintain a stable internal environment within cells.
- Explaining the life cycle of a cell in multicellular organisms.
- Using a model to explain how plants and other photosynthesizing organisms convert light energy into chemical energy.
- Understanding that large carbon molecules, necessary for life, are primarily composed of six elements.
- Using a model to illustrate the ability of live organisms to convert food into energy.

**Ecosystems: Interactions, Energy, and Dynamics (LS2) continued**
- Illustrating the cycling of the carbon molecule throughout the environment.
- Using data to explain how an area which includes living and non-living components, will tend to resist change.
- Analyzing the effects of human activities on living organisms and ecosystem health.

**Heredity: Inheritance and Variation of Traits (LS3)**
- Using a model to show how DNA passes genetic information from parents to offspring.
- Explaining with evidence that genetic variations in an organism may come from new combinations of genes.
- Applying probability to simulate the passing of gene combinations from a parent organism to their offspring.
- Using scientific information to illustrate how genetic and environmental factors can affect the traits of individuals.

**Biological Evolution: Unity and Diversity (LS4)**
- Using scientific evidence to demonstrate biological evolution.
- Constructing an explanation of Darwin’s Theory of Natural Selection.
- Communicating the differences between viruses and bacteria.
- Using models to explain how changes in an environment may result in the modifications of organisms.
STE What to Look For: The example below features three Indicators from the Standards of Effective Practice. These Indicators are just a sampling from the full set of Standards and were chosen because they create a sequence: the educator plans a lesson that sets clear and high expectations, the educator then delivers high quality instruction, and finally the educator uses a variety of assessments to see if students understand the material or if re-teaching is necessary. This example highlights teacher and student behaviors aligned to the three Indicators that you can expect to see in a rigorous High School Biology classroom.

### Expectations (Standard II, Indicator E)
Plans and implements lessons that set clear and high expectations and also make knowledge accessible for all students.

<table>
<thead>
<tr>
<th>What is the teacher doing?</th>
<th>What are the students doing?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Creating culturally responsive lessons that engage and sustain student attention</td>
<td>• Identifying a lesson's standards or objectives and how they connect to unit goals</td>
</tr>
<tr>
<td>• Asking students to apply scientific knowledge and ideas when engaging with real-world problems</td>
<td>• Using information from observations to construct an evidence based account for natural phenomena</td>
</tr>
<tr>
<td>• Modeling the development of complex, testable models</td>
<td>• Evaluating the reasoning behind currently accepted explanations or solutions</td>
</tr>
</tbody>
</table>

### Instruction (Standard II, Indicator A)
Uses instructional practices that reflect high expectations regarding content and quality of effort and work; engage all students; and are personalized to accommodate diverse learning styles, needs, interests, and levels of readiness.

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<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>• Providing opportunities for students to communicate ideas, ask questions, and make their thinking visible in writing and speaking</td>
<td>• Evaluating questions and arguments (e.g., to determine whether they are testable and relevant)</td>
</tr>
<tr>
<td>• Highlighting culturally appropriate and effective negotiation skills they observe in students</td>
<td>• Using both linear and nonlinear functions to find patterns in data</td>
</tr>
<tr>
<td>• Creating activities that require sophisticated analysis (such as finding an equation) to find patterns</td>
<td>• Using detailed statistical analysis or models that can evaluate data sets for consistency</td>
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</tbody>
</table>

### Assessment (Standard I, Indicator B)
Uses a variety of informal and formal methods of assessments to measure student learning, growth, and understanding to develop differentiated and enhanced learning experiences and improve future instruction.

<table>
<thead>
<tr>
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<th>What are the students doing?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Using multiple formative approaches to assess student learning (e.g., mid-unit quiz, completion of investigation)</td>
<td>• Reflecting on how they are progressing toward goals</td>
</tr>
<tr>
<td>• Providing opportunities for students to conduct investigations that test models</td>
<td>• Engaging in challenging learning tasks regardless of learning needs (e.g., linguistic background, disability, academic gifts)</td>
</tr>
<tr>
<td>• Providing exemplars of work (e.g. historical examples, student work)</td>
<td>• Using exemplars to inform their work</td>
</tr>
</tbody>
</table>