HIGH SCHOOL SERIES

# PROGRAM GUIDE

Program Design
Unit Structure
Digital Experience

# Inspire Science

## Explore Our Phenomenal World


INSPIRE CURIOSITY • INSPIRE INVESTIGATION • INSPIRE INNOVATION

Mc Graw Hill

## About the Covers

As students explore the covers of their Student Editions their curiosity begins as they study the main image. The rich phenomena image encourages students to start asking questions.

INSPIRE BIOLOGY



Each back cover supports the phenomenon that students will encounter on each cover of *Inspire High School Science*.

inspire-science.com/6-12



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STEM

Our mission is to provide educational resources that enable students to become the problem solvers of the 21st century and inspire them to explore careers within Science, Technology, Engineering, and Mathematics (STEM) related fields.

# Inspire Science

## Explore Our Phenomenal World

Use this Program Guide to learn about the overall program philosophy and the design, the module and lesson structure, and digital experience that align *Inspire Science High School* series to Next Generation Science Standards (NGSS).


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# Inspire

## Biology · Chemistry · Physics · Earth
## Physical · Physical with Earth

## Explore Our Phenomenal World

Learning begins with curiosity. McGraw-Hill Education's *Inspire Science* High School series provides an in-depth, collaborative, and project-based learning experience designed to help you spark students' interest, and empower them to ask more questions and think more critically. Through inquiry-based, hands-on investigations of real-world phenomena, your students will be able to construct explanations for scientific phenomena or design solutions for real-world problems.

**Are you ready to inspire the next generation of innovators?**

### Inspire Curiosity

Spark critical thinking.

### Inspire Investigation

Spark inquiry-driven, hands-on exploration.

### Inspire Innovation

Spark creative solutions to real-world challenges.

### Need login credentials?

Go to my.mheducation.com and select "Request Login Credentials."

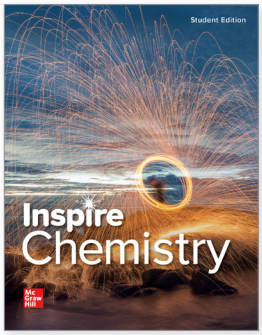
# Resources At-A-Glance

## Learning Resources

*Inspire Science* High School series combines online and print resources to support student inquiry into real-world phenomena. Online projects and investigations give students options to plan their inquiry, collect evidence, and develop their reasoning. The Student Edition, as well as the digital Interactive Content and Additional Resources, serve as research tools to add context and background knowledge. Full support for classroom success is provided in the Teacher's Edition and online.

**INSPIRE BIOLOGY**
STUDENT EDITION


**INSPIRE CHEMISTRY**
STUDENT EDITION

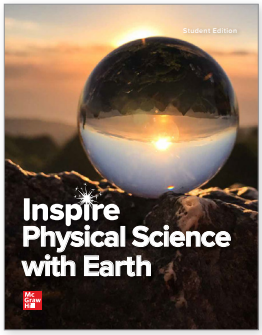



**INSPIRE PHYSICS**
STUDENT EDITION


**INSPIRE EARTH SCIENCE**
STUDENT EDITION

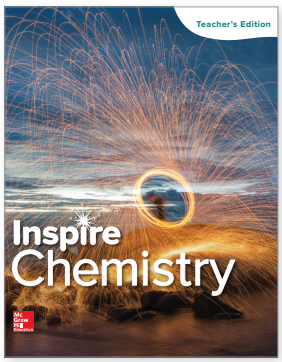

**INSPIRE PHYSICAL SCIENCE**
STUDENT EDITION


**INSPIRE PHYSICAL SCIENCE WITH EARTH**
STUDENT EDITION




**INSPIRE BIOLOGY**
TEACHER'S EDITION


**INSPIRE CHEMISTRY**
TEACHER'S EDITION




**INSPIRE PHYSICS**
TEACHER'S EDITION


**INSPIRE EARTH SCIENCE**
TEACHER'S EDITION

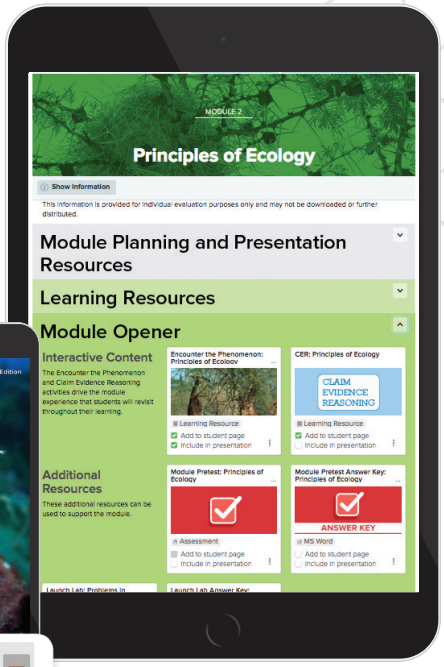

**INSPIRE PHYSICAL SCIENCE**
TEACHER'S EDITION


**INSPIRE PHYSICAL SCIENCE WITH EARTH**
TEACHER'S EDITION

# Digital Resources

## Why Go Online?

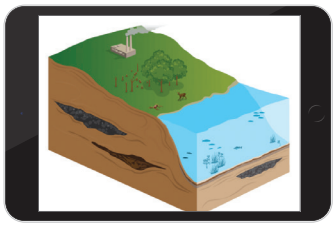
- Engaging Interactive Content
- Science Content Videos
- Text Read Aloud and Highlighting Features
- Dynamic Search Tools




Read Anywhere App

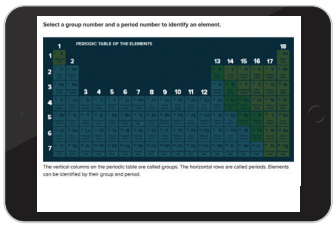
### Info Graphic

### Layer Reveal

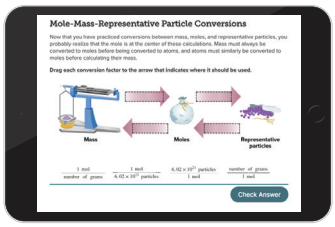


### Phenomena Videos

### Poptips Plus

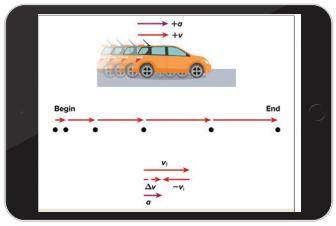


### Drag and Drop



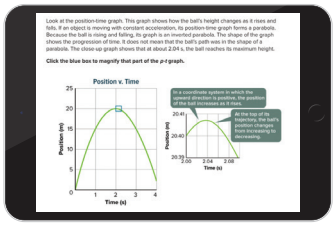

### Swypeline

### Slideline Plus




### Step by Step


### Click Change




### Inspire 3D App


### Beyond the Classroom

See the Digital Experience section of this guide to learn more about these engaging interactives.

# Three-Course Model Scope and Sequence

The *Inspire Science* High School series supports the high school three-course model by providing Earth science content and projects online that can be seamlessly incorporated to meet Performance Expectations

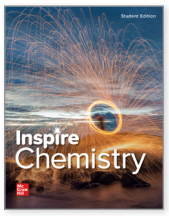

Look for the Earth icon to see where Inspire Earth content has been correlated into Inspire Biology, Inspire Chemistry, and Inspire Physics.

## *Inspire Biology*


| | |
|---|---|
| MODULE | The Study Of Life |
| **UNIT 1** | **ECOLOGY** |
| MODULE | Principles Of Ecology |
| MODULE | Communities, Biomes, And Ecosystems |
| MODULE | Population Ecology |
| MODULE | Biodiversity And Conservation |
| MODULE | Relationships Between Humans and Earth |
| **UNIT 2** | **THE CELL** |
| MODULE | Chemistry In Biology |
| MODULE | Cellular Structure And Function |
| MODULE | Cellular Energy |
| MODULE | Cellular Reproduction And Sexual Reproduction |
| **UNIT 3** | **GENETICS** |
| MODULE | Introduction To Genetics And Patterns Of Inheritance |
| MODULE | Molecular Genetics |
| MODULE | Biotechnology |
| **UNIT 4** | **HISTORY OF BIOLOGICAL DIVERSITY** |
| MODULE | The History of Life |
| MODULE | Evolution |
| MODULE | Primate Evolution |
| MODULE | Organizing Life's Diversity |
| MODULE | Earth's Early History |
| **UNIT 5** | **THE DIVERSITY OF LIFE** |
| MODULE | Bacteria And Viruses |
| MODULE | Protists And Fungi |
| MODULE | Introduction To Plants |
| MODULE | Introduction To Animals |
| MODULE | Animal Diversity And Behavior |
| **UNIT 6** | **THE HUMAN BODY** |
| MODULE | Integumentary, Skeletal, And Muscular Systems |
| MODULE | Nervous System |
| MODULE | Circulatory, Respiratory, And Excretory Systems |
| MODULE | Digestive And Endocrine Systems |
| MODULE | Human Reproduction And Development |
| MODULE | The Immune System |

Hero Images/Getty Images

## Inspire Chemistry




| | |
|---|---|
| MODULE | The Central Science |
| **UNIT 1** | **STRUCTURE AND PROPERTIES OF MATTER** |
| MODULE | Matter—Properties And Changes |
| MODULE | The Structure Of The Atom |
| MODULE | Electrons In Atoms |
| MODULE | The Periodic Table And Periodic Law |
| **UNIT 2** | **CHEMICAL BONDING AND REACTIONS** |
| MODULE | Ionic Compounds And Metals |
| MODULE | Covalent Bonding |
| MODULE | Chemical Reactions |
| MODULE | The Mole |
| MODULE | Stoichiometry |
| **UNIT 3** | **MATTER, ENERGY, AND EQUILIBRIUM** |
| MODULE | States Of Matter |
| MODULE | Gases |
| MODULE | Mixtures And Solutions |
| MODULE | Energy And Chemical Change |
| MODULE | Reaction Rates |
| MODULE | Chemical Equilibrium |
| MODULE | Acids And Bases |
| MODULE | Ocean Acidification |
| **UNIT 4** | **ORGANIC AND NUCLEAR CHEMISTRY** |
| MODULE | Hydrocarbons |
| MODULE | Substituted Hydrocarbons And Their Reaction |
| MODULE | The Chemistry Of Life |
| MODULE | Nuclear Chemistry |
| MODULE | **Climate Change** |

## Inspire Physics

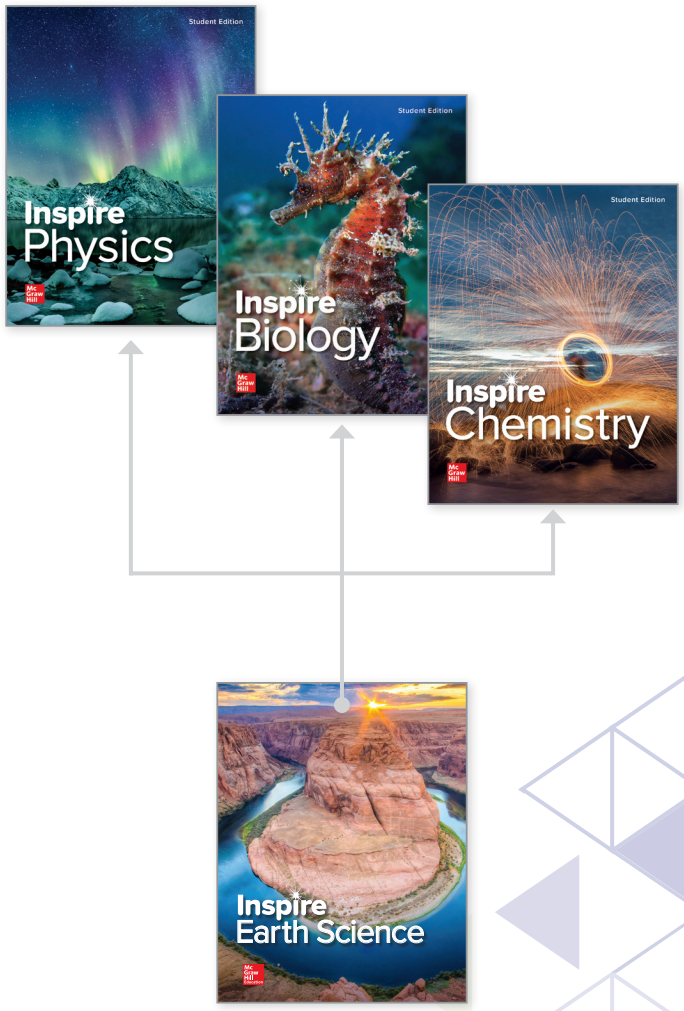

| | |
|---|---|
| MODULE | A Physics Toolkit |
| **UNIT 1** | **MECHANICS IN ONE DIMENSION** |
| MODULE | Representing Motion |
| MODULE | Accelerated Motion |
| MODULE | Forces In One Dimension |
| **UNIT 2** | **MECHANICS IN TWO DIMENSIONS** |
| MODULE | Displacement And Force In Two Dimensions |
| MODULE | Motion In Two Dimensions |
| MODULE | Gravitation |
| MODULE | Rotational Motion |
| MODULE | Earth's Tectonic Processes |
| **UNIT 3** | **MOMENTUM AND ENERGY** |
| MODULE | Momentum And Its Conservation |
| MODULE | Energy And Its Conservation |
| MODULE | Thermal Energy |
| MODULE | States Of Matter |
| MODULE | Earth's Resources |
| MODULE | Earth's Surface Processes |
| **UNIT 4** | **WAVES AND LIGHT** |
| MODULE | Vibrations And Waves |
| MODULE | Sound |
| MODULE | Fundamentals Of Light |
| MODULE | Reflection And Refraction |
| ODULE | Interference And Diffraction |
| MODULE | Seismic Waves |
| **UNIT 5** | **ELECTRICITY AND MAGNETISM** |
| MODULE | Electrostatics |
| MODULE | Electric Current And Circuits |
| MODULE | Magnetic Fields |
| MODULE | Electromagnetism |
| **UNIT 6** | **SUBATOMIC PHYSICS** |
| MODULE | Quantum Theory And The Atom |
| MODULE | Solid State Electronics |
| ODULE | Nuclear And Particle Physics |
| MODULE | Stars |
| MODULE | Cosmology |

# Three-Course Model Support

The Three-Course Model of *Inspire Science* High School series meets your needs by incorporating and highlighting the nature of Earth and Space Sciences as an interdisciplinary pursuit within each high school program: *Inspire Biology, Inspire Chemistry, and Inspire Physics.*

With dynamic online resources embedded, you are empowered to teach confidently with the flexibility to incorporate Earth and Space Science content when and where you need it.

Dynamic resources are embedded into each Three-Course *Inspire Science* High School program to help you and your students meet the challenges of integrating the Earth and Space Sciences (ESS) into each course. You are empowered to teach confidently knowing every unit includes standard-aligned content and emphasizes the Three-Course Model.




## For the Teacher | Print Teacher Edition:

**Standard Maps**

- Indicate where the Earth and Space Science standards are met within each course.
- Located at the beginning of your Teacher's Edition.

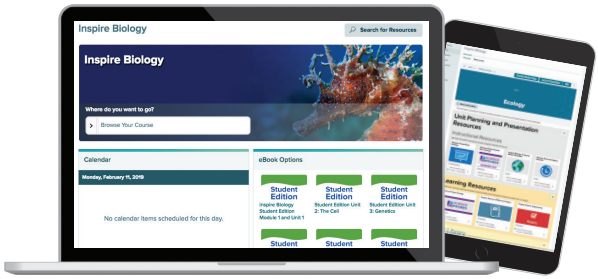
**Unit Opener: Preview the Unit**

- Summarizes the Performance Expectations (PEs) within the unit, including Earth and Space Science PEs.
- Integrates Earth and Space Science standards into the STEM Unit Project when applicable.

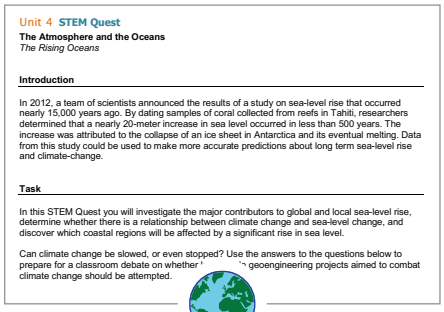
**Earth and Space Science Connections**

Connections within the printed Teacher's Edition and online will show where and when Earth and Space content is included in each Three-Course program and when to utilize it.

| UNIT OPEN | MODULE OPENER | LESSON (5Es) |
|---|---|---|
| Encounter the Unit Phenomenon | Encounter the Module Phenomenon | Engage |
| STEM Unit Project with Earth (Start) | CER Claim/Evidence/Reasoning | Explore/Explain |
| Science Probe | | Earth Applying Practices |
| | | Elaborate |
| | | Evaluate |




## UNIT PROJECT WITH EARTH


Unit 4 STEM Quest

**The Atmosphere and the Oceans**

*The Rising Oceans*

**Introduction**

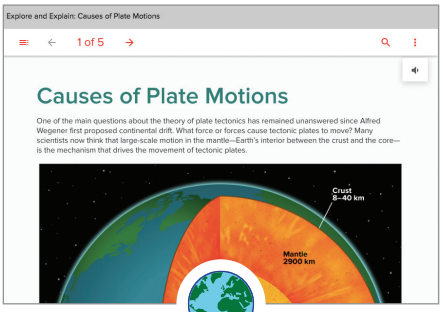
In 2012, a team of scientists announced the results of a study on sea-level rise that occurred nearly 15,000 years ago. By dating samples of coral collected from reefs in Tahiti, researchers determined that a nearly 20-meter increase in sea level occurred in less than 500 years. The increase was attributed to the collapse of an ice sheet in Antarctica and its eventual melting. Data from this study could be used to make more accurate predictions about long term sea-level rise and climate-change.

**Task**

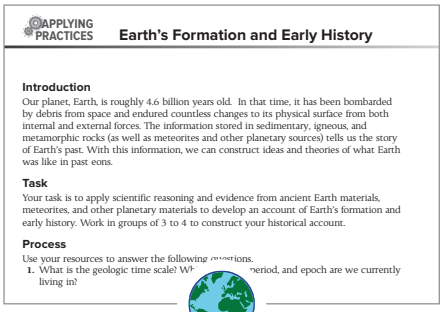
In this STEM Quest you will investigate the major contributors to global and local sea-level rise, determine whether there is a relationship between climate change and sea-level change, and discover which coastal regions will be affected by a significant rise in sea level.

Can climate change be slowed, or even stopped? Use the answers to the questions below to prepare for a classroom debate on whether [redacted] geoengineering projects aimed to combat climate change should be attempted.

## EARTH INTERACTIVE CONTENT




## EARTH APPLYING PRACTICES


APPLYING PRACTICES

**Earth's Formation and Early History**

**Introduction**

Our planet, Earth, is roughly 4.6 billion years old. In that time, it has been bombarded by debris from space and endured countless changes to its physical surface from both internal and external forces. The information stored in sedimentary, igneous, and metamorphic rocks (as well as meteorites and other planetary sources) tells us the story of Earth's past. With this information, we can construct ideas and theories of what Earth was like in past eons.

**Task**

Your task is to apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary materials to develop an account of Earth's formation and early history. Work in groups of 3 to 4 to construct your historical account.

**Process**

Use your resources to answer the following questions.

1. What is the geologic time scale? W[redacted]eriod, and epoch are we currently living in?

## For the Teacher | Digital:

### STEM Unit Projects with Integrated Earth and Space Content

- Helps students understand what problem they are solving.
- Identifies what resource might be helpful to solve the problem.

### Earth and Space Interactive Content

- Encourages student engagement as they interact with 3D learning activities within the Explore and Explain section.

### Earth and Space Applying Practices

- Provide practice opportunities for Disciplinary Core Ideas.
- Offer formative assessment opportunities.

## For the Student | Digital:

### Online Student Center

- Employ the Science and Engineering Practices through The Applying Practices.
- Learn the Disciplinary Core Ideas through interactive Earth and Space Sciences content.
- Demonstrate their understanding of the full Performance Expectations through the STEM Unit Projects.

## MODULE CLOSE

Revisit the Phenomenon

Labs/Projects

Module Test

Vocabulary Review

STEM Unit Project with Earth

## UNIT CLOSE

STEM Unit Project with Earth (Complete)

# Four-Course Model Scope and Sequence

## *Inspire Biology*

| | |
|---|---|
| MODULE | The Study Of Life |
| **UNIT 1** | **ECOLOGY** |
| MODULE | Principles Of Ecology |
| MODULE | Communities, Biomes, And Ecosystems |
| MODULE | Population Ecology |
| MODULE | Biodiversity And Conservation |
| **UNIT 2** | **THE CELL** |
| MODULE | Chemistry In Biology |
| MODULE | Cellular Structure And Function |
| MODULE | Cellular Energy |
| MODULE | Cellular Reproduction And Sexual Reproduction |
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| MODULE | Molecular Genetics |
| MODULE | Biotechnology |
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| MODULE | Primate Evolution |
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| MODULE | Protists And Fungi |
| MODULE | Introduction To Plants |
| MODULE | Introduction To Animals |
| MODULE | Animal Diversity And Behavior |
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| MODULE | Integumentary, Skeletal, And Muscular Systems |
| MODULE | Nervous System |
| MODULE | Circulatory, Respiratory, And Excretory Systems |
| MODULE | Digestive And Endocrine Systems |
| MODULE | Human Reproduction And Development |
| MODULE | The Immune System |

## *Inspire Chemistry*

| | |
|---|---|
| MODULE | The Central Science |
| **UNIT 1** | **STRUCTURE AND PROPERTIES OF MATTER** |
| MODULE | Matter—Properties And Changes |
| MODULE | The Structure Of The Atom |
| MODULE | Electrons In Atoms |
| MODULE | The Periodic Table And Periodic Law |
| **UNIT 2** | **CHEMICAL BONDING AND REACTIONS** |
| MODULE | Ionic Compounds And Metals |
| MODULE | Covalent Bonding |
| MODULE | Chemical Reactions |
| MODULE | The Mole |
| MODULE | Stoichiometry |
| **UNIT 3** | **MATTER, ENERGY, AND EQUILIBRIUM** |
| MODULE | States Of Matter |
| MODULE | Gases |
| MODULE | Mixtures And Solutions |
| MODULE | Energy And Chemical Change |
| MODULE | Reaction Rates |
| MODULE | Chemical Equilibrium |
| MODULE | Acids And Bases |
| **UNIT 4** | **ORGANIC AND NUCLEAR CHEMISTRY** |
| MODULE | Hydrocarbons |
| MODULE | Substituted Hydrocarbons And Their Reaction |
| MODULE | The Chemistry Of Life |
| MODULE | Nuclear Chemistry |

## *Inspire Physics*

| | |
|---|---|
| MODULE | A Physics Toolkit |
| **UNIT 1** | **MECHANICS IN ONE DIMENSION** |
| MODULE | Representing Motion |
| MODULE | Accelerated Motion |
| MODULE | Forces In One Dimension |
| **UNIT 2** | **MECHANICS IN TWO DIMENSIONS** |
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| MODULE | Motion In Two Dimensions |
| MODULE | Gravitation |
| MODULE | Rotational Motion |
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| MODULE | States Of Matter |
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| MODULE | Fundamentals Of Light |
| MODULE | Reflection And Refraction |
| MODULE | Interference And Diffraction |
| **UNIT 5** | **ELECTRICITY AND MAGNETISM** |
| MODULE | Electrostatics |
| MODULE | Electric Current And Circuits |
| MODULE | Magnetic Fields |
| MODULE | Electromagnetism |
| **UNIT 6** | **SUBATOMIC PHYSICS** |
| MODULE | Quantum Theory And The Atom |
| MODULE | Solid State Electronics |
| MODULE | Nuclear And Particle Physics |

## Earth Science

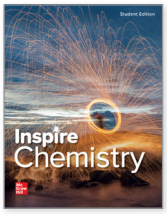
| | |
|---|---|
| MODULE | Introduction to Earth Science |
| **UNIT 1** | **COMPOSITION OF EARTH** |
| MODULE | Matter and Change |
| MODULE | Minerals |
| MODULE | Rocks |
| **UNIT 2** | **SURFACE PROCESSES ON EARTH** |
| MODULE | Weathering, Erosion, and Soil |
| MODULE | Mass Movements, Wind, and Glaciers |
| MODULE | Water |
| **UNIT 3** | **THE ATMOSPHERE AND THE OCEANS** |
| MODULE | Atmosphere |
| MODULE | Meteorology |
| MODULE | The Nature Of Storms |
| MODULE | Climate |
| MODULE | Earth's Oceans |
| **UNIT 4** | **THE DYNAMIC EARTH** |
| MODULE | Plate Tectonics |
| MODULE | Volcanism |
| MODULE | Earthquakes |
| MODULE | Mountain Building |
| **UNIT 5** | **GEOLOGIC TIME** |
| MODULE | Fossils and the Rock Record |
| MODULE | Geologic Time Scale |
| **UNIT 6** | **RESOURCES AND THE ENVIRONMENT** |
| MODULE | Earth's Resources |
| MODULE | Human Impact On Resources |
| **UNIT 7** | **BEYOND EARTH** |
| MODULE | The Sun-Earth-Moon System |
| MODULE | Our Solar System |
| MODULE | Stars |
| MODULE | Galaxies and the Universe |

## Physical Science

| | |
|---|---|
| MODULE | The Nature of Science |
| **UNIT 1** | **MOTION AND FORCES** |
| MODULE | Motion |
| MODULE | Forces and Newton's Laws |
| **UNIT 2** | **ENERGY** |
| MODULE | Work and Energy |
| MODULE | Thermal Energy |
| MODULE | Electricity |
| MODULE | Magnetism and Its Uses |
| MODULE | Energy Sources and the Environment |
| **UNIT 3** | **WAVES** |
| MODULE | Introduction to Waves |
| MODULE | Sound |
| MODULE | Electromagnetic Waves |
| MODULE | Light |
| MODULE | Mirrors and Lenses |
| **UNIT 4** | **MATTER** |
| MODULE | Solids, Liquids, and Gases |
| MODULE | Classification of Matter |
| MODULE | Properties of Atoms and the Periodic Table |
| MODULE | Elements and Their Properties |
| **UNIT 5** | **REACTIONS** |
| MODULE | Chemical Bonds |
| MODULE | Chemical Reactions |
| MODULE | Radioactivity and Nuclear Reactions |
| **UNIT 6** | **APPLICATIONS OF CHEMISTRY** |
| MODULE | Solutions |
| MODULE | Acids, Bases, and Salts |
| MODULE | Organic Compounds |
| MODULE | New Materials Through Chemistry |

INSPIRE BIOLOGY


INSPIRE CHEMISTRY




INSPIRE PHYSICS


INSPIRE EARTH SCIENCE


INSPIRE PHYSICAL SCIENCE

# Unit and Module At-A-Glance

The *Inspire Science* High School series uses the student reference text and the fully interactive digital experience to provide two pathways for learning: student-led and teacher-facilitated. Each pathway provides the ability to adjust depending on the preferred method of learning.

## Teacher-Facilitated Pathway

Use the online teacher presentations found at each module and lesson to support classroom instruction and spark discourse. Obtain data to inform your instruction by assigning the interactive content, additional resources, and assessment.

Both the Teacher-Facilitated and Student-Led Pathways provide nit and module storylines help students seek answers to unit anchoring and investigative phenomena questions. Students are active in developing these questions and other questions as they use science and engineering practices to explain phenomena and solve problems. The unit and module storylines provide a path that builds on disciplinary core ideas and cross cutting concepts.

## Student-Led Pathway

Students can use the online interactive content, along with the Student Edition, Science Notebook, and printable projects and labs to collect evidence to support their claims and demonstrate three-dimensional thinking.

(t)Hero Images/Getty Images; (b) Frederic Cirou/PhotoAlto/Getty Images

Each unit phenomenon of *Inspire Science* High School series sets the stage for the STEM Unit Project. Each module within the unit supports the STEM Unit Project with phenomena-driven 5E lessons to support a variety of learning pathways.

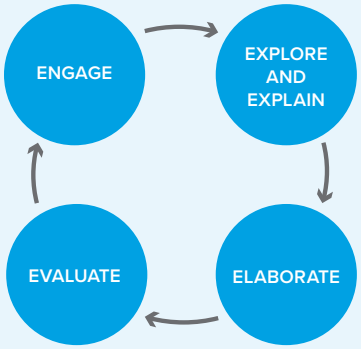
## UNIT OPENER

Encounter the Phenomenon
STEM Unit Project Launch
Formative Assessment Science Probe

## MODULE OPENER

Encounter the Phenomenon
CER Claim, Evidence, Reasoning

## LESSON




**ENGAGE:**
Encounter the Phenomenon
Phenomenon Question

**EXPLORE/EXPLAIN:**
Virtual Labs
PhET Simulations
Labs
Applying Practices
Supporting Resources

**ELABORATE:**
Environmental Connection
STEM Career Connections

**EVALUATE:**
Lesson Review
Three-Dimensional Assessment

## MODULE CLOSE

Revisit the Phenomenon
Three-Dimensional Assessment
CER Claim, Evidence, Reasoning
Labs/Projects
Revisit STEM Unit Project
Module Test
Vocabulary Review

## UNIT CLOSE

**GO ONLINE**
Complete STEM Unit Project

# Key Shifts for NGSS Success

The NGSS Standards are designed to help you prepare students for college and career readiness through a more innovative approach to K-12 science education. This new approach requires a few shifts in science instruction and learning, and *Inspire Science* High School series was designed to support you through each one.

Look for this symbol throughout this guide to learn more about these *Key Shifts for NGSS Success*:

- Three-Dimensional Learning
- Phenomena-Driven, Inquiry-Based, Hands-On Learning
- Evaluating Performance Over Testing Knowledge
- Integrated Engineering
- Depth Over Breadth
- Progressive Learning

## Three-Dimensional Learning

The three-dimensional learning framework of *Inspire Science* High School series delivers on the application-oriented approach needed to prepare your students for any challenge. Students achieve proficiency with the Performance Expectations by working with the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts in tandem to make sense of phenomena and design solutions to real-world problems.

### SEP Science and Engineering Practices

**SKILLS**
(for example, “Engaging in Argument from Evidence”)

### DCI Disciplinary Core Ideas

**CONTENT IN FOCUS**
(for example, “Structure and Function”)

### CCC Crosscutting Concepts

**COMMON THEMES**
(for example, “Systems and System Models”)

### Performance Expectations

Performance Expectations set the learning goals that integrate the three dimensions for students: the Science and Engineering Practices, the Disciplinary Core Ideas, and Crosscutting Concepts that all students should achieve to be scientifically literate.

## Phenomena-Driven, Inquiry-Based, Hands-On Learning

The philosophy of phenomena-driven and hands-on learning showcased throughout *Inspire Science* High School series helps students build long-lasting knowledge and skills by experiencing science and engineering through real-world application.

## Integrated Engineering

Engineering Design is a key shift that is dominant in the *Inspire Science's* High School series. This shift is shown seamlessly throughout the programs in engineering activities and in content within the Student Edition and teacher supports.

## Progressive Learning

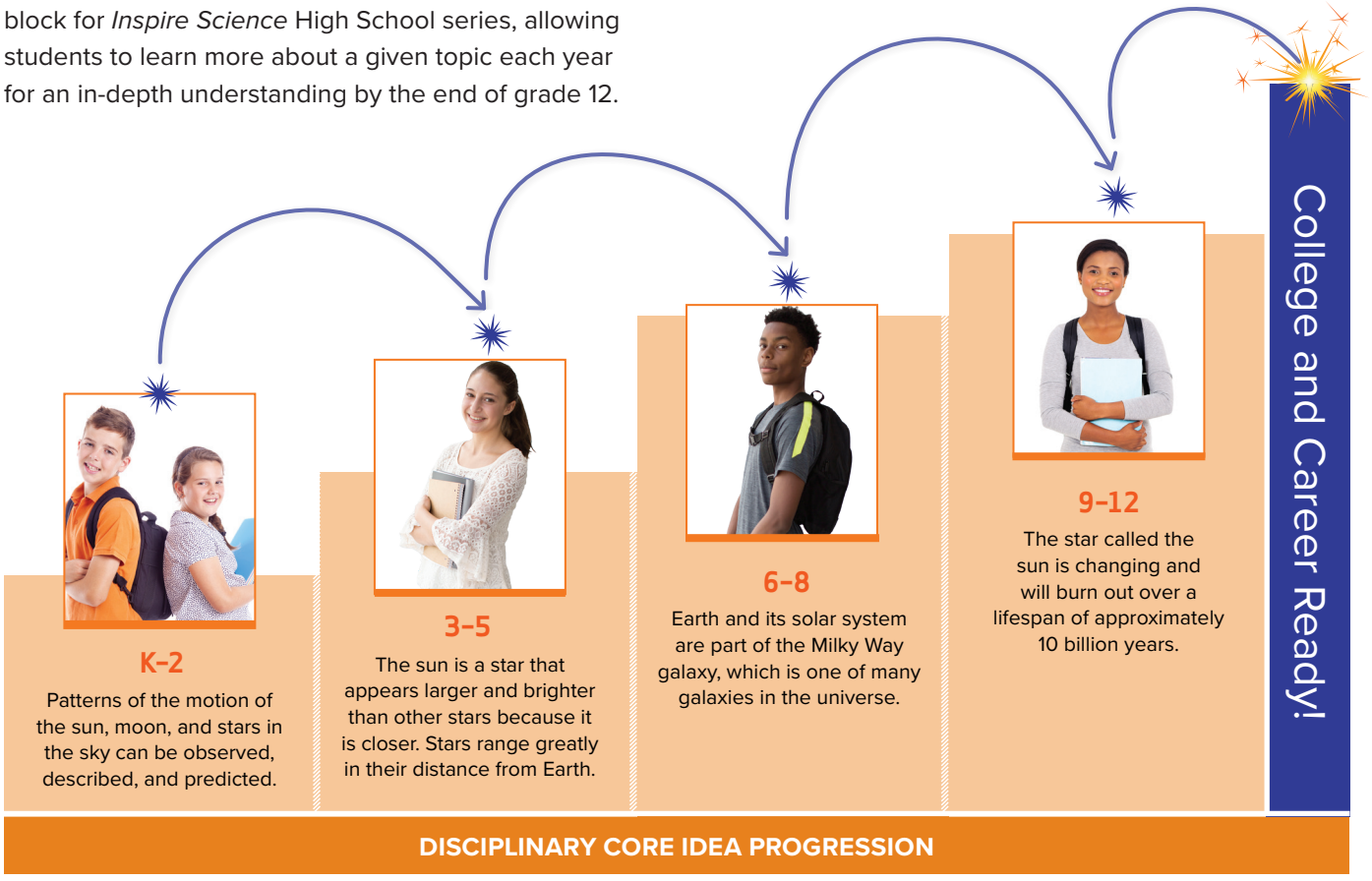
The *Inspire Science* series is built on the Next Generation Science Standards to ensure concepts deepen students conceptual understanding year after year. These progressions serve as a key building block for *Inspire Science* High School series, allowing students to learn more about a given topic each year for an in-depth understanding by the end of grade 12.

## Evaluating Performance Over Testing Knowledge

The formative and summative assessments in the *Inspire Science* High School series focus on helping students achieve a deep level of conceptual understanding through project-based learning with performance-based evaluations and rubrics.

## Depth Over Breadth

*Inspire Science* High School series provides investigations and projects that support in-depth inquiry backed by print and digital resources that support understanding of a full array of concepts.



## Driving Question Board

A Driving Question Board (DQB) is a great way to foster inquiry in the classroom and encourage students to take charge of their learning. Students will ask and answer questions throughout the unit, module, and lesson that support the unit anchoring phenomenon question and the module investigate the phenomena question.


### Summary Tables

Summary Tables provide students with records of the evidence they have gathered and the experiences carried out during the exploration of each unit. Students should explain their reasoning, describe the connection to the Unit and Module Phenomena, and identify the questions answered.

A Summary Table can consist of

1. Activities completed.
2. Patterns or observations.
3. Cause of the patterns.
4. Connections to the phenomenon.

As students complete the activities in the unit, they will gather more evidence to complete the Summary Table. The evidence from the Summary Table can then be used to complete the STEM Unit Projects.

| SUMMARY TABLE | | | | | |
|---|---|---|---|---|---|
| Activity Model | Observation Evidence | Explanation Reasoning | Connection to Phenom | Questions Answered | New Questions |
| *Applying Practices: Modeling Photosynthesis* | *The inputs for photosynthesis are CO2, H2O, and sunlight; outputs are sugar and O2.* | *Photosynthesis allows autotrophs to convert energy from the Sun to chemical energy that is stored in sugar.* | *Unit: Photo-synthesis is one of the cellular processes needed to keep plants alive. Module: A greenhouse allows plants to get the sunlight they need for photosynthesis.* | Why do plants die if you don't water them properly? | *How fast does photosynthesis occur?* |

## The Driving Question Board Helps students:

- Keep track of their learning as the unit progresses.
- Develop additional questions that lead students to answer the anchoring unit phenomenon question.
- Build knowledge of Performance Expectations that will be applied in the STEM Unit Project.

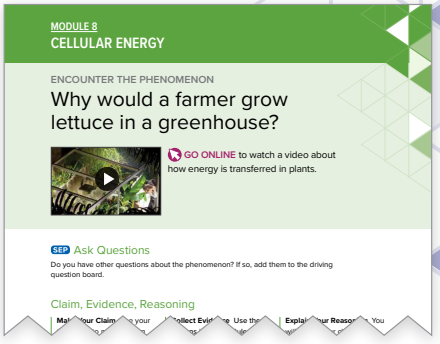
## The Driving Question Board Supports the SEPs:

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations

Instructional tools like this support project-based learning and inquiry by having students organize and focus on the evidence-based, iterative processes at the core of authentic science and engineering practices.

## Claim, Evidence, Reasoning

Throughout the *Inspire Science* High School series, students will be asked to make a claim, provide evidence to support their claim, and analyze their claim with reasoning. This framework supports student learning by focusing on evidence-based processes. Students are encouraged to review and reflect on their findings as more evidence is revealed.

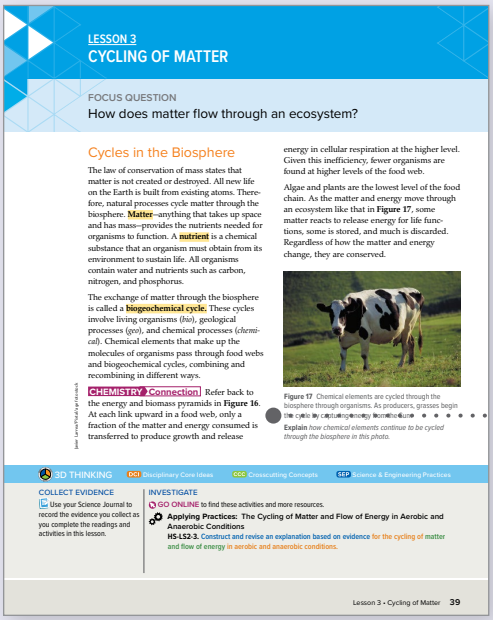


# Cross-Curricular Connections

The *Inspire Science* High School series integrates cross-curricular connections to Common Core State Standards for ELA/Literacy and Mathematics in alignment with the NGSS and Science Framework.

## Content Integration

Other connections, such as those listed below, are found throughout each lesson of the *Inspire Science* High School series. These connections are found across disciplines as students approach a single phenomenon from different perspectives.



LESSON 3
CYCLING OF MATTER

FOCUS QUESTION
How does matter flow through an ecosystem?

Cycles in the Biosphere

The law of conservation of mass states that matter is not created or destroyed. All new life on the Earth is built from existing atoms. Therefore, natural processes cycle matter through the biosphere. **Matter**—anything that takes up space and has mass—provides the nutrients needed for organisms to function. A **nutrient** is a chemical substance that an organism must obtain from its environment to sustain life. All organisms contain water and nutrients such as carbon, nitrogen, and phosphorus.

The exchange of matter through the biosphere is called a **biogeochemical cycle.** These cycles involve living organisms (*bio*), geological processes (*geo*), and chemical processes (*chemical*). Chemical elements that make up the molecules of organisms pass through food webs and biogeochemical cycles, combining and recombining in different ways.

CHEMISTRY Connection Refer back to the energy and biomass pyramids in **Figure 16**. At each link upward in a food web, only a fraction of the matter and energy consumed is transferred to produce growth and release

energy in cellular respiration at the higher level. Given this inefficiency, fewer organisms are found at higher levels of the food web.

Algae and plants are the lowest level of the food chain. As the matter and energy move through an ecosystem like that in **Figure 17**, some matter reacts to release energy for life functions, some is stored, and much is discarded. Regardless of how the matter and energy change, they are conserved.

**Figure 17** Chemical elements are cycled through the biosphere through organisms. As producers, grasses begin the cycle by capturing energy from the sun.
**Explain** *how chemical elements continue to be cycled through the biosphere in this photo.*

3D THINKING DCI Disciplinary Core Ideas CCC Crosscutting Concepts SEP Science & Engineering Practices

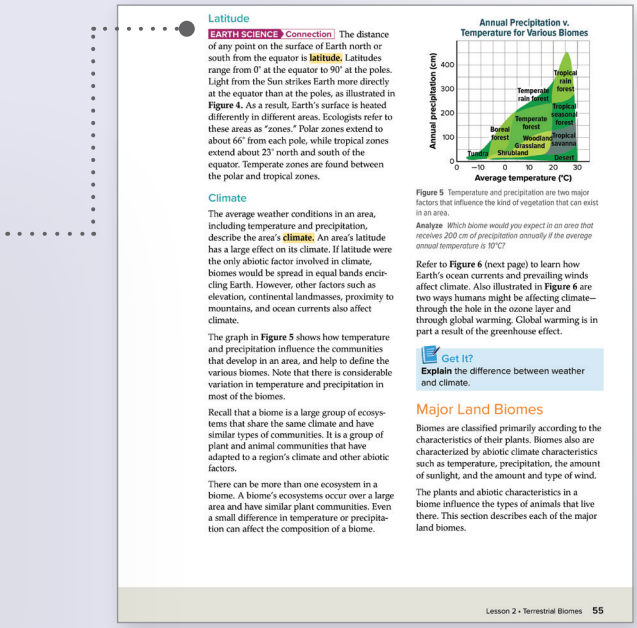
COLLECT EVIDENCE
Use your Science Journal to record the evidence you collect as you complete the readings and activities in this lesson.

INVESTIGATE
GO ONLINE to find these activities and more resources.
**Applying Practices: The Cycling of Matter and Flow of Energy in Aerobic and Anaerobic Conditions**
**HS-LS2-3.** Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

Lesson 3 • Cycling of Matter 39

**CHEMISTRY Connection** Refer back to the energy and biomass pyramids in **Figure 16**. At each link upward in a food web, only a fraction of the matter and energy consumed is transferred to produce growth and release.

INSPIRE BIOLOGY, UNIT 1, MODULE 1, LESSON 3



Latitude

EARTH SCIENCE Connection The distance of any point on the surface of Earth north or south from the equator is **latitude.** Latitudes range from 0° at the equator to 90° at the poles. Light from the Sun strikes Earth more directly at the equator than at the poles, as illustrated in **Figure 4.** As a result, Earth's surface is heated differently in different areas. Ecologists refer to these areas as "zones." Polar zones extend to about 66° from each pole, while tropical zones extend about 23° north and south of the equator. Temperate zones are found between the polar and tropical zones.

Climate

The average weather conditions in an area, including temperature and precipitation, describe the area's **climate.** An area's latitude has a large effect on its climate. If latitude were the only abiotic factor involved in climate, biomes would be spread in equal bands encircling Earth. However, other factors such as elevation, continental landmasses, proximity to mountains, and ocean currents also affect climate.

The graph in **Figure 5** shows how temperature and precipitation influence the communities that develop in an area, and help to define the various biomes. Note that there is considerable variation in temperature and precipitation in most of the biomes.

Recall that a biome is a large group of ecosystems that share the same climate and have similar types of communities. It is a group of plant and animal communities that have adapted to a region's climate and other abiotic factors.

There can be more than one ecosystem in a biome. A biome's ecosystems occur over a large area and have similar plant communities. Even a small difference in temperature or precipitation can affect the composition of a biome.

Annual Precipitation v. Temperature for Various Biomes



**Figure 5** Temperature and precipitation are two major factors that influence the kind of vegetation that can exist in an area.
**Analyze** *Which biome would you expect in an area that receives 200 cm of precipitation annually if the average annual temperature is 10°C?*

Refer to **Figure 6** (next page) to learn how Earth's ocean currents and prevailing winds affect climate. Also illustrated in **Figure 6** are two ways humans might be affecting climate—through the hole in the ozone layer and through global warming. Global warming is in part a result of the greenhouse effect.

Get It?
**Explain** the difference between weather and climate.

Major Land Biomes

Biomes are classified primarily according to the characteristics of their plants. Biomes also are characterized by abiotic climate characteristics such as temperature, precipitation, the amount of sunlight, and the amount and type of wind.

The plants and abiotic characteristics in a biome influence the types of animals that live there. This section describes each of the major land biomes.

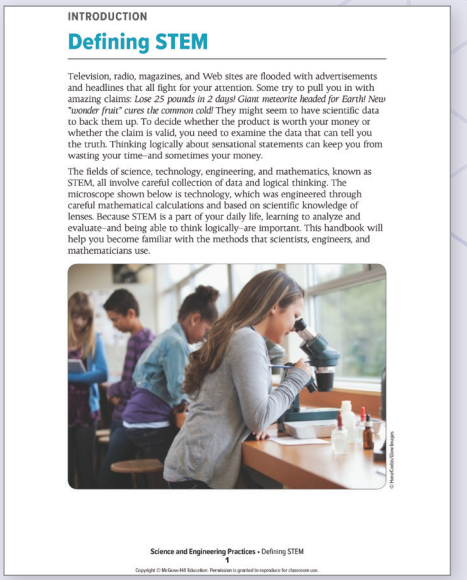
Lesson 2 • Terrestrial Biomes 55

**EARTH SCIENCE Connection** The distance of any point on the surface of Earth north or south from the equator is **latitude.** Latitudes range from 0° at the equator to 90° at the poles. Light from the Sun strikes Earth more directly at the equator than at the poles, as illustrated in **Figure 4.** As a result, Earth's surface is heated differently in different areas. Ecologists refer to these areas as "zones." Polar zones extend to about 66° from each pole, while tropical zones extend about 23° north and south of the equator. Temperate zones are found between the polar and tropical zones.

INSPIRE BIOLOGY, UNIT 1, MODULE 1, LESSON 2

## Integrated Engineering

The *Inspire Science* High School series supports teachers and students with the integration of engineering into the science curriculum. For broad support, teachers and students can access the Science and Engineering Handbook, which provides simple, approachable descriptions of science and engineering practices. Students can also practice these skills as they read through the handbook.


INTRODUCTION

Defining STEM

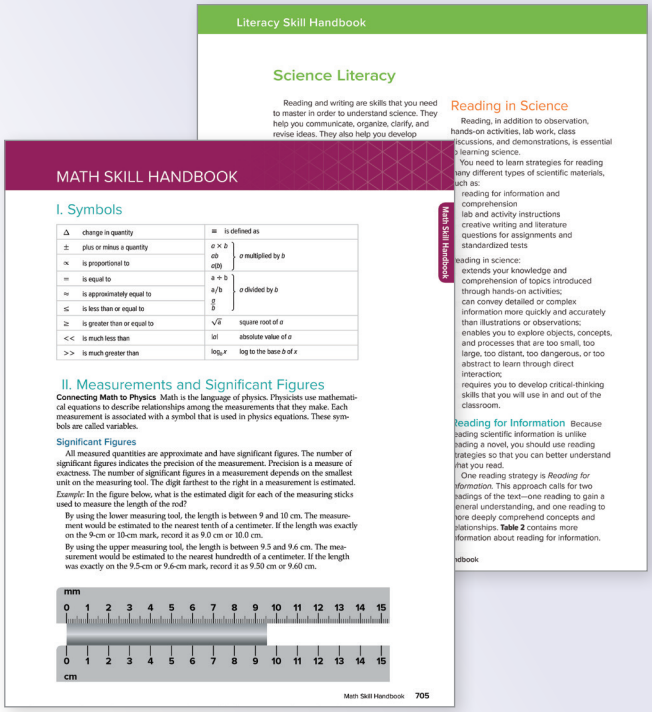
Television, radio, magazines, and Web sites are flooded with advertisements and headlines that all fight for your attention. Some try to pull you in with amazing claims: *Lose 25 pounds in 2 days! Giant meteorite headed for Earth! New "wonder fruit" cures the common cold!* They might seem to have scientific data to back them up. To decide whether the product is worth your money or whether the claim is valid, you need to examine the data that can tell you the truth. Thinking logically about sensational statements can keep you from wasting your time–and sometimes your money.

The fields of science, technology, engineering, and mathematics, known as STEM, all involve careful collection of data and logical thinking. The microscope shown below is technology, which was engineered through careful mathematical calculations and based on scientific knowledge of lenses. Because STEM is a part of your daily life, learning to analyze and evaluate–and being able to think logically–are important. This handbook will help you become familiar with the methods that scientists, engineers, and mathematicians use.

Science and Engineering Practices • Defining STEM 1



**GO ONLINE** to find the Science and Engineering Handbook to learn more about each of the eight SEPs.


Literacy Skill Handbook

Science Literacy

Reading and writing are skills that you need to master in order to understand science. They help you communicate, organize, clarify, and revise ideas. They also help you develop

Reading in Science

Reading, in addition to observation, hands-on activities, lab work, class discussions, and demonstrations, is essential to learning science.

You need to learn strategies for reading many different types of scientific materials, such as:

- reading for information and comprehension
- lab and activity instructions
- creative writing and literature
- questions for assignments and standardized tests

Reading in science:

- extends your knowledge and comprehension of topics introduced through hands-on activities;
- can convey detailed or complex information more quickly and accurately than illustrations or observations;
- enables you to explore objects, concepts, and processes that are too small, too large, too distant, too dangerous, or too abstract to learn through direct interaction;
- requires you to develop critical-thinking skills that you will use in and out of the classroom.

Reading for Information Because reading scientific information is unlike reading a novel, you should use reading strategies so that you can better understand what you read.

One reading strategy is *Reading for Information*. This approach calls for two readings of the text—one reading to gain a general understanding, and one reading to more deeply comprehend concepts and relationships. **Table 2** contains more information about reading for information.

Handbook

MATH SKILL HANDBOOK

I. Symbols

| | | | |
|---|---|---|---|
| Δ | change in quantity | ≡ | is defined as |
| ± | plus or minus a quantity | $a \times b$, $ab$, $a(b)$ | $a$ multiplied by $b$ |
| ∝ | is proportional to | | |
| = | is equal to | $a \div b$, $a/b$, $\frac{a}{b}$ | $a$ divided by $b$ |
| ≈ | is approximately equal to | | |
| ≤ | is less than or equal to | | |
| ≥ | is greater than or equal to | $\sqrt{a}$ | square root of $a$ |
| << | is much less than | $\lvert a \rvert$ | absolute value of $a$ |
| >> | is much greater than | $\log_b x$ | log to the base $b$ of $x$ |

Math Skill Handbook

II. Measurements and Significant Figures

**Connecting Math to Physics** Math is the language of physics. Physicists use mathematical equations to describe relationships among the measurements that they make. Each measurement is associated with a symbol that is used in physics equations. These symbols are called variables.

Significant Figures

All measured quantities are approximate and have significant figures. The number of significant figures indicates the precision of the measurement. Precision is a measure of exactness. The number of significant figures in a measurement depends on the smallest unit on the measuring tool. The digit farthest to the right in a measurement is estimated.

*Example:* In the figure below, what is the estimated digit for each of the measuring sticks used to measure the length of the rod?

By using the lower measuring tool, the length is between 9 and 10 cm. The measurement would be estimated to the nearest tenth of a centimeter. If the length was exactly on the 9-cm or 10-cm mark, record it as 9.0 cm or 10.0 cm.

By using the upper measuring tool, the length is between 9.5 and 9.6 cm. The measurement would be estimated to the nearest hundredth of a centimeter. If the length was exactly on the 9.5-cm or 9.6-cm mark, record it as 9.50 cm or 9.60 cm.




Math Skill Handbook 705

**GO ONLINE** to find the Math and Literacy Handbook.

## Math and Literacy

The *Inspire Science's* High School series supports students with literacy and math access through the Literacy Handbook and the Math Handbook. Each of these handbooks provides background information, student support, and examples that get students ready to make the connections they need to science.

## STEM Career Connections

STEM Career Connections allow students to connect with science by seeing potential career paths, as well as how what they're studying connects to the real world.

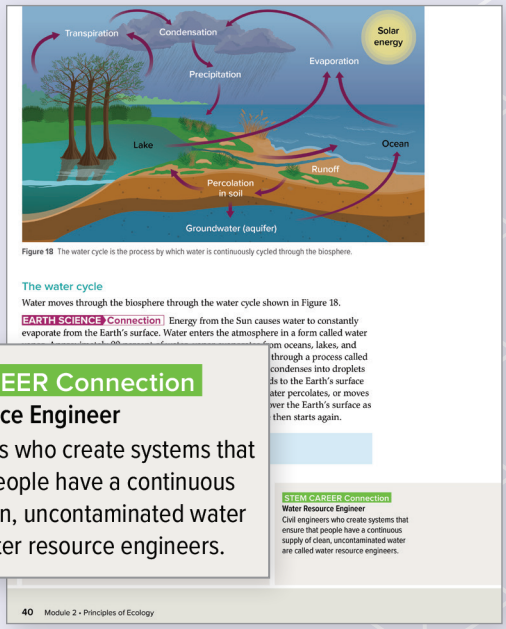



Figure 18 The water cycle is the process by which water is continuously cycled through the biosphere.

The water cycle

Water moves through the biosphere through the water cycle shown in Figure 18.

EARTH SCIENCE Connection Energy from the Sun causes water to constantly evaporate from the Earth's surface. Water enters the atmosphere in a form called water [illegible] from oceans, lakes, and [illegible] through a process called [illegible] condenses into droplets [illegible] ds to the Earth's surface [illegible] ater percolates, or moves [illegible] wer the Earth's surface as [illegible] then starts again.

STEM CAREER Connection

Water Resource Engineer

Civil engineers who create systems that ensure that people have a continuous supply of clean, uncontaminated water are called water resource engineers.

40 Module 2 • Principles of Ecology

**STEM CAREER Connection**

**Water Resource Engineer**

Civil engineers who create systems that ensure that people have a continuous supply of clean, uncontaminated water are called water resource engineers.

# Inspire All Students

*Inspires Science's* High School series has been designed to ensure that ALL students have access to quality, intellectually-rich science and engineering curriculum that supports language development and provides engaging learning opportunities. Here's how!

## Advanced Learners and Gifted Learners

Provide your advanced and gifted learners with challenging activities that identify the Depth of Knowledge (DOK) to provide enrichment opportunities for demonstrating advanced performance in science and engineering. This is in addition to the Approaching, On, and Beyond Level support, included in the differentiated instruction strategies for each module and lesson.

## Uniting Phenomena

Phenomenon-driven instruction levels the playing field for learners by allowing them to access the core science content through a shared experience observing a highly relevant real-world phenomenon. When students feel a personal connection to the phenomenon, they are more invested in aggregating the knowledge needed to explain the event. It is through these shared occurrences and supported instruction that learning is truly accessible to ALL students as they work towards achieving their learning goals.

FatCamera/E+/Getty Images

## EL Support

Rooted in learning sciences research, *Inspire Science* High School series applies the best instructional practices for teaching EL students. Each module and lesson have scaffolded activities designed to meet the English Language Development Standards which offers students of any level of English language proficiency the opportunity to engage in academically challenging science and engineering content that will grow content knowledge and support language acquisition.

Throughout each High School program, *Inspire Science* you will find:

- EL Overview for Teachers
- Module-level support for teachers
- Targeted support in the Teacher's Edition
- Student worksheets with EL strategies

**EL Support**

**Writing ELD PI.9/10.6a**

Support students in understanding compare/contrast structures to interpret the paragraph "Two basic cell types."

**EMERGING LEVEL** Ask students to highlight the two sentences that contain a comparison. Elicit the comparison words in these two sentences (one hundred times larger than, both have...but...). Create a Venn diagram together and elicit from students similarities and differences in the cells to include in the diagram.

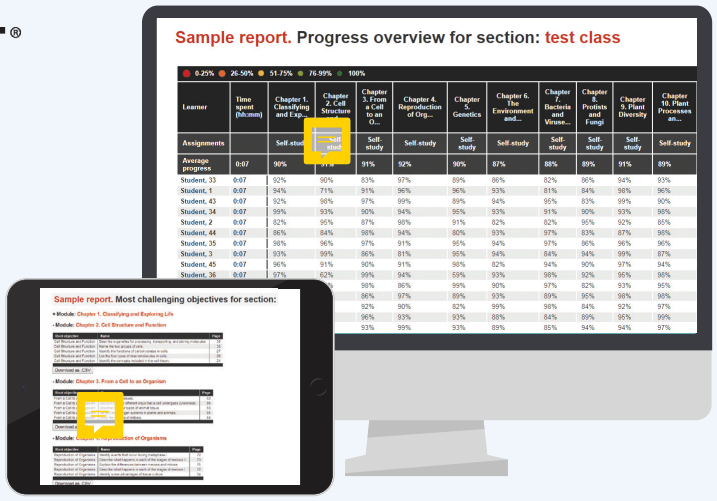
**BRIDGING LEVEL** Elicit compare/contrast words from students using the classroom environment/realia. Then, direct students to use the text and images to list similarities and differences in the cells on a Venn Diagram.

Strategies and activities allow for EL instruction that is just right for each of your students.

# LEARNSMART®

## Adaptive Learning

At McGraw-Hill Education, we recognize that no two students are alike. Using revolutionary adaptive technology, LearnSmart® builds a learning experience unique to each student's individual needs.




## Flexible Implementation to Match Your Classroom Needs

### MODEL 1: FLIPPED

*LearnSmart* previews module content → Class is taught based on *LearnSmart* data → Assessment

### MODEL 2: HOMEWORK

Teacher introduces module content → *LearnSmart* is assigned concurrently → Differentiated support based on *LearnSmart* data → Assessment

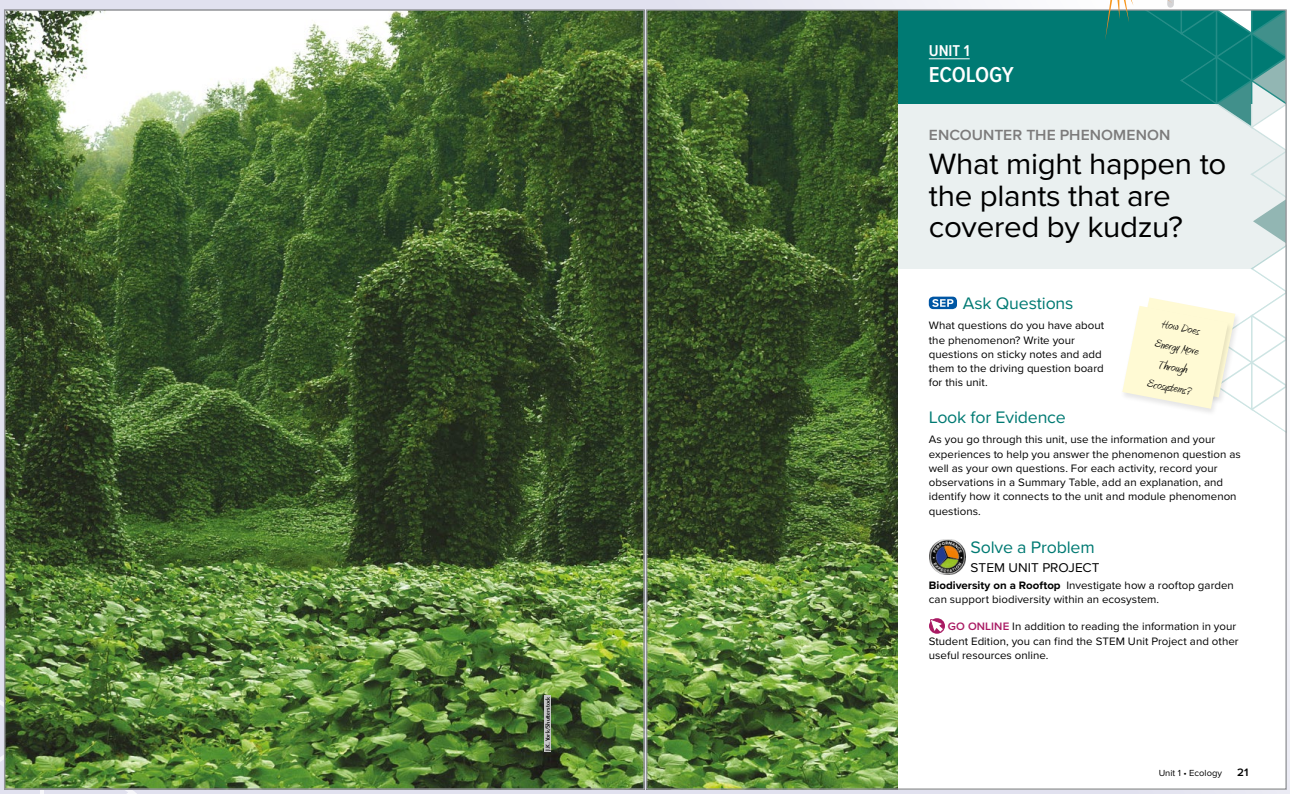
### MODEL 3: REVIEW

Teacher covers module content → *LearnSmart* is assigned to review → Differentiated support based on *LearnSmart* data → *LearnSmart* used to recharge learning

# Phenomena-Driven Learning

Every day, we are surrounded by natural phenomena that pique our curiosity. In the *Inspire Science* High School series, these phenomena are the centerpiece of each unit, module, and lesson to engage students and inspire them to investigate key science and engineering concepts through their three-dimensional learning experience. As students investigate each phenomenon, they will gather their Claim, Evidence, and Reasoning to solve and explain the module-level phenomenon.

## Anchoring Unit Phenomena




INSPIRE BIOLOGY, UNIT 1, ECOLOGY

### Phenomenon:

A way to make learning accessible to all students in a purposeful way. Phenomena are mechanisms that drive dimensions by providing a window into student learning and understanding.

## Investigative Module Phenomena

Students will investigate related module-level phenomena that will help them build understanding so they can uncover the mystery of the anchoring module phenomena.

MODULE 1

**ENCOUNTER THE PHENOMENON**

Are sea spiders different than spiders in your backyard?

MODULE 2

**ENCOUNTER THE PHENOMENON**

Why would a bird build a nest in a tree with thorns?

MODULE 3

**ENCOUNTER THE PHENOMENON**

Why would you grow a garden in a city?

MODULE 4

**ENCOUNTER THE PHENOMENON**

Why are bee populations declining?

MODULE 5

**ENCOUNTER THE PHENOMENON**

What happens to this ecosystem if the river is destroyed?

## Revisit the Phenomenon

Each module contains a Module Wrap-Up where students will connect what they've learned through the lesson to explain the anchoring module phenomenon.

## Unit Wrap-Up

**GO ONLINE** The Unit Wrap-Up allows students to connect what they have learned throughout the unit and complete the STEM Unit Project.

# Inquiry-Based Learning

Investigate questions and solve problems from a variety of angles. Inquiry-driven instruction gives students the practice they need to succeed in developing solutions to whatever challenges they may encounter.

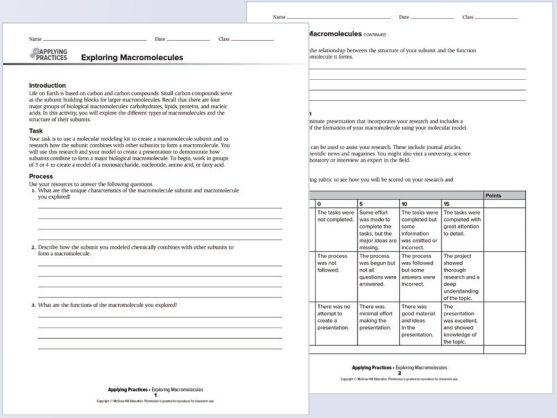
## Types of Inquiry Activities in Each High School Program of Inspire Science

Inquiry is more than hands-on activities. With *Inspire Science's* High School series, students will investigate phenomena through several techniques reflective of the way science and engineering are done in the real world.

### INQUIRY ACTIVITIES

Demonstrations & Hands-on Activities

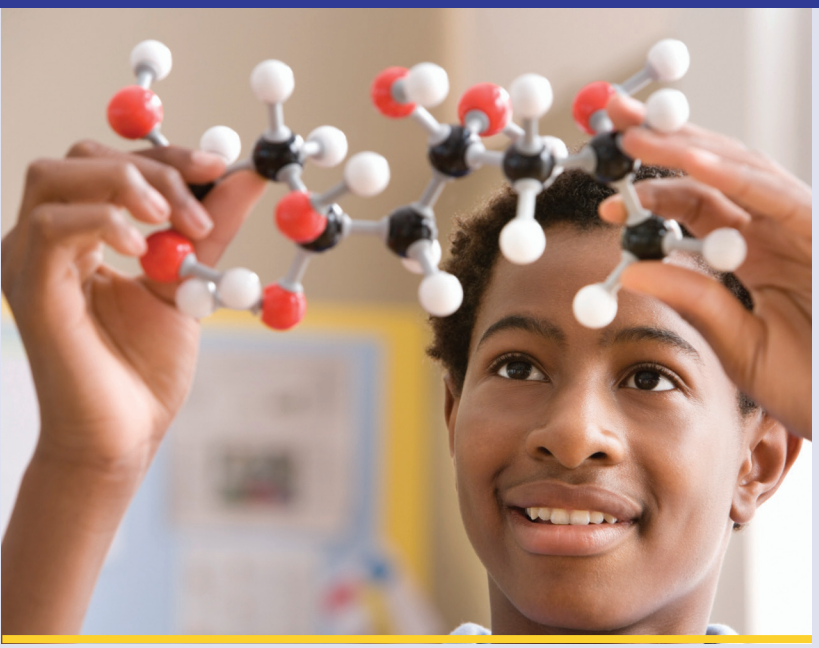
Engineering




Research


Simulations

(tl)FatCamera/istockphoto/Getty Images; (tr)Tetra Images/Getty Images; (b)PhET Interactive Simulations/University of Colorado Boulder/https://phet.colorado.edu



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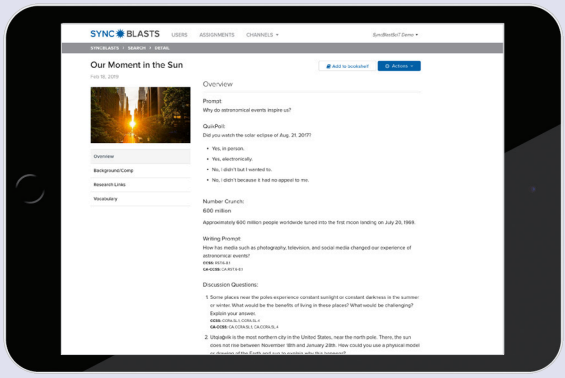



## Hands-On Inquiry

*Inspire Science* High School series is centered around inquiry where the program provides several opportunities in each module for student exploration.

All inquiry activities in *Inspire Science* High School series promote student engagement and allow each student to develop inquiry and science and engineering skills.

## The Inspire Science Inquiry Spectrum

Not all inquiry activities are the same. Depending upon the available time and student readiness, structured inquiry might be perfect, or your class may be ready for open inquiry. The *Inspire Science* High School series Inquiry Spectrum provides flexible options to adjust the inquiry level to align with the learning needs of each student.

## SYNC BLASTS™

*SyncBlasts™* provides reading and writing assignments that present science and current event topics relevant to students' lives and their world. Providing a variety of rich multimedia—including Preview Videos, links to Case Studies,

Explainer Videos, and The Point News Show—SyncBlasts are a smart way to engage students. New reading and writing assignments are published weekly.

SyncBlasts challenge students to:

- Build vital research, writing, and critical thinking skills while providing an easy entry point for peer review.
- Develop informed opinions on high-interest topics of cultural significance.
- Express their opinions succinctly, in a familiar format.
- Participate in thoughtful discussions with an authentic audience of peers.

Supporting student curiosity and deep discussions, SyncBlasts include videos with peers modeling academic conversations about case studies, research and current events.

# Next Generation Assessment Strategies

*Inspire Science's* High School series includes a variety of assessment options to support teachers with differentiation strategies and support students on their journey to mastery of the performance expectations.

## Formative Assessment

Formative assessment facilitates student reflection on their thinking (metacognition) and allows teachers to dynamically differentiate instruction. You can find the following formative assessments, embedded at many points throughout each module and lesson, in each of *Inspire Science's* High School programs.

Following are the types of formative assessment resources you'll find each of *Inspire Science's* High School programs found online and in the print Student Editions.

| FEATURE | INSTRUCTIONAL PURPOSE |
|---|---|
| **Science Probes** | Found at the beginning of each unit in the online resources, Science Probes reveal student preconceptions to guide instruction. |
| **Claim, Evidence, Reasoning** | With the CER Framework (Claim, Evidence, Reasoning) students will make claims and document their reasoning during the EXPLORE phase and add evidence and adjust their claims as needed later in the lesson. |
| **Three-Dimensional Thinking Questions** | Students will encounter questions that address the three dimensions of the NGSS check progress with the SEPs, DCIs, CCCs, and Performance Expectations. |
| **Inquiry Activities** | Students will conduct several Inquiry Activities per unit. These activities provide formative assessment questions that build three-dimensional thinking skills. |

## Summative Assessment

Summative assessment tools at the module and lesson level help ensure lasting learning and alignment of student skills to the Performance Expectations. Following are the summative assessment tools found in each of the *Inspire Science's* High School programs found online and in the print Student Editions.

| FEATURE | INSTRUCTIONAL PURPOSE |
|---|---|
| **Three-Dimensional Thinking Questions** | At the end of the moule, students will demonstrate their understanding of at least two of the three dimensions of NGSS to develop three-dimensional thinking skills. |
| **Lesson Check** | Found in every lesson online, in the EVALUATE section Lesson Checks determine how students are building a progression of learning toward the performance expectations. |
| **Module Test** | Found at the end of each module online, Module Tests evaluate student proficiency against the performance of the module with multiple choice, extended response, constructed response, and performance-task items. |
| **Module Vocabulary Practice** | Module Vocabulary Practice provides students with a study tool to practice key terms and definitions found throughout each module. |
| **STEM Unit Project** | With each STEM Project, found at the end of each unit, students will complete performance-based rubrics and answer summative questions to demonstrate how they've applied their knowledge and understanding of the performance expectations to their project. Both student and teacher rubrics are available online within the STEM Module Project section. |

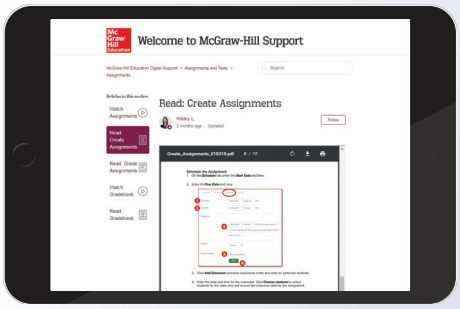
# Professional Learning

We know it can be a challenge to implement a new Science program with new standards. That's why The *Inspire Science* High School series comes with an evolving library of relevant, self-paced, professional learning videos and modules to support you from implementation through instructional progression and mastery, all available 24/7 at your fingertips.


## Program Implementation Support

Implementation support provides everything you need to know to get up to speed on the first day of school.

- **Quick Start eLearning Module** explains program basics to help get you started.
- **Plan, Teach, and Assess eLearning Modules** provides deep-dives of the program instructional model and resources and resources.




## Digital Platform Support

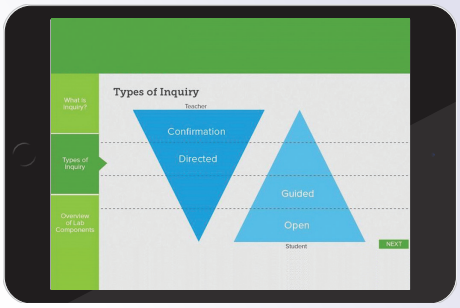
Step-by-step instructions for the use of each of your digital tools are found in the Technical Support Resource Library which will support confident planning, teaching, and assessing in the digital experience. In the Technical Support Resource Library, you will find step-by-step instructions for each of your digital tools to help you feel confident planning, teaching, and assessing in the digital experience.

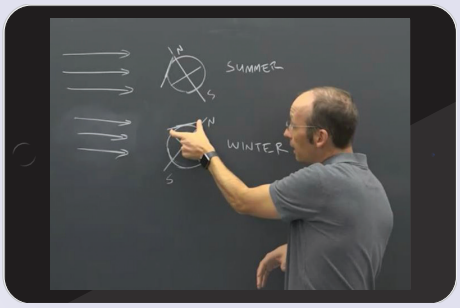

Hero Images/Getty Images

## Ongoing Pedagogy Support

With the *Inspire Science* High School series, you will find a wide range of resources on key instructional and pedagogical topics, including videos from our program authors and consultants.

- **STEM Classroom Videos** that model lessons from real classrooms.
- **Science Preconceptions Videos** that review common preconceptions and strategies to overcome them.
- **Instructional Coaching Videos** discussing best practice strategies and the "Why" behind the success.
- **Science Pedagogy Micro-Courses** designed for your professional learning community with facilitation guides for both self-guided or small-group courses .




## Finding Your Professional Learning Resources

All professional learning resources are easily identifiable in your digital experience—just look for the apple icon in your course, module or lesson pages.

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Smithsonian

## Smithsonian

Following the mission of its founder James Smithson for "an establishment for the increase and diffusion of knowledge," the Smithsonian Institution today is the world's largest museum, education, and research complex. To further their vision of shaping the future, a wealth of Smithsonian online resources are integrated within this program. *License agreement with Smithsonian is pending

SPONGELAB
A GLOBAL STEM COMMUNITY
V5.4

## SpongeLab Interactives

SpongeLab Interactives is  learning technology company that inspires learning and engagement by creating gamified environments that encourage students to interact with digital learning experiences.

Students participate in inquiry activities and problem-solving to explore a variety to topics using games, interactives, and video while teachers take advantage of formative, summative, or performance-based assessment information that is gathered through the learning management system.

PhET
INTERACTIVE SIMULATIONS
University of Colorado Boulder

## PhET Interactive Simulations

The PhET Interactive Simulations project at the University of Colorado Boulder provides teachers and students with interactive science and math simulations. Based on extensive education research, PhET sims engage students through an intuitive, game-like environment where students learn through exploration and discovery.

Inspire

Biology · Chemistry · Physics · Earth · Physical · Physical with Earth

# Unit, Module, and Lesson Walk-Through

This section will provide you with a step-by-step tour of one unit and module to give you a sense for the types of activities and resources, both print and digital, available *Inspire Science* High School series. Here you will find examples of the following:

- Planning the Unit and Module
- *Inspire Science* High School Series
- Plan With Module Resources
- Unit Walk-Through
- Module Walk-Through
- Lesson Walk-Through
- Unit and Module Wrap-Up

## Need login credentials?

Go to my.mheducation.com and select "Request Login Credentials."

# Planning the Unit and Module

## Performance Expectations and CA NGSS Correlations

At the beginning of each Unit and Module are pages that show how the content within each aligns to the NGSS in the Performance Expectations.

The *Inspire Science* High School Teacher's editions provide easy-to-follow correlations to the Next Generation Science Standards, so you know which modules address each Performance Expectation.

### SEP Science and Engineering Practices

**SKILLS** (eg, "Engaging in Argument from Evidence")

Science and Engineering Practices guide how you ask questions and define problems, plan and carry out investigations, analyze and interpret your findings, develop and use models, use mathematics and computational thinking, develop explanations and solutions based on evidence, and critique and communicate ideas.

- **Practice 1:** Asking questions (for science) and defining problems (for engineering).
- **Practice 2:** Developing and using models.
- **Practice 3:** Planning and carrying out investigations.
- **Practice 4:** Analyzing and using data.
- **Practice 5:** Using mathematics and computational thinking.
- **Practice 6:** Constructing explanations (for science) and designing solutions (for engineering).
- **Practice 7:** Engaging in argument from evidence.
- **Practice 8:** Obtaining, evaluating, and communicating Information.

### DCI Disciplinary Core Ideas

**CONTENT IN FOCUS** (eg, "Structure and Function")

Disciplinary Core Ideas bring into focus the concepts and organizing principles important across science or engineering.

### CCC Crosscutting Concepts

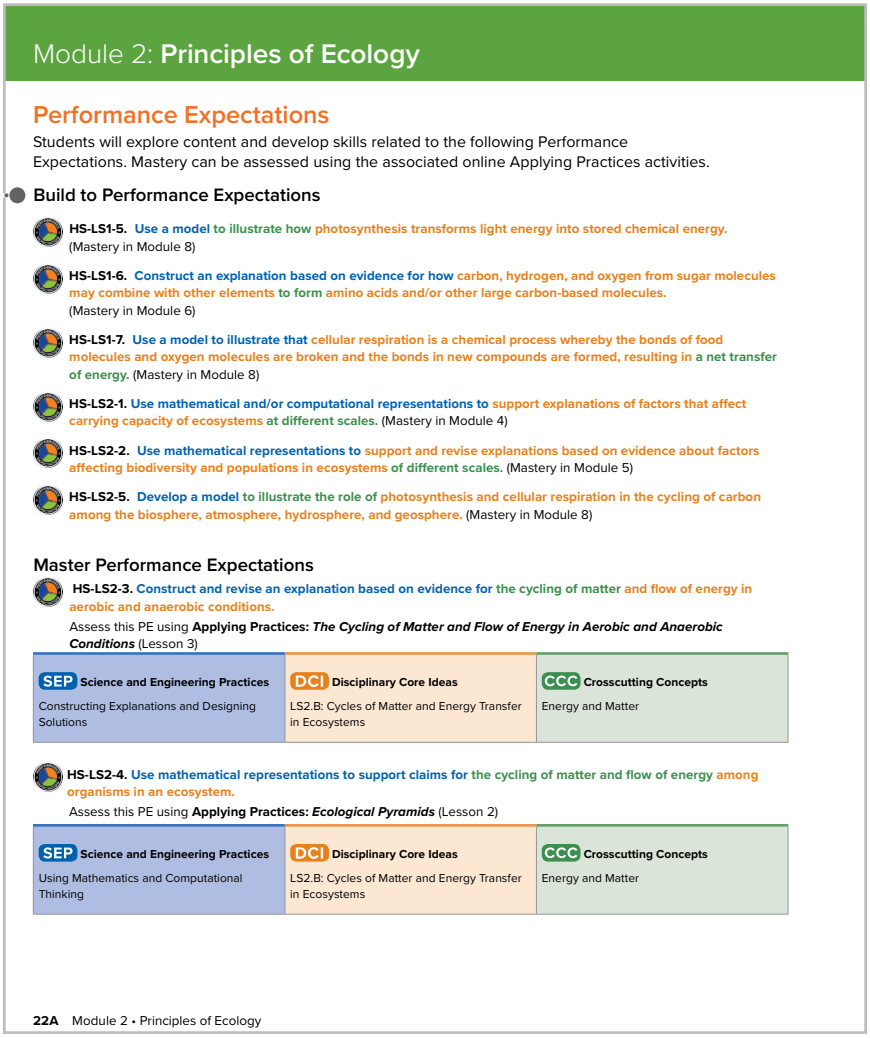
**COMMON THEMES** (eg, "Systems and System Models")

Crosscutting Concepts are big ideas that apply to many areas of science and engineering. They help you to think scientifically while you apply the science and engineering practices and link the core ideas you learn during your biology course.

- Patterns
- Cause and Effect
- Scale, Proportion, and Quantity
- Systems and System Models
- Energy and Matter
- Structure and Function
- Stability and Change

## Performance Expectations

This table shows where students will discover and practice the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts needed to succeed with each Performance Expectation. Every unit and module clearly identified by page number of the *Inspire Science* High School series resources that correlate to the Next Generation Science Standards.



Module 2: **Principles of Ecology**

### Performance Expectations

Students will explore content and develop skills related to the following Performance Expectations. Mastery can be assessed using the associated online Applying Practices activities.

**Build to Performance Expectations**

**HS-LS1-5.** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. (Mastery in Module 8)

**HS-LS1-6.** Construct 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. (Mastery in Module 6)

**HS-LS1-7.** Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed, resulting in a net transfer of energy. (Mastery in Module 8)

**HS-LS2-1.** Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. (Mastery in Module 4)

**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. (Mastery in Module 5)

**HS-LS2-5.** Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. (Mastery in Module 8)

**Master Performance Expectations**

**HS-LS2-3.** Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

Assess this PE using **Applying Practices:** ***The Cycling of Matter and Flow of Energy in Aerobic and Anaerobic Conditions*** (Lesson 3)

| SEP Science and Engineering Practices | DCI Disciplinary Core Ideas | CCC Crosscutting Concepts |
|---|---|---|
| Constructing Explanations and Designing Solutions | LS2.B: Cycles of Matter and Energy Transfer in Ecosystems | Energy and Matter |

**HS-LS2-4.** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

Assess this PE using **Applying Practices:** ***Ecological Pyramids*** (Lesson 2)

| SEP Science and Engineering Practices | DCI Disciplinary Core Ideas | CCC Crosscutting Concepts |
|---|---|---|
| Using Mathematics and Computational Thinking | LS2.B: Cycles of Matter and Energy Transfer in Ecosystems | Energy and Matter |

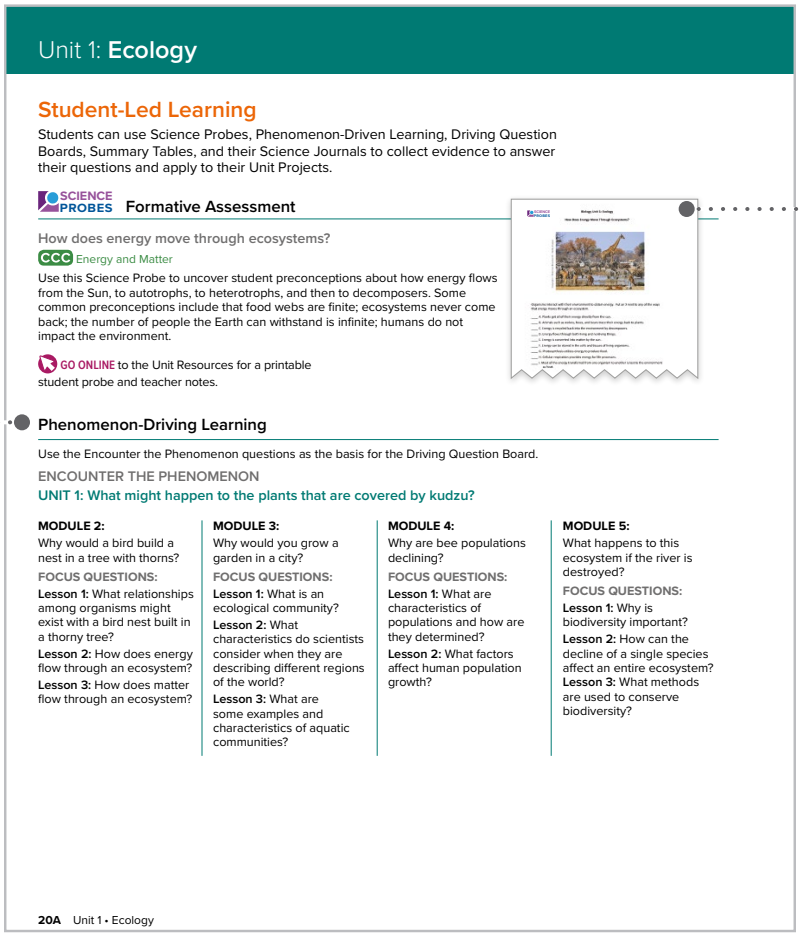
22A Module 2 • Principles of Ecology

**Each Module Correlates to each Performance Expectation including:**

- Science and Engineering Practices
- Cross-Cutting Concepts
- Disciplinary Core Ideas

# Inspire Science High School Series

The *Inspire Science* High School series uses the student reference text and the fully interactive digital experience to provide two pathways for learning: student-led and teacher-facilitated. Each pathway provides the ability to adjust depending on the preferred method of learning.



Unit 1: **Ecology**

## Student-Led Learning

Students can use Science Probes, Phenomenon-Driven Learning, Driving Question Boards, Summary Tables, and their Science Journals to collect evidence to answer their questions and apply to their Unit Projects.

### SCIENCE PROBES Formative Assessment

How does energy move through ecosystems?

CCC Energy and Matter

Use this Science Probe to uncover student preconceptions about how energy flows from the Sun, to autotrophs, to heterotrophs, and then to decomposers. Some common preconceptions include that food webs are finite; ecosystems never come back; the number of people the Earth can withstand is infinite; humans do not impact the environment.

GO ONLINE to the Unit Resources for a printable student probe and teacher notes.

### Phenomenon-Driving Learning

Use the Encounter the Phenomenon questions as the basis for the Driving Question Board.

ENCOUNTER THE PHENOMENON

**UNIT 1: What might happen to the plants that are covered by kudzu?**

**MODULE 2:**
Why would a bird build a nest in a tree with thorns?

FOCUS QUESTIONS:

**Lesson 1:** What relationships among organisms might exist with a bird nest built in a thorny tree?

**Lesson 2:** How does energy flow through an ecosystem?

**Lesson 3:** How does matter flow through an ecosystem?

**MODULE 3:**
Why would you grow a garden in a city?

FOCUS QUESTIONS:

**Lesson 1:** What is an ecological community?

**Lesson 2:** What characteristics do scientists consider when they are describing different regions of the world?

**Lesson 3:** What are some examples and characteristics of aquatic communities?

**MODULE 4:**
Why are bee populations declining?

FOCUS QUESTIONS:

**Lesson 1:** What are characteristics of populations and how are they determined?

**Lesson 2:** What factors affect human population growth?

**MODULE 5:**
What happens to this ecosystem if the river is destroyed?

FOCUS QUESTIONS:

**Lesson 1:** Why is biodiversity important?

**Lesson 2:** How can the decline of a single species affect an entire ecosystem?

**Lesson 3:** What methods are used to conserve biodiversity?

20A Unit 1 • Ecology

### Phenomena-Based Learning

Every day, we are surrounded by natural phenomena that pique our curiosity. In Inspire Biology, these phenomena are the engaging centerpiece of each unit and module to inspire students to investigate key science and engineering concepts through the three-dimensional learning experience. As students investigate each phenomenon, they will use the Claim, Evidence, and Reasoning process to solve and explain the unit and module phenomena.

### Science Probe

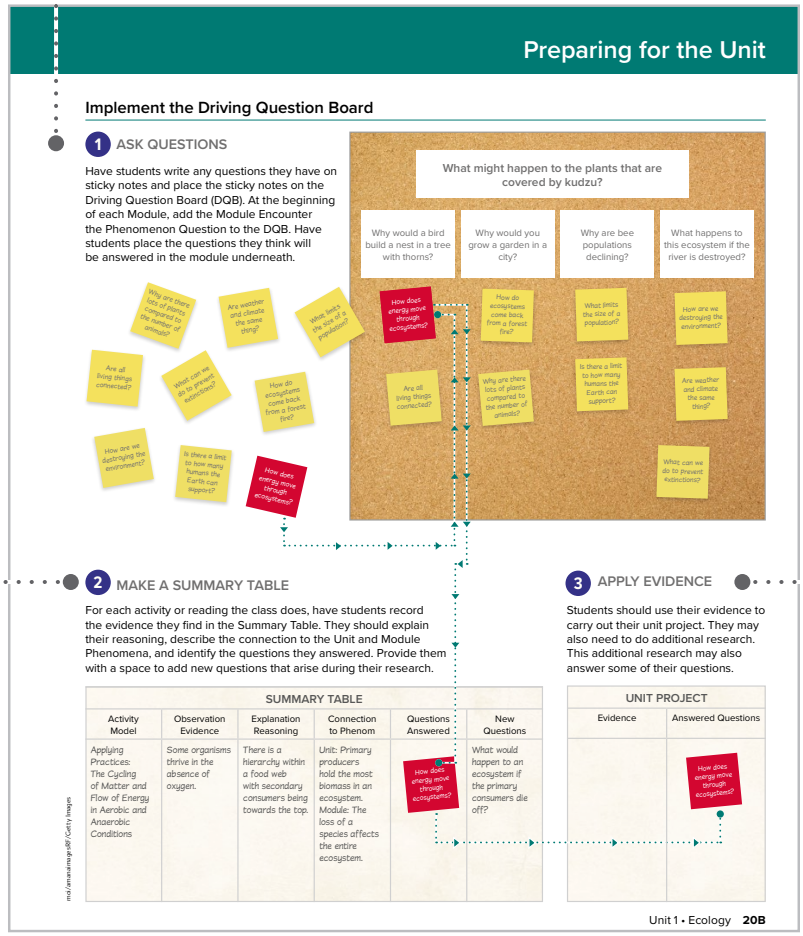
Each unit begins with an online Science Probe that will aid your students in uncovering preconceptions. These formative assessment Science Probes present the unit phenomenon in an engaging way to promote student thinking and discussion, revealing commonly-held preconceptions students bring to their learning.

Why are Science Probes so powerful?

- Engaging phenomena elicit deep explanations.
- Core concepts found in every student probe.
- Meaningful student conversations provoke deeper thinking.

## Driving Question Board

A Driving Question Board (DQB) is a great way to foster inquiry in the classroom and encourage students to take charge of their learning. Students will ask and answer questions throughout the unit, module, and lesson that support the unit anchoring phenomenon question and the module investigate the phenomena question.



Preparing for the Unit

Implement the Driving Question Board

1 ASK QUESTIONS

Have students write any questions they have on sticky notes and place the sticky notes on the Driving Question Board (DQB). At the beginning of each Module, add the Module Encounter the Phenomenon Question to the DQB. Have students place the questions they think will be answered in the module underneath.

What might happen to the plants that are covered by kudzu?

Why would a bird build a nest in a tree with thorns?

Why would you grow a garden in a city?

Why are bee populations declining?

What happens to this ecosystem if the river is destroyed?

2 MAKE A SUMMARY TABLE

For each activity or reading the class does, have students record the evidence they find in the Summary Table. They should explain their reasoning, describe the connection to the Unit and Module Phenomena, and identify the questions they answered. Provide them with a space to add new questions that arise during their research.

SUMMARY TABLE

| Activity Model | Observation Evidence | Explanation Reasoning | Connection to Phenom | Questions Answered | New Questions |
|---|---|---|---|---|---|
| Applying Practices: The Cycling of Matter and Flow of Energy in Aerobic and Anaerobic Conditions | Some organisms thrive in the absence of oxygen. | There is a hierarchy within a food web with secondary consumers being towards the top. | Unit: Primary producers hold the most biomass in an ecosystem. Module: The loss of a species affects the entire ecosystem. | How does energy move through ecosystems? | What would happen to an ecosystem if the primary consumers die off? |

3 APPLY EVIDENCE

Students should use their evidence to carry out their unit project. They may also need to do additional research. This additional research may also answer some of their questions.

UNIT PROJECT

| Evidence | Answered Questions |
|---|---|
| | How does energy move through ecosystems? |

mo/amanaimages/Getty Images

Unit 1 • Ecology 20B

## Summary Tables

Summary Tables provide students with records of the evidence they have gathered and the experiences carried out during the exploration of each unit.

Students should explain:

- Their reasoning
- Describe the connection to the Unit and Module Phenomena
- Identify the questions answered

## Apply Evidence

Students should use their evidence to carry out their unit project. They may also need to do additional research. This additional research may also answer some of their questions.

# Plan With Module Resources

## Module Planner

A Module Planner begins every module. It's a great tool for you to see all the digital assets that support each module and lesson.

### Module Resources

The *Inspire Science* High School series provides numerous resources for teachers to utilize including: **Labs, Investigations, and Projects Assessment and Differentiation Media and OER.**

### Assessment and Differentiation

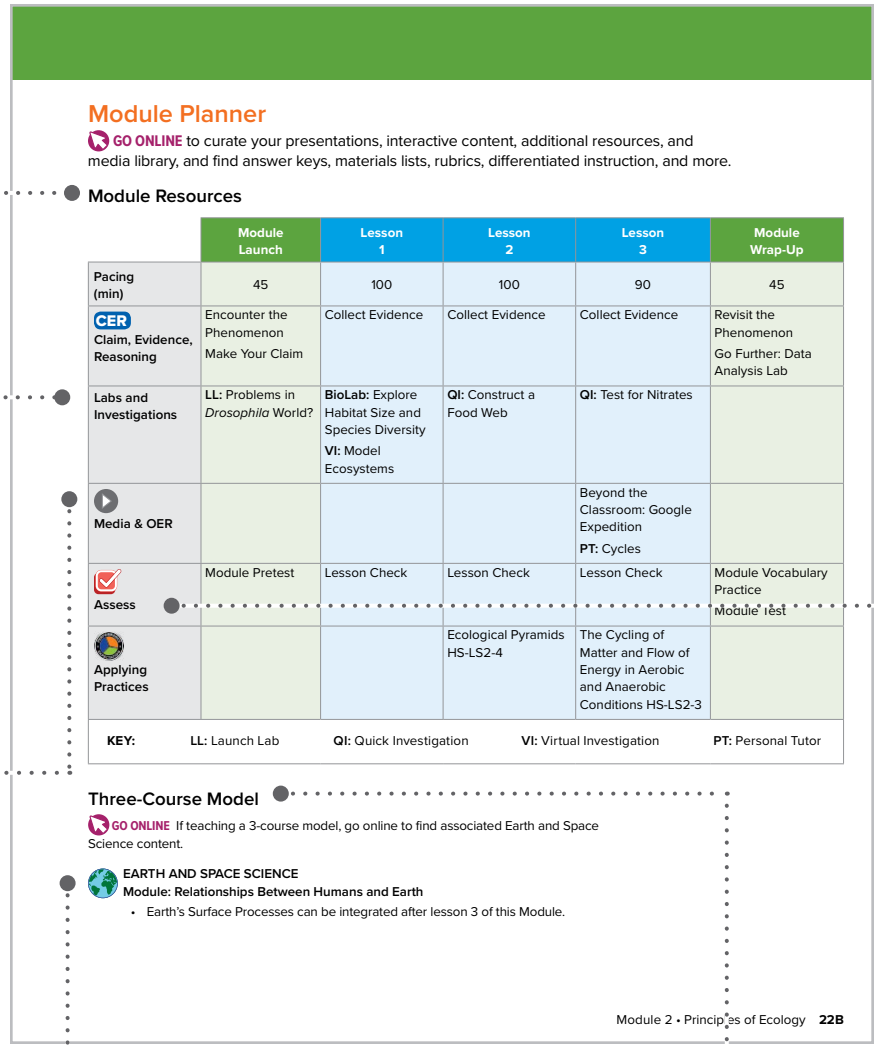
Within each module and lesson, you will find multiple forms of assessment and differentiation.

### Labs, Investigations, and Projects

Within each module and lesson, you will find multiple labs, investigations, and projects to utilize when teaching each lesson.

### Media and OER

Each module and lesson include Media and OER options to utilize in your classroom to support the content within the program.



Module Planner

GO ONLINE to curate your presentations, interactive content, additional resources, and media library, and find answer keys, materials lists, rubrics, differentiated instruction, and more.

Module Resources

| | Module Launch | Lesson 1 | Lesson 2 | Lesson 3 | Module Wrap-Up |
|---|---|---|---|---|---|
| Pacing (min) | 45 | 100 | 100 | 90 | 45 |
| CER Claim, Evidence, Reasoning | Encounter the Phenomenon<br>Make Your Claim | Collect Evidence | Collect Evidence | Collect Evidence | Revisit the Phenomenon<br>Go Further: Data Analysis Lab |
| Labs and Investigations | **LL:** Problems in *Drosophila* World? | **BioLab:** Explore Habitat Size and Species Diversity<br>**VI:** Model Ecosystems | **QI:** Construct a Food Web | **QI:** Test for Nitrates | |
| Media & OER | | | | Beyond the Classroom: Google Expedition<br>**PT:** Cycles | |
| Assess | Module Pretest | Lesson Check | Lesson Check | Lesson Check | Module Vocabulary Practice<br>Module Test |
| Applying Practices | | | Ecological Pyramids HS-LS2-4 | The Cycling of Matter and Flow of Energy in Aerobic and Anaerobic Conditions HS-LS2-3 | |

KEY: **LL:** Launch Lab **QI:** Quick Investigation **VI:** Virtual Investigation **PT:** Personal Tutor

Three-Course Model

GO ONLINE If teaching a 3-course model, go online to find associated Earth and Space Science content.

EARTH AND SPACE SCIENCE
Module: Relationships Between Humans and Earth
- Earth's Surface Processes can be integrated after lesson 3 of this Module.

Module 2 • Principles of Ecology 22B

### EARTH AND SPACE SCIENCE

The Three-Course Model of *Inspire Science* High School series correlates Earth and Space Sciences online as an interdisciplinary pursuit within each high school program: *Inspire Biology*, Chemistry, and Physics. With dynamic online resources embedded, you are empowered to teach confidently with the flexibility to incorporate Earth and Space content when and where you need it.

### Three-Course Model

If teaching a three-course model, go online to find associated Earth and Space Science content.

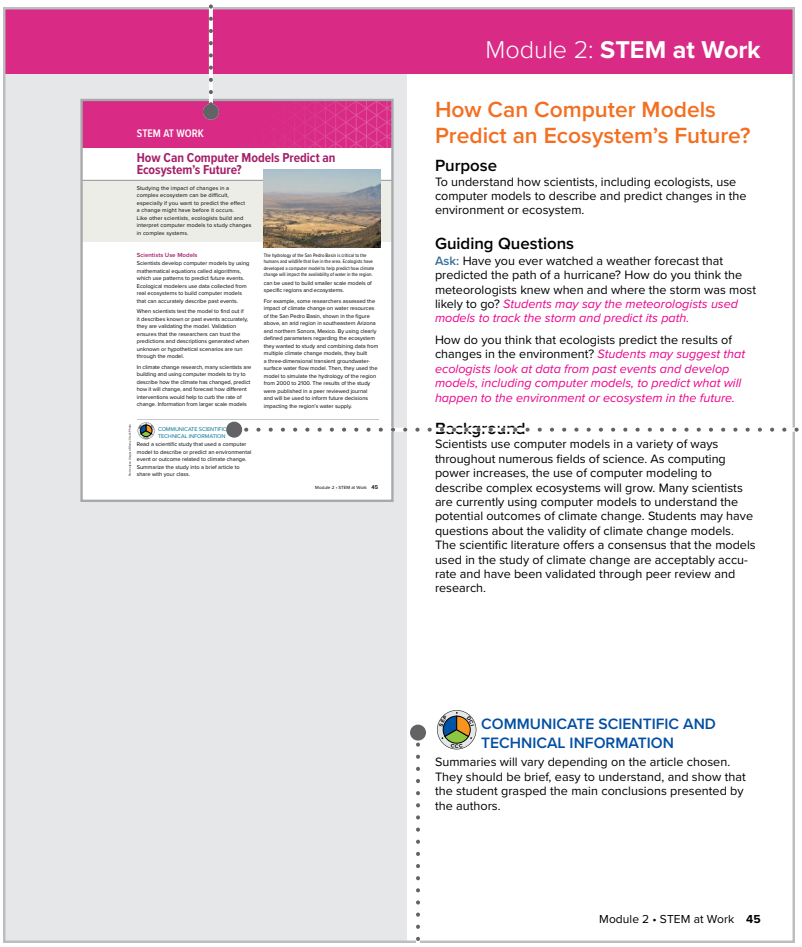
## Real-World Connections

Found at the end of each module, real-world connections engage students and encourage inquiry that focuses on the endless opportunities in STEM. *Inspire Science's* High School series provides numerous examples of the role STEM plays in our daily lives, including:

- Science in Society
- STEM at Work
- Scientific Breakthroughs
- Nature of Science
- Engineering and Technology

### STEM at Work

Introduce students to real-world STEM professions and how they can make a difference.
Additional STEM career connections are available online.



Module 2: **STEM at Work**

STEM AT WORK

How Can Computer Models Predict an Ecosystem's Future?

Studying the impact of changes in a complex ecosystem can be difficult, especially if you want to predict the effect a change might have before it occurs. Like other scientists, ecologists build and interpret computer models to study changes in complex systems.

Scientists Use Models

Scientists develop computer models by using mathematical equations called algorithms, which use patterns to predict future events. Ecological modelers use data collected from real ecosystems to build computer models that can accurately describe past events.

When scientists test the model to find out if it describes known or past events accurately, they are validating the model. Validation ensures that the researchers can trust the predictions and descriptions generated when unknown or hypothetical scenarios are run through the model.

In climate change research, many scientists are building and using computer models to try to describe how the climate has changed, predict how it will change, and forecast how different interventions would help to curb the rate of change. Information from larger scale models can be used to build smaller scale models of specific regions and ecosystems.

The hydrology of the San Pedro Basin is critical to the humans and wildlife that live in the area. Ecologists have developed a computer model to help predict how climate change will impact the availability of water in the region.

For example, some researchers assessed the impact of climate change on water resources of the San Pedro Basin, shown in the figure above, an arid region in southeastern Arizona and northern Sonora, Mexico. By using clearly defined parameters regarding the ecosystem they wanted to study and combining data from multiple climate change models, they built a three-dimensional transient groundwater-surface water flow model. Then, they used the model to simulate the hydrology of the region from 2000 to 2100. The results of the study were published in a peer-reviewed journal and will be used to inform future decisions impacting the region's water supply.

COMMUNICATE SCIENTIFIC AND TECHNICAL INFORMATION

Read a scientific study that used a computer model to describe or predict an environmental event or outcome related to climate change. Summarize the study into a brief article to share with your class.

Module 2 • STEM at Work 45

### How Can Computer Models Predict an Ecosystem's Future?

**Purpose**

To understand how scientists, including ecologists, use computer models to describe and predict changes in the environment or ecosystem.

**Guiding Questions**

**Ask:** Have you ever watched a weather forecast that predicted the path of a hurricane? How do you think the meteorologists knew when and where the storm was most likely to go? *Students may say the meteorologists used models to track the storm and predict its path.*

How do you think that ecologists predict the results of changes in the environment? *Students may suggest that ecologists look at data from past events and develop models, including computer models, to predict what will happen to the environment or ecosystem in the future.*

**Background**

Scientists use computer models in a variety of ways throughout numerous fields of science. As computing power increases, the use of computer modeling to describe complex ecosystems will grow. Many scientists are currently using computer models to understand the potential outcomes of climate change. Students may have questions about the validity of climate change models. The scientific literature offers a consensus that the models used in the study of climate change are acceptably accurate and have been validated through peer review and research.

**COMMUNICATE SCIENTIFIC AND TECHNICAL INFORMATION**

Summaries will vary depending on the article chosen. They should be brief, easy to understand, and show that the student grasped the main conclusions presented by the authors.

Module 2 • STEM at Work **45**

### Background

STEM at Work provides background information.

### Three-Dimensional Learning

Throughout each *Inspire Science* High School series lesson you will find correlating Performance Expectations where Students will apply their three-dimensional learning to show their understanding.

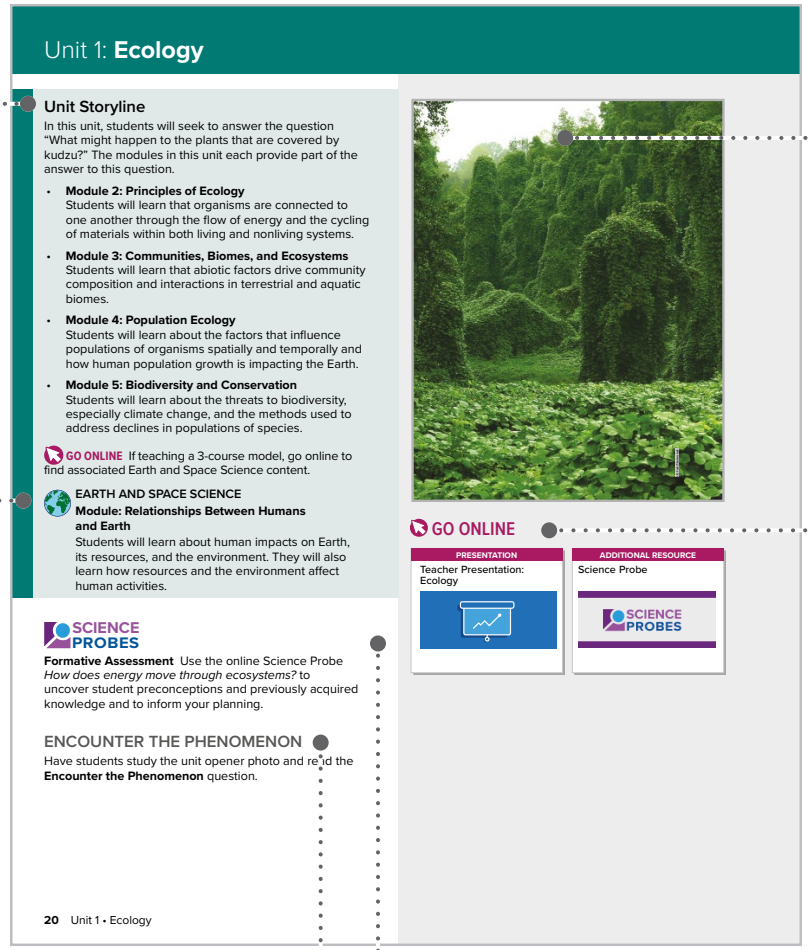
# Unit Walk-Through

## Unit

Inspire your students' curiosity with real-world phenomena that create the desire to ask questions and investigate the world around them. Uncover student preconceptions and allow students to see how their thinking changes as they learn throughout the unit. Your students will get excited about what they will be learning and set goals for the skills they will develop.

### Unit Storyline

Each Unit Storyline in the Inspire Science High School series provides Teachers with the the desired outcomes of each unit. Students will seek the answers to the overarching Explore the Phenomenon question then throughout each module the question will be answered.




### Student Edition

Each Student Edition page is shown and aligns to the correlating Teacher Edition page.

### GO ONLINE

The *Inspire Science* High School series provides numerous online supporting resources for students and teachers. You will find the resources that correlate the student page with wrap around resources.

### EARTH AND SPACE SCIENCE

Look for the Earth and Space Science icon at the beginning of each unit that is correlated to the Earth and Space Science Performance Expectations. This will provide prompts to have students go online to find correlating Performance Expectations to Earth and Space content.

### SCIENCE PROBES

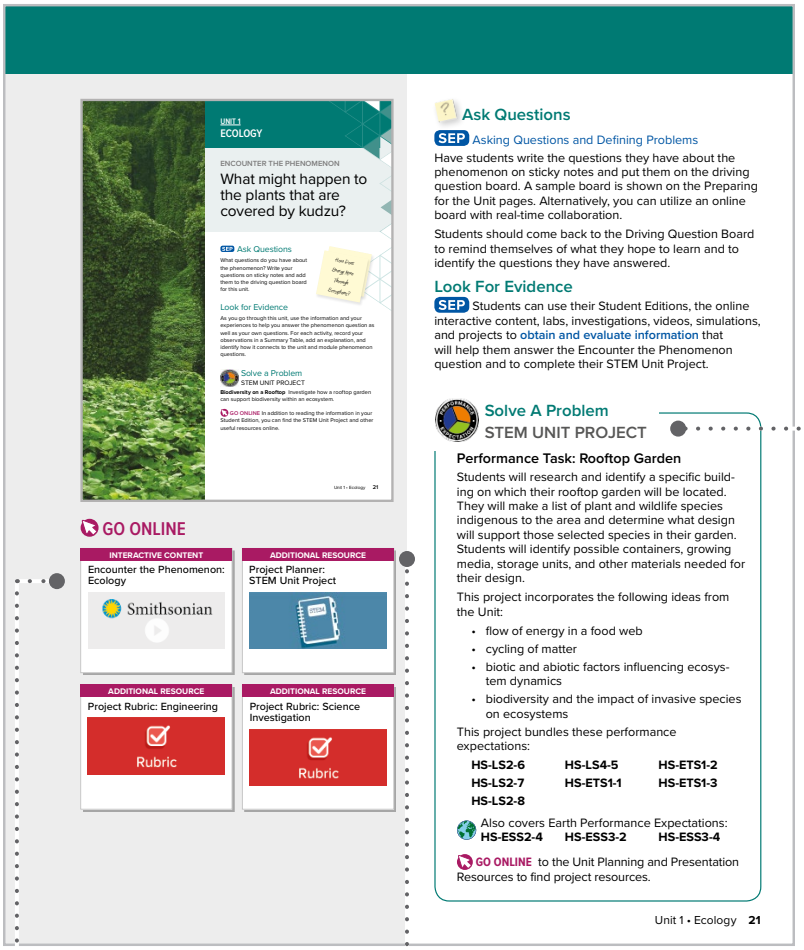
**GO ONLINE.** The *Inspire Science* High School series begins each unit with a formative assessment science probe to assess students' prior knowledge.

### ENCOUNTER THE PHENOMENON

The Unit Opener begins the inquiry process by presenting an overarching phenomenon to explore throughout the Unit and Module.

## STEM UNIT PROJECT

Students assume the role of a scientist or engineer and are charged with the task of designing a solution in the STEM Unit Project. Each project relates back to standards correlating to the unit.



UNIT 1
ECOLOGY

ENCOUNTER THE PHENOMENON

What might happen to the plants that are covered by kudzu?

SEP Ask Questions

What questions do you have about the phenomenon? Write your questions on sticky notes and add them to the driving question board for this unit.

Look for Evidence

As you go through this unit, use the information and your experiences to help you answer the phenomenon question as well as your own questions. For each activity, record your observations in a Summary Table, add an explanation, and identify how it connects to the unit and module phenomenon questions.

Solve a Problem
STEM UNIT PROJECT

**Biodiversity on a Rooftop** Investigate how a rooftop garden can support biodiversity within an ecosystem.

GO ONLINE In addition to reading the information in your Student Edition, you can find the STEM Unit Project and other useful resources online.

Unit 1 • Ecology 21

GO ONLINE

INTERACTIVE CONTENT
Encounter the Phenomenon: Ecology
Smithsonian

ADDITIONAL RESOURCE
Project Planner: STEM Unit Project

ADDITIONAL RESOURCE
Project Rubric: Engineering
Rubric

ADDITIONAL RESOURCE
Project Rubric: Science Investigation
Rubric

Ask Questions

SEP Asking Questions and Defining Problems

Have students write the questions they have about the phenomenon on sticky notes and put them on the driving question board. A sample board is shown on the Preparing for the Unit pages. Alternatively, you can utilize an online board with real-time collaboration.

Students should come back to the Driving Question Board to remind themselves of what they hope to learn and to identify the questions they have answered.

Look For Evidence

SEP Students can use their Student Editions, the online interactive content, labs, investigations, videos, simulations, and projects to obtain and evaluate information that will help them answer the Encounter the Phenomenon question and to complete their STEM Unit Project.

Solve A Problem
STEM UNIT PROJECT

**Performance Task: Rooftop Garden**

Students will research and identify a specific building on which their rooftop garden will be located. They will make a list of plant and wildlife species indigenous to the area and determine what design will support those selected species in their garden. Students will identify possible containers, growing media, storage units, and other materials needed for their design.

This project incorporates the following ideas from the Unit:

- flow of energy in a food web
- cycling of matter
- biotic and abiotic factors influencing ecosystem dynamics
- biodiversity and the impact of invasive species on ecosystems

This project bundles these performance expectations:

**HS-LS2-6** **HS-LS4-5** **HS-ETS1-2**
**HS-LS2-7** **HS-ETS1-1** **HS-ETS1-3**
**HS-LS2-8**

Also covers Earth Performance Expectations:
**HS-ESS2-4** **HS-ESS3-2** **HS-ESS3-4**

GO ONLINE to the Unit Planning and Presentation Resources to find project resources.

Unit 1 • Ecology 21

## Smithsonian

GO ONLINE. Units begin with an engaging interactive to help engage students as they are exploring the phenomenon.

## GO ONLINE

STEM Unit Project resources such as the Project Planner and project details are found at the Unit Learning Resources section.

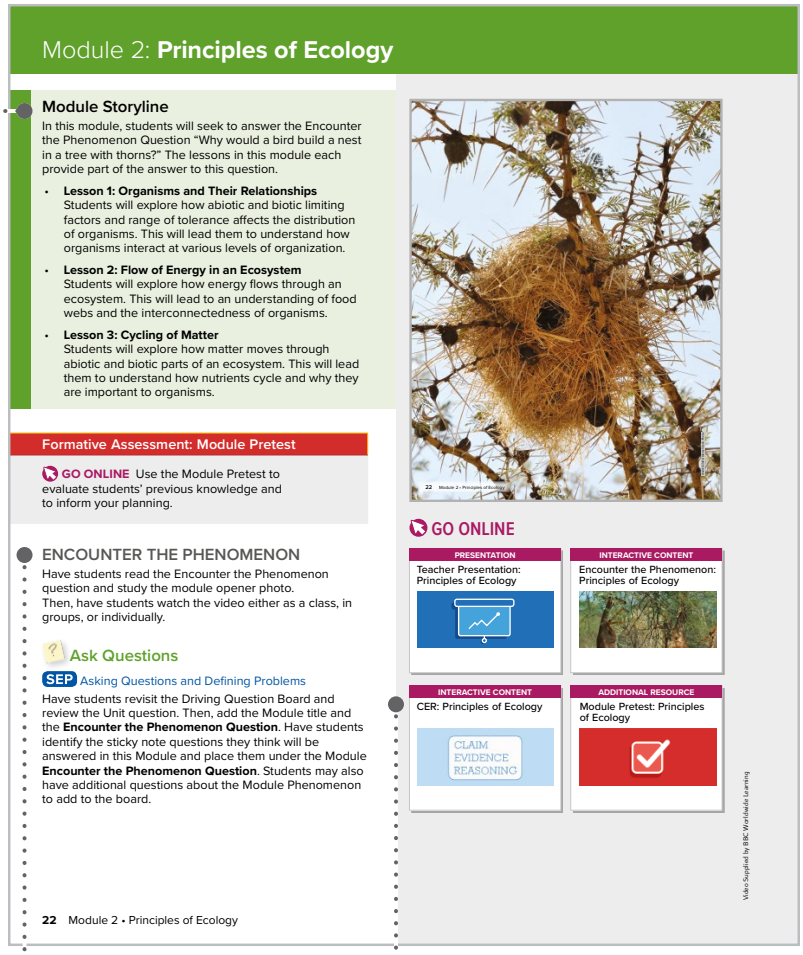
# Module Walk-Through

## Module

The *Inspire Science* High School series encourages student engagement driven by real-world phenomena, claim-evidence-reasoning, and rich interactive content.

### Module Story Line

Each Module Opener in the *Inspire Science* High School series starts with a Module Storyline to provide clarity on the following module allowing teachers the ability to preview the full array of content ahead.




### ENCOUNTER THE PHENOMENON

The Module Opener continues the inquiry process by presenting an overarching phenomenon to explore throughout the module. Phenomenon questions are provided to stimulate student thinking and relates back to the Big Idea of the module.

### Evidence, and Reasoning (CER)

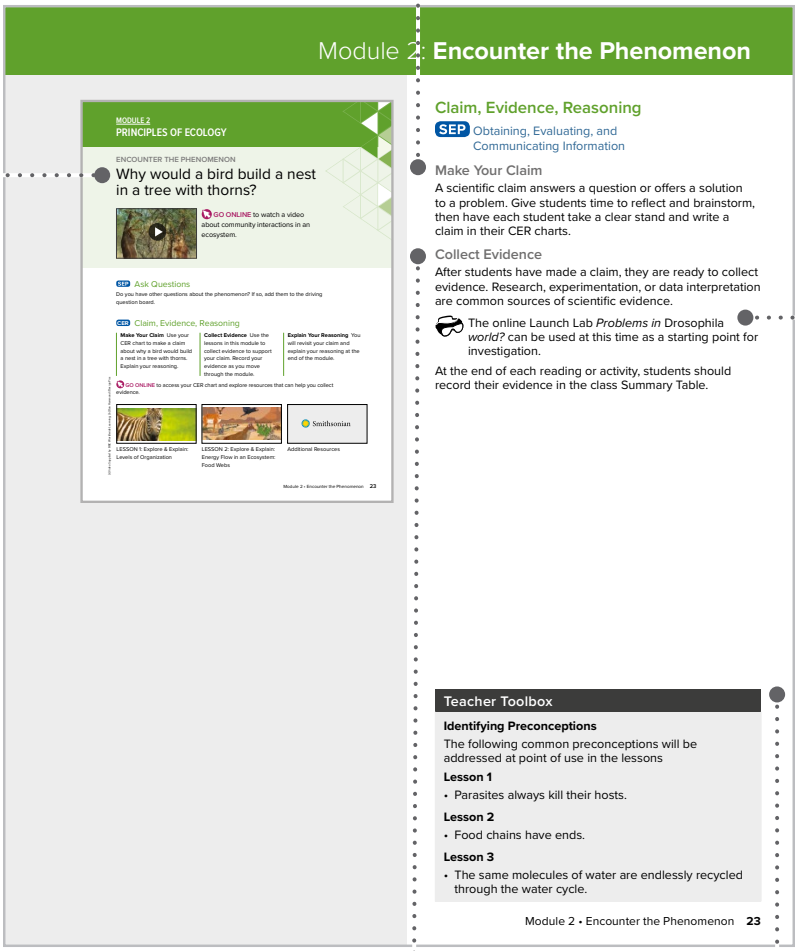
With the CER Framework students will make claims and document their reasoning, then revise and adjust their claims as needed later in the module.

## Student Edition

The *Inspire Science* High School series provides the necessary information for each student to be successful. On many pages, you will see an indicator to utilize the Science Notebook and *LearnSmart*® to aid in your students' success.

## MAKE YOUR CLAIM

The first step in **Claim, Evidence,** and **Reasoning** is where students will reflect and brainstorm possible answers.



Module 2: Encounter the Phenomenon

MODULE 2
PRINCIPLES OF ECOLOGY

ENCOUNTER THE PHENOMENON
Why would a bird build a nest in a tree with thorns?

GO ONLINE to watch a video about community interactions in an ecosystem.

SEP Ask Questions
Do you have other questions about the phenomenon? If so, add them to the driving question board.

CER Claim, Evidence, Reasoning
**Make Your Claim** Use your CER chart to make a claim about why a bird would build a nest in a tree with thorns. Explain your reasoning.
**Collect Evidence** Use the lessons in this module to collect evidence to support your claim. Record your evidence as you move through the module.
**Explain Your Reasoning** You will revisit your claim and explain your reasoning at the end of the module.
GO ONLINE to access your CER chart and explore resources that can help you collect evidence.

LESSON 1: Explore & Explain: Levels of Organization
LESSON 2: Explore & Explain: Energy Flow in an Ecosystem: Food Webs
Additional Resources
Smithsonian

Module 2 • Encounter the Phenomenon 23

Claim, Evidence, Reasoning

SEP Obtaining, Evaluating, and Communicating Information

Make Your Claim
A scientific claim answers a question or offers a solution to a problem. Give students time to reflect and brainstorm, then have each student take a clear stand and write a claim in their CER charts.

Collect Evidence
After students have made a claim, they are ready to collect evidence. Research, experimentation, or data interpretation are common sources of scientific evidence.

The online Launch Lab *Problems in* Drosophila *world?* can be used at this time as a starting point for investigation.

At the end of each reading or activity, students should record their evidence in the class Summary Table.

**Teacher Toolbox**

**Identifying Preconceptions**
The following common preconceptions will be addressed at point of use in the lessons

**Lesson 1**
- Parasites always kill their hosts.

**Lesson 2**
- Food chains have ends.

**Lesson 3**
- The same molecules of water are endlessly recycled through the water cycle.

Module 2 • Encounter the Phenomenon **23**

## LAB

Labs start the inquiry process for students. Each Launch Lab is complete with an estimated time frame in which to conduct the lab, safety precautions, and teaching strategies to ensure a successful hands-on experience.

## COLLECT EVIDENCE

In the second step of Claim, Evidence, and Reasoning students can provide their initial evidence from what they learned in the Inquiry Activity. However, students will return to their claim to add more evidence as it is revealed throughout the lesson.

## Teacher Toolbox

Look for the Teacher Toolbox found throughout each module to provide science background information to identify common preconceptions related to the content at hand.

# Lesson Walk-Through

## Lesson

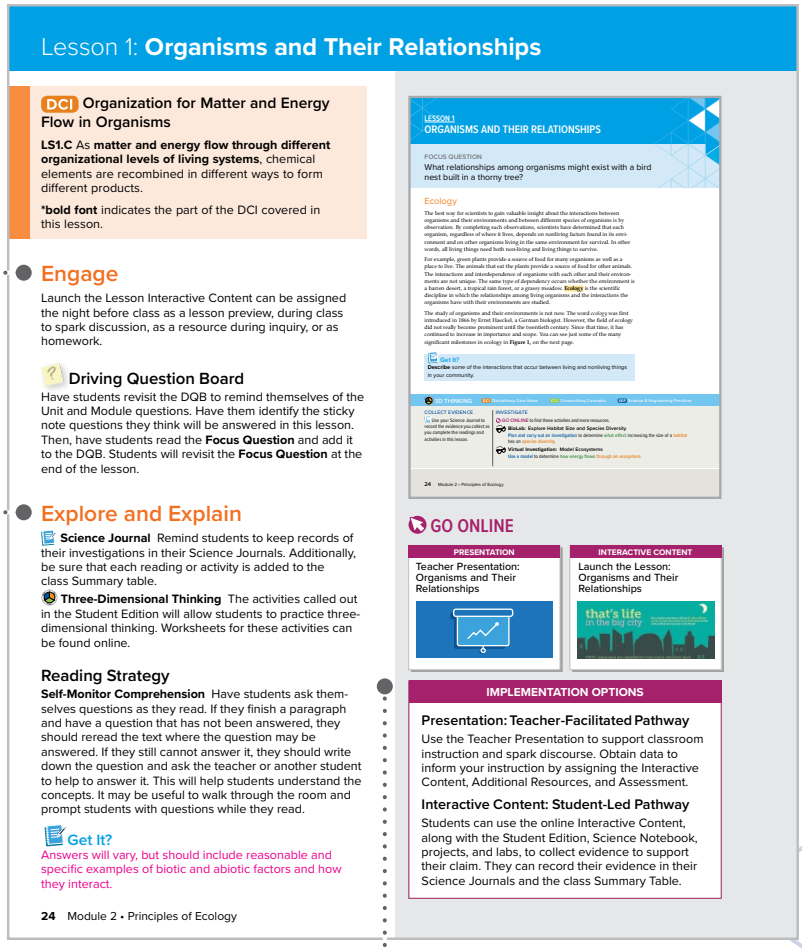
At the lesson level, digital and print resources support students throughout the 5E instruction model.

### Engage

The Engage phase will inspire students to uncover preconceptions with collaborative conversations and watch their initial observations turn into questions.
As students progress through the lesson they will revisit the Driving Question Board to remind themselves of the Unit and Module questions.

### Explore and Explain

The Explore and Explain phase encourages students to get involved and investigate through a related, common experience. Students use their Science Journal to keep records of their investigations. After each reading or activity encourage students to add to their Summary Tables.



Lesson 1: **Organizations and Their Relationships**

**DCI Organization for Matter and Energy Flow in Organisms**

**LS1.C** As **matter and energy flow through different organizational levels of living systems**, chemical elements are recombined in different ways to form different products.

***bold font** indicates the part of the DCI covered in this lesson.

**Engage**

Launch the Lesson Interactive Content can be assigned the night before class as a lesson preview, during class to spark discussion, as a resource during inquiry, or as homework.

**Driving Question Board**

Have students revisit the DQB to remind themselves of the Unit and Module questions. Have them identify the sticky note questions they think will be answered in this lesson. Then, have students read the **Focus Question** and add it to the DQB. Students will revisit the **Focus Question** at the end of the lesson.

**Explore and Explain**

**Science Journal** Remind students to keep records of their investigations in their Science Journals. Additionally, be sure that each reading or activity is added to the class Summary table.

**Three-Dimensional Thinking** The activities called out in the Student Edition will allow students to practice three-dimensional thinking. Worksheets for these activities can be found online.

**Reading Strategy**

**Self-Monitor Comprehension** Have students ask themselves questions as they read. If they finish a paragraph and have a question that has not been answered, they should reread the text where the question may be answered. If they still cannot answer it, they should write down the question and ask the teacher or another student to help to answer it. This will help students understand the concepts. It may be useful to walk through the room and prompt students with questions while they read.

**Get It?**

Answers will vary, but should include reasonable and specific examples of biotic and abiotic factors and how they interact.

24 Module 2 • Principles of Ecology

LESSON 1
ORGANISMS AND THEIR RELATIONSHIPS

FOCUS QUESTION
What relationships among organisms might exist with a bird nest built in a thorny tree?

Ecology

GO ONLINE

PRESENTATION
Teacher Presentation: Organisms and Their Relationships

INTERACTIVE CONTENT
Launch the Lesson: Organisms and Their Relationships

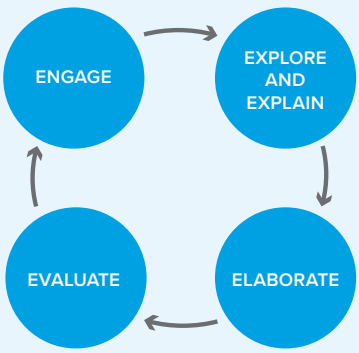
IMPLEMENTATION OPTIONS

**Presentation: Teacher-Facilitated Pathway**
Use the Teacher Presentation to support classroom instruction and spark discourse. Obtain data to inform your instruction by assigning the Interactive Content, Additional Resources, and Assessment.

**Interactive Content: Student-Led Pathway**
Students can use the online Interactive Content, along with the Student Edition, Science Notebook, projects, and labs, to collect evidence to support their claim. They can record their evidence in their Science Journals and the class Summary Table.

### 5E Instructional Model

The 5E Instructional Model provides a proven, research-driven lesson flow with the flexibility to adjust as needed for your classroom needs.




### Implementation Options

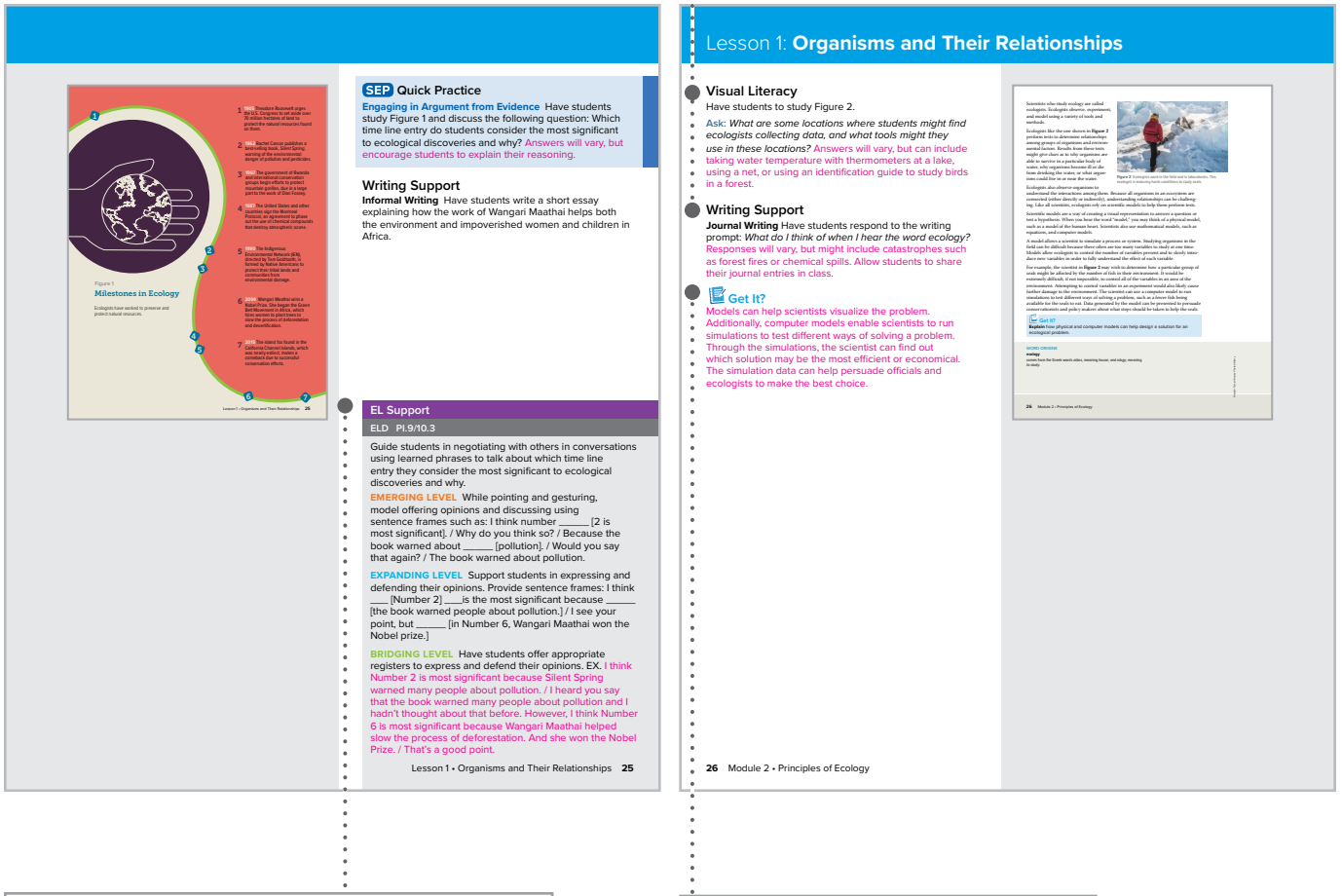
*Inspire Science* High School series provides two pathways for learning, teacher-facilitated and student-led. Each pathway enables teachers and students the ability to adjust dependening on the preferred method of learning.

## Learning Styles

All students learn differently. *Inspire Science* High School series provides opportunities for all learners to be successful.

**Visual Literacy** encourages students to study and review the figure to better learn the topic.

**Writing Support** encourages students to journal in order to understand and comprehend the topic.



Lesson 1: **Organisms and Their Relationships**

**Visual Literacy**
Have students to study Figure 2.
Ask: *What are some locations where students might find ecologists collecting data, and what tools might they use in these locations?* Answers will vary, but can include taking water temperature with thermometers at a lake, using a net, or using an identification guide to study birds in a forest.

**Writing Support**
**Journal Writing** Have students respond to the writing prompt: *What do I think of when I hear the word ecology?* Responses will vary, but might include catastrophes such as forest fires or chemical spills. Allow students to share their journal entries in class.

**Get It?**
Models can help scientists visualize the problem. Additionally, computer models enable scientists to run simulations to test different ways of solving a problem. Through the simulations, the scientist can find out which solution may be the most efficient or economical. The simulation data can help persuade officials and ecologists to make the best choice.

**SEP Quick Practice**
**Engaging in Argument from Evidence** Have students study Figure 1 and discuss the following question: Which time line entry do students consider the most significant to ecological discoveries and why? Answers will vary, but encourage students to explain their reasoning.

**Writing Support**
**Informal Writing** Have students write a short essay explaining how the work of Wangari Maathai helps both the environment and impoverished women and children in Africa.

**EL Support**
ELD PI.9/10.3
Guide students in negotiating with others in conversations using learned phrases to talk about which time line entry they consider the most significant to ecological discoveries and why.
EMERGING LEVEL While pointing and gesturing, model offering opinions and discussing using sentence frames such as: I think number _____ [2 is most significant]. / Why do you think so? / Because the book warned about _____ [pollution]. / Would you say that again? / The book warned about pollution.
EXPANDING LEVEL Support students in expressing and defending their opinions. Provide sentence frames: I think ___ [Number 2] ___is the most significant because _____ [the book warned people about pollution.] / I see your point, but _____ [in Number 6, Wangari Maathai won the Nobel prize.]
BRIDGING LEVEL Have students offer appropriate registers to express and defend their opinions. EX. I think Number 2 is most significant because Silent Spring warned many people about pollution. / I heard you say that the book warned many people about pollution and I hadn't thought about that before. However, I think Number 6 is most significant because Wangari Maathai helped slow the process of deforestation. And she won the Nobel Prize. / That's a good point.

Milestones in Ecology

Lesson 1 • Organisms and Their Relationships 25

26 Module 2 • Principles of Ecology

## EL Support

Rooted in learning science research, *Inspire Science* High School series applies the best instructional practices for teaching EL students.

Each lesson has scaffolded activities designed to meet the English Language Development Standards which offers students at any level of English language proficiency the opportunity to engage in academically challenging science and engineering content. Students will grow content knowledge and will receive support in language acquisition.

## Get It?

*Inspire Science* High School series provides assessment every step of the way. Get It allows the student to think about the phenomena provided and understand how it relates back to the text providing assessment for each teacher.

# Lesson Walk-Through

## Elaborate

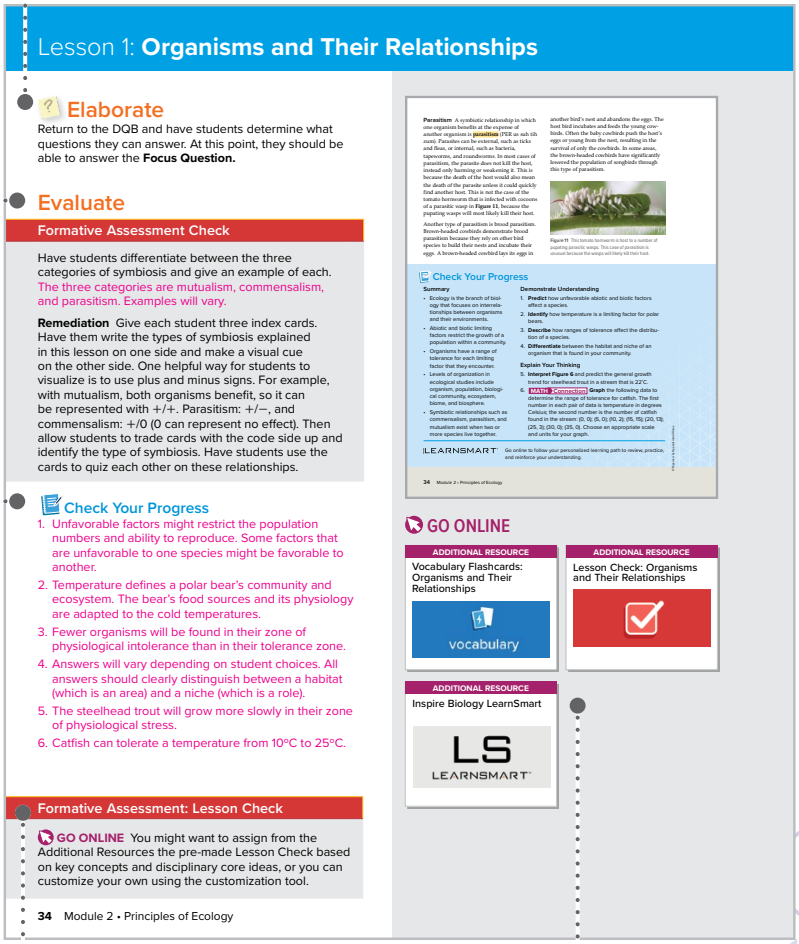
Students will apply knowledge to new situations to develop a deeper understanding of the lesson concepts, use the skills they are learning, and make connections.

## Evaluate

In the Evaluate phase, you are able to gauge student progress. A question is provided to assess students knowledge and remediation suggestions if additional help is needed.

## Check Your Progress

Check Your Progress provides students a summary of the lesson along with follow-up questions to stimulate thinking to help in understanding the main ideas.



Lesson 1: **Organisms and Their Relationships**

**Elaborate**

Return to the DQB and have students determine what questions they can answer. At this point, they should be able to answer the **Focus Question.**

**Evaluate**

**Formative Assessment Check**

Have students differentiate between the three categories of symbiosis and give an example of each. The three categories are mutualism, commensalism, and parasitism. Examples will vary.

**Remediation** Give each student three index cards. Have them write the types of symbiosis explained in this lesson on one side and make a visual cue on the other side. One helpful way for students to visualize is to use plus and minus signs. For example, with mutualism, both organisms benefit, so it can be represented with +/+. Parasitism: +/−, and commensalism: +/0 (0 can represent no effect). Then allow students to trade cards with the code side up and identify the type of symbiosis. Have students use the cards to quiz each other on these relationships.

**Check Your Progress**

1. Unfavorable factors might restrict the population numbers and ability to reproduce. Some factors that are unfavorable to one species might be favorable to another.
2. Temperature defines a polar bear's community and ecosystem. The bear's food sources and its physiology are adapted to the cold temperatures.
3. Fewer organisms will be found in their zone of physiological intolerance than in their tolerance zone.
4. Answers will vary depending on student choices. All answers should clearly distinguish between a habitat (which is an area) and a niche (which is a role).
5. The steelhead trout will grow more slowly in their zone of physiological stress.
6. Catfish can tolerate a temperature from 10°C to 25°C.

**Formative Assessment: Lesson Check**

GO ONLINE You might want to assign from the Additional Resources the pre-made Lesson Check based on key concepts and disciplinary core ideas, or you can customize your own using the customization tool.

34 Module 2 • Principles of Ecology

Check Your Progress

Summary

- Ecology is the branch of biology that focuses on interrelationships between organisms and their environments.
- Abiotic and biotic limiting factors restrict the growth of a population within a community.
- Organisms have a range of tolerance for each limiting factor that they encounter.
- Levels of organization in ecological studies include organism, population, biological community, ecosystem, biome, and biosphere.
- Symbiotic relationships such as commensalism, parasitism, and mutualism exist when two or more species live together.

Demonstrate Understanding

1. **Predict** how unfavorable abiotic and biotic factors affect a species.
2. **Identify** how temperature is a limiting factor for polar bears.
3. **Describe** how ranges of tolerance affect the distribution of a species.
4. **Differentiate** between the habitat and niche of an organism that is found in your community.

Explain Your Thinking

5. **Interpret Figure 6** and predict the general growth trend for steelhead trout in a stream that is 22°C.
6. MATH Connection **Graph** the following data to determine the range of tolerance for catfish. The first number in each pair of data is temperature in degrees Celsius; the second number is the number of catfish found in the stream: (5, 0), (5, 0), (10, 2), (15, 15), (20, 13), (25, 3), (30, 0), (35, 0). Choose an appropriate scale and units for your graph.

LEARNSMART Go online to follow your personalized learning path to review, practice, and reinforce your understanding.

34 Module 2 • Principles of Ecology

GO ONLINE

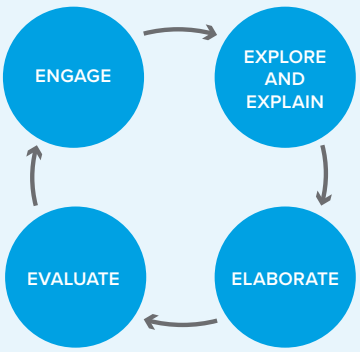
ADDITIONAL RESOURCE
Vocabulary Flashcards: Organisms and Their Relationships
vocabulary

ADDITIONAL RESOURCE
Lesson Check: Organisms and Their Relationships

ADDITIONAL RESOURCE
Inspire Biology LearnSmart
LS LEARNSMART

## 5E Instructional Model

The 5E Instructional Model provides a proven, research-driven lesson flow with the flexibility to adjust as needed for your classroom needs.




## Lesson Check

GO ONLINE The Online Assessment Center provides additional assessment support for student success.

## LEARNSMART®

The *Inspire Science* High School series uses revolutionary adaptive technology, *LearnSmart*® to build a learning experience unique to each student's individual needs.

## Module

Students revisit the module phenomenon and answer the phenomenon question using evidence from what they have learned throughout the module.

### Revisit the DQB and Summary Table

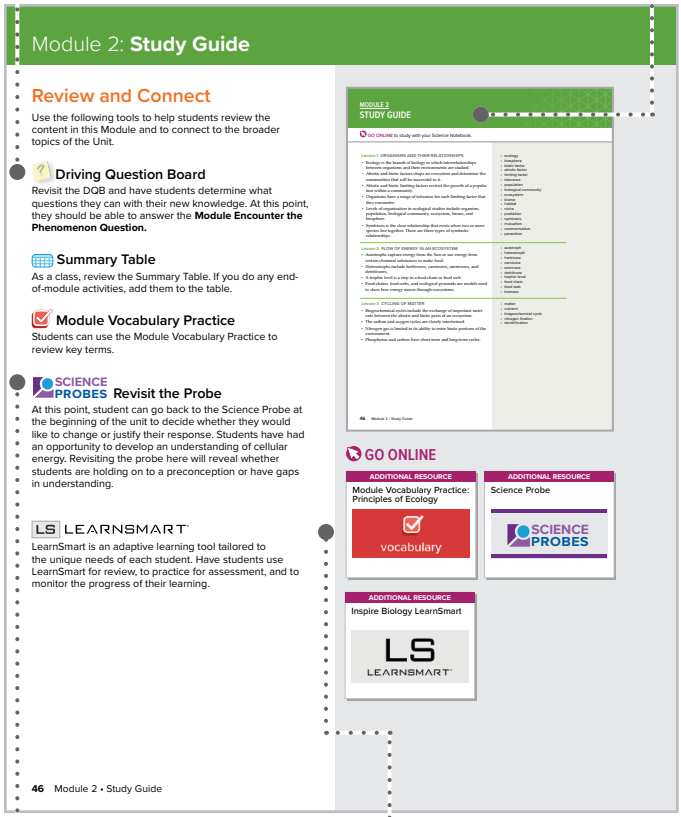
Students are encouraged to revisit the Driving Question Board and Summary Table to determine what questions they can answer with their new knowledge of the concept.

### Study Guide

While the Study Guide is available for students to utilize, teachers are provided resources to aid in each student's retention of the lesson.

### REVISIT THE PHENOMENON

Students revisit the phenomenon and try to answer the phenomenon question using evidence from what they have learned throughout the module.



Module 2: **Study Guide**

**Review and Connect**

Use the following tools to help students review the content in this Module and to connect to the broader topics of the Unit.

**Driving Question Board**

Revisit the DQB and have students determine what questions they can with their new knowledge. At this point, they should be able to answer the **Module Encounter the Phenomenon Question.**

**Summary Table**

As a class, review the Summary Table. If you do any end-of-module activities, add them to the table.

**Module Vocabulary Practice**

Students can use the Module Vocabulary Practice to review key terms.

**SCIENCE PROBES Revisit the Probe**

At this point, student can go back to the Science Probe at the beginning of the unit to decide whether they would like to change or justify their response. Students have had an opportunity to develop an understanding of cellular energy. Revisiting the probe here will reveal whether students are holding on to a preconception or have gaps in understanding.

**LEARNSMART**

LearnSmart is an adaptive learning tool tailored to the unique needs of each student. Have students use LearnSmart for review, to practice for assessment, and to monitor the progress of their learning.

MODULE 2 STUDY GUIDE

GO ONLINE to study with your Science Notebook.

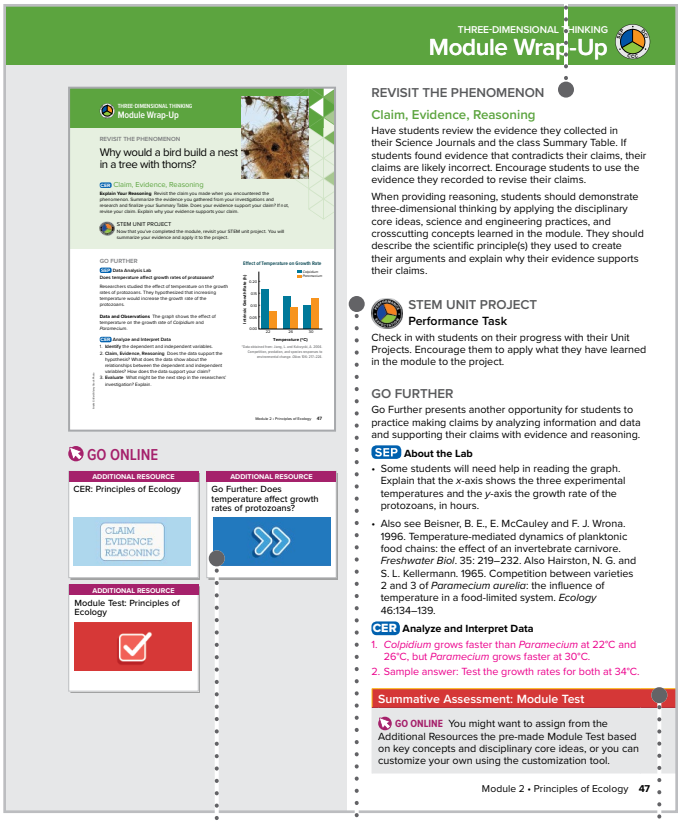
GO ONLINE

ADDITIONAL RESOURCE
Module Vocabulary Practice: Principles of Ecology
vocabulary

ADDITIONAL RESOURCE
Science Probe
SCIENCE PROBES

ADDITIONAL RESOURCE
Inspire Biology LearnSmart
LS LEARNSMART

46 Module 2 • Study Guide



THREE-DIMENSIONAL THINKING
Module Wrap-Up

REVISIT THE PHENOMENON

Why would a bird build a nest in a tree with thorns?

CER Claim, Evidence, Reasoning

STEM UNIT PROJECT

GO FURTHER

CER Data Analysis Lab

Does temperature affect growth rates of protozoans?

Researchers studied the effect of temperature on the growth rates of protozoans. They hypothesized that increasing temperature would increase the growth rate of the protozoans.

Data and Observations The graph shows the effect of temperature on the growth rate of Colpidium and Paramecium.

CER Analyze and Interpret Data

1. **Identify** the dependent and independent variables.
2. **Claim, Evidence, Reasoning** Does the data support the hypothesis? What does the data show about the relationships between the dependent and independent variables? How does the data support your claim?
3. **Evaluate** What might be the next step in the researchers' investigation? Explain.

Effect of Temperature on Growth Rate

Colpidium
Paramecium

Temperature (°C)

Module 2 • Principles of Ecology 47

GO ONLINE

ADDITIONAL RESOURCE
CER: Principles of Ecology
CLAIM EVIDENCE REASONING

ADDITIONAL RESOURCE
Go Further: Does temperature affect growth rates of protozoans?

ADDITIONAL RESOURCE
Module Test: Principles of Ecology

THREE-DIMENSIONAL THINKING
Module Wrap-Up

REVISIT THE PHENOMENON

Claim, Evidence, Reasoning

Have students review the evidence they collected in their Science Journals and the class Summary Table. If students found evidence that contradicts their claims, their claims are likely incorrect. Encourage students to use the evidence they recorded to revise their claims.

When providing reasoning, students should demonstrate three-dimensional thinking by applying the disciplinary core ideas, science and engineering practices, and crosscutting concepts learned in the module. They should describe the scientific principle(s) they used to create their arguments and explain why their evidence supports their claims.

**STEM UNIT PROJECT**

**Performance Task**

Check in with students on their progress with their Unit Projects. Encourage them to apply what they have learned in the module to the project.

GO FURTHER

Go Further presents another opportunity for students to practice making claims by analyzing information and data and supporting their claims with evidence and reasoning.

SEP **About the Lab**

- Some students will need help in reading the graph. Explain that the *x*-axis shows the three experimental temperatures and the *y*-axis the growth rate of the protozoans, in hours.
- Also see Beisner, B. E., E. McCauley and F. J. Wrona. 1996. Temperature-mediated dynamics of planktonic food chains: the effect of an invertebrate carnivore. *Freshwater Biol.* 35: 219–232. Also Hairston, N. G. and S. L. Kellermann. 1965. Competition between varieties 2 and 3 of *Paramecium aurelia*: the influence of temperature in a food-limited system. *Ecology* 46:134–139.

CER **Analyze and Interpret Data**

1. *Colpidium* grows faster than *Paramecium* at 22°C and 26°C, but *Paramecium* grows faster at 30°C.
2. Sample answer: Test the growth rates for both at 34°C.

**Summative Assessment: Module Test**

GO ONLINE You might want to assign from the Additional Resources the pre-made Module Test based on key concepts and disciplinary core ideas, or you can customize your own using the customization tool.

Module 2 • Principles of Ecology 47

### SCIENCE PROBES Revisit the Science Probe

At this point, students are encouraged to go back to the Science Probe at the beginning of the unit to decide whether they would like to change or justify their response. Revisiting the probe here will reveal whether students are holding on to a preconception or have gaps in understanding.

### LEARNSMART

*LearnSmart®* with *SmartBook®* transforms the way students read. A proven, adaptive learning program, LearnSmart individualizes institution to help students study more efficiently and retain more knowledge.

### GO FURTHER

GO ONLINE Use the Go Further activity as another opportunity to have students make and support claims with evidence and reasoning.

### STEM UNIT PROJECT

At the end of each Module, encourage students to apply what they have learned to their STEM Unit Project.

### Module Test

GO ONLINE during the Module Wrap-Up to access the Module Test.

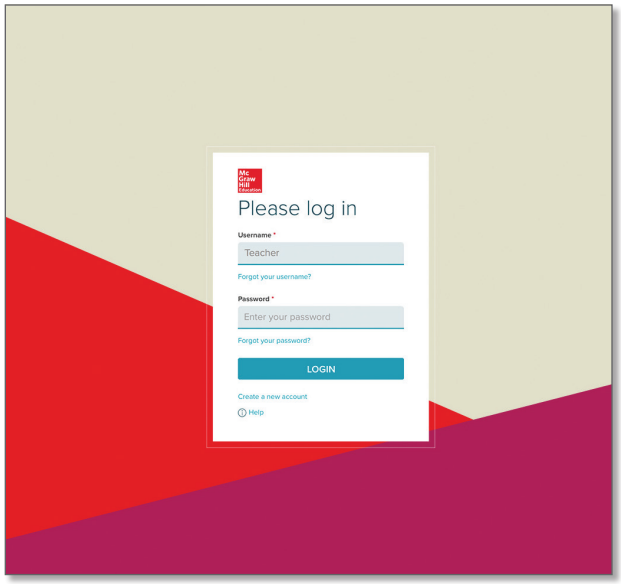
Inspire

Biology · Chemistry · Physics · Earth · Physical · Physical with Earth

# Digital Experience

Use this section to learn more about the engaging interactive resources in the *Inspire Science* High School series digital experience. This section will provide an overview of the following:

- The Course Dashboards
- Unit, Module, and Lesson Landing Pages
- Digital Resource Types and Learning Impact




## Get Started by Logging in:

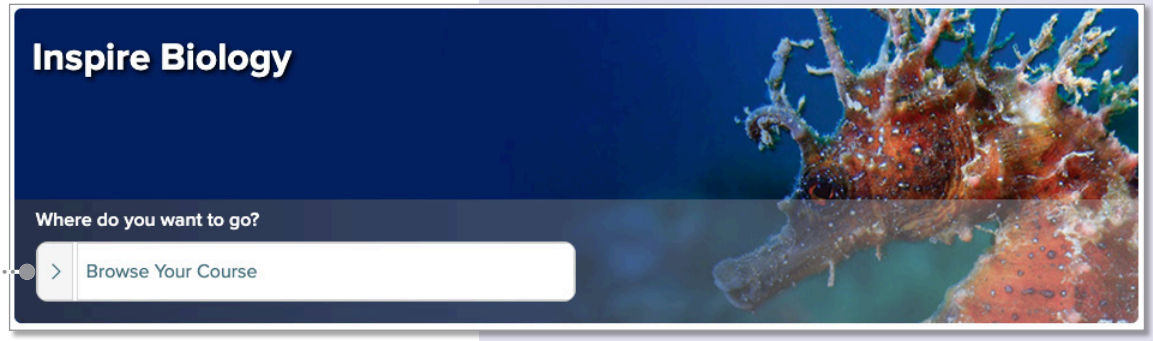
1. Go to https://my.mheducation.com from an Internet browser.
2. Enter your username and password and click “Log In.”

## Need login credentials?

Go to my.mheducation.com and select “Request Login Credentials.”

# Welcome to the *Inspire Science* High School Series Digital Experience!

Use this section of your Program Guide to easily find the digital resources that make the *Inspire Science* High School series engaging and fun for students.



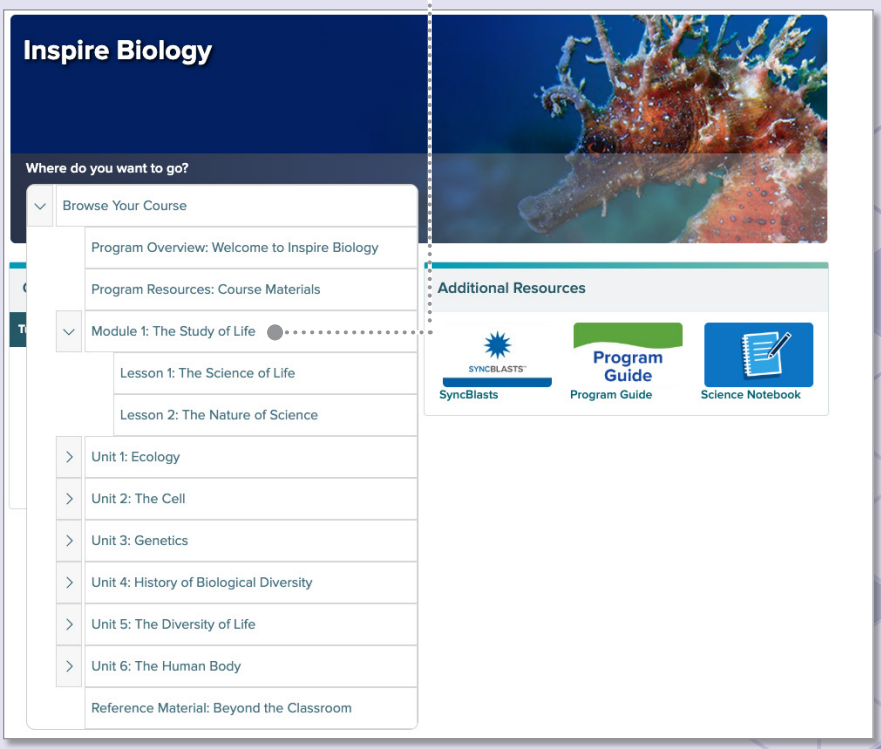

## Browse Course

Upon logging in you will see a colorful banner for your course showing the images from your book covers. Select "Browse Course" or anywhere in this banner to begin access course resources.

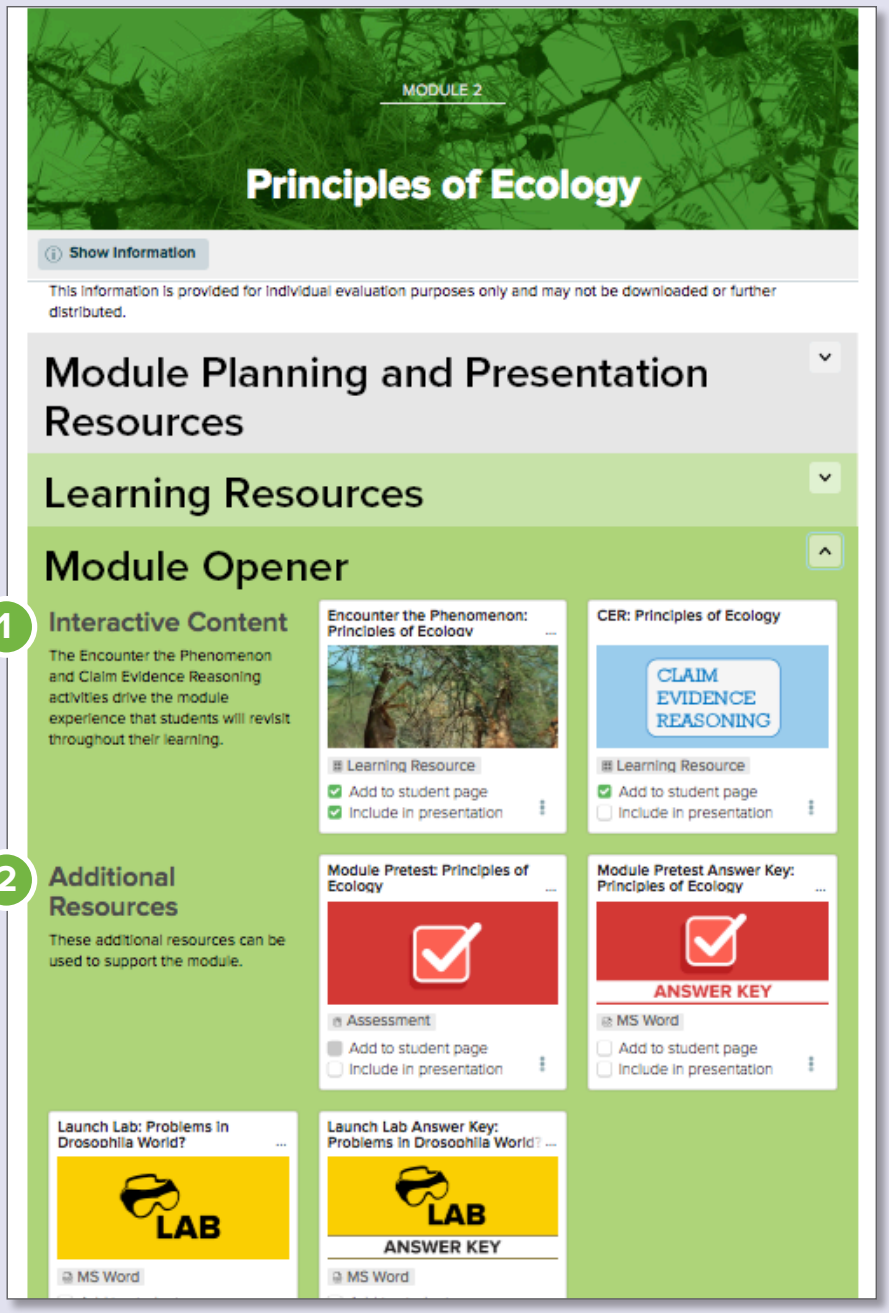
## Choose a Unit, Module, and Lesson

After launching the course, you will access the table of contents page which includes expandable folders for all units, modules, and lessons in the course. Other folders, such as the Program Overview, provide support for understanding the program.

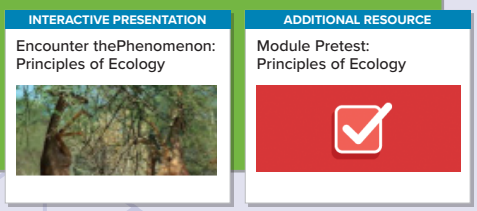
Select a unit, module, or lesson to access the landing pages, where you will find resources such as planning tools, professional learning resources, and student resources aligned to the print Student Editions.




Note: Digital design and navigation may vary.




Your print Teacher's Edition will reference Interactive Content and Additional Resources so you can easily see your print resources:




## Access Your Resources

You will notice within the module and lesson landing page folders that many digital resources are further organized by two categories:

### 1 Interactive Content

These resources provide access to the digital content that aligns with the resources featured in the print Student Edition. By default, these resources will display on the student page and in the teacher presentation.

### 2 Additional Resources

These resources provide access to supplemental content and assessments. Resources in this section are typically hidden from students until teachers are ready to add them to student pages or assign them.

# Unit, Module, and Lesson Landing Pages

## Access Interactive Resources

### The Unit Landing Pages

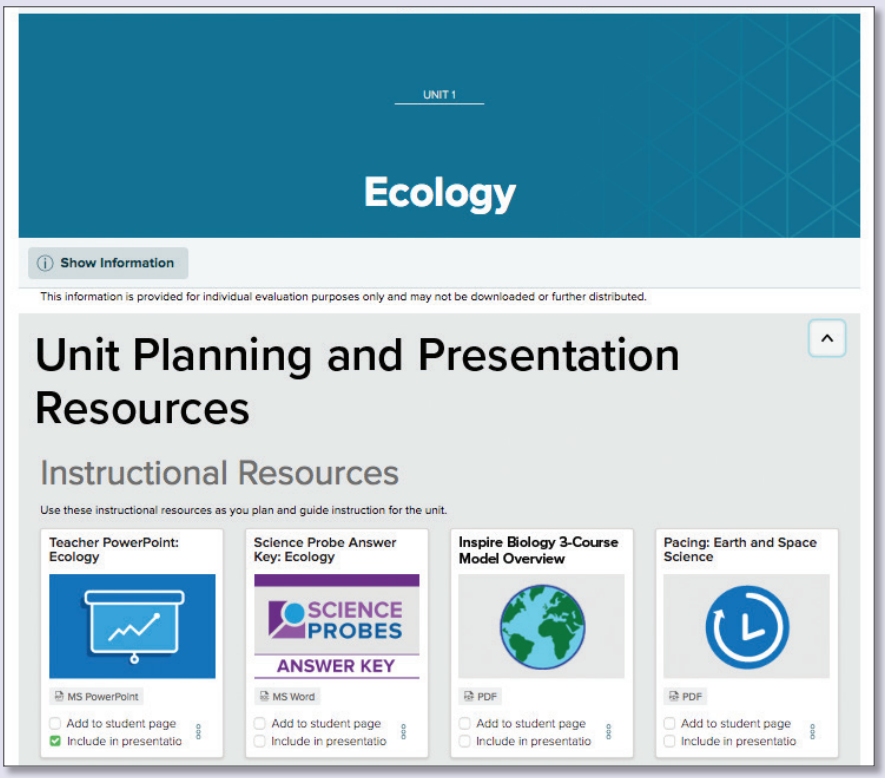
From the unit landing pages, teachers and students can access unit resources. Unit resources include:

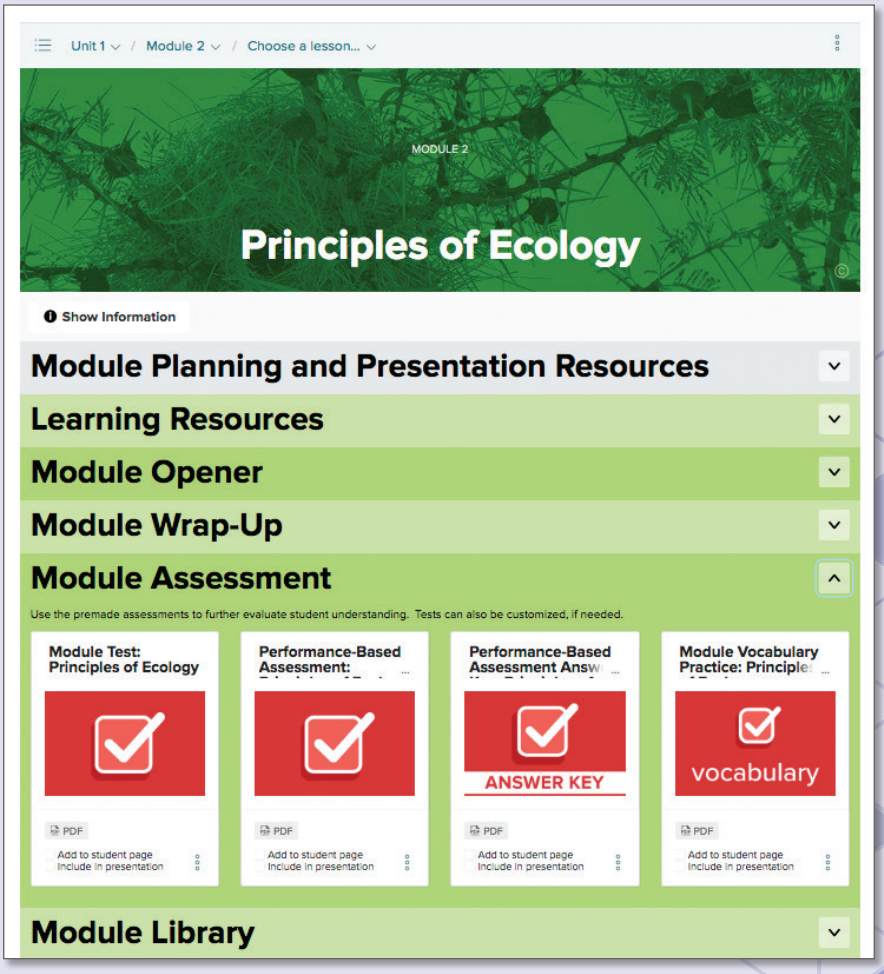
- Unit Planning and Presentation Resources
- Learning Resources
- Unit Library

### The Module Landing Pages

From the module landing pages, teachers and students can access module resources, organized by key module-level activities. Module resource folders for each module include:

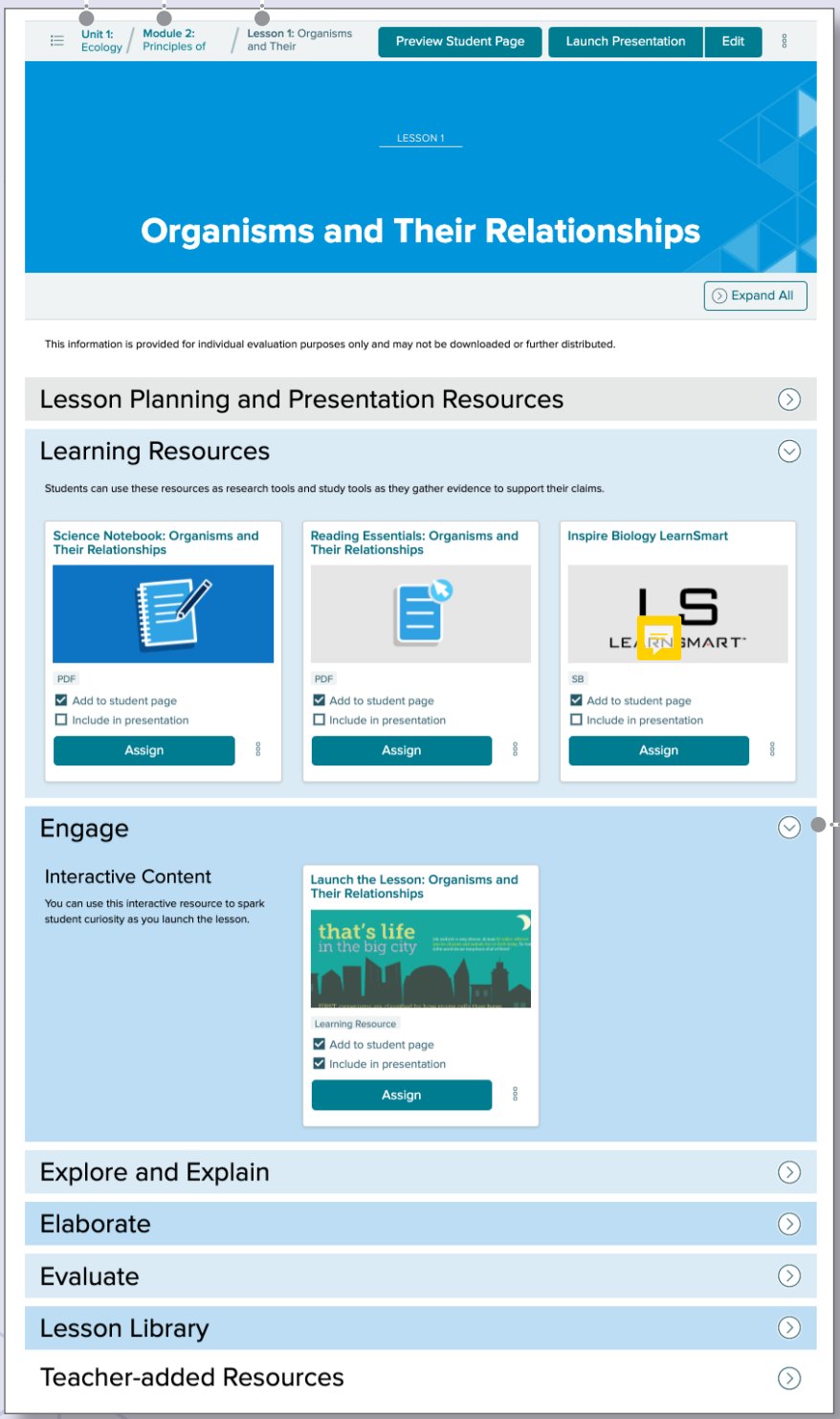
- Module Planning Resources (including Professional Learning Resources)
- Module Opener
- Module Wrap-Up
- Module Assessment
- Module Library




Note: Digital design and navigation may vary.

Easily navigate to other module and lesson landing pages by using the module and lesson drop down menus.




To collapse or open sections, click on

## Access Interactive Resources

### The Lesson Landing Pages

From the lesson landing pages, teachers and students can access lesson resources, organized by the 5E instructional model. Lesson resource folders for each lesson include:

- Lesson Planning Resources
- Engage
- Explore / Explain
- Elaborate
- Evaluate
- Lesson Library

## Viewing Interactive Resources

*Inspire Science* High School series offers a variety of rich media and interactive content with the flexibility to customize lessons to fit students needs.

Follow these tips for viewing resources:

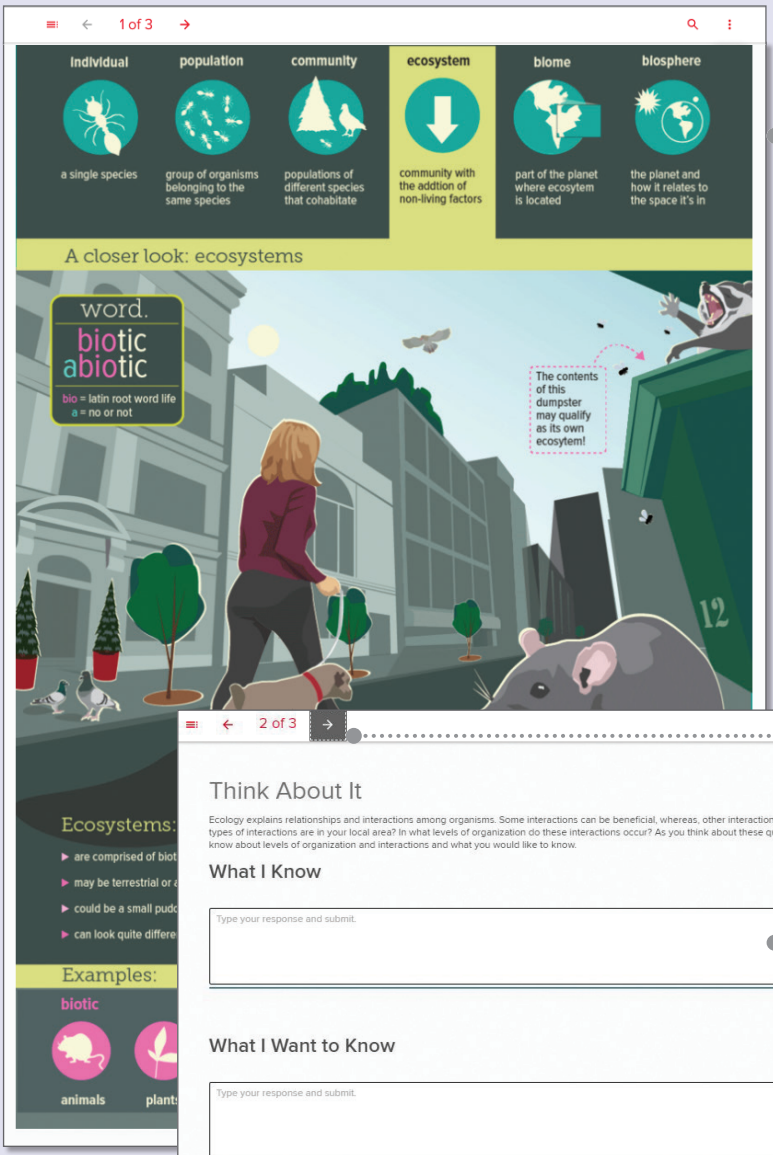
**1. Select**

From a landing page, select any resource to launch and review it.

**2. View**

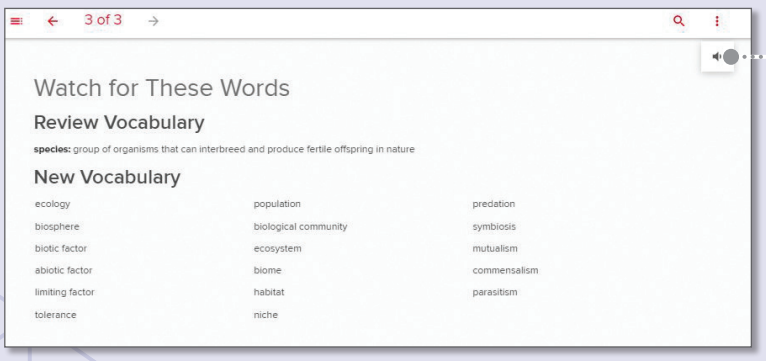
While reviewing a resource in the Interactive Content, use the red arrows to navigate through the screens of each resource.


Note: Digital design and navigation may vary.










**Interactive Content**

Found online in each course are Interactive Content activities. This example can be found in Inspire Biology, Unit 1, Module 2 under the Engage blade.

**Transition**

Select this transition arrow to move to the next page.

**Table Entry**

Students can enter data into tables at the point of use for review.

**Audio Support**

Select the speaker icon to hear on-screen text read aloud. All text in The *Inspire Science* High School series is audio to speech.

# Digital Resource Types and Learning Impact

## Types of Interactive Resources

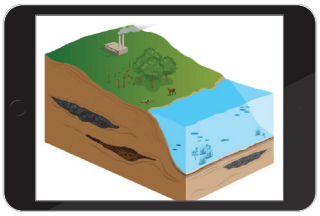
In the *Inspire Science* High School series digital experience, students will interact with a wide variety of digital content types that will make learning science engaging and fun.

### Why Go Online?

- Engaging Interactive Content
- Science Content Videos
- Text Read Aloud and Highlighting Features
- Dynamic Search Tools

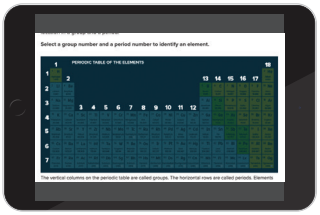
Infographic

Layer Reveal

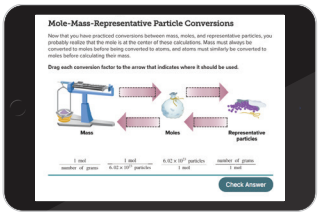


Phenomena Videos

Poptips Plus



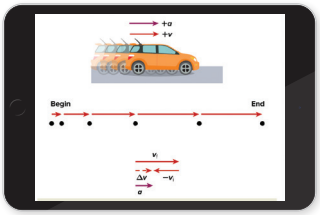
Drag and Drop



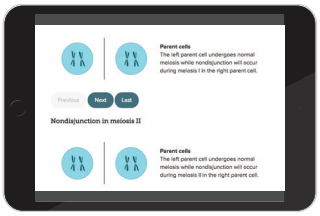

Virtual Investigations


Swypeline


Slideline Plus

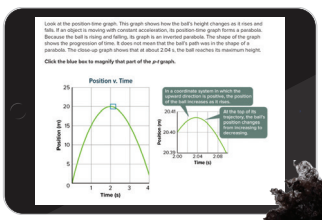



Step by Step




Inspire 3D App


Click Change




PhET


Beyond the Classroom

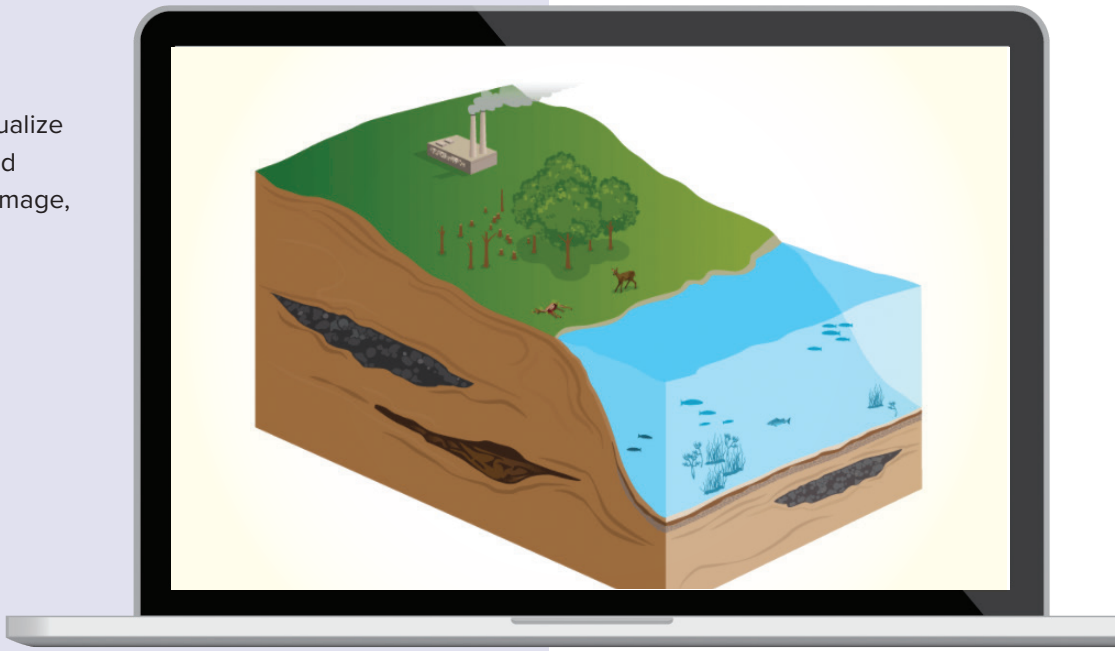
(t)Lebendkulturen.de/Shutterstock.com; (b)Artem Varnitsin/Shutterstock


## Infographic

**Infographics** provide an engaging vsualization to foster collaborative and hands-on learning in the world surrounding them.

## Layer Reveal

The **Layer Reveal** interactive enables students to easily visualize cause and effect scenarios and focus on specific areas of an image, one section at a time.



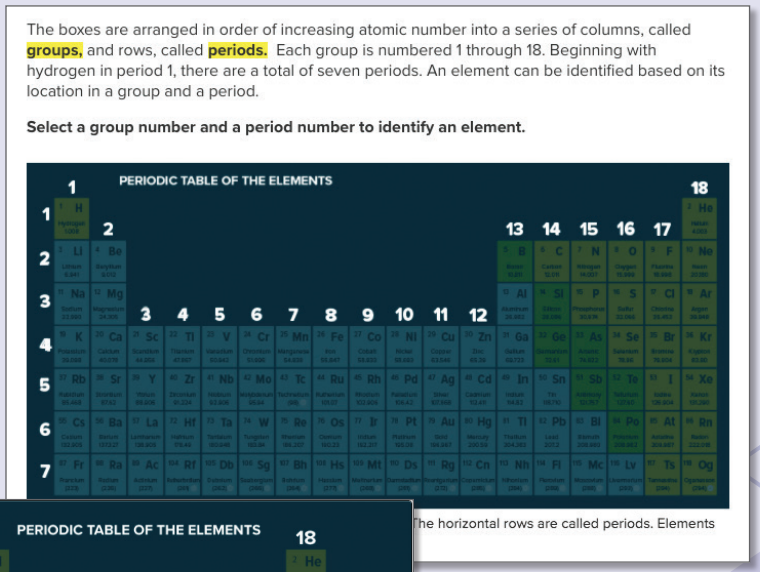
# Digital Resource Types and Learning Impact

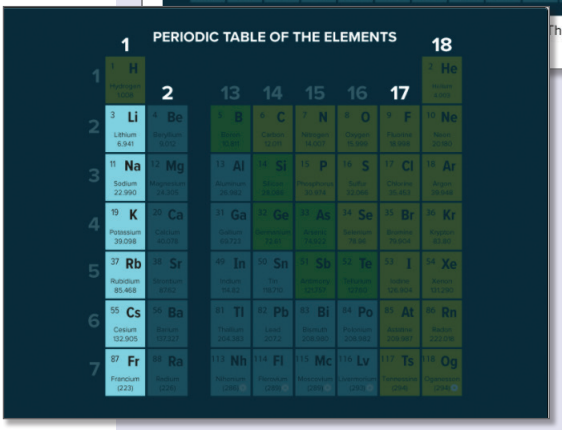
## Phenomenon Videos

**Phenomenon videos** are used to draw students into the content and provide a visual experience to encourage thinking and collaborative conversations.

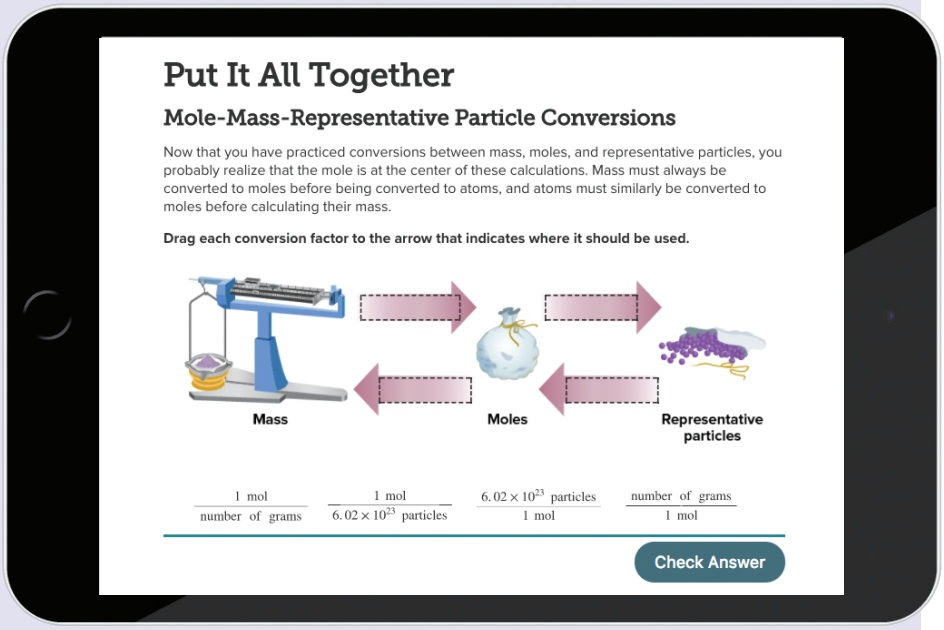
## Poptips Plus

**Poptips Plus** is an interactive tool with a single image or an array of text and images with markers that define clickable hot spots. This immersive feature allows students to interact with the images and connect them to related information to support understanding of their core content.



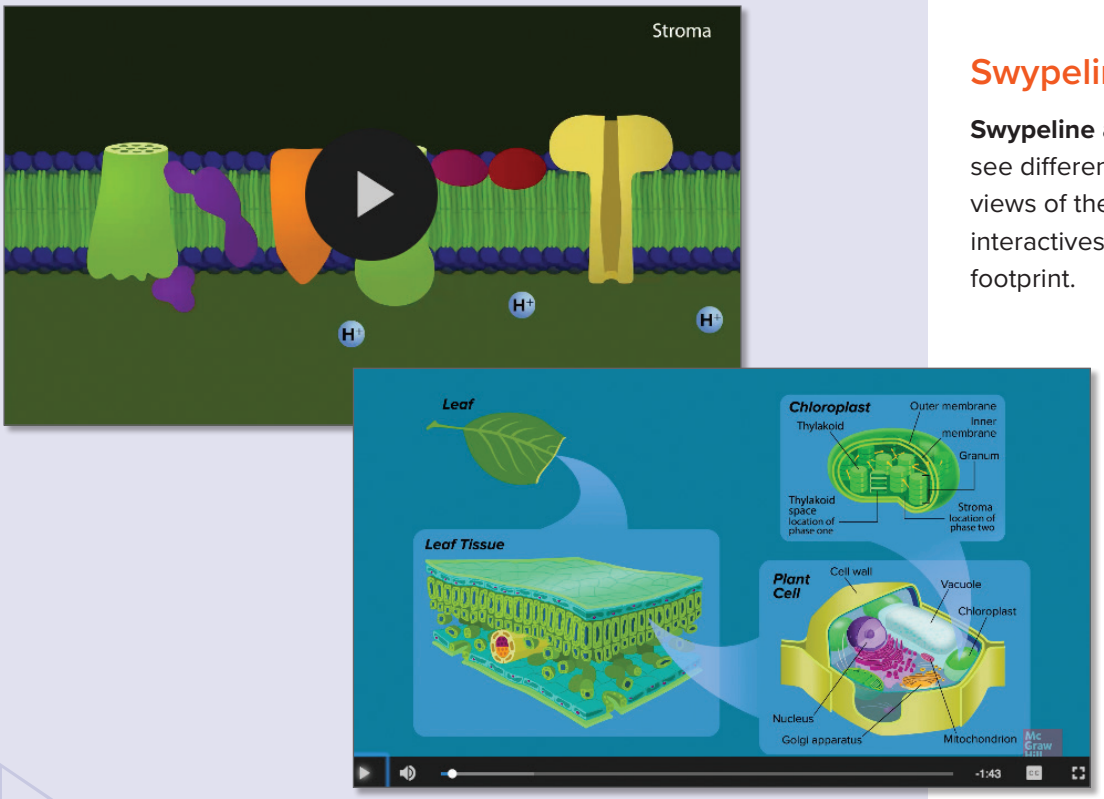




Lebendkulturen.de/Shutterstock.com




## Drag and Drop

The **Drag and Drop** interactive tool is used to support students with sorting and classifying content such as vocabulary terms.



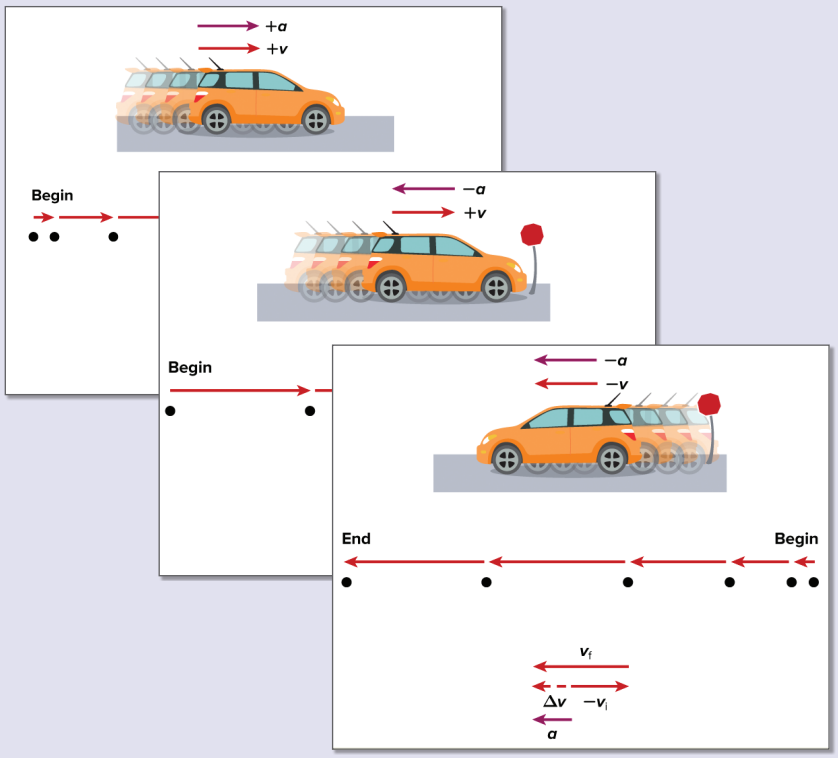

## Swypeline

**Swypeline** allows students to see different stages, versions, or views of the content in sequential interactives that occupy the same footprint.

# Digital Resource Types and Learning Impact

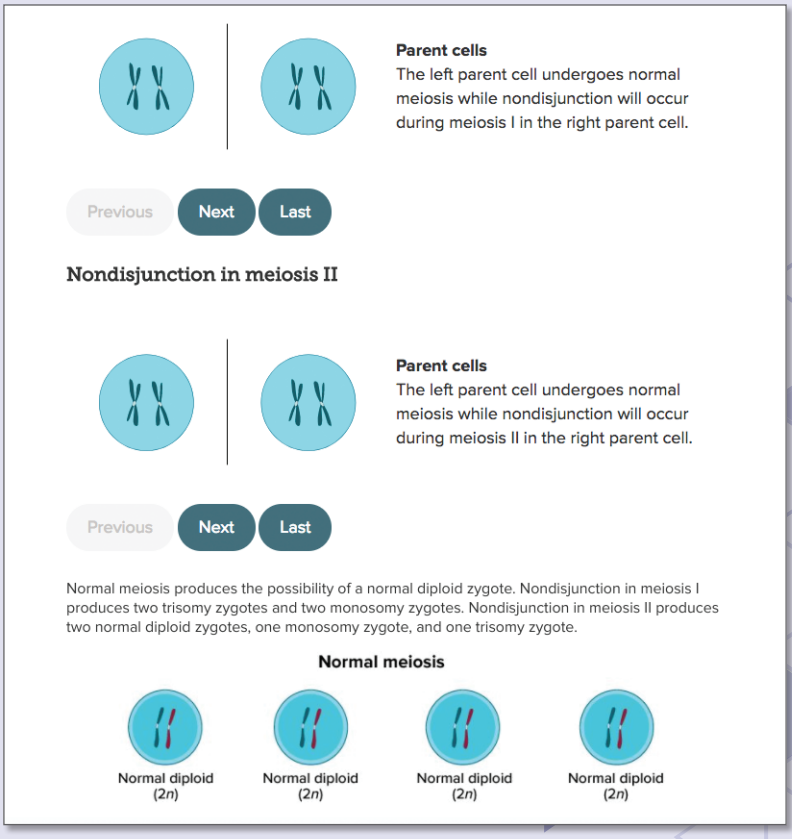
## Slideline Plus

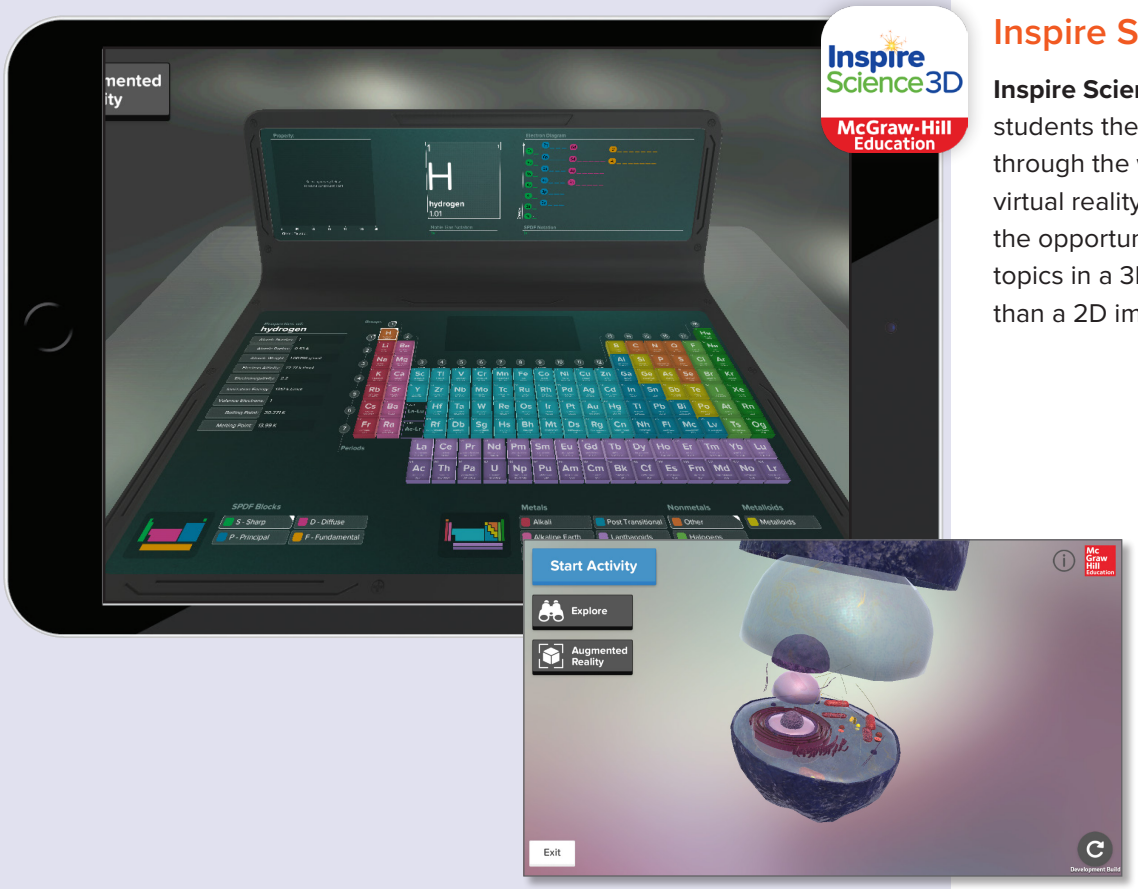
**Slideline Plus** allows students to view a slide show of images that seamlessly fade from one to the next as the user navigates between them.




## Step-by-Step

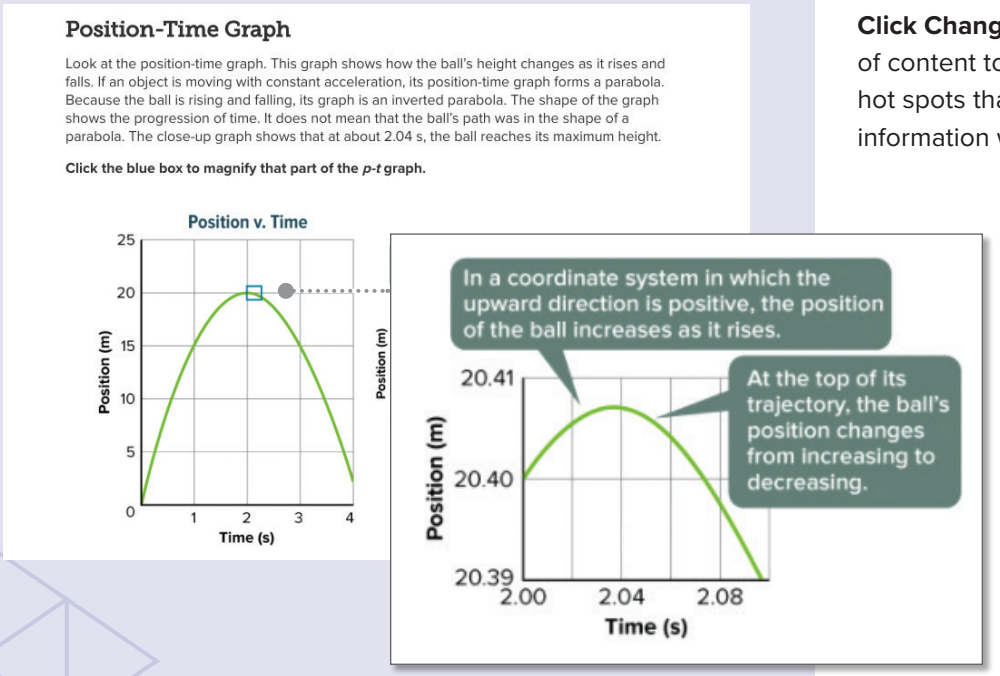
**Step-by-Step** is a presentation of a multi-step process that allows students to view one step at a time.






## Inspire Science 3D

**Inspire Science 3D** provides students the ability to explore through the wonders of augmented/ virtual reality and provides students the opportunity to see science topics in a 3D environment rather than a 2D image found in a page.



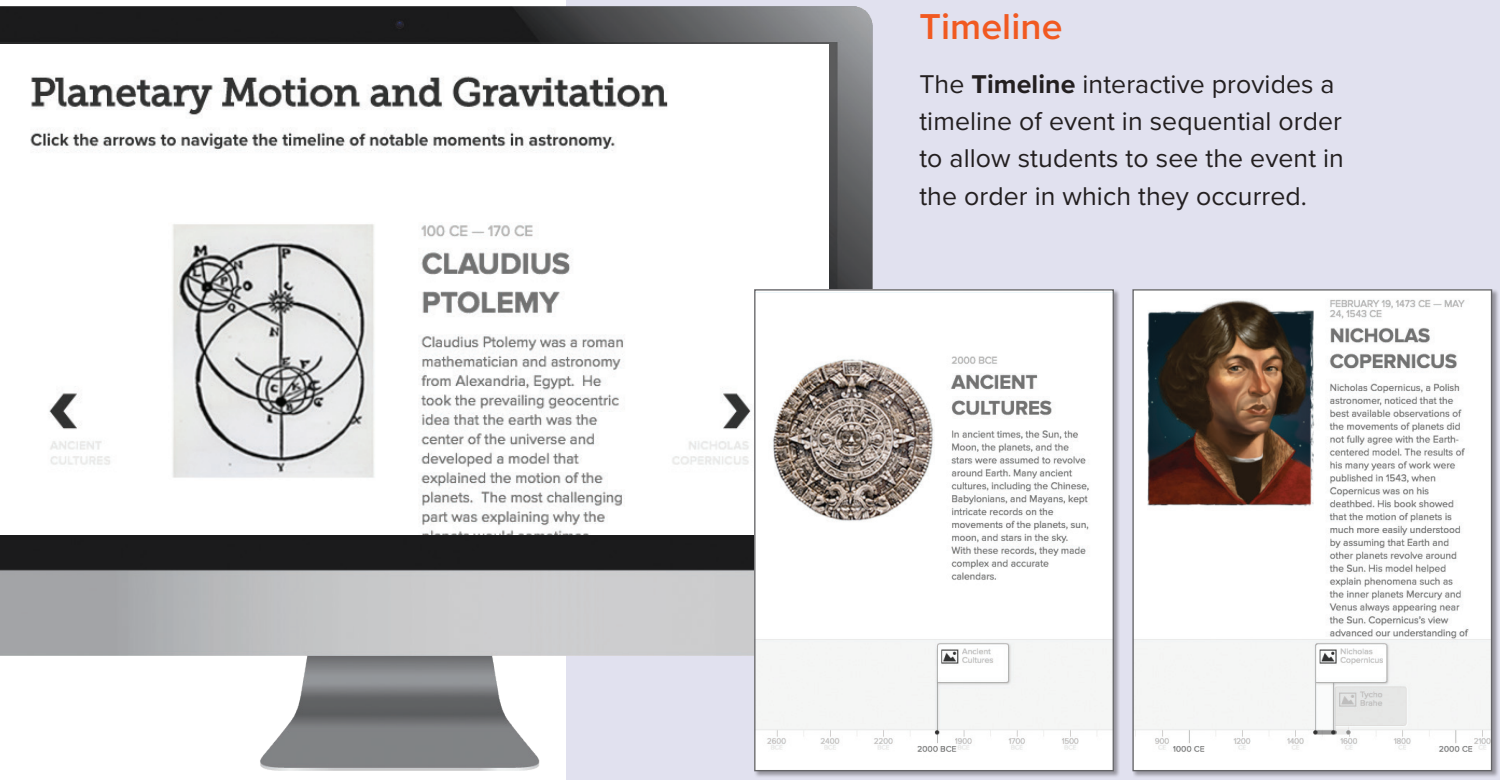

## Click Change

**Click Change** presents a screen of content to the student with hot spots that reveal additional information when clicked.

# Digital Resource Types and Learning Impact

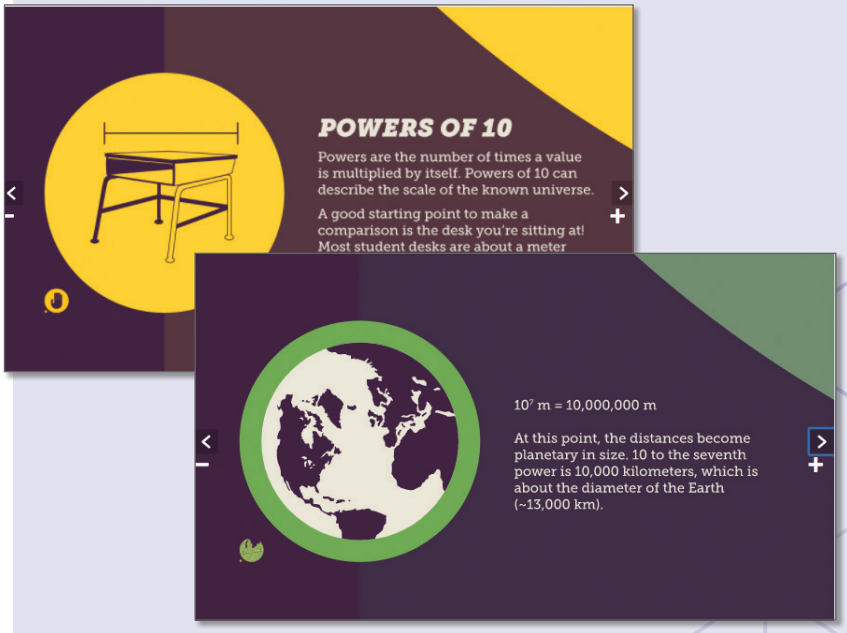
## Timeline

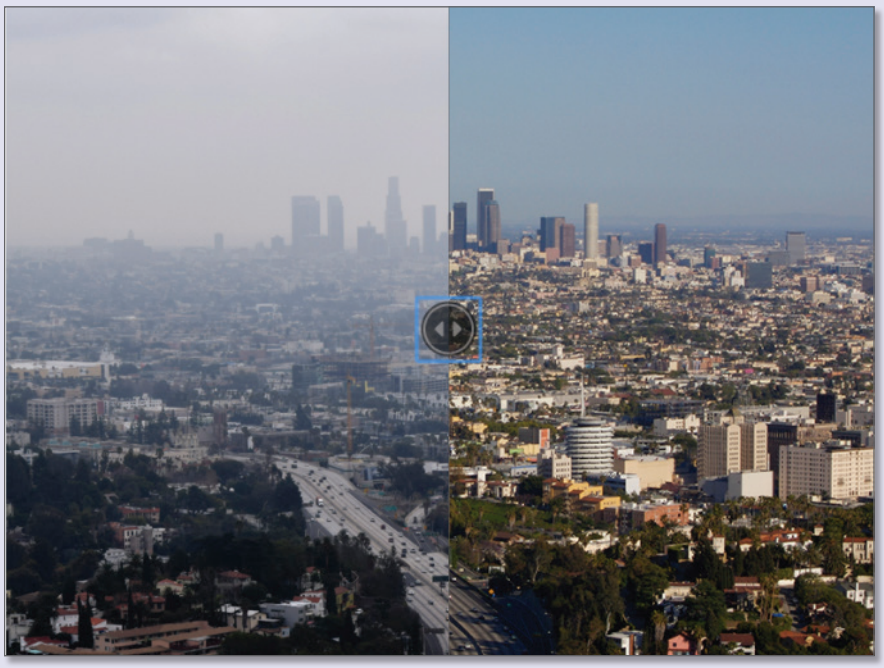
The **Timeline** interactive provides a timeline of event in sequential order to allow students to see the event in the order in which they occurred.




## Swype

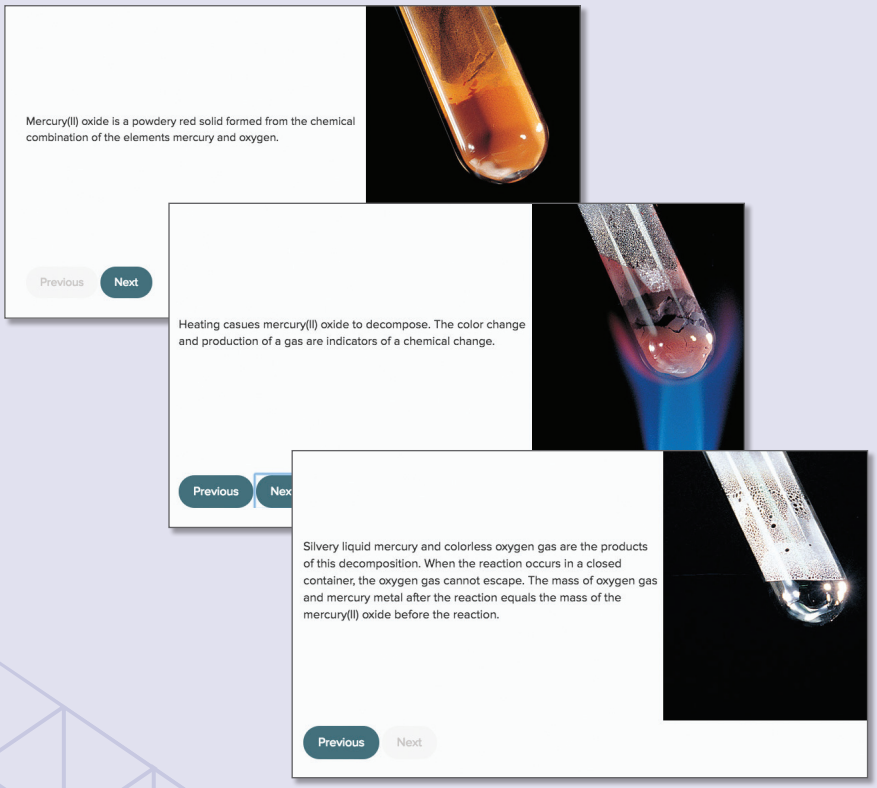
**Swype** allows students to see different stages, versions, or views of the content in an engaging interactive way.





## Layer Reveal Slider

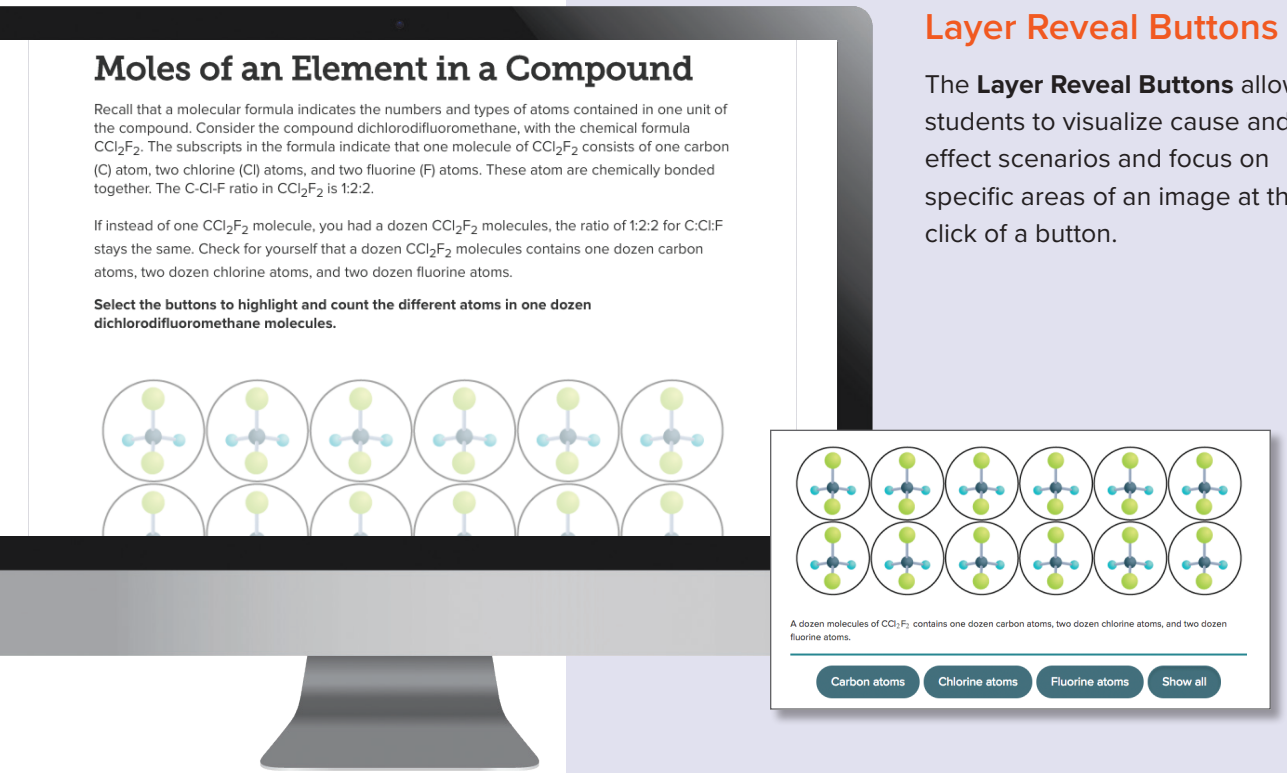
The **Layer Reveal Slider** interactive enables students to easily visualize cause and effect scenarios and focus on specific areas of an image, one section at a time.




## Step-by-Step, Replace Functionality

**Step-by-Step** is a presentation of a multi-step process that allows students to view one step at a time to see the change that is occurring.

# Digital Resource Types and Learning Impact

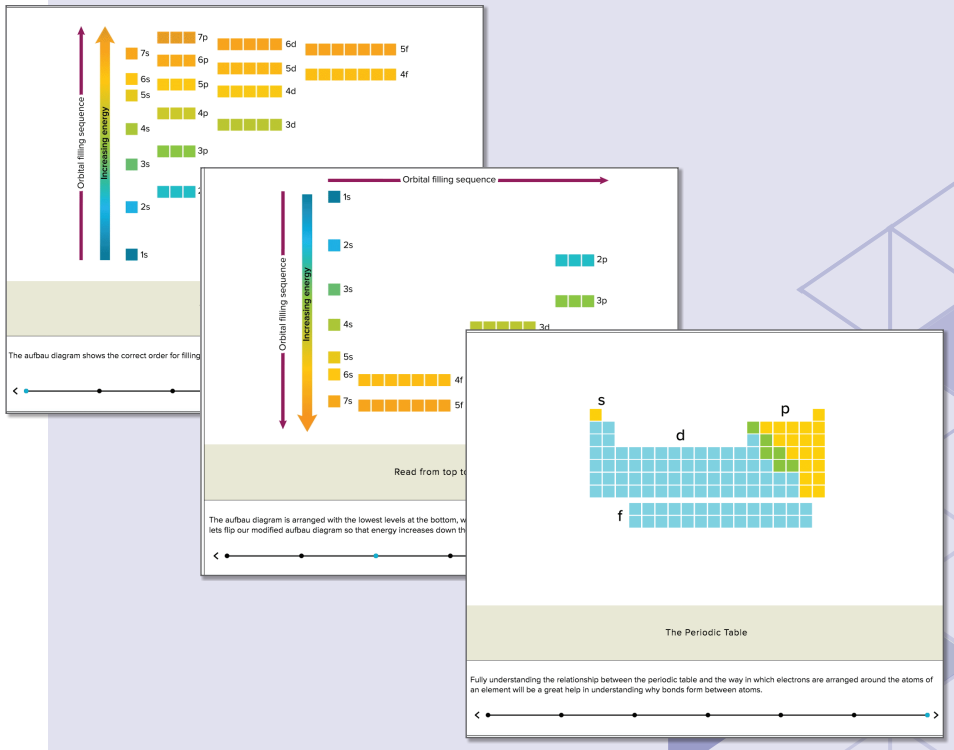


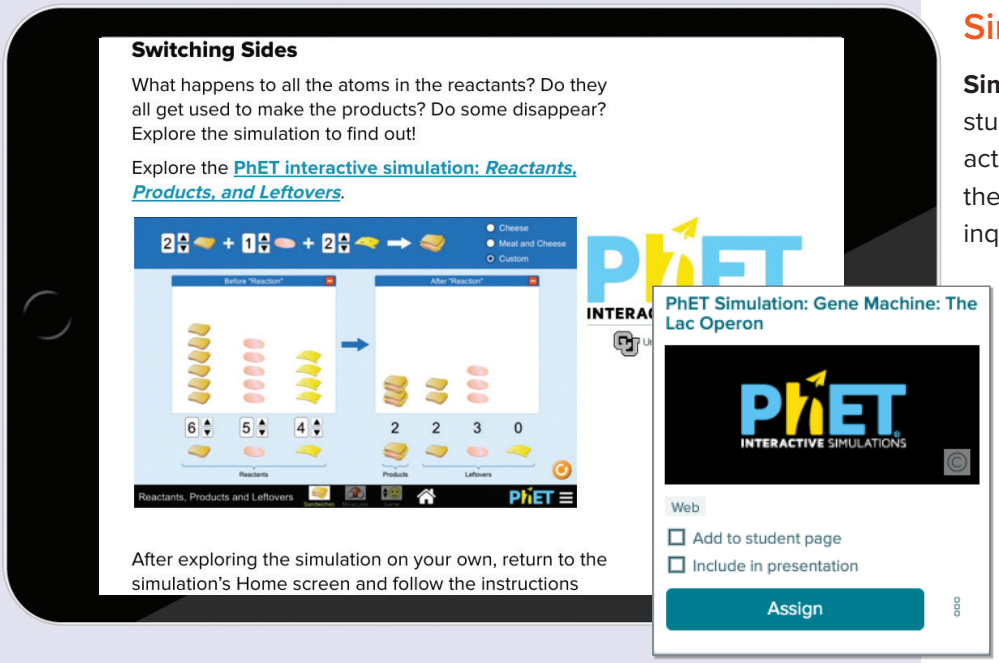

## Layer Reveal Buttons

The **Layer Reveal Buttons** allow students to visualize cause and effect scenarios and focus on specific areas of an image at the click of a button.

## Slideline Plus with Animations

The **Slideline Plus** allows students to progress through a storyline of images or highlight focused areas of visuals to concentrate on one element of a schematic at a time.






## Simulations

**Simulations** are used to provide students an experience when the activity isn't easily replicated in the classroom with a hands-on inquiry activity.


## Virtual Investigations

**Virtual Investigations** provide an alternative engaging way for students to interact with science content that cannot always be done in a classroom setting. The Virtual Investigations are found throughout your *Inspire Science* program.

Inspire Science

We hope you've found this guide helpful in getting started with *Inspire Science* High School series. Thank you for all you do to inspire the students of to be curious, to investigate, and to innovate.

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