Middle School

Program Guide

Program Design
Module and Lesson Structure
Digital Experience

Indiana Inspire Science

Explore Our Phenomenal World

INSPIRE INNOVATION

INSPIRE INVESTIGATION

INSPIRE CURIOSITY

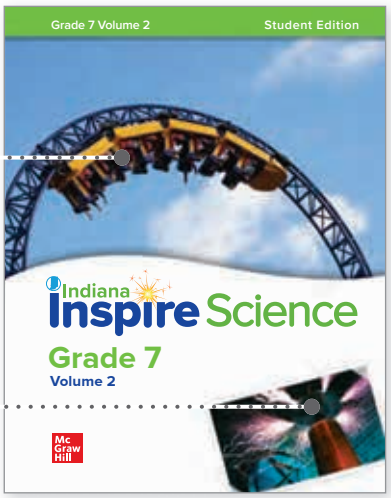
Mc Graw Hill

GRADE 7

About the Covers

As students explore each cover of their Student Edition, their curiosity begins as they study the main image. The rich phenomenon image encourages students to start asking questions.

The photo or illustration at the bottom of the cover supports the students response to the phenomenal photo.



Each back cover supports the types of questions that students will be wondering as they explore through *Inspire Science*.

mheonline.com/indiana

Send all inquiries to:
McGraw Hill
STEM Learning Solutions Center
8787 Orion Place
Columbus, OH 43240

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.

Table of Contents

Indiana Inspire Science

Explore Our Phenomenal World

Use this Program Guide to learn about the overall program philosophy and design, the module and lesson structure, and digital experience that align 100% to the 2022 K–12 Indiana Academic Standards for Science.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Indiana Inspire Science

Explore Our Phenomenal World

Learning begins with curiosity. *Indiana Inspire Science* 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.

100%
Aligned to the 2022 K–12 Indiana Academic Standards for Science

Inspire Curiosity
Spark critical thinking.

Inspire Investigation
Spark inquiry-driven, hands-on exploration.

Inspire Innovation
Spark creative solutions to real-world challenges.

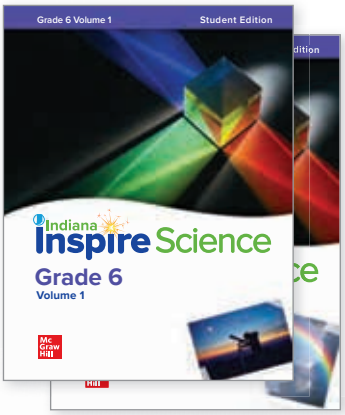
Go Online
Go to mheonline.com/indiana for more information

Resources At-A-Glance

Print Resources

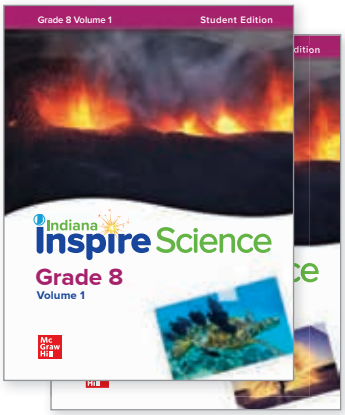
Each Student Edition module encourages hands-on learning that is aligned to the 2022 K–12 Indiana Academic Standards for Science. Each Teacher Edition provides in-depth teacher strategies to make sure that your classroom succeeds.

GRADE 6
STUDENT EDITION

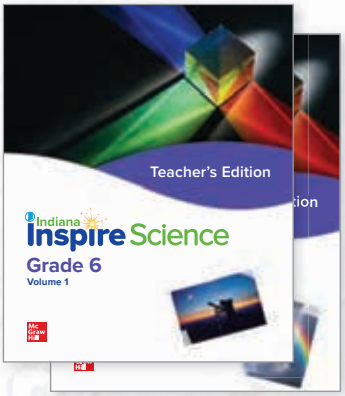


GRADE 7
STUDENT EDITION

GRADE 8
STUDENT EDITION



GRADE 6
TEACHER EDITION



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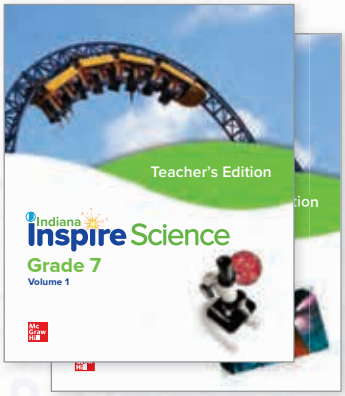
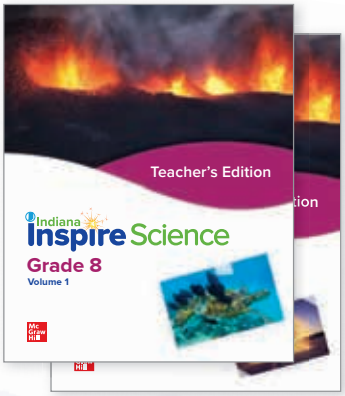
TEACHER EDITION



GRADE 8
TEACHER EDITION



Science Materials Kits*

*Available for Additional Purchase

Inspire Science offers Science Materials Kits that are organized by unit/module and contains consumable, non-consumable and specific equipment that is needed for the hands-on inquiry activities.

Materials for hands-on activities can also be individually sourced as needed.

Learning Re-imagined

Engaging Interactive Content

- Video Demos of Hands-On Activities
- Science Content Videos
- Text Read Aloud and Highlighting Features
- Dynamic Search Tools
- Easily integrate with your District's LMS
- One-Click Google integration

Beyond the Classroom

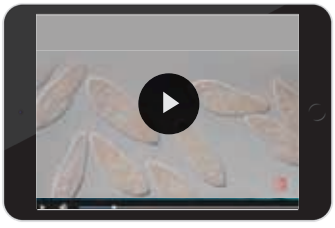
Type Entry

Drawing Tool

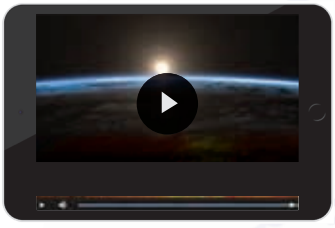
Drag and Drop

Interactive Presentation

Phenomena Videos



Science Content Videos



Simulations

SmartBook®

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

SYNC BLASTS™ *

*Available for Additional Purchase

Scope and Sequence

Indiana Inspire Science is intentionally designed to gradually build knowledge and skills in all three dimensions. As students progress through the program, their knowledge builds from simpler concepts to more sophisticated ones. Learning progressions are specifically designed to build on prerequisite skills. For instance, students need to understand the water cycle before learning about how the environment is impacted by humans. In addition, modules are grouped into intuitive units so that related bundles of Performance Expectations may be explored together.

Indiana Grade 6

VOLUME 1

MODULE 1	**The Sun-Earth-Moon System**
LESSON 1	Earth's Motion Around the Sun
LESSON 2	Lunar Phases
LESSON 3	Eclipses
MODULE 2	**Exploring the Universe**
LESSON 1	Gravity and the Universe
LESSON 2	The Solar System
MODULE 3	**Matter and Energy in Ecosystems**
LESSON 1	Photosynthesis and Cellular Respiration
LESSON 2	Flow of Energy
LESSON 3	Cycling of Matter
MODULE 4	**Dynamic Ecosystems**
LESSON 1	Resources in Ecosystems
LESSON 2	Interactions Within Ecosystems
LESSON 3	Changing Ecosystems

VOLUME 2

MODULE 1	**Biodiversity in Ecosystems**
LESSON 1	Benefits of Biodiversity
LESSON 2	Maintaining Biodiversity
MODULE 2	**Introduction to Waves**
LESSON 1	Wave Properties
LESSON 2	Mechanical Wave Interactions
MODULE 3	**Light**
LESSON 1	How Light Travels
LESSON 2	Reflection and Mirrors
LESSON 3	Refraction and Lenses
LESSON 4	Color of Light
MODULE 4	**Information Technologies**
LESSON 1	Communicating with Signals
LESSON 2	Modern Communication with Digital Signals

Indiana Grade 7

VOLUME 1

MODULE 1	**Geologic Time**
LESSON 1	Analyzing the Rock and Fossil Records
LESSON 2	Building a Time Line
MODULE 2	**Dynamic Earth**
LESSON 1	Moving Continents
LESSON 2	Development of a Theory
LESSON 3	Changing Earth's Surface
LESSON 4	Energy Changes in Chemical Reactions
LESSON 5	The Cycling of Earth's Materials
MODULE 3	**Distribution of Earth's Resources**
LESSON 1	Launch: Science Probe
LESSON 2	Natural Resources
LESSON 3	Distribution of Resources
LESSON 4	Depletion of Resources
MODULE 4	**Natural Hazards**
LESSON 1	Earthquake Risks
LESSON 2	Volcano Risks
LESSON 3	Severe Weather Risks
MODULE 5	**Cells and Life**
LESSON 1	Exploring Life
LESSON 2	Cell Structure and Function

VOLUME 2

MODULE 1	**Body Systems**
LESSON 1	Levels of Organization
LESSON 2	Structure and Support
LESSON 3	Obtaining Energy and Removing Waste
LESSON 4	Moving Materials
LESSON 5	Control and Information Processing
MODULE 2	**Forces and Motion**
LESSON 1	Position and Motion
LESSON 2	Force and Acceleration
LESSON 3	Force Pairs
LESSON 4	Gravitational Force
MODULE 3	**Mechanical Energy**
LESSON 1	Kinetic Energy
LESSON 2	Potential Energy
LESSON 3	Conservation of Energy
MODULE 4	**Electromagnetic Forces**
LESSON 1	Magnetic Forces
LESSON 2	Electric Forces
LESSON 3	Simple Circuits
LESSON 4	Electromagnetism

Indiana Grade 8

VOLUME 1

MODULE 1	**The Water Cycle**
LESSON 1	Water in the Atmosphere
LESSON 2	Water on Earth's Surface
MODULE 2	**Weather and Climate**
LESSON 1	Solar Energy on Earth
LESSON 2	Atmospheric and Oceanic Circulation
LESSON 3	Weather Patterns
LESSON 4	Climates of Earth
MODULE 3	**Human Impact on the Environment**
LESSON 1	Impact on Land
LESSON 2	Impact on Water
LESSON 3	Impact on the Atmosphere
LESSON 4	Impact on Climate
MODULE 4	**Earth and Human Activity**
LESSON 1	Human Population Growth
LESSON 2	People and the Environment
MODULE 5	**Reproduction of Organisms**
LESSON 1	Inheritance
LESSON 2	Types of Reproduction
LESSON 3	Reproduction and Growth of Animals
LESSON 4	Reproduction and Growth of Plants
MODULE 6	**Natural Selection and Adaptations**
LESSON 1	How Traits Change
LESSON 2	The Theory of Evolution by Natural Selection
LESSON 3	Artificial Selection

VOLUME 2

MODULE 1	**Evidence of Evolution**
LESSON 1	Fossil Evidence of Evolution
LESSON 2	Biological Evidence of Evolution
MODULE 2	**Energy and Matter**
LESSON 1	Particles in Motion
LESSON 2	States of Matter
LESSON 3	Thermal Energy Transfers
LESSON 4	Thermal Energy Conductivity
MODULE 3	**Classification and States of Matter**
LESSON 1	Energy and States of Matter
LESSON 2	Changes in Temperature
LESSON 3	Changes in Pressure
LESSON 4	Molecular Structure
MODULE 4	**Matter: Properties and Changes**
LESSON 1	Properties of Matter
LESSON 2	Property Changes in Chemical Reactions
LESSON 3	Energy Changes in Chemical Reactions
MODULE 5	**Materials Science**
LESSON 1	Synthetic Technology
LESSON 2	Synthetic Materials and Societal Impacts

Key Shifts for Science Success

The 2022 K–12 Indiana Academic Standards for Science are designed to help you prepare students for career and college readiness through a more innovative approach to science education. This new approach requires a few shifts in science instruction and learning, and *Indiana Inspire Science* is designed to support you through each one.

Look for this symbol throughout this guide to learn more about these *Key Shifts for Science 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 or thinking of Inspire Science 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, “Developing and Using Models”)

DCI Disciplinary Core Ideas

CONTENT IN FOCUS
(for example, “The Universe and Its Stars”)

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 the skills and 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 are shown throughout *Indiana Inspire Science* as students will build long-lasting knowledge and skills by experiencing science and engineering in a more meaningful, real-world, application-oriented way.

Integrated Engineering

Engineering Design is a key shift that is dominant in the *Indiana Inspire Science* programs. This shift is shown in engineering activities and content within the student edition and in teacher support seamlessly throughout the programs.

Progressive Learning

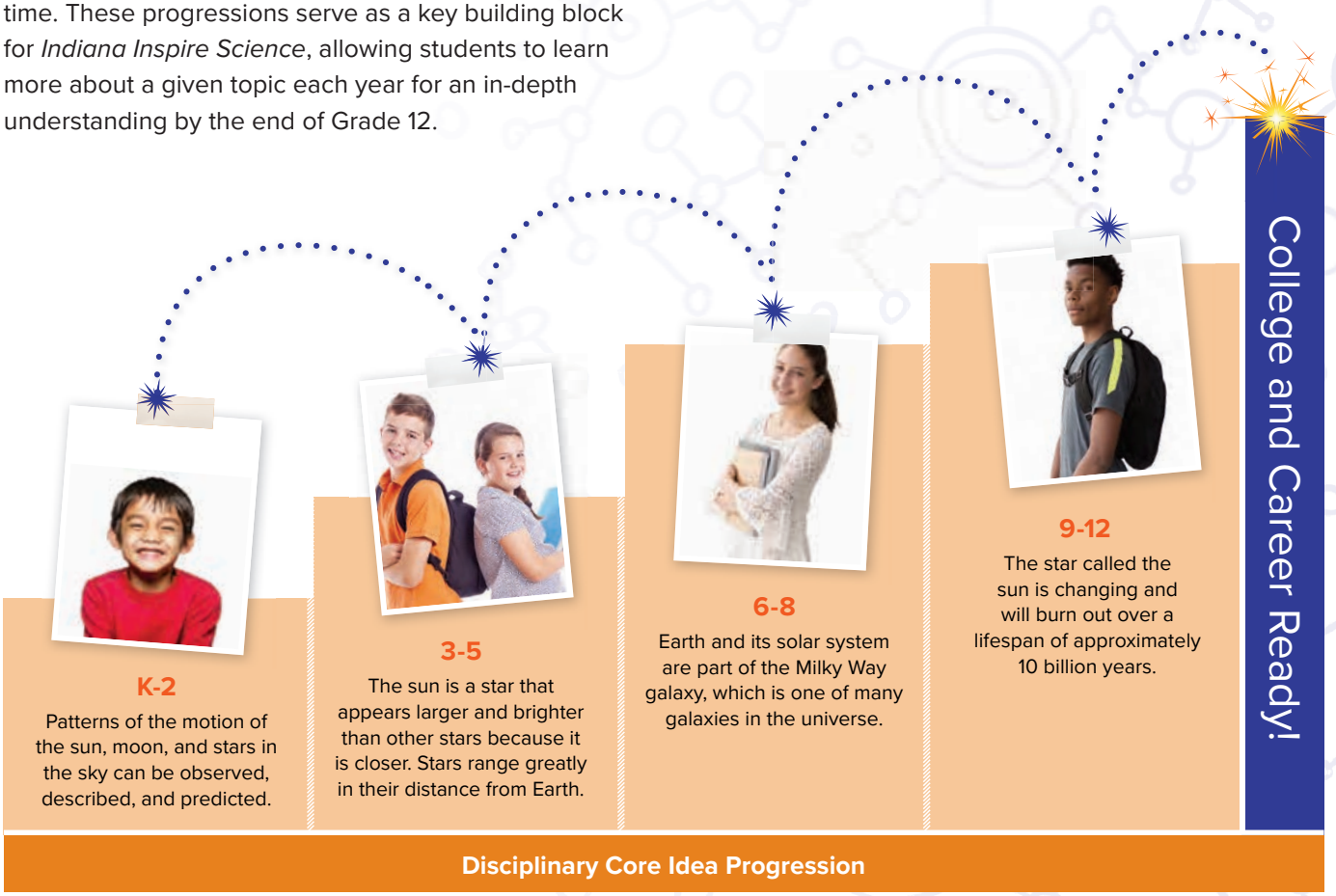
Throughout K–12 *Indiana Inspire Science, a coherent and purposeful* progression of ideas is evident. The program was built to ensure concepts year after year were built to deepen conceptual understanding over time. These progressions serve as a key building block for *Indiana Inspire Science*, allowing 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 *Indiana Inspire Science* programs focus on helping students achieve a deep level of conceptual understanding through project-based learning with performance-based evaluations and rubrics.

Depth Over Breadth

Indiana Inspire Science students will shift from a wide range of topics with shallow exploration to a more narrow range of topics with in-depth exploration to advance conceptual understanding.



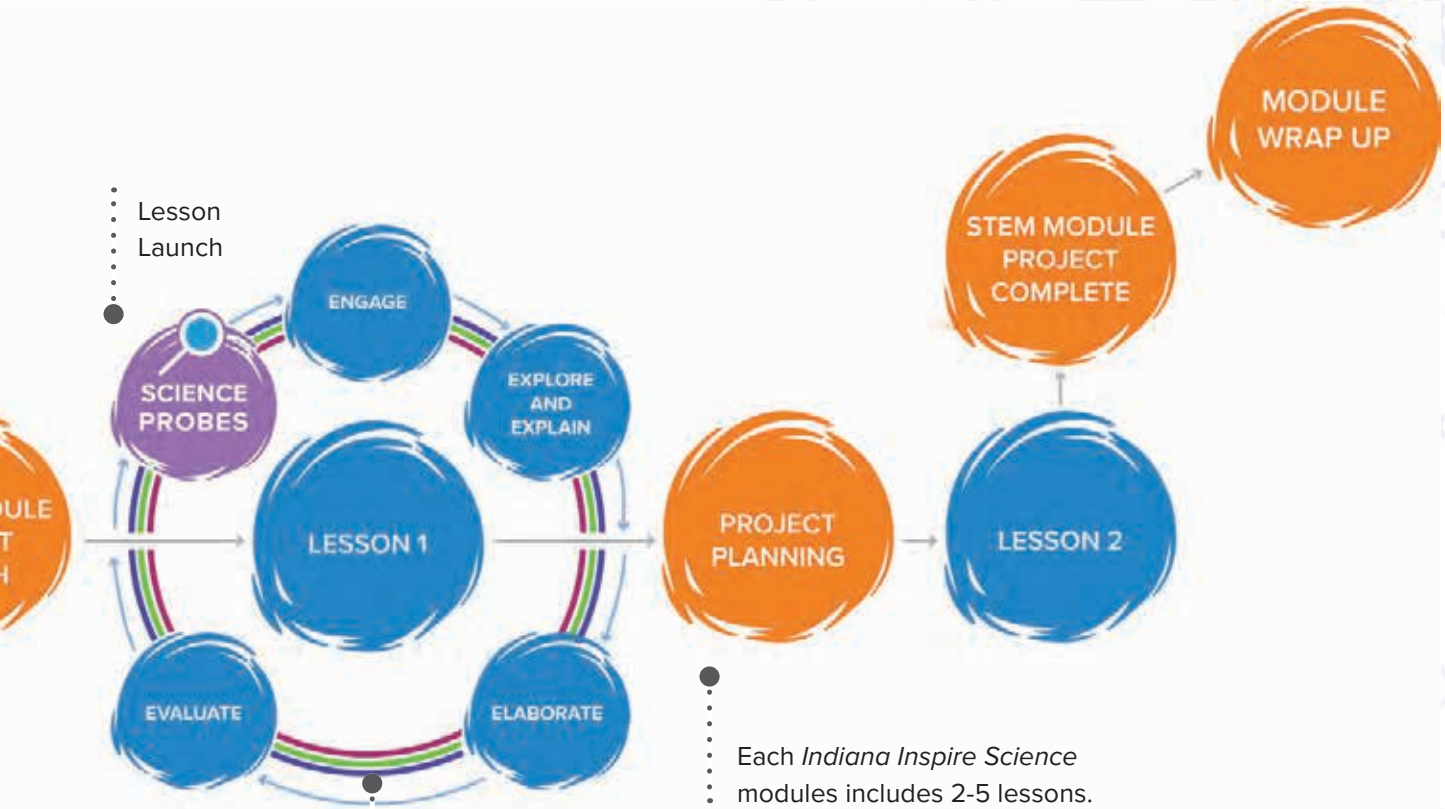
Module and Lesson Experience At-A-Glance

Indiana Inspire Science's phenomena-driven 5E lessons are designed to provoke critical thinking and spark creative problem-solving. At the beginning of each module, students will be introduced to a STEM Module Project that they will complete at the end of the module, with touch points at the end of each lesson for project planning.

Key Student Activities

STEM Module Project Launch

MODULE OPENER	ASSESS PRIOR KNOWLEDGE	ENGAGE	EXPLORE / EXPLAIN
Encounter the Phenomenon	Formative Assessment Science Probe	Encounter the Phenomenon	Encounter the Phenomenon
Phenomenon Question		Phenomenon Question	Explain the Phenomenon with: CLAIM EVIDENCE REASONING (CER)
STEM Module Project Launch			Inquiry Activities
			Close Reading Activities



STEM Module Project Planning (after each lesson) and Completion (end of the module)

EXPLORE / EXPLAIN	ELABORATE	EVALUATE	MODULE WRAP-UP
Three-Dimensional Thinking Questions	Environmental Connection	Lesson Review	Revisit the Phenomenon
Dinah Zike Foldables®	STEM CAREER Connections	Three-Dimensional Assessment	Three-Dimensional Assessment
Life, Earth and Space and Physical Integration	American Museum of Natural History Features	Real-World Connections	
		Explain the Phenomenon	
		Revisit the Science Probes	

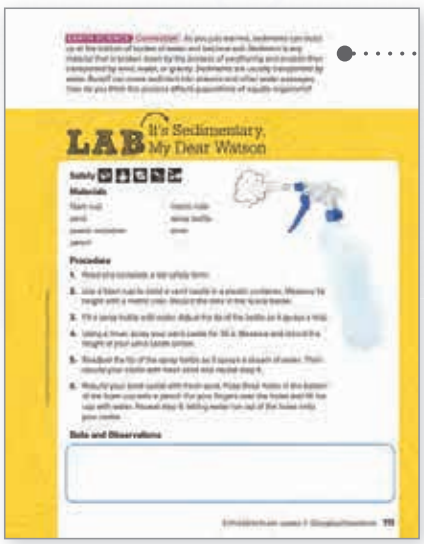
Cross-Curricular Connections

Indiana Inspire Science was built so that the integration of the architecture of the Crosscutting Concepts (CCCs) are seamlessly embedded into the program. Deep understanding of the CCCs as well as the Science and Engineering Practices (SEPs) provide a firm foundation for students to pursue future science in any subject.

CROSS-CURRICULAR Connections

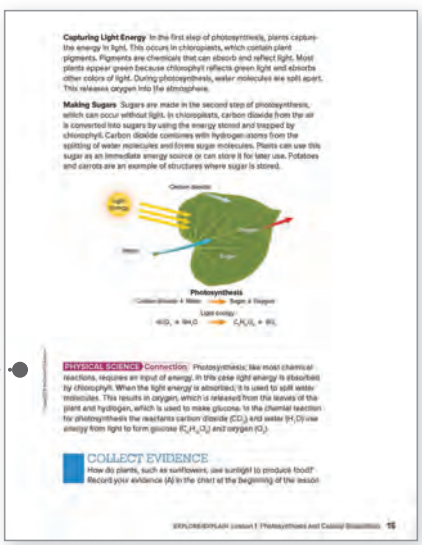
Other connections, such as those listed below are found throughout *Indiana Inspire Science* Lessons. These connections are found vertically and horizontally across disciplines as students approach a single phenomenon from different perspectives.

- Physical Science
- Environmental
- Writing
- Earth Science
- Health
- Reading



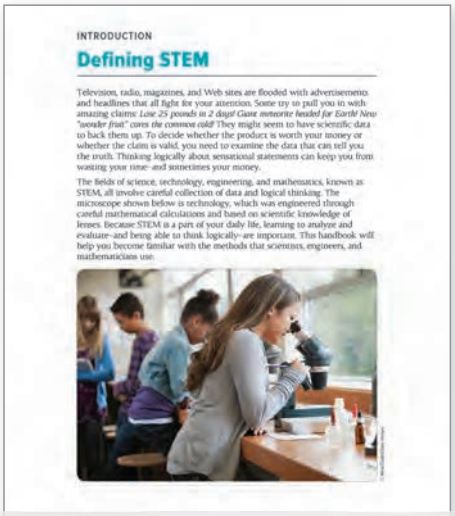
PHYSICAL SCIENCE Connection Photosynthesis, like most chemical reactions, requires an input of energy. In this case light energy is absorbed by chlorophyll. When the light energy is absorbed, it is used to split water molecules. This results in oxygen, which is released from the leaves of the plant and hydrogen, which is used to make glucose. In the chemial reaction for photosynthesis the reactants carbon dioxide (CO_2) and water (H_2O) use energy from light to form glucose ($C_6H_{12}O_6$) and oxygen (O_2).

EARTH SCIENCE Connection As you just learned, sediments can build up at the bottom of bodies of water and become soil. Sediment is any material that is broken down by the process of weathering and erosion then transported by wind, water, or gravity. Sediments are usually transported by water. Runoff can move sediment into streams and other water passages. How do you think this process affects populations of aquatic organisms?



Integrated Engineering

Indiana Inspire Science 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 the Science and Engineering practices. Students can also practice these skills by applying them as they read through the handbook. The Student Edition also helps students understand the integration of engineering through lab explorations and module projects, where the science and engineering practices are interwoven with other concepts and content.

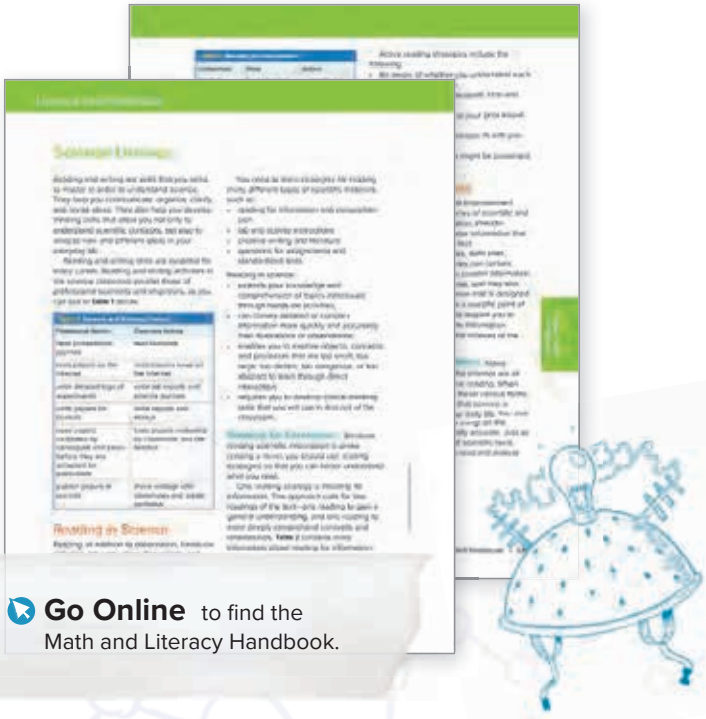

INTRODUCTION

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.

Go Online to find the Science and Engineering Handbook to learn more about each of the eight SEPs.



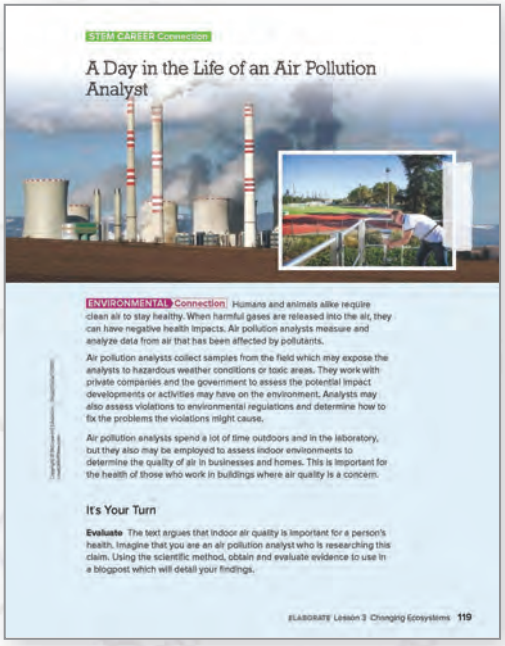
Go Online to find the Math and Literacy Handbook.

Math and Literacy Handbook

Indiana Inspire Science 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 Connection

STEM CAREER Connection allow students to connect with science by seeing potential career paths, as well as how what they're studying connects to the real world. Students can read about the STEM CAREER, and then do an activity for further exploration in the It's Your Turn section of the feature.


STEM CAREER Connection

A Day in the Life of an Air Pollution Analyst

ENVIRONMENTAL Connection Humans and animals alike require clean air to stay healthy. When harmful gases are released into the air, they can have negative health impacts. Air pollution analysts measure and analyze data from air that has been affected by pollutants.

Air pollution analysts collect samples from the field which may expose the analysts to hazardous weather conditions or toxic areas. They work with private companies and the government to assess the potential impact developments or activities may have on the environment. Analysts may also assess violations to environmental regulations and determine how to fix the problems the violations might cause.

Air pollution analysts spend a lot of time outdoors and in the laboratory, but they also may be employed to assess indoor environments to determine the quality of air in businesses and homes. This is important for the health of those who work in buildings where air quality is a concern.

It's Your Turn

Evaluate The text argues that indoor air quality is important for a person's health. Imagine that you are an air pollution analyst who is researching this claim. Using the scientific method, obtain and evaluate evidence to use in a blogpost which will detail your findings.

ELABORATE Lesson 3 Changing Ecosystems 119

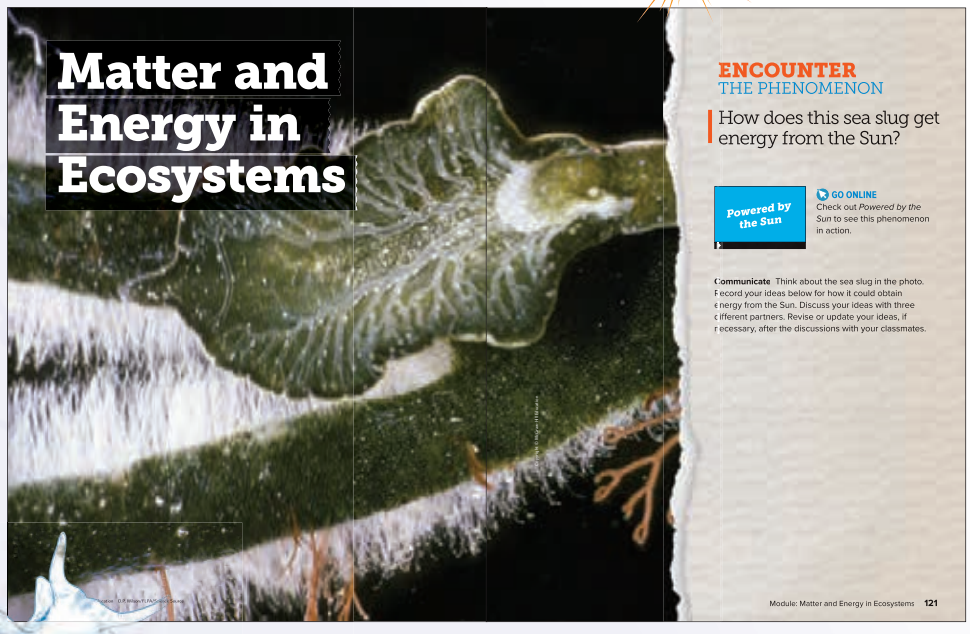
Phenomena-Driven Learning

Every day, we are surrounded by natural phenomena that pique our curiosity. In *Indiana Inspire Science*, these phenomena are the centerpiece of each 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 lesson-level phenomenon, they will gather their Claim, Evidence, and Reasoning to solve and explain the module-level phenomenon.

Anchoring Module Phenomena

ENCOUNTER
THE PHENOMENON

How does this sea slug get energy from the sun?



Phenomena Feature

A fact, occurrence, or circumstance observed or observable; something that is impressive or extraordinary

Did You Know?

Learning Science

Use of real-world phenomena increases student engagement and depth of understanding, grounding scientific concepts in relatable, observable examples and setting the stage for learners to engage in authentic inquiry and scientific thinking.

UW Institute for Science and Math Education, 2016; Hapka, 2017

Investigative Lesson Phenomena

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

LESSON 1

How does a plant get the energy it needs to survive?

LESSON 2

How do organisms, such as these bears and the fish, get energy from the environment?

LESSON 3

How does matter, such as carbon, move through the environment?

Revisit the Phenomenon

In the Module Wrap-Up, students will connect what they've learned through the investigative lesson phenomena to explain the anchoring module phenomenon.

Inquiry-Based Learning

An inquiry-based approach to science and engineering education helps spark student curiosity and empower them to ask more questions, think more critically, answer deeper questions, and design solutions to the problems in their world. Today's students will need to know how to 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.

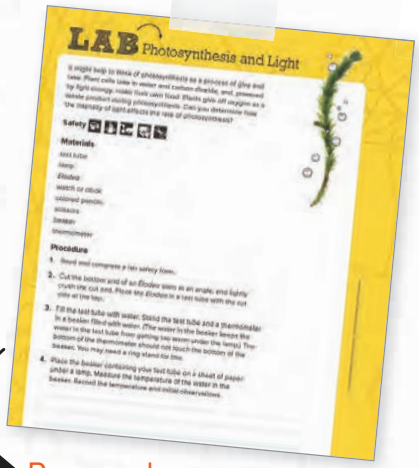
In *Indiana Inspire Science*, students will conduct two or three inquiry activities per lesson, typically in the Explore/Explain, and Elaborate phases of the 5E model. Students will use their results and findings from each lesson to communicate their understanding through the STEM Module Project at the end of each module. These activities help students achieve proficiency with the science and engineering practices.

Types of Inquiry Activities in *Inspire Science*

Inquiry is more than hands-on activities. With *Indiana Inspire Science*, 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



Research

Simulations

Engineering

Data Analysis

ENCOUNTER
THE PHENOMENON

How does a plant get the energy it needs to survive?

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 *Indiana Inspire Science* **Inquiry Spectrum** provides flexible options to adjust the inquiry level to align with the learning needs of each student.

Each lesson offers inquiry activities that have been developed with a recommended inquiry spectrum level, giving you the flexibility to modify the level of instruction based on your students' needs.

Inquiry Spectrum

Lab activities can be altered to one of three levels of inquiry based on student need.

Structured Inquiry
In this Inquiry Activity, students are given a question to investigate and a procedure to follow.

Guided Inquiry
To make this a Guided Inquiry activity, have students make prediction before they begin. Ask them how they will test their prediction. At the conclusion of the lab, encourage them to determine patterns in the data.

Open Inquiry
To make this an Open Inquiry activity, allow time for students to conduct research on factors that influence the rate of photosynthesis. Then, have them design and conduct an experiment to test one of those factors.

Did You Know?

Learning Science

Research suggests that deploying the appropriate type of inquiry approach at various stages of students' learning can improve their understanding of scientific concepts and procedures.

Banchi & Bell, 2008; Martin-Hansen, 2002

Hands-On Learning

Indiana Inspire Science's hands-on activities are designed to engage students, inspire investigation, and motivate deeper thinking about core science concepts.

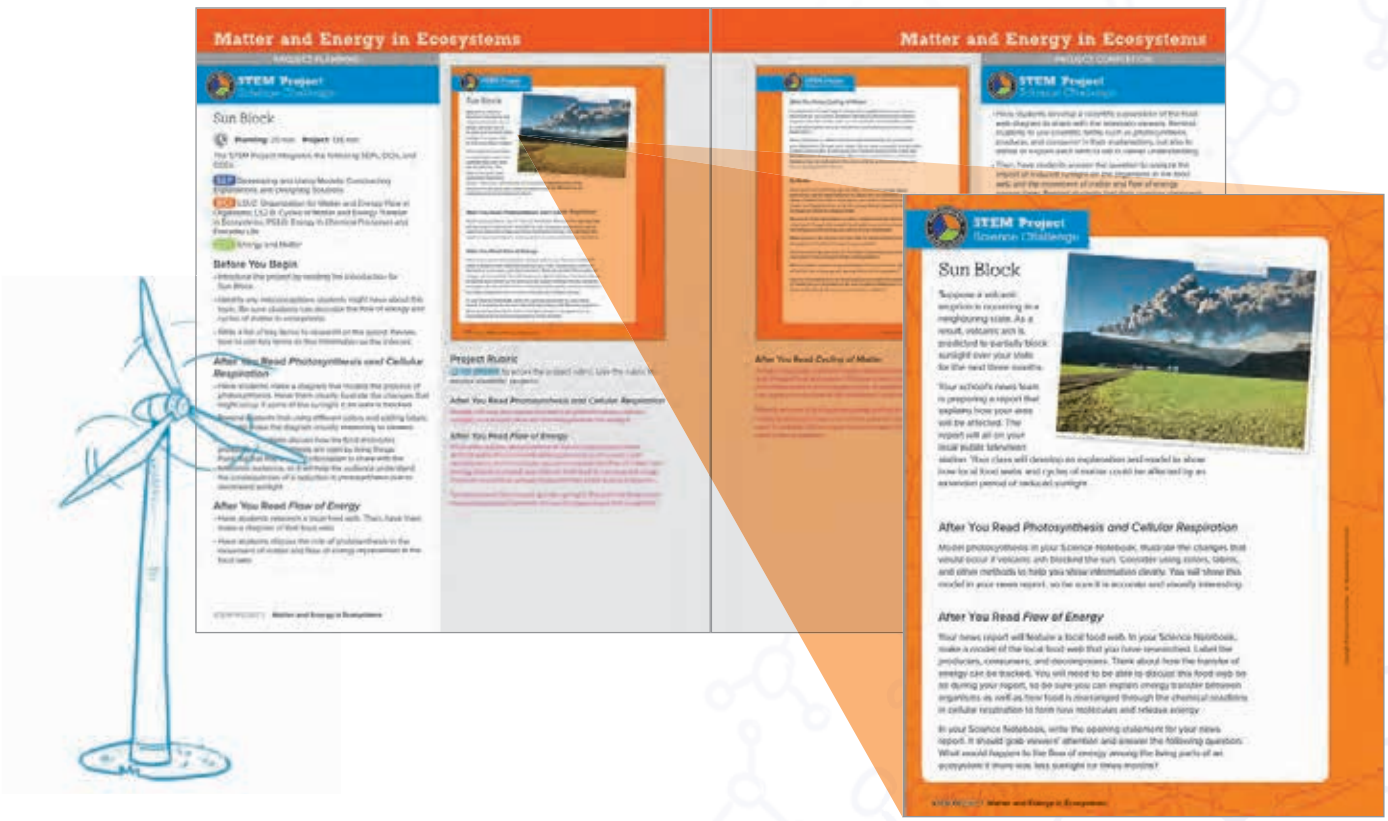
Inquiry Opportunities Include:

- STEM Module Projects
- LABS and INVESTIGATIONS

To help make hands-on learning easier, *Indiana Inspire Science* provides Collaboration Kits with hands-on materials are available for additional purchase.

Inquiry: STEM Module Projects

Each module kicks off with the launch of a STEM Module Project, that allow students to demonstrate their understanding of the module Performance Expectations through an engaging, real-world application, and help to build critical thinkers and innovators in our classrooms. To complete the project, students take on the role of actual scientists to follow the Engineering and Design process to solve problems and develop key Science and Engineering Practices and Cross Cutting Concepts aligned to the Module Anchoring Phenomenon. Customizable teacher and student rubrics are included for evaluation.



Inquiry: LABS and INVESTIGATIONS

Indiana Inspire Science is centered around inquiry where the program provides multiple opportunities in each module for student exploration.

All inquiry activities in *Indiana Inspire Science* promote student engagement and allow each student to develop inquiry and science and engineering skills. Activities range from simple INVESTIGATIONS to more complex LAB explorations, and cover the full range of the inquiry spectrum.

INVESTIGATIONS offer students the ability to quickly dive into a topic with simple questions in single or group settings. LAB activities provide more complex explorations with hands-on approaches to learning.

Did You Know?

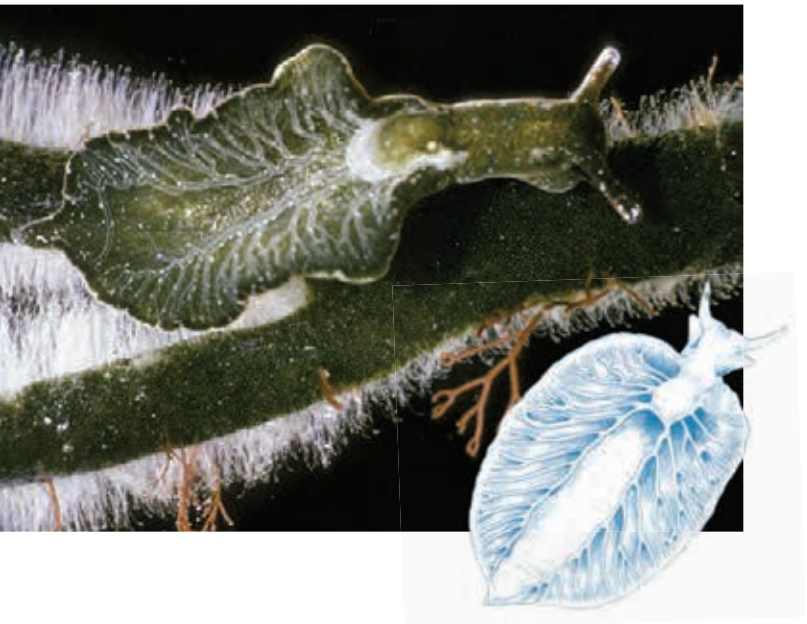
Learning Science

Collaborative learning activities promote student engagement and the development of scientific explanation and argumentation skills.

McNeill et al., 2006; Simon et al., 2006

Inspire All Students

Indiana Inspire Science 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!



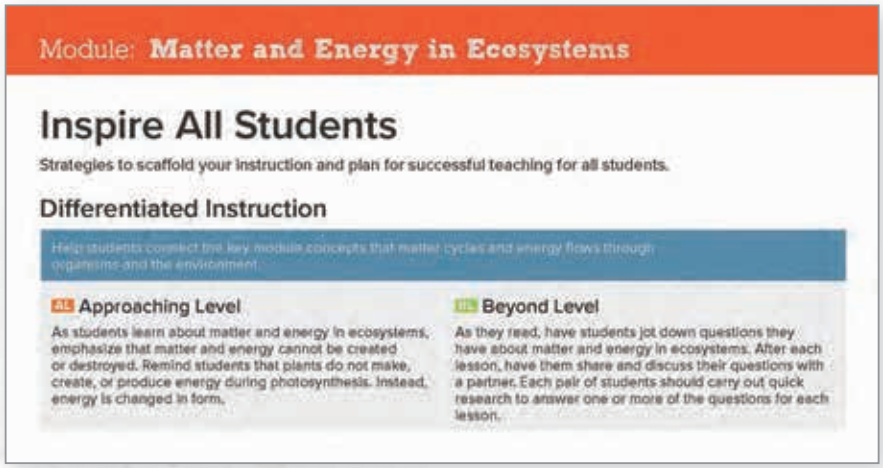
Engaging Phenomena

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.

Differentiated Instruction

Indiana Inspire Science incorporates the research-based Universal Design Learning Principles to provide educational practices that support multiple means of engagement, representation, action, and expression to ensure that all students have access to rigorous curriculum.

Robust differentiation support including guiding questions for different student levels, as well as differentiation guidance is found within the Teacher's Edition. Support with practice strategies is found at the module and lesson level at multiple points. Leveled text aligns with the lexile ranges of the standards.


Module: **Matter and Energy in Ecosystems**

Inspire All Students

Strategies to scaffold your instruction and plan for successful teaching for all students.

Differentiated Instruction

Help students connect the key module concepts that matter cycles and energy flows through organisms and the environment.

AL Approaching Level

As students learn about matter and energy in ecosystems, emphasize that matter and energy cannot be created or destroyed. Remind students that plants do not make, create, or produce energy during photosynthesis. Instead, energy is changed in form.

BL Beyond Level

As they read, have students jot down questions they have about matter and energy in ecosystems. After each lesson, have them share and discuss their questions with a partner. Each pair of students should carry out quick research to answer one or more of the questions for each lesson.

Did You Know?

Learning Science

Alignment with Universal Design for Learning (UDL) guidelines has been found to increase student engagement and contribute to improved learning outcomes, particularly for struggling learners.

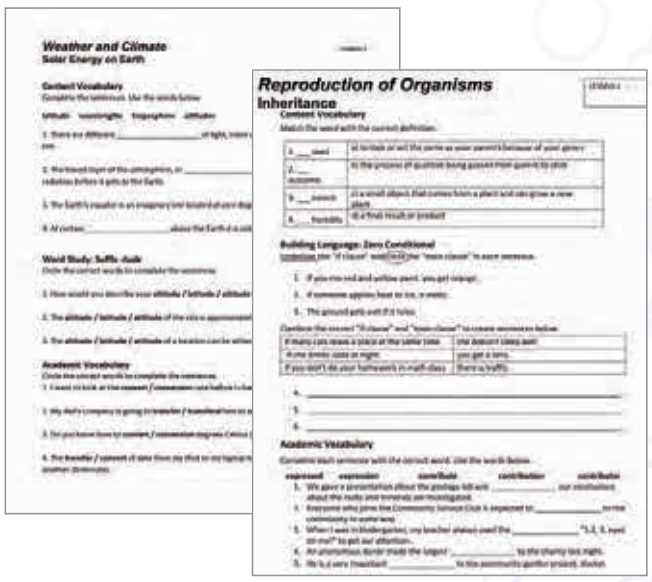
King-Sears, 2009; Rappolt-Schlichtmann et al., 2013

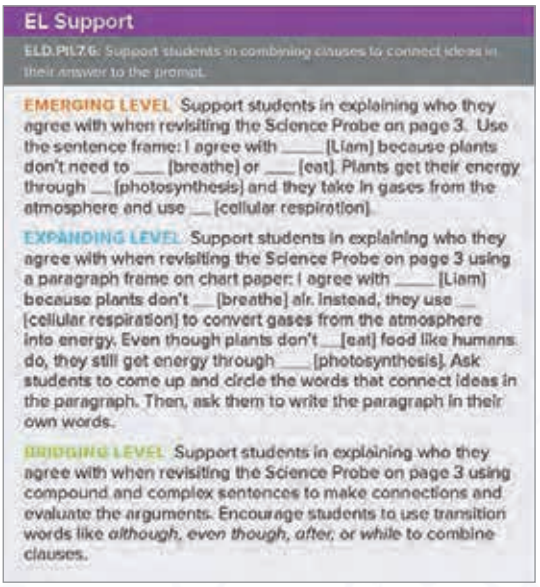
EL Support

Rooted in learning sciences research, *Indiana Inspire Science* applies the best instructional practices for teaching EL students. Each module and lesson has scaffolded activities designed to meet the English Language Development Standards and 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 *Indiana 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





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

Language Building Resources

Indiana Inspire Science lessons carefully integrate reading, writing, speaking, listening, and collaboration into each lesson. By doing so students are given a purpose to use the language in a meaningful way and have access to resources so they can convey their understanding.

Advanced Learners and Gifted Learners

Provide your advanced learners 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 Beyond Level support found in each module and lesson.

Assessment Strategies

Indiana Inspire Science 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 *Indiana Inspire Science*.

FEATURE	INSTRUCTIONAL PURPOSE	EXAMPLE
Page Keeley Science Probes	Found at the beginning of each lesson, Science Probes reveal student preconceptions to guide instruction.	
CLAIM/EVIDENCE/ REASONING	With the CER Framework (CLAIM/EVIDENCE/ REASONING), found in all lessons, 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 at least two of the 3 dimensions, checking their progress with the SEPs, DCIs, CCCs, and Performance Expectations.	
Module Pretest	The Module Pretests, found at the beginning of each module, assess prerequisite knowledge of Disciplinary Core Ideas from prior grades to evaluate student readiness for the module.	
Lesson Check	Found in every lesson online, Lesson Checks determine how students are building a progression of learning toward the Performance Expectations.	

Summative Assessment

Summative assessment tools at the module and lesson level help ensure lasting learning and alignment of student skills to the Performance Expectations.

FEATURE	INSTRUCTIONAL PURPOSE
Three-Dimensional Thinking Questions	At the end of the lessons, students will demonstrate their understanding of at least two of the three dimensions of the 2022 K–12 Indiana Academic Standards for Science to develop three-dimensional thinking skills.
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.
STEM Module Project	With each STEM Module Project 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.
Three-Dimensional Assessment Guide	The Three-Dimensional Assessment Guide provides additional practice with rigorous, three-dimensional questions and tasks. Inside you'll find guided and independent practice assessments for each module and unit, that include both discrete items and performance tasks. Teacher support for each assessment includes scope overviews that demonstrate how each test item is aligned to the three dimensions, along with detailed answer keys and rubrics. For the guided practice assessments, students will have a Three-Dimensional Coach with each item that includes test taking strategies that help them apply key dimensions within their response. In the independent practice assessment students explore similar concepts with new scenarios on their own to gain even more confidence with these question types. Unit tests and additional performance tasks are also included.

SMARTBOOK

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

- Improves reading comprehension by highlighting the most critical content a student needs to know
- Provides practice and review to identify where students are excelling or where more support is needed
- Prompts students to check their understanding and confirm content retention
- Includes detailed reports to help you identify at-risk students or topics for whole-group instruction

Professional Learning

We know it can be a challenge to implement a new science program with new standards. That's why *Indiana Inspire Science* comes with a library of relevant, self-paced, professional learning videos and modules to support you from implementation through instructional progression and mastery, all available 24/7, online.

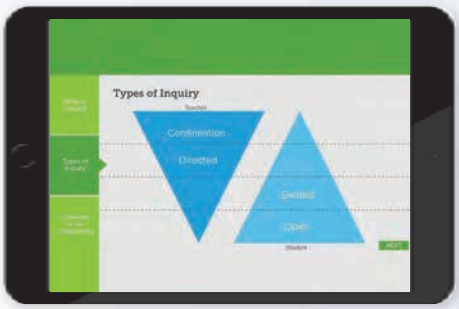
Program Implementation Support

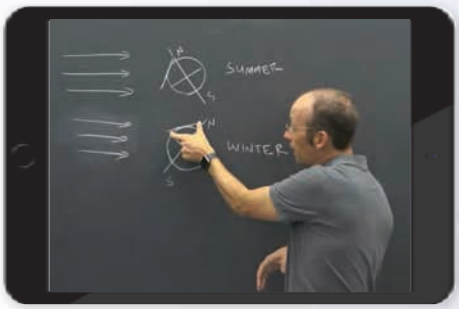
Implementation support provides everything you need to know to get up to speed on the first day of school.

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

Digital Platform Support

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. Step-by-step instructions for each of your digital tools help you feel confident planning, teaching, and assessing with digital.





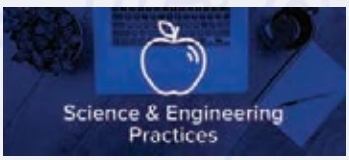
Ongoing Pedagogy Support

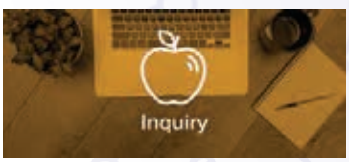
With *Indiana Inspire Science*, you will find a wide range of resources on key instructional and pedagogical topics, including videos from our program authors and consultants.

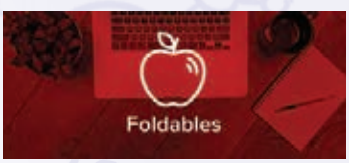
- **STEM Classroom Videos** that model lessons from real classrooms
- **Science Preconceptions Videos** that review common preconceptions and strategies to help overcome them
- **Instructional Coaching Videos** discussing best practice strategies and the "Why" behind the success
- **Teacher Activity Videos** that show planning tips and expected results to help with hands-on activity time
- **Science Pedagogy Micro-Courses** designed for your professional learning community with facilitation guides for both self-guided or small-group courses
- **LAB Videos** provide a step-by-step tutorial to walk students through each hands-on LAB. These can be used as a student guide, or as a substitute experience in remote learning environments or when a student is absent.

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.







Authors and Partners

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American Museum of Natural History
The American Museum of Natural History is one of the world's preeminent scientific and cultural institutions. Founded in 1869, the Museum has advanced its global mission to discover, interpret, and disseminate information about human cultures, the natural world, and the universe through a wide-ranging program of scientific research, education, and exhibition.

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.

SpongeLab Interactives
SpongeLab Interactives is a 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 of topics through the use of games, interactives, and video while teachers take advantage of formative, summative, or performance-based assessment information that is gathered through the learning management system.

Measured Progress, a not-for-profit organization, is a pioneer in authentic, standards-based assessments. Included with *Inspire Science* is **Measured Progress STEM Gauge®** assessment content which enables teachers to monitor progress.

Learning Science Research Citations

Learning Science

Did You Know?

	TOPIC	
1	Three-Dimensional Learning	Krajcik, J. (2015). Project-based science: Engaging students in three-dimensional learning. The Science Teacher, 82(1), 25. Next Generation Science Standards (NGSS). (n.d.). Three Dimensional Learning | Next Generation Science Standards. Retrieved, from https://www.nextgenscience.org/three-dimensions O'Day, B. (2016). Making the Transition to Three-Dimensional Teaching. Science and Children, 53(9), 26. Three Dimensional Learning | Next Generation Science Standards. (n.d.). https://www.nextgenscience.org/three-dimensions
2	Phenomena	UW Institute for Science and Math Education. (2016). Using Phenomena in NGSS-Designed Lessons and Units | (Practice Brief). http://stemteachingtools.org/brief/42 Hapka, A. (2017, June 26). How to Choose Good Phenomena [National Science Teachers Association]. http://nstacommunities.org/blog/2017/06/26/how-to-choose-good-phenomena
3	Inquiry	Banchi, H., & Bell, R. (2008). The many levels of inquiry. Science and Children, 46(2), 26. Martin-Hansen, L. (2002). Defining Inquiry. The Science Teacher, 69, 2.
4	Collaboration Kits	McNeill, K. L., Lizotte, D. J., Krajcik, J., & Marx, R. W. (2006). Supporting students' construction of scientific explanations by fading scaffolds in instructional materials. The Journal of the Learning Sciences, 15(2), 153–191. Simon, S., Erduran, S., & Osborne, J. (2006). Learning to Teach Argumentation: Research and Development in the Science Classroom. International Journal of Science Education, 28(2–3), 235–260.
5	UDL & Differentiated Instruction	King-Sears, M. (2009). Universal design for learning: Technology and Pedagogy. Learning Disability Quarterly, 32(4), 199–201. Rappolt-Schlichtmann, G., Daley, S. G., Lim, S., Lapinski, S., Robinson, K. H., & Johnson, M. (2013). Universal Design for Learning and Elementary School Science: Exploring the Efficacy, Use, and Perceptions of a Web-Based Science Notebook. Journal of Educational Psychology, 105(4), 1210.
6	Claims-Evidence-Reasoning Framework	Brunsell, E. (2012, September 25). Designing Science Inquiry: Claim + Evidence + Reasoning = Explanation. https://www.edutopia.org/blog/science-inquiry-claim-evidence-reasoning-eric-brunsell McNeill, K. L., & Martin, D. M. (2011). Claims, evidence, and reasoning. Science and Children, 48(8), 52. Zohar, A. (2007). Science Teacher Education and Professional Development in Argumentation. In S. Erduran, & M. Pilar Jimenez-Aleixandre (Eds.), Argumentation in Science Education: Perspectives from Classroom-Based Research (pp. 245–268). The Netherlands: Springer Press.
7	EL Support	Colorín Colorado. (2014). Opportunities and Challenges for ELLs in the Science Inquiry Classroom (Part 1). http://www.colorincolorado.org/article/opportunities-and-challenges-ells-science-inquiry-classroom-part-1 Medina-Jerez, W., Clark, D. B., Medina, A., & Ramirez-Marin, F. (2007). Science for ELLs: Rethinking our approach. The Science Teacher, 74(3), 52. Miller, E., Lauffer, H. B., & Messina, P. (2014). NGSS for English Language Learners: From Theory to Planning to Practice. Science and Children, 51(5), 55–59.
8	5E Model	Lesley University. (n.d.). Empowering Students: The 5E Model Explained. https://lesley.edu/article/empowering-students-the-5e-model-explained National Science Teachers Association (NSTA). (n.d.) NGSS Hub: Designing Units and Lessons. Retrieved from http://ngss.nsta.org/designing-units-and-lessons.aspx Tana J. B. Peterman. (2015, July). Next Generation Science Standards and the 5E instructional model. Retrieved March 22, 2018, from http://rr2p.org/article/396

Indiana Inspire Science

Module and Lesson Walk Through

This section will provide you with a step-by-step tour of one module to give you a sense for the types of activities and resources, both print and digital, available in each module of *Indiana Inspire Science*.

Here you will find examples of the following:

* Embedded Alignment 2022 K–12 Indiana Academic Standards for Science
* Module and Lesson Planning Resources
* Module Opener
* STEM Module Project Launch
* 5E Lesson
* STEM Module Project Wrap-Up
* Module Wrap-Up

Go Online

Go to mheonline.com/indiana for more information

Module and Lesson Planning Resources

Performance Expectations

The *Indiana Inspire Science* Teacher's Editions provides easy-to-follow correlations to the 2022 K–12 Indiana Academic Standards for Science so you know which modules address each Performance Expectation.

At the beginning of each unit are examples that show how the modules within the unit align to 2022 K–12 Indiana Academic Standards for Science in the **Performance Expectations at a Glance** feature.

SEP Science and Engineering Practices

SKILLS (for example, "Developing and Using Models")

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 interpreting 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 (for example, "The Roles of Water in Earth's Surface Processes")

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

- **Domain 1: Physical Science (PS)**
- **Domain 2: Life Science (LS)**
- **Domain 3: Earth and Space Science (ESS)**
- **Domain 4: Engineering, Technology, and Applications of Science (ETS)**

CCC Crosscutting Concepts

COMMON THEMES (for example, "Energy and Matter")

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 at a Glance

Students will discover and practice the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts needed to succeed with each Performance Expectation.

INDIANA ACADEMIC STANDARDS FOR SCIENCE

Inspire Integrated Chemistry and Physics, Indiana Edition is designed to meet 100% of the Indiana Academic Standards for Science through both print and digital resources. The Student Edition, accessible in print and online, can be used as a research tool by students as they investigate concepts and collect evidence. Interactive Digital Content, labs, and projects that support the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts are available online.

Correlation of *Inspire Integrated Chemistry and Physics, Indiana Edition* to the Indiana Academic Standards for Science

HS-ICP1-1	Matter and Its Interactions	
HS-ICP1-1	**Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.** **Clarification Statement:** Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.	**Activity:** *Electron Patterns in Atoms*, Module 16 Lesson 3
SEP Science and Engineering Practices		
SEP.2: Developing and Using Models Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s). • Use a model to predict the relationships between systems or between components of a system.		**Science and Engineering Practices Handbook:** Practice 2
DCI Disciplinary Core Ideas		
PS1.A: Structure and Properties of Matter • Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons.		**Student Edition:** 398–403, 404–407, 412, 504–506, 518
• The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.		**Student Edition:** 408–416, 422–429, 430–434, 435–442
CCC Crosscutting Concepts		
CC.1: Patterns • Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.		**Online:** *Science and Engineering Handbook*

xvi Indiana Academic Standards for Science Correlations

Correlations by Module:

Every module clearly identifies, by page number, the *Indiana Inspire Science* resources that align to 2022 K–12 Indiana Academic Standards for Science.

Module and Lesson Planning Resources

STEM Module Project Planning

Build excitement and get students curious about what they will be learning in each module with the STEM Module Project Launch that introduces the Science or Engineering Challenge they will prepare for over the course of the module.

STEM MODULE PROJECT

Students assume the role of a scientist or engineer and are charged with the task of designing a solution in the STEM Module Project.

What to Expect

Expected outcomes are presented aid in the planning process.

Objective

Objectives are in place to guide the discussion and set a goal for the STEM Module Project.

Customize the Module

GO ONLINE

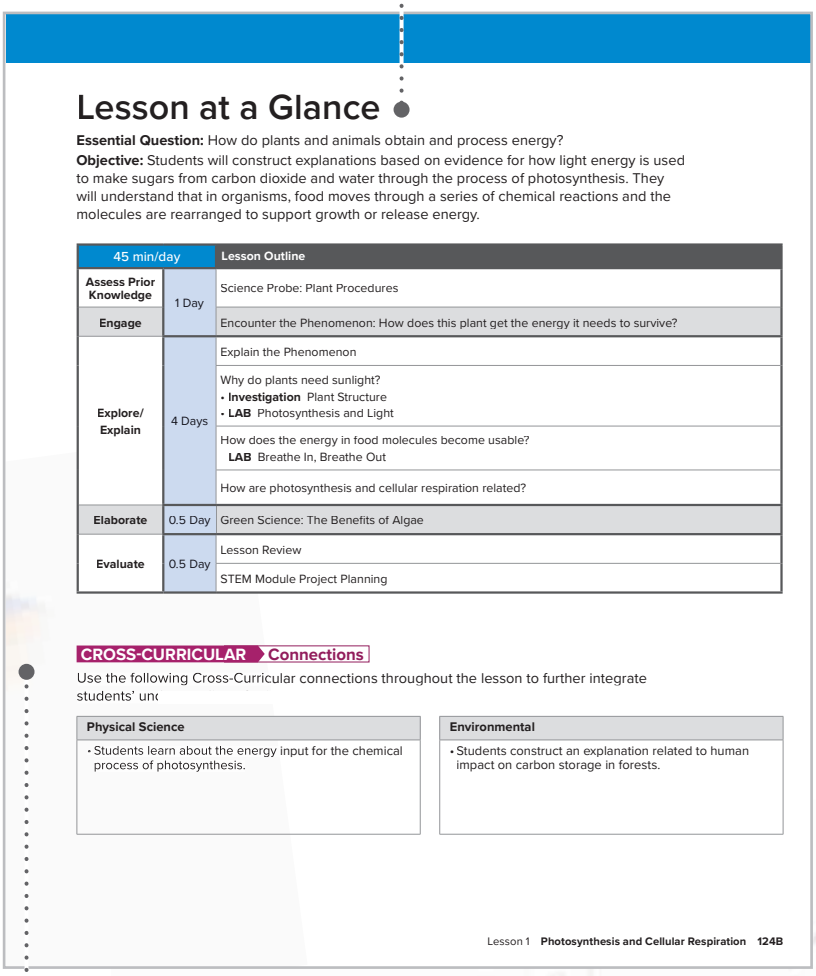
Look for correlated OER resources from our partners SpongeLab , PhET, and American Museum of Natural History to enhance your lesson.

Lesson at a Glance

Lesson at a Glance highlights the Objectives, lesson activities and labs along with Cross-Curricular Connections.

Lesson at a Glance

View connections that are found in each lesson.



Lesson at a Glance

Essential Question: How do plants and animals obtain and process energy?
Objective: Students will construct explanations based on evidence for how light energy is used to make sugars from carbon dioxide and water through the process of photosynthesis. They will understand that in organisms, food moves through a series of chemical reactions and the molecules are rearranged to support growth or release energy.

45 min/day		Lesson Outline
Assess Prior Knowledge	1 Day	Science Probe: Plant Procedures
Engage		Encounter the Phenomenon: How does this plant get the energy it needs to survive?
Explore/ Explain	4 Days	Explain the Phenomenon
		Why do plants need sunlight? • **Investigation** Plant Structure • **LAB** Photosynthesis and Light
		How does the energy in food molecules become usable? **LAB** Breathe In, Breathe Out
		How are photosynthesis and cellular respiration related?
Elaborate	0.5 Day	Green Science: The Benefits of Algae
Evaluate	0.5 Day	Lesson Review
		STEM Module Project Planning

CROSS-CURRICULAR Connections

Use the following Cross-Curricular connections throughout the lesson to further integrate students' unc

Physical Science	Environmental
• Students learn about the energy input for the chemical process of photosynthesis.	• Students construct an explanation related to human impact on carbon storage in forests.

Lesson 1 **Photosynthesis and Cellular Respiration** 124B

CROSS-CURRICULAR Connections

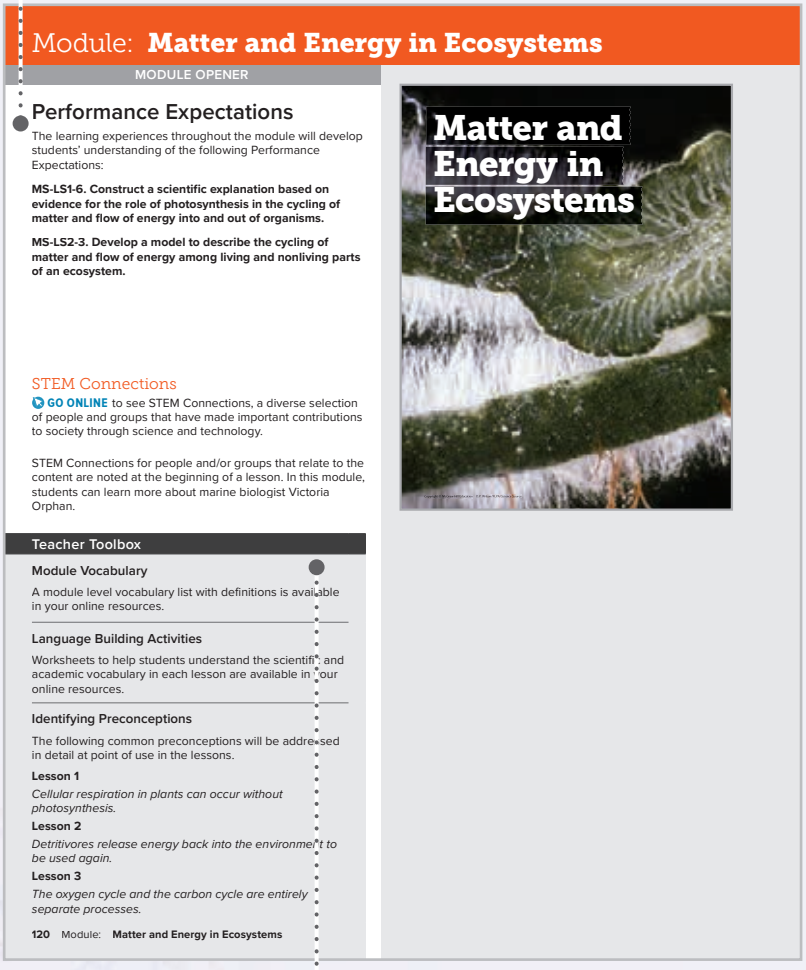
Cross-Curricular Connections are found throughout each *Indiana Inspire Science* Lesson. These connections are found vertically and horizontally across disciplines as students approach a single phenomenon from different perspectives.

Module Opener

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

Performance Expectations

Performance Expectations are identified to inform what students will be learning throughout the module.



Module: **Matter and Energy in Ecosystems**

MODULE OPENER

Performance Expectations

The learning experiences throughout the module will develop students' understanding of the following Performance Expectations:

MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

STEM Connections

GO ONLINE to see STEM Connections, a diverse selection of people and groups that have made important contributions to society through science and technology.

STEM Connections for people and/or groups that relate to the content are noted at the beginning of a lesson. In this module, students can learn more about marine biologist Victoria Orphan.

Teacher Toolbox

Module Vocabulary

A module level vocabulary list with definitions is available in your online resources.

Language Building Activities

Worksheets to help students understand the scientific and academic vocabulary in each lesson are available in your online resources.

Identifying Preconceptions

The following common preconceptions will be addressed in detail at point of use in the lessons.

Lesson 1

Cellular respiration in plants can occur without photosynthesis.

Lesson 2

Detritivores release energy back into the environment to be used again.

Lesson 3

The oxygen cycle and the carbon cycle are entirely separate processes.

120 Module: **Matter and Energy in Ecosystems**

STEM Connections

GO ONLINE

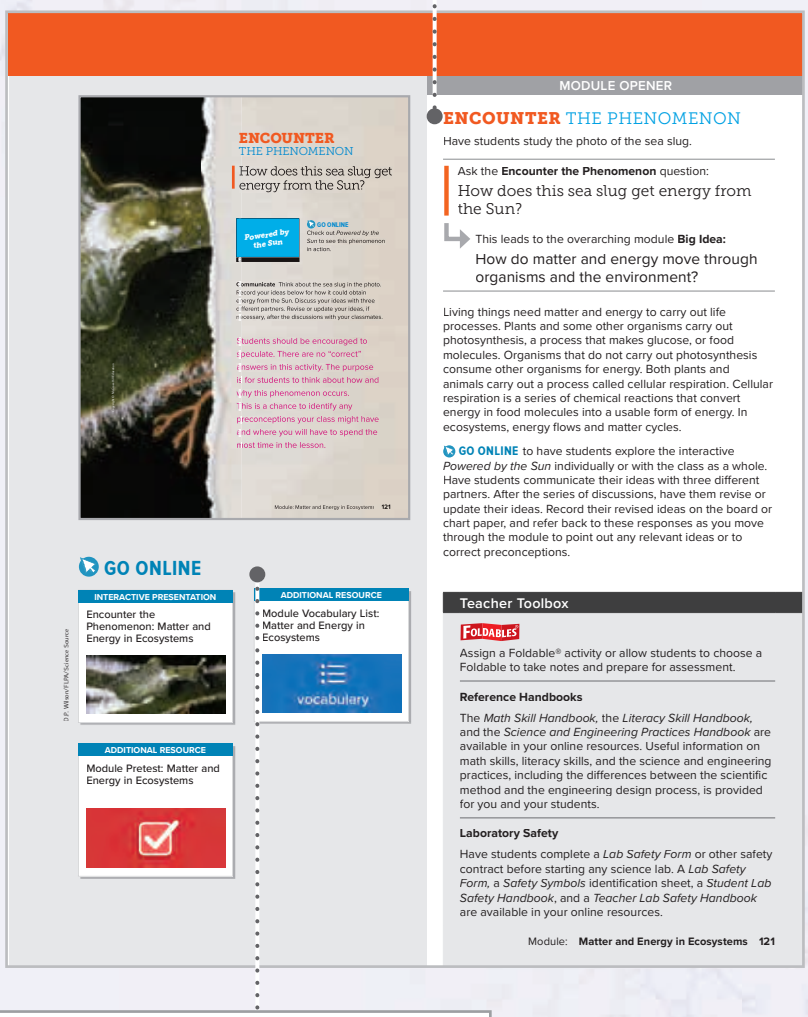
STEM Connections, found online, offer a diverse selection of people and groups that have made important contributions to society through science, technology, engineering, and math.

Teacher Toolbox

The Teacher Toolbox, found throughout each lesson, identifies common preconceptions related to the content at hand.

ENCOUNTER THE PHENOMENON

Performance Expectations are identified to inform what students will be learning throughout the module.



Encounter the Phenomenon

GO ONLINE

By Encountering the Phenomenon's interactive digital content, students begin thinking and talking about the phenomenon.

Science Probe

Formative Assessment

One of the most effective ways to support conceptual learning is through formative assessment. That is why *Indiana Inspire Science* begins every lesson with a formative assessment science probe to assess students' prior knowledge.

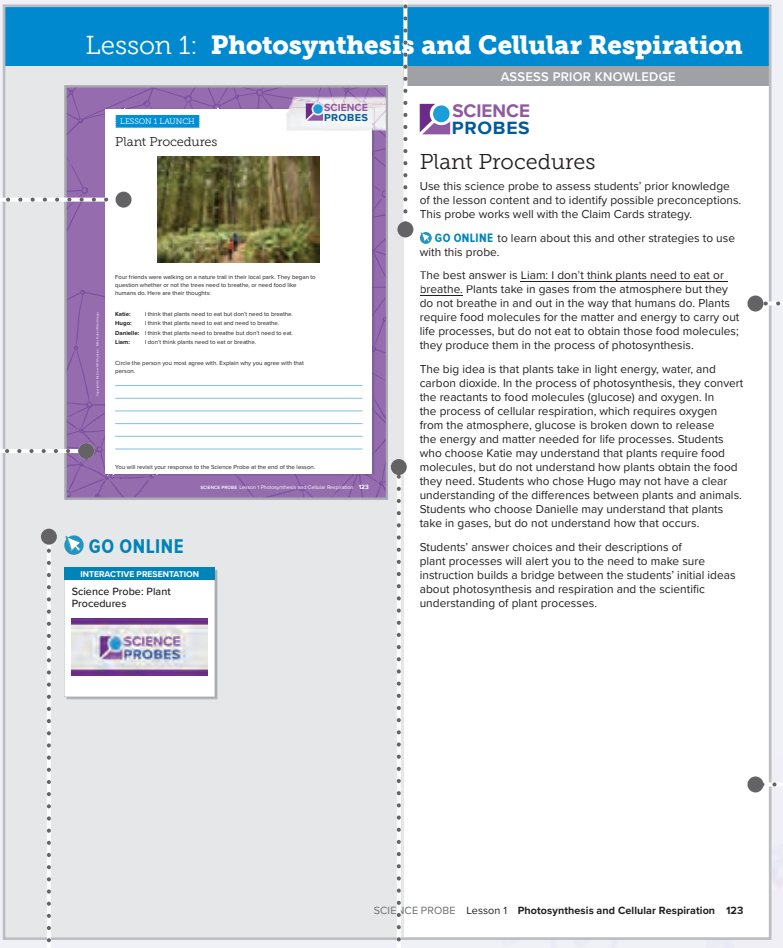
Science probes present a real-world phenomenon or a core concept to promote student thinking and discussion, revealing commonly-held preconceptions and initial ideas that student bring to their learning.

Simple Illustration or Scenarios

Science Probes present students with familiar real-world phenomena or a core concept. These could be in the form of a simple illustration or scenario.

Revisit the Probe

Students will revisit the science probe throughout the lesson to see how your students' thinking evolves.



GO ONLINE

Under your Professional Development blade you will find video strategies to guide each formative assessment probe through differentiation strategies.

"Best" Versus "Right" Answer

Students are more motivated to learn in a non-judgmental environment. By referencing the "best answer" to explain thinking, rather than the "right answer," students feel safe in sharing their thinking.

DCI Disciplinary Core Ideas

DCIs bring into focus the important concepts and organizing principles across science or engineering.

GO ONLINE

Science Probes are available in print or digitally to meet the needs of your classroom.

Explanatory Answers Reveal Students' Thoughts

Students are required to provide an explanation for their answer, which helps uncover preconceptions that may be guiding students' thought process.

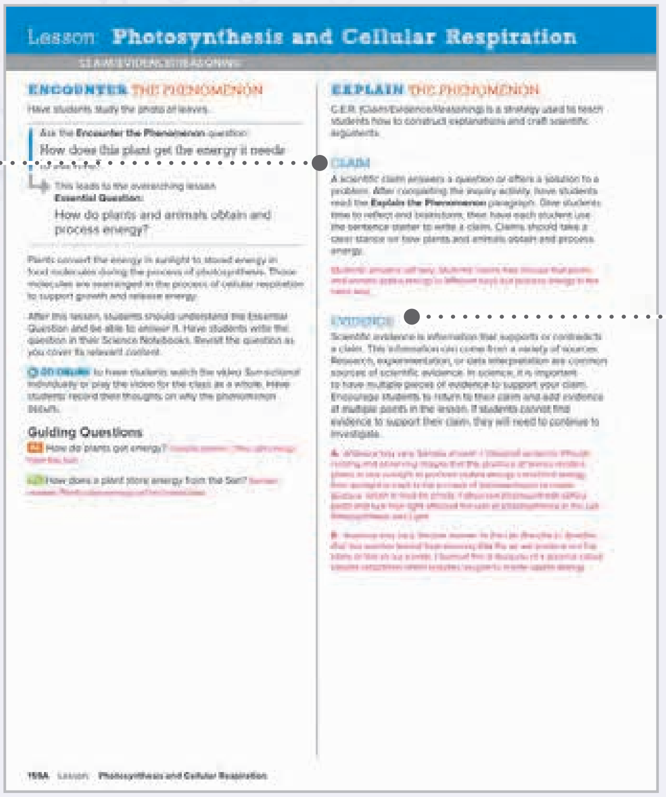
Engage

The ENGAGE phase will inspire students' curiosity with a real-world phenomenon they will investigate throughout the lesson. Uncover students' preconceptions with collaborative conversations and watch them turn their initial observations into questions.

As students progress through the lesson they will begin to reveal answers and will revisit their initial thinking and see how it changes as they learn new information.

CLAIM

Students will reflect and brainstorm possible answers and should take a clear stance on how the object will move.


Lesson: Photosynthesis and Cellular Respiration

ENCOUNTER THE PHENOMENON

How does this plant get the energy it needs?

How do plants and animals obtain and process energy?

Guiding Questions

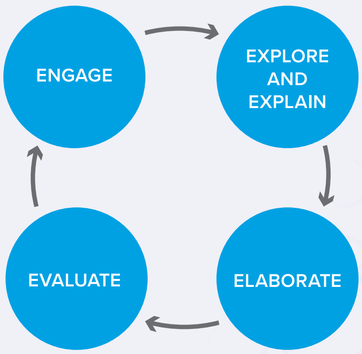
EXPLAIN THE PHENOMENON

CLAIM

EVIDENCE

EVIDENCE

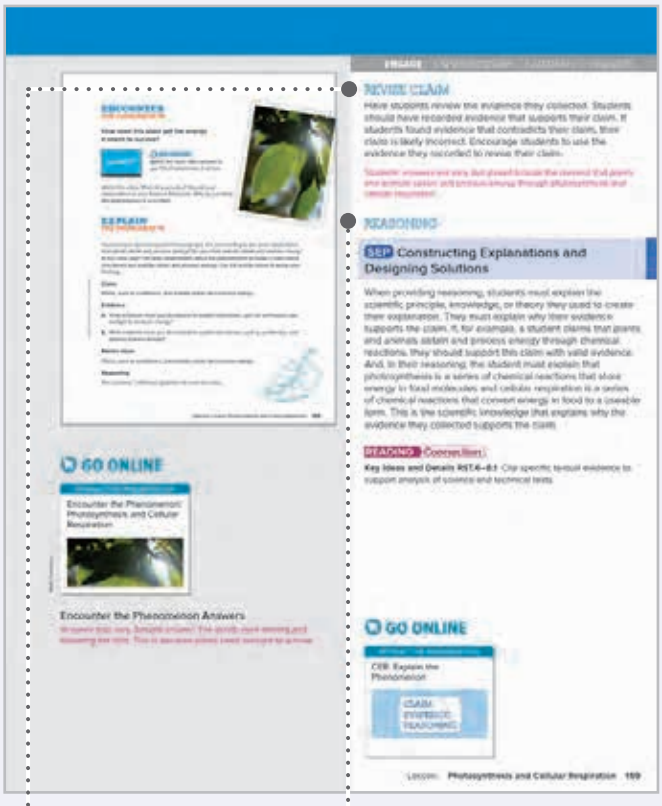
Students can provide evidence from what they learn in the lesson. However, students will return to this chart to add more evidence as it is revealed throughout the lesson.



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.

Engage



REVISED CLAIM

Students will explain the scientific knowledge, principle, or theory they used to support their argument to their claim to add more evidence as it is revealed throughout the lesson.

REASONING

Students provide reasoning to support the scientific knowledge, principle, or theory they used to support their argument used to support their claim.

Explore/Explain

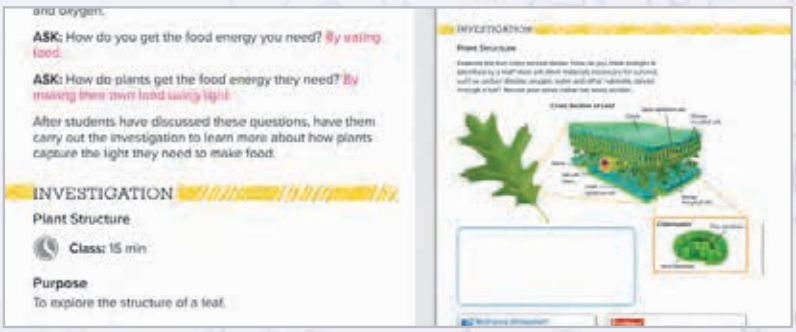
The EXPLORE/EXPLAIN phase lets your students get involved and investigate the phenomenon through a related, common experience. Students will carry out an investigation, collect and interpret data and begin to reveal answers to their questions to build understanding using different types of inquiry activities.

GO ONLINE

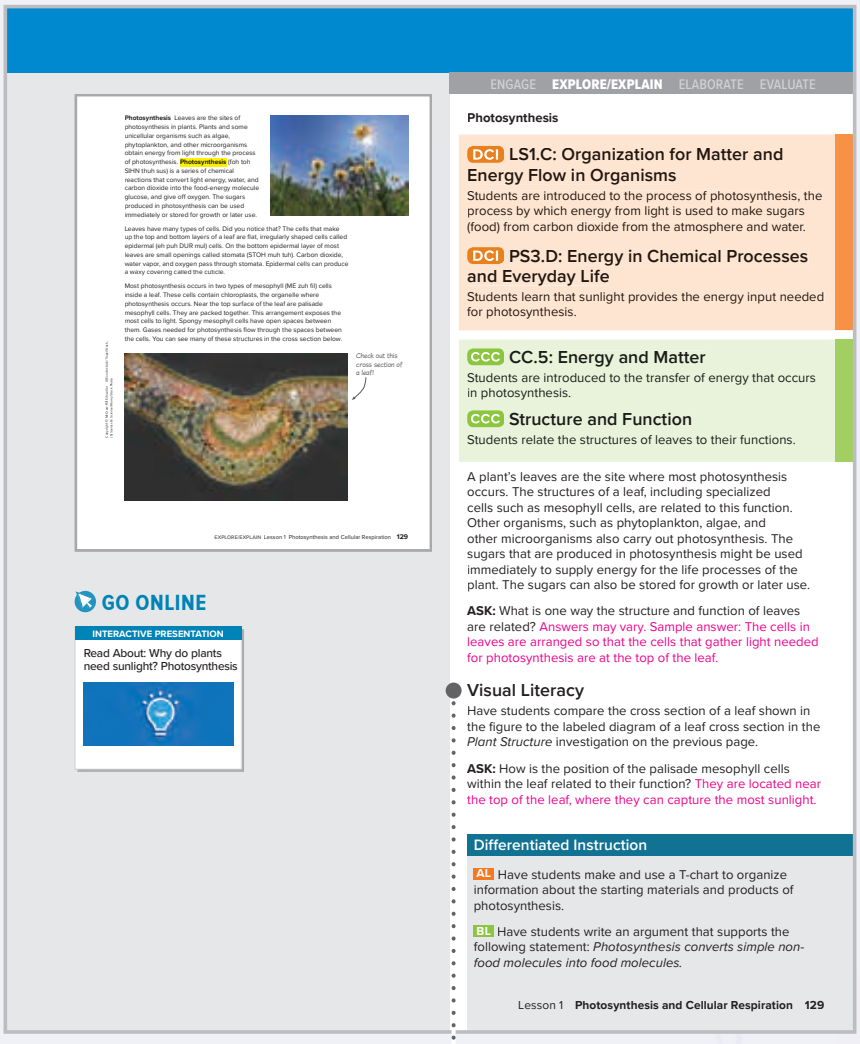
Use Dinah Zike's Notebook Foldables® as a tool to organize important lesson information to help students take notes and construct the meaning of the lesson.

INVESTIGATIONS

All students learn differently and *Indiana Inspire Science* provides opportunities for all learners to be successful. Visual Literacy encourages students to study and review the figure to better learn the topic.



Explore/Explain



Photosynthesis Leaves are the sites of photosynthesis in plants. Plants and some unicellular organisms such as algae, phytoplankton, and other microorganisms obtain energy from light through the process of photosynthesis. **Photosynthesis** (foh toh SIHN thuh sus) is a series of chemical reactions that convert light energy, water, and carbon dioxide into the food-energy molecule glucose, and give off oxygen. The sugars produced in photosynthesis can be used immediately or stored for growth or later use.

Leaves have many types of cells. Did you notice that? The cells that make up the top and bottom layers of a leaf are flat, irregularly shaped cells called epidermal (eh puh DUR mul) cells. On the bottom epidermal layer of most leaves are small openings called stomata (STOH muh tuh). Carbon dioxide, water vapor, and oxygen pass through stomata. Epidermal cells can produce a waxy covering called the cuticle.

Most photosynthesis occurs in two types of mesophyll (ME zuh fil) cells inside a leaf. These cells contain chloroplasts, the organelle where photosynthesis occurs. Near the top surface of the leaf are palisade mesophyll cells. They are packed together. This arrangement exposes the most cells to light. Spongy mesophyll cells have open spaces between them. Gases needed for photosynthesis flow through the spaces between the cells. You can see many of these structures in the cross section below.

Check out this cross section of a leaf!

EXPLORE/EXPLAIN Lesson 1 Photosynthesis and Cellular Respiration 129

GO ONLINE

INTERACTIVE PRESENTATION

Read About: Why do plants need sunlight? Photosynthesis

ENGAGE **EXPLORE/EXPLAIN** ELABORATE EVALUATE

Photosynthesis

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

Students are introduced to the process of photosynthesis, the process by which energy from light is used to make sugars (food) from carbon dioxide from the atmosphere and water.

DCI PS3.D: Energy in Chemical Processes and Everyday Life

Students learn that sunlight provides the energy input needed for photosynthesis.

CCC CC.5: Energy and Matter

Students are introduced to the transfer of energy that occurs in photosynthesis.

CCC Structure and Function

Students relate the structures of leaves to their functions.

A plant's leaves are the site where most photosynthesis occurs. The structures of a leaf, including specialized cells such as mesophyll cells, are related to this function. Other organisms, such as phytoplankton, algae, and other microorganisms also carry out photosynthesis. The sugars that are produced in photosynthesis might be used immediately to supply energy for the life processes of the plant. The sugars can also be stored for growth or later use.

ASK: What is one way the structure and function of leaves are related? Answers may vary. Sample answer: The cells in leaves are arranged so that the cells that gather light needed for photosynthesis are at the top of the leaf.

Visual Literacy

Have students compare the cross section of a leaf shown in the figure to the labeled diagram of a leaf cross section in the *Plant Structure* investigation on the previous page.

ASK: How is the position of the palisade mesophyll cells within the leaf related to their function? They are located near the top of the leaf, where they can capture the most sunlight.

Differentiated Instruction

AL Have students make and use a T-chart to organize information about the starting materials and products of photosynthesis.

BL Have students write an argument that supports the following statement: *Photosynthesis converts simple non-food molecules into food molecules.*

Lesson 1 **Photosynthesis and Cellular Respiration 129**

Learning Styles

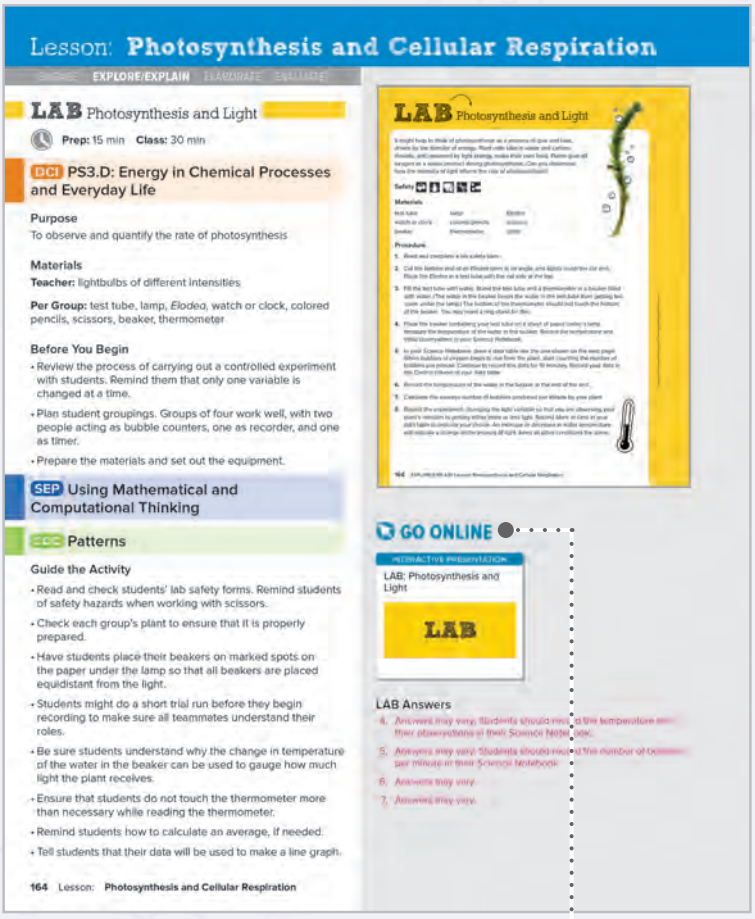
All students learn differently and *Indiana Inspire Science* provides opportunities for all learners to be successful. Visual Literacy encourages students to study and review the figure to better learn the topic.

Explore/Explain

Students will carry out an investigation, collect and interpret data, and begin to reveal answers to their questions and build understanding using different types of inquiry activities.

LAB

The LAB guide students to think about the phenomenon, make a prediction, and carry out an investigation to test their prediction.


Lesson: Photosynthesis and Cellular Respiration

EXPLORE/EXPLAIN ELABORATE EVALUATE

LAB Photosynthesis and Light

Prep: 15 min Class: 30 min

DCI PS3.D: Energy in Chemical Processes and Everyday Life

Purpose

To observe and quantify the rate of photosynthesis

Materials

Teacher: lightbulbs of different intensities

Per Group: test tube, lamp, *Elodea*, watch or clock, colored pencils, scissors, beaker, thermometer

Before You Begin

- Review the process of carrying out a controlled experiment with students. Remind them that only one variable is changed at a time.
- Plan student groupings. Groups of four work well, with two people acting as bubble counters, one as recorder, and one as timer.
- Prepare the materials and set out the equipment.

SEP Using Mathematical and Computational Thinking

CCC Patterns

Guide the Activity

- Read and check students' lab safety forms. Remind students of safety hazards when working with scissors.
- Check each group's plant to ensure that it is properly prepared.
- Have students place their beakers on marked spots on the paper under the lamp so that all beakers are placed equidistant from the light.
- Students might do a short trial run before they begin recording to make sure all teammates understand their roles.
- Be sure students understand why the change in temperature of the water in the beaker can be used to gauge how much light the plant receives.
- Ensure that students do not touch the thermometer more than necessary while reading the thermometer.
- Remind students how to calculate an average, if needed.
- Tell students that their data will be used to make a line graph.

164 Lesson: Photosynthesis and Cellular Respiration

LAB Photosynthesis and Light

GO ONLINE

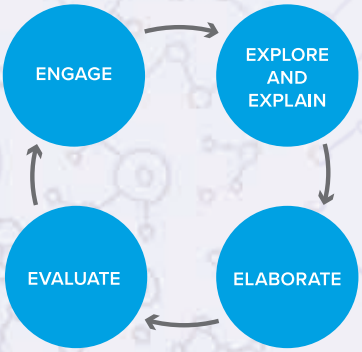
INTERACTIVE PRESENTATION

LAB: Photosynthesis and Light

LAB

LAB Answers

4. Answers may vary. Students should record the temperature in their observations or their Science Notebook.
5. Answers may vary. Students should record the number of bubbles per minute in their Science Notebook.
6. Answers may vary.
7. Answers may vary.

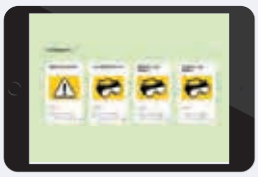


5E Instructional Model

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

GO ONLINE

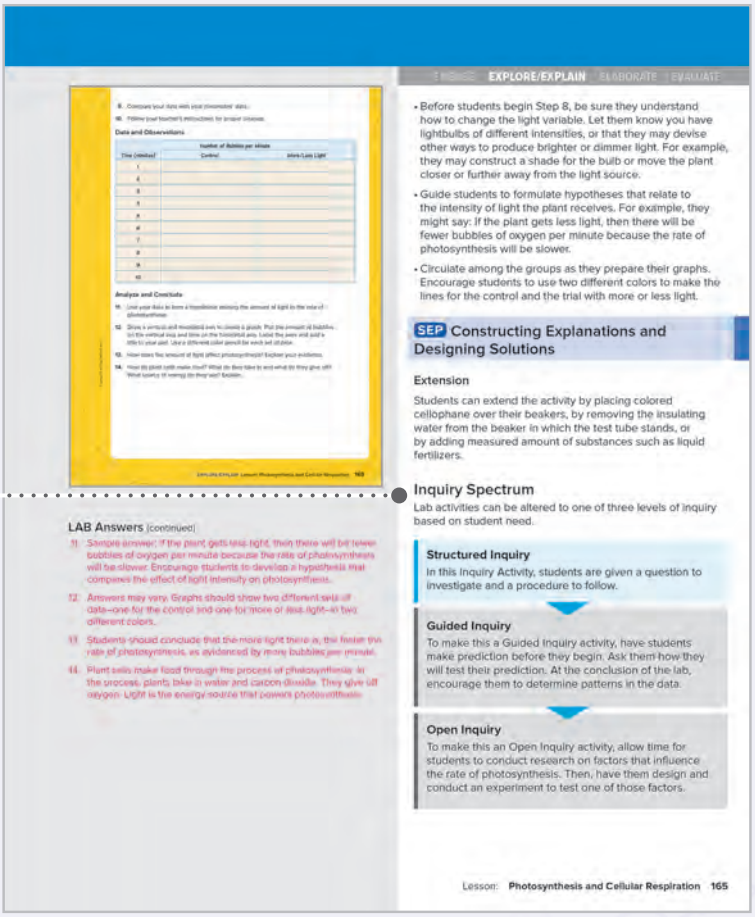
Find all of your student teacher and safety forms online.



Explore/Explain

SEP Science and Engineering Practices

SEPs 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.



EXPLORE/EXPLAIN ELABORATE EVALUATE

- Before students begin Step 8, be sure they understand how to change the light variable. Let them know you have lightbulbs of different intensities, or that they may devise other ways to produce brighter or dimmer light. For example, they may construct a shade for the bulb or move the plant closer or further away from the light source.
- Guide students to formulate hypotheses that relate to the intensity of light the plant receives. For example, they might say: If the plant gets less light, then there will be fewer bubbles of oxygen per minute because the rate of photosynthesis will be slower.
- Circulate among the groups as they prepare their graphs. Encourage students to use two different colors to make the lines for the control and the trial with more or less light.

SEP Constructing Explanations and Designing Solutions

Extension

Students can extend the activity by placing colored cellophane over their beakers, by removing the insulating water from the beaker in which the test tube stands, or by adding measured amount of substances such as liquid fertilizers.

Inquiry Spectrum

Lab activities can be altered to one of three levels of inquiry based on student need.

Structured Inquiry

In this Inquiry Activity, students are given a question to investigate and a procedure to follow.

Guided Inquiry

To make this a Guided Inquiry activity, have students make prediction before they begin. Ask them how they will test their prediction. At the conclusion of the lab, encourage them to determine patterns in the data.

Open Inquiry

To make this an Open Inquiry activity, allow time for students to conduct research on factors that influence the rate of photosynthesis. Then, have them design and conduct an experiment to test one of those factors.

Lesson: Photosynthesis and Cellular Respiration 165

LAB Answers (continued)

11. Sample answer: If the plant gets less light, then there will be fewer bubbles of oxygen per minute because the rate of photosynthesis will be slower. Encourage students to develop a hypothesis that compares the effect of light intensity on photosynthesis.
12. Answers may vary. Graphs should show two different sets of data—one for the control and one for more or less light—in two different colors.
13. Students should conclude that the more light there is, the faster the rate of photosynthesis, as evidenced by more bubbles per minute.
14. Plant cells make food through the process of photosynthesis. In the process, plants take in water and carbon dioxide. They give off oxygen. Light is the energy source that powers photosynthesis.

Inquiry Spectrum

Each lesson offers inquiry activities giving you the flexibility to modify based on your students' needs.

Elaborate

In the ELABORATE phase students will be introduced to real-world STEM Careers and apply knowledge to new situations to develop a deeper understanding of the lesson concepts, use the skills they are learning, and make connections.

STEM CAREER Connection

Introduce students to real-world STEM professions that they may want to pursue.

Before You Read

Before You Read provides the background needed to facilitate class discussion.

After You Read

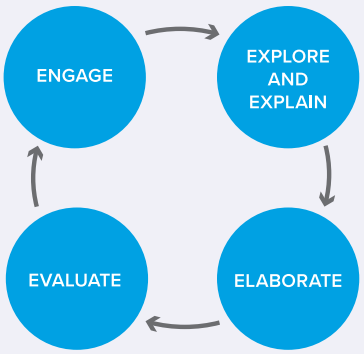
After You Read prompts students to think further and dig deeper into the STEM CAREER Connection.

It's Your Turn

It's Your Turn encourages students to go and find ways they can take what they have learned and apply it to their lives.

PRIMARY SOURCE

Use primary sources to learn about scientists and engineers and their related discoveries.

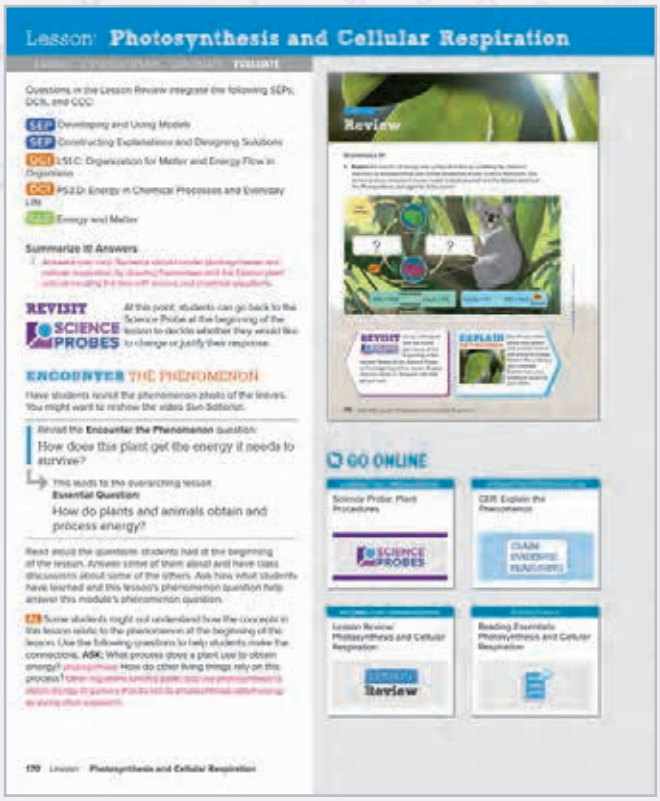


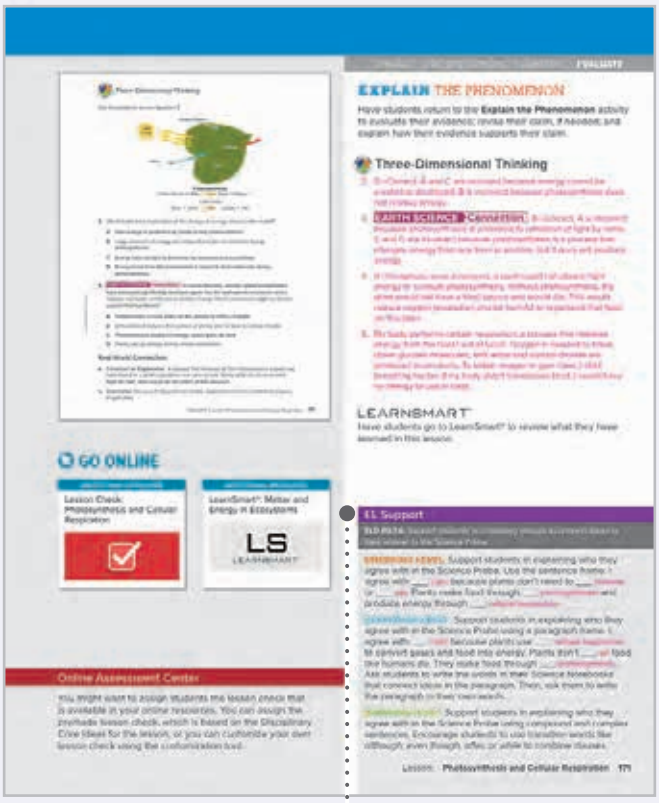
5E Instructional Model

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

Evaluate

In the EVALUATE phase of the instructional model, you are able to gauge student progress toward achieving lesson objectives. Each lesson offers inquiry activities giving you the flexibility to modify based on your students' needs.



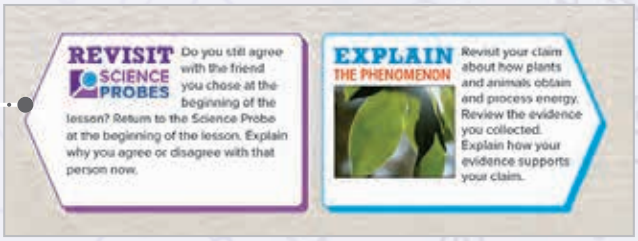


EL Support

Rooted in learning sciences research, *Indiana Inspire Science* 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.

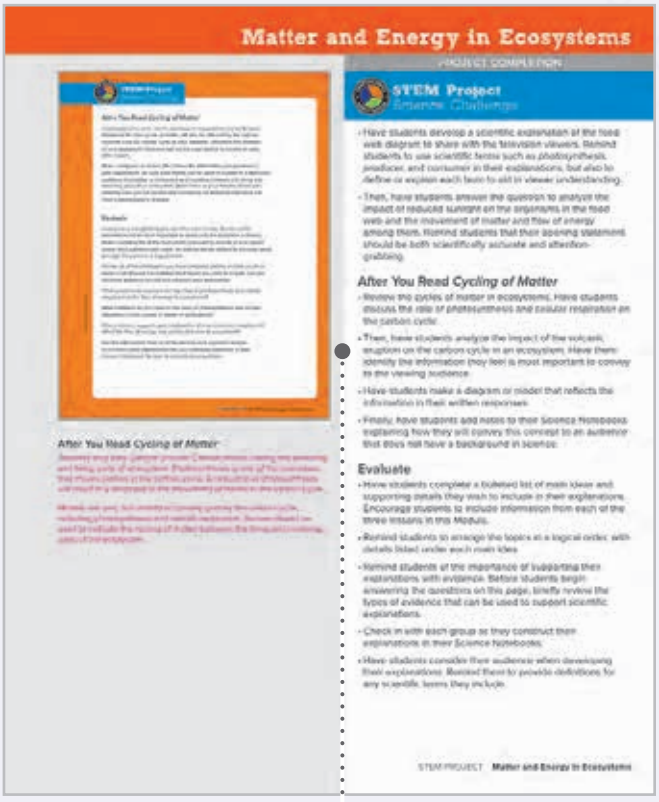
REVISIT the Probe

You will revisit the science probe throughout the lesson and see how your students' thinking evolves.



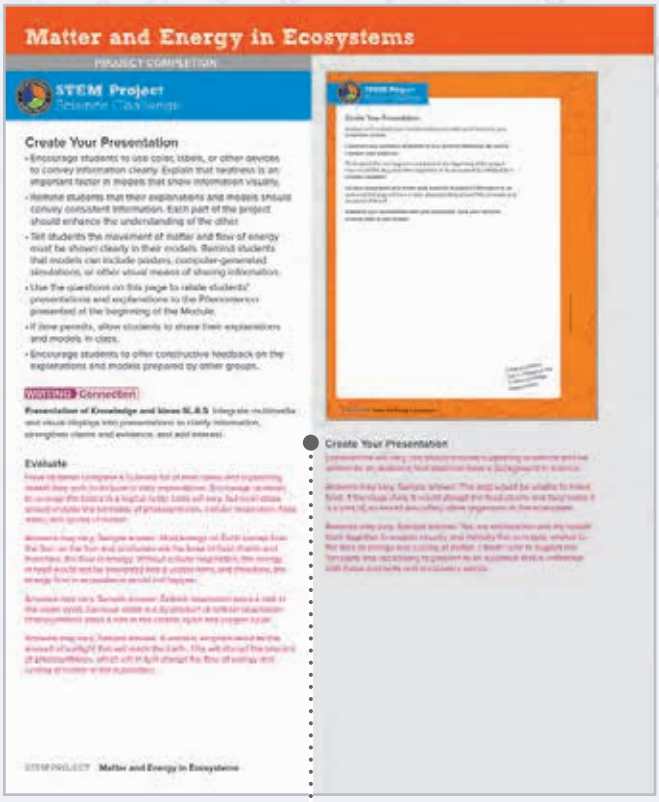
Module Project Completion

As your students begin planning for their STEM Module Project, they will revisit the planning pages they completed at the end of each lesson to see how they can apply to the challenge at hand. Students will define the problem they're trying to solve and complete research to deepen their understanding. After collecting the necessary information they will sketch models and select the best one to build.



Lesson Planning Review

As students begin to complete their project after the last lesson in the module, they will revisit their planning notes completed at the close of each lesson.



Create Your Presentation

As part of the planning process, students will create a presentation.

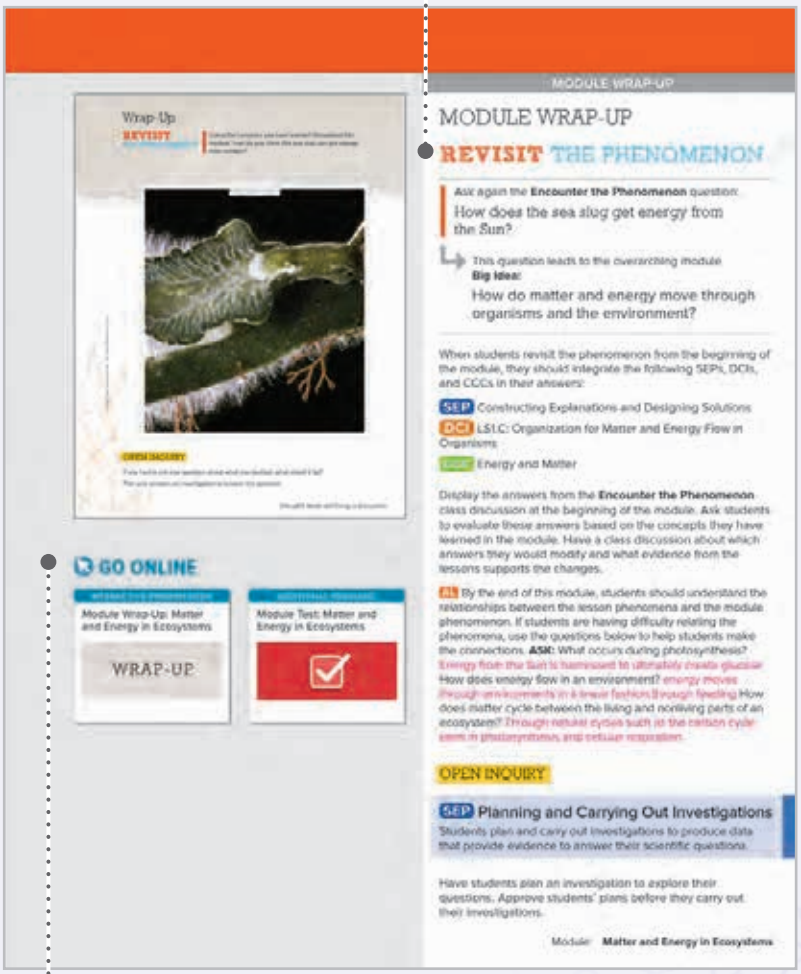
- Encourage students to use color, labels, or other devices.
- Remind students that their explorations and models should convey consistent information.
- Encourage students to offer constructive feedback during peer presentations.

Module Wrap-Up

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

REVISIT THE PHENOMENON

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



GO ONLINE

Go Online during the Module Wrap-Up to access a pre-made module test based on the Disciplinary Core Ideas or customize your own test.

Indiana Inspire Science

Digital Experience

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

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

Get Started by Logging In:

1. Go to **my.mheducation.com** from an Internet browser.
2. Enter your username and password and click "Log In."

Username: IndianaScienceMS
Password: sc1eNce

Go Online

Go to mheonline.com/indiana for more information

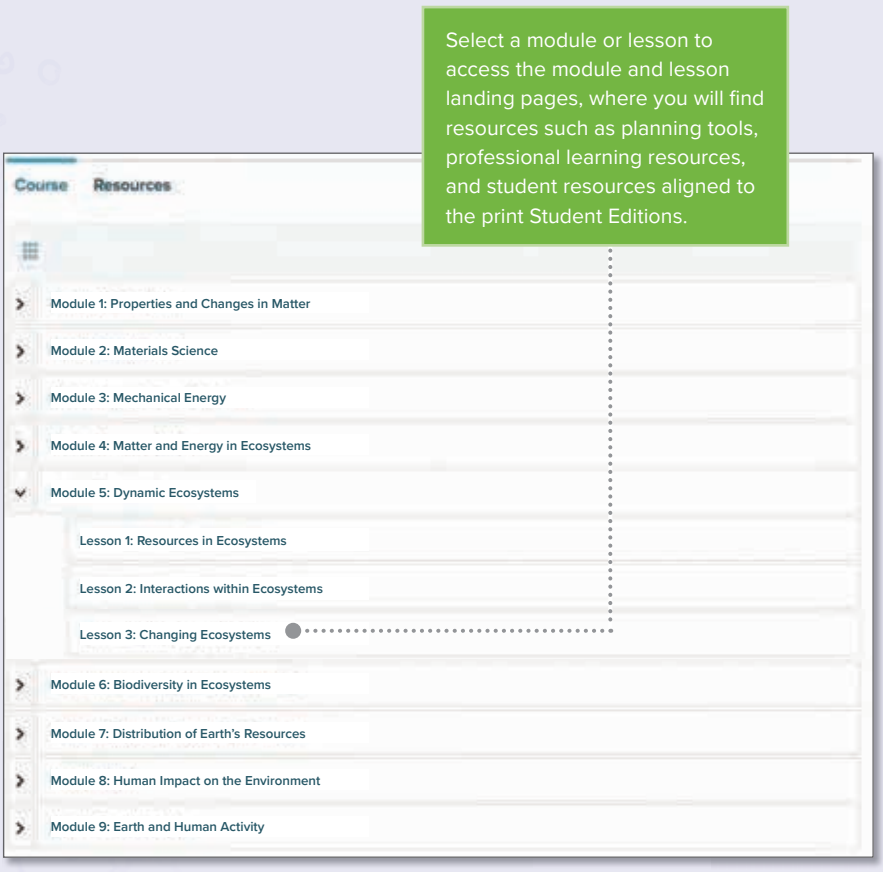
*The digital designs and navigation shown in this guide may vary as we continue to enhance the digital experience

Welcome to the *Indiana Inspire Science* digital experience!

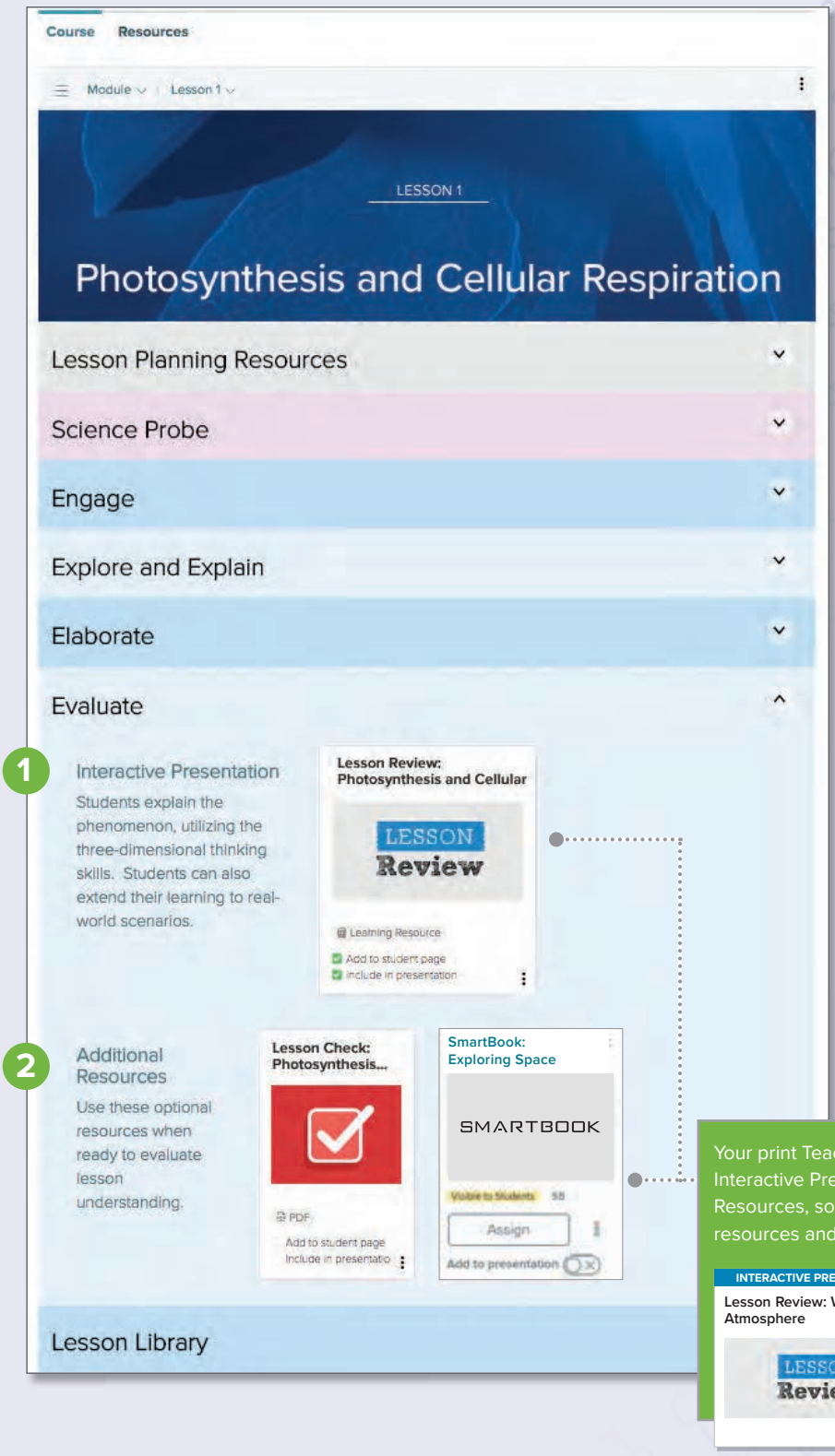
Use this section of your Program Guide to easily find the digital resources that make *Indiana Inspire Science* engaging and fun for students.

Choose a Module and Lesson

After launching your course, you will land on the table of contents page with expandable folders for all modules and lessons in the course. You will also find folders with documents to support understanding of the entire program, such as this Program Guide. Select a module, or a lesson within a module, to access the module and lesson landing pages.



Note: Digital design and navigation may vary.



Access Your Resources

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

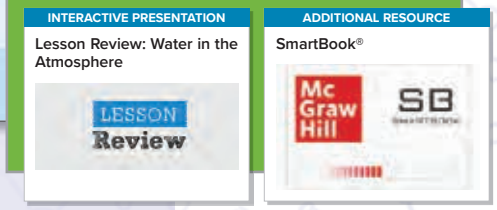
1 Interactive Presentation

These resources provide access to the digital content that aligns with the resources featured in the print Student Editions. By default, these resources will display on the student page and in the teacher presentation. Resources in the Interactive Presentation section of the module and lesson landing page folders are optimized for digital projection and student 1:1 device use.

2 Additional Resources

These resources provide access to supplemental content, optional 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.

Your print Teacher's Edition will reference Interactive Presentation and Additional Resources, so you can easily see your print resources and the paired digital resources:



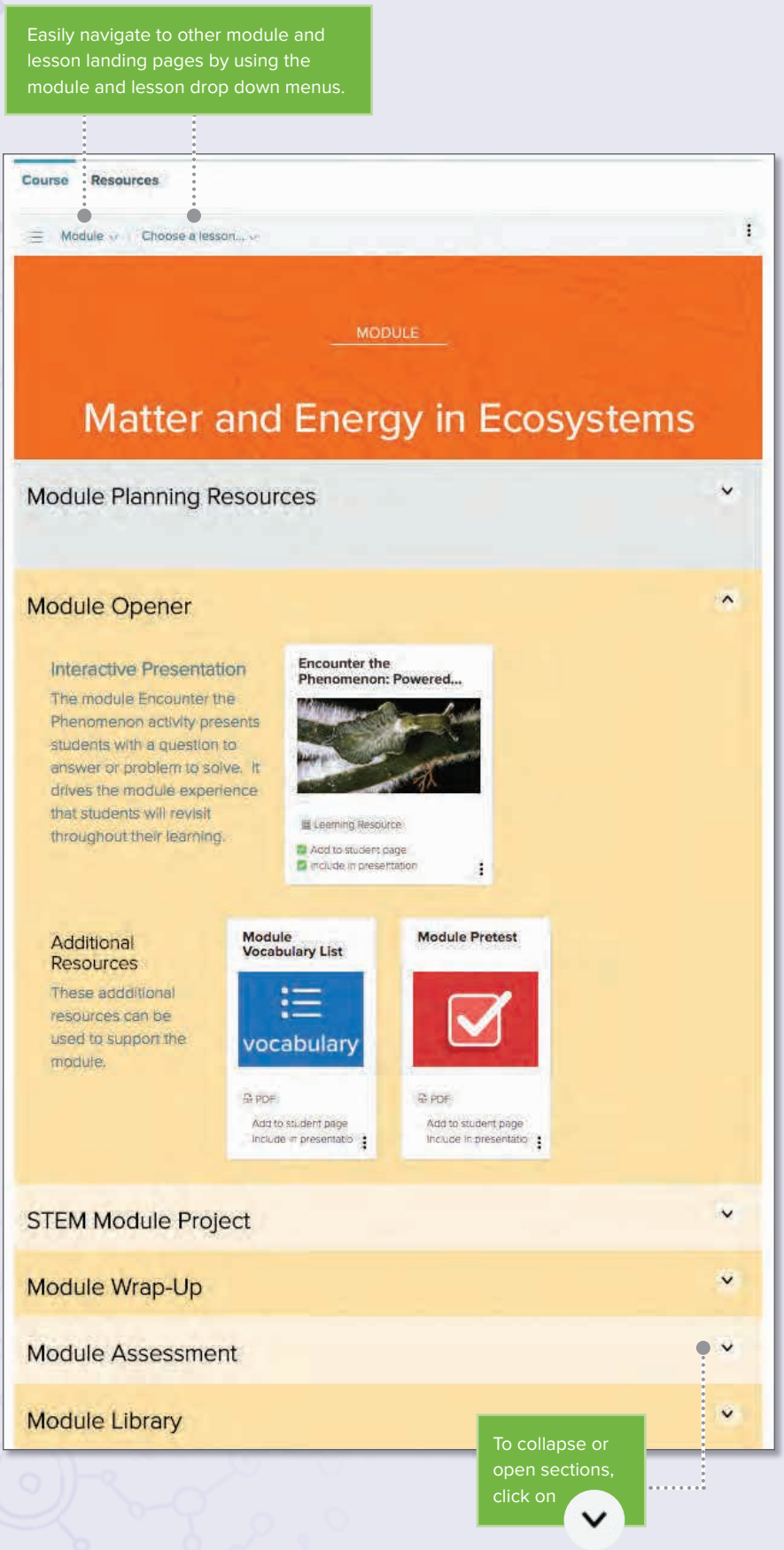
Access Module Interactive Resources

The Module Landing Pages

From the module landing pages, you can access module resources for teachers and students, organized by key module-level activities.

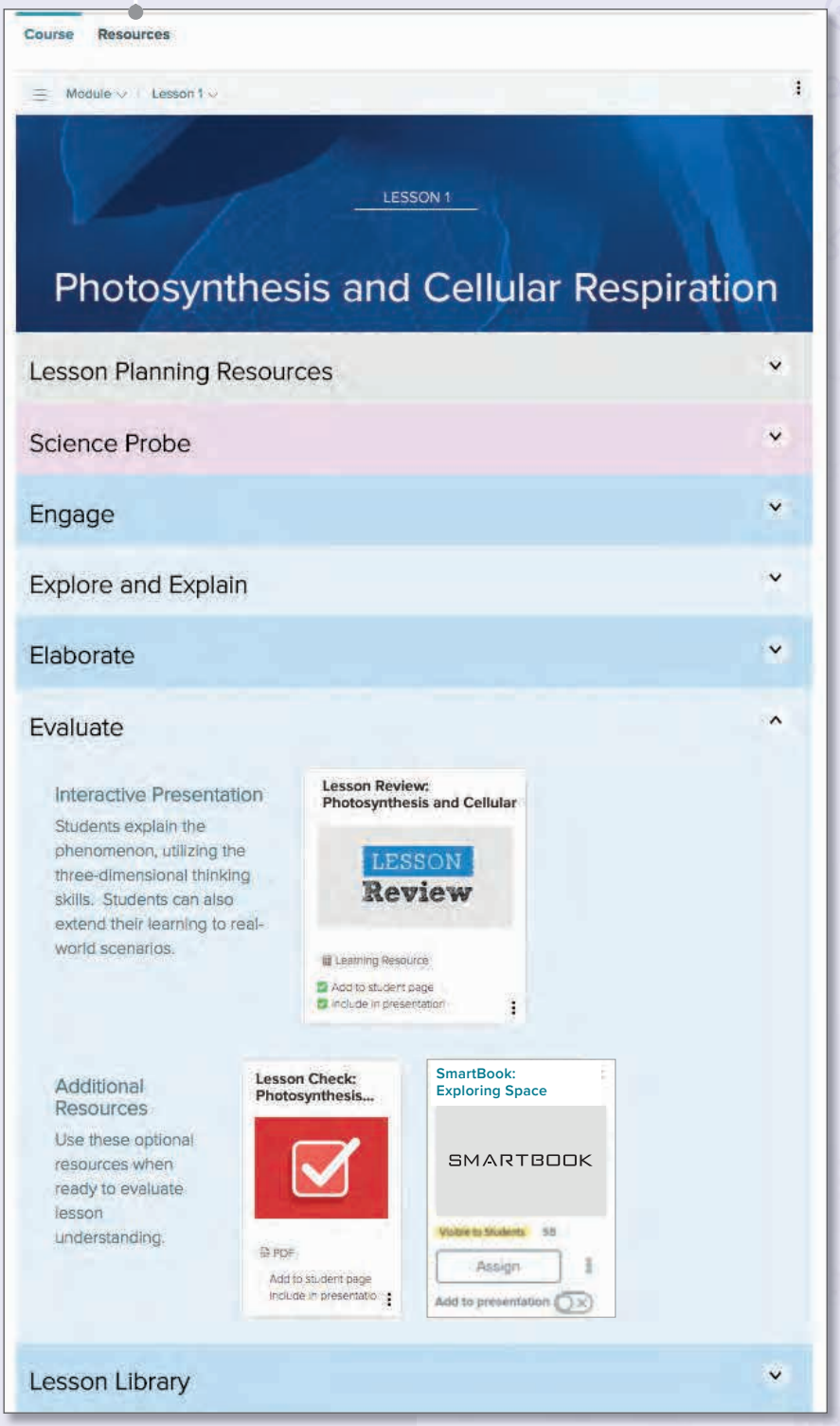
Module resource folders for each module include:

- Module Planning Resources (including Professional Learning Resources)
- Module Opener
- STEM Module Project
- Module Wrap-Up
- Module Assessment
- Module Library (including leveled readers and additional STEM Career Connections)



Note: Digital design and navigation may vary.

Select the Resources tab to search for resources by type, course, and standard.



Access Lesson Interactive Resources

The Lesson Landing Pages

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

- Lesson Planning Resources
- Science Probe
- Engage
- Explore and Explain
- Elaborate
- Evaluate
- Lesson Library

Digital Experience

Viewing Interactive Resources

Indiana Inspire Science offers a variety of rich media and interactive content with the flexibility to customize lessons to fit your needs.

Follow these tips for viewing resources:

1. Select

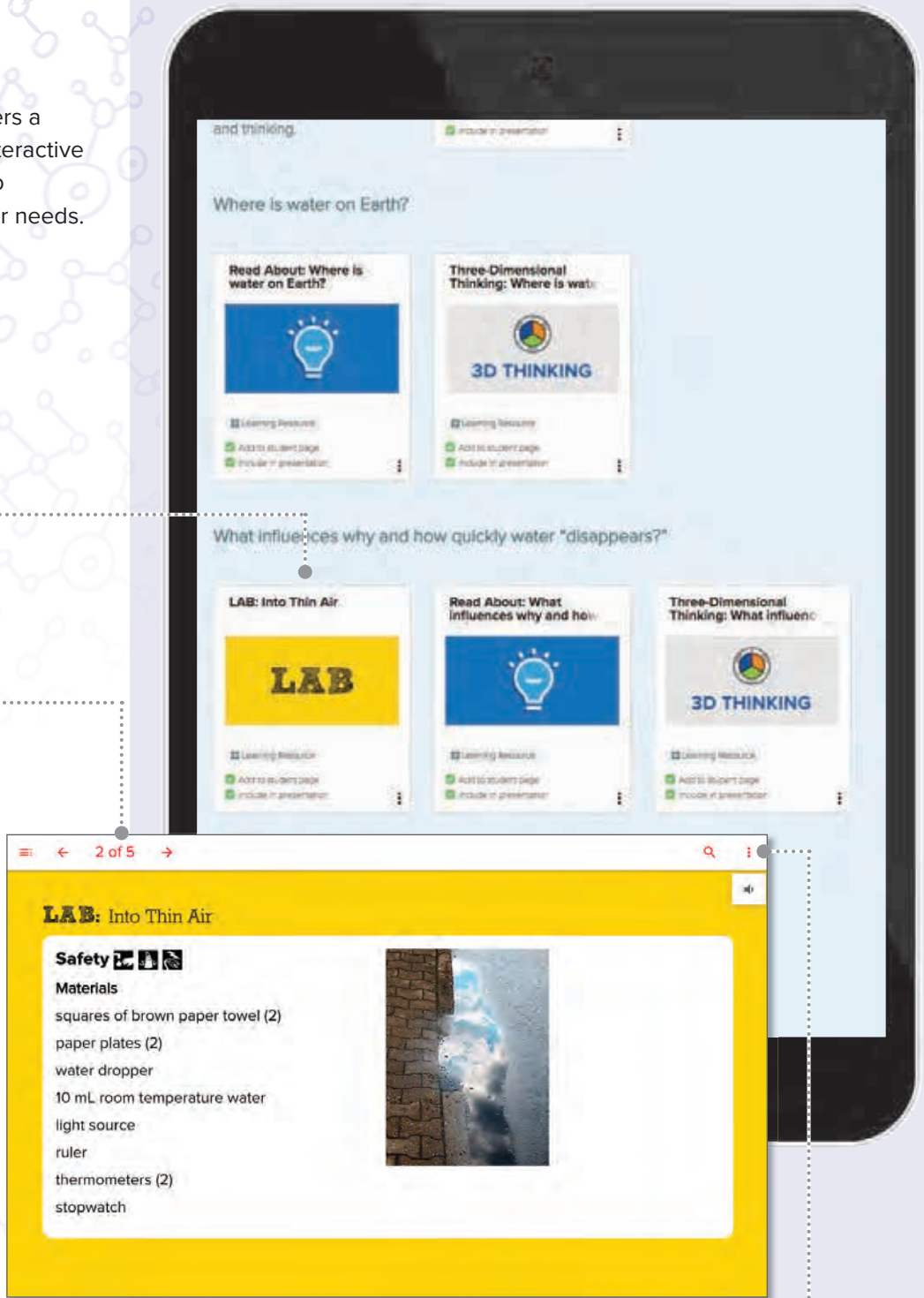
From a landing page, select any resource to launch and review it.

2. View

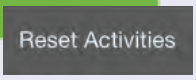
While reviewing a resource in the Interactive Presentation, use the red arrows to navigate through the screens of each resource.

3. Close

Once you are finished reviewing, close out by selecting "X" to get back to the landing page.



To reset an activity within a resource (clear any content entered), use the three vertical dots and select "Reset Activities."



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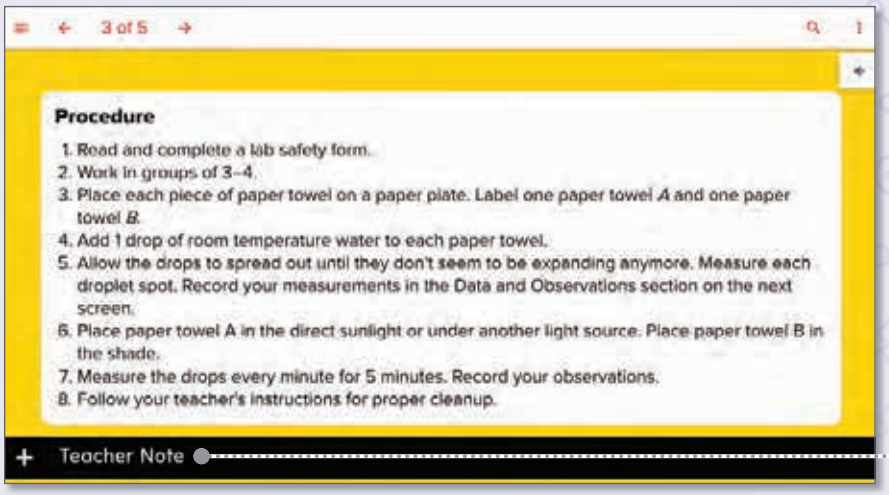


Teacher Notes
From the Online Teacher Center login, teacher support can be seen at point of use by expanding (select +) the Teacher Notes section.

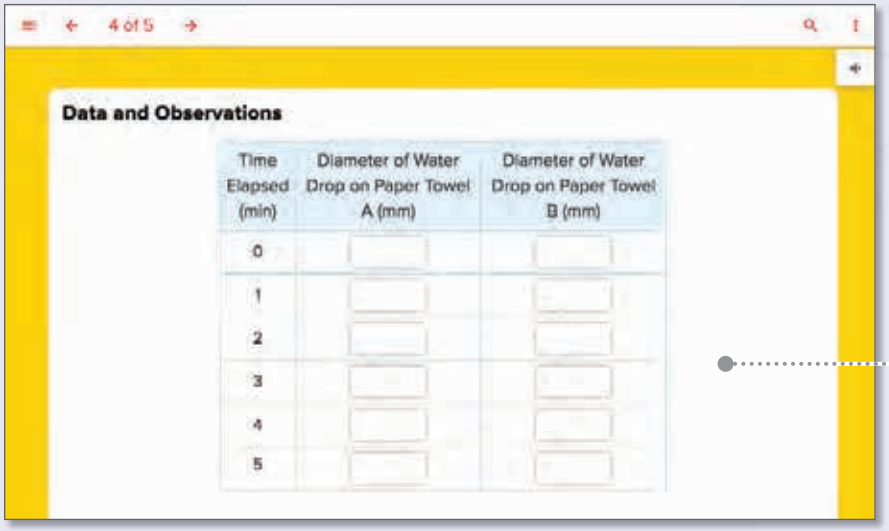
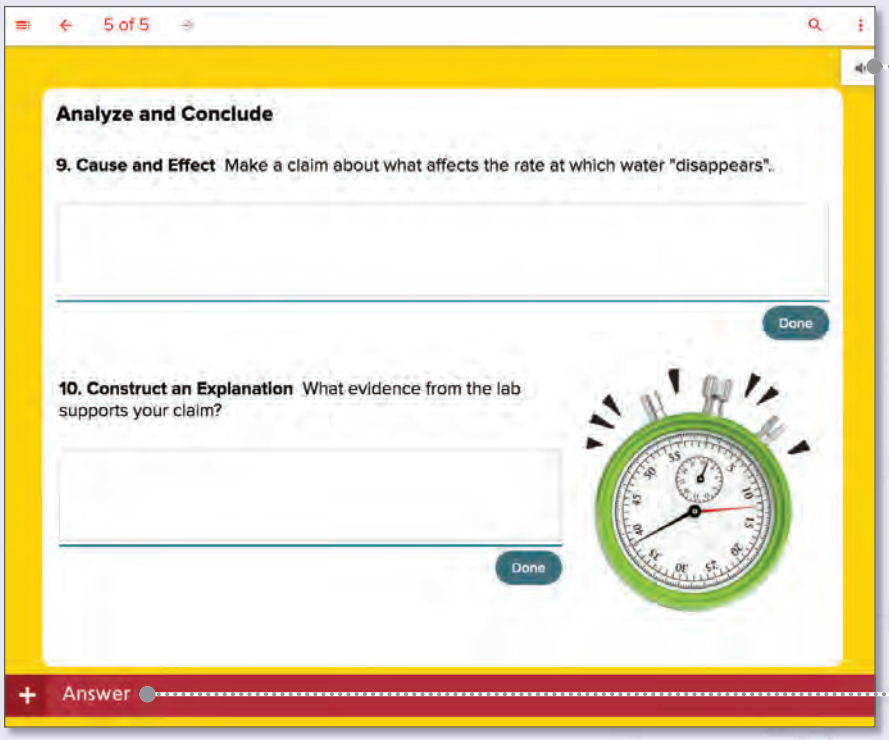


Table Entry
Students can enter data into tables at point of use for review.



Audio Support
Select the speaker icon to hear on screen text read aloud.

Answers
From the Online Teacher Center login, answers can be seen at point of use by expanding (select +) the Answer section.

Digital Experience

Learning Re-imagined

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

Engaging Interactive Content

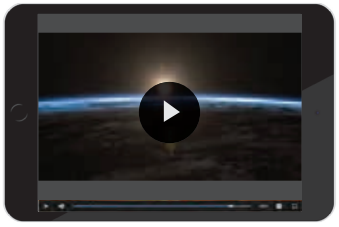
- Video Demos of Hands-On Activities
- Science Content Videos
- Text Read Aloud and Highlighting Features
- Dynamic Search Tools

Drawing Tool

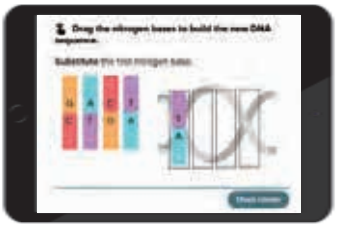
Interactive Text

Phenomena Videos

Science Content Videos



Drag and Drop



Virtual Labs

Layer Reveal

Simulations

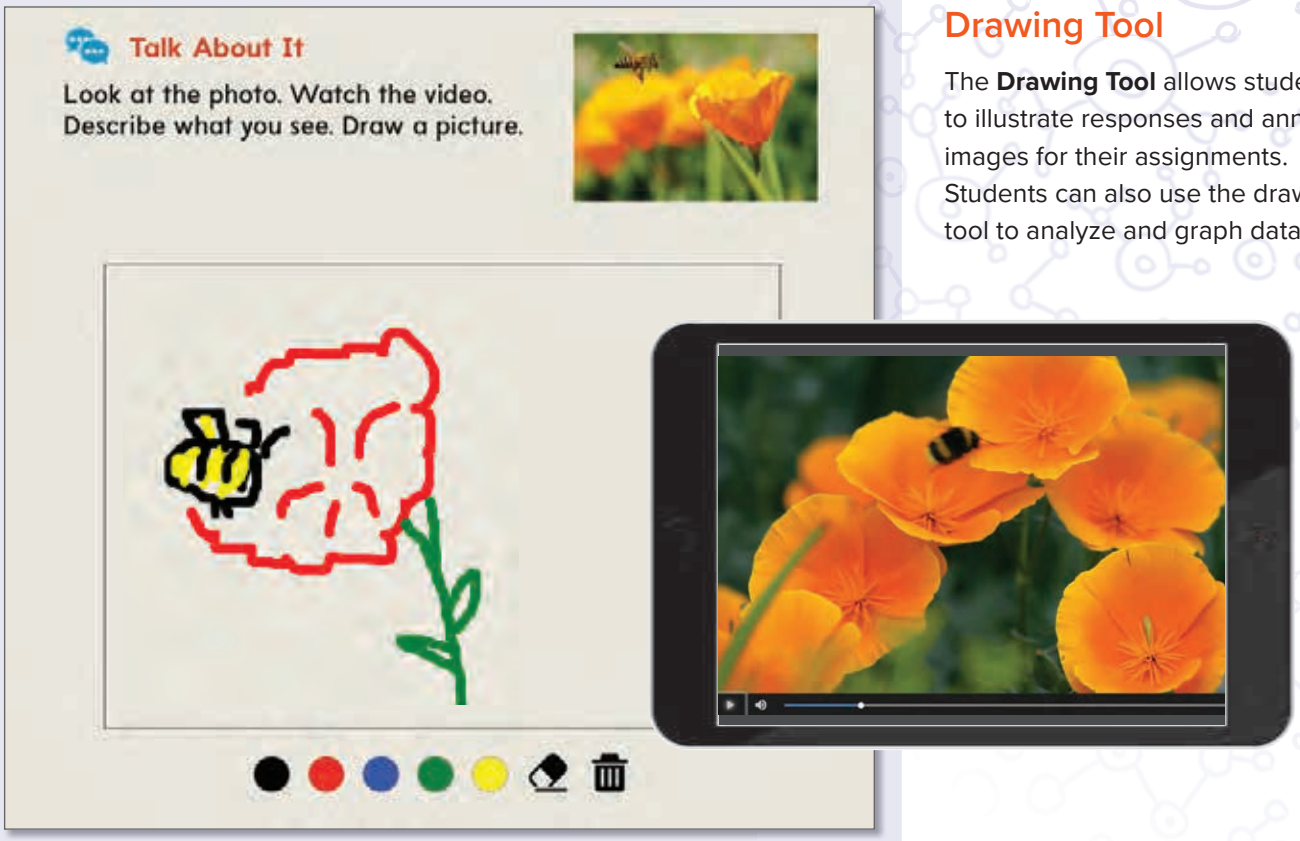
Beyond the Classroom

Choose Your Path

Click Change

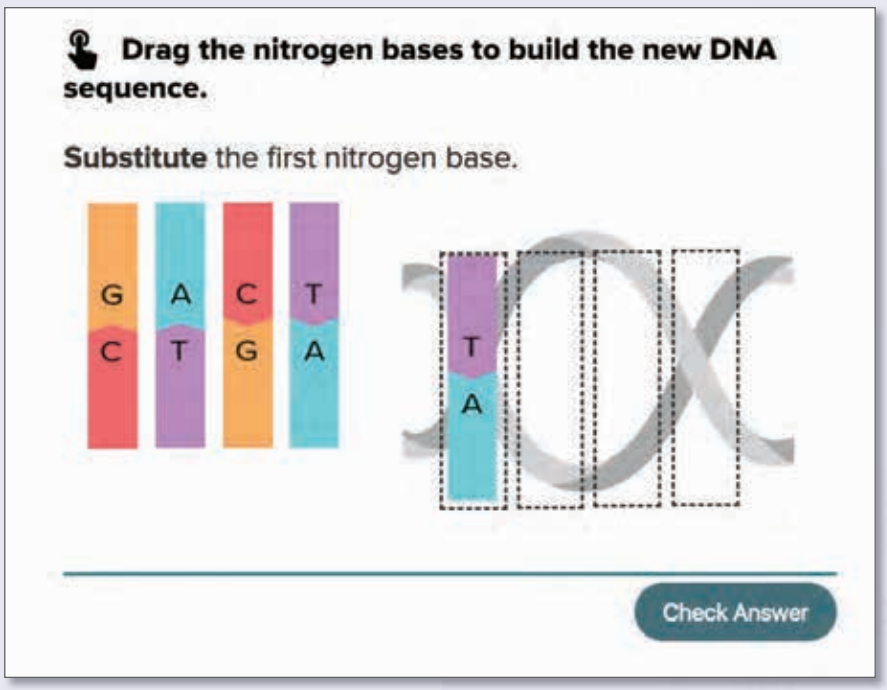
SyncBlasts*

*Available for Additional Purchase



Drawing Tool

The **Drawing Tool** allows students to illustrate responses and annotate images for their assignments. Students can also use the drawing tool to analyze and graph data.



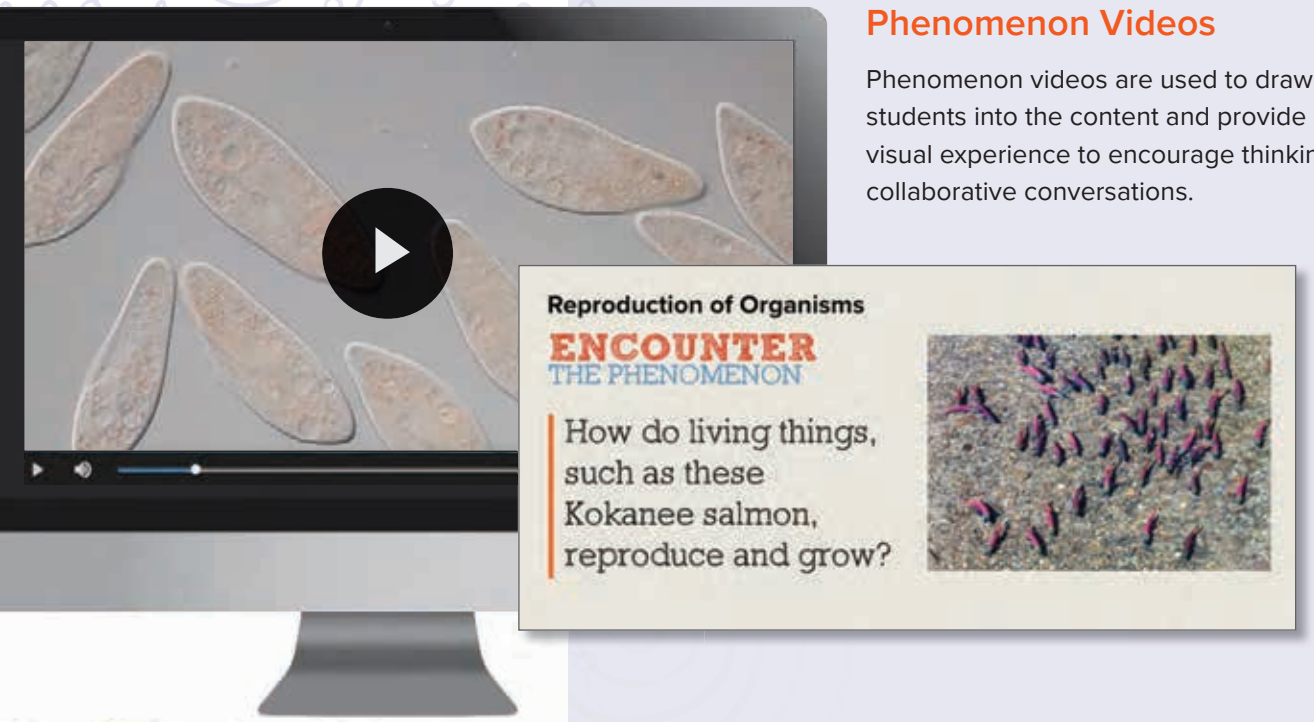
Drag and Drop

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

Digital Experience

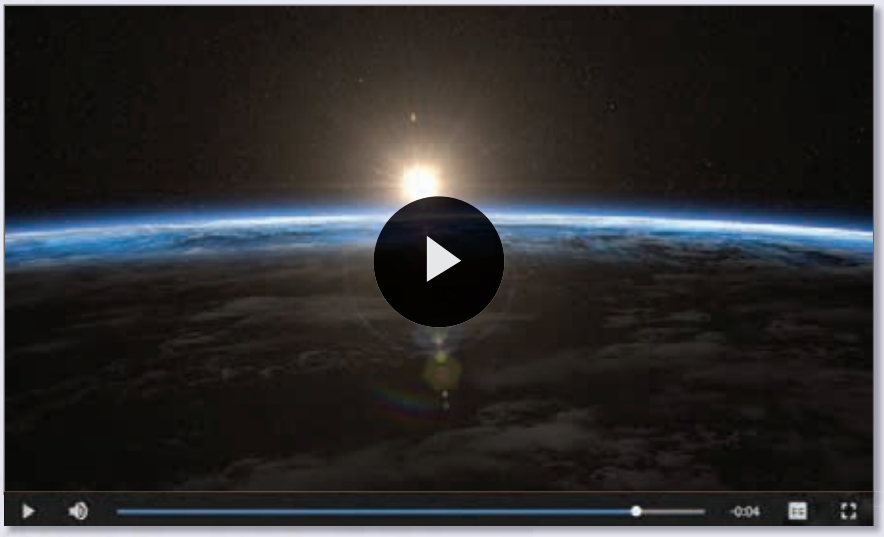
Phenomenon Videos

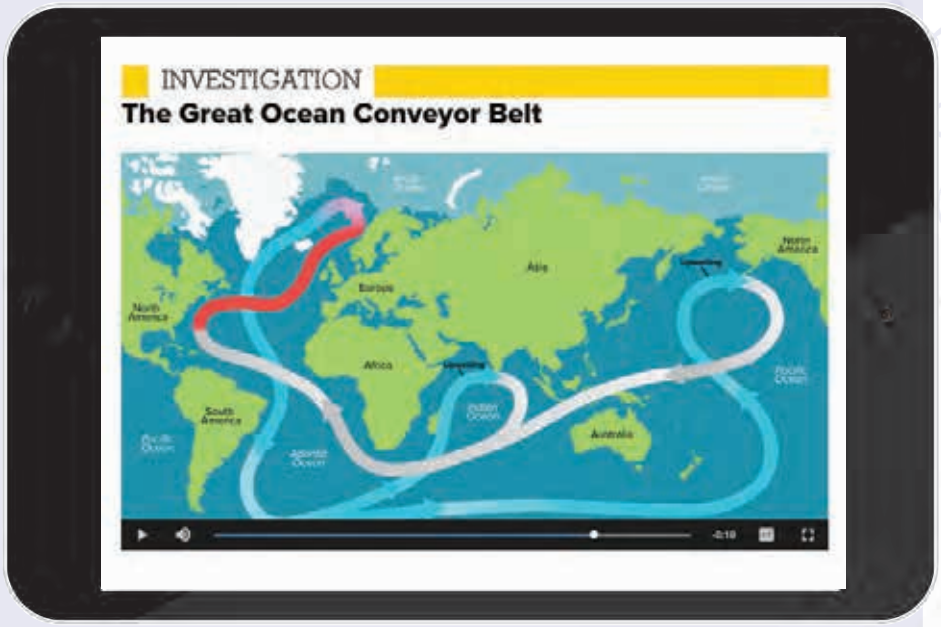
Phenomenon videos are used to draw students into the content and provide a visual experience to encourage thinking and collaborative conversations.



Science Content Videos

Bring interesting phenomenon to life and enable students to feel like they are a part of the experience with inspiring science content videos.





Animations

Embedded throughout lessons in *Indiana Inspire Science* animations bring content to life by providing an engaging learning experience.

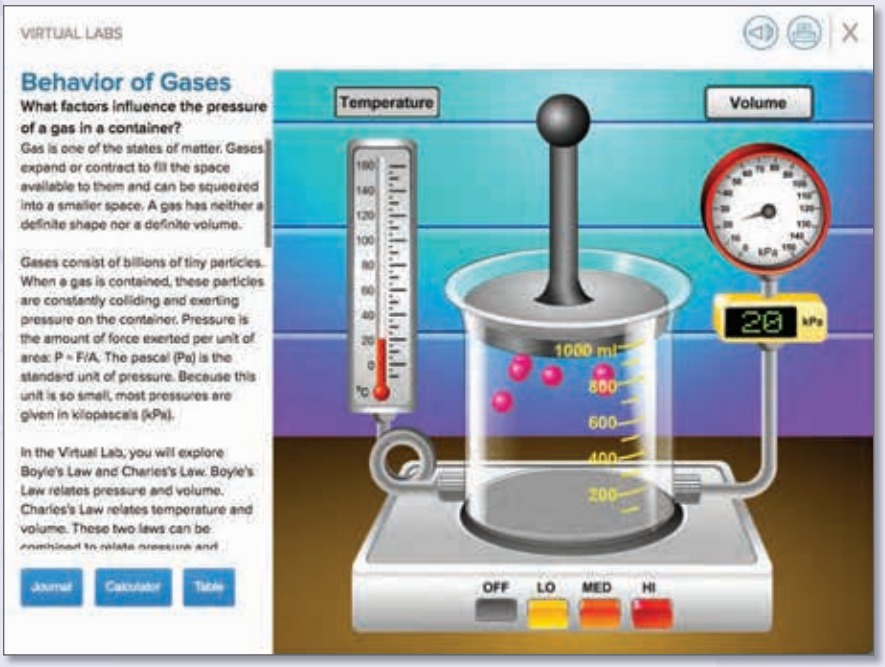
Professional Learning Videos

Indiana Inspire Science comes with library of relevant, self-paced, professional learning videos and modules to support you from implementation through ongoing instructional progression.

Digital Experience

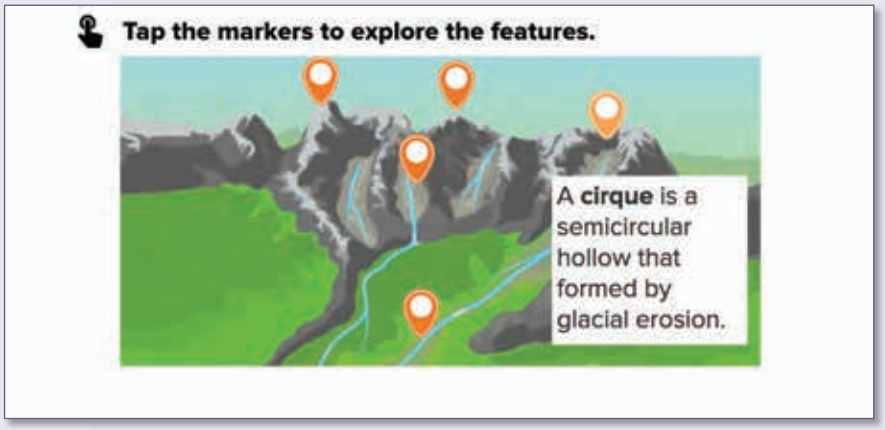
Virtual Labs

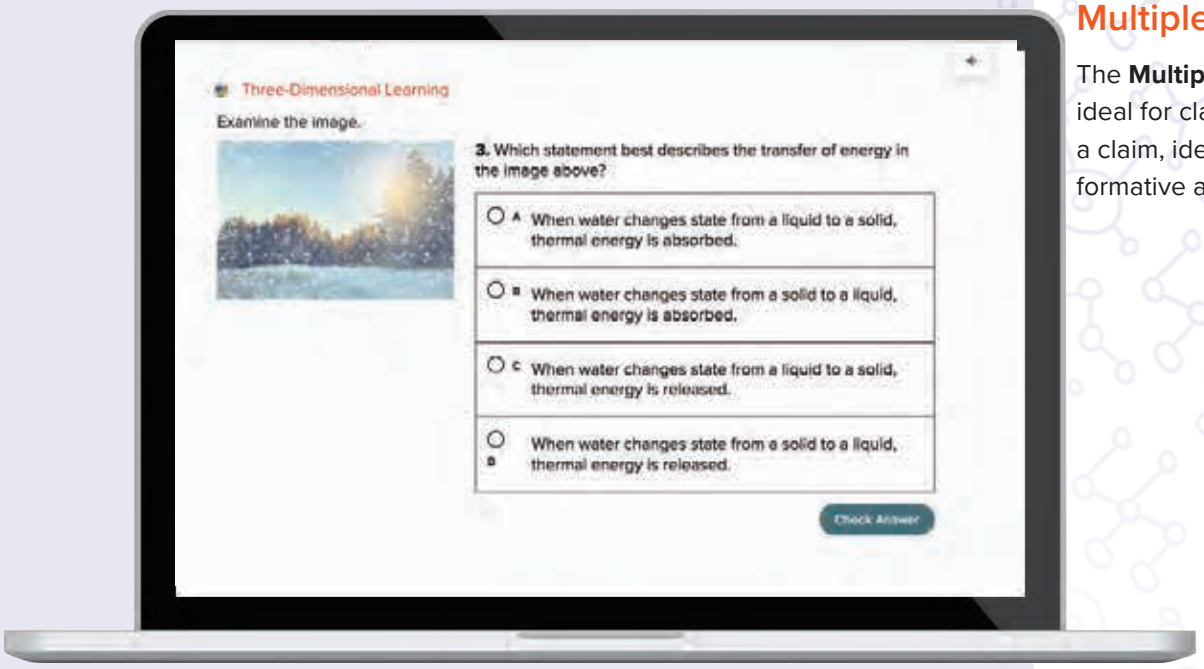
Virtual Labs provide an alternative engaging way for students to interact with an experiment that cannot always be done in a classroom setting. These interactive Virtual Labs are found throughout your *Inspire Science* program.



Pop Tips

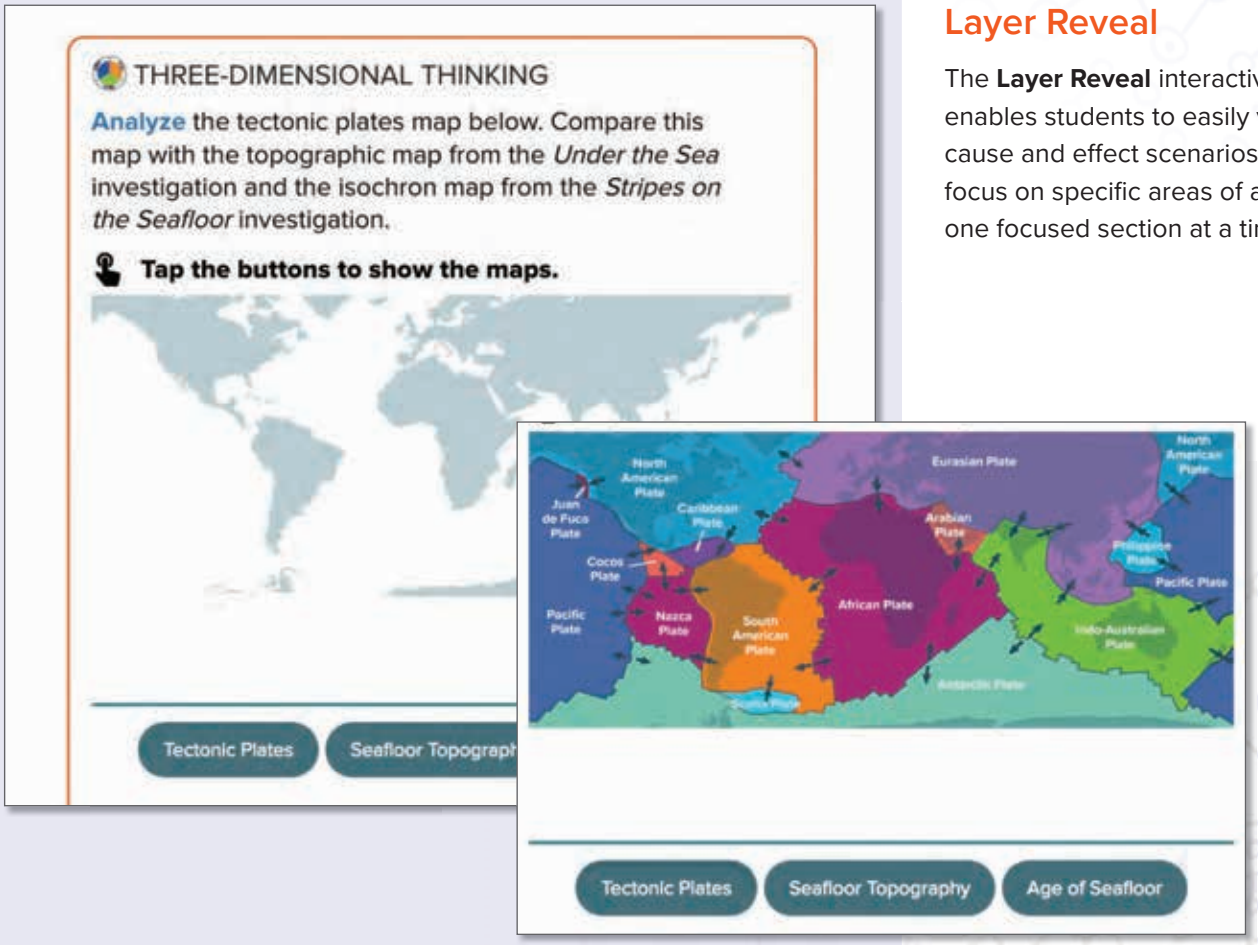
Pop Tips allows students to interact with images and connect to related information in order to support understanding of core content.





Multiple Choice

The **Multiple Choice** interactive is ideal for classifying content, making a claim, identifying key terms, and formative assessment.



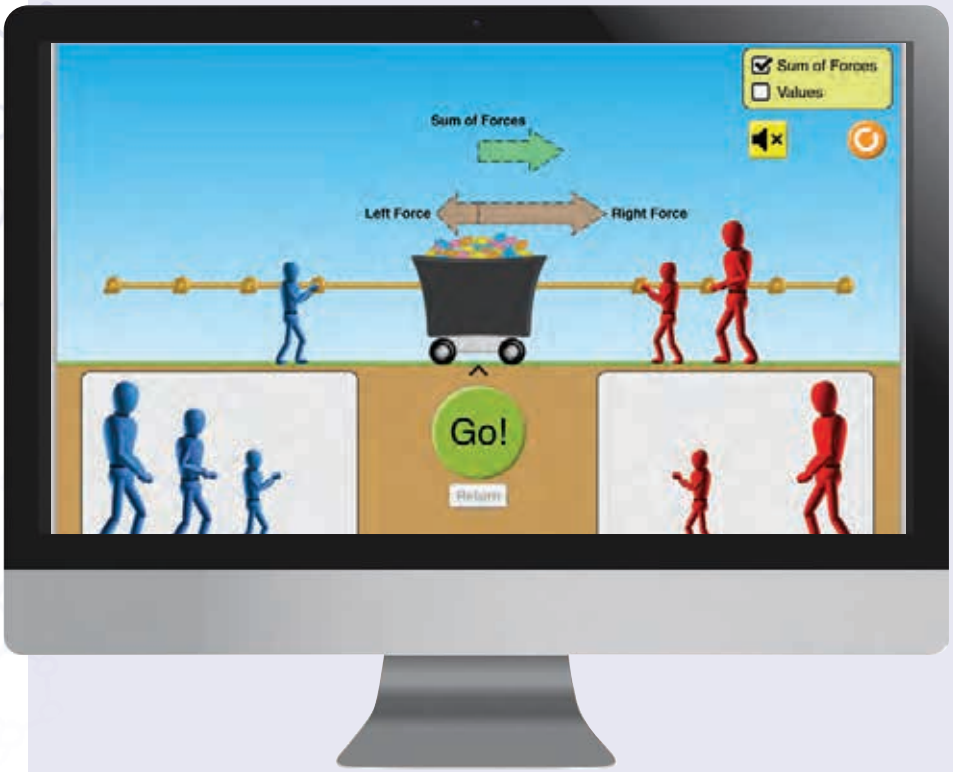
Layer Reveal

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

Digital Experience

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.

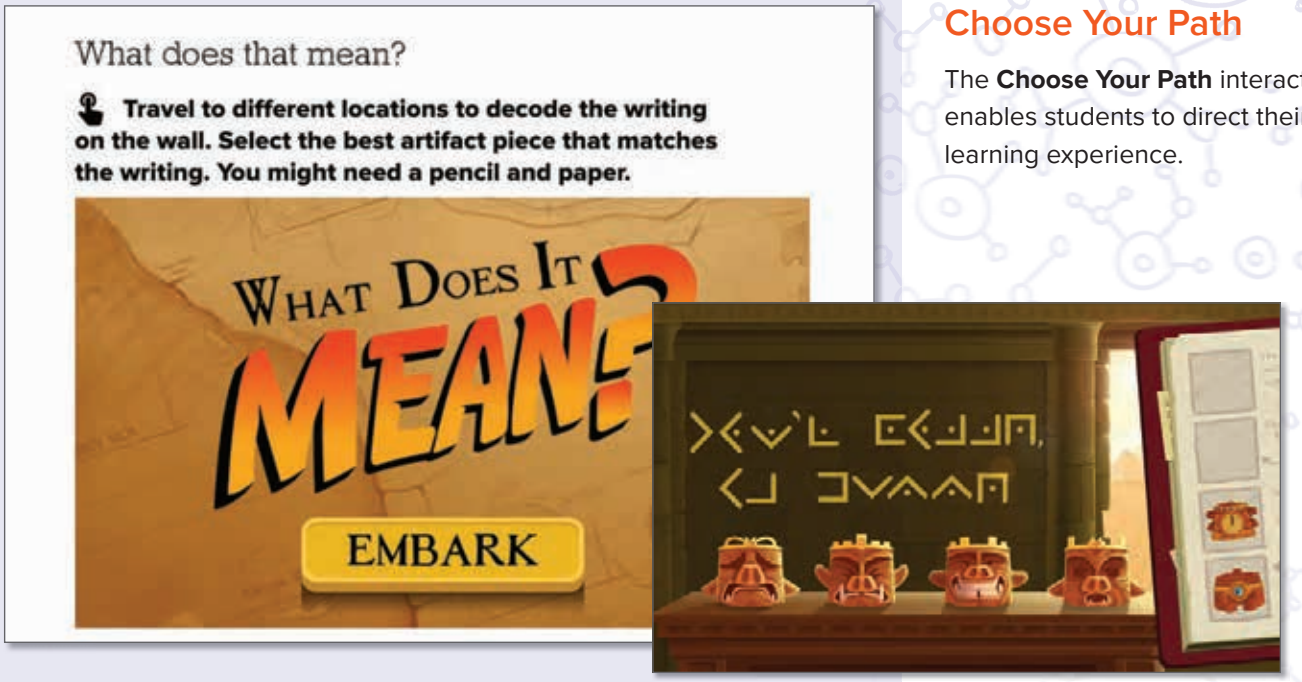


Swype

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

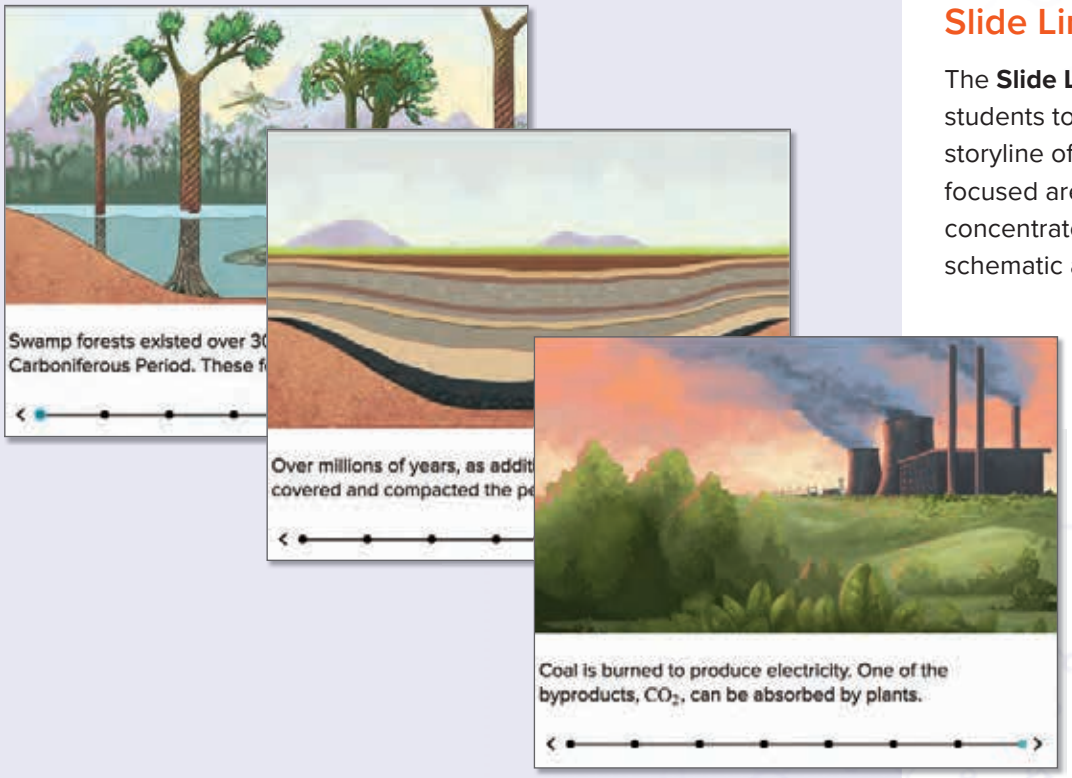
Choose Your Path

The **Choose Your Path** interactive enables students to direct their own learning experience.



Slide Line Plus

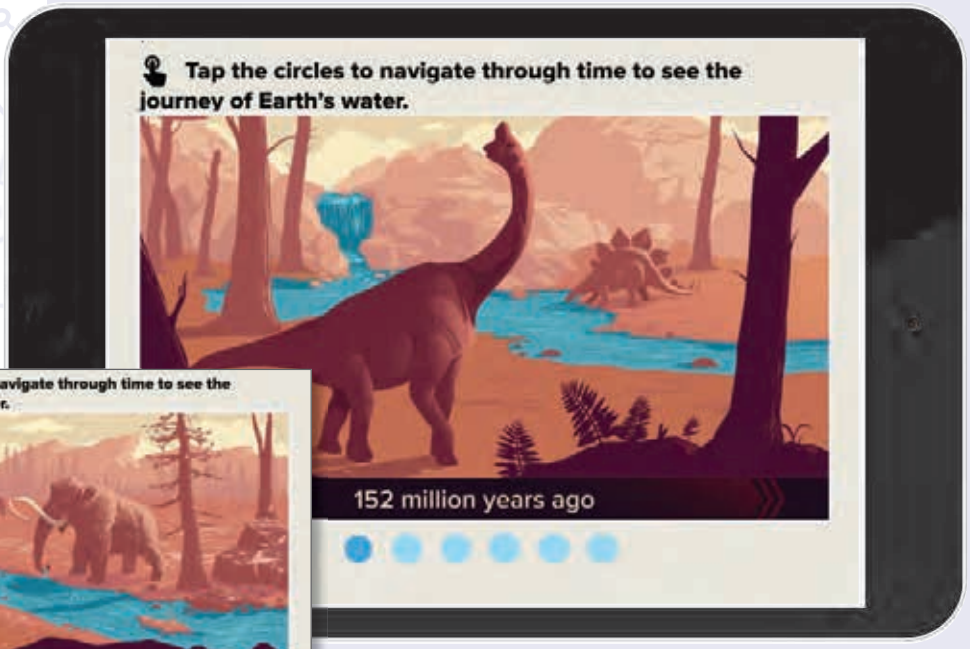
The **Slide Line Plus** feature allows students to progress through a storyline of images, or highlight focused areas of visuals to concentrate on one element of a schematic at a time.

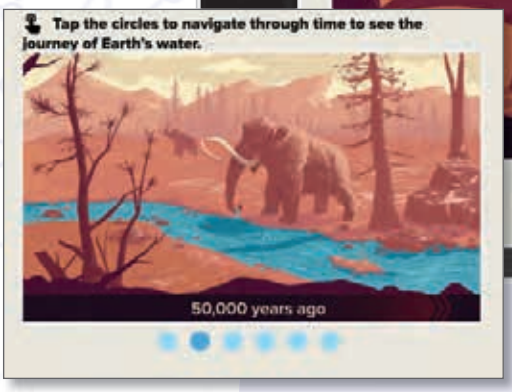


Digital Experience

Click Change

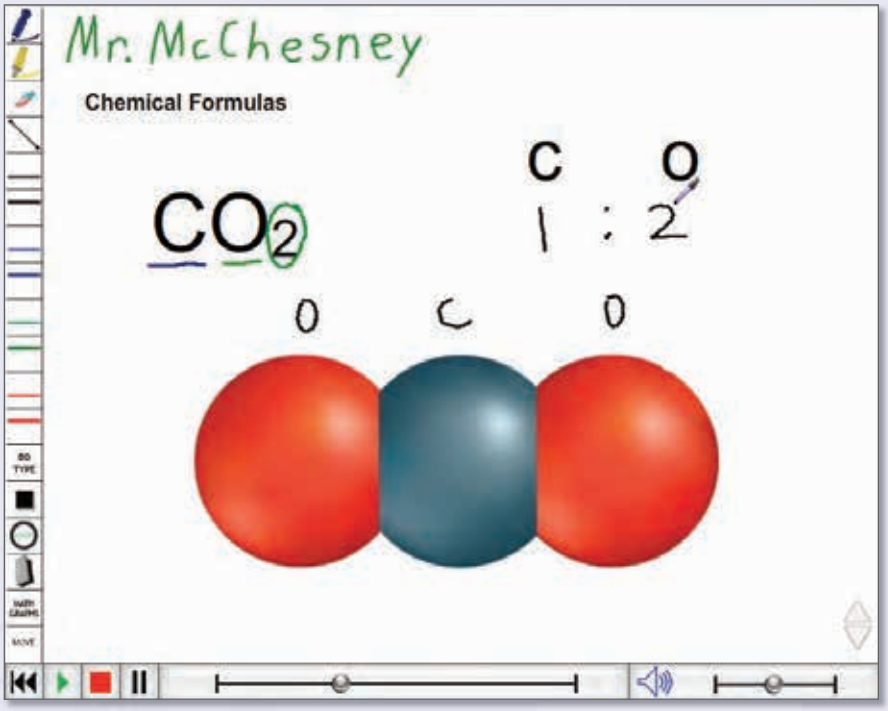
The **Click Change** interactive is used to allow students to engage with images. Students might click through images to select the correct one in a vocabulary check, or click through images in an activity to identify similarities and differences.

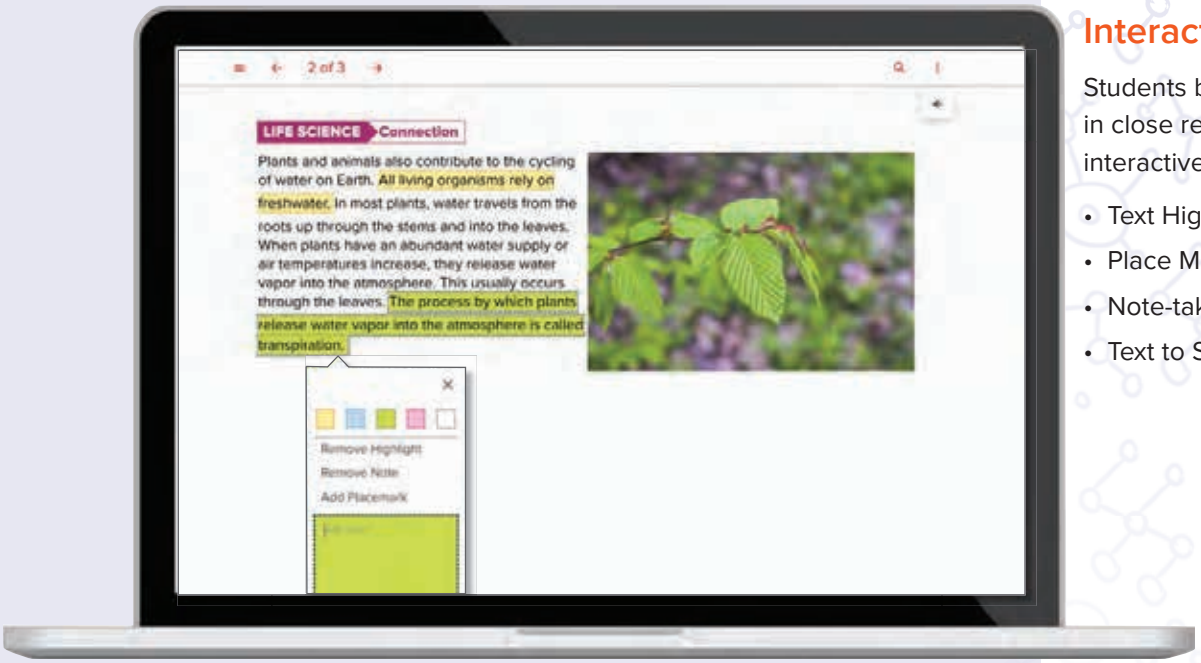




Personal Tutors

Students have access to **Personal Tutors** when they need extra support learning new concepts.

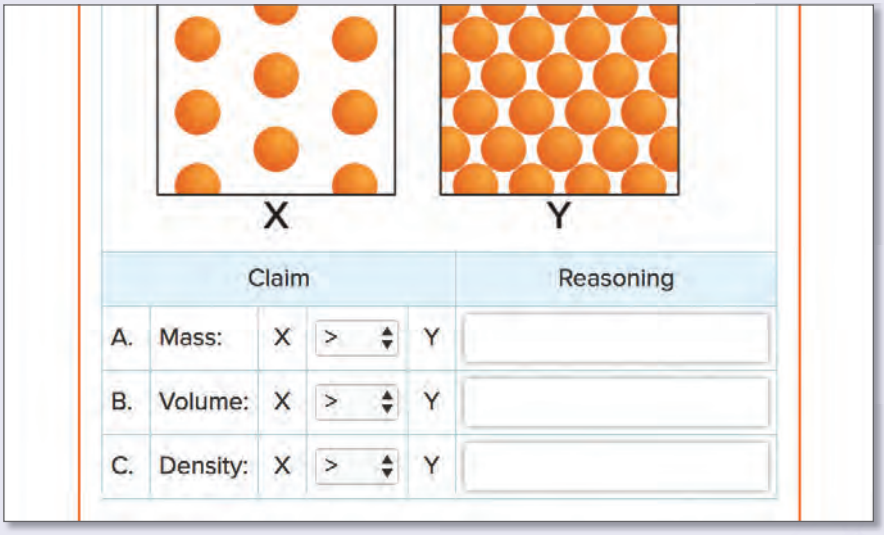




Interactive Text

Students become more engaged in close reading activities with interactive text features:

- Text Highlighting
- Place Marking Capabilities
- Note-taking
- Text to Speech Reading



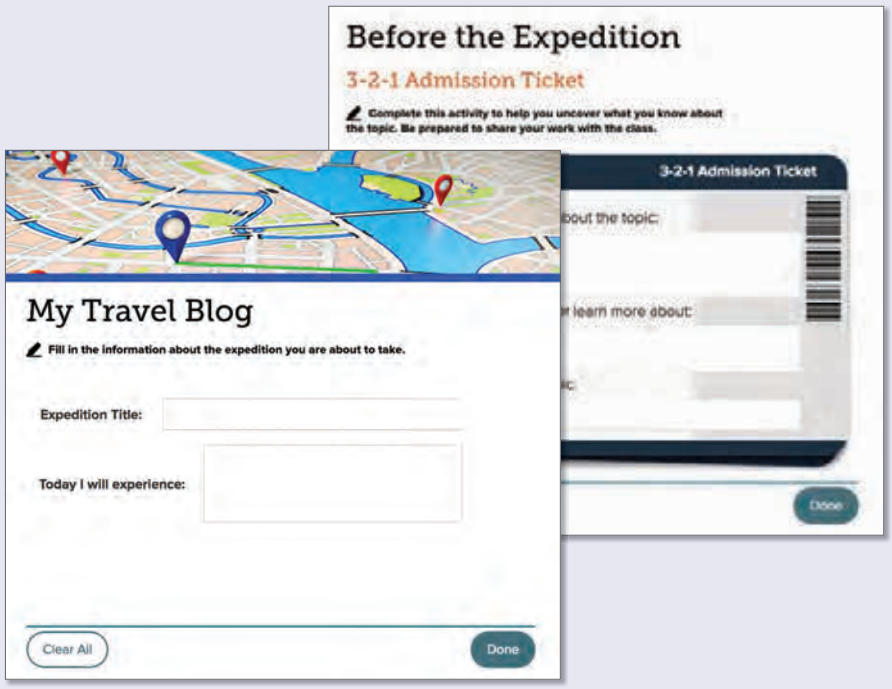
Type Entry

Students can record, edit, and save their assignment responses.

Digital Experience

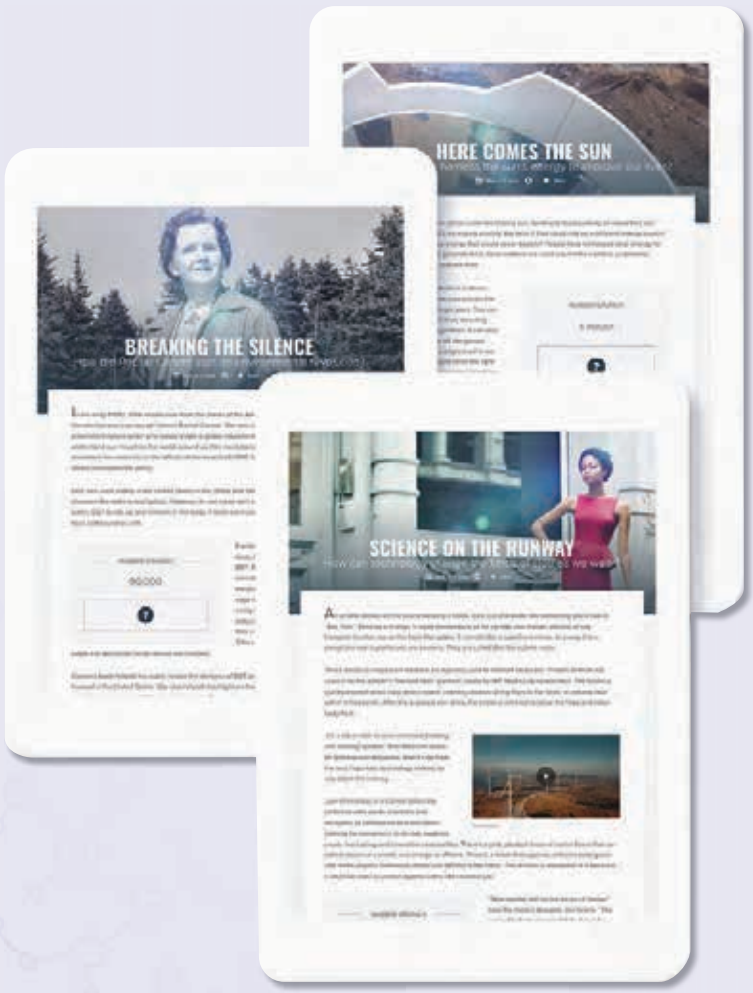
Beyond the Classroom

A virtual field trip experience right from the classroom.



SYNC BLASTS™

*Available for Additional Purchase



Science *SyncBlasts*™ is an ever expanding library of real world science articles and case studies designed to allow students to engage in authentic research and share their voice and opinions about relevant science topics in a social media format. Three to five new *SyncBlasts* are published weekly, and are adapted from trusted partners like Reuters and Scientific American. *SyncBlasts* are also fully correlated to the Inspire Science program.

SyncBlasts invite students to:

- Build vital research, writing, and critical thinking skills in the science domain.
- Develop informed opinions on high-interest topics of scientific significance.
- Express their opinions succinctly, in a familiar format.
- Participate in thoughtful discussions with an authentic audience of peers.

Notes

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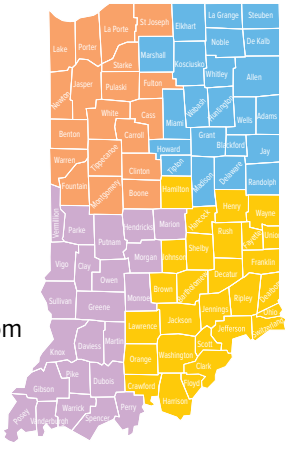

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