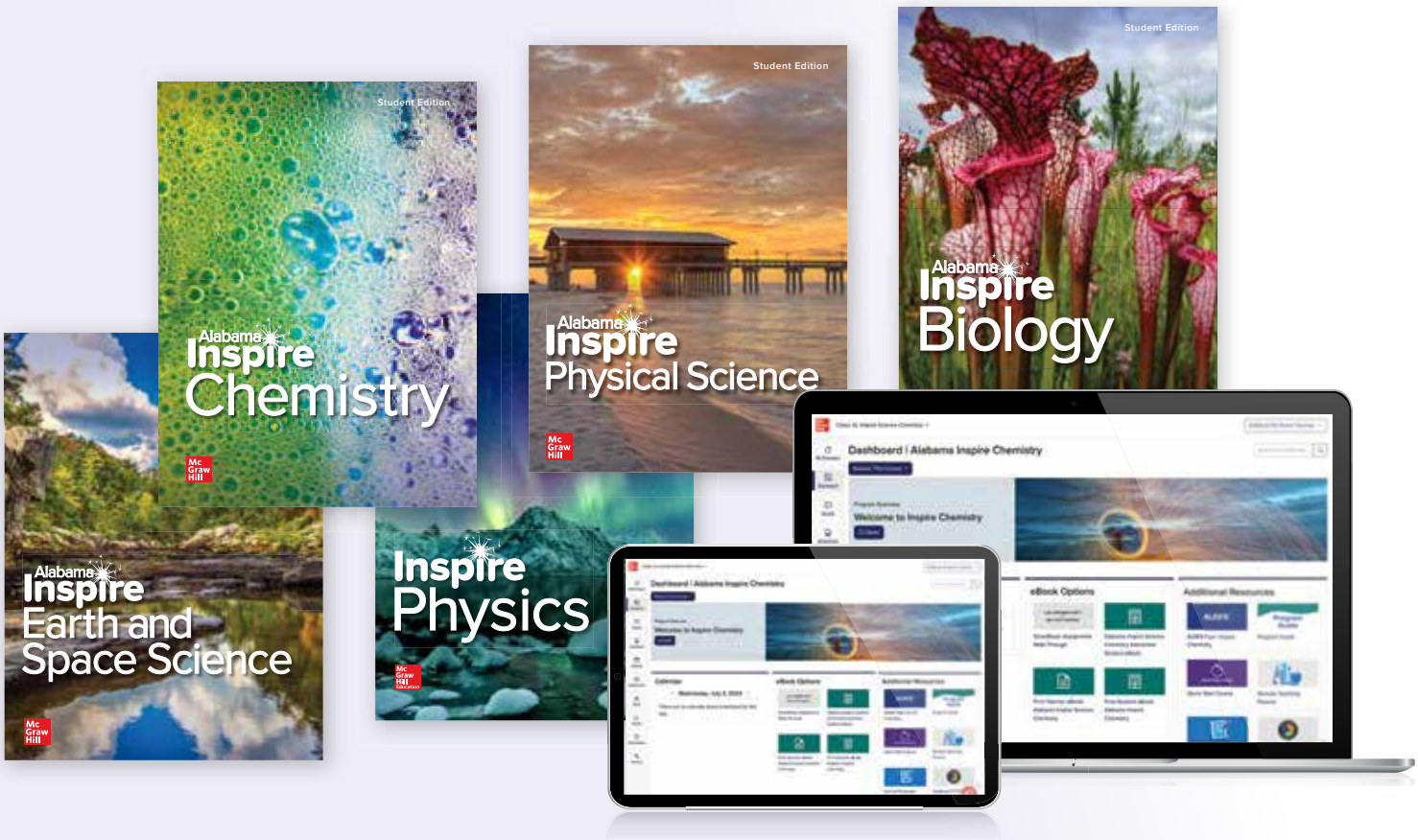
Mc Graw Hill

Program Overview
High School Series

Alabama Inspire Science

High School Series

Biology • Chemistry • Physical Science
Earth and Space • Physics

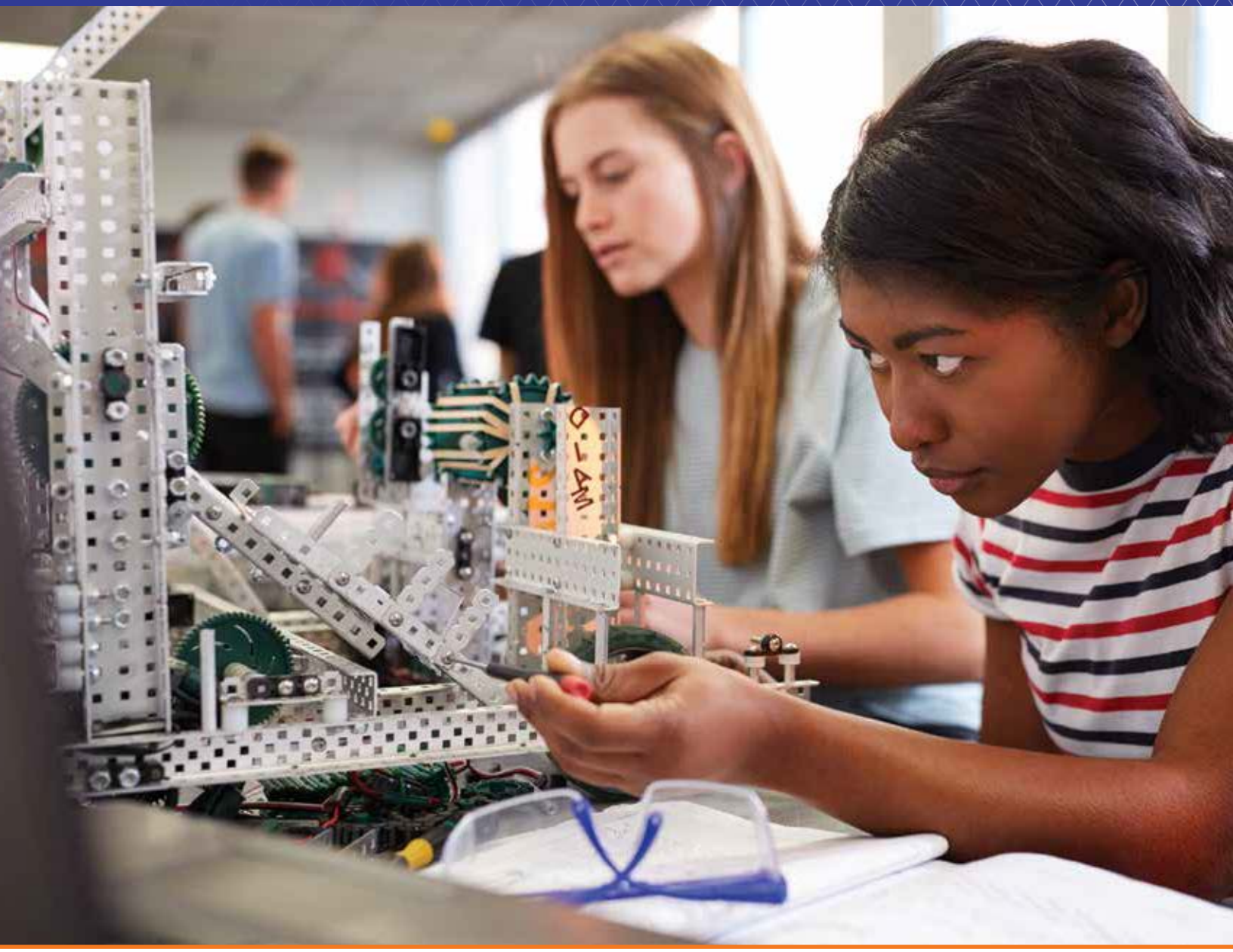


Welcome to *Alabama Inspire Science* High School Series

Engaging, Flexible, Cross-Curricular Learning

Designed with the Alabama Science Course of Study in mind, *Alabama Inspire Science* provides the structure for students to develop a solid background of foundational science knowledge while they learn to practice problem solving and critical thinking skills inherent in science.

Student eBook and assignments can be accessed from anywhere on a mobile device using the K–12 Portal App!



Develop Students to Become Critical Thinkers and Problem Solvers

Our *Alabama Inspire Science* High School Series—including *Alabama Inspire Biology*, *Alabama Inspire Chemistry*, *Alabama Inspire Earth and Space Science*, *Alabama Inspire Physical Science*, and *Inspire Physics*—provides an in-depth, collaborative, and project-based learning experience designed to interest students and empower them to ask questions and think critically.

A new generation of innovators is ready to take on today's challenges to become tomorrow's scientists. **Are you ready to help guide them to be prepared to meet the problem-solving demands of the 21st Century?**

Designed for the Rigor of the Alabama Science Course of Study

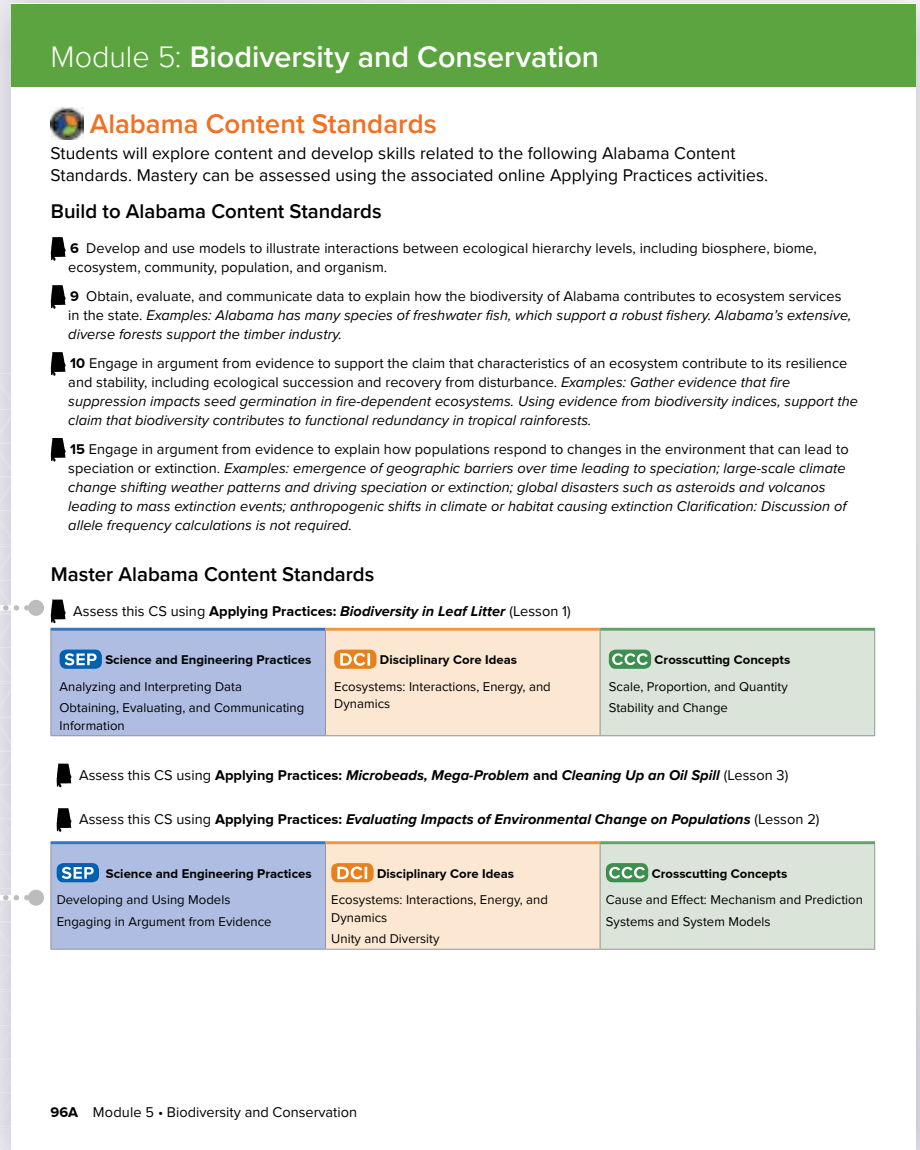
Alabama Inspire Science ensures that Alabama educators have the resources and tools to deliver high-quality instruction to help students meet the rigor and challenge of the Alabama Science Course of Study.

Comprehensive Alabama Science Course of Study Planning

At the beginning of each module, Alabama Science Course of Study codes and descriptions help teachers quickly see performance expectations addressed in the module.

Three Dimensions at a Glance Building to Alabama Academic Standards

Use this chart to identify the focus of the three dimensions that build to the Alabama Science Course of Study expectations within the module.



Module 5: **Biodiversity and Conservation**

Alabama Content Standards

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

Build to Alabama Content Standards

6 Develop and use models to illustrate interactions between ecological hierarchy levels, including biosphere, biome, ecosystem, community, population, and organism.

9 Obtain, evaluate, and communicate data to explain how the biodiversity of Alabama contributes to ecosystem services in the state. *Examples: Alabama has many species of freshwater fish, which support a robust fishery. Alabama's extensive, diverse forests support the timber industry.*

10 Engage in argument from evidence to support the claim that characteristics of an ecosystem contribute to its resilience and stability, including ecological succession and recovery from disturbance. *Examples: Gather evidence that fire suppression impacts seed germination in fire-dependent ecosystems. Using evidence from biodiversity indices, support the claim that biodiversity contributes to functional redundancy in tropical rainforests.*

15 Engage in argument from evidence to explain how populations respond to changes in the environment that can lead to speciation or extinction. *Examples: emergence of geographic barriers over time leading to speciation; large-scale climate change shifting weather patterns and driving speciation or extinction; global disasters such as asteroids and volcanos leading to mass extinction events; anthropogenic shifts in climate or habitat causing extinction Clarification: Discussion of allele frequency calculations is not required.*

Master Alabama Content Standards

Assess this CS using **Applying Practices: *Biodiversity in Leaf Litter*** (Lesson 1)

SEP Science and Engineering Practices	DCI Disciplinary Core Ideas	CCC Crosscutting Concepts
Analyzing and Interpreting Data Obtaining, Evaluating, and Communicating Information	Ecosystems: Interactions, Energy, and Dynamics	Scale, Proportion, and Quantity Stability and Change

Assess this CS using **Applying Practices: *Microbeads, Mega-Problem* and *Cleaning Up an Oil Spill*** (Lesson 3)

Assess this CS using **Applying Practices: *Evaluating Impacts of Environmental Change on Populations*** (Lesson 2)

SEP Science and Engineering Practices	DCI Disciplinary Core Ideas	CCC Crosscutting Concepts
Developing and Using Models Engaging in Argument from Evidence	Ecosystems: Interactions, Energy, and Dynamics Unity and Diversity	Cause and Effect: Mechanism and Prediction Systems and System Models

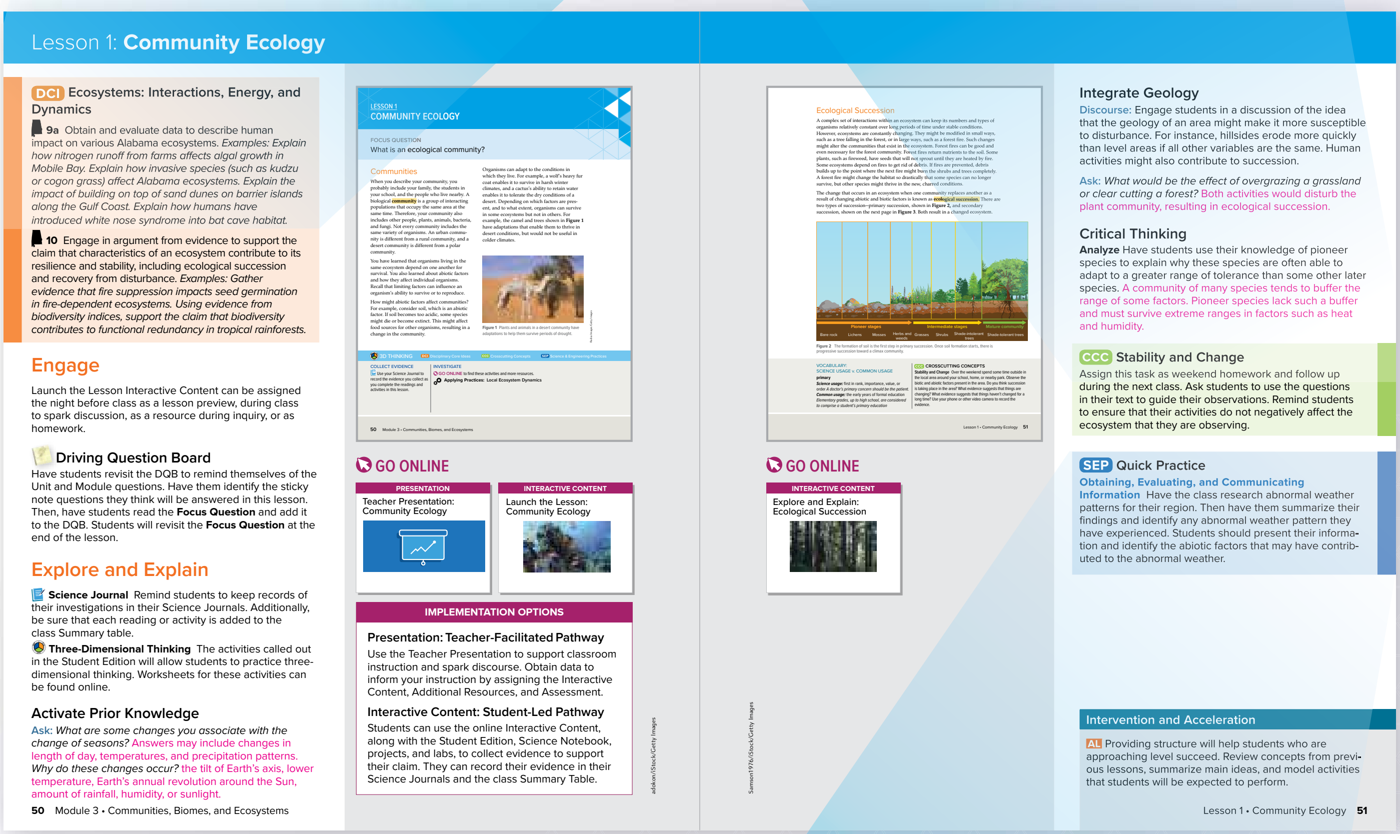
96A Module 5 • Biodiversity and Conservation

DCI Ecosystems: Interactions, Energy, and Dynamics

9a Obtain and evaluate data to describe human impact on various Alabama ecosystems. *Examples: Explain how nitrogen runoff from farms affects algal growth in Mobile Bay. Explain how invasive species (such as kudzu or cogon grass) affect Alabama ecosystems. Explain the impact of building on top of sand dunes on barrier islands along the Gulf Coast. Explain how humans have introduced white nose syndrome into bat cave habitat.*

CCC Stability and Change

Assign this task as weekend homework and follow up during the next class. Ask students to use the questions in their text to guide their observations. Remind students to ensure that their activities do not negatively affect the ecosystem that they are observing.



Lesson 1: **Community Ecology**

DCI Ecosystems: Interactions, Energy, and Dynamics

9a Obtain and evaluate data to describe human impact on various Alabama ecosystems. *Examples: Explain how nitrogen runoff from farms affects algal growth in Mobile Bay. Explain how invasive species (such as kudzu or cogon grass) affect Alabama ecosystems. Explain the impact of building on top of sand dunes on barrier islands along the Gulf Coast. Explain how humans have introduced white nose syndrome into bat cave habitat.*

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Engage

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

Driving Question Board

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

Explore and Explain

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

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

Activate Prior Knowledge

Ask: *What are some changes you associate with the change of seasons?* Answers may include changes in length of day, temperatures, and precipitation patterns. *Why do these changes occur?* the tilt of Earth's axis, Earth's annual revolution around the Sun, amount of rainfall, humidity, or sunlight.

50 Module 3 • Communities, Biomes, and Ecosystems

GO ONLINE

PRESENTATION: Teacher Presentation: Community Ecology

INTERACTIVE CONTENT: Launch the Lesson: Community Ecology

IMPLEMENTATION OPTIONS

Presentation: Teacher-Facilitated Pathway

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

Interactive Content: Student-Led Pathway

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

GO ONLINE

INTERACTIVE CONTENT: Explore and Explain: Ecological Succession

Integrate Geology

Discourse: Engage students in a discussion of the idea that the geology of an area might make it more susceptible to disturbance. For instance, hillsides erode more quickly than level areas if all other variables are the same. Human activities might also contribute to succession.

Ask: *What would be the effect of overgrazing a grassland or clear cutting a forest?* Both activities would disturb the plant community, resulting in ecological succession.

Critical Thinking

Analyze Have students use their knowledge of pioneer species to explain why these species are often able to adapt to a greater range of tolerance than some other later species. A community of many species tends to buffer the range of some factors. Pioneer species lack such a buffer and must survive extreme ranges in factors such as heat and humidity.

CCC Stability and Change

Assign this task as weekend homework and follow up during the next class. Ask students to use the questions in their text to guide their observations. Remind students to ensure that their activities do not negatively affect the ecosystem that they are observing.

SEP Quick Practice

Obtaining, Evaluating, and Communicating Information Have the class research abnormal weather patterns for their region. Then have them summarize their findings and identify any abnormal weather pattern they have experienced. Students should present their information and identify the abiotic factors that may have contributed to the abnormal weather.

Intervention and Acceleration

AL Providing structure will help students who are approaching level succeed. Review concepts from previous lessons, summarize main ideas, and model activities that students will be expected to perform.

Lesson 1 • Community Ecology 51

SEP Quick Practice

Obtaining, Evaluating, and Communicating Information Have the class research abnormal weather patterns for their region. Then have them summarize their findings and identify any abnormal weather pattern they have experienced. Students should present their information and identify the abiotic factors that may have contributed to the abnormal weather.

Point of Use Standards-Based Instruction

Within the lesson, find the call outs focused on Alabama Disciplinary Core Ideas, to focus student learning by standard as well as call outs for Cross Cutting Concepts and Science and Engineering Practices.

Optimized for Teacher Success and Student Content Mastery

Structured for flexibility, *Alabama Inspire Science* supports experienced teachers to quickly assess what adaptations fit the needs of their classes, while new teachers or those with non-traditional certification will find a clear, recommended lesson path with necessary supporting information.

Pacing included for every lesson allow you to plan out modules.

PROGRAM FEATURE!

Resource Overviews in every module and lesson can help curriculum writers recommend specific resources to cover the Alabama Science Course of Study.

Module Planner

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

Module Resources

	Module Launch	Lesson 1	Lesson 2	Lesson 3	Module Wrap-Up
Pacing (min)	45	65	45	90	45
CER Claim, Evidence, Reasoning	Encounter the Phenomenon Make Your Claim	Collect Evidence	Collect Evidence	Collect Evidence	Revisit the Phenomenon Go Further: Data Analysis Lab
Labs and Investigations	**LL:** What lives here?	**QI:** Investigate Threats to Biodiversity	**BioLab:** How do we measure biodiversity? **VI:** Assessing Water Quality	**BioLab:** How can surveying a plot of land around your school help you understand the health of your ecosystem?	
Media and OER	Beyond the Classroom: Google Expedition	Beyond the Classroom: Google Expedition	Beyond the Classroom: Google Expedition		
Assess	Module Pretest	Lesson Check	Lesson Check	Lesson Check	Module Vocabulary Practice Module Test
Applying Practices		Biodiversity in Leaf Litter	Evaluating Impacts of Environmental Change on Populations	Microbeads, Mega-Problem Cleaning Up an Oil Spill	

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

Three-Course Model

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

EARTH AND SPACE SCIENCE
Module: Relationships Between Humans and Earth
- Human and Earth Interactions can be integrated after lesson 2 of this Module.

Applying Practices are tied to every standard to ensure mastery throughout the module.

View the **Labs, Investigations, and Media** associated with the module to think through which will most resonate in your classroom.

Module 5 • Biodiversity and Conservation **96B**

Engage: In the Engage phase, students are introduced to the science topic and establish links with their existing knowledge. This stage piques their interest and fosters their curiosity, motivating them to delve deeper into the subject matter.

Explore and Explain: The Explore and Explain phase encourages students to get involved and investigate through a related, common experience. Students will carry out an investigation and collect and interpret data as they reveal answers to their questions to build understanding using different types of inquiry activities.

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

Evaluate: In the Evaluate phase, teachers gauge student progress. A question is provided to assess students' knowledge and offer remediation suggestions if additional help is needed.

Lesson 1: **Biodiversity**

DCI Ecosystems: Interactions, Energy, and Dynamics

9 Obtain, evaluate, and communicate data to explain how the biodiversity of Alabama contributes to ecosystem services in the state. *Examples: Alabama has many species of freshwater fish, which support a robust fishery. Alabama's extensive, diverse forests support the timber industry.*

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Engage

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Explore and Explain

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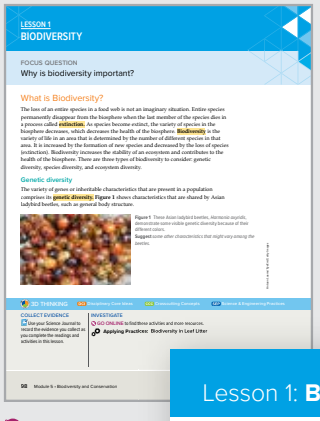
Three-Dimensional Thinking The activities called out in the Student Edition will allow students to practice three-dimensional thinking. Worksheets for these activities can be found online.

Caption Question Fig. 1: number of spots, size.


LESSON 1
BIODIVERSITY
FOCUS QUESTION
Why is biodiversity important?
What is Biodiversity?
Genetic diversity
3D THINKING
COLLECT EVIDENCE
INVESTIGATE
Applying Practices: Biodiversity in Leaf Litter
98 Module 5 • Biodiversity and Conservation

GO ONLINE

PRESENTATION
Teacher Presentation: Biodiversity

IMPLEMENTATIO
Presentation: Teacher-Fa
Use the Teacher Presentatio instruction and spark discou inform your instruction by as Content, Additional Resourc
Interactive Content: Stu
Students can use the online along with the Student Editio projects, and labs, to collect their claim. They can record Science Journals and the cla

98 Module 5 • Biodiversity and Conservation

Lesson 1: **Biodiversity**

Elaborate

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

Evaluate

Formative Assessment Check

Have students list and describe three types of biodiversity. genetic diversity–variety of alleles of genes present in the gene pool of a species; species biodiversity–number and abundance of species in a small area; ecosystem biodiversity–overall number of species in an ecosystem

Remediation Write the following phrases: *dogs in a neighborhood, tropical rain forest, microorganisms in a pond, vegetable garden,* and *students in school.*

Ask: *Which type of biodiversity does each of these represent?* dogs–genetic; tropical rain forest–ecosystem; pond–species; vegetable garden–species; students–genetic

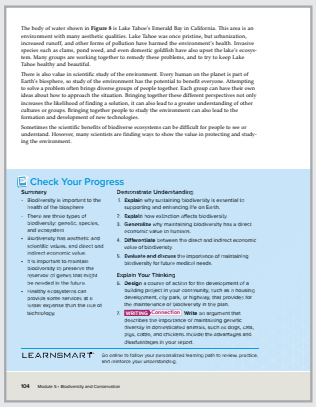
Check Your Progess

1. Biodiversity maintains a healthy biosphere and provides both direct and indirect benefits to humans.
2. Extinction reduces the variety of species.
3. Humans depend on various species for food, medicines, clothing, and shelter.
4. direct economic value—apparent and often recognized immediately; indirect economic benefit—not obvious and/or realized after time
5. Scientists have analyzed only a fraction of species for the medicines they can provide. It is important to maintain biodiversity to preserve species that might prove valuable.
6. Students should address measures that will conserve biodiversity, such as replanting species of plants, and keeping water sources clean.
7. disadvantage—maintaining undesirable traits; advantage—increases chances of survival during times of environmental change

Formative Assessment: Lesson Check

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

104 Module 5 • Biodiversity and Conservation


Check Your Progress
Summary
Demonstrate Understanding
Explain Your Thinking
LEARNSMART
104 Module 5 • Biodiversity and Conservation

Refer to the Intervention and Acceleration activities in this lesson for more opportunities for remediation or challenge higher level students.

GO ONLINE

ADDITIONAL RESOURCE
Vocabulary Flashcards: Biodiversity
vocabulary

ADDITIONAL RESOURCE
Lesson Check: Biodiversity

ADDITIONAL RESOURCE
Inspire Biology LearnSmart
LS LEARNSMART

Teach Your Way With Phenomena-Driven 5E Lessons

The *Alabama Inspire Science* High School Series provides two pathways for learning, teacher-facilitated and student-led. Each pathway provides teachers and students flexibility dependent on the preferred method of learning, day, or topic.

Teacher-Facilitated Pathway

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

Student-Led Pathway

Students can use the online Interactive Content, along with the Student Edition, Science Notebook, and printable projects and labs, to collect evidence to support their claims and demonstrate 3D thinking.

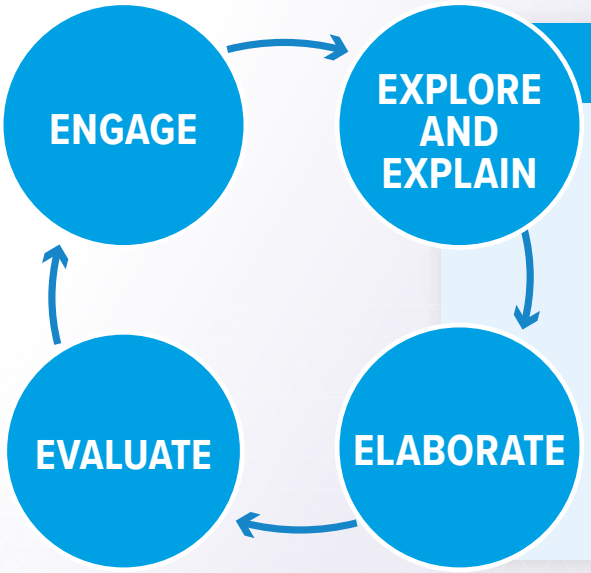
Each *Alabama Inspire Science* High School Series unit phenomenon sets the stage for the STEM Unit Project. Each module within the unit supports the STEM Unit Project with phenomena-driven 5E lessons to support a variety of learning pathways.

UNIT OPENER

Encounter the Phenomenon
STEM Unit Project Launch
Formative Assessment Science Probe

MODULE OPENER

Encounter the Phenomenon
CER Claim, Evidence, Reasoning



LESSON

ENGAGE:
Encounter the Phenomenon
Phenomenon Question

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

ELABORATE:
Environmental Connection
STEM Career Connections

EVALUATE:
Lesson Review
Three-Dimensional Assessment

MODULE CLOSE

Revisit the Phenomenon
State Assessment Practice
CER Claim, Evidence, Reasoning
Labs/Projects
Revisit STEM Unit Project
Module Test
Vocabulary Review

UNIT CLOSE

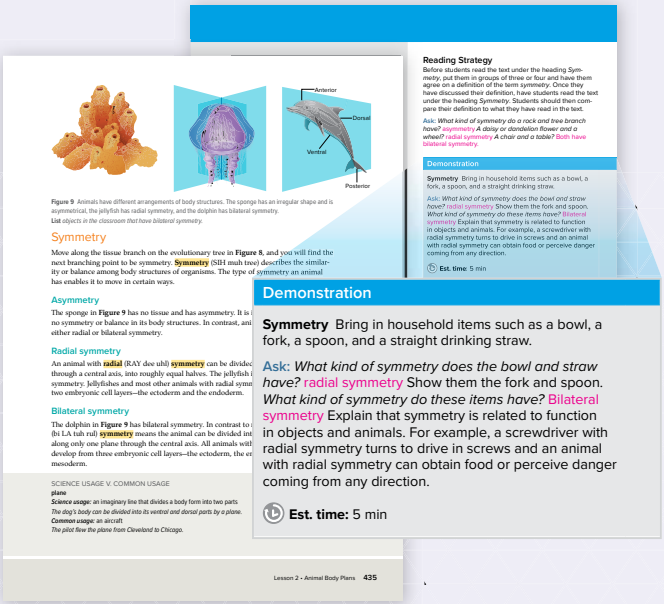
Go Online
Complete STEM Unit Project

Empower Students With Inquiry-Based Learning

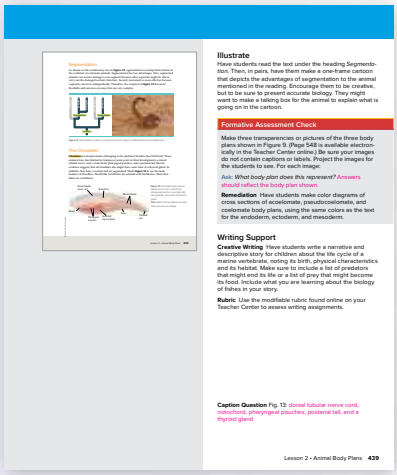
Investigate questions and solve problems from a variety of angles. Inquiry-driven instruction gives students the practice they need to succeed in developing solutions to whatever challenges they may encounter.

Types of Inquiry Activities

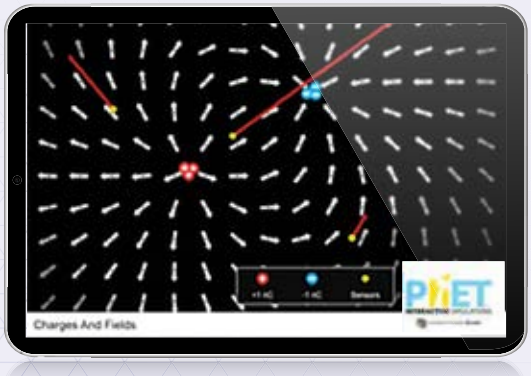
Each course in the High School Series of *Alabama Inspire Science* includes inquiry that builds beyond hands-on activities. With *Alabama Inspire Science*, students will investigate phenomena through several techniques reflective of the way science and engineering are done in the real world.



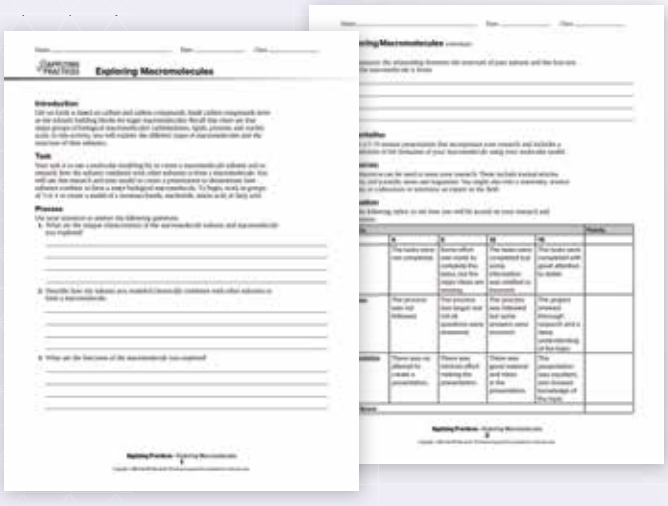
Demonstrations & Hands-on Activities



Engineering



Simulations



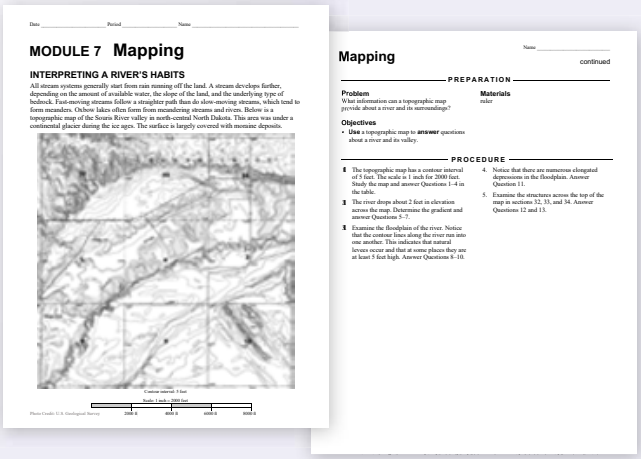
Research

Hands-On Inquiry

Alabama Inspire Science is centered around inquiry. The program provides several opportunities in each module for student exploration.

All inquiry activities in *Alabama Inspire Science* promote student engagement and allow each student to develop inquiry, 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.

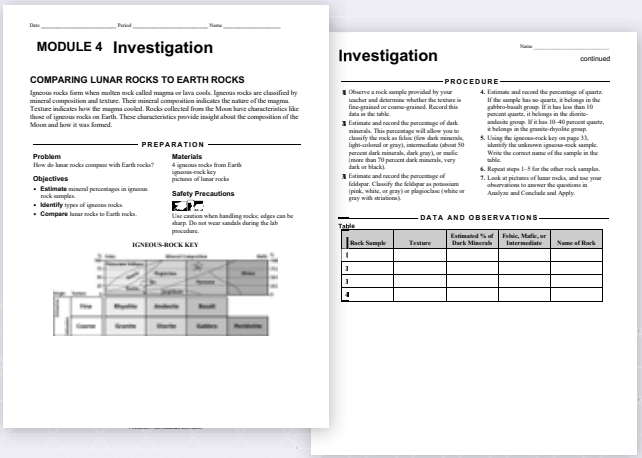

MODULE 7 Mapping

INTERPRETING A RIVER'S HABITS

Mapping

PREPARATION

PROCEDURE

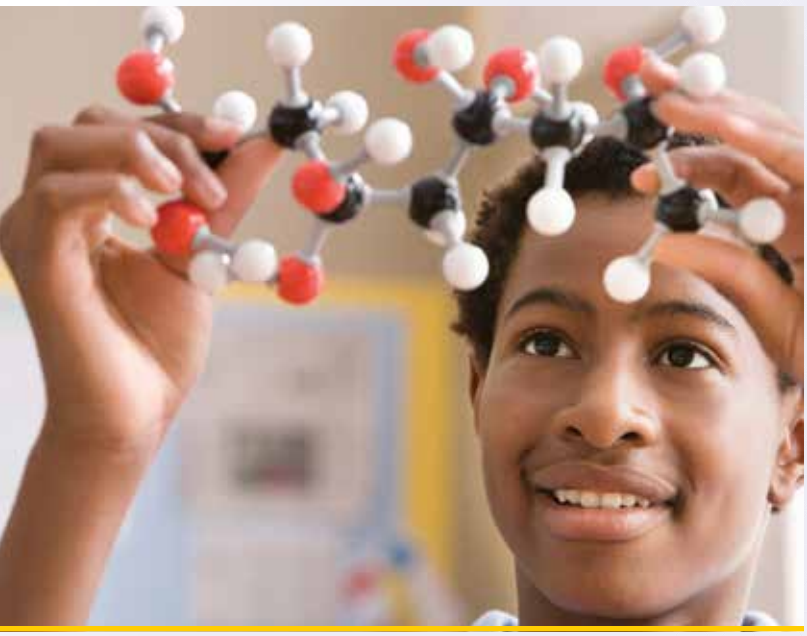

MODULE 4 Investigation

COMPARING LUNAR ROCKS TO EARTH ROCKS

Investigation

PROCEDURE

DATA AND OBSERVATIONS



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

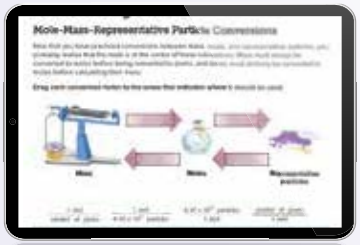
Teach Your Way With Innovative Digital Resources

Transport students beyond the walls of your classroom with cutting-edge digital content, including interactives, simulations, videos, and more.

Fun and easy-to-use, these features align with lesson topics to spark scientific curiosity, support discussion, enhance review, and deepen understanding.

Why Go Online?

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

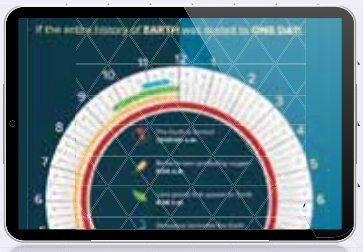


Drag and Drop activities offer students the chance to manipulate new concepts.

Phenomena videos showcase ultra-engaging, content-related examples of science in real life.

Simulations allow students to manipulate variables in a scenario beyond the limits of the classroom.

Vocabulary flashcards deliver focused support for key words.



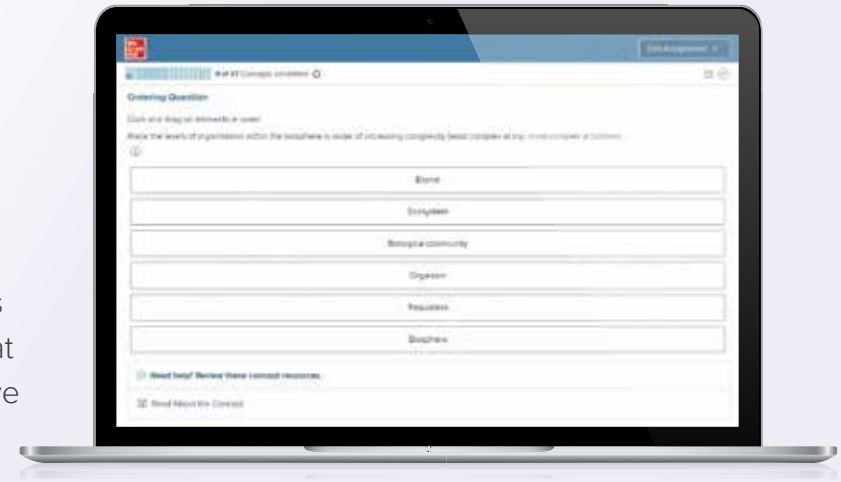
Infographics provide an engaging graphic to foster collaborative and hands-on learning in the world surrounding them.

Interactive Visual Literacy features prepare students to identify visual representations of scientific phenomena.

Adaptive Learning With *SmartBook*®

Each student enters the classroom with different strengths, interests, and abilities. Eliminate guesswork and get to the heart of their learning needs with adaptive, comprehensive differentiation.

The secret is *SmartBook*, the first and only adaptive reading experience designed to change the way students read and learn. As the student progresses, *SmartBook* highlights the most impactful concepts the student needs to learn. When *SmartBook* detects what a student is most likely to forget, that content is presented for review to improve the student's knowledge retention.



See the duration students take to complete the assignment compared to the estimate.

Challenging concepts are revealed as students wrap up assignments, giving teachers the chance to reinforce topics before the next lesson.

Track progress on the assignment as students work through the questions.

Breakdown reporting to the individual student level.

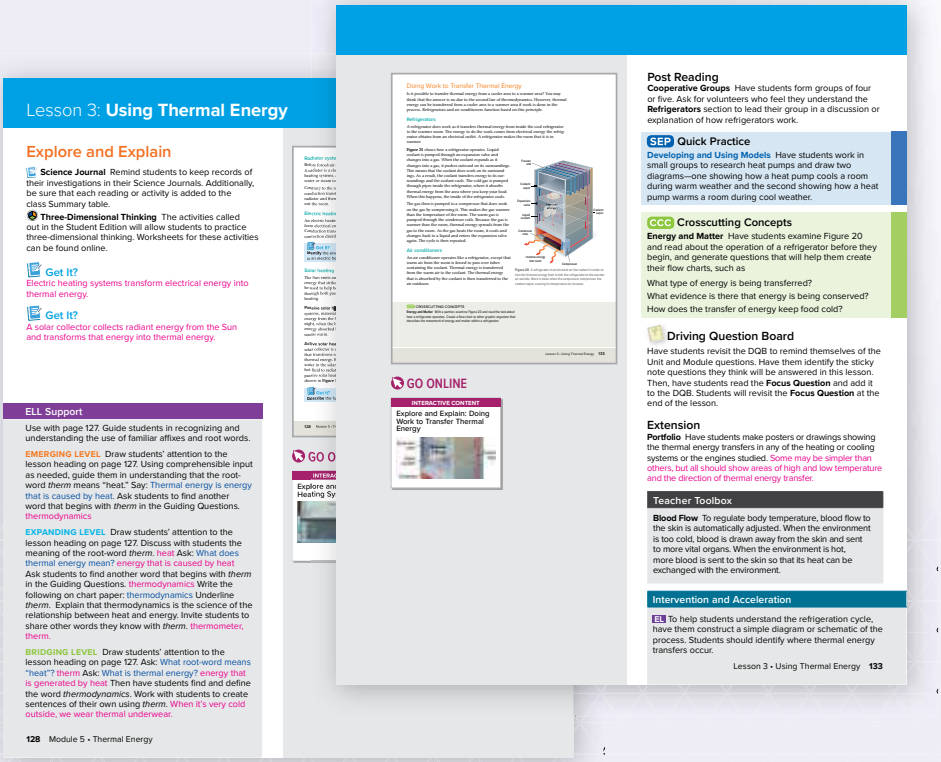
Real-Time Reporting Tools

Find efficiencies by managing and tracking individual student progress and the progress of the whole class. Teachers can focus on what students don't understand or still need to learn, rather than what they've already mastered.

Support Every Learner

Alabama Inspire Science incorporates the research-based Universal Design Learning Principles to ensure that all students have access to rigorous curriculum.

Support with practical strategies is found at the module and lesson level at multiple points. The Leveled text aligns with the Lexile ranges appropriate for each grade level.



Intervention and Acceleration

Robust differentiation support including guiding questions for different student levels, as well as differentiation guidance is found in the Teacher's Edition. Module and lesson level practice strategies are also found at multiple points.

English Language Support

Alabama Inspire Science applies the best instructional practices for teaching EL students. Each module and lesson have scaffolded activities that offer students of any level of English language proficiency the opportunity to engage in academically challenging science and engineering content while supporting language acquisition.

ELL Support

Use with page 127. Guide students in recognizing and understanding the use of familiar affixes and root words.

EMERGING LEVEL Draw students' attention to the lesson heading on page 127. Using comprehensible input as needed, guide them in understanding that the root-word *therm* means "heat." Say: Thermal energy is energy that is caused by heat. Ask students to find another word that begins with *therm* in the Guiding Questions. thermodynamics

EXPANDING LEVEL Draw students' attention to the lesson heading on page 127. Discuss with students the meaning of the root-word *therm*. heat Ask: What does thermal energy mean? energy that is caused by heat Ask students to find another word that begins with *therm* in the Guiding Questions. thermodynamics Write the following on chart paper: thermodynamics Underline *therm*. Explain that thermodynamics is the science of the

Supporting Reading Comprehension in Science

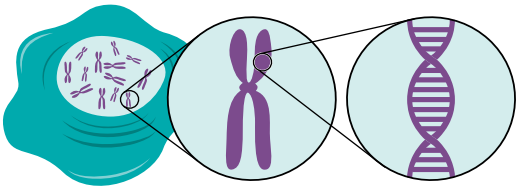
Alabama Inspire Science empowers all students to succeed in science—no matter their starting point. The Science Reading Essentials for *Alabama Inspire Biology* and *Alabama Inspire Physical Science* provide reading and writing support for students in need of a little extra help, including:

- Content written two Lexile levels lower than the on-level content
- Teacher tips to provide ample student support

Tips and questions throughout the margins of the lesson provide support for students at point of use.

Reading Essentials include visual supports to enhance learning for all types of students.

"factors" are part of chromosomes. And, each cell in offspring contains chromosomes from both parents. These exist as pairs, one chromosome from each parent.



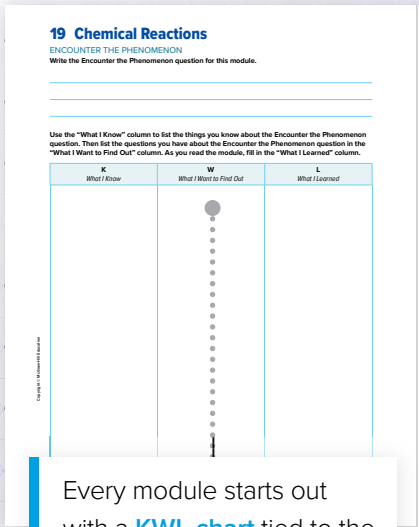
Chromosomes in nucleus | Chromosome | Gene

History Connection How did scientists discover DNA? Rosalind Franklin and Maurice Wilkins were scientists who used X-rays to study DNA. [illegible]

TIP Note that the lines to the chromosome show that this is one of many chromosomes in the nucleus of a cell. The lines to the gene show that a gene is part of a chromosome.

Science Notetaking Support

Note booking is vital to success in the science classroom. The digital Science Notebook is your students' Cornell Notetaking Guide, ensuring they are writing down and keeping track of the important vocabulary, new ideas, and all of the progress along the way!



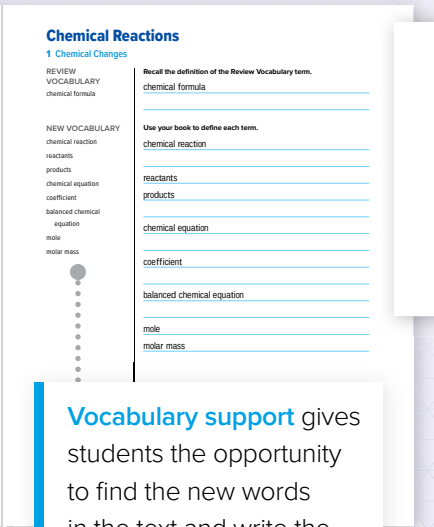
19 Chemical Reactions

ENCOUNTER THE PHENOMENON

Write the Encounter the Phenomenon question for this module.

Use the "What I Know" column to list the things you know about the Encounter the Phenomenon question. Then list the questions you have about the Encounter the Phenomenon question in the "What I Want to Find Out" column. As you read the module, fill in the "What I Learned" column.

K *What I Know*	W *What I Want to Find Out*	L *What I Learned*



Chemical Reactions

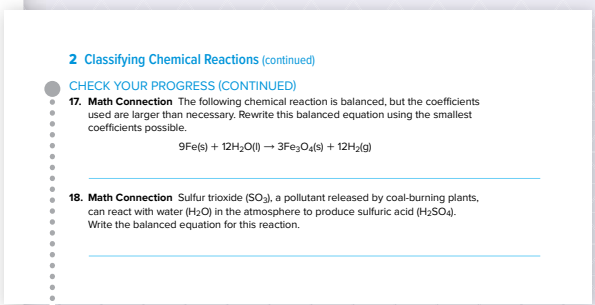
1 Chemical Changes

REVIEW VOCABULARY
chemical formula

NEW VOCABULARY
chemical reaction
reactants
products
chemical equation
coefficient
balanced chemical equation
mole
molar mass

Recall the definition of the Review Vocabulary term.
chemical formula

Use your book to define each term.
chemical reaction
reactants
products
chemical equation
coefficient
balanced chemical equation
mole
molar mass



2 Classifying Chemical Reactions (continued)

CHECK YOUR PROGRESS (CONTINUED)

17. **Math Connection** The following chemical reaction is balanced, but the coefficients used are larger than necessary. Rewrite this balanced equation using the smallest coefficients possible.

$$9Fe(s) + 12H_2O(l) \rightarrow 3Fe_3O_4(s) + 12H_2(g)$$

18. **Math Connection** Sulfur trioxide (SO_3), a pollutant released by coal-burning plants, can react with water (H_2O) in the atmosphere to produce sulfuric acid (H_2SO_4). Write the balanced equation for this reaction.

Every module starts out with a **KWL chart** tied to the new module phenomena.

Vocabulary support gives students the opportunity to find the new words in the text and write the definitions themselves.

Check Your Progress asks questions reflecting on the new content covered in the lesson.

Cross-Curricular Connections

Alabama Inspire Science has been designed to seamlessly integrate science content across disciplines within each course to help students make connections within them.

By integrating Literacy and Mathematics, STEM Careers, and integrated Engineering students approach a single phenomenon from different perspectives.

LESSON 3
CYCLING OF MATTER

FOCUS QUESTION
How does matter flow through an ecosystem?

Cycles in the Biosphere

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

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

CHEMISTRY Connection Refer back to the energy and biomass pyramids in **Figure 16**. At each link upward in a food web, only a fraction of the matter and energy consumed is transferred to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, fewer organisms are found at higher levels of the food web.

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

Javier Lorca Photo/Age Fotostock

Figure 17 Chemical elements are cycled through the biosphere through organisms. As producers, grasses begin the cycle by capturing energy from the Sun.

Explain *how chemical elements continue to be cycled through the biosphere in this photo.*

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

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

INVESTIGATE
GO ONLINE to find these activities and more resources.
Applying Practices: The Cycling of Matter and Flow of Energy in Aerobic and Anaerobic Conditions

Lesson 3 • Cycling of Matter 39

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

Latitude

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

Climate

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

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

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

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

Annual Precipitation v. Temperature for Various Biomes

Annual precipitation (cm)

Average temperature (°C)

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

Got It?
Explain the difference between weather and climate.

Major Land Biomes

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

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

Lesson 2 • Terrestrial Biomes 55

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


INTRODUCTION

Defining STEM

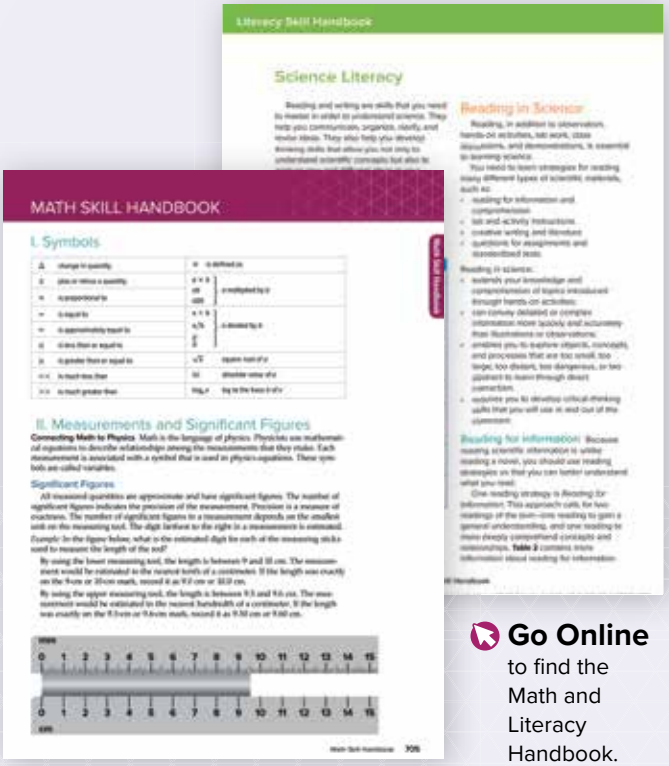
Go Online to find the Science and Engineering Handbook to learn more about each of the eight SEPs.

Integrated Engineering

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

Math and Literacy

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


Literacy Skill Handbook

Science Literacy

MATH SKILL HANDBOOK

I. Symbols

II. Measurements and Significant Figures

Go Online to find the Math and Literacy Handbook.

STEM CAREER Connection

Water Resource Engineer

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

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

Bring Science to Life

Alabama Inspire Science transports students beyond the walls of your classroom with cutting-edge digital content, including interactives, simulations, videos, and more.

Fun and easy-to-use, these features align with lesson topics to spark scientific curiosity, support discussion, enhance review, and deepen understanding.

Student Advantages

Simulations

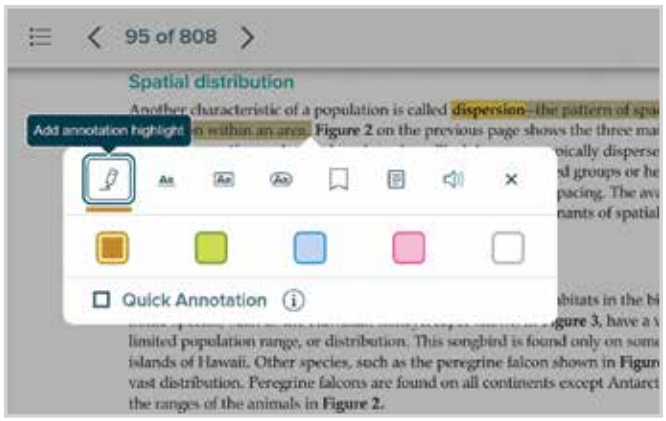
Simulations offer a chance to experience real-life scenarios that depict true events. These proven tools improve learning and create safe and engaging learning environments where failure is possible–something that is often missed when students are learning.

Inspire Science 3D App

Inspire Science 3D application provides students the ability to explore through the wonders of augmented virtual reality and provides students the opportunity to engage with science topics in a 3D environment rather than just a 2D image found on a page.

Poptips Plus

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

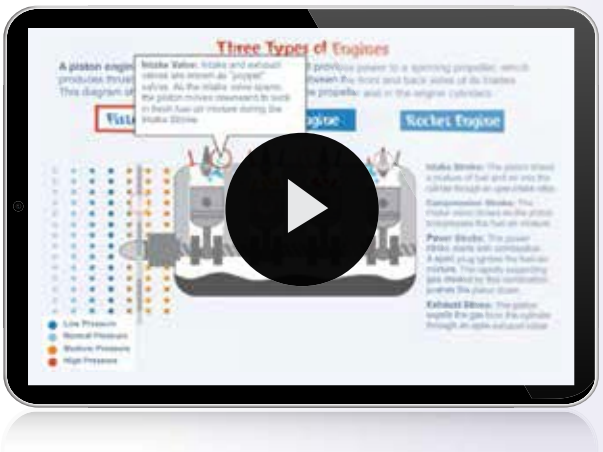


Interactive Text

Engage students in online literacy learning with tools like text-to-speech, note-taking, and text highlighting, and text highlighting. Interacting with learning creates a dynamic experience that's more engaging and will improve student learning and retention.

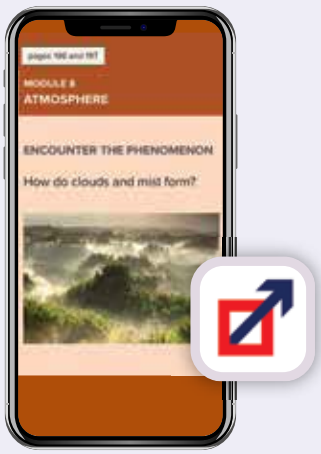
Kahoot!

Help students review important material in an engaging way with fun, game show-like quizzes using Kahoot!



Videos

Enhance teaching and learning with videos that reinforce concepts and spark discussion. Videos encourage students to hone their analytical skills by analyzing media using the theories and concepts they are studying while experiencing worlds beyond their own.



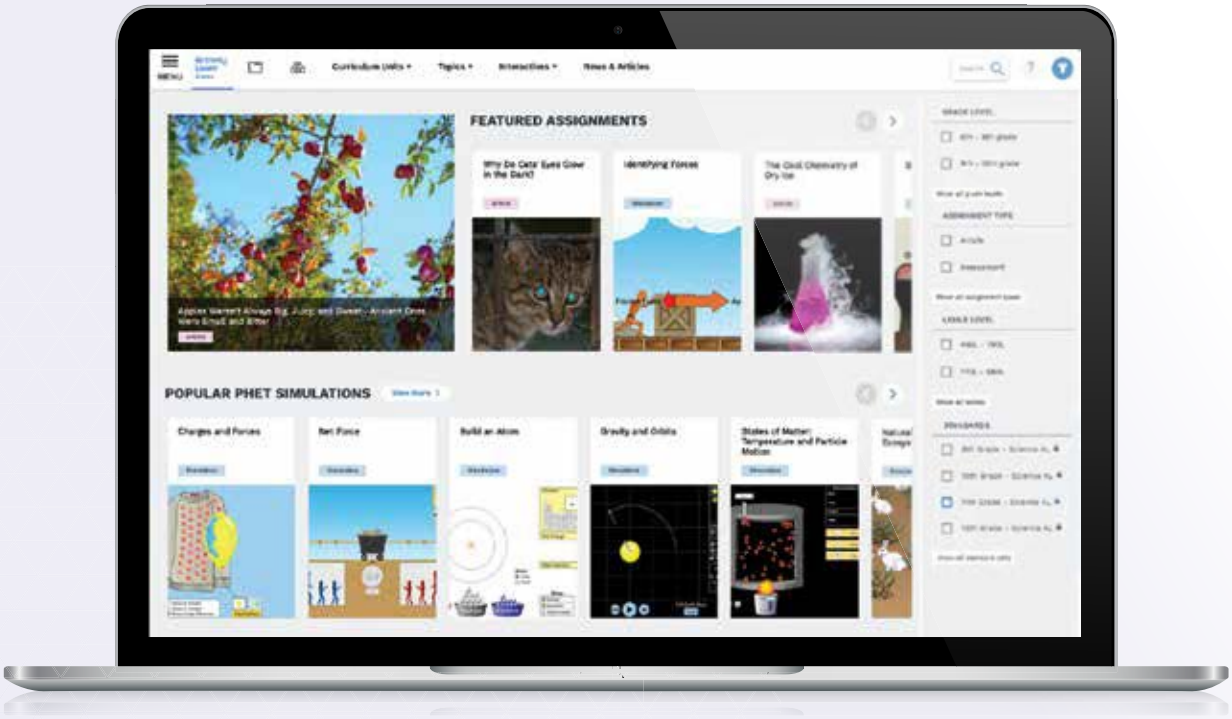
McGraw Hill K–12 Portal App

Students can access their content anywhere, any time, on any device—with or without internet access—using the McGraw Hill K–12 Portal App.

Drive Deeper Science Learning With *Actively Learn*

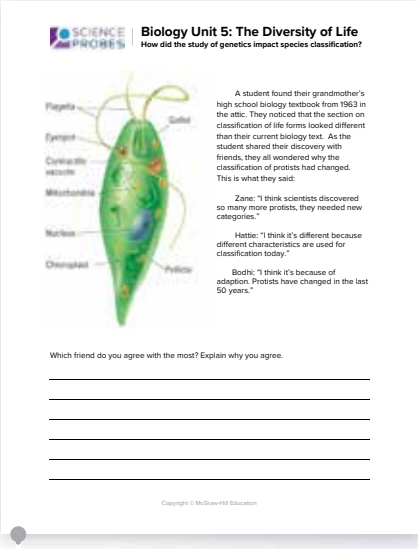
As educators, we know how important it is to keep students engaged.

That's why each *Alabama Inspire Science* module and lesson is designed to tap into students' natural curiosity about the world around them through the investigation of real-world phenomena. Student engagement is further fueled through an innovative digital experience, and connections to real-world applications.



- **Engaging, relevant, standards-based content** for all learners
- **Science texts, articles, and videos** at each student's level
- **Inquiry-driven science simulations** that bring natural phenomena to life
- **Interactive reading and study aids** that promote active collaboration
- **Rich, cross-curricular connections** to literature and history
- **Powerful tools** that let teachers customize content or upload their own
- **Access to student data** to inform instructional decisions

Fuel Student Engagement Using the World Around Them


SCIENCE PROBES

Biology Unit 5: The Diversity of Life

How did the study of genetics impact species classification?

A student found their grandmother's high school biology textbook from 1963 in the attic. They noticed that the section on classification of life forms looked different than their current biology text. As the student shared their discovery with friends, they all wondered why the classification of protists had changed. This is what they said:

Zane: "I think scientists discovered so many more protists, they needed new categories."

Hattie: "I think it's different because different characteristics are used for classification today."

Bodhi: "I think it's because of adaption. Protists have changed in the last 50 years."

Which friend do you agree with the most? Explain why you agree.

Science Probes

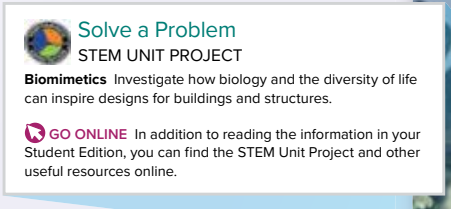
Science Probes are module launch questions centered around relevant phenomena designed to interest and get students talking about their ideas. When students do the talking, it is evidence that they are thinking and provides you an avenue to uncover and resolve commonly-held preconceptions or misconceptions.

Visualizing Phenomena in Action

Encounter the Phenomenon Videos enable students to observe scientific topics in action, providing a visual experience that encourages thinking and collaborative conversations.

Virtual Investigations

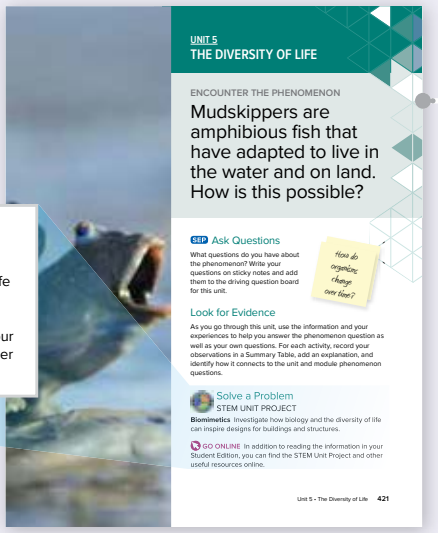
Extend experiments beyond the classroom setting. With Virtual Lab, students have an engaging, alternative, digital interaction to interact with an experiment.


Solve a Problem

STEM UNIT PROJECT

Biomimetics Investigate how biology and the diversity of life can inspire designs for buildings and structures.

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


UNIT 5

THE DIVERSITY OF LIFE

ENCOUNTER THE PHENOMENON

Mudskippers are amphibious fish that have adapted to live in the water and on land. How is this possible?

SEP Ask Questions

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

How do organisms change over time?

Look for Evidence

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

Solve a Problem

STEM UNIT PROJECT

Biomimetics Investigate how biology and the diversity of life can inspire designs for buildings and structures.

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

Unit 5 • The Diversity of Life 421

STEM Unit Projects

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

Alabama Assessment Strategies

Alabama Inspire Science includes a variety of assessment options to support teachers with differentiation strategies and support students on their journey to mastery of the Alabama Science Course of Study and culminating with success on the End of Course Assessment and the ACT.

Formative Assessment

Formative assessment, embedded at many points throughout each module and lesson, facilitates student reflection on their thinking (metacognition) and allows teachers to dynamically differentiate instruction. The table below shows the types of formative assessment resources in *Alabama Inspire Science* found online and in print.

FEATURE	INSTRUCTIONAL PURPOSE
Science Probes	Found at the beginning of each unit in the online resources, Science Probes reveal student preconceptions to guide instruction.
Claim, Evidence, Reasoning	With the CER Framework (Claim, Evidence, Reasoning) students will make claims and document their reasoning during the EXPLORE phase and add evidence and adjust their claims as needed later in the lesson.
Three-Dimensional Thinking Questions	Students will encounter questions that address the 3 dimensions of the Alabama Science Course of Study check progress with the SEPs, DCIs, CCCs, and Performance Expectations.
Applying Practices	Within each lesson you will find Applying Practices Projects to help you apply the Science and Engineering Practices and build understanding of the Disciplinary Core Ideas so that you can complete each STEM Unit Project.

Summative Assessment

Summative assessment tools at the module and lesson level help ensure lasting learning and alignment of student skills to the Performance Expectations with the following summative assessment tools found in *Alabama Inspire Science* in print Student Editions and online.

FEATURE	INSTRUCTIONAL PURPOSE
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 are ready for the module.
Three-Dimensional Thinking Questions	At the end of the lessons, students will demonstrate their understanding of at least two of the three dimensions of Alabama Science Course of Study to develop three-dimensional thinking skills.
Lesson Check	Found in every lesson online, Lesson Checks determine how students are building a progression of learning toward the performance expectations.
Module Test	Found at the end of each module online, Module Tests evaluate student proficiency against the performance of the module with multiple choice, extended response, constructed response, and performance-task items.
STEM Unit Project	With each STEM Module Project, found at the end of each module, 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.
Module Vocabulary Practice	Through online interactives, students practice and check their understand of science language. Immediate feedback from the system provided!

State Assessment Guide

Organized by the *Alabama Inspire Science* High School Series scope and sequence for each program, the State Assessment Guide provides guided and independent practice for both discrete items and performance tasks with teacher support for each. Also included are standards alignment correlations, DOK levels, evidence statements, answer keys with rationale for correct and incorrect answers, and scoring rubrics for performance tasks.

Use this guide in your classroom in a variety of ways to meet the needs of your students.

- ✓ Use the Guided Practice and Practice sections prior to a Module Test to provide extra support or as preassessment to serve as a benchmark.
- ✓ Use the Guided Practice and Practice sections after a Lesson Check, but prior to a Module Test for remediation.
- ✓ Choose an approach by administering the Guided Practice section first and then give students the Practice section.

Seamless Integration Services

We are proud to work with schools across Alabama to implement our programs into a range of classroom environments using different platforms. Both our Integration team and our Digital Technical Support team are ready to support you and your implementation.

To learn more, visit **mheducation.com/alabama**.

Google Classroom

Clever

PowerSchool

CANVAS BY INSTRUCTURE

schoology

Preparing Students for the ACT

Alabama Inspire Science is an inquiry-based program that leads students to be able to think, reason, and problem solve. The science portion of the ACT measures the interpretation, analysis, evaluation, reasoning, and problem solving skills.

Interpretation of Data 40–50%

Applying Practices, Go Further Activities, and Practice Problems all give students opportunities to interpret data to answer questions.

Scientific Investigation 20–30%

With well over 100 Labs, Projects, and Demos in the *Alabama Inspire Science* program, students will have a thorough understanding of experimental tools, procedures, and design and compare, extend, and modify experiments.

Evaluation of Models, Inferences, and Experimental Results 25–35%

With real-world articles and data, students are able to make inferences, think critically and problem solve.

Continued Professional Learning

Professional Development

We know it can be a challenge to implement a new science program with new standards. That's why *Alabama 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, from any device.

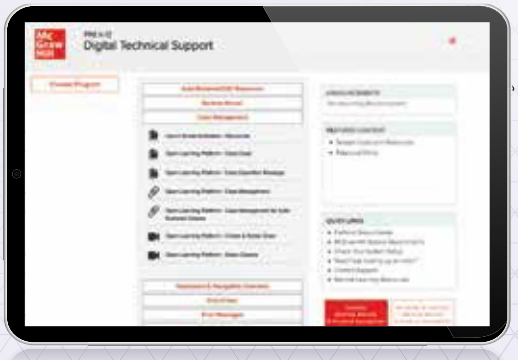
Program Implementation Support

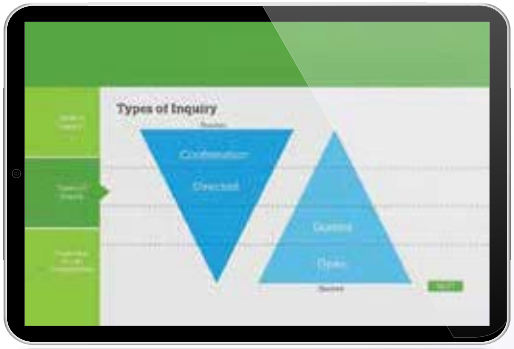
Implementation support provides everything you need to know to get up to speed on the first day of school.

Quick Start Videos explain program basics to help get you started.

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 *Alabama 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** model lessons from real classrooms
- **Science Preconceptions Videos** review common preconceptions and strategies to overcome them
- **Instructional Coaching Videos** discuss best practice strategies and the "Why" behind the success
- **Teacher Activity Videos** show planning tips and expected results to help with hands-on activity time
- **Science Pedagogy Micro-Courses** provide facilitation guides for both self-guided or small group courses

Alabama Inspire Science

Learn More at mheducation.com/alabama

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