



# Three-Dimensional Learning Guide to **iSCIENCE**



# Three-Dimensional Learning Guide to *iScience*



McGraw-Hill Education is your partner in delivering a balanced learning experience to meet the needs of your diverse 21st century classroom and students. This **Three-Dimensional Learning Guide** is your blueprint for a hands-on, student inquiry classroom to meet the new science standards.

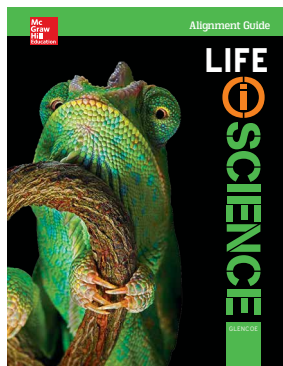
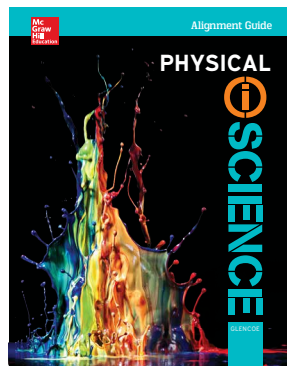
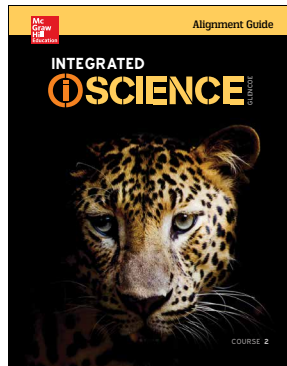
This Guide will take you through the programs by highlighting how to implement **Inquiry** and **Student-led exploration**, disciplinary core ideas, crosscutting concepts, and science and engineering practices.

Each chapter starts with a visual phenomenon, online guiding questions in the Phenomenon Bank, and a Launch Lab to spark student inquiry. Multiple opportunities for Student Exploration and Investigation foster collaboration throughout each lesson. Formative assessment and student self-evaluation guide learning.

Look for these icons throughout this guide to show where to find the NGSS tools of the *iScience* program.



# Ease the Transition to Meeting the Next Generation Science Standards



**Life Science**

<b>MS-LS1</b>	<b>From Molecules to Organisms: Structures and Processes</b>	<p><b>MS-LS1-1</b> Construct a scientific explanation of how the structure of biological molecules relates to their function. Use models to illustrate how the structure of biological molecules (carbohydrates, lipids, and proteins) is related to their function. Use evidence to support the claim that the structure of biological molecules is related to their function.</p>	<p><b>Grade 7-8 Science Practices</b></p>
<b>MS-LS2</b>	<b>From Ecosystems to Biospheres: Interactions and Processes</b>	<p><b>MS-LS2-1</b> Analyze and compare data to support an explanation of the change in a community or ecosystem over time. Use models to illustrate the change in a community or ecosystem over time.</p>	<p><b>Grade 7-8 Science Practices</b></p>
<b>MS-LS3</b>	<b>Genetics and Heredity</b>	<p><b>MS-LS3-1</b> Analyze and compare data to support an explanation of the role of DNA in the development of an organism. Use models to illustrate the role of DNA in the development of an organism.</p>	<p><b>Grade 7-8 Science Practices</b></p>
<b>MS-LS4</b>	<b>Biological Evolution: The Unity and Diversity of Life</b>	<p><b>MS-LS4-1</b> Analyze and compare data to support an explanation of the role of natural selection in the development of an organism. Use models to illustrate the role of natural selection in the development of an organism.</p>	<p><b>Grade 7-8 Science Practices</b></p>

**Life Science continued**

<b>MS-LS1</b>	<b>From Molecules to Organisms: Structures and Processes</b>	<p><b>MS-LS1-2</b> Analyze and compare data to support an explanation of the structure of biological molecules and their function. Use models to illustrate the structure of biological molecules and their function.</p>	<p><b>Grade 7-8 Science Practices</b></p>
<b>MS-LS2</b>	<b>From Ecosystems to Biospheres: Interactions and Processes</b>	<p><b>MS-LS2-2</b> Analyze and compare data to support an explanation of the change in a community or ecosystem over time. Use models to illustrate the change in a community or ecosystem over time.</p>	<p><b>Grade 7-8 Science Practices</b></p>
<b>MS-LS3</b>	<b>Genetics and Heredity</b>	<p><b>MS-LS3-2</b> Analyze and compare data to support an explanation of the role of DNA in the development of an organism. Use models to illustrate the role of DNA in the development of an organism.</p>	<p><b>Grade 7-8 Science Practices</b></p>
<b>MS-LS4</b>	<b>Biological Evolution: The Unity and Diversity of Life</b>	<p><b>MS-LS4-2</b> Analyze and compare data to support an explanation of the role of natural selection in the development of an organism. Use models to illustrate the role of natural selection in the development of an organism.</p>	<p><b>Grade 7-8 Science Practices</b></p>

iScience helps ease the transition to **Next Generation Science Standards (NGSS)\***. Our middle school science programs ensure you are fully aligned to:

- Performance Expectations
- Science and Engineering Practices
- Disciplinary Core Ideas
- Cross-cutting Concepts

We are committed to ensuring that you have the tools and resources necessary to meet the expectations for NGSS.

## What is NGSS?

The purpose of NGSS is to act as the foundation for science education while describing a vision of what it means to be proficient in science. It emphasizes the importance of the practices of science and engineering to learning critical thinking skills as well as content.

## Why NGSS?

NGSS has developed in an effort to create unified standards in science education that consider content, practices, pedagogy, curriculum, and professional development. The standards provide all students with an internationally benchmarked education in science.

\*Next Generation Science Standards is a registered trademark of Achieve. Neither Achieve nor the lead states and partners that developed the Next Generation Science Standards was involved in the production of, and does not endorse, this product.

# Science and Engineering Practice Handbook



The *Science and Engineering Practices Handbook*, found in the Student Center and Teacher Center online at ConnectEd, introduces students to the skills they will use in science investigations and engineering projects. It explains the Cross-cutting Concepts as well as the eight Science and Engineering Practices defined by *A Framework for K-12 Science Education*.

This useful tool eases the transition to the NGSS by providing definitions, examples, and Quick Practice activities to be used as reference while students develop their projects and meet performance expectations.

Students practice reading and literacy in science and technical subjects by determining central ideas of the text with the **Big Idea** question that appears at the beginning of each chapter.

**Nature of Science**

## Scientific Explanations

**THE BIG IDEA** How can science provide answers to your questions about the world around you?

**Inquiry** **Vacuuming Corals?**

No, these two divers are collecting data about corals in waters near Sulawesi, Indonesia. They are marine biologists, scientists who study living things in oceans and other saltwater environments.

- What information about corals are these scientists collecting?
- What questions do they hope to answer?
- How can science provide answers to their questions and your questions?

**Methods of SCIENCE**

This chapter begins your study of the nature of science, but there is even more information about the nature of science in this book. Each unit begins by exploring an important topic that is fundamental to scientific study. As you read these topics, you will learn even more about the nature of science.

<b>Models</b>	<b>Unit 1</b>
<b>Technology</b>	<b>Unit 2</b>
<b>Graphs</b>	<b>Unit 3</b>
<b>Systems</b>	<b>Unit 4</b>
<b>History</b>	<b>Unit 5</b>

**connectED**  
Your one-stop online resource  
[connectED.mcgraw-hill.com](http://connectED.mcgraw-hill.com)

<b>LS</b> LearnSmart®	<b>PBL</b> Project-Based Learning Activities
<b>CR</b> Chapter Resources Files, Reading Essentials, Get Ready to Read, Quick Vocabulary	<b>LM</b> Lab Manuals, Safety Videos, Virtual Labs & Other Tools
<b>AV</b> Animations, Videos, Interactive Tables	<b>VG</b> Vocabulary, Multilingual eGlossary, Vocab eGames, Vocab eFlashcards
<b>SC</b> Self-checks, Quizzes, Tests	<b>PT</b> Personal Tutors

NOS-2

NOS-3

**Science and Engineering Practices** are prevalent throughout *iScience*. Students are presented with the practice of asking questions throughout the program. An **inquiry** question is proposed to students at the beginning of each chapter and lesson, prompting students to ask their own questions.

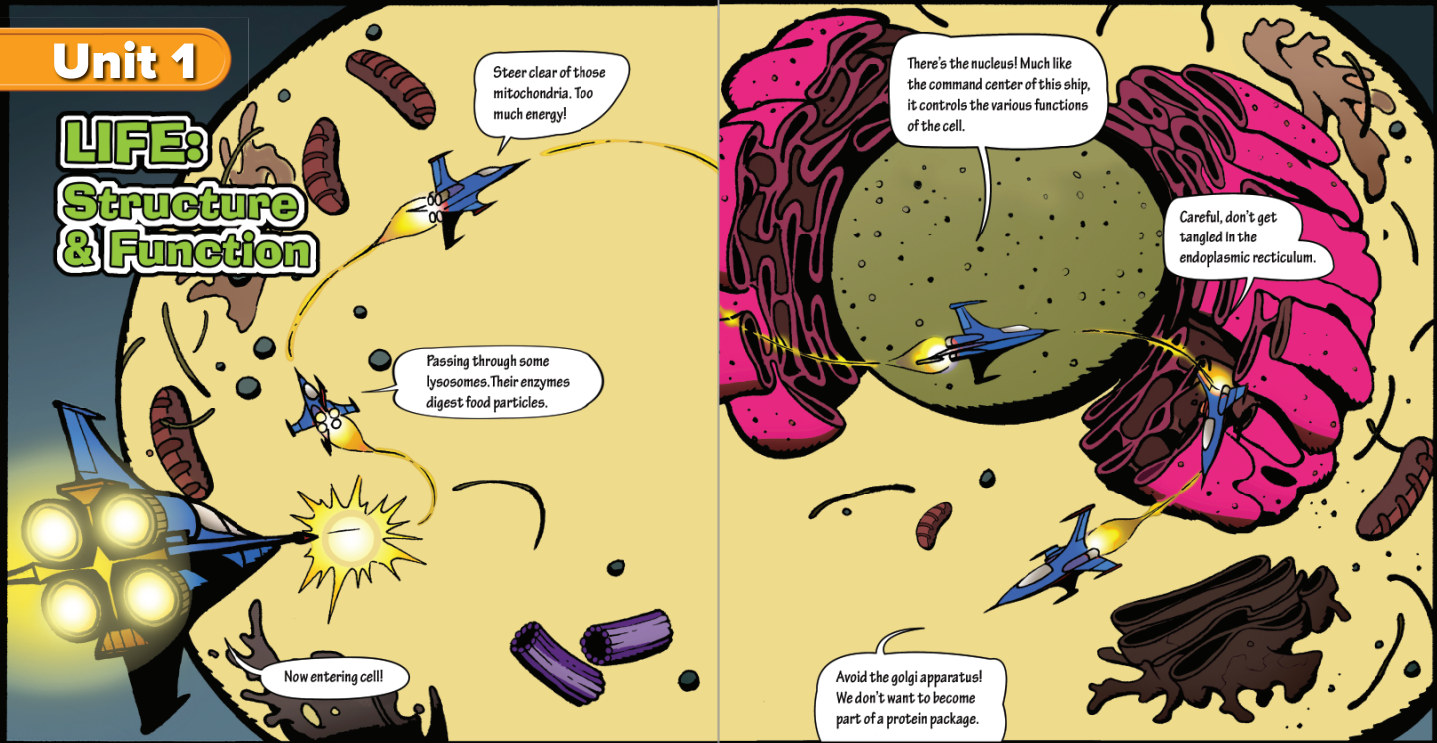


Starts with the **Big Idea** which encourages students to ask questions.

**Cross-cutting Concepts** are an integral part of the *iScience* program. This unit discusses the way living organisms are shaped and how that shape determines the properties and functions of that organism and its components.

## Unit 1

# LIFE: Structure & Function



1600

**1665** Robert Hooke discovers cells while examining thin slices of cork under a microscope.

**1674** Anton van Leeuwenhoek observes living cells under a microscope and names the moving organisms *animalcules*.

1800

**1831** The nucleus is given its name by Robert Brown.

**1839** Theodor Schwann publishes a book suggesting that the cell is the basic unit of life.

1850

**1858** Rudolf Virchow concludes that all cells come from preexisting cells.

**1875** Walther Flemming introduces the term *mitosis* and notes that chromosomes split longitudinally during this process.

**1953** James Watson and Francis Crick develop the double-helix model of DNA.

2 • Unit 1

Visit ConnectED for this unit's **STEM** activity.

Unit 1 • 3

Science, Technology, Engineering and Mathematics are woven throughout the *iScience* program. A STEM activity is available for each unit in the program. This unit's **STEM activity** asks students to compare a cell to a building and then design and construct a three-dimensional model of a building that they will use to illustrate these comparisons.



Brings Cross-cutting Concepts to life.

The *iScience* program presents abundant opportunities for student engagement, meaningful discourse, and reflection. This process begins with Page Keeley formative assessment probes at the beginning of every chapter.

## The Mitten Problem

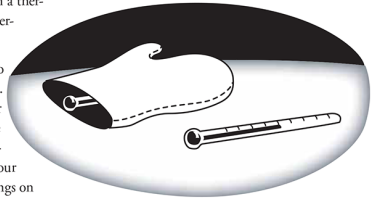
Sarah's science class is investigating heat energy. They wonder what would happen to the temperature reading on a thermometer if they put the thermometer inside a mitten.

Sarah's group obtained two thermometers and a mitten. They put one thermometer inside the mitten and the other thermometer on the table next to the mitten. An hour later they compared the readings on the two thermometers. The temperature inside the room remained the same during their experiment.

What do you think Sarah's group will discover from their investigation? Circle the response that best matches your thinking.

- A The thermometer inside the mitten will have a lower temperature reading than the thermometer on the table.
- B The thermometer inside the mitten will have a higher temperature reading than the thermometer on the table.
- C Both thermometers will have the same temperature reading.

Describe your thinking. Provide an explanation for your answer.



A screenshot of the McGraw Hill Education iScience platform interface. The left sidebar contains navigation options: ConnectED, Class Management, Resources, Assignment Tracker, Calendar, My Files, Home, Plan and Present (highlighted with a red box), Assessment, Standards, Professional Development, Glossary, Notebook, My Messages, and My Discussions. The main content area shows a 'Chapter Overview' for Chapter 1, with a red box around the chapter navigation. Below the overview are sections for Standards, Resource Preview, Labs and Activities, The BIG Idea, Inquiry, and Get Ready to Read. At the bottom, there is a section for 'Page Keeley Science Probes' (highlighted with a red box) which includes a logo and text stating: 'A formative assessment Science Probe for this chapter is available in the resources to the right.' A small thumbnail of the assessment probe is visible in the bottom right corner.



This Formative Assessment is found online and correlated to each chapter in the Plan and Present tab.

The **Big Idea** question is the overarching question for this chapter. This provides the framework for understanding the details that follow. The inquiry questions generate student interest in the image, prompting them to ask their own questions.



**Chapter 21**

## Populations and Communities

**THE BIG IDEA** How do populations and communities interact and change?

**Get Ready to Read**

**What do you think?**  
Before you read, decide if you agree or disagree with each of these statements. As you read this chapter, see if you change your mind about any of the statements.

- 1 Some life exists in the ice caps of the North Pole and the South Pole.
- 2 A community includes all organisms of one species that live in the same area.
- 3 Some populations decrease in numbers because of low birthrates.
- 4 An extinct species has only a few surviving individuals.
- 5 No more than two species can live in the same habitat.
- 6 A cow is a producer because it produces food for other organisms.

**Inquiry Too Many Pigeons?**

This group of pigeons does not depend only on the environment for food. Tourists visiting the area also feed the pigeons. Because so much food is available, more pigeons than normal live in this part of the city.

- Do you think this large number of pigeons affects other organisms in the area?
- How do you think groups of pigeons and other organisms interact and change?

**connectED**  
Your one-stop online resource  
[connectED.mcgraw-hill.com](http://connectED.mcgraw-hill.com)

- LS LearnSmart®
- PBL Project-Based Learning Activities
- Chapter Resources Files, Reading Essentials, Get Ready to Read, Quick Vocabulary
- Lab Manuals, Safety Videos, Virtual Labs & Other Tools
- Animations, Videos, Interactive Tables
- abc Vocabulary, Multilingual eGlossary, Vocab eGames, Vocab eFlashcards
- Self-checks, Quizzes, Tests
- Personal Tutors

738 739

An anticipatory set of statements help prepare students for reading.



Starts with an engaging image that will spark questions for students to collaborate and investigate.



The **Reading Guide** helps students practice reading and literacy in science and technical subjects by asking **Essential Questions** to simulate student thought.

Launch Labs are found at the beginning of lessons and help students to explore using a hands-on approach to what the lesson content will be teaching.

## Lesson 1

**Reading Guide**

**Key Concepts**

**ESSENTIAL QUESTIONS**

- What defines a population?
- What factors affect the size of a population?

**Vocabulary**

**biosphere** p. 741

**community** p. 742

**population** p. 742

**competition** p. 743

**limiting factor** p. 743

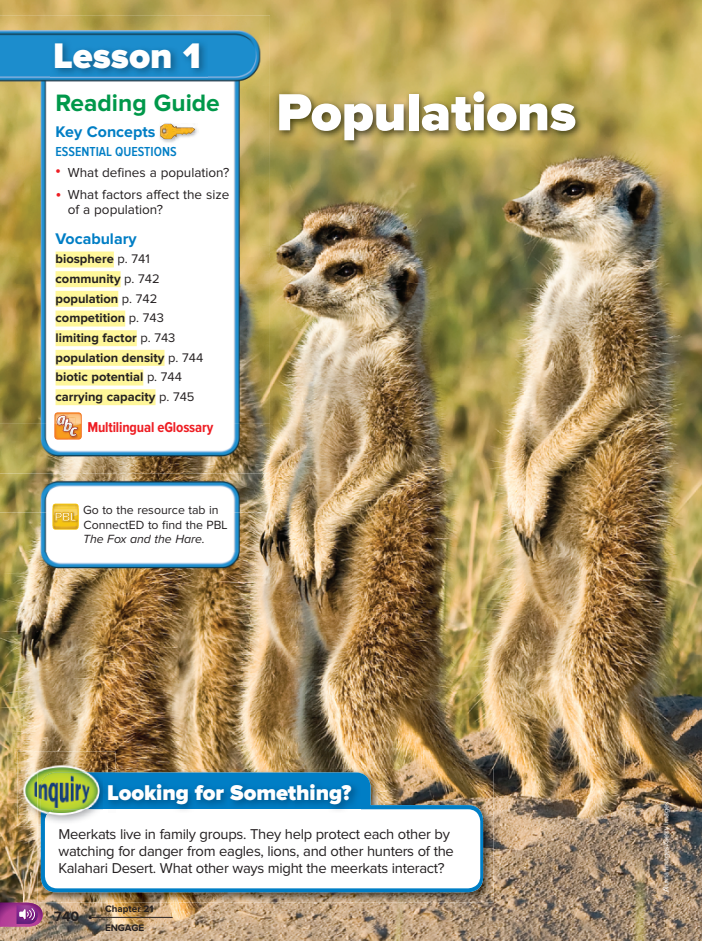
**population density** p. 744

**biotic potential** p. 744

**carrying capacity** p. 745

**Multilingual eGlossary**

# Populations



**Inquiry** **Looking for Something?**

Meerkats live in family groups. They help protect each other by watching for danger from eagles, lions, and other hunters of the Kalahari Desert. What other ways might the meerkats interact?

740

Chapter 21

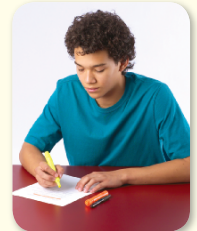
ENGAGE

**Launch Lab** 15 minutes

**How many times do you interact?**

Every day, you interact with other people in different ways, including talking, writing, or shaking hands. Some interactions involve just one other person, and others happen between many people. Like humans, other organisms interact with each other in their environment.

- 1 Make a list in your Science Journal of all the ways you have interacted with other people today.
- 2 Use a **highlighter** to mark the interactions that occurred between you and one other person.
- 3 Use a **highlighter** of another color to mark interactions that occurred among three or more people.



**Think About This**

1. Were your interactions mainly with one person or with three or more people?
2. **Key Concept** How might your interactions change if the group of people were bigger?

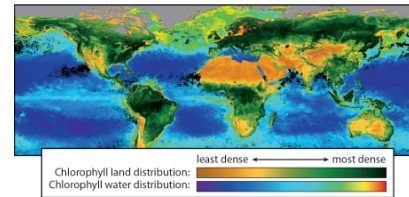
### The Biosphere and Ecological Systems

Imagine flying halfway around the world to Africa. When your plane flies over Africa, you might see mountains, rivers, grasslands, and forests. As you get closer to land, you might see a herd of elephants at a watering hole. You also might see a group of meerkats, like the ones on the previous page.

Now imagine hiking through an African forest. You might see monkeys, frogs, insects, spiders, and flowers. Maybe you catch sight of crocodiles sunning themselves by a river or birds perching on trees.

You are exploring Earth's **biosphere** (Bī uh sīr)—the parts of Earth and the surrounding atmosphere where there is life. The biosphere includes all the land of the continents and islands. It also includes all of Earth's oceans, lakes, and streams, as well as the ice caps at the North Pole and the South Pole.

Parts of the biosphere with large amounts of plants or algae often contain many other organisms as well. The biosphere's distribution of chlorophyll, a green pigment in plants and algae, is shown in **Figure 1**.



**Figure 1** The colors in this satellite image represent the densities of chlorophyll, a green pigment found in plants and algae.

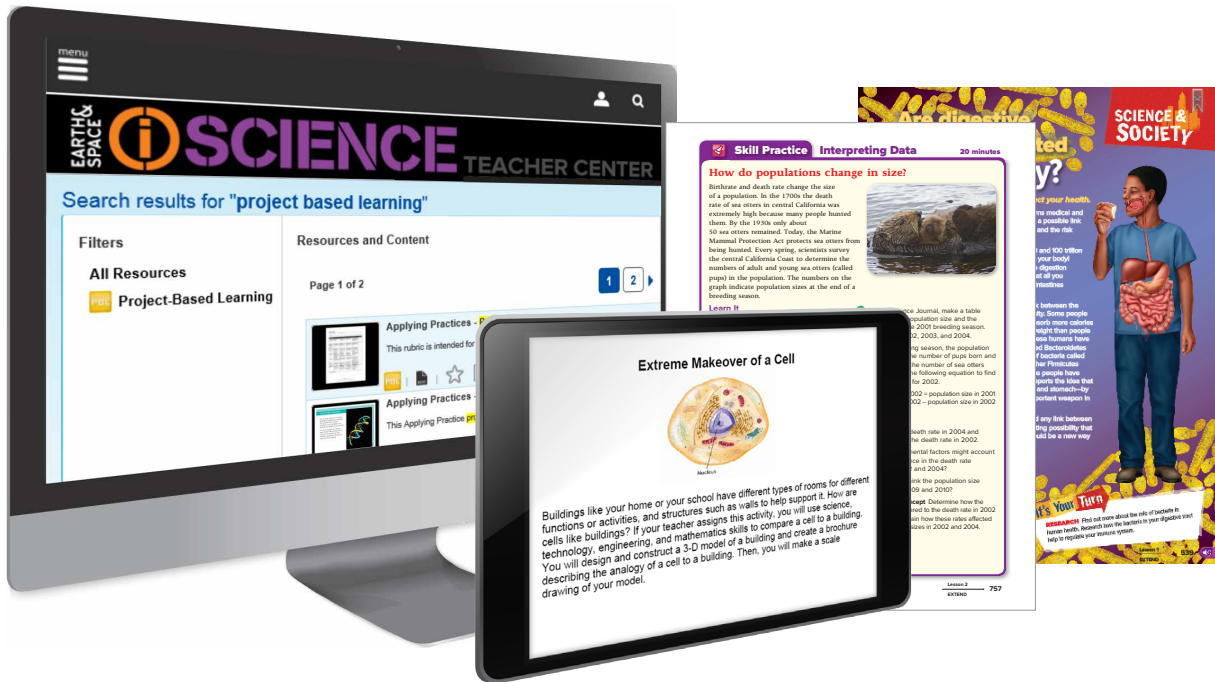
**Visual Check** Why might the North Pole have very little green?

Each lesson starts with one of two potential phenomenon: the visual phenomenon with inquiry questions or a launch lab.



Each lesson opens with a visual phenomenon with an inquiry question and a Launch Lab.

# Student Exploration/Investigation



There are several Collaborative options within the chapter and lesson:

1. Inquiry
2. Project-Based Learning
3. Webquests
4. Other Optional Student Activities that are designed to further understanding of the Phenomenon and Essential Questions:
  - Enrichment Resource
  - Challenge Resource
  - Real World Extension with Student Response

MiniLabs are found within the lesson and focus on reinforcing specific key concepts explained in the reading.

Full Chapter Labs are found at the end of each chapter and are tied back to the Essential Question from the beginning of the Chapter.

### Competition

At times, not enough food is available for every organism in a community. Members of a population, including those in the Kalahari Desert, must compete with other populations and each other for enough food to survive. **Competition is the demand for resources, such as food, water, and shelter, in short supply in a community.** When there are not enough resources available to survive, there is more competition in a community.

### Population Sizes

If the amount of available food decreases, what do you think happens to a population of meerkats? Some meerkats might move away to find food elsewhere. Female meerkats cannot raise as many young. The population becomes smaller. However, the size larger as more meerkats are born and live longer. Climates can result in population changes.

### Limiting Factors

Environmental water, food, shelter, and space are possible limiting factors. A limiting factor is the size of a population. A limiting factor is not enough sunlight. Plants that are available.

Temperature is a limiting factor. When it is too cold to eat, predators and natural factors are limiting factors. **Key Concept** Factors that affect the size of a population.

### MiniLab 15 minutes

**What are limiting factors?** Certain factors, called limiting factors, can affect the size of a population.

- 1 Read and complete a lab safety form.
- 2 Your teacher will divide your class into groups.
- 3 Using a meterstick and masking tape, mark a 1-m square on the floor. Place a piece of paper in the middle of the square.
- 4 All members of your group will stand entirely within the square. While one member keeps time with a stopwatch, members of the group will write the alphabet on the sheet of paper one at a time.

### Lab 40 minutes

#### Materials

- clownfish
- symbiosis cards

## How can you model a symbiotic relationship?

As you read earlier, organisms in communities can have many different types of relationships. Symbiotic relationships occur when two organisms live in direct contact and form a relationship. Symbiotic relationships include mutualism, commensalism, and parasitism. Although communities around the world have symbiotic relationships, coral reef communities often include all three types of symbiosis. Many of the organisms in these communities, such as clownfish, sea anemones, and even microscopic copepods, have some type of symbiotic relationship. In this lab, you will research and model one type of symbiosis in a coral reef community.



#### Question

How do you model a symbiotic relationship and determine its type?

#### Procedure

- 1 Read and complete a lab safety form.
- 2 Get a card from your teacher with the name of an organism that has a symbiotic relationship. Find your partner(s) in the symbiotic relationship.
- 3 With your partner, brainstorm what type of symbiotic relationship your organism and your partner's organism might have. List and explain your choice(s) in your Science Journal.



- 4 Using your library and reference books, research your organism with your partner.
- 5 Develop a visual presentation, such as a skit, a slide presentation, or a series of posters with your partner showing how your symbiotic relationship works and how your organisms interact with other members of the community.
- 6 Show your presentation to the class.

#### Analyze and Conclude

- 1 Identify What type of symbiotic relationship did your organism have? What was your organism's role in the relationship?
- 2 Compare How would your organism interact in the community if its partner were not present?
- 3 Contrast What other organisms in a coral reef community have the same type of symbiotic relationship as your organism? If none, explain why.
- 4 The Big Idea How did your organism interact with other members of its population and community?

#### Communicate Your Learning

Make a poster illustrating the relationships you and your class members identified. Identify which organisms are involved in each relationship.

#### Inquiry Extension

All of the organisms you researched in the coral reef ecosystem, showing how the organisms interact with each other.

#### Lab 100

- Think about your organism's niche in the ecosystem.
- Carefully select resources for accuracy.

Remember to use scientific methods.

Make Observations

### Skill Practice Interpreting Data 20 minutes

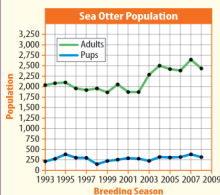
#### How do populations change in size?

Birthrate and death rate change the size of a population. In the 1930s the death rate of sea otters in central California was extremely high because many people hunted them. By the 1930s only about 50 sea otters remained. Today, the Marine Mammal Protection Act protects sea otters from being hunted. Every spring, scientists survey the central California Coast to determine the numbers of adult and young sea otters (called pups) in the population. The numbers on the graph indicate population sizes at the end of a breeding season.



#### Learn It

Most scientists collect some type of data when testing a hypothesis. Once data are collected, scientists look for patterns or trends in the data and draw conclusions. This process is called **interpreting data**.



#### Try It

- 1 The above graph shows changes in adult and pup sea otter populations over many years. Assume that the number of pups seen during the survey represents all the pups that were born and survived in one year—the birthrate. For example, in the 1997 breeding season, the birthrate was 300.

- 2 In your Science Journal, make a table showing the population size and the birthrate for the 2001 breeding season. Repeat for 2002, 2003, and 2004.

- 3 In each breeding season, the population increases by the number of pups born and decreases by the number of sea otters that die. Use the following equation to find the death rate for 2002.
 
$$\text{Death rate in 2002} = \text{population size in 2001} - \text{birthrate in 2002} - \text{population size in 2002}$$

- 4 Calculate the death rate in 2004 and compare it to the death rate in 2002.

- 5 What environmental factors might account for the difference in the death rate between 2002 and 2004?

- 6 How do you think the population size changed in 2009 and 2010?

- 7 **Key Concept** Determine how the birthrate compared to the death rate in 2002 and 2004. Explain how these rates affected the population sizes in 2002 and 2004.

Skill Practice Labs are found within the lesson and often focus on a **Science and Engineering Practice** or a **Cross-cutting Concept** along with a Disciplinary Core Idea.



Labs play a fundamental role in developing students' understanding of the key concepts.

# Student Exploration: Project-Based Learning (PBL)

Real-World projects, such as the PBLs that are found online and are correlated to the chapters, engage students as they apply three-dimensional learning. Project rubrics and the NGSS Alignment Guide provide key information for assessing students projects.

**Model Mighty Mutations**

You have been hired by a comic-book publisher to develop a new superhero. This character's story includes mutations in his or her genes—one positive, one negative, and one neutral. Your job is to design this character. Then, write a brief summary of his or her story that identifies the three mutations and explains why they are important to the character.

**Get Started!**

- Brainstorm ideas for your character. Decide whether your character is born with the mutations or something happens to cause the mutations later in his or her life.
  - Does your character have three traits due to mutations with positive, negative, and neutral results?
- Draw your character, labeling or identifying the three traits due to mutations.
- Write a story for your character. Identify the mutations associated with each mutation and how it affects your character.

**Finish Up!**

- Present your character and his or her story to the comic-book publisher.
- Then, answer the following questions.
  - How is your character an example of a model in genetics?
  - How does your character show the relationship between a structure present in the body and its function?
  - How does your character show that mutations can affect the structure and function of an organism?




PBLs are correlated to the lesson content and focus on bringing the content being taught to life.

# Student Exploration: WebQuests

**Alternative Fuels**

**Introduction**  
The economic and environmental concerns associated with using gasoline as the primary fuel for motorized vehicles have increased the demand for alternative fuel sources. Some alternative fuels can be added to gasoline to reduce its overall cost. Other alternative fuels can be used directly in present-day engines. Most alternative fuels are renewable resources because they can be replaced easily, and will not run out. However, gasoline is made from petroleum, a nonrenewable resource that can run out. Burning gasoline in engines also generates pollution.



**Task**  
Your job in this WebQuest is to discover what alternative fuels are, and learn how using these fuels in vehicles can reduce overall air pollution. You will explore different types of alternative fuels, and identify one alternative fuel that you support. The alternative fuel that you choose should be cost effective, generate a minimal amount of pollution, and have a minimal impact on the environment.

**Process**  
Use the resources listed to identify and explore the different alternative fuels available. Keep in mind that not all Web sites are written specifically for students. Some of what you read might be challenging. Look for information that will be useful in completing this WebQuest. Weigh the costs and benefits of each alternative fuel and decide which one you think is best. Answering the questions below about alternative fuels will help guide your research.

1. What is an alternative fuel?
2. Give three examples of alternative fuels.
3. What is biomass?
4. Give three examples of biomass fuels.
5. What are the four types of biomass that can be converted into alternative fuels?
6. What is bioenergy?
7. What is biodiesel fuel? What is it made from?
8. What is ethanol? What is it made from?
9. What is methanol? What is it made from?
10. How is biomass converted to ethanol?

After completing your research and identifying an alternative fuel that you support, write a letter to an elected official explaining the benefits of your alternative fuel, and why your alternative fuel, instead of gasoline, should be used to power vehicles. How will the fuel help save money? How will its use benefit the environment? Once you have completed your letter, present your work to the class. Use visual aids to help support your argument.

**Evaluation**  
Read this rubric to determine how you will be scored in this WebQuest.

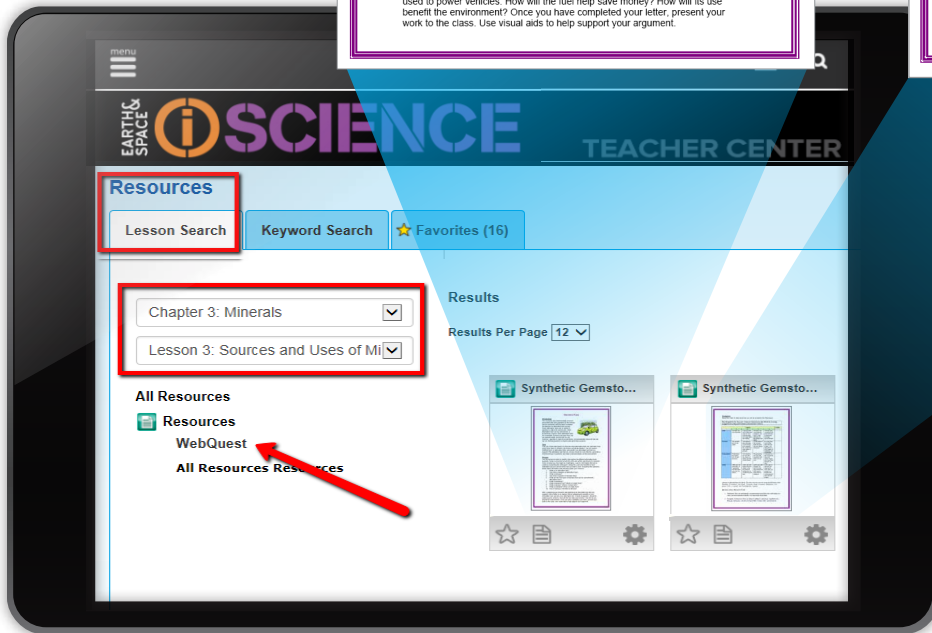
See *Blueprints for Success: Science Classrooms that Work* for scoring suggestions using performance-assessment rubrics.

Task	Criteria				Points
	1	2	3	4	
<b>Task</b>	The task was not completed.	It appears that some effort was made to complete the task, but major ideas are missing.	The task was completed as assigned, but some of the rationale for the design was faulty.	The task was completed with great attention to detail and thorough documentation.	
<b>Process</b>	The process was not followed.	The research was complete, but the design and presentation could have been better organized.	All the steps of the process were followed and the design was good.	It is clear that much effort went into the project. The ideas show a high degree of originality and imagination.	
<b>Presentation</b>	Presentation was sloppy and not well prepared.	The presentation included key ideas but lacked general cohesiveness.	The presentation was well organized with only minor errors.	Presentation is well organized, ideas are clearly stated, and visual aids are well utilized.	
<b>Letter</b>	Letter was not completed, or it appeared that little effort went into the project.	Letter was well researched but lacked some key features needed for accomplishing the task.	Letter was well thought out and included arguments that were clearly supported by research.	Letter was organized and arguments were well supported. It is evident that much research went into the project.	

Answers to the questions are below. You may rate each answer using the following scale:  
*Excellent: 9–10 points; Very Good: 7–8 points; Good: 5–6 points; Satisfactory: 3–4 points; Poor: 1–2 points; and Unsatisfactory: 0 points.*

**Questions about Alternative Fuels**

1. Alternative fuels are substantially non-petroleum-based fuels that yield energy security and environmental benefits over petroleum-based fuels.
2. Examples of alternative fuels are ethanol, methanol, natural gas, liquefied petroleum gas, hydrogen, coal-derived liquid fuels, biomass fuels, and electricity.



WebQuests are tied to the **Disciplinary Core Ideas** and require students to engage in **Science and Engineering Practices**. These are correlated to the chapter and are found online within ConnectED.



WebQuests can be found correlated to our online content in ConnectED.

# Student Exploration: Student Activities

Name \_\_\_\_\_ Date \_\_\_\_\_ Class \_\_\_\_\_

**Enrichment** LESSON 2

## The Muscular System

When a person dies, the respiratory and circulatory systems stop delivering oxygen to the muscles. Muscles use oxygen to produce ATP, an energy molecule that helps them relax after contracting. Without ATP, the muscles stiffen. About 10 to 12 hours after death, the muscles and joints are locked into place. This condition is called rigor mortis.

**Rigor Mortis**  
The term *rigor mortis* comes from the Latin words *rigor*, meaning “stiff,” and *mors*, meaning “death.” Rigor mortis usually affects the facial muscles first, sometimes within minutes after death. It then moves to other parts of the upper body and finally to the lower body. Several factors affect rates of rigor mortis, including temperature. Cold temperatures slow rates of rigor mortis. In contrast, warm temperatures increase rates of rigor mortis. A person who exercises shortly before death will have a warm body temperature, increasing the rate of rigor mortis.

Fat distribution and age also affect how quickly rigor mortis sets in. Rigor mortis usually lasts about one to two days. A body found outside during the winter, however, might be locked in rigor mortis for days. During this period, tissues in the body begin to decay. This causes the muscles to relax. The muscles generally relax in the same order in which they stiffened—that is, relaxation begins in the face first and then moves to other parts of the body.

**Forensics**  
Rigor mortis can provide useful information in forensic studies. Forensics is the science of gathering and analyzing evidence for legal purposes. This work sometimes involves crime-scene investigations. Rigor mortis can help forensic scientists determine the time of death. Because a body tends to stiffen in the position it held at the moment of death, rigor mortis can also help scientists determine whether a body was moved.

**Applying Critical-Thinking Skills**  
Directions: Answer each question or respond to each statement.

- Evaluate** The upper body of a corpse is stiff, but the lower body is relaxed. When might death have occurred? Explain your answer.
- Infer** On Friday, police find the body of a person who they know died on Tuesday. The body exhibits full rigor mortis. What can you infer about the conditions in which the body was found?

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

Structure and Movement 39

**Enrichment Resources** challenge students to go beyond the norm and apply knowledge to new situations.

**Challenge Resources** provide additional ways to engage beyond-level learners with scenario-based activities.

Name \_\_\_\_\_ Date \_\_\_\_\_ Class \_\_\_\_\_

**Challenge** LESSON 2

## Exercise Video

You are a personal trainer who wants to help people understand the importance of physical fitness. You decide to create an exercise video. In your video, you will describe different types of muscles and how these muscles work. You will also explain how exercise benefits muscles and suggest specific exercises for muscle fitness.

On the lines below, write the script for your video.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

40 Structure and Movement

**Student Exploration activities** allow students to go above and beyond and expand their knowledge base.

## Are digestive bacteria related to obesity?

**SCIENCE & SOCIETY**

*Bacteria percentages might affect your health.*

The worldwide rate of obesity greatly concerns medical and health professionals. New research reveals a possible link between bacteria in the human digestive tract and the risk of being overweight.

Your digestive system is home to between 10 and 100 trillion bacteria. That’s ten times the number of cells in your body! Certain bacteria are necessary, however, for the digestion of food. Without “friendly” bacteria, you could eat all you wanted, but the food would pass through your intestines mostly undigested.

Recent studies suggest there might be a link between the bacteria in the human digestive tract and obesity. Some people have a type of bacteria that causes them to absorb more calories than normal from their food. They gain more weight than people with a different type of bacteria. In general, obese humans have a lower percentage of a group of bacteria called Bacteroidetes (BAK-tear-oid-dee-teez) and more of a group of bacteria called Firmicutes (fir-MIK-cu-teez). It is not clear whether Firmicutes bacteria make people obese, or whether obese people have more of this type of bacteria. But evidence supports the idea that changing the bacteria in someone’s intestines and stomach—by means of diet or medications—might be an important weapon in the fight against obesity.

Additional research is needed to understand any link between digestive bacteria and obesity. But it is an exciting possibility that managing the bacteria in the digestive tract could be a new way to improve human health.

**It’s Your Turn**

**RESEARCH** Find out more about the role of bacteria in human health. Research how the bacteria in your digestive tract help to regulate your immune system.

Lesson 2

539



Student Activities found in print and online help students explore through hands-on activities and self-engagement.

A variety of assessment types offer “pen and paper” assessment, technology-enhanced questions, and performance task assessment.

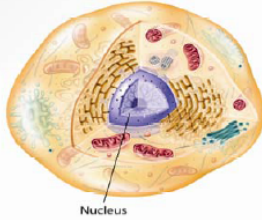


Numerous options for formative and summative assessment help provide comprehensive insight into student learning.



Built-in assessment strands throughout *iScience* will help students stay on track.

## Extreme Makeover of a Cell



Buildings like your home or your school have different types of rooms for different functions or activities, and structures such as walls to help support it. How are cells like buildings? If your teacher assigns this activity, you will use science, technology, engineering, and mathematics skills to compare a cell to a building. You will design and construct a 3-D model of a building and create a brochure describing the analogy of a cell to a building. Then, you will make a scale drawing of your model.

STEM projects enable students to gain knowledge and skills by investigating and designing an authentic, real-world problem or challenge. Sustained inquiry extends the process of asking questions, finding answers, and applying information.

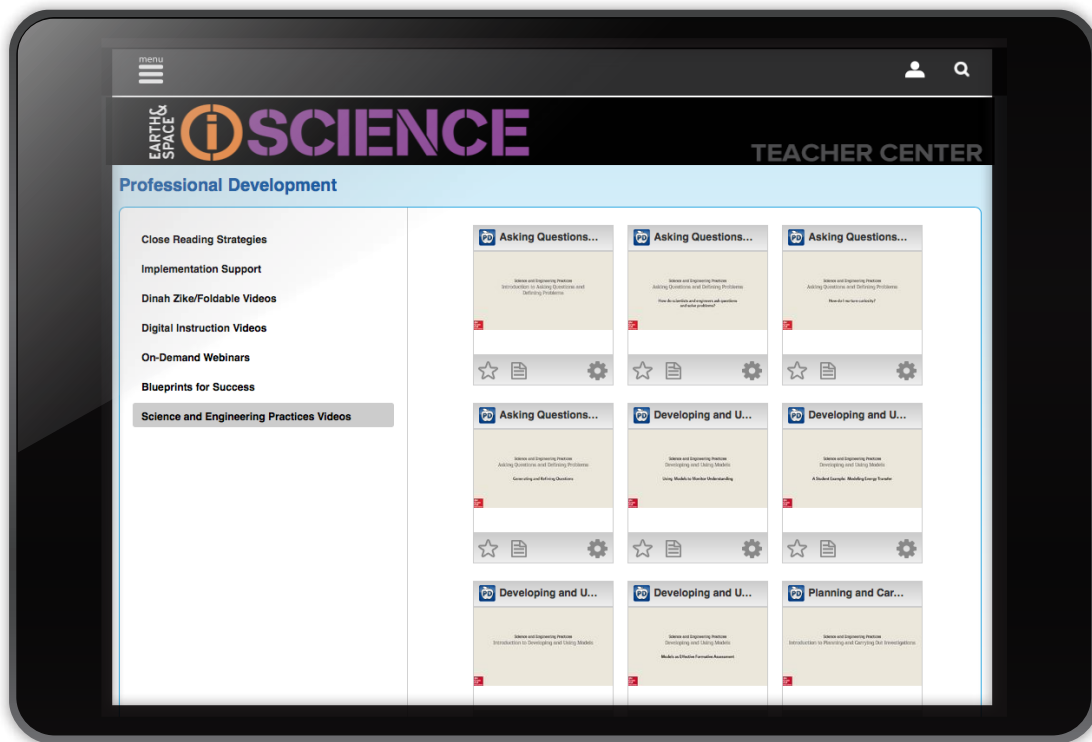
Information within the student text provides the foundation for answering questions and the STEM project pulls all of the student's learning into an application of that learning.



Unit Projects build throughout the unit.



Professional Development around NGSS can be found under the Professional Development menu item in ConnectED.



NGSS Implementation videos provide guidance for teaching **Science and Engineering** Practices. These valuable videos are found online within the Professional Development menu in ConnectED.



Resources provide teaching strategies and content support help teachers develop better skills and content knowledge.







[mheducation.com/prek-12](http://mheducation.com/prek-12)

SD.1017682