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

*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.*
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.
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.

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.

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?

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.

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.
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 mitten 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.

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

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

How do populations and communities interact and change?

Ingram Publishing

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.

An anticipatory set of statements help prepare students for reading.

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- LearnSmart®
- Project-Based Learning Activities
- Lab Manuals, Safety Videos, Virtual Labs & Other Tools
- Vocabulary, Multilingual eGlossary, Vocab eGames, Vocab eFlashcards
- Personal Tutors

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?
Lesson Opener

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.

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**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**

Go to the resource tab in ConnectED to find the PBL The Fox and the Hare.

**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?

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**Launch Lab**

**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** (Bl uh sfir)—the parts of Earth and the surrounding atmosphere where there is life. The biosphere includes all of 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?
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
How do you model a symbiotic relationship?  

**Materials**
- The organisms you want to model need to interact with each other.
- An environment that is similar to the natural environment of the organisms.
- A safe lab environment to prevent any harm to the organisms.

**Procedure**
1. Identify the type of symbiotic relationship you want to model.
2. Research the symbiotic relationship and gather information about the organisms involved.
3. Create a 3D model of the organisms and their environment.
4. Test the model to ensure it accurately represents the symbiotic relationship.

**Communicate Your Results**
- Create a presentation or poster to share your findings with others.
- Discuss the challenges and solutions you encountered during the modeling process.
- Reflect on the importance of symbiotic relationships in the ecosystem.

**Extension**
- Investigate the impact of human activities on symbiotic relationships.
- Evaluate the role of symbiotic relationships in disease control.

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**Population Sizes**
- When there are not enough resources available in a habitat, the population size decreases.
- Limiting factors, such as food, water, and space, can affect the size of a population.

**Limiting Factors**
- Environmental factors, such as weather and climate, can limit population sizes.
- Inadequate food or water can lead to a decrease in population size.

**Competition**
- Intraspecific competition occurs when organisms within the same species compete for resources.
- Interspecific competition occurs between different species.

**Disease**
- Diseases can spread rapidly within a population, leading to a decrease in population size.

**Death Rate**
- As populations become smaller, the death rate increases.
- Factors such as predation, disease, and climate change can increase the death rate.

**Birthrate**
- Birthrate is the number of offspring produced by a population in a given time period.

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

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

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**Skill Practice Labs**
- Skill Practice Labs are found at the end of each chapter and are tied back to the Essential Question from the beginning of the Chapter.
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.

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

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

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.
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.
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.