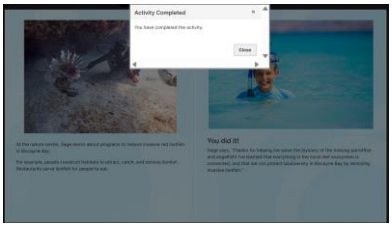
# Coral Reef Ecology—Usage Guide

This guide provides recommendations for using the *Coral Reef Ecology* Investigation Series in your classroom and offers general information about Gizmos Investigations for new users.

In this Investigation, students explore possible causes for a recent decrease in fish populations in a coral reef ecosystem. They construct a coral reef food web, manipulate an ecosystem model, and analyze data to determine how changes in biotic and abiotic factors affect coral reef populations over time. Ultimately, they construct a scientific argument about how the invasive red lionfish has disrupted the ecosystem's biodiversity.

## Classroom Pacing Schedule (Series)

This Investigation Series should take approximately three class periods (about 90 minutes). Each lesson has an “End of Lesson” screen that can serve as a pause point for students.

| Period | Minutes | Investigation Section | Heatmap Questions* | Students STOP when they see this screen |
|---|---|---|---|---|
| 1 | 30 | Lesson 1<br>Students create a coral reef food web, define coral bleaching, and investigate whether increased temperature could be responsible for changes in fish populations. | 1–10 |  |
| 2 | 30 | Lesson 2<br>Students define algae blooms and explore the impact of human activities, including logging and sewage overflows, on the coral reef ecosystem. | 11–20 |  |
| 3 | 30 | Lesson 3<br>Students define biodiversity and investigate whether overfishing or an invasive species could be responsible for changes in the coral reef ecosystem. | 21–32 |  |

**Question numbers are not visible to students; questions are numbered only in the Heatmap for teachers.*

# Series vs. Standalone Lessons

Our lesson platform offers both **series** and **standalone** lessons to support flexible use in a variety of classroom contexts. Teachers can choose to implement an entire sequence of lessons or use a single lesson independently, depending on instructional goals, student readiness, and available time.

## Series Lessons

- Designed to be taught in a specific order, with each lesson building on the ideas, models, and evidence from previous lessons.
- Students revisit and revise models, refine explanations, and apply their learning to new scenarios over time.
- Encourage deeper understanding of disciplinary core ideas, crosscutting concepts, and science and engineering practices through a coherent storyline.
- Ideal for comprehensive instruction, sustained engagement, and performance-based assessments.

## Standalone Lessons

- Fully self-contained and can be used independently from other lessons in the series.
- Include necessary background or recap content to ensure all students can engage meaningfully, even without completing prior lessons.
- Useful for targeted instruction, intervention, enrichment, or aligning to specific standards or pacing needs.
- Designed to deliver meaningful learning outcomes in a single class or unit without requiring prior knowledge from other lessons.

## Recommendation

Use **series lessons** when you want students to explore a phenomenon over time, develop and revise models, and connect concepts across multiple lessons. Use a **standalone lesson** when you're focusing on a specific concept, skill, or standard—or when time constraints require a more flexible instructional approach.

# Teacher Preview Version

We highly recommend that teachers complete a preview version of an Investigation before assigning it to their class. In the teacher version, each page functions as it would for your students, so you can preview feedback, scaffolding, and other support tools. You can use this version to familiarize yourself with the activities that students will complete. You can also use it to review concepts with your class by presenting them via a projector or smartboard.

# Heatmap

The heatmap is a tool available for all Investigations that allows teachers to observe their students' current thinking and monitor student progress in real time. It can also be used to determine what additional support students might need in the content and practices involved, individually or as a class.

Some questions are automatically graded and instantly populate the heatmap with a score and color, while others are categorized as "teacher graded." These questions require a teacher to grade a student's response for points to be awarded. All teacher-graded questions are provided with rubrics to support grading.

## Prior Knowledge

Throughout the Investigation, students are encouraged to share their current thinking and preconceptions to help relate new information they explore to their prior knowledge and experiences. These questions are shown on the heatmap with a purple lightbulb and labeled as "Conversational Questions."

## Formative Assessment

Students are assessed on their learning by answering questions and receiving feedback as they progress through the Investigation. Students can check their understanding and receive targeted feedback when answering questions to discover if they have a misunderstanding. Students receive three tries on a formative question, listed to the left of the Submit button.

Formative questions are color-coded within the heatmap to help teachers best support students. Detailed "scoring criteria" within the question view explains how colors were assigned for the heatmap question. The heatmap color codes are based on colors distributed across three percentage categories:

| Mastered | Developing | Below Expectations |
|---|---|---|
| 75–100% | 50–75% | 0–50% |

## Summative Assessment

Additionally, some questions within the Investigation are labeled as summative. These questions reflect moments where students have had ample opportunity to practice their understanding of a concept or skill and are thus assigned points after a single attempt to judge their current knowledge. These questions are color-coded in the heatmap using the same percentages described above. The only difference here is that students are only given one attempt to answer a summative question. Summative question point values are the only points included in the total on the heatmap. Teachers can use these question types to assess students' knowledge or skills to better support learning in their classroom.

While rubrics are provided for teachers to score free-response summative questions, we recommend considering your own understanding of student abilities when assigning points.

## Student Support and Accessibility

Investigations include the following supports to help students further their learning.

### Vocabulary Support

- The Key Vocabulary handout provides definitions and phonetic pronunciation for all key vocabulary terms used in the Investigation. The handout also includes space for students to draw pictures to help them learn these terms.
- Teachers can preview vocabulary using the handout to help support students before starting the Investigation.

### Writing Support

- Where applicable, sentence stems are provided for open-response questions to help students structure their writing.
- For some open-response questions, key vocabulary terms are automatically highlighted in green when included in student responses. This helps reinforce student vocabulary usage.
- Validation feedback is triggered for open-response questions when students submit vague answers or skip important vocabulary. This feedback guides students toward complete and meaningful responses. There is a checkbox at the bottom of this type of feedback so that students can move forward if they choose without getting stuck.