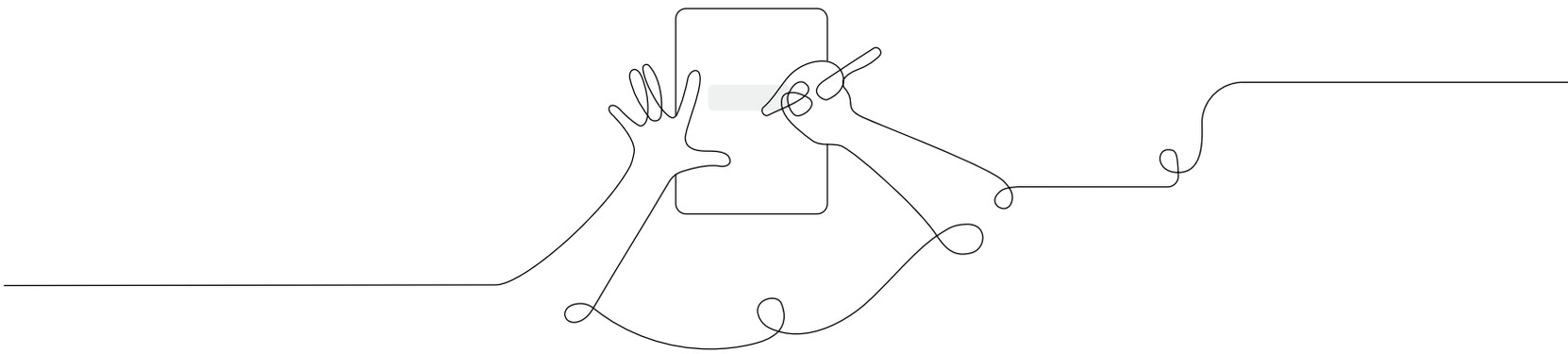
Amplify Science

Participant Notebook

Deep-dive and Strengthening Workshop
Populations and Resources

Grade 6



Welcome to the workshop

This Participant Notebook will serve as a resource during today's workshop.

Populations and Resources
Grade 6

Amplify Science

Unit-specific workshop agenda

Introductions

Framing and reflection

- Reflecting on our teaching
- Scenario challenge

Experiencing the unit

- Model experiences from Populations and Resources
- Reflecting on coherence

Science Seminar modeling and analysis

Targeted small group work time

- Analyzing the End-of-Unit Assessment
- Deepening understanding of content
- Formative assessment and differentiation
- Internalizing the upcoming unit

Closing

- Questions
- Survey

Demo account for your workshop:

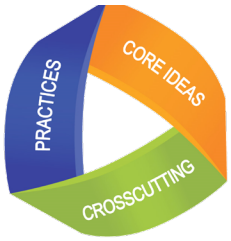
URL: **learning.amplify.com** (Log in with Amplify)

Temporary account (teacher): _____**@tryamplify.net**

Temporary account (students):
_____**@tryamplify.net**
_____**@tryamplify.net**
_____**@tryamplify.net**

Password (for all): **AmplifyNumber1**

Three dimensions of NYSSLS reference



3-D learning engages students in using scientific and engineering practices and applying crosscutting concepts as tools to develop understanding of and solve challenging problems related to disciplinary core ideas.

Science and Engineering Practices

1. **Asking Questions and Defining Problems**
2. **Developing and Using Models**
3. **Planning and Carrying Out Investigations**
4. **Analyzing and Interpreting Data**
5. **Using Mathematics and Computational Thinking**
6. **Constructing Explanations and Designing Solutions**
7. **Engaging in Argument from Evidence**
8. **Obtaining, Evaluating, and Communicating Information**

Disciplinary Core Ideas

Earth and Space Sciences:
ESS1: Earth's Place in the Universe
ESS2: Earth's Systems
ESS3: Earth and Human Activity

Life Sciences:
LS1: From Molecules to Organisms
LS2: Ecosystems
LS3: Heredity
LS4: Biological Evolution

Physical Sciences:
PS1: Matter and its Interactions
PS2: Motion and Stability
PS3: Energy
PS4: Waves and their Applications

Engineering, Technology and the Applications of Science:
ETS1: Engineering Design
ETS2: Links among Engineering Technology, Science and Society

Crosscutting Concepts

1. **Patterns**
2. **Cause and Effect**
3. **Scale, Proportion, and Quantity**
4. **Systems and System Models**
5. **Energy and Matter**
6. **Structure and Function**
7. **Stability and Change**

Reflecting on Amplify Science implementation

1. What was a positive moment from teaching your first unit(s)? What was particularly effective in your classroom?

2. What was a challenge you experienced in your first few units? What was an "aha" moment you had while planning or teaching that helped you overcome that challenge?

3. Amplify Science uses a multimodal approach — students **do**, **talk**, **read**, **write**, and **visualize** as they construct explanations of phenomena. Describe a time when the multimodal approach helped a particular student or students in your classroom.

Self-assessment: How comfortable are you teaching Amplify Science?

Directions:

After each group shares the solution to their scenario, rank your comfort level with the scenario's category using the statements along the top of the table.

Scenario	I am starting to understand this	I can do this (with a little help)	I've got this! I feel confident	I can teach this to a peer
Scenario 1 Using program resources to deepen content knowledge and find information to answer content questions				
Scenario 2 Using formative assessment to inform instruction				
Scenario 3 Analyzing student work on the End-of-Unit Assessment				
Scenario 4 Understanding the 3-D nature of standards in the unit				
Scenario 5 Understanding how ideas build across a chapter and unit				
Scenario 6 Preparing to teach a lesson				

Unit Map

What caused the size of the moon jelly population in Glacier Sea to increase?

Glacier Sea has seen an alarming increase in the moon jelly population. In the role of student ecologists, students investigate reproduction, predation, food webs, and indirect effects to discover the cause. Jellyfish population blooms have become common in recent years and offer an intriguing context to learn about populations and resources.

Chapter 1: What caused the size of the moon jelly population in Glacier Sea to increase?

Students figure out: There must have been a change to the birth rate or the death rate in the moon jelly population. Within a population, organisms are always being born and dying. If the number of births and deaths in a given time are equal, then the population size will be stable. If there are more births than deaths in a given time, then the size of the population will increase. If there are fewer births than deaths, then the size of the population will decrease.

How they figure it out: They watch a documentary video about ecologists studying jelly populations. They explore the Simulation and read about other populations that are part of the moon jelly ecosystem. They model births and deaths in a population using tokens and watch a video about stability and change. They evaluate evidence about the jelly population and create a visual model showing two possible reasons the jelly population may have increased.

Chapter 2: What could have caused the births to increase or the deaths to decrease in the moon jelly population?

Students figure out: The jellies may have increased because of an increase in zooplankton or a decrease in sea turtles. Organisms need to release energy from energy storage molecules in order to reproduce. Organisms in consumer populations get energy storage molecules from eating organisms in resource populations. The more energy storage molecules available to a population, the more the organisms in that population can reproduce. The larger the resource population, the more energy storage molecules are available for its consumer populations. The larger the consumer population, the more energy storage molecules it will need. Therefore, it will eat more, causing more deaths in the resource population.

How they figure it out: They read an article about why organisms need energy in order to reproduce. They conduct a yeast experiment, testing the effect of more or less food available for a population. They test ways of changing the amount of reproduction and ways of changing the amount of deaths in the Sim.They create visual models showing possible reasons for the increase in moon jellies. They evaluate and analyze evidence about other populations in the ecosystem.

Chapter 3: How could a population besides the zooplankton or sea turtles have caused the moon jelly population to increase?

Students figure out: The jellies may have increased because of a increase in phytoplankton, leading to an increase in zooplankton; a decrease in walleye pollock, leading to an increase in zooplankton; or an increase in orcas, leading to a decrease in sea turtles. Two populations can compete for the same resource population. A change to one of these populations affects the size of the other. The size of a population can be affected by any population that is connected to it in a food web, even if they are not directly connected.

How they figure it out: They read about two real populations of moon jellies, one that increased and one that remained stable. They investigate competition and other indirect effects in the Sim. They evaluate and analyze evidence about different populations in the ecosystem and write final arguments about the cause of the moon jelly increase.

Chapter 4: Students apply what they learn to a new question—What was the main cause of the decrease in the size of the orange-bellied parrot population?

Students consider whether the decrease in this parrot's population is due to a decrease in births or an increase in deaths by being eaten. They analyze evidence about several populations in the ecosystem including Tasmanian devils, buttongrass seeds, foxes, and more. They engage in oral argumentation in a student-led discourse routine called a Science Seminar and then write final arguments.

Populations and Resources: Too Many Moon Jellies

The problem students work to solve	
Chapter 1 Question	What caused the size of the moon jelly population in Glacier Sea to increase?
Investigation Question	How do births and deaths in a population affect its size? (1.3, 1.4)
Evidence sources and reflection opportunities	• Use the Sim to to observe what can happen to an organism in a population (1.2) • Use a token to find out how births and deaths in a population can affect the population size (1.3) • Watch a video demonstrating stability and change in a system (1.3)
Key concepts	• Within a population organisms are always being born and dying. (1.2) • A system can be stable even as things are being added to and removed from it. If the amounts being added and being removed are not equal, then the system will change. (1.3) • If the number of births and deaths in a given time are equal, then the population size will be stable. (1.3) • If there are more births than deaths in a given time, then the size of the population will increase. If there are fewer births than deaths, then the size of the population will decrease. (1.3)
Application of key concepts to the problem	• Evaluate the quality of evidence about the moon jelly population (1.4) • Use the paper Modeling Tool to show the cause of the moon jelly population increase (1.4)
Explanation that students can make to answer the Chapter 1 Question	There are always births and deaths happening in the jelly population. If the population increased it means that there were more births than deaths. This could have happened because births increased or because deaths decreased.

Populations and Resources: Too Many Moon Jellies

The problem students work to solve

Chapter 2 Question

Investigation Questions

Evidence sources and reflection opportunities

Key concepts

Application of key concepts to problem

Explanation that students can make to answer the Chapter 2 Question

What caused the size of the moon jelly population in Glacier Sea to increase?

What could have caused the births to increase or the deaths to decrease in the moon jelly population?

What can change the number of births in a population? (2.1, 2.2, 2.3)

- Read "Reproduction and Energy" (2.1)
- Conduct a hands-on experiment with yeast to get evidence that more energy storage molecules result in an organism releasing more energy (2.2)
- Revisit "Reproduction and Energy" (2.2)
- Use the Sim to investigate what can increase the number of births in a population (2.3)

- Organisms need to release energy from energy storage molecules in order to reproduce. (2.2)
- Organisms in consumer populations get energy storage molecules from eating organisms in resource populations. (2.2)
- The more energy storage molecules available to a population, the more the organisms in that population can reproduce. (2.2)
- The larger the resource population, the more energy storage molecules are available for its consumer populations. (2.3)

What can change the number of deaths in a population? (2.4)

- Use the Sim to investigate what can change the number of deaths in a population. (2.4)
- Write and share about how changes to consumer populations can affect the size of their resource populations (2.4)

- The larger the consumer population, the more energy storage molecules it will need. Therefore, it will eat more, causing more deaths in the resource population. (2.4)

- Use the paper Modeling Tool to model a claim about why the moon jelly population increased (2.7)
- Evaluate the quality of evidence about Glacier Sea populations (2.7)

The moon jelly population increased there were either more births or fewer deaths in the population than before. Moon jellies eat zooplankton and the zooplankton population increased, so there are more energy storage molecules available for the jellies to eat. To reproduce, organisms need to release energy from energy storage molecules. If there are more energy storage molecules available to the moon jellies, they can reproduce more, resulting in more births. Fewer deaths would also cause the jelly population to increase. The sea turtle population, the moon jellies consumer population, decreased. A smaller consumer population needs fewer energy storage molecules so the turtles would eat less of the moon jellies, so fewer moon jellies would die. As a result, the moon jelly population increased.

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Populations and Resources: Too Many Moon Jellies

The problem students work to solve	
	What caused the size of the moon jelly population in Glacier Sea to increase?
Chapter 3 Question	How could a population besides the zooplankton or sea turtles have caused the moon jelly population to increase?
Investigation Question	What can affect the size of a population besides its resource or consumer populations? (3.1, 3.2, 3.3)
Evidence sources and reflection opportunities	• Read "Jelly Population Explosion" (3.1) • Revisit "Jelly Population Explosion" (3.2) • In the Sim, find two two populations that compete for the same resource and try to change one population in order to increase the other (3.2) • Investigate other indirect effects in the Sim by changing the size of a population without changing its resource or consumer population (3.3)
Key concepts	• Two populations can compete for the same resource population. A change to one of these populations affects the size of the other. (3.2) • The size of a population can be affected by any population that is connected to it in a food web, even if they are not directly connected. (3.3)
Application of key concepts to the problem	• Write and share about indirect effects on the size of the moon jelly population in the Glacier Sea (3.3) • Evaluate and analyze evidence about populations in the Glacier Sea ecosystem (3.4) • Write an argument about the cause of the Moon Jelly population increase (3.4)
Explanation that students can make to answer the Chapter 3 Question	When the walleye pollock population decreased, there were more zooplankton available for the moon jellies to eat. Since the jellies had more energy storage molecules, they were able to reproduce more. This lead to more births than deaths in the moon jelly population, which caused the jelly population to increase.

Populations and Resources: Too Many Moon Jellies

Problem students work to solve and the Chapter 4 Question

What was the main cause of the decrease in the size of the orange-bellied parrot population?

Application of key concepts to new problem

- Create food webs for the Tasmanian ecosystem (4.1)
- Evaluate the quality of evidence about the Tasmanian ecosystem (4.1)
- Analyze and sort evidence based on claims (4.2)
- Participate in the Science Seminar (4.3)
- Write an argument to support a claim (4.3)

Explanation that students can make to answer the Chapter 4 Question

One possible explanation students can make:

The parrot population decreased because births decreased. The evidence shows that sparrow hawks decreased. A smaller population needs fewer energy storage molecules so they would eat fewer sparrows. This means that there would be fewer deaths in the sparrow population. The evidence also shows that births of the sparrows increased. If the births increased and the deaths decreased, the sparrow population would increase. A larger population would need more energy storage molecules so they would eat more buttongrass causing more buttongrass deaths. If the deaths of the buttongrass increased, there could be a decrease in the buttongrass if births were less than deaths. A smaller buttongrass population means that fewer energy storage molecules would be available to the parrot population. Ecologists found parrots had less fat on their bodies, which is evidence that they have been eating fewer energy storage molecules). With fewer energy storage molecules, they would reproduce less and have fewer births. This could cause births to be less than deaths, and the population would decrease.

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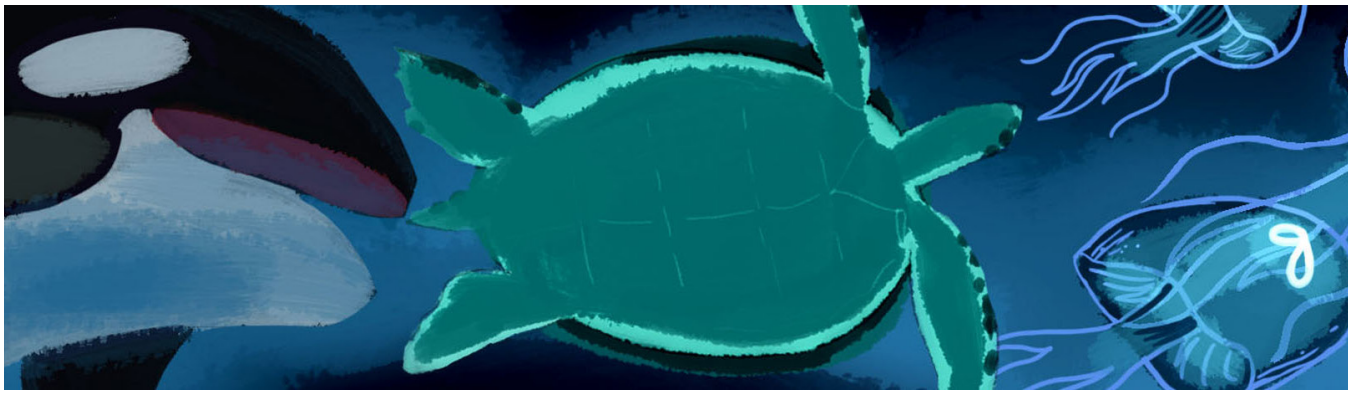


Populations and Resources:

Too Many Moon Jellies

Investigation Notebook

Name: _____ Date: _____

Exploring the *Populations and Resources* Sim

Part 1: Introducing the *Populations and Resources* Simulation

Talk with your partner as you explore the *Populations and Resources* Simulation (use 3 Populations—Intro mode). Share what you both notice.

As you explore the Sim, discuss the following questions with your partner:

- What do the different buttons do in the Sim?
- What did you notice about what you can change in the Sim?
- What questions do you have about the Sim?

Part 2: Observing Organisms in the Sim

A population is a group of the same kind of organism living in the same area. Use the Sim to observe what organisms in a population do and what can happen to them.

1. Launch the *Populations and Resources* Simulation.
2. Track an individual organism from any of the populations. Observe and record what it does and what happens to it in the table below.
3. Track another organism from another population. Observe it and record what it does and what happens to it in the table below. Repeat until you have observed and recorded the information for at least three organisms.

Things that organisms I tracked did: (example: ate other organisms)	**Things that happened to the organisms I tracked:** (example: was eaten by other organisms)

Name: _____ Date: _____

Birth and Death Token Model

Births and deaths are always happening in a population. How does the number of births and deaths in a population affect its size? To find out, try these missions:

Mission 1: Make the population size **stay the same** over time.

Mission 2: Make the population size **increase** over time.

Mission 3: Make the population size **decrease** over time.

1. Add 14 tokens to the circle on the Token Model Population Circle sheet to start with a population of 14 organisms.
2. Every year 1, 2, or 3 organisms must die and 1, 2, or 3 organisms must be born. How many is up to you and your partner.
   - To make an organism die, remove it from the population and add it back to the cup. Count this as one death.
   - To make an organism be born, add one token from the cup to the circle. Count this as one birth.
3. Repeat until you have modeled 6 years.
4. At the end of every year, record the number of births, deaths, and organisms on the chart and plot the number of organisms on the graph on page 13.
5. At the end of 6 years, add up the total numbers of births and deaths and record it in the total column.
6. After you've completed the graphs, circle your answer to complete the sentences below.

   When the population size **stays the same** over time, the total number of births
   (**equals** / **is less than** / **is greater than**) the total number of deaths.

   When the population size **increases** over time, the total number of births
   (**equals** / **is less than** / **is greater than**) the total number of deaths.

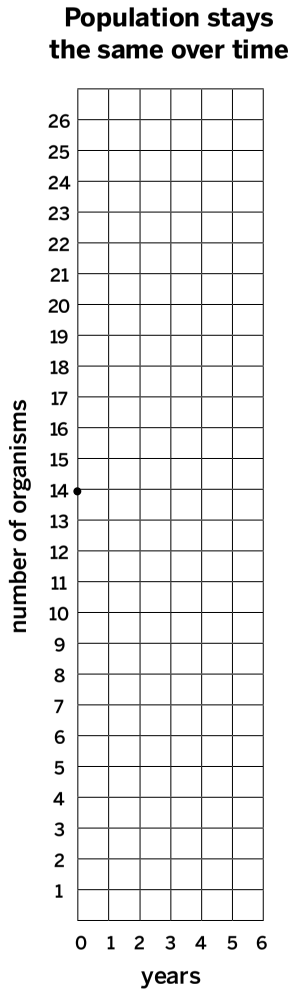
   When the population size **decreases** over time, the total number of births
   (**equals** / **is less than** / **is greater than**) the total number of deaths.

Name: _____ Date: _____

Birth and Death Token Model (continued)

Mission 1: Make the population size **stay the same** over time.

Years (round)	1	2	3	4	5	6	Total
Births							
Deaths							
Organisms							N/A

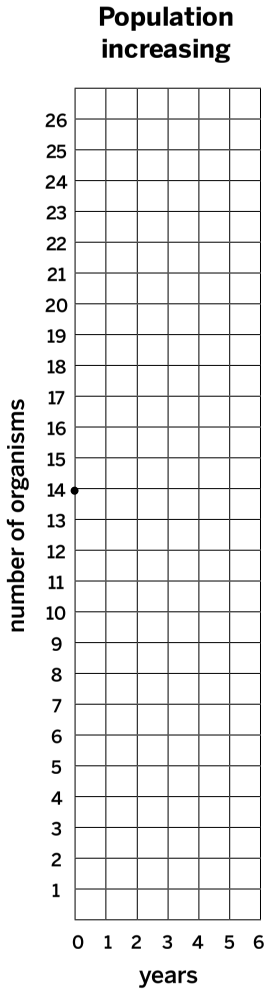


Name: _____ Date: _____

Birth and Death Token Model (continued)

Mission 2: Make the population size **increase** over time.

Years (round)	1	2	3	4	5	6	Total
Births							
Deaths							
Organisms							N/A

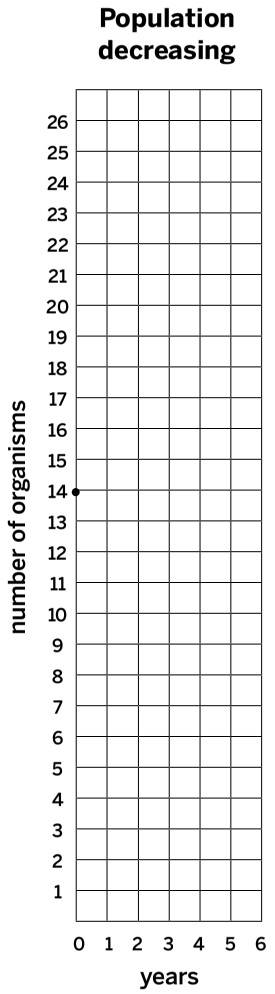


Name: _____ Date: _____

Birth and Death Token Model (continued)

Mission 3: Make the population size **decrease** over time.

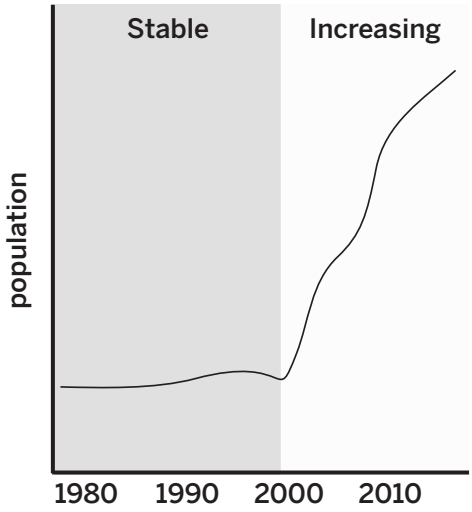
Years (round)	1	2	3	4	5	6	Total
Births							
Deaths							
Organisms							N/A



Name: _____ Date: _____

Modeling Births and Deaths in the Moon Jelly Population

Estimate of Jelly Population Change



You have been investigating the question *How do births and deaths in a population affect its size?* Use the Modeling Tool activity: Births and Deaths in the Moon Jelly Population on the next page to show your thinking about this question. Follow the instructions below.

Goal: Show the births and deaths in the moon jelly population when it was stable and when it was increasing.

Do:

- Draw boxes and write a "B" inside to show births.
- Cross out boxes to show deaths.
- Annotate your model as needed to explain your ideas.

Tips:

- There is more than one way to create this model.
- It is not important exactly how many births and deaths you show, but you should think about how births compare to deaths in the population when it was stable and when it was increasing.

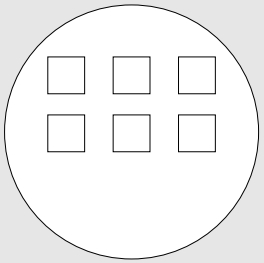
Name: _____ Date: _____

Modeling Births and Deaths in the Moon Jelly Population (continued)

Goal: Show the births and deaths in the moon jelly population when it was increasing.

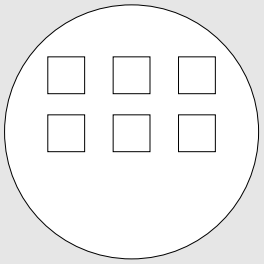
Stable

moon jelly population



Increasing

moon jelly population



Key

organism in population 

Cross out a box to show a death. 

Draw a new box with a "B" in it to show a birth. 

Connecting key concepts to chapter explanations

Populations and Resources

Directions:

1. For each chapter, read the key concepts, then the explanation.
2. With a partner, discuss how the key concepts connect to the explanation.
3. Make annotations about the connections.

Ch	Key concepts	Explanation
1	Within a population organisms are always being born and dying. (1.2) A system can be stable even as things are being added to and removed from it. If the amounts being added and being removed are not equal, then the system will change. (1.3) If the number of births and deaths in a given time are equal, then the population size will be stable. (1.3) If there are more births than deaths in a given time, then the size of the population will increase. If there are fewer births than deaths, then the size of the population will decrease. (1.3)	There are always births and deaths happening in the jelly population. If the population increased it means that there were more births than deaths. This could have happened because births increased or because deaths decreased.
2	Organisms need to release energy from energy storage molecules in order to reproduce. (2.2) Organisms in consumer populations get energy storage molecules from eating organisms in resource populations. (2.2) The more energy storage molecules available to a population, the more the organisms in that population can reproduce. (2.2) The larger the resource population, the more energy storage molecules are available for its consumer populations. (2.3) The larger the consumer population, the more energy storage molecules it will need. Therefore, it will eat more, causing more deaths in the resource population. (2.4)	The moon jelly population increased there were either more births or fewer deaths in the population than before. Moon jellies eat zooplankton and the zooplankton population increased, so there are more energy storage molecules available for the jellies to eat. To reproduce, organisms need to release energy from energy storage molecules. If there are more energy storage molecules available to the moon jellies, they can reproduce more, resulting in more births. Fewer deaths would also cause the jelly population to increase. The sea turtle population, the moon jellies consumer population, decreased. A smaller consumer population needs fewer energy storage molecules so the turtles would eat less of the moon jellies, so fewer moon jellies would die. As a result, the moon jelly population increased.
3	Two populations can compete for the same resource population. A change to one of these populations affects the size of the other. (3.2) The size of a population can be affected by any population that is connected to it in a food web, even if they are not directly connected. (3.3)	When the walleye pollock population decreased, there were more zooplankton available for the moon jellies to eat. Since the jellies had more energy storage molecules, they were able to reproduce more. This lead to more births than deaths in the moon jelly population, which caused the jelly population to increase.

Reflecting on the progression of ideas

Directions:

Part 1: Reflecting on the progression

1. Using the key concepts and explanations, reflect on how ideas build throughout the unit.
2. With your group, discuss the following questions:
   - Which ideas are revisited over multiple chapters?
   - What new ideas are added in each chapter?
3. Make notes about the progression of ideas in the space below.

Part 2: Creating a visual

1. With your group, use the provided materials to create a visual to represent your ideas. You can use words or pictures, or a mix of both. The following questions may help you plan your visual:
   - How can you represent the new information that is added throughout the progression?
   - How can you represent foundational ideas that are revisited throughout the unit?

Notes

Progress Build

Each Amplify Science Middle School unit is structured around a unit-specific learning progression, which we call the Progress Build. The unit's Progress Build describes the way students' explanatory understanding of the unit's focal phenomena is likely to develop and deepen over the course of a unit. It is an important tool in understanding the structure of a unit and in supporting students' learning: it organizes the sequence of instruction (generally, each level of the Progress Build corresponds to a chapter), defines the focus of assessments, and grounds the inferences about student learning progress that guide suggested instructional adjustments and differentiation. By aligning instruction and assessment to the Progress Build (and therefore to each other), evidence about how student understanding is developing may be used during the course of the unit to support students and modify instruction in an informed way.

The *Populations and Resources* Progress Build consists of three levels of science understanding. To support a growth model for student learning progress, each level encompasses all of the ideas of prior levels and represents an explanatory account of unit phenomena, with the sophistication of that account increasing as the levels increase. At each level, students add new ideas and integrate them into a progressively deeper understanding of how populations in an ecosystem can affect one another's size. Since the Progress Build reflects an increasingly complex yet integrated explanation, we represent it by including the new ideas for each level in bold.

Prior knowledge (preconceptions). Middle School students will come into this unit with a general understanding that animals eat plants or other animals in order to survive, and that those same animals may in turn be another animal's prey. Students who have first completed the *Metabolism* unit will have learned that organisms release energy from energy storage molecules (such as glucose) through cellular respiration, and that this energy is needed for organisms to function. However they are unlikely to have explored how this affects the movement of matter in an ecosystem. Some students may be familiar with the idea that a change to one population in an ecosystem can affect another population, but they are unlikely to have considered how that change could impact populations that are not directly connected. The *Populations and Resources* Progress Build and unit structure are designed to build upon and refine this experience and prior knowledge.

Progress Build Level 1: There are always births and deaths occurring in a population. Changes in the number of births and deaths can change the size of a population.

Within a population there are always births and deaths occurring. When organisms are born, new organisms are added to the population. When organisms die, they are removed from the population. Together, the number of organisms that die and the number of organisms born determine the size of a population. If the number of births equals the number of deaths, then the size of the population will not change (it is stable). If the number of births is less than the number of deaths in a given period of time, the population size will decrease over that time. If the number of births is greater than the number of deaths in a given period of time, the population size will increase over that time.

Progress Build Level 2: A change in the number of births and deaths in a population can be caused by a change in the size of its resource populations or consumer populations.

Within a population there are always births and deaths occurring. When organisms are born, new organisms are added to the population. When organisms die, they are removed from the population. Together, the number of organisms that die and the number of organisms born determine the size of a population. If the number of births equals the number of deaths, then the size of the population will not change (it is stable). If the number of births is less than the number of deaths in a given period of time, the population size will decrease over that time. If the number of births is greater than the number of deaths in a given period of time, the population size will increase over that time. **Organisms require**

energy in order to reproduce. Organisms get energy from energy storage molecules which they get by eating other organisms from their resource populations. A change in the size of a resource population can cause the number of births in its consumer population to change. A larger resource population provides more energy storage molecules to its consumer population, causing births to increase. A smaller resource population provides fewer energy storage molecules to its consumer population, causing births to decrease. Also, a change in the consumer population can cause the number of deaths in its resource population to change. A larger consumer population requires more energy storage molecules, so it will eat more of its resource population causing deaths in its resource population to increase. A smaller consumer population requires fewer energy storage molecules, so it will eat fewer organisms in its resource population, causing deaths in the resource population to decrease. Therefore, a change to a population's resource or consumer population can change the size of the population.

Progress Build Level 3: A change in the number of births and deaths in a population can be caused by a change in the size of a population other than its resource or consumer population.

Within a population there are always births and deaths occurring. When organisms are born, new organisms are added to the population. When organisms die, they are removed from the population. Together, the number of organisms that die and the number of organisms born determine the size of a population. If the number of births equals the number of deaths, then the size of the population will not change (it is stable). If the number of births is less than the number of deaths in a given period of time, the population size will decrease over that time. If the number of births is greater than the number of deaths in a given period of time, the population size will increase over that time. Organisms require energy in order to reproduce. Organisms get energy from energy storage molecules which they get by eating other organisms from their resource populations. A change in the size of a resource population can cause the number of births in its consumer population to change. A larger resource population provides more energy storage molecules to its consumer population, causing births to increase. A smaller resource population provides fewer energy storage molecules to its consumer population, causing births to decrease. Also, a change in the consumer population can cause the number of deaths in its resource population to change. A larger consumer population requires more energy storage molecules, so it will eat more of its resource population causing deaths in its resource population to increase. A smaller consumer population requires fewer energy storage molecules, so it will eat fewer organisms in its resource population, causing deaths in the resource population to decrease. Therefore, a change to a population's resource or consumer population can change the size of the population. **A change in one population can cause a change in another population which, in turn, can cause a change to yet another population. Therefore, a change in the size of one population can cause changes in populations to which it is not directly connected in a food web. For example, two populations can compete for the same resource population. When the size of one competitor population changes and requires more for fewer energy storage molecules from its resource population, the size of the resource population can change. This can cause the size of the other competitor population to change because the number of energy storage molecules that are available to it changes.**

Populations and Resources: Too Many Moon Jellies (Middle School)

Rubrics for Assessing Students' Final Written Arguments

Argumentation is an important practice in science; scientists use arguments to convince an audience that the explanation being proposed is the best one supported by evidence. To assess students' written arguments—as an opportunity for demonstrating their understanding of science concepts and for demonstrating the *practice* of constructing arguments—we have provided three rubrics. The first rubric may be used summatively to assess students' understanding of science concepts from the unit. The second rubric may be used summatively to assess students' application of the crosscutting concept of Stability and Change as applied to a specific phenomenon. The third rubric is designed to formatively assess the practice of constructing arguments, which includes the associated practices of Constructing Explanations and Obtaining, Evaluating, and Communicating Information; students' facility with this practice takes time to develop, and students will have opportunities to practice argumentation in each unit. Rubric 3 provides possible student responses that illustrate how a student's written work may demonstrate different levels of understanding. A full response for each claim is provided in the Possible Responses tab in the instructional guide for the activity in which students write their scientific arguments.

Prompt for final written argument: *What was the main cause of the decrease in the size of the orange-bellied parrot population?*

- **Claim 1:** The population decreased because births decreased.
- **Claim 2:** The population decreased because deaths increased.

Rubric 1: Assessing Students' Understanding of Science Concepts

Rubric 1 may be used to assess students' written arguments from Lesson 4.3 for how well the writing demonstrates mastery of core science concepts from the unit. The science concepts described in the rubric build in complexity with each row.

Rubric 1: Assessing Students' Understanding of Science Concepts	
Score	**Description**
0	Response is off-target or does not yet demonstrate understanding of key concepts identified in the Progress Build.
1	Response correctly describes: how the size of one population can indirectly affect the size of the target population.
2	Response correctly describes: how the size of one population can indirectly affect the size of the target population. AND EITHER explains that the size of a population determines how many energy storage molecules it needs from its resource population or how many energy storage molecules it provides for its consumer population. OR explains that the change in the size of a population is determined by comparing the number of births to the number of deaths over a given period of time.
3	Response correctly describes: how the size of one population can indirectly affect the size of the target population. AND explains that the size of a population determines how many energy storage molecules it needs from its resource population or how many energy storage molecules it provides for its consumer population. AND explains that the change in the size of a population is determined by comparing the number of births to the number of deaths over a given period of time.

Rubric 2: Assessing Students' Understanding of the Crosscutting Concept of Stability and Changes

Rubric 2 considers how well students are able to apply the crosscutting concept of Stability and Change to a specific phenomenon..

Rubric 2: Assessing Students' Understanding of the Crosscutting Concept of Stability and Change	
Score	**Description**
0	Response is off-target or does not yet demonstrate understanding of key concepts identified in the Progress Build.
1	Response correctly describes that: If there is a change to the amount of something being added to or removed from a system (e.g., increase/decrease in births or deaths), the system will change (e.g., the number of individuals in a population will change). Example: "If the births increased then the sparrow population would increase" or "The buttongrass population would decrease when the deaths increase.
2	Response correctly describes that: The net balance of what is added to and removed from a system (e.g., the number of births relative to deaths) determines whether the system will change (e.g., whether the number of individuals in a population will change). Example: "If there are more births than deaths, then the sparrow population would increase" or "There would be a decrease in the buttongrass population if births were less than deaths."

Rubric 3: Assessing Students' Performance of the Practice of Constructing Scientific Arguments

Rubric 3 may be used to assess students' written arguments from Lesson 4.3. The purpose of this rubric is to guide support for students as they develop the scientific practice of argumentation and come to appreciate that science, as a field, advances through argumentation. The rubric is grounded in the principle that ideas in science are based on evidence and that students are doing science when they are making explanations and arguments—just as scientists use evidence to justify why a particular explanation is the best one available. The rubric is designed to guide formative feedback that:

- supports students in understanding science as a collaborative process of knowledge building, using evidence derived from the natural world.
- helps students feel capable as they build on the skills they already have for evaluating possible answers in relation to available evidence.
- develops students who can skillfully construct and critique arguments in science and bring those skills to other areas.

In this unit, a strong written argument meets the following criteria:

- **takes a stance** by stating a claim that directly addresses the question
- **explanatory** by identifying a cause for the phenomenon in question *and* explaining the mechanism by which it is a cause
- **justified by the reasoned use of evidence** that is likely to convince a scientific audience
- **employs high-quality information** as evidence to support the claim
- **clear and well-organized** by following conventions and being structured in a way that clearly communicates to the intended audience why the proposed claim is the one most likely to be true
- **going further: engages with alternative claims** by acknowledging and challenging competing ideas

Rubric 3 describes how these criteria may be applied to students' written arguments in this unit and suggests feedback to help students advance the practice of argumentation.

Rubric 3: Assessing Students' Performance of the Practice of Constructing Scientific Arguments		
Criteria	**Score**	**Description and possible feedback**
takes a stance Does the argument propose a claim that directly answers the question?	0	No claim is proposed, or proposed claim does not answer the question. (e.g., the claim is off-topic) Possible feedback: *What question are we trying to answer? What kinds of things might cause that to happen? How can you make sure that your proposed answer is clear to your audience?*
	1	Argument proposes a claim that answers the question. Note that students who select one of the provided claims would receive a score of 1 for this criterion.
explanatory Does the argument fully address the question by identifying a cause for the phenomenon and by explaining the mechanism or process by which it is a cause?	0	Argument does not offer an explanatory account to answer the question. A cause is not identified, and a mechanism is not described. Possible feedback: *Why do you think the parrot population decreased because births decreased?*
	1	Argument identifies a cause of the observed phenomenon without indicating the mechanism. Example (Claim 1): The number of births decreased in the parrot population because the size of the sparrow hawk population decreased. Possible feedback: *How did the decrease in the size of the sparrow hawk population lead to a decrease in the number of births in the parrot population?* OR Summarizes the mechanism without identifying the cause. Example (Claim 1): The number of births decreased in the parrot population because fewer energy storage molecules that they need to reproduce were available to them. Possible feedback: *You wrote about how the parrots didn't have as many energy storage molecules, but why is that?*

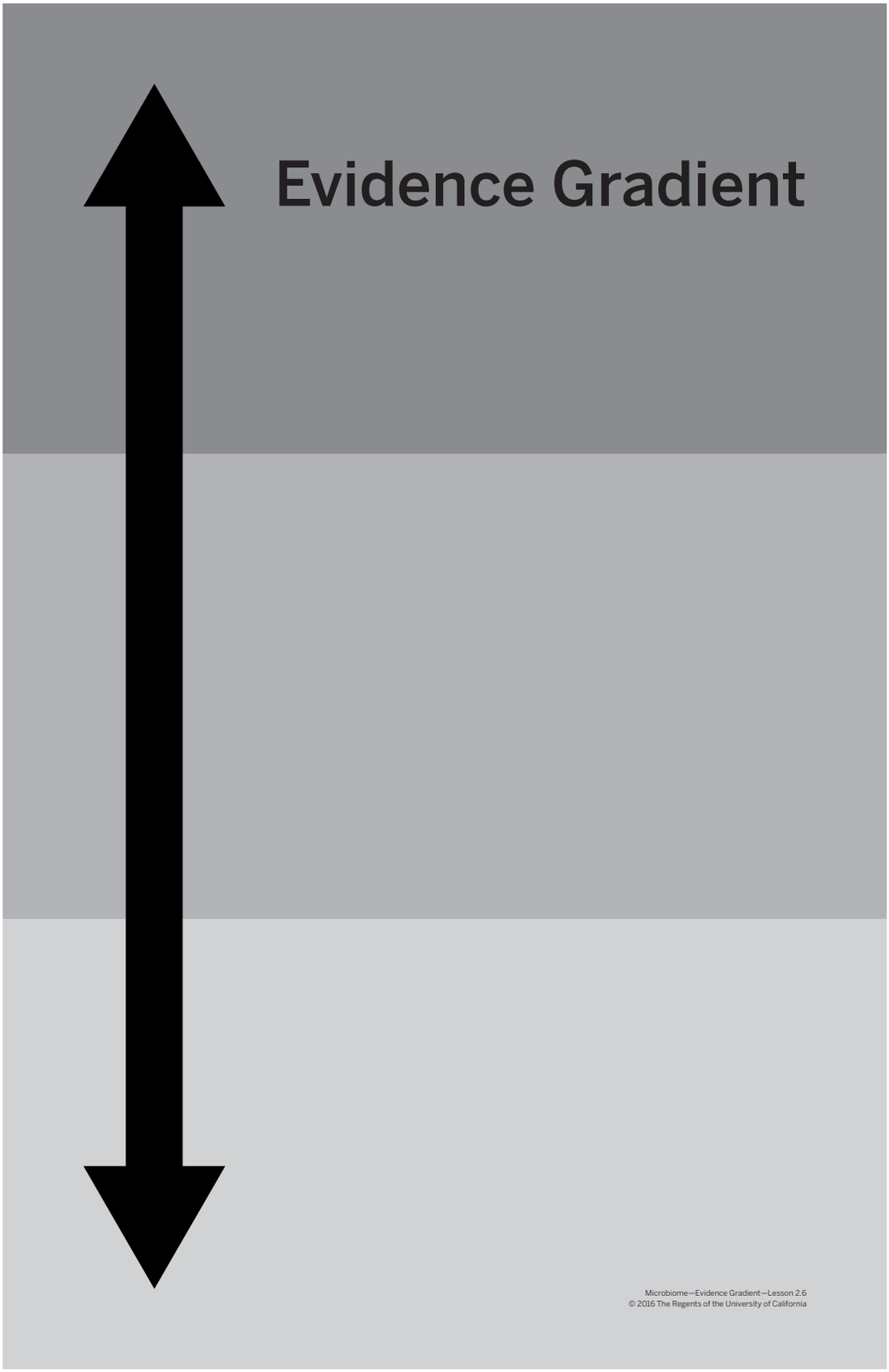
Rubric 3: Assessing Students' Performance of the Practice of Constructing Scientific Arguments		
Criteria	**Score**	**Description and possible feedback**
explanatory Does the argument fully address the question by identifying a cause for the phenomenon and explaining the mechanism or process by which it is a cause?	2	Argument proposes an explanation that identifies the cause but does not explain the mechanism in appropriate depth, or argument explains only part of the mechanism. Example (Claim 1): The number of births decreased in the parrot population because the size of the sparrow hawk population decreased. The smaller sparrow hawk population needed fewer energy storage molecules from the sparrow population, so the size of the sparrow population increased. Possible feedback: *You have told me that the smaller sparrow hawk population needed fewer energy storage molecules and how the sparrow population increased. How did that cause the number of births in the parrot population to decrease?*
	3	Argument proposes a complete and thorough explanation that identifies the causes and fully describes the mechanism. Example (Claim 1): The number of births decreased in the parrot population because the size of the sparrow hawk population decreased. The smaller sparrow hawk population needed fewer energy storage molecules from the sparrow population, so the size of the sparrow population increased. Since the sparrows and the parrots compete for button grass as their resource population, the increased sparrow population meant that there were fewer energy storage molecules available for the parrot population. This led to a decrease in the number of births in the parrot population.
justified by the reasoned use of evidence Is evidence connected to the claim in a way that is likely to convince the audience that the proposed explanation is the best one?	0	Argument does not support the claim with any of the available information (data or science ideas). Possible feedback: *How could you convince your audience that the claim you made is the best one?*

Rubric 3: Assessing Students' Performance of the Practice of Constructing Scientific Arguments		
Criteria	**Score**	**Description and possible feedback**
justified by the reasoned use of evidence Is evidence connected to the claim in a way that is likely to convince the audience that the proposed explanation is the best one?	1	Argument includes information to support the claim but does not explain *how* that information supports the claim. Example (specific data but not science ideas) (Claim 1): The sparrow hawk population decreased (Evidence Card E). Therefore the number of births in the parrot population decreased. Possible feedback: *How do these specific data support your claim? Why does the information you provide matter? Why is the information you provided evidence for your claim? Why does the size of the sparrow hawk population matter for the number of births in the parrot population?* OR Example (science ideas but not specific data) (Claim 1): A larger sparrow population would need more energy storage molecules so it would eat more button grass. The sparrows and the parrots compete for button grass as their resource population. Therefore, the number of births in the parrot population decreased. Possible feedback: *How do you know that this is what happened in this specific case? What evidence informs you that the sparrow population increased?*
	2	Argument includes information to support the claim and explains how some of the information supports the claim. Example (Claim 1): Births in the parrot population decreased because the sparrow population increased (Evidence Card D). The larger sparrow population needed more energy storage molecules so they probably ate more button grass. This would have led to a decrease in the size of the button grass population, which would have led to there being fewer energy storage molecules available for the parrot population. This led to a decrease in the number of births in the parrot population. Also, Ecologists found parrots had less fat on their bodies (Evidence Card I).

Rubric 3: Assessing Students' Performance of the Practice of Constructing Scientific Arguments		
Criteria	**Score**	**Description and possible feedback**
justified by the reasoned use of evidence Is evidence connected to the claim in a way that is likely to convince the audience that the proposed explanation is the best one?	2	(continued) Possible feedback: *You explained how the sparrow population change could have lead to fewer births in the parrot population, but how does the amount of fat on parrots' bodies support your claim?*
	3	Argument includes information to support the claim and explains how *all* the information supports the claim. Example (Claim 2): Births in the parrot population decreased because the sparrow population increased (Evidence Card D). The larger sparrow population needed more energy storage molecules so they probably ate more button grass. This would have led to a decrease in the size of the button grass population, which would have led to there being fewer energy storage molecules available for the parrot population. This led to a decrease in the number of births in the parrot population. Also, Ecologists found parrots had less fat on their bodies (Evidence Card I). This information supports that the parrot population is not getting enough energy storage molecules from their resource population, which would lead to a decrease in the number of births in the parrot population. Possible feedback: *Are there other reasons why some kinds of light would not be visible at the ocean floor? Are there other ways or types of visible light that could get to the ocean floor? Does all the available information support your claim? Does any available information support other claims? How might you refute one of the other claims?*
employs high-quality information as evidence This unit's criterion for quality of evidence involves using data from reliable sources.	0	Argument prioritizes information and evidence sources that are not from reliable sources presented in the *Populations and Resources* unit. Example: Student uses Evidence Card A or B, each of which represents samples collected from only one location in the island.

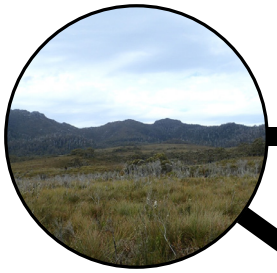
Rubric 3: Assessing Students' Performance of the Practice of Constructing Scientific Arguments		
Criteria	**Score**	**Description and possible feedback**
employs high-quality information as evidence This unit's criterion for quality of evidence involves using data from reliable sources.	1	Argument includes high-quality information that could be used as evidence to support the claim. Example: Student uses Evidence Card E or F, each of which represents samples collected from multiple locations throughout the island. Note that students practiced with Evidence Cards in Lesson 4.1 during which they might have discarded low-quality Evidence Cards based on the criteria. In such cases, they are not expected to include these data in their written arguments.
clear and well-organized Does the argument follow conventions and is it structured in a way that clearly communicates to the intended audience why the proposed claim is the best and most likely to be true?	0–3	This criterion, scored on a scale of 0–3, is intended to be applied to the written argument as a whole to formatively assess how clearly students' writing communicates why the proposed claim is most likely to be true. The questions below are intended to guide scoring and formative feedback for students to support their development of academic writing and language as it relates to scientific argumentation. • Does the argument begin with a clearly articulated claim? • Is the argument logically organized (e.g., by focusing on one causal factor at a time)? • Does the argument follow grade-appropriate conventions for academic writing? • Does the argument use transition words to organize ideas?

Rubric 3: Assessing Students' Performance of the Practice of Constructing Scientific Arguments		
Criteria	**Score**	**Description and possible feedback**
going further: engages with alternative claims Does the argument adequately address counterclaims? (While refutation is not a practice that is explicitly supported in this unit, some students may engage with alternative claims. This rubric can help provide feedback for students who do so.)	0	Alternative claims are not acknowledged. Possible feedback: *Have you considered what other claims might have some support?*
	1	Alternative claims are acknowledged, but evidence against those claims is not leveraged. Example: The other claim is that the number of deaths in the parrot population increased, but that is wrong. Possible feedback: *You mentioned that another claim might not be as strong. Can you provide evidence for why that claim might not be as strong?*
	2	Alternative claims are acknowledged, and evidence against those claims is leveraged. Example: Another claim is that the number of deaths in the parrot population increased, but that is wrong. Even though some evidence shows an increase in the feral cat population (Evidence Card B), which eats parrots, that data was collected from only one location, so I don't think that sample accurately represents the whole feral cat population. There is also evidence of an increase in the red fox population (Evidence Card C), which also eats parrots, but that evidence relies on samples from only the middle part of the island, which leads me to believe that it does not best represent the whole red fox population. Possible feedback: *You mentioned evidence that supports your claim and you have critiqued and discarded the evidence that could support the other claim. Is there any evidence that is against that claim?*



Island Ecosystem Food Web

pixie's
parasol mushrooms
?
no data

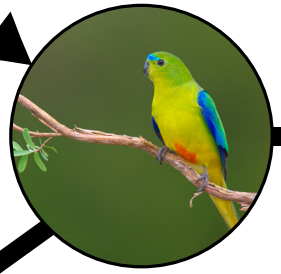


button grass
?
Data shows increase, but plants counted in just one location. Evidence should be eliminated.

sparrows
more births?
Collection sites only in the middle of the island.
Data shows number of sparrow eggs increased.

collared sparrow hawks
decrease
Data collected at eight locations throughout the island.

long-nosed potoroos
?
no data



orange-bellied parrots
decrease

feral cats
?
Data shows increase, but cats counted in just one location. Evidence should be eliminated.

Tasmanian devils
decrease
Data collected in 10 locations throughout the island.

red foxes
increase?
Data collected in four locations in the middle of the island.

Argument Organizer

Claim 1: The population decreased because births decreased.

Argument Organizer

Claim 2: The population decreased because deaths increased.

Science Seminar Observations

Write a check mark in the right-hand column every time you hear one of your peers say or do something listed in the left-hand column. If you hear an interesting idea, write it in the last row of the table.

OBSERVATIONS DURING THE SEMINAR	CHECK MARKS
I heard a student use evidence to support a claim.	
I heard a student respectfully disagree with someone else's thinking.	
I heard a student explain how her evidence is connected to her claim.	
I heard a student evaluate the quality of evidence.	
I heard an idea that makes me better understand one of the claims. That idea is: _____ _____	

Completed Scientific Argumentation Wall Diagram

Scientific Argumentation

1.3

The purpose of a scientific argument is to convince others, using evidence and reasoning.

1.3

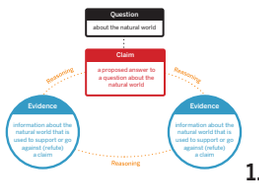
Evaluating Evidence

1.3

Evidence can support or go against a claim.

1.3

Scientific Argument



1.3

Reasoning Tool

Evidence	This matters because . . . (How does this evidence support the claim?)	Therefore, . . . (claim)

3.3

A scientific argument . . .

- begins with a question.
- has a claim that proposes an answer to the question.
- has evidence that supports the claim.
- clearly explains how the evidence supports the claim (reasoning).

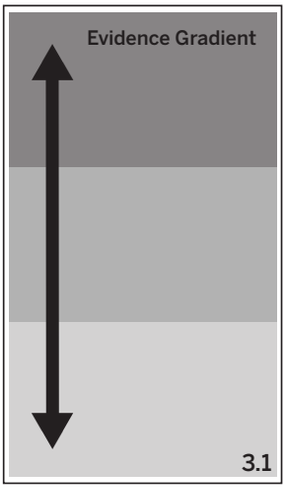
1.3

Argumentation Sentence Starters

- I think this evidence supports this claim because . . .
- I don't think this evidence supports this claim because . . .
- I agree because . . .
- I disagree because . . .
- Why do you think that?

1.3

Evidence Gradient



3.1

Example Student Arguments

3.4

Name: _____ Date: _____

Homework: Writing a Scientific Argument

Write your scientific argument about what caused the size of the orange-bellied parrot population to decrease. As you write, remember to:

1. Clearly state your claim. You may choose to use one of the two claims below, or you can create your own.
2. Use your strongest evidence from the Island Ecosystem Food Web or the Evidence Cards to support your claim.
3. Use the Argumentation Sentence Starters and the Word Bank below to help you explain your thinking.

Science Seminar Question: *What was the main cause of the decrease in the size of the orange-bellied parrot population?*

The population decreased because . . .

Claim 1: births decreased.

Claim 2: deaths increased.

Argumentation Sentence Starters

Describing evidence:	**Explaining how the evidence supports the claim:**
The evidence that supports my claim is . . .	If ___, then . . .
My first piece of evidence is . . .	This change caused . . .
Another piece of evidence is . . .	This is important because . . .
This evidence shows that . . .	Since, . . .
	Based on the evidence, I conclude that . . .
	This claim is stronger because . . .

Word Bank

consumer population	indirect effect	ecosystem	population
resource population	energy storage molecule	competition	reproduction

Name: _____ Date: _____

Homework: Writing a Scientific Argument (continued)

Targeted small group work time

i. Analyzing the End-of-Unit Assessment
ii. Deepening understanding of content
iii. Formative assessment and differentiation
iv. Internalizing the upcoming unit

Analyzing the End-of-Unit Assessment

Populations and Resources

Goal: Deepen understanding of how student responses in the End-of-Unit Assessment reflect the conceptual learning progression.

Reflect
In your teaching, how have you used summative assessments in the past?

In what format have you conducted an End-of-Unit Assessment or summative assessment (i.e. short answer, multiple choice, performance tasks)? What do students do to show what they've learned?

Analyze the End-of-Unit Assessment

In Amplify Science, the End-of-Unit Assessment is a summative assessment that provides students an opportunity to demonstrate their understanding of a unit's content. It's designed to reveal students' understanding along the unit's Progress Build.

A unit's Progress Build defines a progression of student understanding. Let's analyze the Progress Build for Populations and Resources in order to deepen our understanding of the End-of-Unit Assessment.

Level 1	Level 2	Level 3
There are always births and deaths occurring in a population. Changes in the number of births and deaths can change the size of a population.	A change in the number of births and deaths in a population can be caused by a change in the size of its resource populations or consumer populations.	A change in the number of births and deaths in a population can be caused by a change in the size of a population other than its resource or consumer population.

Between Level 1 and Level 2, what new ideas were integrated into students' deep understanding of populations and resources?	Between Level 2 and Level 3, what new ideas were integrated into students' deep understanding of populations and resources?

Check your understanding!

Navigate to the Populations and Resources unit landing page and select Jump Down to Unit Guide. Click to open the Progress Build and read each level of the expanded Progress Build to better understand how student learning progresses throughout the unit. Add any new ideas to the diagram above.

Part 1: Assessment design

Navigate to Lesson 4.4 in the Populations and Resources unit. To view the multiple choice items, either select Activity 1 in the Lesson Map or select Populations and Resources End-of-Unit Assessment copymaster from Digital Resources. Spend the next 5 minutes reading through the multiple choice items. Record any patterns or observations in the space below:

Analyzing the End-of-Unit Assessment cont.

You might have noticed that the assessment items follow a pattern. Each assessment item is aligned to a particular level of the Progress Build:

- 4 items focusing on each level
- Answering at least 3 out of the 4 items correctly represents full, explanatory understanding of that level.

Return to the Populations and Resources Progress Build on page 28 in your Participant Notebook. Then, reread multiple choice items 1-3 in the End-of-Unit Assessment and reflect on which Progress Build level is to be assessed for each question. Record in your responses in the table below:

Multiple choice item	Corresponding Progress Build level	Evidence
1		
2		
3		

Check your understanding!

Open the Populations and Resources End-of-Unit Assessment Answer Key and Scoring Guide in the Digital Resources of Lesson 4.4. Refer to the Item-PB Mapping table on page 2 to check your responses above.

Supporting concepts

Next, turn to page 1 of the End-of-Unit Answer Key and Scoring Guide. What supporting concepts are assessed in this unit? Which items are aligned in these supporting concepts?

Part 2: Analyzing student responses

Navigate to Lesson 4.4, Activity 2 and read Written-Response Question 1. Below you will find four different student responses to the question. Using your analysis of the Progress Build, determine which Progress Build level (Level 0 to Level 3) each response reflects. You may want to annotate the student response or use the space provided to include the rationale for your choice.

Written-response question #1: Scientists have been studying four populations in the ocean near Alaska. In the ocean, sharks eat sea otters, and both sea otters and sea stars eat clams (a type of shellfish). The data shows that recently the shark population increased. How will the increase in the shark population affect the other populations? Be sure to explain whether the sea otter population, the sea star population, and the clam population will change, and why.	
Student A response The sharks will eat the sea otters so they will die.	**Progress Build level: ____** **Rationale:**
Student B response There must have been more births than deaths in the shark population for the size of the shark population to have increased. The larger shark population would need more energy storage molecules, so more sea otters would be eaten by the sharks, causing more deaths than births in the sea otter population. This would lead to a decrease in the size of the sea otter population.	**Progress Build level: ____** **Rationale:**
Student C response There will be more deaths than births in the sea otter population so the size of the sea otter population will decrease.	**Progress Build level: ____** **Rationale:**
Student D response There must have been more births than deaths in the shark population for the size of the shark population to have increased. The larger shark population would need more energy storage molecules, so more sea otters would be eaten by the sharks, causing more deaths than births in the sea otter population. This would lead to a decrease in the size of the sea otter population. The smaller sea otter population would need fewer energy storage molecules from its resource population, so there would be fewer deaths in the clam population. This would lead to an increase in the size of the clam population. The smaller sea otter population would also cause the size of the sea star population, which competes with the sea otters for clams, to increase because there would be more energy storage molecules available for the sea star population.	**Progress Build level: ____** **Rationale:**

Check your understanding!

Open the Populations and Resources End-of-Unit Assessment Answer Key and Scoring Guide in the Digital Resources of Lesson 4.4. Refer to Science Content Rubrics on page 7 to check your responses above.

What are the advantages of using a summative assessment to determine where a student's understanding falls on the Progress Build at the conclusion of a unit?

Deepening understanding of content

Goal: Deepen my own content knowledge.

Step 1: Read the Science Background Planning for the Unit doc (10 mins)

- Read today's deep dive unit's Science Background Planning for the Unit doc. The purpose of this active reading activity is for you to pay attention to concepts that you want more support with and, in turn, about which you feel hesitant in supporting students (i.e. your "challenge concepts").
- As you read, note these concepts in the "My challenge concepts" column in the table below.
- Also consider concepts that you feel particularly comfortable with. Your expertise in these areas may support your colleagues later in this activity. Note these concepts in the "My comfort concepts" portion of the table (at the bottom).

Step 2: Share your challenge areas (5 mins)

- Working in a group of 4, take turns sharing your challenge concepts. Note who is sharing similar concepts to yours. You will want to partner with them in a moment.

Step 3: Find your challenge concepts within the unit (25 mins)

- Use the Coherence Flowchart to identify where your personal challenge concepts arise during the unit. Look at the Investigation Questions and key concepts to consider which moments in the unit students grapple with ideas related to your challenge concepts. Record the lesson(s) when this happens (indicated on the Coherence Flowchart) in the"Location in Unit" column.
- Navigate to the identified lessons, and explore the activities during which students build these key concepts. Try to dive into a variety of modalities, including a Sim activity, active reading, and using a modeling tool, etc. Record the activity in the "Activity that helps construct this concept" column in the table below. In the last column of the table, note how this activity helps students figure out this concept (much like how we annotated the Coherence Flowchart earlier in the day).

My challenge concepts	Location in unit (lesson-level)		Activity that helps construct this concept	How does this activity help construct this concept?
My comfort concepts				

Reflect: Discuss these questions with a partner, and record your thoughts. (5 mins)

- What steps will I take to ensure that I am prepared enough to teach this concept effectively and accurately?

- What are my resources for deeper learning around these concepts?

- How will I know if I am teaching these concepts effectively?

OPTIONAL: Identifying student preconceptions

Goal: Get to know possible student preconceptions in your upcoming unit, and identify where your challenge concepts and theirs align.

Step 1: Re-read Science Background doc with preconception focus. (5 mins)

- Return to the Science Background document. The purpose here is to identify possible student preconceptions that may require extra support during teaching. Skim through the document, stopping where you come to a "Note: Preconceptions" paragraph. Read and record brief notes in the associated column in the table below.

Step 2: Identify associated key concepts.

- Using the Coherence Flowchart, identify and record the associated key concepts, including the location in which these preconceptions may arise.

Step 3: Consider how to best support your students.

- Navigate to these locations in the digital platform, and use the Differentiation tab in the Lesson Brief and the Teacher Support tabs within the activities to research ideas for extra support at these points. Record in the "Extra support ideas from Amplify Science" column below.
- Discuss other ideas with a partner about how to identify when these preconceptions arise, and how to support your students. Record in the "Your ideas" column in the table which follows.

Possible student preconceptions	Associated concepts	Location(s) in unit	Extra support ideas from Amplify Science	Your ideas

Reflect:

- Review your two tables constructed during these activities. Where do your challenge concepts and possible student preconceptions overlap? How will you use this information during your implementation?

Formative assessment and differentiation

Populations and Resources

Goal: Examine embedded formative assessment opportunities in order to plan for differentiated instruction.

Step 1: How do we assess learning?

In Amplify Science, students can demonstrate what they've learned through embedded formative assessments (e.g., On-the-Fly Assessments, Critical Juncture Assessments, Student Self-Assessments). These assessments represent the most opportune moments for a glimpse into students' developing conceptual understanding and their facility with the practices.

First, let's analyze an embedded assessment opportunity we experienced earlier in the day. During our Populations and Resources deep dive sequence, you used the modeling tool to demonstrate your understanding of how the jelly population increased. Follow the steps below to navigate to the On-the-Fly Assessment in Lesson 1.4.

- Navigate to Magnetic Fields → Chapter 1 → Lesson 1.4 → Activity 3
- Select Embedded Formative Assessment
- Select On-the-Fly Assessment 2: Modeling Births and Deaths in a Population
- Read the Look for and Now what? sections and then complete the table below.

Populations and Resources Lesson 1.4, Activity 3	
Which disciplinary core ideas, science and engineering practices, and/or crosscutting concepts are being assessed?	
What data can be collected from this assessment opportunity?	
How could you collect data?	
What will this formative assessment opportunity tell you about student understanding?	

Step 2: Reflecting on differentiated instruction

Based on student responses to embedded formative assessments, you may need to differentiate instruction in the next activity or lesson. Differentiated instruction is a powerful classroom practice that recognizes that students bring a wide variety of skills, talents, and needs to their daily learning. When you differentiate instruction, it enables you to address varying degrees of proficiency and skill while also meeting identifiable differences in learning styles and interests. There are various ways to differentiate instruction—what you teach, how you teach, and/or how students demonstrate their learning.

How do you currently respond to students' needs, styles, or interests in your classroom?

Step 3a: Determine strategies to differentiate instruction.

First, let's read about the variety of differentiation strategies which are embedded in the Amplify Science curriculum. Follow the steps below to access the Program Guide:

1. Navigate to the Science Program Guide using the Global Navigation Bar.
2. Select Access and Equity.
3. Choose Differentiation Strategies.
4. Explore the description and associated strategies for the student groups listed.
5. Use the space below to record strategies you could use to differentiate instruction for each group of students.

Student population	Strategies for support
English learners	
Students with disabilities	
Standard English learners	
Girls and young women	
Advanced learners and gifted learners	
Students living in poverty, foster children and youth, and migrant students	

Step 3b: Review Lesson Brief

Navigate to the 1.4 Lesson Brief and select the drop-down arrow to expand the Differentiation section. Read the Embedded Supports for Diverse Learners. Are there any additional strategies noted in this brief that you would like to capture in the table above?

Step 4: Preparing to differentiate

Now it's time to draft a plan to implement differentiated instruction.

What is one strategy you just reviewed and/or recorded which you feel most comfortable implementing after the next embedded formative assessment opportunity?

How will you prepare your students for the implementation of this new strategy?
(Ex: Expected student behavior for group work, step-by-step directions)

How will you prepare your classroom for the implementation of this new strategy?
(Ex: Classroom arrangement, organizing materials)

Internalizing the upcoming unit

Goal: Gain familiarity with an upcoming unit, and start to plan how you will teach it!

Step 1: Begin by reading the general guidance in *Planning for the Unit: Getting Ready to Teach.* (Navigate to the unit landing page, select Jump Down to Unit Guide, then select Getting Ready to Teach).

Step 2: Use the following questions and workspace to guide you as you get to know a new unit.

Question to ask yourself	Resources Note: resources in italics are names of documents
Getting to know the unit overall	
What is the problem students have to solve, and how is it introduced?	• *Planning for the Unit: Unit overview* • Grades 6-8: lesson 1.2
My notes:	
What are the learning goals (NGSS) for this unit? • DCIs • SEPs • CCCs	• *Planning for the Unit: Standards at a Glance* • *Teacher Reference: Standards and Goals* • *Teacher Reference: 3-D Statements*
My notes:	
How does the unit unfold chapter by chapter?	• Chapter Overviews • *Planning for the Unit: Unit Overview* • *Planning for the Unit: Unit Map* • *Teacher Reference: Lesson Overview Compilation*
My notes:	
What is the Progress Build and how will students demonstrate their progress? (Core units only)	• *Planning for the Unit: Progress Build* • *Teacher Reference: Assessment System* • *Teacher Reference: Embedded Formative Assessments*
My notes:	

What is some of the underlying science background that will help you teach this unit?	• *Planning for the Unit: Science Background*
My notes:	
Gathering evidence to make explanations and arguments	
What are some of the types of activities students do to gather evidence?	• *Planning for the Unit: Unit Overview*
My notes:	
Articles: What articles do students read? Students engage with some of the articles during two active reading sessions; generally the students read and annotate for the first read to get to know the unit. What is the focus for the second read of the same article?	• *Teacher Reference: Articles in this Unit* • Lessons with the article title as the lesson title
My notes:	
What are the explanations or arguments students come to at the end of each chapter? What is the topic of the Science Seminar?	• *Planning for the Unit: Unit Map* • Download the Investigation Notebook • Look in end-of-chapter lessons
My notes:	
Digital apps	
Sims: Every unit has a Sim (except Geology on Mars which uses *Google Mars*.) Get to know the Sim and how it's used throughout the unit.	• Go to the Global Navigation menu to find the Sim with the same name as your unit. • *Teacher Reference: Apps in this Unit.*
My notes:	

Modeling tool: All core units have a modeling tool. Is it paper or digital? When and how is it used?	• For units with digital modeling tools, *Teacher Reference: Apps in this Unit* • Otherwise, first lesson where modeling tool is used
My notes:	
Materials management for your unit	
What physical materials and print materials come in your kit? What is considered "teacher provided?"	• *Planning for the Unit: Materials and Preparation*
My notes:	
What days will you need more time to prep and set up?	• *Planning for the Unit: Materials and Preparation ("Preparation at a Glance" section)*
My notes:	
How often will students need the digital devices?	• *Planning for the Unit: Materials and Preparation ("Preparation at a Glance" section)* • "Unplugged?" section in each lesson's Lesson Brief
My notes:	

Amplify Science support

Program Guide

Glean additional insight into the program's structure, intent, philosophies, supports, and flexibility.
my.amplify.com/programguide

Amplify Help

Find lots of advice and answers from the Amplify team.
my.amplify.com/help

Customer care

Seek information specific to enrollment and rosters, technical support, materials and kits, and teaching support, weekdays 7AM-7PM EST.

800-823-1969

scihelp@amplify.com

Amplify Chat

When contacting customer care, be sure to:

- Identify yourself as an Amplify Science user.
- Note the unit you are teaching.
- Note the type of device you are using (Chromebook, iPad, Windows laptop, etc.).
- Note the web browser you are using (Chrome or Safari).
- Include a screenshot of the problem, if possible.
- Cc: your district or site IT contact.

Notes