

Sample Life Science Learning Plan

Big Idea/ Topic

Interdependence of Organisms, Relationships in Ecosystems, Cycling of Matter and Energy, Biomes

Standard Alignment

S7L4. Obtain, evaluate, and communicate information to examine the interdependence of organisms with one another and their environments.

- Construct an explanation for the patterns of interactions observed in different ecosystems in terms of the relationships among and between organisms and abiotic components of the ecosystem. (Clarification statement: The interactions include, but are not limited to, predator-prey relationships, competition, mutualism, parasitism, and commensalism.)
- Develop a model to describe the cycling of matter and the flow of energy among biotic and abiotic components of an ecosystem. (Clarification statement: Emphasis is on tracing movement of matter and flow of energy, not the biochemical mechanisms of photosynthesis and cellular respiration.)
- Analyze and interpret data to provide evidence for how resource availability, disease, climate, and human activity affect individual organisms, populations, communities, and ecosystems.
- Ask questions to gather and synthesize information from multiple sources to differentiate between Earth's major terrestrial biomes (i.e., tropical rain forest, savanna, temperate forest, desert, grassland, taiga, and tundra) and aquatic ecosystems (i.e., freshwater, estuaries, and marine). (Clarification statement: Emphasis is on the factors that influence patterns across biomes such as the climate, availability of food and water, and location.)

Connection to Other Content Areas:

ELAGSE7W1 Write arguments to support claims with clear reasons and relevant evidence.

ELAGSE7W2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

ELAGSE7W7 Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

ELAGSE7W8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

MGSE7.SP.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is

representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences

MGSE7.SP.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulations.

Instructional Design

Engage:

Students should observe the following [video](#) or read an article about the Thorny Devil. This organism is specifically adapted to get the things it needs to survive in its environment.

The entire world is made of up of different environments that organisms must be adapted to survive in. So, students should begin to identify the major environments within the world that organisms live in. Students should begin to [ask questions](#) about what might differentiate environments on Earth. Students should then have a class discussion and decide about what list of questions will help them differentiate between the environments. Some questions that would be helpful to students are:

- How much rainfall does the area get?
- What is the normal temperature in the area?
- What type of soil is in the area?
- Is the area on land or in the water?
- What types of plants are native to the area?
- Where are environments like this located on Earth?
- What Animals are native to the area?

Then students should begin researching information about the biomes on earth. Students can use their questions to assist them in finding information about the [biomes](#) and [aquatic ecosystems](#).

Students should begin to construct an explanation about which biome the Thorny Devil lives in and why based on the information that they found on the biomes.

Unplugged: Consider providing students with articles about the Thorny devil and be sure to provide students with images so that they can see the adaptations rather than trying to imagine them. Students will need the organizers to record their ideas, questions, and research. Consider providing students with articles about terrestrial biomes and aquatic ecosystems.

Explore:

Students should determine which biome the state of Georgia is in and construct an argument to support their assessment. Students should support their argument with information that they obtained about biomes and what they know about the environment that they live in.

Now let us focus on an Ecosystem. Within the state of Georgia there are several types of ecosystems on various scales. So, students should think about where they live, go outside, and observe nature, in a safe place, and make notes the information they are gathering. Students can use this [sheet](#) to record information about their observations.



Now students should focus on organisms within the environment. Have students observe organisms in their environment from a safe place and use [these organisms](#) to have students begin to see patterns of interactions in different ecosystems.

Students should begin identify biomes that organisms belong to and construct explanations about how organisms are interacting with each other and abiotic factors in the following [scenarios](#).

Unplugged: Students may benefit from articles on the ecosystems within Georgia. Also, students should have articles about the interactions that occur in ecosystems. Have a system in place to provide students with feedback as they move through the lesson.

Explain:

Students should then focus on predator-prey, lynx and snowshoe hare, relationships to begin to explore how energy is transferred within an ecosystem. Students should research food webs within the taiga and begin to think about how the ecosystem is transferring energy. Students should then begin constructing a model that shows energy flow throughout the ecosystem that the student lives in.

Some questions to help students analyze and construct their models:

- Where does the energy start in the ecosystem?
- What is the first stop for the energy in the ecosystem?
- Where is the most energy available in the ecosystem?
- Where does energy go after that?
- How much energy is moving from one place to the next?

Now students refer to their food chain model. Students should ask questions about what might be moving other than energy (this could be discussion or brainstorming activity). The goal is to get students to focus on the matter movement throughout the ecosystem. Some questions to assist students in identifying the movement of matter:

- What besides energy could be moving when organisms are eating?
- What is returned to the environment when something decomposes?
- Where do we, as humans, fall within the food chain?
- What would we be called (producers, consumers, decomposers)?
- What makes up everything living and non-living?

Have students find information about how carbon and water cycle are important to life in the ecosystem. Then students should create a basic model of how matter cycles in the ecosystem.

Unplugged: Students will need an article about the lynx and snowshoe hare. Be sure that there is a consistent procedure for students to get feedback as they work through the lesson. Students may benefit from articles about the movement of energy and matter within an ecosystem.

Elaborate:

So, food/energy is not the only resource that organisms need access to. Besides energy, what other things do organisms need to survive? Use the following questions to assist in identifying resources that are required for organisms to live:

- What do you need to survive?
- Think about an animal that you have seen. What did they need to survive?
- What do plants need to survive?



Students should identify things like sunlight, food, water, minerals, and oxygen as resources that living things need. The teachers should tell students that we are going to focus on the water a resource that can impact life.

Students should [analyze and interpret data](#) on organisms that have limited access to water in Georgia. Then students should research droughts that occur in Georgia and the impacts on living things in Georgia. Students should then construct an argument using evidence that describes the connection between resources and changes in individuals, populations, communities, and ecosystems. Some questions to assist students in finding connections between resource accessibility and changes to every level of biological organization:

- What does the data show?
- What is the connection between resources availability and population size?
- What types of resources can impact communities?
- What types of resources can impact ecosystems?
- How can resource availability affect the individual organisms?

Unplugged: Students will need access to the data set and a way to ask questions as they work on analyzing the data. There should be a clear and consistent way for students to ask questions and receive feedback.

Evaluation:

Students should pick a [biome](#) and complete the following:

- Research and identify a food web that contains at least 7 organisms.
 - Explain the relationships between the organisms within the food web and ecosystem.
 - Develop a model to show how energy and matter are flowing through the food web and ecosystem.
 - Explain why these organisms live in the biome that you chose.
 - Discuss what human impacts, disease and/or resources are limited in the area. Also, explain how these things could potentially impact the organisms that are included in your food chain.

Unplugged: Students will need the biome project sheet. Consider providing students with a rubric to evaluate their own work. Students may need some organisms to pick from and articles about the organisms. Students may, also, require information about human impacts, diseases, and resource availability.



Lesson Goals Checklist

Standards:

S7L4. Obtain, evaluate, and communicate information to examine the interdependence of organisms with one another and their environments.

a. Construct an explanation for the patterns of interactions observed in different ecosystems in terms of the relationships among and between organisms and abiotic components of the ecosystem. (Clarification statement: The interactions include, but are not limited to, predator-prey relationships, competition, mutualism, parasitism, and commensalism.)

b. Develop a model to describe the cycling of matter and the flow of energy among biotic and abiotic components of an ecosystem. (Clarification statement: Emphasis is on tracing movement of matter and flow of energy, not the biochemical mechanisms of photosynthesis and cellular respiration.)

c. Analyze and interpret data to provide evidence for how resource availability, disease, climate, and human activity affect individual organisms, populations, communities, and ecosystems.

d. Ask questions to gather and synthesize information from multiple sources to differentiate between Earth's major terrestrial biomes (i.e., tropical rain forest, savanna, temperate forest, desert, grassland, taiga, and tundra) and aquatic ecosystems (i.e., freshwater, estuaries, and marine). (Clarification statement: Emphasis is on the factors that influence patterns across biomes such as the climate, availability of food and water, and location.)

- ☐ Construct an explanation about the relationships of organisms and non-living components within ecosystems.
- ☐ Develop a model that shows the cycling of matter and energy within ecosystems.
- ☐ Analyze and interpret data to discuss how resource availability and other factors impact organisms, communities, and ecosystems.
- ☐ Ask questions and gather information to show similarities and differences between biomes and aquatic ecosystems.

Evidence of Student Success

Student mastery is assessed throughout this unit using formative and summative components. Student discussion, explanations and products should reflect the understanding indicated in the Evaluate section above. Each activity in the segment functions as an assessment opportunity as well to plan targeted supports or provide extension items. Formative options using the self-evaluation checklist and the activities at various points during the segment.



Student Learning Supports

The goal for science education in the state of Georgia is as follows: All Students, over multiple years of school, actively engage in science and engineering practices and apply crosscutting concepts to deepen their understanding of the core ideas in these fields.

The learning experiences provided for students should engage them with fundamental questions about the world and with how scientists have investigated and found answers to those questions.

This lesson includes the disciplinary core ideas, science and engineering practices and crosscutting concepts to actively engage students in exploring science concepts with real world topics. As part of the vision we must support the inclusion of all students in science learning. Some **general** ideas to consider when designing things to support students that struggle are as follows:

- Be sure that students can access the information that you they are learning. Make sure that you can answer the following questions:
 - Do students have what they need to get the information? This is about them having the book or internet access to get to the information.
 - Once students obtain the information, are students able to determine what information is important? This is about the students having materials on the appropriate grade level and that is in a format that students can understand.
 - Is the material presented in multiple ways that allows all students to interact with information in a way that works for them? Such as video, audio, and articles.
 - Consider read aloud as a potential option for students that have reading deficits as an option to assist students in accessing the material. This could be done using video, read aloud or via phone.
- Students may need ideas about where to find information. Providing students with information about what a reliable source is and even where to find reliable sources may be beneficial for students.
- Some students may find it difficult to complete the entire lesson workload. Some students may benefit from a reduced workload (note: this should be used only when absolutely necessary). Be sure that the information that is removed will not negatively impact the student's understanding of the disciplinary core idea.
- Consider how students show their knowledge. Students need multiple ways and opportunities to show their knowledge. Things to consider:
 - Recording video or audio
 - Drawing
 - Writing
 - Typed
 - Verbal
- Provide students with a way to ask questions in a forum that does not cause anxiety. Frequently students do not want to ask questions in front of their peers because they are afraid of what their peers may think of them. So, be sure to provide students a way to ask questions that is private or anonymous.
- Consider materials that students need to complete the assignments.
 - Do students have needed materials?
 - What are some alternative materials that students may have available to them?



- Have a clear and consistent set of guidelines for providing consistent feedback to all students.
- Utilize graphic organizers such as those from the [Wonderofscience.com](https://wonderofscience.com)
- Use high leverage and evidence-based practices to reach all students.

Some ideas for supporting **this lesson specifically** would be to make sure to consider the following:

- Make sure to have videos that have closed captions available.
 - You may need to teach students how to turn on or turn off the captions.
 - Also, consider telling students that it is ok to turn the captions on or off as needed. Some students will benefit from the captions and other students will be distracted by them.
- Provide students with ways for articles to be read aloud to them. These ways should meet with your district's policy on student/parent communication. This could be done via video chat, using video instead of articles for some information, using the telephone, utilizing read aloud feature of Microsoft word or the programs mentioned in the video and resource document on virtual supports that is available on the Georgia Department of Education science webpage.
- Consider providing students with question stems to assist students in generating questions.
- Provide students with sources to find information.
 - Consider providing links or articles for students to use as resources.
 - Consider teaching students to evaluate sources to find reliable information that they can use.
- Consider helping students understand what it means to observe.
 - When observing nature, you must be quiet, in a safe location and watching the environment.
 - Help students understand that it must be something they notice with their senses to be consider an observation.
 - Students may need a refresher about the differences in observations and inferences.
- Consider providing students with sentence stems to assist them in getting started with explanations.
- Consider providing a rubric for students' models and other assignments.
- Consider providing students with multiple ways to gather and share information.

Engaging Families

- Additional resources to support this segment can be found at GPB: [Georgia Home Classroom](https://www.gpb.org/home-classroom).
- [Science Support for Families During School Closures](#)



How do we differentiate environments?

Directions: Think about your environment and other environments that you have heard of, visited, or seen on TV. What questions would help us notice patterns within the different environments and allow us to create categories based on those patterns? Below, you have a space to record questions that might help us differentiate between the different environments.

Questions:

1. _____
2. _____
3. _____
4. _____
5. _____



Now create a list of the things that your peers feel are important that are not addressed in your questions.

What is the consensus about the characteristics that are likely to differentiate between the biomes? (Hint: These are things that will be patterns within the biomes)



Terrestrial Biome Chart

Directions: Use the questions that you asked and the information that your class decided was important to find important information about the different biomes on planet Earth. Then fill in the chart below with information about each of the biomes.



 Characteristics				
 Biomes				
Tropical Rainforest				
Savanna				
Desert				
Grassland				
Taiga				

Tundra				
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Aquatic Ecosystems Chart

Directions: Fill in the chart below with information about aquatic ecosystems. These things indicate patterns within aquatic ecosystems that impact life that live in the area.

 Characteristics	Type of water	Climate	Plant Life	Animal Life
 Ecosystems				
Freshwater				
Estuaries				
Marine				

How in the world would Georgia be classified?





Directions: Use the information that you found about the and some observations that you make in your neighborhood to determine what biome Georgia is a part of. So, go outside, in a safe place, and observe the environment that you live in. Record your observations about your environment below.

1. What do you notice in your environment?
2. What is the temperature and weather like in your area?
3. What is the climate like in your area?
4. How much rainfall does your area get?
5. Is your area the same all year around or does it change throughout the year?
6. What sorts of plant and animal life do you see?

Now take a minute to compare your biome chart to your observations. Then construct an argument about which biome Georgia is a part of. Use the space below to write your argument and back it up using evidence from your research about the patterns in biomes and the observations from your area.



Organisms Interactions







Interaction type and Justification	Organism 1	Organism 2
	 <p>Red-Tailed Hawk</p>	 <p>Deer mouse</p>
	 <p>Gopher Tortoise</p>	 <p>Eastern Indigo Snake</p>







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	Water Oak	Mistletoe
		
	Bobcat	Eastern Grey Squirrel
		
	Beaver	Wood Duck

	 <p>Eastern Cottontail Rabbit</p>	 <p>American Dog Tick</p>
	 <p>Hummingbird</p>	 <p>Red Buckeye</p>
	 <p>American Black Bear</p>	 <p>Blueberries</p>

Biome and Interaction Scenarios

Directions: Read the following scenarios. In each scenario identify the Biome that the species is in and then identify the interaction. Please provide evidence as a justification for your identification.

1. A student is interested in the Keel-billed toucan which is a large and brightly colored bird that lives in South America very close to the equator. The keel-billed toucan frequently eats Jucara fruit that contains large seeds produced by a certain type of palm tree. The Keel-billed toucan is no longer hungry, and the tree's seeds are dispersed throughout the area. The Keel-billed toucan is a very poor flyer that jumps from tree to tree which means that it must live in an area with a very dense tree population.
2. A grey whale breaches, meaning that it jumps its body out of the water, and researchers notice that it has a very specific pattern of white pattern on its chin. Barnacles are a naturally occurring part of a whale's life. Barnacles burrow into the skin of whales and create a hard shell on the outside with just an opening to feed. As barnacle clusters grow it can create drag and make it more difficult for the whale to move through the water. This can be a huge problem for Grey whales because they migrate from above Alaska to the warm waters off the coast of northern Mexico.
3. When studying a particular type of cactus, called the Cholla Cacti, a researcher notices that a bird is building its nest in the cactus. The researcher gathers some information and finds out that the bird is called a cactus wren. The cactus wren is happy with its safe place to nest and the cactus does not even know that the bird exists. The cactus is happy to live in the hot and dry climate with very few things that are able to feed on it.
4. A student finds a documentary on a large cat, the lynx. The documentary discusses how the lynx lives in a cold pine forest near mountains. The ground is covered in snow and ice. The lynx is adapted to the snowy environment with light colored, thick fur and large feet. The lynx frequently hunts in the taiga. The snowshoe hare is camouflaged well and moves very quietly and quickly within the taiga to try to stay safe. Sometimes the lynx and snowshoe hare interact with each other.
5. A student wakes to hear chittering outside their open window. The students look out the window to see a squirrel and a chipmunk fighting over an acorn in the water oak outside the window. The student lives in an area that normally has both chipmunks and squirrels. Since winter is approaching the student believes that both the chipmunk and the squirrel are trying to store food for the winter.



Resource and Population Data

Directions: Look over the following data, make observations and draw some conclusions about the organisms and the resources. Then answer the questions following the data.

A scientist, who is interested in threatened and endangered species, has been observing a population of Georgia Aster plants in a protected forest in Northern Georgia. The scientists compiled the data from their observations below. The scientist, also, noted that the forest that the Georgia Aster occurs in is very well managed by the Department of Natural Resources to allow for optimal growth of the Georgia Aster. Take some time and look over the data.



This is the Georgia Aster

Year	Amount of Rainfall (in inches)	Number of Georgia Aster Plants
2012	40	155
2013	30	130
2014	15	88
2015	18	97
2016	30	141
2017	48	182

Use the data to answer the following questions:

1. What is the resource that is limited here? Justify.
2. Does the Georgia Aster require the resource to survive? Justify.
3. What happens to the number of organisms when the amount of the resource is limited?
4. What happens the number of organisms when the resource is available in large quantities?

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5. Could the resource availability for the Georgia Aster impact other species in the area?
6. Will the ecosystem be affected by the limited resource?
7. Make a prediction about how human impact, such as cutting down trees and paving a parking lot in the area, would impact the Georgia Aster's population.
8. Make a prediction about how a disease would impact the population, community, and ecosystem.



Biome Project

Research and identify a food web that contains at least 7 organisms.

- Explain the relationships between the organisms within the food web and ecosystem.
- Develop a model to show how energy and matter are flowing through the food web and ecosystem.
- Explain why these organisms live in the biome that you chose.
- Discuss what human impacts, disease and/or resources are limited in the area. Also, explain how these things could potentially impact the organisms that are included in your food chain.

