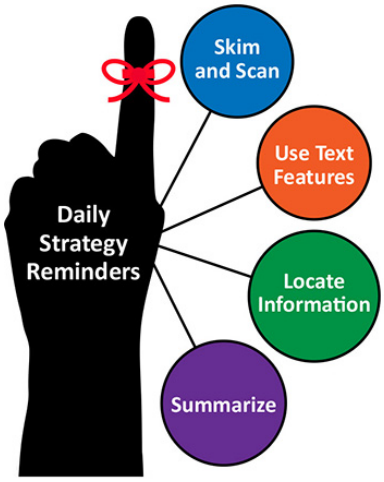
DAY 13 How Can Changes in a Food Chain Affect an Ecosystem?		
Reading Strategy: Monitoring Comprehension and Fix Up Strategies Practice		**Science Concept:** In an ecosystem, food chains transfer energy between organisms, from producers to consumers. An imbalance or disruption in a food chain can occur when one component changes, impacting the entire ecosystem.
Reading TEKS: 3.6 I	**ELPS:** Speaking K-12, 19 TAC 74.4(c)(3) D	**Science TEKS:** 3.9(B)
Materials for Reading Mini Lesson: chart paper, markers, pond ecosystem inquiry chart, nonfiction pond text to model strategy		
Materials for Inquiry Circle Groups: group inquiry charts, pencils, variety of nonfiction texts for each group		
Materials for Science Whole Group Lesson: See lesson		
Content Vocabulary: **Nutrients**- Nourishment or a substance that provides what an organism needs for survival and growth. In a pond, important nutrients are in the form of chemical elements such as oxygen, carbon, nitrogen, and phosphorous. **Decay** – The process of rotting or decomposition by bacteria or fungi. Occurs when an organism dies. **Decomposition** – the breaking down of material; rotting **Bacteria** – Microscopic, one-celled organisms that live everywhere and break down decaying matter. **Fungi** – A group of living organisms that are not animals, plants or bacteria. They get their food from decomposing matter. They can be microscopic or very large.		
Science and Literacy Connection: Reviewing what they already know or have learned helps scientists when they are faced with a new situation or challenge.		

For an expanded version of the Standards listed above, see page ___.

Reading Mini-lesson — 15 minutes

OVERVIEW

Mini-lesson practice should be used as a time to practice the reading strategies previously taught in this unit. Teachers are encouraged to use this time to best meet the needs of their students. Perhaps your class needs more time with the mini-lesson from the day before, or you may choose to circle back to mini lessons from a week ago. The choice is yours; we just ask that you use this time to practice!



Teachers should determine if this mini lesson will be facilitated with the whole group or a small group (i.e., a particular inquiry circle group) who needs additional support. If you are working with a small group, we suggest your other learners spend additional time within the inquiry circles.

Explain the strategy:

- **Tell what the strategy is (declarative knowledge)**
  - Say something like, "Today we will continue to practice monitoring comprehension and using fix up strategies. Remember, monitoring comprehension means I will listen to myself as I read to be sure everything makes sense, looks right, and sounds right. If I don't understand something, then I will use a fix-up strategy." Refer to the anchor charts previously made with the class.
- **Tell when and why to use the strategy (conditional knowledge)**
  - Say something like, "This week, we talked about how we monitor every time that we read even though we may not notice it (like with an easy book). It is important to always pay close attention so we know when to use a fix-up strategy."
- **Tell how to employ the strategy (procedural knowledge)**
  - For this section in the mini-lesson, the teacher may choose to model the strategy again for the class. Be sure to use a different text or page in the text than what you modeled yesterday.
  - Teachers are encouraged to share examples of students using this strategy from the day before. Say something like, "Mohamed's group did a great job yesterday using a fix-up strategy. I was so impressed when they____." Teachers also are encouraged to invite the groups to share with their peers (you may need to scaffold this and prepare the students for sharing beforehand.)

    If you choose to model the strategy again, you might want to say something like:
  - I ask myself three things while I am reading:
    - "Does that look right?"
    - "Does that make sense?"
    - "Does that sound right?"
  - If the answers to these questions are yes, then all is well. If the answer is 'no,' then I have to use a fix-up strategy. When I am finished reading, I will ask myself, 'What did I learn?' If I can answer this, all is well. If I cannot, then I should use a comprehension fix-up strategy.
  - There are several comprehension fix-up strategies that I can use. But, first I have to recognize that something has gone wrong in my reading. I know something has gone wrong when I read and I think, 'What in the world did I just read?' Once I recognize that I'm not understanding, then there are a few things I can do to fix it. Here are some of them:
    - I can look at the graphs, charts, and pictures in the text.
    - I can read out loud.
    - I can visualize or create a picture in my head.
    - I can re-read the text.
    - I can stop and think about what I already know.
    - I can ask someone in my inquiry circle.

Practice in text (print, video, or interview)

Post the anchor charts in your classroom so students can refer to it while in their inquiry circles. Encourage scientists to use the strategy during in their Inquiry Circles.

Inquiry Circle Groups — 30 minutes

OVERVIEW

Scientists work in teams when conducting research and investigations. Each day of this unit, students will work in inquiry circle groups while embodying the role of a scientist. They will do so by taking on roles of scientists in research by speaking like a scientist, reading like a scientist, and writing like a scientist.

PROCEDURE

Before Inquiry Circle Groups — 5 minutes

You might want to say something like this to the readers:

- It is time to get into our inquiry circle groups. You will be with the same research team as yesterday.
- When we research ecosystems, we will practice our roles as scientists. We will do this because scientists have a special way in which they observe the world, read scientific texts, and write reports. There is no better way to learn about science than to become a scientist!

During Inquiry Circle Groups — 20 minutes

You might want to say something like this to the readers:

- We have anchor charts to help guide your thinking. Do not forget to use them while in groups. (Refer to the "Inquiry Tool Box" anchor chart and the daily anchor chart. Remind students that they can use all the reading strategies taught, not just the one for that day.)
- My role is to help guide the inquiry circle groups, but I expect you to work as a scientific team to solve your problems together.
- Do not forget to answer your research questions and record it on the inquiry chart. It is important to record your sources on the inquiry chart as you complete it. (Be sure to explicitly explain how students should use the chart.)

(While groups are working together, walk around the room to facilitate as needed.)

After Inquiry Circle Groups — 5 minutes

You might want to say something like this to the readers:

- As we are concluding our inquiry circle groups for today, each group will have a chance to share what they accomplished and learned.
- The Lab Director should lead the discussion with their inquiry circle group about today's results. For example, what did you learn about your ecosystem? Which reading strategies did you use? What problems did you encounter? How did you resolve those problems?
- The Data Scientist will now share with the entire class either something the group learned about their ecosystem, which reading strategy(ies) were used, or how the group solved a problem.

Science Whole Group Lesson — 30 -45 minutes

OVERVIEW

Students view a slideshow to discover how changes in a food chain such as overpopulation or elimination of organisms can impact ecosystems.

GUIDING QUESTIONS

What happens when a producer or a consumer is added or missing from a food chain? How does a change in a food chain affect an ecosystem?

BACKGROUND INFORMATION

Scientists study how living and non-living things interact in many different environments. Those environments support ecosystems unique to their surroundings, made up of food chains and food webs that provide the energy transfer necessary for the survival of life. Understanding how organisms interact and compete within an ecosystem

However, there are many factors that can upset the balance of an ecosystem. Some of them are natural, others are the result of natural disasters or human impact. On the most basic level, a change in a food chain can set off a series of impacts to an entire ecosystem.

When a pond is first formed it begins with mostly water and little life. As nutrients begin to enter the system, plant and animal life begins to grow, food chains develop. When organisms die, they decay and put nutrients back into the pond to keep the life cycle going. The enrichment of a pond with nutrients is called eutrophication. Over decades, a pond or lake may fill up with materials creating a wetland, and eventually land.

Natural nutrients needed for a healthy aquatic ecosystem include carbon, oxygen, nitrogen and phosphorous. However, animals, agriculture, and urban areas can speed up the process of eutrophication by adding excessive nutrients to the pond or lake. Too many nutrients can cause algal blooms (rapid population growth) and plant growth that directly impact food chains. Algal blooms can deplete other resources in an aquatic ecosystem. In addition, when the algae finally die, decomposers that feed on the dead algae use so much oxygen that low oxygen levels threaten fish and other members of the ecosystem.

SAFETY

Remind students to follow safety rules for making observations on their sample.

MATERIALS

- Pond Ecosystem Slideshow
- Projector/computer
- Science Notebooks

DAILY OBSERVATIONS

Students observe their samples and record data/information on data logs in their science notebooks.

PROCEDURE

Engage

1. Ask students to refer back to the drawings they made of the pond ecosystem.
2. Review the food chain they discussed (algae, tadpoles, fish, heron).

3. Tell them that today they will consider what happens when changes occur to that food chain. ***Note: This activity is focused on only one simple food chain to represent the dynamics of interactions between the organisms in a pond.***

Explore

4. Project the first slide. Ask them to describe what they see.
5. Explain that the light green color near the surface of the water is the algae. Remind them that algae are so small that we can only see the color of the numerous individual alga cells.
6. Overall, this is a healthy ecosystem, with a good balance of organisms. Tell them that in the next slides, they will see changes and they need to consider what is happening.
7. Project slide #2. Ask what they see different (more heron, less fish, more tadpoles??) Why?? Listen for their responses. They should explain that with more heron, the population of fish goes down because they eat more. Because there are less fish now, there will be more tadpoles. More tadpoles will eat more algae.
8. Ask them if there appears to be more algae. Explain that organisms can add nutrients to the water because of their waste and decay, making plants and algae grow. We add nutrients to our lawns and plants at home for the same reason- for growing.
9. Project slide #3. Ask the students to describe the changes. (no heron, lots of fish, few tadpoles, more plants, more algae, why??)
10. Listen for their explanations to be more specific, to offer more complex explanations with less prompts from the teacher. Are they making connections such as "there are more fish eating the tadpoles, so less tadpoles"; and "there are more fish because there are no heron to eat them". Fish population grows if there is nothing to eat them. However, since there are more fish, there are less tadpoles. What happens when they run out of tadpoles to eat? Some fish may die. Also note that the water is turning greener- more algae and plants
11. Project slide #4. Once again ask students to describe what they see. (Do they notice the dead fish? The dead plants? Why did they die?)
    - Several scenarios here. The fish died because they had no food- they had used up their supply of tadpoles. When they die, the began to decay.
    - Also, there has been an algal bloom- too much algae growing faster in the water, perhaps because of too much nitrogen and phosphorus (nutrients) from the air and water; too much algae uses up the oxygen that fish and other organisms need.
    - Some plants and algae die.
    - As bacteria breaks down the dead organisms, they also use up the oxygen in the water.
    - Because they need oxygen to survive, any remaining organisms eventually die.

    This slide may be harder for students to analyze on their own, but it opens up the conversation for a beginning understanding of the complexity of the interactions between organisms in an ecosystem.

Explain

12. Explain that a *dead zone* occurs when there is low or no oxygen left in an aquatic system. There are many things that cause the dead zones but too many nutrients are the main cause.
13. Tell them that besides the natural causes we have described, human activity can make these changes occur faster by doing things that put more nutrients into the water.

Elaborate

14. Remind students that they have been looking at only one of the food chains that make up a pond ecosystem. In real life, there are many food chains that are connected in the same pond, making food webs that they will learn more about in later studies.

15. Ask them to think about the ecosystems they have been researching and learning about. How many different food chains have they discovered in the same ecosystem? Do the consumers in the food chains eat more than one thing??
16. Ask them to write 1-2 sentences in their science notebooks about how changes in the food chains might affect their research ecosystems.

Evaluate

17. Did students actively participate in the discussions?
18. Did their descriptions or explanations communicate understanding of the changes they observed in the pond ecosystem slides?
19. Did students use scientific vocabulary in their responses?
20. Were students able to make connections between the dynamics of the pond food chain activity and the ecosystem food chains they are researching?

Expanded Standards

Reading TEKS: 3.6I Comprehension skills: listening, speaking, reading, writing, and thinking using multiple texts. The student uses metacognitive skills to both develop and deepen comprehension of increasingly complex texts. The student is expected to: (I) monitor comprehension and make adjustments such as re-reading, using background knowledge, asking questions, and annotating when understanding breaks down.

ELPS: Student Expectations for Speaking K-12, 19 TAC 74.4(c)(3) The student is expected to: (D) speak using grade level content vocabulary in context to internalize new English words and build academic language proficiency (E) share information in cooperative learning interactions.

Science TEKS: 3b9B: The student is expected to identify and describe the flow of energy in a food chain and predict how changes in a food chain affect the ecosystem such as removal of frogs from a pond or bees from a field.