ALL for Science™
Authentic Literacy and Language for Science

Baylor College of Medicine
CENTER FOR EDUCATIONAL OUTREACH

DAY 4: WHAT IS A LIFE CYCLE? (PART 1)

MINI-LESSON

Teacher introduces the "Drawing Conclusions" anchor chart and models the strategy.

SCIENCE INQUIRY CIRCLES

Teams continue to research questions about their animals and record the information on their team Inquiry Charts.

GUIDED SCIENCE INVESTIGATIONS

Children learn about life cycles and role play the life cycle stages of a frog.

ABBREVIATED STANDARDS

- Reading TEKS: 2(b)(6)(F)
- CCSS: SL.2.2, W.2.7, W.2.8
- NGSS: 3-LS1-1
- Science TEKS: 2.1(G), 2.13(D), 2.5(G)

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Day 4: What Is a Life Cycle? (Part 1)

Literacy Strategy: Drawing conclusions from text.

Science Concept: Animals go through a series of changes throughout their life cycles.

Science and Literacy Connection: Just like readers, scientists have to read between the lines to draw conclusions. Scientists use observations they make to draw conclusions about what might be happening when looking for answers or explanations.

Mini-Lesson (15 minutes)

OVERVIEW

Scientists draw conclusions every single day. When conducting an investigation, they look at the new data and think about what they already know. Then, they draw a conclusion about the investigation based on all the information they have. Readers do that, too.

NOTE: You are encouraged to create the "Drawing Conclusions" anchor chart with your learners as you move through the lesson, using the provided anchor chart as a model. Post it for easy reference when completed and remind learners to refer to the anchor charts during inquiry circles.

MATERIALS

Teacher needs:

- chart paper
- marker(s)
- class Inquiry Chart about butterflies
- "Drawing Conclusions" anchor chart
- butterfly text to model strategy (see "Animal Resources" spreadsheet for ideas)

PROCEDURE

Each *italicized statement* below contains suggested wording the teacher may choose to use for the lesson; additional teacher actions and considerations are in parentheses.

Tell what the strategy is (declarative knowledge)

1. *Today we will learn how to draw conclusions while we read. Drawing conclusions is a type of inference and is sometimes called "reading between the lines."*

Tell when and why to use the strategy (conditional knowledge)

1. *Sometimes authors do not clearly state information. Often, authors are telling you more than they have simply written. To discover everything authors are trying to tell us, we need to draw conclusions, or infer, based on the details the author has written.*

Tell how to use the strategy (procedural knowledge)

1. (Model the strategy using a text example.) *The first thing I will do is pay attention to the details (clues) the author does give me when reading, watching a video, or interviewing an expert.*
2. *Next I will think about what I already know about this topic and what the author is telling me.*
3. *Then I will put these two things together to draw a conclusion.*
4. *If I read further and notice that the author is saying something different than what I thought in my original conclusion, I can revise my thinking based on the new evidence I have found.*
5. *To help us remember the skill "drawing conclusions" we can think about being a detective. First, we find the clues (details) the author has given us. Then, we think about how the clues (details) go together along with what we already know. We can revise our conclusions as we read if we find new evidence that changes our mind. Finally, we draw conclusions based on all the clues (details) and evidence we have.*

Science Inquiry Circles (30 minutes)

OVERVIEW

Today, inquiry circles will continue research to answer questions about their animals.

MATERIALS

Each team needs:

- team Inquiry Chart
- pencils
- access to informational texts/media

Teacher needs:

- "Animal Resources" spreadsheet for ideas

PROCEDURE

Each *italicized statement* below contains suggested wording the teacher may choose to use for the lesson; additional teacher actions and considerations are in parentheses.

Before Inquiry Circles

1. *It is time to get into our inquiry circles.* (Have the Equipment Directors gather the Inquiry Chart for their team.) *Today we will continue to look for answers to the questions on your Inquiry Charts. The more we know about a topic, the better we will understand the results in our science investigations.*

During Inquiry Circles (20 minutes)

1. *Remember, you may refer to the anchor charts to help guide your thinking.* (Point to the posted anchor charts, and remind students that they can use all the reading strategies taught, not just the one for that day.)
2. *The Lead Scientists will guide all research for the day by picking which questions will be answered, and the Data Scientists will record all source information and the answers to your research questions on the team Inquiry Chart. The Lab Directors and Equipment Director must help find the answers to the questions online and in texts.*
3. *My role is to help guide the inquiry circles, but I expect you to work as a scientific team to solve your problems together*. (While teams are working together, walk around the room to facilitate as needed.)

After Inquiry Circles (10 minutes)

1. *As we conclude our inquiry circles for today, each team will have a chance to share what they accomplished and learned.*
2. *The Lab Directors should lead the discussion with their inquiry circle team about today's results. For example, Did your team use "drawing conclusions" or any other reading strategy? What did your team learn about its animal? Did your team encounter any problems? How did your team resolve those problems?*
3. (After you have allowed the teams to gather their thoughts, have the Data Scientists share with the class. Try to encourage teams to share a variety of things—you do not want just facts about animals, just reading strategies, or just cooperative learning strategies.)
4. (When all teams have shared, thank them for their hard work, and point out any excellent behaviors that you observed. If you noticed any problems in the teams, take a moment to point them out and explain your expectations for all future inquiry circles.
5. Collect all Inquiry Charts or have the Equipment Directors put them in their normal classroom place for ongoing work so learners can easily access them.)

Guided Science Investigation (30–45 minutes)

OVERVIEW

Learners will make observations about the life cycles of animals and role play the stages in the unique life cycle of a frog.

GUIDING QUESTIONS

What are the different stages in the life cycle of a frog? In what ways are young frogs different from their parents?

BACKGROUND INFORMATION FOR THE TEACHER

As teams continue to observe the changes model organisms undergo throughout their life cycle, it is important to understand that all animals go through changes throughout their lives. While some animals (such as birds, dogs, and humans) undergo more subtle changes, other animals (such as butterflies, ladybugs, and frogs) undergo more noticeable changes in form throughout their lives. Some young animals look very similar to their parents at birth and grow to develop only subtle changes as they

become adults; other animals may look much different from their parents and be unrecognizable at birth.

Some animals go through distinct changes and stages in their lifespan; this is called *metamorphosis*. Complete metamorphosis occurs in a series of 4 stages: egg, larva, pupa, and adult. During the pupa stage, the animal will completely transform in appearance. Butterflies are examples of animals that undergo complete metamorphosis in their life cycles. In contrast, some organisms go through incomplete metamorphosis, with only 3 distinct stages: egg, larva, and adult. These changes occur a bit more gradually over time, and the larva and adult look very different from one another. Frogs are examples of animals that undergo incomplete metamorphosis.

Adult female frogs lay eggs in water that is typically shallow and still, such as in a pond. After eggs are fertilized, they can grow and become tadpoles. Tadpoles are the larval stage in the life cycle of a frog. A new tadpole does not look much like a frog at all: at first, it looks like a tiny, wiggly fish with a long tail for swimming. This allows the tadpole to swim to find sources of food and to escape predators. Gradually, a tadpole will grow two hind legs and then two front legs, while still having its tail and living in the water. Over time, the tail shrinks as the tadpole becomes an adult frog and starts living on land, using its legs to move around. Young adult frogs are called froglets. Froglets continue to grow, and their tail finally disappears, as it is no longer needed for swimming. Other changes take place within the body of the froglet that are not easily seen.

In this lesson, children will be able to see the formation of a froglet's hind and front legs, and the shortening of its tail. The differences between a tadpole with four legs and a froglet are subtle, but the adult froglet stage is denoted by the transition to living on land. Froglets continue to grow, and their tail finally disappears, as it is no longer needed for swimming.

MATERIALS

Each team member needs:

- "Frog Life Cycle Stages" hatband (made ahead of time by the teacher; see Setup)
- Butterfly Investigation Journal
- pencil

Each team needs:

- 1 set of "Name That Baby!" cards

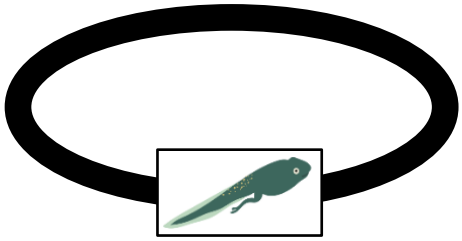
Teacher needs:

- "Frog Life Cycle Stages" cards
- 1 set of "Name That Baby!" cards with answer key
- small baggies
- construction paper
- tape
- scissors

SET UP

- Make the "Frog Life Cycle Stages" hatbands (1 for each learner).
- Cut apart the "Name That Baby!" cards and place in a baggie (1 bag per team).

- **NOTE:** there are 7 "Frog Life Cycle Stages" picture cards included: 1 egg, 4 tadpole (2 without legs; 1 with two hind legs; 1 with two front legs), and 2 adult (froglet and fully grown).
- To make the hats, begin by printing enough copies of the "Frog Life Cycle Stages" cards for your learners (e.g., if you have 21 learners, you will need 3 copies of the page). Cut apart the cards.
- Create a hatband by cutting a 2-inch wide strip of construction paper and attaching the ends. Tape or glue 1 frog-stage card to each hatband to create the hatband.



- Label one location in the classroom "Pond" and another location "Land."

SAFETY

- Remind teams daily to be gentle with the growth habitats during handling to prevent disturbing the larvae, especially once the chrysalis forms. **Ideally, the growth habitats should be placed where teams can do daily observations without moving them**.
- Please follow all district and school science laboratory safety procedures.
- It is good laboratory practice to have teams wash hands before and after any laboratory activity.

DAILY OBSERVATIONS

Give learners time to observe their caterpillars (whether they are in the larva, pupa, or adult stage), take measurements of the larvae (if applicable), and record their observations in their Butterfly Investigation Journals. Facilitate team discussions by asking questions, such as *What did you notice? What has changed since the last time you observed your caterpillars?*

PROCEDURE

Engage

1. Distribute the "Name That Baby!" cards to each team.
2. Inform learners that today they will look at animal baby photos and try to determine what the baby will look like as an adult animal.
3. Ask learners to decide as a team what adult animal they believe each baby belongs to.
4. Review answers with the team and debrief. *Which were the easiest to figure out? Why? Which were more challenging? Why?*
5. Inform learners that all animals go through life cycles, changing from young to adult. While some animals simply grow larger or change slightly, others are unique in that the young look very different from their adult form.
6. Tell learners, *Today, we are going to investigate the life cycle of one of those unique animals: the frog.*

Explore

1. Provide each learner with a frog life cycle hatband.
2. Instruct learners to carefully look at the picture on their hatband and find others who have the same picture. Tell them, *Look carefully, because there may be slight differences in the pictures!*
3. Ask teams to what they believe their image represents.
4. After discussions, ask teams to share .
5. Inform your learners that each of images represent a stage in the life cycle of a frog. They will now role play the life cycle of a frog!

Explain

1. Walk over to the area of the classroom labeled "Pond." Explain that adult frogs lay clumps of hundreds of eggs in shallow, still water, like in a pond. Ask, W*ho has an egg stage on their hat*? Have those learners come to the pond and act out being laid in a clump in the pond location. Eggs will remain in the pond and not move.
2. Explain that the eggs will hatch and become the next stage in the life cycle: the larval stage. Frog larvae are called *tadpoles.* Tadpoles almost look like little fish. At first the tadpole will have a long tail, but no legs. Ask for all the tadpoles with no legs to come into the pond location and swim around.
3. Explain that gradually, the tadpoles will start to develop hind legs. They still have their tails and continue to swim in the pond. Have learners who are tadpoles with two hind legs come to the pond and swim around.
4. Ask learners to predict might happen next. *Tadpoles will gradually develop two front legs, but they still have long tails and continue to swim around the pond.* Have learners who are tadpoles with four legs act this out.
5. Explain that the tadpole stage ends when the young adult frogs, called froglets, are able to live on land. Froglets have two hind legs and two front legs, and their tail begins to shorten. Learners who are froglets should act out jumping out of the pond and onto land.
6. Explain that other changes occur within the frog's body that allow it to transition to land, but what we can easily see is the shortening of the tail. As froglets grow and their tails continue to shorten, they become fully grown adults. Have learners who represent fully grown adult frogs hop around on land like a frog.

Elaborate

1. Explain to learners that some female adult frogs will return to the water to lay eggs, whereby the cycle is repeated.
2. Have learners assemble in an open area of the classroom and challenge them to place themselves in life cycle order, starting with the egg state. Depending on the number of students, this could be done in smaller groups (1 group per each stage) or whole class.

Evaluate

1. Did learners communicate a reasonable understanding of the stages in the life cycle of frogs?
2. Are learners using new scientific language in their communications (written or oral)?

Science Language

- A **larva** is the wingless, often wormlike form in the life cycle of a newly hatched insect (larva is singular, larvae is plural).
- A **caterpillar** is the larval stage in the life cycle of a butterfly.
- When a caterpillar is transformed into a **butterfly,** it has reached the adult stage in its life cycle.
- When animals or insects go through a dramatic change in a life cycle, it is called **metamorphosis**.

Expanded Standards

Reading TEKS

2(b)(6) 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: **(F)** make inferences and use evidence to support understanding.

CCSS

SL.2.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media; **W.2.7** Participate in shared research and writing projects(e.g., read a number of books on a single topic to produce a report; record science observations); **W.2.8** Recall information from experiences or gather information from provided resources to answer a question.

NGSS

3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles, but all have in common birth, growth, reproduction, and death.

Science TEKS

2.1 Scientific and engineering practices. The student asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to: **(G)** develop and use models to represent phenomena, objects, and processes or design a prototype for a solution to a problem. **2.13** Organisms and environments. The student knows that organisms have structures and undergo processes that help them interact and survive within their environments. The student is expected to**: (D) i**nvestigate and describe some of the unique life cycles of animals where young animals do not resemble their parents, including butterflies and frogs. **2.5** Recurring themes and concepts. The student uses recurring themes and concepts to make connections across disciplines. The student is expected to: **(G)** describe how factors or conditions can cause objects, organisms, and systems to either change or stay the same.