Unit of Study: Inquiry into Animal Biology

Grade Level: 2/3 (Tim O'Keefe)  
Date: Beginning of the year

Planning Units of Study: Center for Inquiry

Envisioning Possibilities: Planning on Paper

Our best planning comes from making predictions and creating conditions for students to engage in particular kinds of thinking (for example, strategies, skills, and content connections). When planning demonstrations or engagements, it is critical to ask ourselves what kind of thinking, conversations, and learning strategies we want to promote.

Bringing Plans to Life

Curriculum is the transaction occurring between teacher, students and resources within and across curricular structures; such as morning meetings, reading, writing, and math workshops, and units of study in the social and physical sciences.

Responsive teaching is about identifying patterns in kidwatching data and planning responsively for individuals, small groups, and for whole-class instruction. From kidwatching to curriculum, from moment to moment, as well as planning ahead—the teacher designs minilessons deciding what or who to highlight during strategy sharing sessions.

Creating curriculum with and for children to help them think, work, and communicate as readers, writers, mathematicians, scientists, and social scientists by working within an apprenticeship model (working in front of, alongside, and behind students).

(Mills with CFI faculty, 2008)

Beliefs that Underpin this Inquiry

Most children are intrinsically motivated to know about the animals around us. From gazing out the window at birds to looking down on the playground at animal behavior, from examining a lizard as it crawls across a fence rail to looking closely at near microscopic mosquito larvae, most children are extremely curious about animals and come to school with a great deal of information and personal experience. For some there is a special animal or group of animals they come to school knowing a great deal about.
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Many children have pets and have already begun recognizing patterns in animal behaviors through their intimate contact.

Children also learn best from authentic experiences with creatures. While textbooks, trade books, videos, and internet information all provide important background information and may be useful in answering questions, it is the firsthand experiences with animals that pique interest and provide important opportunities to observe and get to know animals.

An important feature of science inquiry is gathering and sharing information in formal and informal situations. Therefore, children are encouraged to explore and report, to question and converse about their findings through various teacher-directed experiments and engagements (investigating the life cycle of black swallowtails) as well as informal situations (conversation, public journals, KWL charts, and graffiti boards).

Children can naturally learn to respect and appreciate animal life in an environment that encourages exploration but with an emphasis on mindfulness about caring for and respecting animals.

Questions to Frame this Particular Inquiry

Two important concepts that underlie this study are diversity and balance. First, diversity, because of the amazing array of animals known to us even within our own area. From size to color, from physical to behavioral adaptations, across animal families, across habitats, there is a rich, diverse group of animals quite close to us.

Balance assists in the understanding of how every creature affects all others in a complex web of coexistence. When one species, the mayfly for example, has a population increase, predators of the mayfly such as swallows, may also increase in numbers because of the abundance of food. During the next season, when mayfly population decreases, the overpopulated swallows are stressed and lack the necessary food to sustain their high numbers. This concept may be seen in obvious scenarios (such as the mayfly and the swallow) as well as more subtle examples including man’s effect on the environment.

Much of this unit is developed with the input of the students. Questions surrounding this would be: How can I get the children involved in planning and participating actively? How can I encourage children to record and share personal experiences with the class? How can I help to develop a passion for this study and a respect and reverence for animals? In what ways can I be sure to use real animals for learning opportunities while demonstrating respect for life? How can I use the resources close to school effectively? Among the more discreet questions about animals themselves:

- What are commonalities among animals?
- What are some differences?
- How are animals adapted for their environments?
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- Why have some animals become extinct?
- Why are some animals endangered?
- What, if anything, can we do to help protect animals and preserve habitat?

### Method(s) or Investigation(s) that will Promote Authentic Inquiry

*How might students learn the skillfulness of inquiry? Given the questions posed, would observations, interviews, experiments, surveys, controlled studies or other methods best support this inquiry?*

Much of the focus of this inquiry will be on observation and sharing insights and information. Personal experiences and anecdotes, inquiries and passions will be considered as important as information learned from outside sources. Children will be asked to learn in-depth information about a single animal and to share that information with the rest of the class and school through expert project presentations as well as a project share fair for other classes.

Children will learn to read like nonfiction nature writers by writing expert project pieces about an animal they observed over time. Once they have collected extensive observation data, they will pose questions and read to investigate the creature of their choice. In writing workshop we will focus on nonfiction writing using *Ranger Rick* magazines for inspiration. The children will write a “Ranger Rickish” piece about an animal they have directly observed and researched, using primary and secondary sources.

Additionally, we would conduct continuous observations of the natural world as well as up-close investigations of certain species. Through intensive investigations of particular species, children would learn what kinds of questions to ask about the animals they choose to study. Owl pellets will be used to inspire children to pose questions about animal biology and foster connections between primary and secondary source observations.

Direct observation of real animals would be one of the main methods of investigation. Animals may be observed in the school neighborhood setting as well as animal watches at home. Animals may be brought into the classroom for careful observation and note taking and sketching. Zoo cameras and nature films could be used to observe and document animal behavior in a more or less natural setting (described below in *Demonstrations/Engagements* section).

Surveys may also contribute to knowledge of local animal populations. Tallying bird sightings at a bird feeder or ants on the playground would be examples of this.

Interviews with local naturalists as well as the professionals at the local zoo would add a professional perspective to the class’ understandings.
Key Demonstrations and Engagements throughout this Inquiry

*What are the primary teaching and learning strategies to be employed?*

- Take each major animal group (mammals, birds, insects, reptiles, amphibians) and ask children in small groups—on large pieces of chart paper—to write:
  1. what they know about those animals;
  2. questions they have about that group of animals; and,
  3. to write the names and draw sketches of animals belonging to that group.

As a whole group, compile a class list of facts and questions about the animal groups as well as a list of animals belonging to each group. These are displayed in a public space in the room and should be added to or changed as the class’ understanding about animals develops.

- There should be opportunities for students to read and share information from an animal text set including children’s nature magazines (*Kids, Ranger Rick, Highlights*, etc.) and nonfiction books. This could be used as guided independent reading as well as exploration or homework. Nonfiction reading texts should be used for shared reading as well as guided reading and read-alouds. These may be used as reference materials or for independent reading. Animal books in big book format such as Rigby and Wright Group should be used for shared reading. The children are also encouraged to bring in animal books and magazines to contribute to the class text set.

- Realistic fiction or memoir with animals playing key roles should be used as read-alouds during the unit of study (*Rascal, Shiloh, Hatchet, Where the Red Fern Grows, Old Yeller*, etc.).

- There should be a science area containing animal artifacts contributed by the teacher and students. This could contain found feathers, bones, skulls, shells, animal teeth, etc. The science area should have a journal for animal observations and scientific tools for measurement and observations (magnifiers, microscopes, rulers, cloth measuring tapes). A large blank *Science Journal* is placed in the science area for children to record their observations to share out with the class.

- Start a humane insect collection in which children bring in insects found dead. These could be mounted simply by gluing the insects to a poster board or displayed in small containers for observation and sketching.

- Place bird feeders close to a classroom window. Have bird identification field guides and books along with binoculars at the window with opportunities to record and tally birds viewed at bird feeder. This information may be used as data for graphing the types and frequency of local birds.

- Examine various easily obtained animals in small groups and/or whole-group settings. Worms, crickets, and mealworms may be obtained at bait stores and pet stores. Often, tadpoles or minnows may be collected easily for classroom observation. Ask students to sketch the animals before direct examination. Then examine, sketch, and record notes on the structures and animal behaviors of the creatures. After direct observations and note taking, demonstrate the research process by collecting and sharing information with the students.

- Have an aquarium in the science area designated for “safe” animals brought in by students. Frogs, toads, salamanders, small, non-venomous snakes, various insects,
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etc. may stay in the classroom for a day or two while the students record sketches and notes about their behaviors and structures. These should be released fairly quickly back into the wild.

- Classroom pets are important in a classroom studying zoology. These might be permanent pets such as hamsters or turtles or fish. Other semi-permanent classroom animals could include butterfly and moth larvae, ant farms, tadpoles, etc.

- Take an animal safari with a classroom camera and sketch journals to capture on film and through sketches all of the animals on the playground or some other defined area. Take walking field studies to nearby natural areas such as Hidden Pond or Hunter’s Pond. Animals recorded on these trips may be added to a class journal under animal sightings.

- Plan field studies and guest speakers for this unit of study. Riverbanks Zoo offers classes for a small extra fee. Sesquicentennial State Park offers programs as well as Congaree Swamp National Monument and Saluda Shoals State Park. These experiences become touchstones for later conversations and discoveries. Carolina Wildlife Cares offers speaker services in which the guest brings wild rescue animals in the process of rehabilitation. These range from large snakes to handicapped birds.

- Plant a butterfly garden to attract bees, butterflies, and hummingbirds. Plant fennel and parsley to attract black swallowtail butterflies. Observe as butterflies lay eggs on the larval plants and harvest some of the larvae to observe in a butterfly enclosure in the classroom. Keep replacing fennel and parsley as needed so that the larvae will metamorphose. Keep watching as the butterflies emerge. Release in the butterfly garden.

- Bring in buckets of forest soil for children to investigate closely with magnifiers looking for animals or evidence of animals. Catalogue findings. This project could be done at least twice during the year to determine if there are differences in the animals over time.

- Bring in water from stagnant sources such as puddles, ponds, and drainage ditches. Isolate animals found in the water and observe under magnifiers and magnifying glasses. Ask children to sketch and record notes of the behaviors and structures of these animals. Identify and record animals found.

- The class could decide on a specific animal to explore together. The teacher could research and share findings about this animal in front of the class, demonstrating the research and note taking process on large chart paper. The teacher shows how the information can be cut and paste into logical chunks of information or topics (habitat, diet, protection, reproduction, etc.). This could be the model for the children’s own individual research. Research topics could have a special focus such as animals native to SC, endangered animals, insects only, etc.

- There are enough ants around our campus to provide for outdoor experiments. Place different kinds of food on white construction paper near an ant mound or hole. Watch and record which kinds of food attract the most ants. Record and graph numerical information. Try the same experiment with different species of ants. Try different kinds of foods. Look for patterns to determine which kinds of foods are most attractive to different kinds of ants. Consider sugary foods, fatty foods, etc.
foods, meats, fruits, etc. Research ants to determine which foods they eat naturally.

- Animals found dead such as birds, frogs, or small mammals (moles, mice) can be buried shallowly in a plastic, mesh bag (such as those used when purchasing fruit). After four or five months (the amount of time will depend on how large the animal is and how much moisture is in the soil) the bag can be unearthed and searched for animal remains. The bones of the animal may be carefully reassembled. This works best in small groups. The questions and observations made during the assembling period should be recorded and shared with the entire class. This can be done through videotaping and photographs. This could also be done with owl pellets, which may be purchased from science supply sources.

- Children will learn to read like nonfiction nature writers by writing pieces about an animal they observed over time and using *Ranger Rick* magazines for inspiration. They will write a “Ranger Rickish” piece about an animal they have directly observed and researched, using primary and secondary sources.

- Publish information in class about animals in the news.

### Envisioning a Possible Touchstone Experience

*Just as touchstone texts are accessed throughout units of study in reading and writing workshop and revisited over and over again to deepen and broaden learning, touchstone experiences are foundational to units of study in the sciences and social sciences. Field studies, visits to the pond, author studies, summer inquiry projects, science experiments, teaching/learning projects, genealogy projects, and expert projects are a few examples of touchstone experiences. Given the key demonstrations and engagements planned, which one might best serve as a touchstone experience?*

Many of these are listed above.

- Field studies including Hunter’s Pond, Riverbanks Zoo, Sesquicentennial State Park.

- Close classroom animal observations including wild “visitors” brought in by the teacher and students, mealworms, earthworms, crickets/grasshoppers, etc.

### Strategies, Skills, Content and Concepts to be Addressed Through Demonstrations, Engagements, and Touchstone Experiences

*What standards will be uncovered through this inquiry?*

**Standard 2-1:** The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

- **2-1.1** Carry out simple scientific investigations to answer questions about familiar objects and events.

- **2-1.2** Use tools (including thermometers, rain gauges, balances, and measuring cups) safely, accurately, and appropriately when gathering specific data in US customary (English) and metric units of measurement.
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2-1.3 Represent and communicate simple data and explanations through drawings, tables, pictographs, bar graphs, and oral and written language.
2-1.4 Infer explanations regarding scientific observations and experiences.
2-1.5 Use appropriate safety procedures when conducting investigations.

Standard 2-2: The student will demonstrate an understanding of the needs and characteristics of animals as they interact in their own distinct environments. (Life Science)

2-2.1 Recall the basic needs of animals (including air, water, food, and shelter) for energy, growth, and protection.
2-2.2 Classify animals (including mammals, birds, amphibians, reptiles, fish, and insects) according to their physical characteristics.
2-2.3 Explain how distinct environments throughout the world support the life of different types of animals.
2-2.4 Summarize the interdependence between animals and plants as sources of food and shelter.
2-2.5 Illustrate the various life cycles of animals (including birth and the stages of development).

Strategies for Reflecting on and Documenting Learning

How might we demonstrate growth and change? What are our new questions?

The teacher and children will keep careful records in the form of notes and sketches of formal and informal investigations. The teacher will model note taking and sketching along with the children for various experiences and continuous sharing will be a part of the science classroom routine. The children should be coached to develop the level of detail in both written and visual record keeping. Examining these over time will reveal children’s growth as scientists.

From time to time for important shared experiences, the children will create written evaluations. For example, when learning about butterflies and complete metamorphosis; after living the process, reading articles and recording observations, the children will submit questions they think are important to know about metamorphosis. These questions and answers are discussed and compiled into a written evaluation. Only the most important experiences should be evaluated this way.

The teacher will record anecdotal notes about children’s growth as well. Level of participation in discussions, the number and quality of science journal entries and responses to others entries, the ability to get along with others and to make significant contributions in small inquiry groups, the amount of effort and quality of record keeping in scientific experiments, etc.

There should be a self-assessment component as well. The children should clearly record and demonstrate understanding of important facts about animals (The student will demonstrate an understanding of the needs and characteristics of animals as they interact...
in their own distinct environments. Life Science Standard 2-2). An effort should be made to also understand the level of appreciation the students gain about animals. Part of the written assessment should contain questions such as: What do you appreciate and understand about animals that you didn’t at the beginning of our study? Why do you think wild animals are important? What can we do as a class to help protect animals? What can you do?

A summative product for this unit of study is an Expert Project Presentation about animals the students are passionate about. Each student should submit a proposal for their choice and be able to clearly articulate why that animal is important to them. Each child should generate a list of at least ten important questions they would like to know about their animal. After several shared experiences with animals the class should work together to generate a list of “essential questions” about animals if one is to understand and appreciate them. These questions should include: Where does the animal fit into the food web in its environment? How does the animal protect itself? What are important features of its habitat? How does the animal get food? How does the animal reproduce? The students are expected to write a final draft paper reflecting what they learned about writing nonfiction by studying Ranger Rick articles (two or more pages in length) and what they learned about their animal and make a presentation of at least five minutes for the class. Each presentation should have some original artwork that teaches the class about the animal. As children are researching their animal, they are encouraged to share interesting facts, behaviors, physical adaptations, ideas for their artwork, etc. The teacher should model the entire research process including gathering information, using search engines on the internet, his own questions about the animal he is passionate about, reading and note taking, organizing information, writing rough drafts, and creative and informative ways to teach through art. Children are encouraged throughout this process to contact primary sources, to use interesting and novel ways to present using various sign systems, to use mathematics as a way of teaching us, to make scale models, to try a different artistic technique they have never used before, etc. In other words, the children are encouraged to “think outside of the box” and to challenge themselves to outgrow their earlier presentations. Part of this process includes asking the students to generate essential qualities of great presentations. These will be compiled into the rubric used to evaluate the presentations. This list should include the characteristics of creativity and effort as well as quality of research and information and a goal for the next research/presentation project. These rubrics will be used by peers, the teacher, parents or other interested adults at home as well as for self-evaluation. The presentations are recorded on video and sent home for family viewing and evaluation as well as for the self-evaluation component. One final demonstration of learning is to have an informal share fair in which students set up their presentations and share what they have learned with other classes. Project shares have also been used to present to parents on curriculum nights.

Other ideas to document learning include:

- Objective tests co-created by students and teacher covering essential material about animals studied.
- An objective test created by students with questions about animal expert projects.
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Students submit several important questions (with answers) concerning information they presented in their expert projects. These questions and answers are compiled into a study guide. The test is created using the students’ own questions.

- As children prepare for student-led conferences, there is another opportunity for them to reflect on their growth as zoologists. Their animal observations, field notes and sketches should be copied and filed along with other important artifacts.

### Reflexivity: Studying Ourselves and the Implementation of this Unit of Study to Grow and to Change

*How did it go? What do we want to hold onto? What do we want to revise?*

### Data Sources (primary and secondary) to Support this Inquiry:

**Envisioning Text Sets with Books, Videos, and Artifacts, and Possible Collaborations with Related Arts and Technology**

Internet sites for *insect metamorphosis:*
This one has excellent examples of metamorphosis from many different insects from beetles to bed bugs to ants to dragonflies.
http://www.uen.org/utahlink/activities/view_activity.cgi?activity_id=2024

This looks very complete and represents insects and other animals that go through metamorphosis. Nice diagrams, many links, and photographs. This would be great to put on the Smartboard.
http://en.wikipedia.org/wiki/Metamorphosis

Fairly scientific in nature, but this one is brief and succinct.
http://www.ndsu.nodak.edu/entomology/topics/growth.htm

This one has many links and a way to sign up for a newsletter from an entomologist, blogs, etc.
http://insects.about.com/od/growthmetamorphos1/ss/typesmetamorph_4.htm

Internet sites for *animal classification:*
This one is very kid friendly and has quizzes to practice.
http://www.sheppardsoftware.com/content/animals/kidscorner/classification/kc_classifica
tion_main.htm

This is a lesson on classification and includes Carolus Linnaeus (1707-1778)’s system of taxonomy (kindom, phylum, etc.)
http://school.discoveryeducation.com/lessonplans/programs/animaladaptations/

This site has a lot of “report images” which may be good examples.
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Internet sites for life cycles:
This one has interesting links to specific animals and other sources of information including E.B. White’s website.
http://www.uen.org/themepark/cycles/animal.shtml

These are “lessons” with many great photos and brief summaries of various animal life cycles.
http://www.eriesd.org/LessonPlans/LifeCycle/animals.htm

This one is for teachers with great links including specific life cycles as well as activities like crossword puzzles.
http://www.kidskonnect.com/content/view/87/27/

General animal information websites:
Ranger Rick

Yahoo information—classification, puzzles, great kid-friendly information.
http://kids.yahoo.com/animals

National Geographic Kids Magazine—constantly updating.
http://kids.nationalgeographic.com/Animals/CreatureFeature

Books:
There are so many great content/information books. The few picture books I have listed below are more for appreciation and wonder.
The Butterfly Alphabet by Kjell Sandved
The Boy Who Lived With Seals by Rafe Martin
Seven Blind Mice by Ed Young
To Climb a Waterfall by Jean Craighead George
The Land of Gray Wolf by Thomas Locker
The Great Kapok Tree by Lynne Cherry

Possible Guiding Questions for Planning

Conceptual

Perspectives: Which perspectives (reader, writer, mathematician, scientist and/or social scientist) offer potential insights or strategies for investigating this unit of study, i.e., What questions would a social scientist ask and how might she investigate this issue? What questions would a mathematician ask about this topic?
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- **Systems:** What systems are involved in this unit and how are they related?
- **Cycles:** Are there cycles embedded in this unit of study? How might we gain a deeper understanding of the unit by investigating the natural and man-made cycles?
- **Change:** Has change occurred over time in relation to this unit of study? If so, how might studying the natural or man-made changes help us better understand the topic?
- **Voice:** Whose voice is heard or privileged? Whose voice is absent or silenced?
- **Power:** How might power structures help us better understand this issue?

**Pragmatic/Universal**

- **Who developed the idea, invention, or concept?**
- **Why was the idea or invention created?** What was the purpose of the invention give the context and culture of the time period?
- **Where did the knowledge or information presented in the materials we are reading in this unit of study come from?** Can we trust or believe it? Do we need to access multiple sources to triangulate our knowledge or understanding?
- **Have common knowledge, beliefs, or understandings about this topic changed over time?** What led to shifts in our beliefs or understandings?

**Personal Knowledge**

- **Why does this knowledge or information matter to me?**
- **How has what I have learned during this unit changed me?**

**Social Knowledge**

- **Why does the knowledge I’m learning in this unit of study matter in the world?**

**From Personal Knowledge to Social Action**

- **So what?**
- **Now what?** How might we take action on what we have learned during this unit of study?
- **How might we show or demonstrate what we have learned during this unit to others?**

(Mills 2013)