**ARTS IMPACT LESSON PLAN**

**Visual Arts and Science Infused Lesson**

**Observation Process**
Author: Meredith Essex

**Enduring Understanding**
Close study and visual documentation of proportion, contour lines, texture, value, and color can show what is observed. Structure reflects function and ecosystem in living organisms.

**Lesson Description** (Use for family communication and displaying student art)
In this visual arts and science lesson, students build critical thinking skills through analyzing how the surface and structure of organisms can reveal how they survive in a greater ecosystem. Students sharpen observation skills through a warm-up study recording line, detail, and surface textures of a plant or animal. Next, an organism is mapped out proportionally. Contour line, surface texture, and color value in watercolor pencil are added to develop a detailed and visually descriptive drawing.

**Learning Targets and Assessment Criteria**

<table>
<thead>
<tr>
<th><strong>Target:</strong></th>
<th><strong>Criteria:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifies relationship of form to environment in a living organism.</td>
<td>Analyzes and describes how structure and surface reveal information about organism and ecosystem.</td>
</tr>
<tr>
<td>Observes and approximates proportion.</td>
<td>Compares, measures, and accurately maps out parts that compose the whole organism for final drawing.</td>
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<tr>
<td>Observes and visually describes organism in detail.</td>
<td>Creates contour lines, textural line patterns, and a range of color values to show surface and form using watercolor pencils in final drawing.</td>
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<tr>
<td>Thinks critically.</td>
<td>Asks clarifying questions; uses evidence to question or explain; constructs meaning.</td>
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**Vocabulary**

<table>
<thead>
<tr>
<th>Arts Infused:</th>
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<tbody>
<tr>
<td>Color</td>
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<tr>
<td>Detail</td>
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<tr>
<td>Form</td>
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<td>Observation</td>
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<td>Pattern</td>
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<td>Proportion</td>
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<td>Shape</td>
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<td>Texture</td>
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<table>
<thead>
<tr>
<th>Science:</th>
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<tbody>
<tr>
<td>Ecosystem</td>
</tr>
<tr>
<td>Function</td>
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<tr>
<td>Habitat</td>
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<tr>
<td>Part</td>
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<td>Specie</td>
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<td>Structure</td>
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**Materials**

<table>
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<th>Museum Artworks or Performance</th>
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<tr>
<td>Seattle, WA</td>
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<td>Tacoma, WA</td>
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**Additional:**
Botanical illustrations from *Flora by Brent Elliot; Field Journal/Scientific Illustrations from the Lewis and Clark expedition and the Voyage of the Beagle (Charles Darwin)*

**Learning Standards**

**WA Arts Learning Standards in Visual Arts**
For the full description of each standard, see: [http://www.k12.wa.us/Arts/Standards](http://www.k12.wa.us/Arts/Standards)

**Creating (Concepts: Line, Shape/Form, Value, Texture, Proportion. Technique: Drawing)**
1. Generate and conceptualize artistic ideas and work.
2. Organize and develop artistic ideas and work.
3. Refine and complete artistic work.

**Performing/Producing**
4. Select, analyze, and interpret artistic work for presentation.
5. Develop and refine artistic techniques and work for presentation.
6. Convey meaning through the presentation of artistic work.

**Responding**
7. Perceive and analyze artistic work.
8. Interpret intent and meaning in artistic work.
9. Apply criteria to evaluate artistic work.
Connecting
11. Relate artistic ideas and works with societal, cultural, and historical context to deepen understanding.

Early Learning Guidelines (Pre-K – Grade 3)

(Age 4-5) 6. Learning about my world: Math: Compare size. Describe objects using size words. Follow simple directions for position. Science: Investigate properties of things in nature. Begin to understand what various life forms need in order to grow and live. Take walks outside and gather different types of leaves, name colors he/she sees outdoors. Arts: Use a variety of materials to create representations of people and things.

Next Generation Science Standards
http://www.nextgenscience.org/next-generation-science-standards

Topic:
Interdependent Relationships in Ecosystems
Matter and Energy in Organisms and Ecosystems
Inheritance and Variation of Traits: Life Cycles and Traits
Structure, Function, and Information Processing
Structure and Properties of Matter

Disciplinary Core Ideas:
LS1.A: Structure and Function
LS1.B: Growth and Development of Organisms
LS2.A: Interdependent Relationships in Ecosystems
LS3.B. Variation of Traits
LS4.B. Natural Selection
LS4.C. Adaptation
LS4.D. Biodiversity and Humans

Foss Science Kits Addressed:
PreK: Discovering Nature
K: Animals
1: Organisms
3: Plant Growth and Development
4: Ecosystems
5: Microworlds

Materials
A class set (30) samples of diverse species of real plants (or bones, feathers, or shells); Photos of diverse birds: one for each student (or collection of photos from other animal groups such as fish, reptiles, bats, insects); Arts Impact Sketchbooks/Field Journals;
Drawing pencils: 2H, HB, 2B, 4B, Ebony; Vinyl erasers; Watercolor pencils: one set per student; Watercolor brushes; Watercolor paper: 9x12”; Water containers; Paper towels; Copy paper, 8.5x11”: copy Observation/Critical Thinking Worksheet from lesson; Class Assessment Worksheet

Seattle Art Museum images: Two Hawks on an Aged Juniper, Xiao Haishan, ca. 1450, 33.1676

Birds of America, John James Audubon, 1840-1844:
American Goldfinch, 43.7

Meadowlark, 43.63
Performance Expectations:
K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.
K-LS1-2. Use a model to represent the relationship between the needs of different plants and animals and the places they live.
2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats.
3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment.
3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.
4-LS1-1. Construct an argument that plants and animals have internal and external structure that function to support survival, growth, behavior, and reproduction.

Crosscutting Concepts:
Patterns
Structure and Function
Cause and Effect
Systems and Systems Models

Science and Engineering Practices:
1. Asking Questions and Defining Problems
2. Developing and Using Models
6. Constructing Explanations and Designing Solutions.
8. Obtaining, Evaluating, and Communicating Information
Pre-Teach
Guide students in observing and drawing objects from the natural world daily in sketchbook/field journal...leaves, bones, shells, feathers, flowers...with focus on noticing and comparing line, shapes, colors, and textures.

Lesson Steps Outline

Day One
1. Facilitate discussion about scientific questioning, explanations, and observation. Guide peer/group discussion of relationship of organism structure to function. Introduce photos of species of birds from diverse ecosystems (i.e. penguin, owl, hummingbird, ostrich, cormorant, parrot...)

☑ Criteria-based teacher process assessment: Analyzes and describes how structure and surface reveal information about organism and ecosystem.

2. Introduce examples of historical descriptive drawing in botanical illustrations and field journal illustrations from exploratory expeditions.

3. Introduce and guide art analysis of *Two Hawks on an Aged Juniper* by Xiao Haishan from the Seattle Art Museum collection and *Mountain Forest Seedlings* by Morris Graves from the Tacoma Art Museum collection.

☑ Criteria-based process assessment: Analyzes descriptive line, shape, value, and texture seen in works of art.

4. Facilitate exploration of line, pattern/texture, and value using drawing pencils. Demonstrate and guide 10 minute warm-up experimenting with drawing pencils.

Demonstrate and guide drawing objects from nature using contour line. Help students develop artistic/scientific observation skills.

☑ Criteria-based peer and teacher process assessment: Describes and draws contours, textural line patterns, and value in warm-up.
Day Two

1. Introduce *Birds of America: American Goldfinch* and *Meadowlark* by John James Audubon from the Seattle Art Museum collection. Guide students in analyzing how use of line, shape, pattern, value, and color effectively communicate information.

- Criteria-based process assessment: Analyzes descriptive color as well as line, shape, value, and texture seen in works of art.

2. Introduce and analyze shapes seen in *Birds Eye* by Robert Helm from the Tacoma Art Museum collection. Demonstrate and guide analyzing proportion to create the foundational shapes for final bird drawing.

Demonstrate and guide group in analyzing and lightly drawing foundational shapes for their bird.

- Criteria-based teacher checklist: Compares, measures, and accurately maps out parts that compose the whole organism for final drawing.

3. Demonstrate and guide exploration of watercolor pencil techniques.

4. Guide adding contours, patterns for texture and a range of values to shape drawing of bird (developed in Step 2.) using watercolor pencils.

- Criteria-based teacher checklist and peer assessment: Creates contour lines, textural line patterns, and a range of color values to show surface and form using watercolor pencils in final drawing.

5. Model and guide critical thinking and writing process in response to *Observation/Critical Thinking Worksheet*.

- Criteria-based teacher checklist: Asks clarifying questions; uses evidence to question or explain; constructs meaning. Analyzes and describes how structure and surface reveal information about organism and ecosystem.


- Criteria-based group reflection: Describes form and surface of birds and the adaptations and ecosystem they reveal. Reflects on evidence of effective observation skills.
LESSON STEPS

Day One

1. Facilitate discussion about scientific questioning, explanations, and observation.
   - *In the Next Generation Science Standards, I found this quote about what we will be doing today:* The goal of science is to construct explanations for the causes of phenomena. An explanation includes a claim that relates how a variable or variables relate to another variable or a set of variables. (Next Generation Science Standards: Scientific Practice: Constructing Explanations and Designing solutions.
   - *What do you think this means?*

   **Guide peer/group discussion of relationship of organism structure to function. Introduce photos of species of birds from diverse ecosystems (i.e. penguin, owl, hummingbird, ostrich, cormorant, parrot...)**

   - Distribute a photo of a bird to student pairs or groups. Birds are all around us, are accessible drawing subjects for all ages, and demonstrate a huge range of adaptation and diversity. Other animal groups such as insects, reptiles or fish are also possible subjects of drawing and study.
     - *Why are these birds so different? What are shared traits of these birds and what are not?*
     - *Work with your group or partner: Describe unique structures or parts you observe that function to support survival. What do they do?*
     - *How are animal traits influenced by the environment? What can we tell about an ecosystem just by closely observing one animal that lives in that ecosystem?*
     - *Share your thinking with the whole group.*

   **Criteria-based teacher process assessment:** Analyzes and describes how structure and surface reveal information about organism and ecosystem.

2. Introduce examples of historical descriptive drawing in botanical illustrations and field journal illustrations from exploratory expeditions.
   - Examples can include 19th century botanical/zoological illustrations, field journal/scientific illustrations from the Lewis and Clark expedition and/or artwork from the *Voyage of the Beagle* (Charles Darwin).
     - *Why are observation skills important to artists and scientists?*
     - *How did scientists record and communicate visual information before cameras were widely used? Observational drawing once was an integral part of higher education.*
     - *Imagine being an explorer in a strange land seeing plants and animals you have never seen before. If you could not take a photograph of them or carry them back with you to where you started from, you would have to find a way to “describe them” using more than words.*
3. Introduce and guide art analysis of *Two Hawks on an Aged Juniper* by Xiao Haishan from the Seattle Art Museum collection and *Mountain Forest Seedlings* by Morris Graves from the Tacoma Art Museum collection.

The Seattle Art Museum’s collection is available on-line at: http://www1.seattleartmuseum.org/eMuseum/code/emuseum.asp. To find the images in this lesson, enter the accession number for the work of art in the search box on the collections page of SAM’s website. Accession numbers for these works of art are listed in the materials box at the beginning of the lesson.
The Tacoma Art Museum’s collection is available on-line at:
http://www.tacomaartmuseum.org/explore/collections

- In Two Hawks on an Aged Juniper, what do line, shape, value, and texture tell us about the plants and animals we see?
- In Mountain Forest Seedlings, how line is used to show the texture of young trees?

Criteria-based process assessment: Analyzes descriptive line, shape, value, and texture seen in works of art.

4. Facilitate exploration of line, pattern/texture, and value using drawing pencils. Demonstrate and guide 10 minute warm-up experimenting with drawing pencils.
- Note that each drawing step of the lesson can be taught as a distinct mini-lesson (with extra practice time built into it) over the course of multiple days.

- Experiment with drawing pencils to learn what they can do. A hard pencil 2H to 6H can create a lighter thinner line and a 2B to 6B can make a darker heavier line. Notice the role of pressure in creating different values (lightness/darkness) of line.

- Make patterns of different kinds of line. Imagine the textures you could make with those lines — bark, feathers, fur, scales ... Practice making areas that are light, medium, and dark.
Demonstrate and guide drawing objects from nature using contour line. Help students develop artistic/scientific observation skills.

- Bones, feathers, shells, plants, or other real objects from nature can be interesting drawing subjects.
  - I start in one place on the edge of the object and using a continuous contour line, follow the edge slowly with my eyes and my pencil. When I am observing, note that I keep my eyes on the subject at least 80% of the time so I am gathering as much information as I can about it.
  - Patterns of line can represent the textures I observe. Pressure or pencil choice can show light or dark areas.
  - Switch sketchbooks/field journals with a peer. Where do you see contour line, pattern, and value that effectively describe what is seen?

Criteria-based peer and teacher process assessment: Describes and draws contours, textural line patterns, and value in warm-up.
LESSON STEPS

Day Two

1. Introduce *Birds of America: American Goldfinch* and *Meadowlark* by John James Audubon from the Seattle Art Museum collection. Guide students in analyzing how use of line, shape, pattern, value, and color effectively communicate information.

- Audubon was a famous naturalist who was both an artist and a scientist. In *Birds of America*, what techniques did the artist use to make these birds look realistic?

- Criteria-based process assessment: Analyzes descriptive color as well as line, shape, value, and texture seen in works of art.
2. Introduce and analyze shapes seen in *Birds Eye* by Robert Helm from the Tacoma Art Museum collection. Demonstrate and guide analyzing proportion to create the foundational shapes for final bird drawing.

- Provide detailed color photographs, one per student, of diverse birds.

- In Robert Helm’s artwork the basic shapes of the bird are clearly seen. What are they (ovals, triangles)?

- Practice drawing very light shapes with a 2H pencil in your sketchbook. Practice drawing all different kinds of shapes in different directions using a light pressure. Practice joining shapes to form a bird.
Demonstrate and guide group in analyzing and lightly drawing foundational shapes for their birds.

If uncomfortable free-hand drawing an example, you can project the bird image on your screen or active board. Slide your white board over the projected image or tape a large piece of white paper on the screen. Now you can draw the basic shape of the bird using a dry erase marker. When you slide the white board away or turn off the projection, students will clearly be able to see the simple shapes you have drawn as your bird. This technique can also be used as students draw with you, adding details to the drawing step by step.

- What does proportion mean? How do we create the same relationship of parts to the whole that we observe in the photograph we are working from?

- Formally or informally measure the parts of the bird and make some comparisons. How big is the head relative to the body? Think of an owl vs. a goose. The head might be one-third the length of the body or one-tenth the length of the body. What about the legs, beak, or tail?

- Using the 2H pencil, lightly and loosely map out the shapes that you see that make up your bird on watercolor paper. Adjust to reflect the proportion of parts to the whole that you observe. Make sure your bird shapes fill the space of the paper.

Criteria-based teacher checklist: Compares, measures, and accurately maps out parts that compose the whole organism for final drawing.

3. Demonstrate and guide exploration of watercolor pencil techniques.

- Watercolor pencils used dry can create contours, textures and value just like the drawing pencils used earlier.

- You can experiment with these tools in your sketchbook. Layer available colors to create darker tones as well as create the range and depth of color that is observed.

- After developing areas of color through drawing with watercolor pencils, practice adding small amounts of water to blend and extend color using a small brush.

- Remember that additional details can be drawn on top of dry areas with pencils.
4. Guide adding contours, patterns for texture and a range of values to shape drawing of bird (developed in Step 2) using watercolor pencils.

- *With watercolor pencils, draw the contour of your bird, making last adjustments to overall shape based on observation and analysis of proportion.*

- *Layer color and build up areas of textural line to show what you see. Be sure to notice and show a range of value from light to dark. Value can suggest three-dimensionality.*

- *Add water with a small brush carefully a little at a time for specific effects.*

- *Show your drawing to a peer and talk about what they did to show surface and form.*

Criteria-based teacher checklist and peer assessment: Creates contour lines, textural line patterns, and a range of color values to show surface and form using watercolor pencils in final drawing.
5. Model and guide critical thinking and writing process in response to Observation/Critical Thinking Worksheet.

Worksheet responses can reflect critical thinking strictly based on observation (explanation of theories in response to scientific questioning) or can be supplemented and informed by deeper research linked to STEM-based Life Science projects or investigations.

- You’ll be using your critical thinking skills as you respond on your worksheet.

- Describe what you observed when you drew your bird: form/shape, colors, textures...

- What questions come to mind? What do you wonder about your bird?

- Describe traits /parts/structures of your bird that are unique or stand out, and record what you think their specific function or purpose is.

- For instance, an owl has huge eyes that help it see movement from far away and at night. Great Blue Herons have long legs, necks, and beaks that help it wade and feed on fish in shallow waters.

- Describe the kind of ecosystem that you think your bird is a part of. Is there water? Is it warm and tropical? Is it cold or frozen? Does this bird fly, swim, wade, soar, hover?

- What specialized structures and related functions did you observe that led you to that explanation?

Criteria-based teacher checklist: Asks clarifying questions; uses evidence to question or explain; constructs meaning. Analyzes and describes how structure and surface reveal information about organism and ecosystem.

- Describe the bird’s structure and surface (texture/coloration) observed in a peer’s drawing. What adaptations do you notice?

- What do your observations suggest about the ecosystem that the bird lives in?

- Where do you see evidence of observation skills? How do you know the artist scientifically studied the subject very closely? Use of color, texture, value?

Criteria-based group reflection: Describes form and surface of birds and the adaptations and ecosystem they reveal. Reflects on evidence of effective observation skills.
**Observation Process Observation/Critical Thinking Worksheet**

Name: ________________________________ Date: __________

1. ORGANISM DESCRIPTION
   *As you observe and draw, what do you notice?*

   Form (Shapes)
   ________________________________________________________________
   ________________________________________________________________

   Colors
   ________________________________________________________________

   Textures
   ________________________________________________________________

2. QUESTIONING
   *What do you wonder about or want to know about this organism?*

   ___________________________________________________________________________________

3. STRUCTURE
   *Describe and analyze specialized traits or unique structures you see. Explain your ideas about their function or purpose. How do they help that organism survive?*

   Describe: Parts or Traits   Explain: Function

   ___________________________________________   ___________________________________________

   ___________________________________________   ___________________________________________

4. ECO SYSTEM
   *What kind of ecosystem do you think this organism lives in? Why? Support your explanations with evidence gained through observation and critical thinking.*

   ___________________________________________________________________________________

   _____________________________  _____________________________
Teachers may choose to use or adapt the following self-assessment tool.

**STUDENT SELF-ASSESSMENT WORKSHEET**

<table>
<thead>
<tr>
<th>Disciplines</th>
<th>SCIENCE/VISUAL ARTS</th>
<th>Criteria-based Reflection Questions: Peer Reflection:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept</td>
<td>Observational Drawing: Surface and Form</td>
<td>• Describe the bird’s structure and surface (texture/coloration) observed in a peer’s drawing. What adaptations do you notice?</td>
</tr>
<tr>
<td></td>
<td>Critical Thinking</td>
<td>• What do your observations suggest about the ecosystem that the bird lives in?</td>
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<tr>
<td>Student Name</td>
<td></td>
<td>• Where do you see evidence of observation skills?</td>
</tr>
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<td></td>
<td></td>
<td>• How do you know the artist scientifically studied the subject very closely? Use of color, texture, value?</td>
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</tbody>
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<thead>
<tr>
<th>Concept</th>
<th>Student Name</th>
<th>Observational Drawing: Surface and Form</th>
<th>Critical Thinking</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Compares, measures, maps parts that compose the whole.</td>
<td>Creates contour lines.</td>
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<tr>
<td></td>
<td></td>
<td>Creates textural line patterns.</td>
<td>Creates a range of color values (3+).</td>
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<tr>
<td></td>
<td></td>
<td>Analyzes and describes how structure and surface reveal information about organism and ecosystem.</td>
<td>Asks clarifying questions; uses evidence to question or explain, constructs meaning.</td>
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Total 6
### CLASS ASSESSMENT WORKSHEET

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<tr>
<th>Disciplines</th>
<th><strong>SCIENCE/VISUAL ARTS</strong></th>
<th><strong>Total</strong></th>
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<tr>
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<tr>
<td>Student Name</td>
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<td>2.</td>
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<td></td>
<td>Total</td>
<td>Percentage</td>
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**What was effective in the lesson? Why?**

**What do I want to consider for the next time I teach this lesson?**

**What were the strongest connections between visual arts and science?**

Teacher: ___________________________ Date: ___________________
Dear Family:

Today your child participated in an Arts and Science lesson. We learned about how artists and scientists use observation skills.

- We built critical thinking skills through asking scientific questions and posing explanations based on what we observed.

- We looked at different species of birds and noticed very different traits. We questioned why they are so different. We learned that by observing the structure and surface of birds we can learn about the ecosystem they live in.

- We looked at historical art that conveyed detailed information about plants and animals. We analyzed how the artists communicated information about what they saw.

- We experimented with drawing pencils and then closely observed and drew natural objects with attention to contour lines as well as patterns of line that can suggest surface texture.

- We each chose to study a specific species of bird. We observed, informally measured, compared, and mapped shapes of our bird to help us draw it in proportion.

- We experimented with and used watercolor pencils to add the lines colors, textures, and areas of light and dark we observed.

- We used critical thinking skills. We described what we observed in writing, then we identified questions we have about what we observed. Next, we wrote about the parts/traits of our bird and analyzed what those traits tell us about function: how that bird travels, feeds, survives, and what ecosystem that bird is a part of.

At home, you could observe and draw birds, insects, fish, reptiles, or mammals that you see or interact with in your daily life. You could also compare and draw species of plants that live in your yard, neighborhood or local parks.

**Enduring Understanding**

Close study and visual documentation of proportion, contour lines, texture, value, and color can show what is observed. Structure reflects function and ecosystem in living organisms.