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Science is all around us. All children are natural scientists, looking at the world around them and trying to make sense of it. Children experiment all the time: What happens when you hit a pile of blocks? What happens if you keep filling a cup with water? What happens when you step on the cat’s tail? As we grow, we answer these questions and move on to more sophisticated questions, such as “Why is the sky blue?” or “What is inside your eyeball?” This is the beginning of scientific inquiry.

Science is defined as a branch of knowledge involving systematic observation, experimentation, and induction. In plain speaking, this means that scientists make an observation, and then ask a question about this observation. They then perform an experiment and draw some conclusions based on the results of their experiment.

Reading

Read “The Scientific Method” and “Bird Beaks as Tools” (both found in Reading Selections at the end of this lesson).

Assignments

1. After reading about bird beaks, collect as many pictures of birds as you can. Arrange your bird pictures according to beak type, and group the different beak types together.
Scientific Inquiry

(continued)

Paste the pictures on a piece of paper, grouped according to beak types, and then draw pictures of the food that each bird eats, using the information in “Bird Beaks as Tools” as a reference. Alternately, you might like to make up a game that matches each bird with its food.

2. Observe the birds in your back yard or a local park. Ask yourself what type of food each bird might eat based on the shape of its beak. Make a list of at least three different types of birds you observe (if you don’t know the type of bird, just describe it as well as you can, particularly its beak shape). If you can’t observe birds directly, find three different pictures to use. Create a hypothesis for each that predicts which types of food the bird will prefer.

Experiment

Bird Beaks

Design a simple experiment to determine which types of food the birds actually eat. One way to do this is to purchase different types of birdseed and set up “feeding stations.” For instance, you might wonder, “Will only birds with triangle shaped beaks eat sunflower seeds?” Or you might ask, “If I put out two different types of bird seed, one with shells and one without, will the birds that eat from each pile of seed have different types of beaks?” You can pose whatever question you like! Once you decide on your question and make a prediction about what will happen, brainstorm ways to test your hypothesis.

List the steps of the scientific method and follow them one by one as you carry out your experiment. Try to remove as many variables as you can. For instance, in this experiment, a variable might be the location of the bird seed. If one pile of bird seed is raised off the ground (where birds feel safe) and one is on the ground near the dog’s resting spot, how might this variable (location) affect your experiment results? You want to make everything the same except for the one thing you are testing.

After conducting your experiment, write a few sentences about what happened during each step of the scientific method. What are your conclusions? How could your experiment be improved?
The Scientific Method

The scientific method is the set of rules that scientists use to try to make sense of the world around us. Every day in our own lives we make observations try to find the answers to inquiries, just like scientists do. However, in our day-to-day lives there are many factors affecting our results or conclusions, like whether or not we are late for school or have missed breakfast. These factors will influence our ability to notice things in our world and interpret them accurately. If you are in a hurry, you may not notice that flock of birds that feeds in your yard every morning.

A scientist is usually trying to figure out the effect of one particular factor on something. This means that a scientist will set up a controlled experiment to try to test an idea. A controlled experiment means that you are testing one thing at a time, so you want only one variable in each experiment. Variables are aspects of the experiment that might change (thereby possibly changing the outcome of the experiment). Some examples of variables are time of day, temperature, type of plant or animal, type of food, amount of sunlight or air, etc.

A scientific experiment will always follow the steps of the scientific method:

- **Observation/Question:** A question is formed about something that you have noticed. The question should be brief, clear, and “testable.” This is the observation.

- **Hypothesis:** A guess or prediction is made about what the answer to the question might be. This is called a hypothesis.

- **Experiment:** A step-by-step process is developed to test the hypothesis. It is important to try to have as few variables as possible so that you will be able to answer your original question. When performing the experiment, all the variables are taken into account.

- **Results:** Observations are recorded describing what happened during the experiment. These are called the results. Sometimes the results of an experiment are not clear, or not what was expected! The important thing is to notice what happened.
Conclusions: Comparisons are made between the hypothesis (the original question and what was expected to happen) and what actually did happen. The conclusion notes how the variables may have affected the experiment results.

Bird Beaks as Tools

Have you ever noticed how different the beaks of birds are? Some are long and straight, some are short and fat. Others seem very strange, like a toucan’s, or a pelican’s big pouch-like beak. Why do you think that birds have such a variety of beaks? The answer is because they eat different things. A toucan’s beak is designed to pluck whole fruits off of trees. A pelican’s beak makes it possible for the pelican to scoop up fish like a net. The shape and size of its beak enables the bird to eat what it wants.

Let’s look at some other examples. Ducks have bills with a sieve-like edge that strains out water and allows the duck to capture plants and small aquatic organisms. Warblers have small beaks that can pick small insects off tree bark. Hummingbirds have long thin beaks that act like straws to make it easy to gather nectar from deep inside a flower.

A cardinal has a triangle or cone-shaped beak. The beak’s shape and size make it useful for cracking open seeds and nuts, which is what cardinals like to eat. If you were to see another bird with a similar beak (like a grosbeak, finch, or an indigo bunting), you could reasonably guess that they eat the same foods.

However, a cardinal’s beak would not be very useful for catching fish, or frogs. What
birds have a good beak for that purpose? Herons, egrets and kingfishers do. These birds have beaks that are like spears, and that is how they use them. Herons stand very still while staring at a certain spot in the water. When a fish or other water creature swims close enough, the heron reaches out with a lightning quick movement and (with luck) stabs the fish with the end of its beak. Herons and egrets then usually flip the fish around so that they can swallow it. Kingfishers, while they have similar beaks, are too small to stand in the water, so they wait on a branch or hover over the water until they see something that they want to eat. Then, they dive headfirst into the water and stab the fish.

Raptors (eagles, hawks, falcons, owls, and vultures) also have special beaks, which are curved and hook-shaped. This enables them to cut or tear their food. Raptors usually eat small mammals, like mice or rabbits, or reptiles, but depending on their size may eat grasshoppers, deer, or other birds. However, these birds do not use their beaks to catch their food. Instead they use the talons on their feet. Then, they take their meal somewhere and tear it apart with their beaks.

Birds would have a hard time trying to eat foods for which their beaks were not well-suited. It would be like trying to eat soup with a fork! Bird beaks are perfectly adapted for eating their preferred foods.

**For Enrolled Students**

You will be sending a sample of work from this lesson to your Oak Meadow teacher at the end of lesson 2. In the meantime, feel free to contact your teacher if you have any questions about the assignments or the learning process. You can use your assignment summary checklist and the learning assessment form to keep track of your student’s progress. There is also a weekly student planner included in the English/United States History coursebook that you can use to plan your assignments each week. You will be sending this documentation to your teacher every two weeks (with each submission of student work).
Learning Assessment

These assessment rubrics are intended to help track student progress throughout the year. Please remember that these skills continue to develop over time. Parents and teachers can use this space to make notes about the learning the student demonstrates or skills that need work.

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<th>SCIENCE</th>
<th>Not Yet Evident</th>
<th>Developing</th>
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<td>Demonstrates knowledge of the scientific method</td>
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<td>Demonstrates knowledge of experiment variables</td>
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<td>Displays focused observation skills</td>
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<td>Forms a hypothesis based on previous knowledge</td>
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<td>Follows the steps of the scientific method</td>
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<td>Records observations in detail</td>
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<td>Draws conclusions based on results</td>
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<td>Reflects on experiment process and ways to gain more accurate results</td>
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<td>Sorts and classifies information according to different variables</td>
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