Georgia Performance Standards Framework for Life Science - 7th Grade

Which Beak is Best?

Subject Area: Life Science
Grade: 7

Standards (Content and Characteristics):
S7L5 Students will examine the evolution of living organisms through inherited characteristics that promote survival of organisms and the survival of successive generations of their offspring.
  b. Describe ways in which species on earth have evolved due to natural selection.

S7CS1 Students will explore the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works.
  a. Understand the importance of—and keep—honest, clear, and accurate records in science.
  b. Understand that hypotheses can be valuable, even if they turn out not to be completely accurate.

S7CS2 Students will use standard safety practices for all classroom laboratory and field investigations.
  b. Demonstrate appropriate techniques in all laboratory situations.

S7CS3 Students will have the computation and estimation skills necessary for analyzing data and following scientific explanations.
  b. Use the mean, median, and mode to analyze a set of scientific data.
  d. Draw conclusions based on analyzed data.
  e. Decide what degree of precision is adequate, and round off appropriately.

S7CS6 Students will communicate scientific ideas and activities clearly.
  a. Write clear, step-by-step instructions for conducting particular scientific investigations, operating a piece of equipment, or following a procedure.
  b. Organize scientific information using appropriate simple tables, charts, and graphs, and identify relationships they reveal.

S7CS7 Students will question scientific claims and arguments effectively.
  b. Identify the flaws of reasoning that are based on poorly designed research (i.e., facts intermingled with opinion, conclusions based on insufficient evidence).
  c. Question the value of arguments based on small samples of data, biased samples, or samples for which there was no control.

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S7CS9  Students will investigate the features of the process of scientific inquiry. Students will apply the following to inquiry learning practices:

a. Investigations are conducted for different reasons, which include exploring new phenomena, confirming previous results, testing how well a theory predicts, and comparing competing theories.
b. Scientific investigations usually involve collecting evidence, reasoning, devising hypotheses, and formulating explanations to make sense of collected evidence.
c. Scientific experiments investigate the effect of one variable on another. All other variables are kept constant.

Enduring Understanding: Changes in species occur due to natural selection, reproduction and environmental conditions.

Essential Question(s): How do physical characteristics of organisms demonstrate/ support the theory of evolution?

Pre-Assessment: K-W-L: In cooperative pairs, students will write down what they “think they know” and what they would like to learn about bird beaks. Students will do another K-W-L chart about natural selection. Students will post their ideas on chart paper. The class will review the student’s submissions for the “Know” and “Want to Learn” columns.

| Outcome/Performance Expectations | Students will explain how the physical characteristics of organisms promote their survival by investigating the shapes of birds’ beaks and the food sources found in their environment. Students will recognize and explain through research and data collection that if a beak is not well adapted to the available food, the bird will be at risk. Those birds that have a well suited beak will thrive. Students should investigate the features of scientific inquiry. |
| Write a concept statement…How would you formulate an expert idea? | Focusing Question: How can you test three “beaks” to determine which is the best for collecting your food source? |
| Discussion | • Why do different birds have different shaped beaks? • Were all birds put on earth exactly how they appear or have they evolved from a common ancestor? Have they changed over time? Why? • Display some pictures of birds and discuss shape of their beak. Relate this to their food source. Ex) woodpecker, hummingbird, hawk, robin, finch, heron, duck, swallow, etc. • What are the characteristics of a valid experiment? (only test one variable, keep everything else constant, etc). |

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#### Write a concept statement / question...What kind of situation would cause this concept to become apparent in students’ understanding?

#### Suggested Materials:

- Food at centers: graduated cylinder or tall vase with colored water, gummy worms, sunflower seeds, Styrofoam cut into squares floating in a tray of water, tea leaves floating in water, rice, piece of bark, marshmallows, string, popcorn (popped).
- Tools: straws, tweezers, nut crackers, needle nose pliers, wrenches, eye droppers, slotted spoons, small strainers, chopsticks, assorted pliers, etc. (Since each group is choosing 3 tools, you should have multiples of each tool).

#### Day 1

- Divide the class into 8 groups and assign each group to a station.
- In groups, students should choose three “beaks” (tools) that they believe will be most efficient in meeting their “challenge”. Students, with prior approval, are allowed to bring “beaks” from home if they wanted a particular one that I didn’t have. Be sure that any tools they bring are appropriate and meet safety standards.
- Students will create a lab report in which they develop
  - the problem. (Example: “What beak will be the best for collecting our worms from the mud?”)
  - hypothesis (Example: “We believe the tweezers will be the best for collecting worms from the mud.”)
  - the procedures they will use to test their hypothesis, (including number of trials (encourage at least 3 trials for each tool),
  - A data table (students can use computer software or other technology to record data). Some students may be provided with a table.
  - Have their lab design approved by the teacher. Teacher should ask questions to help students edit their lab procedure.

#### Day 2

- Students gather at their assigned stations.
- Review safety precautions involving the use of the tools. Students are not to eat or drink any of the lab materials.

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- Using their research plan & data table they should carry out their experiment and record their results to determine “which beak is best?”
- Upon completion of their experiments, students should average and graph their results and present their findings to the class.

Challenges for each center:

1. You have been given a graduated cylinder (or narrow vase) filled with a food source (colored water). Your challenge is to determine how many seconds it takes each “beak” to get 10mL of water from one container to another.
2. You have been given gummy worms as your food source. Your challenge is to find out how many seconds it takes to remove the gummy worms from the dirt using each “beak”. Bury your gummy worms after each trial!
3. You have been given sunflower seeds as your food source. Your challenge is to find out how many seconds it takes each beak to crack the shell and remove the seed inside.
4. You have been given floating Styrofoam squares as your food source. Your challenge is to find out how many seconds it takes each “beak” to remove all the Styrofoam squares from the water. Return your squares to the water after each trial.
5. You have been given tea as your food source. Your challenge is to find out how many seconds it takes to get all the tea from the water. Return the tea to the water after each trial.
6. You have been given rice as your food source. Your challenge is to find out how many seconds it takes for each “beak” to remove thirty grains of rice from the bark of the tree. Return the rice to the “tree” after each trial.
7. You have been given marshmallows hanging from a string as your food source. Your challenge is to find out how many seconds it takes each “beak” to remove five marshmallows from the string.
8. You have been given popped popcorn as your food source. A group member will gently toss some kernels into the air. Your challenge is to find out how many seconds it takes to

| Identify necessary data and observations… | Data Collection  
Students will collect and record the amount of time taken to collect the food source.  
Students will test three different tools.  
Students will test each tool at least three times to improve the validity of the experiment.  
Students will draw conclusions about which beak is best.  
Possible Misconceptions:  
• Students may choose tools that are not necessarily the most efficient tool simply because they are larger or have more prongs, etc.  
• An inefficient beak would result in the death of a species. (Even a poor designed beak may still be able to collect enough food for survival).  
• Organisms can adapt by changing their beak. |
| Write procedures that will cause students to organize data… | 1. One group member will time another as they complete the challenge at hand with a chosen tool.  
2. The same tool will be used at least three times and data will be collected.  
3. Students will test the other two tools in the same manner.  
OR  
4. Three students may decide to “race” each using a different tool to see who can pick up the most food in a given time. If they do this, they should switch tools and retest so that they each get a chance to test each tool.  
Next….  
5. Record data in a table (on paper, voice recorder, computer, etc).  
6. Average the results.  
7. Create a graph using a computer program. A bar graph would be the best for this type of data.  
8. Write a concluding statement. |
| Write questions or activities to use or apply the concept (represent, model, visualize, or design new experiments). | Upon collecting and analyzing data, students will decide which “beak” was the best to collect the food supply. Students will then brainstorm the type of birds that have a similar shaped beak and explore the food supply that they eat. Students may use reference materials and the Internet to complete this task. |

### Possible Answers

- Nectar (colored water) will need to be sucked out. 
  Hummingbird
- Worms (gummy worms) need to be dug and pulled out. 
  Robin
- Seeds (sunflower seeds) need to be cracked open. 
  Sparrows, Finches
- Fish (Styrofoam pieces) will probably need to be scooped out of the water. 
  Heron
- Fine bits of vegetation (tea or herbs) will need to be carefully scooped out of water. 
  Ducks, Geese, Swans
- Flying insects (popcorn) need to be caught in wide openings. 
  Swallows
- Small insects (rice) will need to be picked and pried out of small crevices. 
  Woodpeckers
- Meat (marshmallows) will need to be pulled off of bones. 
  Owls, Hawks

### Homework/Extension

Students will list what they learned to complete the KWL chart. As a class discuss what the students have learned about the beaks and relate this to natural selection.

### Instructional Tasks

| Accommodations for ELL Students | Provide pictures of birds to choose from to decide which bird would have a similar beak and food supply. 
Group students with English speaking peers. |
|---------------------------------|--------------------------------------------------------------------------------------------------|
| Accommodations for Students with Disabilities | Give pictures of birds to choose from to decide which bird would have a similar beak and food supply. 
Provide more structure or assist students in developing there lab report. 
Group students with general education peers that are responsible and capable. |
| Accommodations for Gifted Students | Upon completion of the experiment, critique the lab design that your group used. 
List questions that address possible inconsistencies or reasons that your results may be invalid. List suggestions that would make the lab design better. |

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