**Fill the Bill**

 Third Grade STEM Inquiry Lesson

**Standards**

Science HCPS III:

* SC.3.4.1: Compare distinct structures of living things that help them to survive
* SC.3.1.1: Pose a question and develop a hypothesis based on observations
* SC.3.1.2: Safely collect and analyze data to answer a question

Common Core Mathematics

* CC.3.MD.1: Tell and write time to the nearest minute and measure time intervals in minutes.
* CC.3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories.

Common Core Writing

* CC.3.W.1 Write opinion pieces on topics or texts, supporting a point of view with reasons.

a. Introduce the topic or text they are writing about, state an opinion, and create an organizational structure that lists reasons.

b. Provide reasons that support the opinion.

c. Use linking words and phrases (e.g., *because*, *therefore*, *since*, *for example*) to connect opinion and reasons.

d. Provide a concluding statement or section.

**Materials**

* 3 bowls of ‘food’ (corks in water, string in straws, raisins in oatmeal)
* 4 ‘bird bills’(spoon, fork, tweezers, chopsticks)
* Small cup as ‘stomach’
* Timers

**Safety rules**

Do not eat any of the materials used for the experiment

Do not spill the water, if a spill occurs, clean it up quickly.

Use the tools carefully

**STEP 1 - Explore**

* Teacher introduces students to food sources and bill types. (String must be removed from straw, raisins must be removed from oatmeal, corks must be removed from water.) Do not give any other directions. Do not give out timers.
* Students explore the ways the 4 bills can be used to ‘eat’ the food.

**STEP 2 - Inquiry**

* With your group choose which one food you want to study, string, cork or raisins
* Write your experimental question by filling in the chosen food in the blank.( Which bill type ‘eats’ 5 pieces of \_\_\_\_\_ the fastest?)
* Based on your prior exploration think about which bill would be the fastest for the food you chose.
* Write your hypothesis. (The \_\_\_\_\_\_\_ bill will eat the \_\_\_\_\_\_\_\_\_\_\_\_\_ faster than the other 3 bills.)

**STEP 3 - Experiment**

* Time how long it takes to collect 5 food items with one bill. (review use of timer)
* Collect food one piece at a time and place in the stomach.
* Do not put any non-food items in the stomach.
* Repeat for each bill type.
* Write time in data table.
* Each team shares data with class
* Optional – repeat for the other 2 food types

**STEP 4 – Data Analysis**

* Make a bar graph of the data.
* Write your analysis statement. ( The \_\_\_\_\_\_\_\_ bill ate the\_\_\_\_\_\_\_\_\_\_\_ faster than the other 3 bills.)

**STEP 5- Write conclusion (written in Common Core Opinion format)**

* Introduce the topic.
* State your opinion to answerExperimental Question. (analysis statement)
* Use data to support the opinion (Example: The chopstick ate 5 food pieces in 25 seconds. This was faster than the spoon which took 56 seconds, the fork which took 47 seconds and the tweezers which took 36 seconds)
* Provide a concluding statement.

**Extension activities**

Engineering Design Process

Given a different, challenging food source (macadamia nuts, coconuts, worms in mud, sails in shell) students design a bird bill analog that could best eat this food.

* Draw ideas
* Build and test one model
* Revise and improve model
* Present model to class

Common Core Writing

Do a research project about one Hawaiian bird. Research its bill shape. Research its food source. Write an informative essay about the bird focused on its bill and food source.

CC.3.W.7 Conduct short research projects that build knowledge about a topic.

CC.3.W.7 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

a. Introduce a topic and group related information together; include illustrations when useful to aiding comprehension.

b. Develop the topic with facts, definitions, and details.

c. Use linking words and phrases (e.g., *also*, *another*, *and*, *more*, *but*) to connect ideas within categories of information.

d. Provide a concluding statement or section.

**Fill the Bill**

Experimental Question: Which bill type ‘eats’ 5 pieces of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the fastest?

Hypothesis: Choose 1 food type and predict which bill would ‘eat’ 5 pieces of food the fastest.

* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bill will eat the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ faster than the other 3 bills.

Experimental Procedure

* Time how long it takes to collect 5 food items with the bill.
* Collect food one piece at a time and place in the stomach.
* Do not put any non-food items in the stomach.
* Repeat for each bill type.

Record the time on the data table.

|  |  |
| --- | --- |
| Food: |  |
| Fork | Seconds |
| Spoon | Seconds |
| Tweezers | Seconds |
| Chopsticks | Seconds |

Make a bar graph of the data.

Time to collect 5 \_\_\_\_\_\_\_\_\_\_\_\_ items

Time (seconds)

60

55

50

45

40

35

30

25

20

15

10

5

0

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|  |  |  |  |
|  |  |  |  |
| Fork | Spoon | Tweezers | Chopsticks |

Bill Type

Analysis: The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bill ate the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ faster than the other 3 bills.