Sandwich Science – Exploring the Scientific Process & Classification

Background: This lesson started as a question on my back-to-school survey for students, which asked "Is a hot dog a sandwich?" I could tell when students reached that question from their expressions as they started searching for "evidence" on Google. Since I use Google Forms for the survey, I was able to collect data from all the kids to present the next day in class. It was a good-spirited debate from the start - sometimes quite lively. Throughout the lessons that followed numerous connections between their efforts to find answers and the process scientists use in their fields. This one question lead to a short unit on the process of science that I will be able to build on throughout the year. I have found many ways to refer to the classification process as we work our way through the first unit on ecology. I imagine I will find other connections just to start up the debate again when things get slow!

UPDATED August 2020:

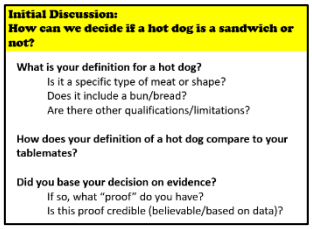
I have created a digital version of this lesson. While most of these directions apply to the digital version, please see the teacher notes on each PPT slide for more details. The worksheets for the printed version are not the same as those included in the digital one.

Click here for
Digital Notebook Versions

Resources: The PowerPoint for this lesson is available on my website – Go to the Science Classroom → General Science Lessons. I have also included the student worksheets in this download.

Day 1

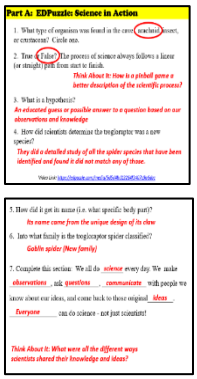
Initial Discussion: After sharing the circle graph of the overall results for the question (56% yes and 44% no), I led the students through the questions outlined on the slide shown at right.



The focus of the discussion was to get an idea of all the possible definitions for a "sandwich" and how we could come to an agreement (at least a majority if not unanimous one.) I did allow the students to share their "evidence" as we discussed different definitions.

NOTE: The students continued to "research" their definitions online and came up many conflicting articles and reports. It was a great learning opportunity to reinforce the idea that "just because it says it online, doesn't make it true!" I asked them to determine if their sources were reliable/credible, which prompted them to make a critic of their sources.

Assignment 1: EDPuzzle
Video Link: https://edpuzzle.com/media/5d71af77594353411ccf7cde



See page 4 for the worksheet I created for students to use while watching the Science in Action video on EDPuzzle. The video highlights the work scientists do -- starting with the discovery of a possible new species through the final decisions on the need to create a new family in order to classify it. Students filled out the worksheet as they watched and answered the questions built into the video. (I used their score as a daily grade!)

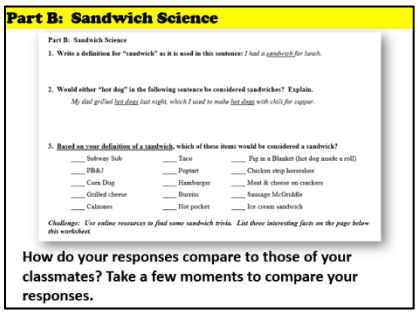
Students also had time during class to respond to the questions on the back of the worksheet, which we would discuss later in class. I instructed them not to discuss their

responses at that time, but to add notes to their pages with any details that they used to make their decisions.

Day 2

After reviewing the answers to the EDPuzzle video and highlighting important parts of the process (communication, research, peer review, collaboration, etc.), I asked students to share their responses for the first two questions on Part B (back of the worksheet). During the sharing of definitions for #1, I made notes which I used later in the lesson to identify common characteristics – a sandwich was a food item, it had a filling, and it had bread (or other pastry/baked good).

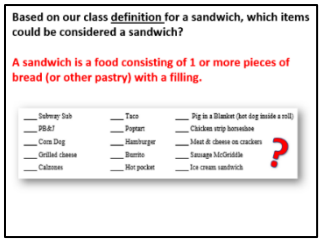
During the discussion of #2, I highlighted the difference between the two uses for the term "hot dog" and asked students to share what they think (see) when they hear the term used in both places. Most students agreed they thought of hot dogs (sausages) on a grill but pictured them on buns with chili and cheese on top. From this discussion, I made a point that in order to decide if a hot dog was a sandwich or not, we had to define what a sandwich was in specific terms as well as what we would get if we ordered a "hot dog" at a restaurant.



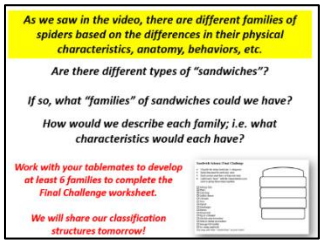
For #3, I asked the students to count how many items they had selected as sandwiches. While the numbers varied, it was interesting to see it range from only a couple to some who said all of them could be sandwiches. As a side note, many of the students were not familiar with some of the items listed – calzones and pigs in a blanket. I had them look up any items they did not know to get a better of idea of how it should be classified.

Day 3

I shared the common characteristics in the student definitions and worked with the class to create a "class" definition (as opposed to all the individual definition) that we could use to classifying food items as sandwiches or not. Although I had a few strong believers in the "2-pieces of bread is a sandwich" category, I was able to get the students to see that there would be different types of sandwiches and relate it to the class of Arachnids that includes all the spiders and their kin. For example, although a scorpion does not look like a spider and we wouldn't call it a spider, both belong to the bigger group of Arachnids.



At this point I saw a few light bulbs go off and the kids moved on to the next question – are there different types of sandwiches? I gave them the Final Challenge worksheet (see page 5) and allowed time for them to work in small groups to create their own "families" of sandwiches along with the characteristics needed to classify the items listed on the worksheet. They were allowed to add layers (dividing layers into two parts) if needed.

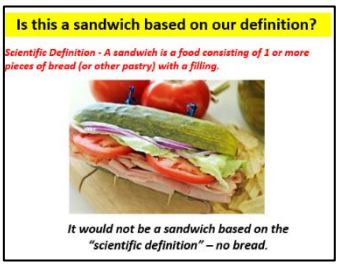


Day 4

I allowed time for students to share their classification structures. Many groups had traditional and untraditional as groups, while others based it on structure – hamburger style, hot dog style, Poptart style, etc.

I used the slide shown at right to help students compare the process we used to classify sandwiches to the process scientists used in the videos. The students were able to see similarities between the two. I have added them as notes on the slide.

Although I had enjoyed this lesson from the first question to the last lesson, the most fun was when I shared the final slide showing a "pickle sandwich". I asked the students whether it would be considered a sandwich. If so, I prompted them to tell me how it would be classified. A spirited debate was had in all classes, but they decided it did not fit our class definition nor would it fit into any of their categories because it did not have bread, or anything baked. I related this experience to the need for scientists to create a new family for the spider. As some would say, "It's back to the drawing board!"



Note: The teacher's aide who assists with my inclusion classes was the person who found the pickle sandwich. It had been featured on the Today Show. She also found "pepper sandwiches" that could be used as an example.

***Extension Lessons**:*

- *I followed this lesson with a unit on dichotomous keys, which would be used during our classification unit to help us identify insects. The student worksheets and PowerPoint are available on the General Science Lessons page of the Science Classroom at sciencespot.net – scroll down below the Sandwich Science lesson. For advanced students or those in high school, you could challenge them to create a dichotomous key for sandwiches!*
- *I also incorporated a CER (Claim-Evidence-Reasoning) activity (see page 6) as an introduction to CERs for my students. It was helpful to use this at the end of the unit as the students were able to reflect on the class discussion and their own research. This worksheet is included on the last page of this download. Search the web for other great CER examples, such as Sheryl's She Shed or the Doritos commercial (regarding a dead cat.) See page 7 for a blank worksheet you could use with either of these examples.*

Sandwich Science

Name _____

Part A: EDPuzzle: Science in Action – Watch the video to help you complete this section.

1. What type of organism was found in the cave: arachnid, insect, or crustacean? Circle one.
2. True or False? The process of science always follows a linear (or straight) path from start to finish.
3. What is a hypothesis? _____
4. How did scientists determine the trogloraptor was a new species? _____

   _____

5. How did it get its name (i.e. what specific body part)? _____
6. Into what family is the trogloraptor spider classified? _____
7. Complete this section: We all do _____ every day. We make _____, ask _____, _____ with people we know about our ideas, and come back to those original _____. _____ can do science - not just scientists!

Part B: Sandwich Science

1. **Write a definition for "sandwich" as it is used in this sentence:** *I had a hamburger <u>sandwich</u> for lunch*.

2. **Would either "hot dog" in the following sentence be considered sandwiches? Explain.**

   My dad grilled <u>hot dogs</u> last night, which I used to make <u>hot dogs</u> with chili for supper.

3. **<u>Based on your definition of a sandwich</u>, which of these items would be considered a sandwich?**

____ Subway Sub	____ Taco	____ Pig in a Blanket (hot dog inside a roll)
____ PB&J	____ Poptart	____ Chicken strip horseshoe
____ Corn Dog	____ Hamburger	____ Meat & cheese on crackers
____ Grilled cheese	____ Burrito	____ Sausage McGriddle
____ Calzones	____ Hot pocket	____ Ice cream sandwich

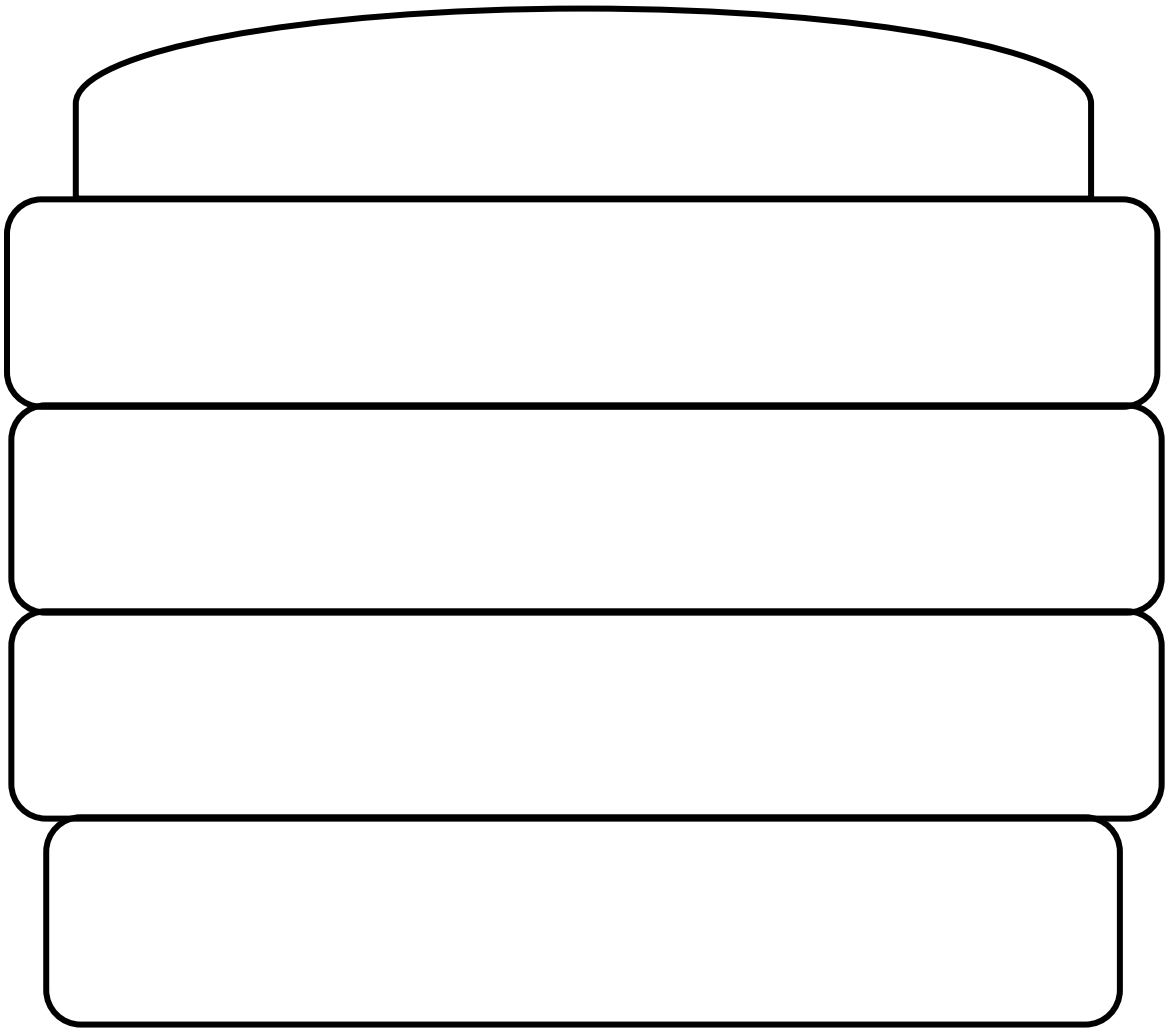
Challenge: Use online resources to find some sandwich trivia. List three interesting facts on the page below this worksheet.

Sandwich Science: Final Challenge

Name _____

- Classify the items listed into 5 categories.
- You must use all the items, and each can be used only once. *You may add other "sandwiches" to your chart!*
- Each section must have at least one item.
- Label each "layer" with a category (the characteristic(s) you used to group those items together.)

☐ Subway Sub	☐ Taco	☐ Pig in a Blanket
☐ PB&J	☐ Poptart	☐ Chicken strip horseshoe
☐ Corn Dog	☐ Hamburger	☐ Meat & cheese on crackers
☐ Grilled cheese	☐ Burrito	☐ Sausage McGriddle
☐ Calzones	☐ Hot pocket	☐ Ice cream sandwich



Sandwich Science: CER Challenge

Name _____

Directions: Use the definitions to help you complete the table.

A claim is a statement that answers the question. The claim does not include any explanation, reasoning, or evidence.

The evidence is the data used to support the claim. It can be either quantitative (numerical, measured) or qualitative (descriptive). Evidence should directly support the claim.

The reasoning is the explanation of "why and how" the evidence supports the claim. The underlying science concept that produced the evidence or data should also be included.

Question	**Is a hot dog a sandwich?**
Claim	
Evidence	
Reasoning	

CER Challenge

Name _____

Directions: Use the definitions to help you complete the table.

A claim is a statement that answers the question. The claim does not include any explanation, reasoning, or evidence.

The evidence is the data used to support the claim. It can be either quantitative (numerical, measured) or qualitative (descriptive). Evidence should directly support the claim.

The reasoning is the explanation of "why and how" the evidence supports the claim. The underlying science concept that produced the evidence or data should also be included.

Question	
Claim	
Evidence	
Reasoning	