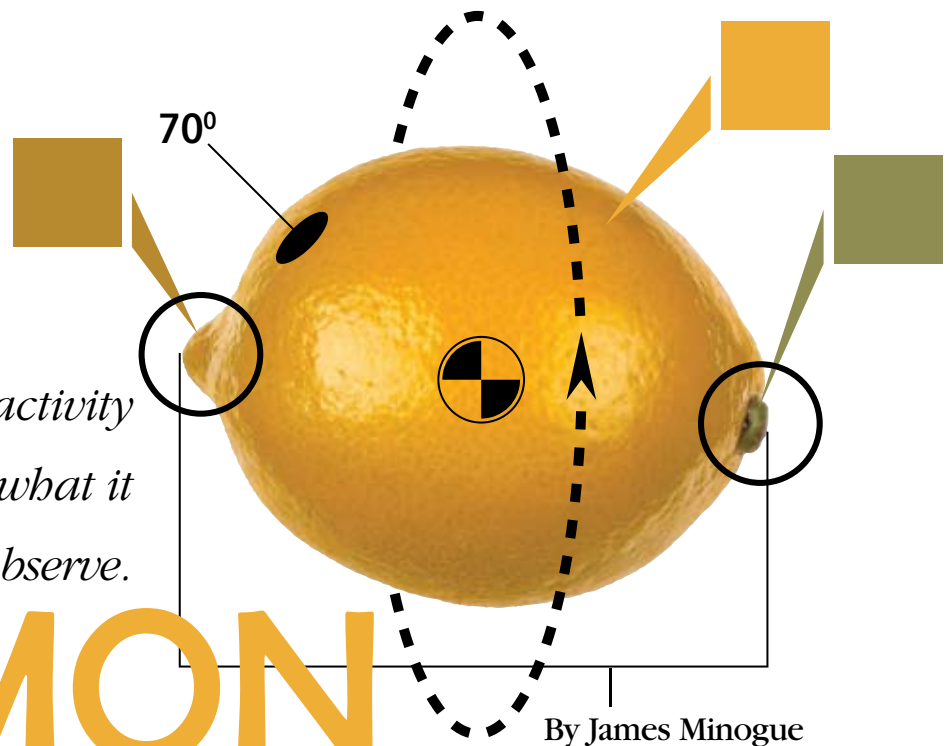


A simple yet effective activity introduces students to what it means to observe.



By James Minogue

A LEMON OF A LESSON

If life hands you lemons, make lemonade. This age-old advice is hard to argue with, but if you're handed lemons in science class, it's time to make observations. I have used "A Lemon of a Lesson" early in the school year with third- through sixth-grade students and with the preservice teachers I currently serve and have found it a fun and indispensable activity that really gets students in both populations thinking about what it means to observe.

Comparing lemons is not usually a part of many science investigations, but having students examine this familiar object in a way they've never considered before opens their minds to the numerous factors involved in observation. The lesson also provides valuable opportunities for students to hone their observation skills and extend these observations through the use of magnifiers and measuring devices. I like to conduct this lesson before doing any inquiry experiences in class. Once this seed of "observation awareness" has been planted, students understand why they need to make more in-depth observations—and do so—during later inquiry experiences in class.

The Lemon Challenge

For this lesson, you will need a large bowl, one metric measuring tape per student, one hand lens per student, and three more lemons than the number of students in your class. When buying the lemons, try to select lem-

ons similar in size and shape (this will help highlight the value of detailed and accurate observations).

It is assumed that students will have had some prior exposure to and practice using the metric system to measure length with a ruler or tape measure. The overall goal of this activity is to help students discover the importance of making detailed and accurate observations in science. Therefore, the activity works best when students have had little formal practice making observations prior to this lesson.

To begin, I ask students if they want to take a "Lemon Challenge" to see how good their observation skills are. I show the bowl of lemons. I explain that these lemons are not *ordinary* lemons, they are lemons designed to help us learn about the importance of *observation* and *evidence*.

Students are usually amused to hear their teacher talking so excitedly about lemons, but their interest is piqued, and I pass the bowl around and have each student choose one lemon from the bowl.

Once everyone has chosen a lemon, I distribute the lesson activity sheet (Figure 1, p. 26; see NSTA Connection) and explain that, in the first part of this activity, they are to make as many detailed *observations* about their lemon as they can, including a sketch of their lemon. They are not to write on, mark, or change their lemon in any way.

Next, I pass out the tape measures and hand lenses, making sure that each student has one. Students examine the lemons for about 10 to 15 minutes—this is usually ample time to make and record as many detailed observations as they can think of. While the students are working, I circulate the room and monitor their progress. If needed, I encourage students to use the tape measures and offer comments to encourage them to make detailed observations (i.e., *not* “It is yellow” or “It is a funny shape”). If students are having difficulty recording worthwhile observations, I ask guiding questions, such as:

- How long is the lemon?
- What is the circumference of the lemon?
- Are there any distinguishing features or marks on the lemon?
- What do you notice when you roll it across your desk?

When students have made all the observations of their lemon they can think to make, they return their lemons to the bowl in the front of the room.

At this point, spread the lemons (include a few extra lemons to make the search more challenging) to different areas of the room on desks or tables and have students circulate the room, trying to find their lemon using the observations they recorded on their worksheet. Inevitably, a few students will claim to have found the lemon they have been searching for, but unfortunately it is the same lemon. Capitalize on this situation by assuming a mediator’s role.

Call the class’s attention to the dilemma, so that everyone can participate in the discussion and learn from it. Point out that as a mediator of the dispute, you must examine the *evidence* in the case—in this example, the evidence is both students’ lemon observations—and make an evidence-based decision. Here the teacher can look for variations in the quantity and quality of the students’ observations. *Did either student include measurements? Are these measurements of multiple dimensions? Are they accurate? Does the student have a drawing? Does the drawing include distinguishing features?* Discuss how this process of weighing evidence and then making decisions based on what is observed

Figure 1.

“A Lemon of a Lesson” activity sheet.

(Answers from a recent group of preservice students.)

Part I)

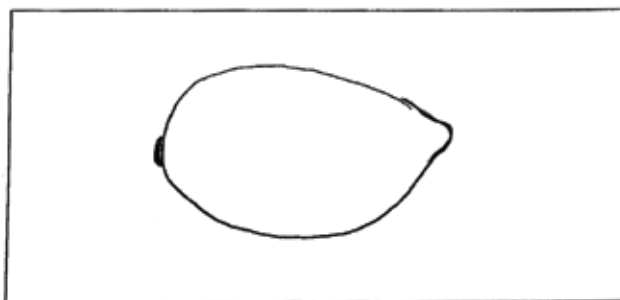
Each student will choose a lemon from the bowl. Study your lemon. Make as many **OBSERVATIONS** of your lemon as you can (for example its measurements, its smell, its shape...). You may even want to make drawing of your lemon.

DO NOT MARK YOUR LEMON IN ANY WAY!!!

Make a list of your observations below. Be as detailed and descriptive as possible.

- | | |
|-----------------------------------|--|
| 1) <u>yellow</u> | 6) <u>2 flaws (brown) toward bigger end</u> |
| 2) <u>about 1/2 pound</u> | 7) <u>2 3/4 in. long</u> |
| 3) <u>cold</u> | 8) <u>large bump @ smaller end</u> |
| 4) <u>sticks out on both ends</u> | 9) <u>lots of pores</u> |
| 5) <u>black dot on bigger end</u> | 10) <u>green pointy end not pointing straight out.</u> |

Sketch:



is what scientists do as they interpret their observations, and what students must learn to do if they are to be scientifically literate citizens.

A Second Challenge

Once everyone has had an opportunity to find their own lemon using their own observations, have students try to find a classmate’s lemon using the classmate’s observations. Have students exchange lesson worksheets with a neighbor. Challenge students to find their neighbor’s lemon using the descriptions on the worksheet, but make sure they are not helping each other—each student is to rely solely on the observations on the worksheet. Once they think they have found their neighbor’s lemon, verify it with their neighbor. Again, if necessary, “mediate” any disputes. (It usually takes about 10 to 15 minutes for students to find their neighbors’ lemons.)

Once all the lemons have been identified, return the worksheets to their original creators and have students answer the Postactivity Discussion Questions (Figure

Figure 2.

Postactivity discussion questions from “A Lemon of a Lesson.” (Answers from a recent group of preservice students.)

Part III) Directions:

Once you have found your partner's lemon be sure to get your list of observations back so you can work on the following questions.

1) In Part I, how did you make your **OBSERVATIONS**? What did you do to gather the information that you recorded? (be specific)

what it looked like, how it felt

2) What instruments did you use to extend your senses? measuring tape, magnifying glass

3) In Part II, were you able to find your partner's lemon? Explain why or why not. What was it about your partner's **OBSERVATIONS** that made the lemon hard or easy to find?

Yes. It had some very noticeable bruises unlike the other lemons. She included this in the drawing and the description.

4) Suppose that in you were blindfolded in Part I when you made your **OBSERVATIONS**...How would this have affected your observations? Explain.

I wouldn't have seen the color differences; touch would have been more important.

A Final Note

I have encountered times when the high price of lemons has caused me to consider alternative objects for observing. In my experience, clementine oranges are a less expensive option (of course, you might want to change the title of the activity to “Orange You Glad You Made Careful Observations!”) or you could substitute rocks or minerals as way to introduce an Earth science topic or unit. Whatever you choose as your object, you'll likely find this lesson to be a great way to open students' eyes to the importance of observations in science. ■

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References

National Research Council (NRC). 1996. *National science education standards*. Washington, DC: National Academy Press.

2). Again, circulate the room to assess students' understanding and guide them, if necessary, in answering the questions appropriately. Here I hope that students are able to make the connection between using their senses and extending these senses with tools to make detailed observations. I also hope that students gain an appreciation for the value of detailed observations in this instance and in science.

Post Discussion

Afterwards, discuss the postactivity questions together. Encourage students to describe what it was about their neighbor's observations that made it easy or hard to find their lemon. The students typically come to realize that accurate measurements, careful sketches, and attention to distinguishing features all help them to identify their neighbor's lemon. As students share their comments, they will begin to realize that specific observations were the most helpful in identifying their lemons. Here it is important to reiterate that scientific knowledge is in part built upon the careful observation of the natural world.

Connecting to the Standards

This article relates to the following *National Science Education Standards* (NRC 1996):

Content Standards**Grades K–4****Standard A: Science as Inquiry**

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

Standard B: Physical Science

- Properties of objects and materials

NSTA Connection

Download a blank activity sheet at www.nsta.org/0802.



A Lemon of a Lesson activity sheet

Part I

Each student will choose a lemon from the bowl. **Study your lemon.** Make as many **OBSERVATIONS** of your lemon as you can (for example its measurements, its smell, its shape...). You may even want to make drawing of your lemon.

DO NOT MARK YOUR LEMON IN ANY WAY!!!

Make a list of your observations below. Be as detailed and descriptive as possible.

1) _____ 6) _____

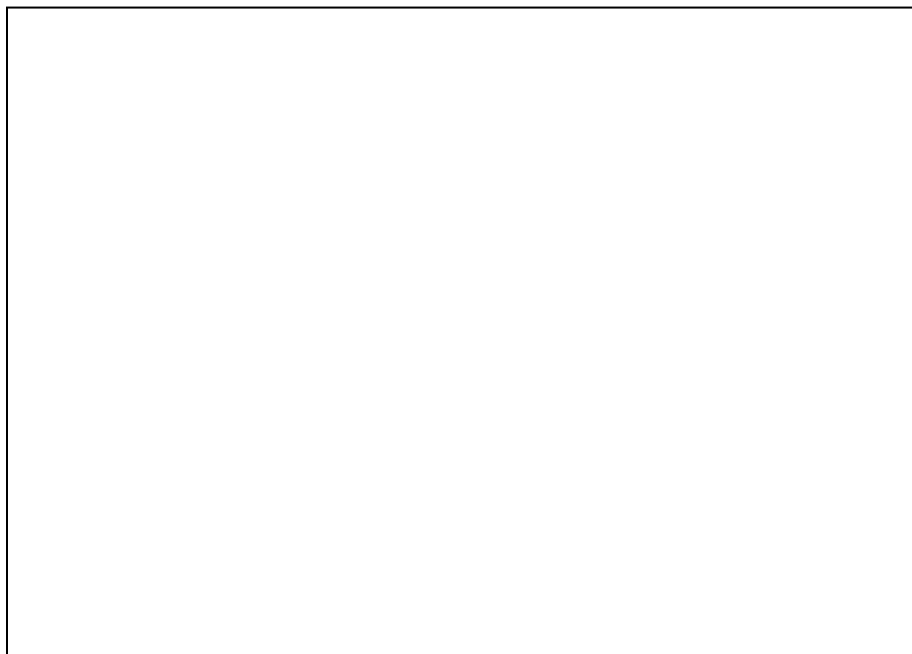
2) _____ 7) _____

3) _____ 8) _____

4) _____ 9) _____

5) _____ 10) _____

Sketch:



Part II

Find a neighbor close to you to work with and exchange your list of observations with your partner. Next, using your partner's list of observations, try to find his or her lemon. You can only use the observations; your partner can not help you in any other way.

Part III

Once you have found your partner's lemon be sure to get your list of observations back so that you can work on the following questions.

1. In Part I, how did you make your OBSERVATIONS? What did you do to gather the information that you recorded? (Be specific).

2. What instruments did you use to extend your senses?

3. In Part II, were you able to find your partner's lemon? Explain why or why not. What was it about your partner's OBSERVATIONS that made the lemon hard or easy to find? (Be specific).

4. Suppose you had to explain why OBSERVATIONS are so important in science to a younger student. What would you say?