

LEMONS AND ONIONS

ACTIVITY AT A GLANCE:

In a well-controlled activity, students smash lemons and onions to observe what happens when they are exposed to the odors. Then, they participate in a demonstration that links together the health problem, the hazard, and the people who are exposed. Afterwards, they use the concept of links in a discussion about how scientists reach a conclusion that a hazard is responsible for causing health problems in people.

OBJECTIVES:

Upon completion of this lesson, students will be able to:

Explain that the health problems, hazard, and people who are exposed must be linked together to conclude that a particular hazard is causing people to have health problems.

LESSON OUTLINE:

1. Conduct the lemons and onions activity.
2. Connect the lemons and onions activity to the ToxRAP Map
3. Conduct the triangle demonstration.
4. Debrief the demonstration.

COMPONENTS OF THE ToxRAP FRAMEWORK COVERED:

- I. State the health problem.
 - A. Why do you think there is a health problem?
- II. Do an investigation.
 - A. Investigate the hazard--
 - What is the hazard?
 - Where does it come from?

- How does it get into a person's body?

- B. Investigate people who are exposed to the hazard.

- Who is exposed?
- How are they exposed?
- How much are they exposed?
- Why are some people bothered more than others?

III. Reach a conclusion.

- What are the links that tie together the health problem, the hazard, and the people who are exposed?

TIME:

One to two, 30-45 minute class periods.

SUBJECTS:

Health, Language Arts, Science.
This lesson would complement a lesson on smell.

VOCABULARY:

No new vocabulary

LEMONS AND ONIONS ACTIVITY

Students first smash lemons and observe that they do not experience any health effects.

Then, they smash onions and observe that their eyes water and their noses run.

An important part of this lesson is to let students experience a respiratory hazard without being harmed. Onions were selected to be the “respiratory hazard” because they cause only temporary health effects (watery eyes and a runny nose) when cut or smashed and are inexpensive and readily available year round. They are also much less likely to bother children with asthma than ground, black pepper, another “hazard” that causes temporary health effects. Several ways to reduce the effects of the onion smell are given in the Advance Preparation section.

MATERIALS:

- Enough lemons so that every student can have a chunk or thick slice to smash (leave one whole).
- Enough yellow or white onions so that every student can have a chunk or thick slice to smash (leave one whole).
- A sharp knife for you to cut up the lemons and onions into large chunks.
- Newspaper on which to smash up the lemons and onions.
- Wooden blocks, unopened cans, or large stones for smashing up the lemons and onions.
- Sandwich size zip lock bags (optional).

CLASS DISCUSSION

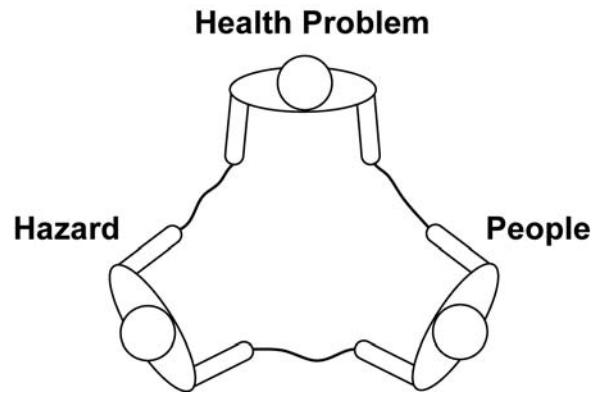
- The wall chart of the ToxRAP Map.
- The wall chart of the Hazard Questions.
- The wall chart of the People Questions.

These wall charts can be downloaded from the referring COEP site



TRIANGLE DEMONSTRATION

(Three students stand to form the points of a triangle. Each student represents one of the points in the triangle on the ToxRAP Map: “health problem”, “hazard,” and “people.” Various scenarios are portrayed to illustrate the circumstances under which these three points are linked to each other. When the links exist, the three students form the sides of the triangle by holding lengths of yarn).



MATERIALS:

- Several yards of yarn.
- Several sheets of card stock.
- A hole punch.
- Scissors.
- The original of the “Health Problem” sign.
- The original of the “Hazard” sign.
- The original of the “People” sign.
- The original of the “Watery Eyes/Runny Nose” sign
- The original of the “Onion Slices” sign or a few onion slices in a sealed bag or container. (Use the sign if you do not want to have the smell of onions in your classroom.)
- One whole onion from above.
- A few lemon slices in a sealed bag or container.
- The original of the “Pine Tree” sign, a branch from a pine tree or a pretend branch made out of construction paper.

ADVANCE PREPARATION:

LEMONS AND ONIONS ACTIVITY

- Leave a whole onion on your desk or other place in the classroom for a day but do not call students’ attention to it.
- Think about ways to keep the onion smell manageable in your classroom when students smash them. Below are suggestions:
 - Have students do the activity outside.
 - Conduct the activity at the end of the day so that the onion odor will have dissipated by the next morning.
 - Give each student a sandwich size zip lock bag containing an onion slice. Have students squeeze the onion slices in the sealed bags and then open them and smell.
 - Do the activity as a demonstration.

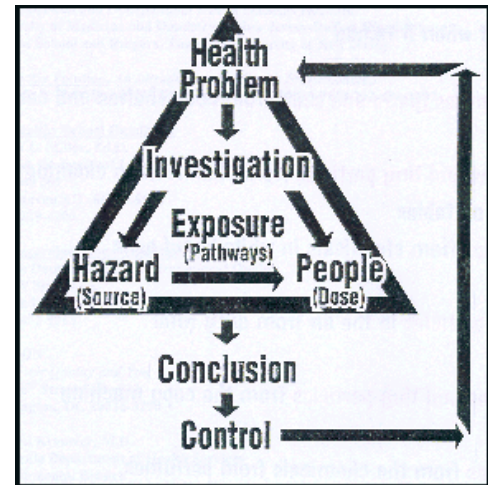
TRIANGLE DEMONSTRATION

- Photocopy the signs onto card stock. Punch two holes at the top of each sign and thread yarn through the holes so that students can wear the signs around their necks.
- Cut the remaining yarn into three pieces. Each piece should be about four feet long.

SUGGESTED PRESENTATION

Conduct the lemons and onions activity.

1. Have students display or wear their Health Hazard Detective Badges. Show them the ToxRAP Map wall chart that you made for Lesson One. Point to the triangle shape. Tell them that today, as Health Hazard Detectives; they are going to find out what the triangle means.
2. Have students carry out the lemons part of the activity.



NOTE: The lemon activity should be done before the onion activity so that students do not confuse the health effects that they experience from the onions with their exposure to lemons. Caution students not to wipe their eyes with their hands when touching lemon or onion slices.

- A. Cut the lemons into chunks or thick slices.
 - B. Have students smash up the lemon pieces on sheets of newspaper using a block of wood or other smashing tool. You may want younger students to put a sheet of newspaper on top of the lemons before they smash them to reduce the possibility of getting lemon juice into their eyes.
 - C. Have students describe the effects that the lemons have on them physically. (No effect. The lemon smells good.)
3. Tell students that some things in the air bother most people, whether they have allergies or not. Have students carry out the onions part of the activity. *Students with asthma or other severe respiratory problems may watch, but should not participate.*
 - A. Peel and cut several of the onions into chunks or slices.
 - B. Have students smash up the onion pieces on sheets of newspaper, using a block of wood, or other smashing tool. You may want younger students to put a sheet of newspaper on top of the onions before they smash them to reduce the possibility of onion juice getting into their eyes.
 - C. Have students describe the effect that the onion has on them physically (tearing, sniffing, etc.)
 - D. Explain that even though they are not allergic to onions, the odor from onions is so strong that it causes a reaction in nearly all people.
 - E. Reassure students that their symptoms from their exposure to the onions will not last very long.

CONNECT THE LEMONS AND ONIONS ACTIVITY TO THE ToxRAP MAP.

4. Show students the ToxRAP Map wall chart and apply what they learned from the onion activity to it. The words in italics are from the ToxRAP Framework and are included for your reference.

A. Point to the words “health problem” on the ToxRAP Map. Ask students what happened to them when they smashed the onions. (Several students had watery eyes and runny noses.) Ask students why they think the ToxRAP Map begins with “health problem.” (Health problems are a clue that something is wrong. If people did not have health problems there would be no need for an investigation.)

I. State the health problem.

- *Why do you think there is a health problem?* (Students had watery eyes and runny noses.)

NOTE: *In real health hazard investigations, the process can be either reactive (in response to health problems) or proactive (in anticipation of possible health problems). Using the ToxRAP Framework for proactive investigations is explored in the ToxRAP Middle School Module.*

B. Point to the word “investigation” on the ToxRAP Map. Explain that having a whole class of students with health problems (watery eyes and runny noses) should be investigated.

C. Point to the word “hazard” and explain that investigating the hazard would be a good place to start. Show students the Hazard Questions wall chart that you made for Lesson Two. Remind them that these are some of the questions that scientists ask when investigating the hazard. Have students answer the questions, drawing upon their experiences with the onions.

II. Do an investigation.

A. Investigate the hazard.

- *What is the hazard?* (the odor)
- *Where does it come from?* (onions, when they are smashed, but not when they are whole)
- *How does it get into a person’s body?* (inhaled. Point out that people eat raw and cooked onions without ill effect. The odor also comes into contact with the eyes.)
- *What does it do to people?* (causes watery eyes, runny noses, etc.)

D. Point out the word “people” on the ToxRAP Map and remind students that they should also investigate people who are ex-posed to the hazard. Show students the People Questions wall chart that you made for Lesson Three. Remind them that these are some of the questions that scientists ask when investigating people who are exposed to a hazard. Have students answer the questions, drawing upon their experiences with the onions.

B. Investigate people who are exposed to the hazard.

- *Who is exposed?* (The students who are smashing the onions and students who are standing nearby.)
- *How are they exposed?* (The odor is released from the onions that the students are smashing. The odor travels through the air.)
- *How much are they exposed?* (The students smashing the onions are exposed the most. Shorter students would be closer to the source so their exposure would be greater than taller students. Students standing nearby but not smashing onions have less exposure because they are further from the source. Other factors that influence the amount of exposure include the number of onions they were smashing and how long they were smashing onions.)
- *Why are some people bothered more than others?* (Some students may have a cold or other mild illness that makes them have more health effects. Other students may not be bothered by onions at all. Ask students if everyone reacted in the same way to the onion odors.)

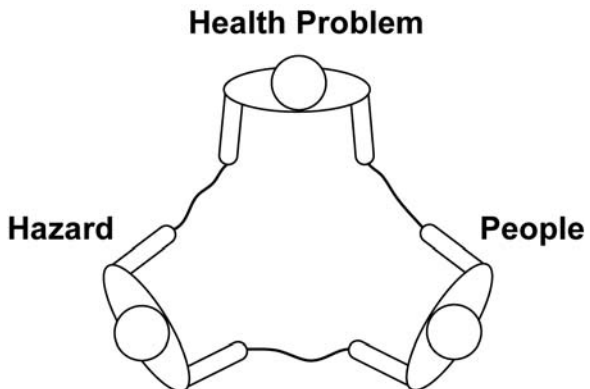
CONDUCT THE TRIANGLE DEMONSTRATION.

5. Point to the ToxRAP Map. Explain that they have already thought about the health problem part of the map. They have also learned to do an investigation to find out about the hazard and the people who are exposed to the hazard. Point to the word “conclusion.” The next step is to reach the conclusion that the hazard is really what is causing people to have a health problem. This is an important step. It is a way to check that what they think is going on makes sense. Point to the triangle shape on the ToxRAP Map. Explain that they are about to use the points of the triangle (“health problem,” “hazard,” and “people”) to help them do this.
6. Have students push their desks back to the walls of the room to create a large open space in the middle of the classroom.

ONION SLICES IN A BAG

7. Select three students to be involved in the demonstration. Have them stand in the open space, three to four feet from each other. Each one should be a point of a triangle. Have one student wear the “Health problem” sign and the “Watery Eyes/Runny Nose” sign. Have one student wear the “Hazard” sign and the “Onion Slices” sign (or hold the bag of onion slices). Have one student wear the “People” sign.
8. Explain to the class that the student with the “Hazard” sign represents onion slices. The person with the “People” sign represents the students in the classroom who were exposed to the onions. The student with the “Health Problem” sign represents the health problems that students had from being exposed to the onions.
9. Ask students how can they know for sure that the onions caused them to have watery eyes and runny noses?
 - A. Point to the “Onion Slices” sign (or bag of onion slices) and ask if the hazard is there. (yes).
 - B. Point to the “People” sign and ask were they exposed to the onion? (yes)
 - C. Point to the “Health Problem” sign and the “Watery Eyes/Runny Nose” sign and ask did they develop a health problem after being exposed to the hazard? (yes, watery eyes and runny noses)

10. Link the health problem, hazard, and people points of the triangle by having the three students form the “sides” with the three pieces of yarn that you cut earlier. Tell students that they have linked together the health problem, the hazard, and the people who were exposed.



11. Point to the word “Conclusion” on the ToxRAP Map wall chart. Tell students that they now have all of the links or connections to conclude that the health problems they had were caused by the onion odors (the hazard). (Remember that the onion is the source of the hazard. The hazard is the odors from the onion when it is cut.) Explain that linking the points of the triangle helps scientists conclude that a particular hazard is causing people to have health problems. (The words in italics below are from the ToxRAP Framework and are included for your reference).

III. Reach a conclusion.

- *What are the links that tie together the health problem, the hazard, and the people who are exposed?*

A WHOLE ONION

12. Take back the yarn. Replace the “Onion Slices” sign (or bag of onion slices) with a whole onion. Remind students that you had this onion sitting out all day. Ask them the questions below.
- A. Is the hazard present? (No, the onion is the *source* or where the odors came from. The hazard-the onion smell-is not present.)
 - B. Are people (students) exposed to the hazard? (No, because the hazard is not present even though the source is.)
 - C. Did anyone have any health problems after being exposed to the onion odors? (No, because the onion odors were not present.) Have the student wearing the “Watery Eyes/Runny Nose” take it off.
 - D. Can they make all three links to say that people had health problems after being exposed to onion odors? (No, the hazard was not present and people did not have health problems since they were not exposed to the hazard.)

LEMON SLICES

13. Replace the whole onion with the opened bag of lemon slices. Ask students the questions below.
- A. Is the hazard present? (Yes.)
 - B. Are people (students) exposed to the hazard? (Yes, they were exposed when they smashed up the lemon slices.) (Link the hazard and the people points of the triangle with yarn, having the students hold it.)
 - C. Did anyone have any health problems after being exposed to the lemon odors? (No, because lemon odors do not cause health problems. Most people like the smell of lemons.) Have the student wearing the “Watery Eyes/Runny Nose” sign take it off if he or she has put it back on.
 - D. Can they make all three links to say that people had health problems after being exposed to lemon odors? (No, because people did not develop health problems after being exposed.)

DEBRIEF THE DEMONSTRATION

14. Tell students that scientists who study health hazards use the triangle to check that they have drawn the correct conclusions. Emphasize that the health problems that people get must come after their exposure to the hazard. If there are health problems before exposure, then the hazard cannot be the cause.
15. Give the lemon slices back to the student wearing the “Hazard” sign. Tell the student wearing the “Watery Eyes/Runny Nose” sign not to remove the sign. Tell students to pretend that some of them had watery eyes and runny noses several hours before they were exposed to the lemon slices.
 - A. Is the hazard present? (It is present now, but was not present when students first had health problems.)
 - B. Were people (students) exposed to the hazard? (They are exposed now, but had not yet been exposed when they had health problems.)
 - C. Did anyone have any health problems after being exposed to the lemon odors? (No, the health problems started before they were exposed.)
 - D. Can they make all three links to say that people had health problems after being exposed to lemon odors? (No, because the health problems took place before they were exposed.)
16. Ask the class why the students had health problems if they were not exposed to the hazard. (Perhaps they had colds or allergies.) Discuss why it is important to make the correct conclusions. (So that people do not have to worry about things that are not health hazards, but can protect themselves from things that really are health hazards.) Explain that they will be learning more about protecting themselves from health hazards in the next lesson.
17. Have students reflect on the points below.
 - A. Some hazards cause harm under some circumstances, but not others.
 1. Remember the onions did not bother them when they were whole, only when they were smashed into pieces.
 2. Unlit cigarettes are not hazardous to hold, but they are to smoke!
 3. A bar of soap gets your skin clean, but would make you sick if you ate it! Soap also hurts if you get it in your eyes.
 4. Some kinds of insect repellent are OK for you if you put them on your clothes, but are not good for you if you put them directly on your skin.
 - B. Some hazards are bad for some people but not for others. For example, pollen or cat dander or other things that trigger allergies in some people don’t seem to bother other people
 - C. **Some hazards are always dangerous.** Examples of hazards That are always dangerous are pesticides, antifreeze, and drain cleaners.
Warn students that chemicals should not be handled by children!