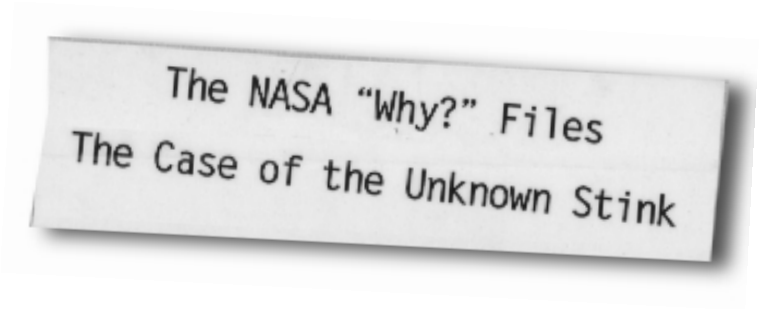
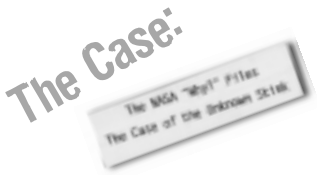
Part 2



Part 2 | Search for the Stink



Age Range

Ages 8-10

Duration

15 Minutes

Science Concepts

Science as Inquiry

Science and Technology

Science in Personal and Social Perspectives

History and Nature of Science

Mathematics Concepts

Geometry and Spatial Sense

Measurement

Connections

Representation

Key Science Vocabulary

Ammonia

Hydrogen sulfide

Bacteria

Organic materials

Pollutants

Sanitation plant

Sewage

Aeration basin

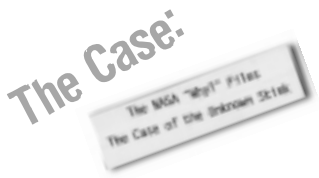
Meter

Odorous substances

Program Overview

Part 2 : Search for the Stink

The three tree house detectives continue their search for the solution to the cause of the curious unknown odor affecting a nearby town and threatening other towns. The children review the methods for studying science and what they have discovered thus far to help them solve the problem. They make some additions to their informational chart. The three visit a local sanitation department as a possible source of the odor. A scientist there escorts them through the waste water treatment plant, explains the steps in processing sewage and waste water, and shows how the plant uses the scientific method. After the visit, the children decide that the plant is not causing the unpleasant odor. Meanwhile, the latest news report indicates that the odor appears to be lessening in Phewsville. However, the children know that they must continue to pursue the source of the problem in case the odor returns. Looking at a map, they find that there is a chemical plant nearby. The investigators decide to form a hypothesis based on the chemical plant as the possible cause of the bad odor. However, after their friends at school help them organize E-mail responses from the towns' residents and they analyze the data, the three detectives decide to revise their hypothesis and do some more data gathering and experimenting.



Science as Inquiry
Science and Technology
Science in Personal and Social Perspectives
History and Nature of Science

Science Concepts

Part 2 : Search for the Stink

National Science Teachers Association (NSTA) Standards

Science as Inquiry

Students develop abilities necessary to do/to understand scientific inquiry.

- Observe and ask questions to identify problems.
- Plan and conduct a simple scientific investigation.
- Compare evidence and what is already known.

Science and Technology

Students learn how technological systems work to help solve problems.

- Observe technology being used to solve problems and perform tasks.

Science in Personal and Social Perspectives

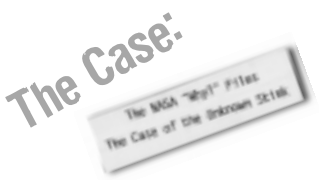
Students understand how the environment affects personal health.

- Learn how science and technology can improve the quality of health and sanitation.

History and Nature of Science

Students understand that science is a human endeavor.

- Recognize that people of all backgrounds engage in various science career activities.



Measurement

Data Analysis, Statistics, and Probability

Connections

Representation

Mathematics Concepts

Part 2 : Search for the Stink

National Council of Teachers of Mathematics (NCTM) Standards

Geometry and Spatial Sense

Students identify characteristics and properties of geometric shapes.

- Visualize, draw, and identify geometric shapes.

Measurement

Students understand attributes, units, and systems of measurement and apply a variety of techniques, tools, and formulas for determining measurement.

- Use appropriate tools of measurement to collect data.

Connections

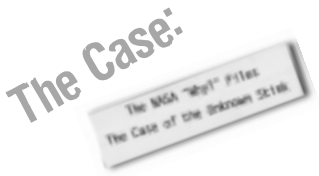
Students recognize, use, and learn about mathematics in contexts outside of mathematics.

- Observe the mathematics and science connections in problem solving and experiments.

Representation

Students create and use representations to organize, record, interpret, and communicate mathematical ideas.

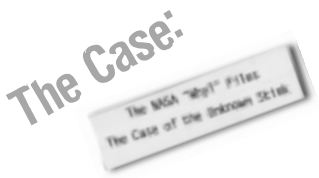
- Use graphs to mathematically represent a written image/ response to a question or problem.



Key Science Vocabulary

Part 2 : Search for the Stink

ammonia	a colorless, pungent or bitterly sharp-tasting or sharp-smelling gas used in manufacturing fertilizers and a wide variety of nitrogen-containing chemicals
hydrogen sulfide	a compound of sulfur and hydrogen, which is a colorless, odorless, and highly flammable gaseous element found in most organic compounds
bacteria	any of numerous unicellular microorganisms existing in various shapes and associated with processes such as fermentation, putrefaction, and the causation of infectious diseases in plants and animals
organic materials	substances derived from living organisms
pollutants	impurities or contaminants
sanitation plant	a building and equipment that handle the disposal of sewage and garbage for public health purposes
sewage	liquid and solid waste carried off in sewers and drains
aeration basin	an artificially enclosed area of water that charges substances with a gas and/or exposes them to fresh air for purification
meter	a device used to measure, indicate, record, or regulate
odorous substances	materials that can be perceived by a sense of smell



Before Viewing
(Questions 1-4)

After Viewing
(Questions 5-10)

Program Discussion

Part 2 : Search for the Stink

Before Viewing

1) Help the students summarize briefly what took place in the first program (*What's the Stink?*).

Three friends meet after school to watch the TV program, NASA's Kids Science News Network (KSNN). They learn that a town is being bothered by an unpleasant odor, and viewers are invited to help locate the odor's unknown source. The three friends decide to try to solve the problem. To begin their investigation, the children prepare an informational chart to determine what they know, what they need to know, and where to go for help. A neighbor, a retired science professor, gives them suggestions for informational resources and introduces them to the methods for studying science. They search for information about smells by using a computer, the internet, and a web-browser; then, they visit a NASA Langley electronics engineer to learn about conducting experiments and the role of variables.

2) Review with the students the informational chart prepared as an extension after viewing the first program (What's the Stink?).

Need to Know Board

What we know	What we need to know	Where to go for help
Health Department has given a warning	What's in a smell	Dr. D (science expert)
People in Phewsville smelled something bad	How a smell moves	Computer/Internet
No one knows where the smell is coming	How to experiment	NASA electronics engineer

3) If available, use the chart (page 21) prepared after viewing the first program to review the processes of the scientific method. (Remember to adapt the steps, if necessary, for third graders.)

The chart will include identifying the problem or question to be answered, asking questions about the problem, observing

and gathering data or helpful information, forming a hypothesis, testing the hypothesis, trying again if the data do not support the hypothesis, reaching a reasonable conclusion or explanation, and communicating the results to others.

4) Ask the students to predict what they think the children in the video will do next.

Accept all responses, as long as the students can support their predictions with logical reasons.

After Viewing

5) Ask the students why the children in the video used a map in their investigation.

The children located Phewsville and the adjoining towns on the map. They were especially interested in how close their town was to Phewsville. They didn't know where the odor was coming from or when the bad smell might return and spread to their town and the surrounding towns. Examining things shown on the map might give them a clue.

6) Have the students explain why the children in the video went to the waste water treatment plant at the sanitation department.

Because the sanitation department and the waste water treatment plant handled sewage and garbage, the children thought they might be the source of the unpleasant odor.

7) Ask the students if the sanitation department and the waste water treatment plant proved to be the source of the bad odor. Ask them to explain their response.

The department and plant were not the source of the bad odor because after the process was completed, the remaining water was clean and had no unpleasant odor. If an odor had remained, the process and the steps of the scientific method would have been repeated until the problem was resolved *(See "Purifying Water" page 37 and "Phew Wee" pages 39-40.)*

8) Have the students relate the latest news about the mystery odor as reported by KSNN.

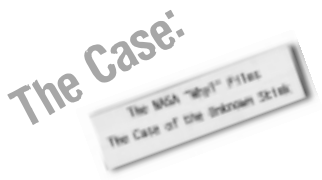
KSNN reported that the stink in Phewsville appeared to be gone and that no one had reported getting sick from it.

9) Have the students explain why the children in the video are not giving up on trying to solve the problem, although the stink is no longer apparent in Phewsville.

The problem of what the stink was and what caused it has not been solved. Therefore, the bad smell might return to Phewsville or to other nearby towns unless the cause of the odor is found and a reoccurrence can be prevented.

10) Have the students explain the process the children in the video and their school friends used to organize the E-mail responses they had received from the residents of the nearby towns with information about the unpleasant odor.

The children in the video and their friends separated the responses by towns and then by days. This separation told them who smelled the odor and when. They next used colored pins on the map to show the data visually *(See "Our School Stinks" page 41.)*



NOTE:
The extensions can be class or individual enrichment activities and should be selected and/or adapted according to student developmental levels.

Program Extensions

Part 2 : Search for the Stink

1. Mathematics and Geography
Use a state map so the students can locate their town or city and then find/name the nearest towns or cities. Have them use the map legend to estimate the distance from their town to some of the other locations. Use a local map so the students can locate their school and the next nearest school, fire department, post office, mall, or other locations of interest.

2. Mathematics and Geography
Tell the students to imagine and then draw their own maps showing the location of Phewsville, Exville, Mid City, and Big City. (The children in the tape live in Big City.) Remind the students to devise a simple scale to indicate the distance between the towns *(See "Map Quest" page 42.)*

3. Mathematics and Language Arts
Ask the students to use their maps to draw a straight line connecting the towns and creating a geometric shape. Ask them to write a sentence or short paragraph naming the geometric shape most nearly like the one they made. Direct them to write why they selected the particular geometric figure.

4. Science, Mathematics, and Language Arts
Ask the students to think of the different kinds of meters that might be used in the school or around their homes. Have them make a chart with three columns showing (1) the name of the meter; (2) what the meter measures or records; and (3) the unit of measure the meter uses.

Name of meter	What it measures or records	Unit of measure
Electric meter	Electricity	Kilowatts
Thermometer	Temperature	Degrees
Speedometer	Speed	Miles per hour

5. Science and Language Arts
Ask the students to draw and label a diagram (similar to a flowchart) or to write a description of the process used by the waste water treatment plant from the time waste comes into the plant to the conclusion of the process.

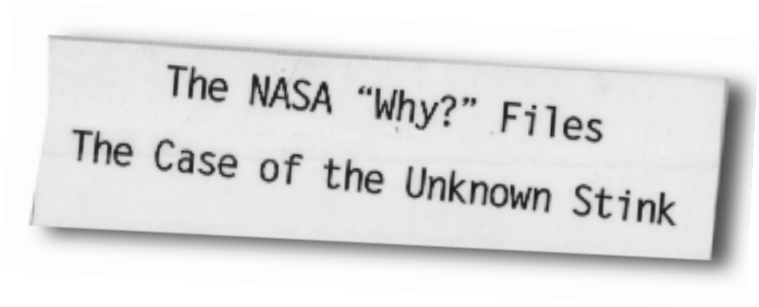
6. Science and Language Arts
Have the students write a paper explaining why the work of the sanitation department and the waste water treatment plant are so essential to public health and the quality of life.

7. Science, Technology, and Language Arts
Let the students use the Internet or available print materials to learn more about ammonia and hydrogen sulfide and some of the products that contain these gaseous elements. Have the students share their findings orally or in writing.

Give the students options for further research topics: water pollution, the necessity of water for good health, the usefulness of "good" bacteria, and a particular kind of meter.

8. Science and Technology
Encourage the use of the NASA "Why?" Files web site.
http://whyfiles.larc.nasa.gov

Exercises



Part 2 : Search for the Stink

Purifying Water

Problem

How is water purified?

Materials

1. gallon of water from a lake, pond, bay, or ocean
2. purification tablets (from local sporting goods store)
3. microscope
4. slides and slide covers
5. eye dropper
6. 2 beakers or 2 small containers

Procedure

1. Gather a gallon of water from a lake, pond, bay, or ocean.
2. Pour a small amount of the water in one beaker for each group.
3. Have students observe the water and write their observations on the Water Identification Chart (page 38).
4. Have students use the eye dropper to place 2-3 drops of water on a slide and cover with cover slip. Teacher Note: These items can be prepared for younger children.
5. Students will place the slide on the microscope and observe. Record observations.
6. Discuss what could possibly be in the water. Inform students that not all water is pure and often when you travel, you get sick from drinking the water.
7. Drop purification tablets into the gallon of water as per directions on label of tablets.
8. Pour a small amount of purified water into the second or empty beaker of each group.
9. Have students observe and record observations.
10. Have students make another slide for the purified water and observe under the microscope.
11. Record observations.
12. Discuss with the students why it is important to drink water only from sources that have been purified, such as a water treatment system.

Water Identification Chart

Dirty Water	Purified Water
Draw what you observe	Draw what you observe
Write a description	Write a description

Conclusion

1. What do you think is in the pond water?

2. What happened to the water once the tablets were added?

3. Why do you think it is unsafe to play in water that is found in ditches?

4. How does “dirty” water make you sick?

Problem

What makes a landfill smell bad?

Materials

1. a large cardboard box
2. one garbage can plastic liner (trash bag)
3. masking or duct tape
4. a bag of potting soil
   (enough to cover the bottom of the box to a 1-2 inch depth)
5. watering can
6. water
7. students' lunch trash

Procedure

1. Cut the flaps off one end of the cardboard box.
2. Reinforce the bottom of the box with duct tape or masking tape.
3. Prepare the landfill by lining the box with the plastic liner. The liner should extend beyond the top edges of the box so that it is folded over.
4. Tape the folded edges to the outside of the box.
5. Pour potting soil in the box and distribute evenly.
6. Have students place one item left over from their lunch in the box. Make sure there is a variety of trash, including food, plastics, and paper.
7. Be sure that these items are buried and covered with dirt.
8. Water the landfill with enough water to make a mud mixture.
9. Place the landfill in an out of the way area for about a week.
10. Make sure that the landfill stays wet; water when necessary.
11. After about a week, uncover the items that were placed in the landfill.
12. Observe items and smell.
13. Discuss with students why some of the items appear to look different and some do not (the biodegrading process.) Also, discuss why there is a strong offensive smell.

Conclusion

1. What caused the items to smell bad?

2. How did some of the items change their appearance?

3. Why were some items affected more than others?

4. Why did we have to add water to the soil?

5. How could we reduce the odor in landfills?

Our School Stinks!

Problem

Our school is having a bad smell day! Many students and teachers are complaining about a bad odor. We need to locate the source of the smell. Therefore, our 4th grade class decided to e-mail all the classes and offices to find out if everyone is smelling the offensive odor! Here are the responses we have received. Please help us organize our data by designing a chart to classify these e-mails! Let's see where the smell is coming from. We must stop the smell!

Data

Ms. Hill-1st grade
No smell in our room.
Good luck!

Mrs. Smith-5th grade
It stinks!

Mrs. Black-2nd grade
No smell here.

Mr. Lee-3rd grade
We smell a light, faint odor
that is not pleasant!

Mrs. Ricks-Kindergarten Class
No smell here.

Mr. Williams
Kindergarten Class
No smell here.

Mr. Hart-1st grade
No smell here.

Mr. Mills-Cafeteria Manager
Really smelly in here.

Mrs. Hope-3rd grade
We smell a bad odor,
but it is not very strong.

Mrs. Keeton-4th grade
We are pretty smelly in here!

Mrs. Everett-Janitor
Lots of stinky smell in my office.

Mr. Geirsch-Head Janitor
Gosh it stinks in here!

Ms. Chappel 4th grade
We really have a stink problem!

Ms. Ricles-Principal's office
No smell here!

Mrs. Newby-Cafeteria
It stinks and it's not us!

Mrs. Ellison-2nd grade
No smell here!

Mrs. Duell in the office.
No smell in the office.

Conclusion

1. Where is the smell coming from?

2. How do you know?

3. Draw a layout of the school and locate the smell.

Map Quest

Using an atlas or map of your state, answer the following questions.

Extension

Do an internet search for maps of your local area.

1. What is the scale of your map?

2. *Measure the distance from your town to the nearest city.*
   What is that distance and what is the name of the city?

3. Which direction would you have to go to get to the nearest lake?

4. *Find the Key/Legend on your map.*

   What is the symbol for

   _____ Railroad track? _____ Lake?

   _____ Interstate Highway? _____ River?

   _____ US Highway? _____ Capital City?

5. What is the name of the city in your state with the largest population?

6. What is the capital city of your state?

7. Using the scale, determine the approximate distance across your state from east to west. From north to south.

8. Draw a compass rose.

9. Where is your town located in your state? Example: northwest corner.

10. Driving at 50 mph, how many hours would it take you to drive to the nearest state?