

The Garbage Story
Dealing with Solid Waste Disposal

catalog #2972

Teacher's Guide

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Published & Distributed by...



AGC/UNITED LEARNING

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THE GARBAGE STORY

Dealing With Solid Waste Disposal

Viewing Time: 21 minutes

INTRODUCTION

“Garbage,” “trash,” “rubbish,” or “municipal solid waste”--it does not make any difference what we call it, the fact remains the same, we produce huge amounts of it, and it takes an enormous amount of every community’s resources to deal with it.

This video lesson gives students in the 7th through 12th grades a firsthand look at the challenge we face in dealing with the mountains of garbage our society produces and acquaints them with the various technologies involved.

PRESENTATION GOALS

The goals of this presentation are to explain:

- What goes into our garbage.
- How much garbage we produce each year.
- How we dispose of it.
- The role of recycling.
- How source reduction helps.

STUDENT OBJECTIVES

After viewing the video and participating in the lesson activities, students should be able to...

- Define the term “municipal solid waste.”
- Describe the contents of municipal solid waste.
- Explain how we use landfilling, incinerating and composting to dispose of our garbage.

- Describe the structure and operation of a modern landfill.
- Define the working of incinerators and how they can be used to generate electricity.
- Explain the role of recycling and how the “mining” of our garbage can turn problems into resources.
- Describe how source reduction helps reduce the amount of garbage with which we have to deal.

SUMMARY OF THE VIDEO PRESENTATION

THE GARBAGE STORY, Dealing With Solid Waste Disposal opens by introducing viewers to the huge amounts of garbage, or, “municipal solid waste” our society produces. It describes what our garbage is composed of and the role landfilling, incineration and composting play in modern waste disposal programs.

The video lesson then moves on to a discussion of recycling and how it can help to reduce the volume of garbage that must be disposed of by other means. The presentation closes with an explanation of how source reduction can help reduce the problems of waste disposal before they begin.

THE VIDEO INSTRUCTIONAL QUIZ

The video presentation is followed by a short Video Instructional Quiz. This quiz consists of ten questions, and you can elect to have your students answer them orally or use the quiz form provided on Blackline Master 1, **Video Instructional Quiz**. This quiz is intended to focus the students' attention and is not intended for evaluation purposes.

TEACHER PREPARATION

It is suggest that you preview the video and read the related instructional procedures and the accompanying blackline masters before involving your students in the lesson activities. Duplicate those blackline masters you have chosen to use with your class.

As you review the instructional program outlined in this guide and the accompanying blackline masters, you may find it necessary to make some changes, additions, or deletions to meet the specific needs of your class. We encourage you to do so, for only by tailoring this program to your students will they obtain the maximum instructional benefits afforded by the materials.

It is also suggested that the video presentation take place before the entire group under your direction. The lesson activities grow out of the content of the video, therefore, the presentation should be a common experience for all students.

INTRODUCING THE VIDEO

This video deals with a topic that's familiar to every student — trash. You may choose to begin your introduction of the topic by dumping a trash can out and having your students analyze its contents. Ask for volunteers or appoint a group of students to draw a pie chart on the chalkboard showing what they think to be the composition of the garbage generated by their own community. After they have seen the video, students can then go back and correct the chart. You may decide to expand on this introductory activity and have your students draw a pie chart analyzing the composition of the country's garbage.

Another suggestion for introducing the program is to take the “Why” approach. Begin by asking your students if they think recycling is a good idea. Once they have answered the usual “yes,” then ask them to explain why--what it is that is helpful about recycling. Record their responses on the chalkboard. After viewing the video, discuss the answers they gave prior to the presentation.

Current events can also provide useful ways of introducing the subject. For example, articles about recycling, source reduction, or the pros and cons of landfills and incinerators provide very effective topic “hooks” to introduce *The Garbage Story*.

You may decide to lead a discussion with your students, either before or after viewing the video, using the topics/questions found below under the heading **Discussion Topics/Quiz**.

- Show the video. The viewing time is 21 minutes.

DISCUSSION TOPICS/QUIZ

You can use the following four discussion questions in different ways. One useful approach is to use them as stimulants for classroom discussion.

The same topics are also presented as Blackline Master 2, **Discussion Topics/Quiz**. You may choose to use this blackline master as a quiz to test your student’s grasp of the material either before or after you show the video.

1. How much garbage and trash (municipal solid waste) do Americans produce a year?

Answer: About 200 million tons.

2. Name three ways in which municipalities dispose of their garbage and trash.

Answer: It is buried in landfills, burned in incinerators and decomposed by composting.

3. Of what kind of material is most of our garbage and trash composed?

Answer: Most of our waste (over a third) is composed of paper products.

4. How is recycling helping our landfills?

Answer: Recycling helps to reduce the amount of trash we need to dispose of in landfills.

BLACKLINE MASTER DESCRIPTIONS

Blackline Master 1, **Video Instructional Quiz**, is the printed student version for the Video Instructional Quiz.

Blackline Master 2, **Discussion Topics/Quiz**, is the student hand-out for the Discussion Guide/Quiz

Blackline Master 3, **Glossary /Vocabulary**, will help students become familiar with some of the terms used in the video presentation.

Blackline Master 4, **Vocabulary Review**, is an exercise to enforce understanding of some of the terms used in the video lesson.

Blackline Master 5, **Crossword Puzzle**, can be used as an in-class activity or as a take-home assignment.

Blackline Master 6, **Concept Map**, can be used as an in-class activity or as a take-home assignment.

Blackline Master 7, **Composting**, explains how to make a compost pile.

Blackline Master 8, **Incinerators: An Issue of Debate**, is a fact sheet that students can use to analyze both sides of the incineration issue.

Blackline Master 9, **Reduce, Reuse, Recycle**, is an activity in which students develop ways to reduce, reuse and recycle their school's trash.

Blackline Master 10, **Tracking Your Trash**, is an activity that explains how to keep a trash diary.

ANSWER KEY

Blackline Master 1, Video Instructional Quiz

1. We dispose of most of our municipal solid waste by burning it.
A. *False*

2. Some critics oppose incinerators because they feel they are a wasteful way of getting rid of garbage.
A. *True*

3. It takes about the same amount of energy to recycle aluminum cans that it does to mine and process the aluminum ore in the first place.
A. *False*

4. Trying to cut back on the amount of garbage we produce before it becomes a problem is called source _____.
A. *reduction*

5. One of the aims of recycling is to use the things we throw away to make something _____.
A. *new or useful*

6. The potentially poisonous liquids that seep down through landfills are called _____.
A. *leachates*

7. Waste-to-energy facilities use the heat from burning garbage to produce _____.
A. *steam, electricity, or power*

8. Incineration can concentrate poisons, such as heavy metals, in the resulting _____.
A. *ash*

9. The decomposing organic material in landfills gives off methane gas.
A. *True*

10. Nationally, paper products make up over one third of our garbage.
A. *True*

Blackline Master 2, Discussion Topics/Quiz

1. How much garbage and trash (municipal solid waste) do Americans produce each year?

A. About 200 million tons.

2. Name three of the ways in which municipalities dispose of their garbage and trash.

A. It is buried in landfills, burned in incinerators, and decomposed by composting.

3. Of what kind of material is most of our garbage and trash composed?

A. Most of our waste (over one third) is composed of paper products.

4. How is recycling helping our landfills?

A. Recycling helps to reduce the amount of trash we need to dispose of in landfills.

Blackline Master 4, Vocabulary Review

1. (c) methane

6. (h) incinerator

2. (g) recycling

7. (i) leaching

3. (e) toxic

8. (b) composting

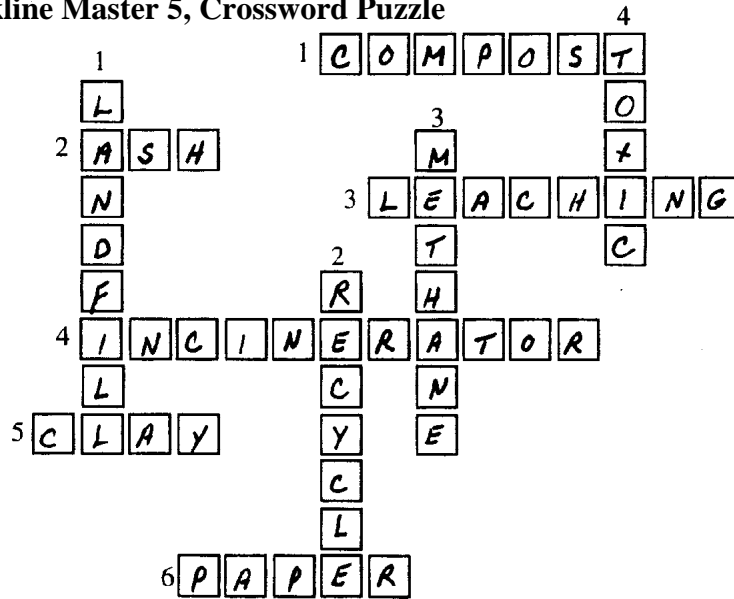
4. (a) ash

9. (d) municipal solid waste

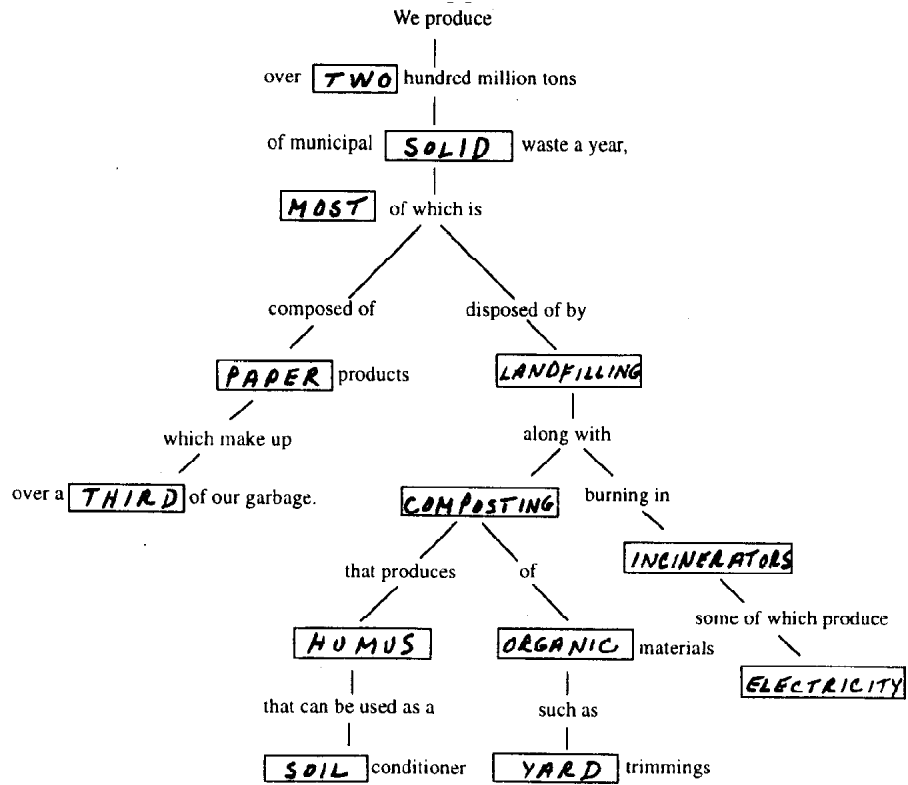
5. (j) landfill

10. (f) source reduction

Blackline Master 5, Crossword Puzzle



Blackline Master 6, Concept Map



Blackline Master 7a, Composting

Procedure:

8. After you have recorded the temperature of the compost for 10 to 15 days, graph the data. What trends do you notice? The temperature should have risen. Why did this occur?

A. The interior of the compost pile should register an elevated temperature as evidence of biochemical reactions of microbes breaking down the compost.

Conclusion:

1. Describe what natural composting involves.

A. Composting involves the decay of organic material, such as leaves, logs, and animals by microorganisms.

2. What are the advantages of composting?

A. Composting is inexpensive, easy to do, and reduces the amount of trash.

3. How does composting reduce the amount of solid waste placed in a landfill?

A. Composting reduces the amount of solid waste by simply eliminating food and yard trimmings from the waste stream.

4. What role do microorganisms play in the composting process?

A. Microorganisms break down objects placed in the compost by biochemical reactions that turn them into humus.

5. Things like aluminum cans and plastic bottles cannot be composted. Why?

A. Things like aluminum and plastic cannot be composted because they are not organic and cannot undergo biochemical reactions from microorganisms and thus cannot be broken down into humus.

Blackline Master 8, Incinerators: An Issue of Debate

4. Lists should include the effects on the environment, health, cost, transportation, and the future.

5. As an alternative to a debate, students can write a position statement.

Conclusion:

Try to get students to explore all sides of the issue.

Blackline Master 9, Reduce, Reuse, Recycle

3. Answers may include the recycling of paper and cans, reducing the use of paper products in the cafeteria or classroom, and buying products with less packaging.

Blackline Master 10a, Tracking Your Trash

2.

a. paper, yard trimmings, plastic

b. 206.9 million tons

c. Paper is recovered the most due to newspaper and other paper recycling.

d. 21.75%

e. Other materials which can be recycled easily include plastics and yard trimmings.

3.

a. Answers will vary

b. Answers will probably vary from two to six pounds.

Conclusion:

Answers will vary. You may want to compare the national average on the chart to your class data.

Script of Video Narration

Hi. I'm Dr. Brian Jerome, and I'm standing in a landfill, the end of the line for thousands and thousands of tons of trash.

Dealing with our garbage is one of the most complex problems we face today. Just what are we going to do with the huge amounts of trash that we produce every day?

As we'll see during the next few minutes, there aren't any easy answers to that question. But modern science and technology are helping us come up with some very workable solutions.

The first thing to understand about garbage--or as it's called, "municipal solid waste"--is that we create tremendous amounts of it. And just what do I mean when I say "tremendous"?

Well, it's estimated that every year our homes, businesses and schools churn out over 200 million tons of municipal solid waste a year. And, incredibly, that amount keeps going up.

If that sounds like a massive amount of trash to you, you're dead right. It is. It's so much, in fact, that it equals almost a ton of trash per year for every man, woman and child in this country.

Up to now, I've talked about the huge amounts of garbage, or municipal solid waste, that we produce.

But I haven't said anything about the garbage itself, in other words, what's in it.

Well, if you and I could dig through all that garbage we throw away, here's what we'd find.

As you can see, there's a whole lot of paper involved.

Nationally, in fact, paper products of one kind or another make up over a third of our garbage. The rest of our garbage is a mixture of plastics, metals and glass, yard and food wastes, and other miscellaneous trash.

So as you can see, our garbage is a combination of many different things, and, as we're about to find out, different things happen to them.

The garbage story begins when you and I throw something away.

But what happens next ? What happens to all those bottles, cans, newspapers and other things that we throw away?

Well, for the most part, one of three things.

They're either buried in landfills, burned, or recycled--like these plastics--into something we can use again.

Of the three routes our trash can take, landfilling is by far the most common.

It's how we deal with almost two-thirds of our trash.

When we first think of landfills, we may well think of piles of rubbish rotting at the edge of town, or fouling the shores of some lake or river, often poisoning near-by wells in the process.

And, for many years, that pretty well described how we disposed of most of our trash.

That's not the case today, however. Today's landfills are marvels of engineering and technology. And they are built with many safeguards to prevent pollution.

This diagram shows how a typical landfill is constructed.

First, a large hole is dug. Then it's carefully lined with layers of clay, plastic and gravel. These linings prevent potentially poisonous liquids, called leachates, from seeping down through the garbage and polluting the groundwater under it and poisoning nearby wetlands and drinking water supplies.

Modern landfills also have leachate collection systems, which channel leachates in the landfill to a pond where they are stored. Leachates are then held in this pond until they can be disposed of safely.

Notice this plastic liner. It's made of tough, tear-resistant plastic, and it prevents poisons from seeping out of the pond into the surroundings.

Test wells, like this one, are drilled deep down into the earth surrounding the landfill. Water samples are taken periodically to make sure that harmful leachates are not seeping through the liner into the surrounding groundwater.

Compactors then crush the trash to take up as little space as possible. Then, at the end of the day, the fresh trash is "capped," or covered over. This helps to keep rats and other pests away and prevents loose trash from being blown about.

In this case, the covering being used is called "fluff." It's made from the shredded interiors of junked cars--a great example of recycling at work.

Later, when a landfill is closed, it's covered with soil and then seeded with grass to make sure that everything is held in place.

Careful measures are taken to deal with the methane that's produced by garbage rotting inside the landfill. And that's where this pipe comes in.

It's part of the state-of-the-art methane recovery system here at this landfill.

As the organic material in the garbage buried in the landfill decomposes, it gives off large amounts of methane gas. This is the same gas that's produced in wetlands by rotting plants.

At this landfill, methane gas is collected by wells, like this one, that are drilled deep down into the garbage. The methane gas is then compressed and sent by pipes to a nearby correctional facility where it's burned as fuel.

The closing of older landfills, combined with the high cost of building new ones, as well as the opposition of many people to having a landfill near where they live, is forcing many communities to explore other ways of disposing of at least some of their garbage.

Burning, or incineration, is one of these options.

I'm standing in front of one of the kind of modern facilities that are increasingly being used to burn our garbage. A so-called "waste-to-energy" plant, this incinerator uses the heat from the burning garbage to power steam generators.

They produce electricity which is sold to the local utility company.

Incinerators are becoming popular in densely populated areas where high property values and strong citizen opposition make new landfills both expensive and politically difficult to build.

However, as is true with all other ways of getting rid of our garbage, incinerators aren't without their opponents.

Some critics, for example, feel that burning is a very wasteful way of disposing of garbage, and, that instead, communities should recycle far more than they do now, to recover metals and other useful materials, such as newspapers, cardboard, and plastics.

To burn them, opponents of incineration say, is a total waste of potentially valuable resources that it would be much better to recycle and reuse.

Some opponents believe that burning garbage is not good for our health. For example, scientists know that incineration concentrates poisonous materials, such as heavy metals, and leaves them in the ash.

This incinerator ash, which we see here being dumped into a special landfill can, under some circumstances, later release these poisons, thus increasing the risk of polluting the environment.

One way of guarding against such pollution is to dispose of all incinerator ash in specially constructed landfills, such as this state-of-the-art facility in Fairfax, Virginia.

Built with thick, leak-resistant liners and carefully monitored, such landfills are designed to prevent any poisons from escaping from the incinerator ash into the environment.

Incinerator operators must also be careful that nothing dangerous goes up their smoke stacks. That's because whenever garbage is burned, pollutants, such as mercury, lead, dioxins and PCBs, can be released into the atmosphere.

People who favor incinerators claim that modern air quality systems keep such poisonous emissions to a safe, acceptable minimum level. Critics, on the other hand, claim that unacceptable amounts of poisons can, at times, still escape into the atmosphere.

Obviously, this is a question that won't be settled until more research is done.

As you can see, it's pretty cold out here today, but actually, I'm quite warm.

And that's because I'm wearing a bunch of recycled plastic bottles.

This hat, jacket and gloves that I'm wearing from Patagonia Company are made from discarded plastic bottles, like this one, that are ground up into chips and then processed to make a durable, warm fabric.

And that's what recycling is really all about.

The ways of getting rid of our garbage we've explored so far--burying it in landfills and burning it--are based on the idea that our trash is worthless, is bad, is a problem to be gotten rid of.

There is, however, another way of looking at our garbage.

We can look at at least some of our garbage as something good, as a resource from which we can benefit. And that's where recycling comes in. Recycling turns many kinds of garbage into something useful.

Take, for example, the countless millions of metal cans we throw away each year. They're an important source of valuable metals and a great example of trash that we're successfully recycling into something useful.

Here we see a magnetic sorter that's separating steel from aluminum cans. As the cans to be sorted pass under the magnetic belt, the steel ones are attracted to it and carried to the side where they are dropped in a storage bin.

But because the aluminum cans are not attracted to the magnetic belt, they continue on under it to another collection bin.

The cans are then taken to a compacting machine that crushes them together into large bales.

These are then shipped to factories where the metal in the cans is reclaimed and used again.

Here, for example, we see ground up recycled aluminum cans being melted. The melted aluminum from them is then cast into huge slabs that are called ingots.

These ingots are then squeezed over and over again until they are flattened into thin sheets. These are wound into large rolls and then stored until they are used to provide the aluminum needed to make new cans or other aluminum products.

The whole process is so efficient that much of the aluminum in the cans we throw away today, will be used to make new ones within a few weeks.

That means the aluminum in these cans has, more than likely, been used to make dozens of cans before, cans that have been, and will continue to be, recycled and reused over and over again.

Then there's paper. It's another recycling success story.

Across the country, we're successfully recycling newspapers and other paper products. Every year, for example, the Southeast Paper Manufacturing Company turns hundreds of tons of recycled newspapers into top-quality newsprint.

The process is so efficient that old newspapers are often recycled and remanufactured into new newsprint ready for the printer in a matter of days.

And here's a kind of recycling you may not have thought of before. I'm raking these leaves into a compost pile.

Composting is a great way of disposing of dead leaves, grass and other yard waste.

In a few months, the natural decay process will have broken the leaves down into rich, humus-like material. It's a great soil conditioner for gardens and flower beds.

But regardless of whether it's turning leaves into compost, waste papers into newspapers, used plastic into clothing and other useful things, or old cans into new ones, we all benefit from recycling.

And that's because recycling reduces the amount of garbage we have to get rid of, thus reducing the amount we need to bury in our already overcrowded landfills or burn in incinerators.

In addition, recycling also helps reduce the amount of energy used to make new products. Getting aluminum for new cans by recycling old ones, for example, uses only about a tenth of the energy needed to take aluminum ore from the ground and operate the huge plants needed to extract the metal from it.

This energy saving, in turn, helps to conserve natural resources, such as coal and oil, and cut down on the pollution that's produced when these fossil fuels are burned.

So far today we've talked about the after side of our garbage problem--about what we do with our garbage after the fact--after it has become part of our growing waste disposal problem.

Recycling, burning and landfilling are all such "after the fact" actions. They're all things we do with our waste after it's waste.

But we can also help by reducing our mountains of garbage before they become a problem. We call this approach "source reduction," and its aim is to reduce the amount of waste we create.

Here, for example, are some construction staples. They're sold in a typical "blister" or "bubble" pack.

They're a total of a hundred staples in these ten packages. The same number of staples are also sold in this box. But look at the difference in packaging in this box compared to these other ten packages.

Another way to reduce the amount of packaging that we produce is to buy things in bulk.

For example, this bulk pack of laundry detergent contains about eighty percent less packaging than the equivalent amount of detergent purchased in these boxes.

Buying things in concentrated form also helps cut down on packaging. Like with orange juice, this container of frozen concentrate makes about 64 ounces of juice after adding water, the equivalent to all these cartons of juice. And look how much less packaging is involved.

Garbage, it's a mess that won't go away. But it's also one with which we must deal.

There are no easy answers--no simple ways of disposing of the huge amounts of trash that we churn out every day.

But by working together, all of us can help to make a big problem as small as possible.

(The Instructional Video Quiz and the answers can be found on page 6 of this teacher's guide.)

THE GARBAGE STORY
Dealing With Solid Waste Disposal

Video Instructional Quiz

Directions: Mark the boxes on your answer sheet either True or False or fill in the blank with the correct answer when you hear the tone.

T F

1. [] [] We dispose of most of our municipal solid waste by burning it.
2. [] [] Some critics oppose incinerators because they feel they are a wasteful way of getting rid of garbage.
3. [] [] It takes about the same amount of energy to recycle aluminum cans that it does to mine and process the aluminum ore in the first place.
4. Trying to cut back on the amount of garbage we produce before it becomes a problem is called source _____ .
5. One of the aims of recycling is to use the things we throw away to make something _____ .
6. The potentially poisonous liquids that seep down through landfills are called _____ .
7. Waste-to-energy facilities use the heat from burning garbage to produce _____ .
8. Incineration can concentrate poisons, such as heavy metals, in the resulting _____ .
9. [] [] The decomposing organic material in landfills gives off methane gas.
10. [] [] Nationally, paper products make up over a third of our garbage.

THE GARBAGE STORY
Dealing With Solid Waste Disposal

Discussion Topics/Quiz

Directions: Answer the following questions as directed by your teacher.

1. How much garbage and trash (municipal solid waste) do Americans produce a year?
2. Name three of the ways in which municipalities dispose of their garbage and trash.
3. Of what kind of material is most of our garbage and trash composed?
4. How is recycling helping our landfills?

THE GARBAGE STORY
Dealing With Solid Waste Disposal
Glossary/Vocabulary

Ash: A by-product of burning municipal solid waste, or anything else.

Composting: The process of breaking down organic material, such as yard trimmings, by bacteria and fungi to a humus-like material that can be used as a soil conditioner.

Groundwater Contamination: The pollution of underground water sources; can occur when contaminants leach into groundwater from landfills.

Hazardous Waste: Any kind of discarded waste that may pose a threat to human health or the environment if improperly handled; may be solid, liquid or gas.

Incineration: A process used to reduce the volume of solid waste. Extreme heat is applied to combustible and semi-combustible materials.

Landfill: An area of land used to deposit wastes. Most of our garbage is disposed of in landfills. Many of these areas have reached their capacity and have been closed.

Leaching: The process by which soluble materials, such as pesticides and other contaminants, are dissolved and washed to a lower level.

Methane: A gas that is formed by the decay of organic material when oxygen is not present. Modern landfills take steps to capture methane and either burn it or sell it. Methane is a "greenhouse" gas.

Municipal Solid Waste: (MSW) Trash or garbage produced by our homes, institutions and commercial establishments, including schools, hospitals, restaurants and offices; commonly called "garbage" or "trash."

Organic: Substances that contain carbon, such as garbage composed of food and yard wastes or other materials that can be composted

Recyclable: Materials, often disposed of as waste, which can be reprocessed and turned into new materials for human use.

Recycling: The recovery and reuse of useful substances from waste materials; involves the collection of discarded materials and processing them into new forms which can then be used as raw materials for new products.

Source Reduction: Involves the manufacture and use of products that produce the minimum pollution, use the minimum packaging, and have a longer life.

Toxic: Poisonous or harmful to humans or other organisms.

THE GARBAGE STORY
Dealing With Solid Waste Disposal

Vocabulary Review

Directions: Match 1 through 10 below with the word(s) it defines at the bottom of the page.

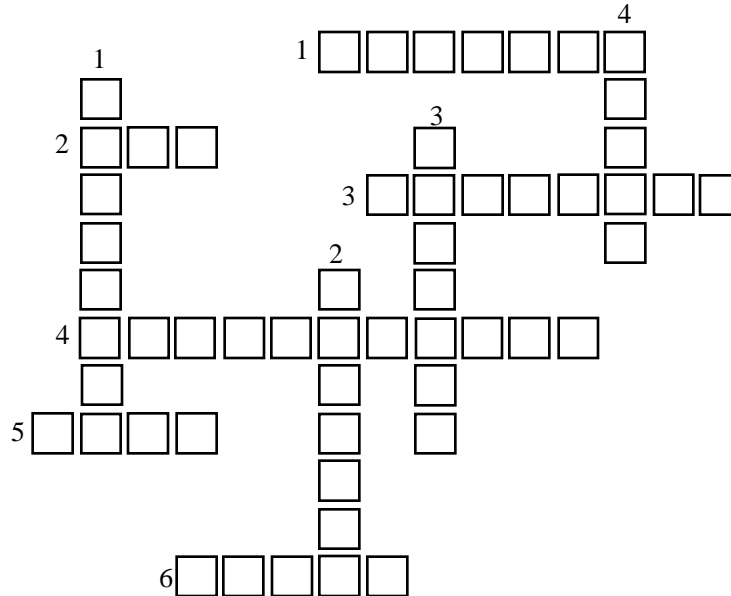
1. _____ A gas that is often either burned or collected at landfills.
2. _____ The recovery and reuse of useful materials from waste.
3. _____ Poisonous, harmful.
4. _____ Is left when something is burned.
5. _____ Where we deposit most of our wastes.
6. _____ Where we burn trash. Sometimes heat from the process is used to produce electricity.
7. _____ The process by which solublecontaminants seep down to lower levels in a landfill.
8. _____ The process by which organic wastes are broken down by bacteria and fungi.
9. _____ Trash or garbage produced by our homes, institutions and commercial establishments, including schools, hospitals, restaurants and offices.
10. _____ Involves the manufacture and use of products that produce the minimum pollution, use the minimum packaging, and have a longer life.

- | | |
|--------------|--------------------------|
| A. Ash | B. Composting |
| C. Methane | D. Municipal Solid Waste |
| E. Toxic | F. Source Reduction |
| G. Recycling | H. Incinerator |
| I. Leaching | J. Landfill |

THE GARBAGE STORY
Dealing With Solid Waste Disposal

Crossword Puzzle

Directions: Fill in the blanks using the clues given below.



Down:

1. The most popular way of getting rid of trash.
2. Reduces the amount of trash in our landfills.
3. A gas produced by landfills.
4. Poisonous.

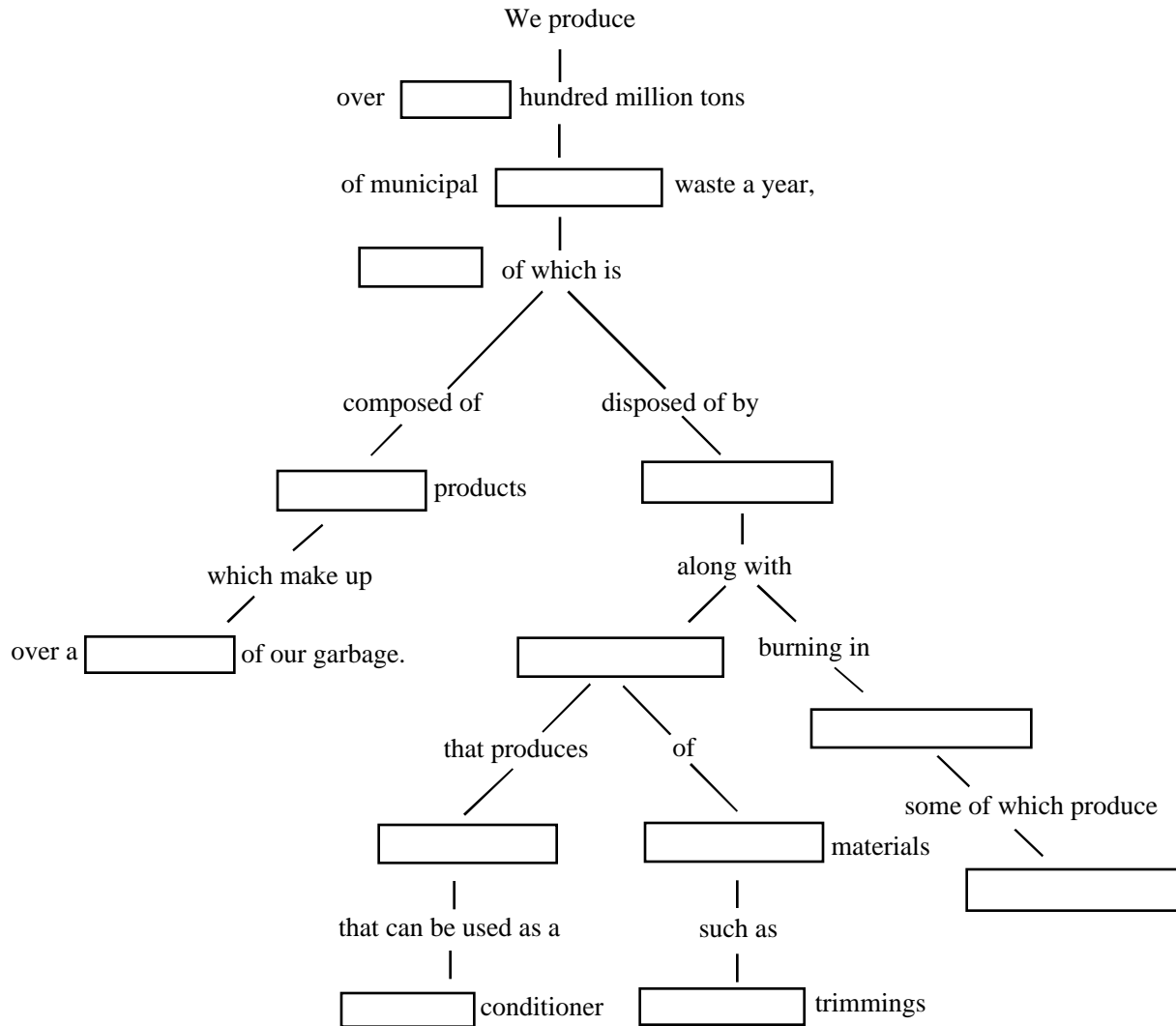
Across:

1. Made by decay.
2. Left after burning.
3. When potentially poisonous substances sink to lower levels in landfills.
4. Where wastes are burned.
5. Can be used to line landfills.
6. Makes up most of our trash.

THE GARBAGE STORY
Dealing With Solid Waste Disposal

Concept Map

Directions: Fill in the boxes from the list of words given below.



Word List:

- | | |
|--------------|-------|
| Composting | Paper |
| Electricity | Soil |
| Humus | Solid |
| Incinerators | Third |
| Landfilling | Two |
| Most | Yard |
| Organic | |

THE GARBAGE STORY
Dealing With Solid Waste Disposal
Composting

Objective:

You will see how the composting process works by actually creating a compost pile and monitoring it.

Materials:

Pitchfork, shovel or rake
Outside area - 4 feet by 4 feet
Thermometer
Notebook

Background:

Solid waste, such as vegetables, food scraps, leaves, yard clippings and even some paper can be composted. Composting is a process by which organic municipal solid waste decomposes into a reduced material, such as a rich soil called humus. Composting is very easy to do, requires few materials or equipment, and is a natural occurring process. Microorganisms gradually decompose materials. In nature this occurs everywhere so that dead leaves, animals, and even large trees get smaller and seem to fade into the earth. Using a variety of strategies, such as secreting enzymes, physically breaking up organic material, and in some cases ingestion, organisms gradually break down dead things. Humans use this natural process by taking things we normally throw away and composting them into rich humus, which provides valuable nutrients and mulch for gardens. In some parts of the country composting is done on a large scale for whole communities at a central location. But it is most commonly done in people's backyards in small compost piles or containers.

Procedure:

1. In this activity you will actually create a compost operation from certain organic wastes you would normally throw away. The first step is to figure out where to place your compost pile. You don't need a big area, only four feet by four feet. The compost can simply be put on the ground in a pile or you can create a compost container. A compost container could be a plastic container (such as an old garbage can), a metal barrel, or a wooden crate. Whatever container you choose, it must have lots of holes in it so that air can easily pass through all parts of the compost. If the compost is not well aerated, it may begin to develop a bad odor.
2. Once you have your compost container ready, begin adding waste, such as food scraps, leaves, or grass clippings. Try to avoid adding meats or food that contain animal fats. At the same time you are adding your first batch of compost, throw in about half as much dirt or topsoil. This should provide your compost with enough natural microorganisms to help the compost decompose.
3. After mixing the compost with the dirt, record the temperature with a thermometer. Take the reading toward the middle of the pile. Write down the temperature.
4. Next day, record the temperature and write down any changes you see in the compost. Add more compost if you like.

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Name _____

THE GARBAGE STORY
Dealing With Solid Waste Disposal

Composting (Continued)

5. Record the temperature as well other observations for five days. On the fifth day take a shovel or pitchfork and turn over the compost. Record your observations while doing this.
6. Continue taking the temperature and making observations for at least 10 to 15 days. Turn over the compost every five days.
7. Continue your compost operation as long as you like. Eventually you will produce beautiful, rich, dark compost which you can use to fortify gardens.
8. After you have recorded the temperature of the compost for 10 to 15 days, graph the data. What trends do you notice? The temperature should have risen. Why did this occur?

Conclusion:

Answer the following questions:

1. Describe what natural composting involves.
2. What are the advantages of composting?
3. How does composting reduce the amount of solid waste placed in a landfill?
4. What role do microorganisms play in the composting process?
5. Things like aluminum cans and plastic bottles cannot be composted. Why?

THE GARBAGE STORY
Dealing With Solid Waste Disposal

Incinerators: An Issue of Debate

Objective:

You will research, discuss, and debate the positive and negative attributes of incinerators.

Materials:

Several articles covering the positive and negative attributes of incinerators.

Paper and pencil

Background:

In the United States incinerators burn about 27 million tons of municipal solid waste (MSW) each year. This represents approximately 15 percent of all the MSW in the U.S. There are both advantages and disadvantages in utilizing incinerators. Communities must weigh the pros and cons of building an incinerator to take care of their MSW management needs.

Procedure:

1. Begin the activity by making a list of the possible means to dispose of our trash.
2. Possible routes of discarding trash is to landfills, composting, or incinerators. Incinerators burn or combust garbage. In some cases heat produced by incineration is used to produce energy. Go to the library to get information on how incinerators work. Make a diagram of an incinerator which illustrates features such as the disposal pit, furnace floor, boiler system, turbines, and ash collectors, smokestacks, and scrubbers. Write a brief sentence about each part of the diagram you label.
3. After making a diagram of an incinerator, try to obtain two to three articles which discuss how incinerators work. The articles can come from magazines, newspaper, or an encyclopedia.
4. Make a two-column list with the first column titled "Pros" and the second column titled "Cons." Under each column list the pros and cons of using incinerators. When making your list you may want to consider issues relating to garbage disposal, transportation of garbage, generation of electricity, effects on the environment, and effects on people. You can get this information from your research articles, by calling experts, or by discussing them among yourselves.
5. After making your lists, hold a class discussion or debate focused on the pros and cons of incineration.

Conclusion:

Following the discussion or debate, hold a class vote to decide if an incinerator should be built in your community. After tallying the vote, discuss the results. Discuss the consequences of the decision. Who will benefit and who will not?

THE GARBAGE STORY

Dealing With Solid Waste Disposal

Reduce, Reuse, Recycle

Objective:

You will identify ways the school can reduce, reuse, and recycle garbage.

Materials:

Paper and pencil

Clipboard

Data on school garbage weights

Background:

Not all garbage needs to be thrown out, sent to a landfill or incinerated. Much of the garbage we throw away can be put to good use. Glass, aluminum, and plastic containers can be recycled into new containers. In some states a refund is even offered for every container that is returned. There are three main ways we can decrease the amount of garbage we throw away: reduce, reuse, recycle. Ways of reducing garbage start at the source. For example, do not buy things that make a lot of garbage, such as overpackaged products, or things you don't need. Reuse means to use products again before you throw them away. For example, instead of throwing away grocery bags, keep them until you need a bag for some other reason. Recycling of many products is becoming more and more common. Through recycling garbage is used to make new products. For example, plastic bottles can be used to make new plastic bottles, sneakers, and even clothing.

Procedure:

1. List ways you have observed your community taking positive action to reduce, reuse, and recycle.
2. Make a list with three columns labeled: Reduce, Reuse, and Recycle. Under each column list types of garbage that could be managed in this manner. For example, under the Reduce column you might put packaging or buying food in bulk. Under the Reuse column you might put plastic containers. And under the Recycle column you might put newspapers. Hold a class contest to see who can come up with the most ideas.
3. Believe it or not, over 60 million students in the United States, along with teachers and administrators, generate about five to seven million pounds of garbage each year. This is a lot of garbage, and much of it could be reduced, reused, or recycled with a little work and creative thinking. Take 15 to 20 minutes to think of ways your school can reduce, reuse, and recycle.
4. To understand the different types of solid waste your school produces, it will be necessary to go on a fact-finding mission. Divide into small groups, each responsible for different parts of the school. The following parts of the school should be researched to see what type of garbage is thrown away: cafeteria, administrative offices, maintenance, classrooms, art room, and gym. Take a clipboard, paper, and pencil to visit your assigned area. You may need to make an appointment first. Ask the person responsible for the area what type of garbage they most commonly produce on a daily or weekly basis. Take the data back to your classroom.
5. Each group should evaluate their list to identify any trash that could be recycled or reused. Write these items on the chalkboard.

Conclusion:

As a class, decide how you can help your school reduce and recycle. Think of ways you can help the different parts of your school to go about this process. Develop a plan of action. Once you have decided on a plan, go about putting it in place.

THE GARBAGE STORY

Dealing With Solid Waste Disposal

Tracking Your Trash

Objective:

You will identify the different types of garbage which make up the solid waste stream through mathematical computations and graphing. You will then take an inventory of your personal garbage production by keeping a garbage journal.

Materials:

Notebook, colored pencils, graph paper

Background:

The composition of garbage and its movement from creation to disposal is referred to as the solid waste stream. The waste stream includes paper, containers, food scraps, packaging, yard clippings, and other types of waste. The United States produces huge amounts of garbage--over 200 million tons each year. Understanding the composition of our waste is important in developing strategies for managing our garbage.

Procedure:

1. Numerous graphs can be generated from the data provided in Table 1:
 - a. Create a pie graph or bar graph of the data in Column 1, "Weight Generated."
 - b. Create a pie graph or bar graph of the data in Column 2, "Weight Recovered."
 - c. Create a pie graph or bar graph of the data in Column 3, "Percent of Generation."

Table 1

Generation and Recovery of Materials in Municipal Solid Waste (MSW) in the U.S., 1993

(In millions of tons) Note: This information is slightly different than that in the video program.

	Weight Generated	Weight Recovered	Percent of Generation
Paper	77.8	26.5	34.06
Glass	13.7	3.0	21.89
Ferrous metals	12.9	3.4	26.35
Aluminum	3.0	1.1	36.66
Nonferrous metals	1.2	0.8	66.66
Plastics	19.3	0.7	3.63
Rubber and Leather	6.2	0.4	6.45
Textiles	6.1	0.7	11.47
Wood	13.7	1.3	9.48
Other Materials	3.3	0.7	21.21
Food Wastes	13.8	Neg.	--
Yard Trimmings	32.8	6.5	19.82
Misc. Inorganics	3.1	Neg.	--
Total Municipal Solid Waste	206.9	45.0	21.75

Source: Characterization of Municipal Solid Waste in the United States: 1994 Update, Environmental Protection Agency, EPA 530-R-94-042. Washington, D.C. November, 1994.

(Continued on Blackline Master 10a)

THE GARBAGE STORY
Dealing With Solid Waste Disposal
Tracking Your Trash (Continued)

2. Use your graphs to answer the following questions:
- a. What is the greatest type of waste generated? What is second and third?
 - b. How many millions of tons of waste are produced each year?
 - c. What is the greatest type of waste recovered (recycled)? Why?
 - d. What percentage of MSW (municipal solid waste) is presently recycled or recovered?
 - e. What types of materials do you think can be easily recovered but are not?
3. It is estimated that each person in the United States produces about 4.4 pounds of garbage per day. To see if this average applies to you, do the following for two days:
- a. Keep a log of all the pieces of garbage, such as paper, cardboard, wrappers, tin cans, newspaper, and food waste, that you throw away.
 - b. Throw all your garbage into a separate trash container. After two days, weigh the trash bag. How much does it weigh?

Conclusion: Compare your data with the data of other students by writing it on the chalkboard. Put the garbage into different categories: paper, cans, food, plastic, etc. Try to figure out which pieces of garbage could have been recycled or reused.