Waste Audit Upgrade

## Grade: 7-8, or 9-12 with extension

Time Allotment: Teacher Preparation: 30-60 minutes

Lesson and Activity: Part I, 20-30 minutes. Part II, 20 minutes.

CCCS

Math 4.1.7.A.3., 4.1.7.B –D., or 4.1.8 A. 5., 4.1.8 B.1.&4., 4.2.8.D.

Language Arts 3.2.12.D.2, extension 3.1.12.H.1

Science 5.1.8.B.1

Social Studies 6.1.12.C.16.a

Objectives: Students will –

List major components of residential waste, especially paper and plastic, and note their relative proportions in the waste

Explain how a very small portion of waste can cause big management problems

Explain human behavior’s role in the environmental problems caused by packaging

Understand that weight and volume of trash may not be closely linked

Predict, observe, categorize and record

Compare their functional categories to the state’s material categories

Calculate percentages of a whole

Materials:

For teacher’s presentation and the entire class:

-Chalk or white board or flip chart and markers for same.

-bathroom scale or big kitchen scale or science balance scale.

-Clean garbage bags, small.

-Newspaper on which to spread the garbage to keep the desk neat.

-Chart of normal waste audit results

-Fat permanent marker

-Index cards

- Rubber gloves

### Anticipatory Set

Two choices; the teacher may collect her trash for one or two days and bring it in, in its bags. Alternately, she may ask one or two students to do so. (Consider that they should not include personal trash such as medication containers, paper with personal data, and anything really disgusting like used tampons).

She should place this on her desk, and state that it’s her garbage. She should ask:

* 1. What do you think makes up most of my garbage? (Any answer will do: it’s a hypothesis.) Record these hypotheses.
	2. What is the lumpiest portion? What is the heaviest? (Lumpy might be packaging or food, heavy might be cat litter. They’re not the same.)
	3. Do you think I accidentally let recyclables into the garbage? (Probably.)
	4. If we open the bags and examine and separate the garbage into piles, what piles should we create? (Reasonable guesses would be food, clothing, broken houseware, hazardous waste, empty containers, metal, plastic, etc.)

Explain that you can categorize garbage by its material, or by its function. Both are done by various governments who want to know what’s in the trash. In this case, the class will sort by function. What did the garbage do, not what it’s made of: Food, clothing, broken housewares, hazardous waste, empty containers, anything else the students suggest.

* 1. Why would a government want to know that? (Because it costs money to dispose of trash, because it may be hazardous and need special handling, because they need to anticipate whether they have landfill space for it all).

Teacher’s Presentation or Modeling

1. Teacher creates a chart (or asks a student to do so) to allow for recording of weight of categories and number of items.
2. Enlist a student to assist in tallying the items.
3. Wearing rubber gloves, break open the garbage: sort into bags. Label the bags as you go. Make sure one bag is marked “packaging”. Have the students call out what category the waste goes into.
4. Once everything is sorted, weigh the bags and record the weights. You already have the number of items.
5. Ask:
	1. Is weight related to number of items? (No, an appliance will weight a lot. Packaging weighs little yet we’re likely to generate many little bits of it.)
	2. Were we right in our hypotheses? (Will vary.)
	3. Do you think this is typical trash, nationwide? (Answers will vary).
6. Share the table of what’s in MSW. It will probably be a bit different than the teacher’s waste, but maybe not by much.
7. Explain that the table is getting old, since the survey was done in 2005, but people’s habits can change very slowly, so it’s a good estimate of generation and content. (Internet shopping has increased use of cardboard boxes a bit.)
8. You can see that cardboard and paper is a bid chunk of the “municipal solid waste stream”, (garbage that comes from homes and shops and institutions). But cardboard, which is used for packaging, is only part of that. It’s between 7% and 10% of the MSW. There’s a lot more cardboard out there, but it’s being recycled into new boxes and doesn’t cause environmental problems. Plastic bags and shrink wrap make up most of “plastic film”, which makes up 5%. Cans and bottles make up 5%. So packaging materials are only making up about 20% of the waste.
9. Was it more or less that students expected?
10. Teacher’s choice: either help students turn those pounds and ounces into percentages, or assign this below as independent work.
11. Throw out the bags of trash. Tidy up the table.
12. Think of items that could be recycled, but often aren’t: clothing and textiles is a common one. Note how to do it locally. (Usually a bin in a parking lot, but also Good Will, Veterans, or other agencies.)

Guided and Independent Practice

* Optional: have students turn all trash weights to ounces (or retain in grams if recorded that way.). Calculate percentages of each bag as part of the whole. Optional: have some students do each category, just to double check the numbers, but don’t have each student calculate all categories. This will expedite the activity.

##### Closure

1. Conclude: the biggest portion of our MSW may not be the most problematic. Because packaging is small, it can escape trash bags (that’s why many towns require disposal in cans), and get into storm sewers, and blow around. Because packaging is often plastic, it doesn’t decompose and hangs around. Toys are lost down storm drains, and show up in the bay. This is being prevented as each town adds baffles to storm drains.
2. The problem is not only a technical one, it’s a behavioral one. Much of the trash is not escaped, but dumped.
3. Teacher asks why people behave this way, and who’s responsibility it is to clean the bay. (Many answers are valid.)

Assessment:

1) Teacher will assess whether students could identify the packaging materials as sorted by their contributions to discussion during sorting.

2) The teacher will assess students’ understanding of sorting by function rather than by material by evaluation of verbal response.

3) Teacher will assess student ease with calculating percentages.

4) Optionally, teacher may assess group performance when working together on a mural, skit, song, poem or other creative expression summarizing the results of their sort.

Extension of Lesson:

1. Student can discuss what would happen if New Jersey had a bottle bill. Would people really clean up the highways to cash in the ten cents?
2. Students can find out if their town has a strong Clean Communities program and find out what they do and how they spend their money. They can find out how Clean Communities gets its money (tax on disposable beverages sold).
3. Teacher can move on to a lesson on why people litter (How did it get there?).
4. Food is a big part of MSW. Students can research communities where the government has banned food from landfills and incinerators and built food composting plants. They use taxpayer money to do so. Students can explore the pros and cons of this. (See San Francisco for instance).
5. This can be tied to renewable and nonrenewable resource and global sharing of resources, depending upon the school’s curricula.
6. Students can research how communities try to prevent littering.

Teacher resources:

Municipal Solid Waste, MSW, is the garbage from our homes and shops and institutions. In New Jersey, this is almost always picked up by the same companies and trucks, so that we can’t get an accurate accounting of which garbage is generated in homes and which is shops. The two categories tend to be alike. MSW doesn’t include the waste of industry: more often, those materials can be separated and recycled from those sources. But MSW is always a messy mix of materials that resist recycling.

Note that paper and cardboard make up a big part of MSW. That’s a failure of people to separate – markets exist for the material, which is to say that businesses and communities can have it picked up free in most cases, since the hauler can sell it. Trash costs money to remove. This is something that the students and the school can improve: zero tolerance for paper in the trash.

The teacher, when bringing her trash in, can simply grab the latest bag, but could surreptitiously change the mix in the garbage before bringing it in. It should however be reasonably representative of the teacher’s garbage.

**New Jersey’s Waste**