CEH Hands-on Waste Audit Lesson (60 minutes)

Before Class Preparation

Print material preparation at least a day before the class:

- ❏ Print and Collect a class set of CEH Waste Audit Analysis Journal.
- ❏ Print and Collect CEH Waste Audit Data Sheets (student) for each waste audit group. Write the names of the group, date, school, and class on the data sheets.

Materials preparation at least a day before the class:

TRASH

- ❏ Organize a collection of school waste with the custodian of the school. Make sure to check in with the custodian multiple times to ensure **two large bags of cafeteria waste** will be waiting for you at the school before the lesson begins.

Materials

- ❏ 4 tarps of 4 different colors (preferably: red, green, yellow and blue).
- ❏ 2 boxes of gloves small or medium for students.
- ❏ 4 hook scales and extra batteries. Check function and batteries.
- ❏ 2 rolls of garbage bags. Make sure you have at least 15 bags. Collect a 1 roll of clear garbage bags.
- ❏ 12, ten-gallon bins (preferably 4 recycling (blue), 4 compost (green), and 4 landfill (gray)).
- ❏ One class set of child aprons (35)
- ❏ One class set of child Safety Goggles (35)
- ❏ Place the safety goggles into a set of 4 cloth drawstring bags (color coded if possible)
- ❏ Place the apron into a set of 4 mesh drawstring bags (color coded if possible)
- ❏ 4 clip boards (green, yellow, blue, red)
- ❏ 3 markers and 1 pencil (green, blue, red, yellow pencil)
- ❏ 2 plastic bins to place the above items into.
- ❏ 1 cart that can hold the bins.
- ❏ A bucket of cleaning materials (small brooms and dustpans, spray bottles, sponges).
- ❏ A large bottle of hand sanitizer.

Preparation immediately before class:

- Check to make sure the **two large bags of landfill waste** have been collected.
    - Optional: You can differentiate the waste from one stream (singularly landfill) to three streams (compost, recycling, and landfill). One bag for compost, one for recycling, and a large bag of landfill. You will split the landfill bag into two.
- Find an appropriate area for waste audit setup.
- Put down all four colored tarps in the area. Allow for some spacing.
- Place bags into each of the 12 bins. If you have green or compostable bags, make sure they end up in the 3 compost bins.
- Place 3 bins (landfill, recycling, and compost) on each of the 4 tarps.
- Distribute the waste bags equally into four equal bags. Place each bag on the tarp. Do a brief search of the waste and remove items we don't want students to handle.

Activities and Time Break Down

Title	*Time*	*Activity*	*Evaluation*	*Lead*
Information from Waste	10 min	Lecture	Directions followed	
Waste Sorting	20 min	Small group hands on	Participation and comments	
Waste Expert	10 min	Small group hands on	Waste sorted correctly and comments	
Waste Audit Data Collection and Clean	20 min	Small group hands on	Data collected and clean gear	

Lesson Goal:

Students will sort the waste from a school lunch and will discover the weight and makeup of their school's cafeteria's waste from a single day.

Lesson Objectives:

Students will:

- ❏ Sort waste from lunch in large groups.
- ❏ Make predictions about types of waste.
- ❏ Make predictions and learn how many food trays and food packaging items come from a single lunch day.

- ❏ Find the weight of contamination in landfill waste.

Information from Waste (10 min)

1. Get students' attention and direct it to the waste bin in the classroom. Dump out the contents, and start browsing through items. Have students think about what information you can gain going through the waste and why it might be important.

    Example Scenario: Pretend like you lost something and you think it ended up in the waste bin. Start by looking for it, but become fascinated with the other items in there. Put on gloves if need be. Pull out interesting false items (old homework, gum, broken pencil, candy wrappers, notebooks, bandaids, coffee cup) if need be. Talk while you're sorting and learning through the trash.

2. Explain what knowledge can be gained by going through waste exploration.

    Teacher Talk: You can learn so much about people by going through their waste. Anthropologists or scientists that study past humans and their behavior will look for waste piles when excavating ruins because the trash or waste of a civilization can give many insights into how that civilization lived. Do any of you do anthropology at home? Or, in other words, do any of you take out the trash at home or sort the trash and/or the recycling? Show me on your thumbometers if you do it all of the time, some of the time or none of the time. Allow for students to share answers.

3. Have students consider the school's waste and discuss how the school handles waste disposal. Are there things that the school could improve?

    Teacher Talk: Since some of you are anthropologists at home, maybe we can use your expertise at school. How do you think your school system is at sorting waste in the cafeteria during lunch? Do you think there are ways the school could improve? Turn and talk with your neighbor.

        Clean up the trash scenario while students talk. Gather Students' attention. No student share out at this time.

    Teacher Talk: How could we investigate how well the school is doing at sorting waste? Turn and talk with your neighbor

        Allow for student share outs. Lead students to measuring weight (and/or volume) of the waste and then seeing how much waste could have been recycled or composted.

    Teacher Talk: Well, today we are going to see how good our school system is doing at sorting waste. We are going to go outside to collect some data about your school's waste or trash. Everyone is going to put on goggles, aprons, and

gloves and sort through the waste the cafeteria made yesterday. By doing this, everyone of you will become an Anthropologist, or someone who studies human cultures or societies. To become these anthropologists we all have to sort the trash together and see if we can learn something about our school's culture around waste.

4. Establish the call word "Contamination:" wrong thing in the wrong place. Write it on the board.

   Teacher Talk: Since we are going to go outside and look at waste, I will need to be able to get your attention quickly. We are going to use a call word. That word is **Contamination.** When you hear it, you say, "Contamination! Wrong thing in the wrong place!"

   Practice with the students.

Waste Sorting (20 min)

1. Go over the rules of being outside and sorting trash. List rules on the board.

   Teacher Talk: I am so happy to see so many folks want to become Anthropologists today. To do that, we need to do some science on garbage! So we are going to go outside to collect some data about your school's waste or trash. We are going to perform a waste audit and sort some trash together. Everyone is going to put on goggles, aprons, and gloves and sort through the waste the cafeteria made yesterday. To do this, we need to go over some of the ground rules.

   a. Don't Throw Waste.
   b. Don't Eat Waste.
   c. If it looks dangerous, tell an adult.
   d. Keep gloves, goggles, and aprons on at all times.
   e. Teamwork.
   f. Keep all waste on the tarps or plastic blanket.

2. Transition outside, and place students into 4 different groups.

   Teacher Talk: We are going to go outside in a line. Once we get out there I would like you to make a toes touching toes circle.
   Example Teacher Talk: I am going to number you off 1-4. When I number you, hold up that number on your fingers.

   Example Teacher Talk: When I say "Environmental Health" I want the "ones" to go to the blue group, twos the green, threes the yellow, and fours the red. I want

everyone to put just one foot on the tarp of your group color.

3. Check for understanding of rules and distribute Waste Audit gear.

   Teacher Talk: Once you get to your group, your group has to tell me (or another adult) the six rules of the waste audit before we give you the aprons, and goggles. Once everyone in the group is wearing their aprons and goggles, I will give out the gloves to put on. Group members can help each other tie on the aprons. It is easiest to tie the springs in the front. We will not start sorting waste until everyone in the group is wearing the apron, goggles, and gloves.

   Once each group tells you the rules, give them the aprons and goggles.

4. Explain the sorting task and allow students to sort waste items from their own knowledge. Do not provide assistance if they ask what goes where.

   Teacher Talk: Today we are going to sort the waste from the cafeteria into three different bins. The green bins are for compostables. Compostable items can be broken down into compost or healthy soil. The blue bins are for recycling. Recyclable items contain materials that can be used again to make something new from something old. The gray bins are for the landfill. These items will be sent to the landfill where they will stay forever. I want to see if you and your group can decide which items from the school cafeteria go into which bin. I want to know what you know, so I (and the other adults) will not be answering questions about “Where does this go?” at this time. Everyone will sort the waste and you will only have a certain amount of time to sort all the waste into these three bins. Any questions?

   Answer questions about the task, but do not specify which item goes where.

   If the question: “Do we have to?” comes up, encourage all students to sort, but if there are resistant students, do not force them to sort. Digging through waste is not for everyone. Have them sit and observe the sorting. Leverage the teamwork group agreement and timing urgency to make sure each group completes sorting their waste.

   Teacher Talk: Begin Sorting!

5. Have students sort. Give timing updates.

Waste Expert (10 min)

1. Gather the students' attention and address the entire class. Have students rate how well they sorted.

2. Have students discuss how well they sorted and some things that could help them be better sorters.

    Teacher Talk: What are some tools that would make this sorting task easier? Turn and talk.

        Allow some students to share out.

3. Explain that sorting waste is actually hard, and that it is good to ask an expert if you do not know.

    Teacher Talk: Sorting waste can be tricky and there is a lot of different information out there. If I am not sure where something is supposed to go, I try to contact an expert. We could use the internet to check, but there is actually an expert waste sorter right here.

    Call out whoever the expert sorter is. If you are teaching alone, it will be you. If you have another person you are teaching with, incorporate them as the waste expert.

4. Visit each group sorting station with the class and explain where three items should be placed.

    Teacher Talk: The green bins are for compostables. Can anyone tell me what from a school lunch can be composted?

        Lead students to food, partially eaten food, inedible food scraps (banana peels) and paper products (napkins, molded fiber trays)

    Teacher Talk: The blue bin is recycling. Can anyone tell me what from a school lunch can be recycled?

        Note: This is different in different places.

        - In general, metals are the easiest thing recycled and the most valuable. Aluminum cans and tin foil are the most common metal items that are recyclable at lunch
        - Paper is also readily recyclable, but unfortunately would get very wet in the waste bin in the cafeteria. We say paper products (brown paper bags and napkins and molded fiber trays) should be **composted.** Some paper products have a glossy coat (Milk cartons and Lunchable cardboard boxes). These might be able to be recycled, but in general cannot be composted. Some might need to go into the landfill depending on waste infrastructure. You might have to check with your local hauler to see what they take.
        - Plastic is not easily recycled. If you have plastic recycling, it is usually for hard plastics (specifically Number 1 and 2, although

many will take Numbers 3-6 & 7). Plastic water bottles and yogurt cups are examples of recyclable plastic. Flimsy plastic (sandwich bags and Capri Sun Juice pouches) are not recyclable.

- Polystyrene (Styrofoam) is really not recyclable. It costs more to process it than what you get out of it. If you can “recycle” it at school, it usually means folks just compact it. The Compacted EPS bricks do not sell and often just end up in the landfill.
- Materials that are mixed (plastic bottle with metal lid) need to be sent to the landfill.
- Items that are particularly small (straws, plastic forks and smaller) will most likely end up in the landfill. The recycling machines require a certain size item and everything else will fall through the grates and get into the landfill ultimately.
- If you are unsure, it will most likely be sent to the landfill.

Teach students that metal is recyclable, paper is not recyclable in the lunchroom, and plastic can be recycled, but often is not.

Teacher Talk: The gray bin is landfill. Can anyone tell me what from a school lunch should go to the landfill?

Lead students to flimsy plastic, chip bags, plastic straws and utensils.

5. Explain that students will have another chance to sort with new helpful tools.

   Teacher Talk: Now with some new found knowledge, let's see how well you can sort your materials. You can also ask me or the sort expert where things go.

6. Optional: If you have helpful sorting pictures, have students place them on the waste bins.

7. Have students sort their waste again. Circulate and check for understanding.

Waste Audit Data Collection (10 min)

1. Once students have correctly sorted most of their groups' waste, assign a student in each group to be a weigher, tray counter, utensil counter and a recorder. Tell students how to operate the scales with their bags of waste.

   Example Teacher Talk: These scales have smiley faces on them. The smile turns the scale on and off. When you turn the scale on, it should be blue and the weight should read 0.0 with nothing on the hook. It should also be in pounds (lbs). Hold the scale high off the ground with the silver bar handle. Have someone collect the bag of waste and put it on the hook. Make sure the bag is completely off the ground. Eventually, the scale will say "Hold" in little letters. This is the weight of the waste. Have the recorder write it down. After this, remove the

bag and turn the scale off and then on before measuring the next bag.

2. Distribute Student Data sheets and scales.

3. Have students weigh their waste and record their findings. Circulate and encourage data collection. Make sure each student group collects the weight of each bag of waste and the number of trays and utensils in the waste. Give time checks. This is a great time to take pictures of students doing hands-on science.
4. Take pictures of the data sheet once they are completed. Do not move to clean up until all data is collected.

5. Gather students' attention. Begin the cleaning up process of the waste audit and collecting the gear.

   Example Teacher Talk: Thank you anthropologists for all your hard work in performing this waste audit. The last step of any good anthropologist or scientist is to clean up their area. We are going to make sure that the waste is in bags, the tarps are wiped down and folded, and the goggles, and aprons are put away. Once you all do that, we will dispose of the gloves in the landfill bins.

6. Finalize cleaning and transition students back inside.

   Note: Once the waste is bagged, you or the custodian can later dispose of it. If you do not have industrial recycling or composting dumpsters, you can throw it into the landfill dumpster. It was going there anyway. If you have means to recycle or compost (school garden composting for example) you can dispose of it there.

Background knowledge assumed:

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Potentially new vocabulary, terms, or multiple meaning words:

waste	trash	garbage	compost	landfill
sort/sorting	plastic	Contamination	Audit	scale
weight	volume	Anthropologist		

Worksheet and link
Journal
Data Sheet

NGSS and Common Core Standard:

Cross Cutting Concepts (CCC)
System and system models

Science and Engineering Practices (SEPs)
Asking questions (for science) and defining problems (for engineering)
Planning and carrying out investigations