
Rethinking Recycling in Our City

A Thinking by Design Project

Grades 6-12



Introduction

These lessons are designed to help students authentically engage in problem solving, research, brainstorming, prototype design, speaking and listening skills, and presentation skills. The core standards and skills covered are listed below. Students will examine the problem of waste in their community and the effectiveness of the current recycling options. Students will interview people in their community to promote creative thinking to solve problems. The learning objectives will be centered around why waste is a problem and how the problems of waste management relate to their community and lives.

Core Standards

These lessons can be used for almost any grade from 6th grade up to 12th grade. Skills listed are general and can be focused for specific grade levels as needed for differentiation and grade appropriateness.

Reading Standards

Reading: Literature Standard 1

Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

Reading: Informational Text Standard 1

Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

Reading: Informational Text Standard 3

Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.

Reading: Informational Text Standard 4

Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).

Reading: Informational Text Standard 7

Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

Writing Standards

Writing Standard 1

Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

Writing Standard 6

Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Writing Standard 7

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Writing Standard 9

Draw evidence from literary or informational texts to support analysis, reflection, and research.

Writing Standard 10

Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes.

Language Standards

Language Standard 1

Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

Language Standard 2

Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Speaking and Listening Standards

Speaking and Listening Standard 1

b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

Speaking and Listening Standard 2

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

Speaking and Listening Standard 4

Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed,

and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Speaking and Listening Standard 5

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Speaking and Listening Standard 6

Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.

Preparation

This project spans several activities and outcomes. There is a field trip, socratic seminar, brainstorming, community interviews, writing, prototype design and construction, and final presentation. Students will need access to the Internet for research, time for collaboration with their group, materials to design a prototype, time and access to community members, and computer access to create presentations.

This project will take several weeks. Many core standards are imbedded into the process and may be addressed along with and throughout the lessons.

Activity 1: Introduction of Problem and Research Task

Suggested Time: 60 Minutes

Lesson Overview: Students will be introduced to the concept of waste management and begin to develop claims about the problem.

Lesson Objective: Students will discuss and research waste management and determine how

Materials needed: Whiteboard, students need paper and pencils

Task 1: Quick Classroom Brainstorm

Ask students, “What do you think about when you hear the words, ‘waste and waste management?’” Write answers on the board.

Task 2: Quick Write and Share with a Partner

Have students think about how much trash they take to the curb each week. Do they fill their garbage can? Do they have to “pack it down” to get it to all fit? What kinds of trash does their family generate? Have students do quick write reflecting on these questions and then share out with a partner.

Task 2: Short Classroom Discussion and Calculation

Introduce the statistic that the average person generates 4 pounds of trash per day. Using this figure, have students calculate the amount of garbage they generate in a year, and how much their family generates in a year. Total the amount of waste generated by the families of everyone in the class. Based on the population of your city, determine the amount of garbage generated annually by the whole city. Write these totals on the board.

Task 3: Short Small Group Discussion

In small groups, have students reflect on these questions and be ready to share their collective answers with the class:

1. *How might the amount of waste the average person generates affect the future of our city?*
2. *What concerns do you see?*

Task 4: Writing Assignment

Have students use the following resources to explore the ideas discussed in class. This is a short writing assignment. They are writing a news article about waste management in their community and how it impacts the environment. Students must form a claim about waste management in their community and support their claim with evidence from their resources. They may focus on the ecological impact, economic impact, or any other focus they discover through their research as long as all claims are backed up with valid evidence.

Website Resources:

General Information on Waste and Recycling

<http://www.epa.gov/epawaste/>

<http://www.earth911.com>

<http://www2.epa.gov/recycle>

<http://www.aenvironment.com/environmental-concerns-recycling.htm>

Statistics on Waste and Recycling in America

http://www.kab.org/site/PageServer?pagename=recycling_facts_and_stats

<https://www.dosomething.org/facts/11-facts-about-recycling>

<http://www.sciencekids.co.nz/sciencefacts/recycling.html>

<http://recycleacrossamerica.org/recycling-facts>

Statistics on Utah Waste

http://www.deq.utah.gov/Topics/Waste/household_waste.htm

Information on Waste and Recycling for Ogden

http://www.ogdencity.com/en/community/public_services/garbage_recycling_services.aspx

Assessment Opportunities

Quick journal activities for learning indicators focusing on the scale of the waste would be a great indicator if students are understanding basic concepts. Another quick write on future problems of waste management in our city would be a great indicator if students are both engaged and understanding.

Activity 2: Trip to Local Land Fill and Green Waste Facilities

Suggested Time: Classroom time- 30 minutes, Field Trip time- 1/2 day

Lesson Overview: Students will participate in effective observation, collaboration, and interviewing skills

Lesson Objective: Students will observe the scale of waste management in their community and begin to consider possible solutions

Materials needed: Whiteboard, students need paper and pencils, sketchbooks, digital cameras, notebooks

Classroom Activities Before Field Trip

Task 1: Quick Classroom Brainstorm for Interview Questions

Brainstorm a list of questions students would like to ask in order to develop a more complete understanding of how waste management is handled in their communities. Write questions on the board and have students copy down questions they like in their notebooks.

Suggestions for questions:

1. *How much waste gets generated in our city?*
2. *How long does it take for waste to decay?*
3. *How is the waste collected and disseminated?*
4. *How is recycling handled?*
5. *How much of the community participated in recycling?*

Task 2: Field Trip Observations and Objectives

Review the activity of active observing as a research tool. Discuss the use of note taking, sketching, interviewing, and picture taking effective field tools for research. Make a list on the board of good examples of effective uses of these tools. Discuss any inappropriate uses of these tools and behaviors to avoid to comply with school and facility policies.

Assign students the objective to return to class with at least 3 new things they have learned about waste management in their community. Have them formulate questions they have now based upon this new information.

Task 3: Field Trip Debrief

Ask students to discuss what they learned on the field trip. Be specific. Ask students to provide at least three new facts about waste they learned on the trip. Make a list of the observations on the board and ask students to add to their lists anything they may have missed.

Task 4: Short Small Group Discussion

In small groups, have students reflect on the list of observations on the board and discuss any major paradigm shifts. Have students be ready to share their collective answers with the class:

Task 5: Short Writing Assignment

Write a small observation paper comparing and contrasting the differences of the impacts of the land fill and the green waste sites.

Assessment Opportunities

Observations of developed, unique, and grounded field trip questions would be a great learning indicator. Also watch to see that students are building off of each others' thoughts. Most of the tasks could be turned into quick writes and handed in for grading for content and form.

Activity 3: Community Interview-Empathy Building

Suggested Time: Classroom time- 60 minutes, Outside of classroom time-1 hour

Lesson Overview: Students will participate in effective observation, collaboration, and interviewing skills

Lesson Objective: Students will observe the scale of waste management in their community, interview community members, and begin to consider possible solutions using empathy

Materials needed: Whiteboard, students need paper and pencils, sketchbooks, digital cameras, recorders, and notebooks, also butcher paper for Task 5 brainstorming activity.

Classroom Activities Before Field Trip

Task 1: Quick Classroom Brainstorm Problems and Solutions

As a class, discuss what students observed and learned about waste management in our city. What was surprising, disturbing, or predictable? What problems does our city have now concerning waste management and what future problems can be predicted? Write these observations on the board.

Explain to the class that our objective is to solve or ease these current and future problems, but before we tackle the problem, we need to develop empathy for our user, the citizens of our town. To facilitate an understanding of our user, we are going out into the community to interview and generate empathy.

Task 2: Quick Classroom Brainstorm for Interview Questions

Brainstorm a list of questions students would like to ask in order to develop a more complete understanding what their community members need to make waste management in their communities more effective. Write interview questions for community members on the board and have students copy down questions they like in their notebooks.

Suggestions for questions:

- 1. How much waste do you take from your home to the curb each week?*
- 2. What would make it easier for you to diminish the waste taken from your home to the curb?*
- 3. How much do you compost and recycle?*
- 4. What do you know about how waste is handled in our city?*
- 5. What would make it easier for you to compost and/or recycle?*

Task 2: Community Field Interviews, Observations, and Objectives

Review the activity of active observing as a research tool. Discuss the use of note taking, sketching, interviewing, and picture taking effective field tools for research. Make a list on the board of good examples of effective uses of these tools. Discuss any inappropriate uses of these tools and behaviors to avoid to comply with school and facility policies.

Assign students the objective to go out into their communities and using interviewing, sketching, recording, and photography skills, develop an authentic understanding of the problems the community faces regarding waste management.

Task 3: Classroom Discussion-Insights gained from field interviews and observations
Ask students to discuss their findings from their field interviews and observations. Write observations on the board and look for patterns.

Task 4: Short Small Group Discussion

In small groups, have students reflect on the list of observations on the board and think about your community's needs regarding waste management. Working collaboratively, create a needs statement for the average citizen regarding their waste management needs.

As a group, fill in these blanks to come up with an empathetic needs statement:

Community members need a way to _____ (user's need) because they _____ (insight)

Have students be ready to share their collective answers with the class

Task 5: Small Group Brainstorming for Solutions

Brainstorm 25 or more ideas for different ways to meet your user's needs. No idea is too wild! Sketch or write them on the butcher paper.

Assessment Opportunities

Pay attention to what stories they are telling based upon their users' comments. How neural are they to other people's experiences? What are the students' observations revealing about the debt of their interviews? Assessment could be handled formatively through class discussions, or even through quick writing prompts that could be turned in and graded for content and form.

Activity 4: Prototype Development and Final Presentations

Suggested Time: Classroom time- 90 minutes minus presentations. Presentations can be made to the whole class, or to small groups, or even to partners.

Lesson Overview: Using empathy and all information gathered to this point, students will identify the needs of their user (community citizens) and design a prototype to satisfy those needs.

Lesson Objective: Students will synthesize all information gathered, work collectively and individually, and engage in design thinking to design a prototype solution for their user.

Materials needed: Whiteboard, students need paper and pencils, sketchbooks, digital cameras, notebooks

Task 1: Students begin the prototype design process-building a solution

Based on the brainstorming ideas for solutions, students will choose one idea and design a prototype as a solution. These prototypes may be in the form of a physical model, electronic presentation, letter or proposal, etc. The prototype structure will be based solely on the desired outcome. Students will sketch, outline, or in some way create an example of their solution prototype and be ready to share with a partner or small group.

Task 2: Sharing prototype solutions and capturing feedback

Share your solution prototype with a partner, small group, or class. Ask for feedback and take notes. As prototypes are reviewed, contemplate these questions:

1. What worked?
2. What could be improved?

Presenter is quiet while prototype is reviewed and only takes notes. When review process is finished, presenter replies to group or partner with an “I heard you say...” statement and reviews feedback.

Task 3: Being mindful of the Design Thinking Process

Students take captured feedback and make any alterations or changes to their prototypes.

Task 4: Implementation

Students have a myriad of options for implementation. This could look like letters to the editor in an effort to educate the community, engineered compost bins that are user friendly, to proposals to mayors or city council members for policy review or changes. Remember to only censor students’ projects where necessary. Creativity is key. Your students’ ideas will astound you.

Task 5: Reflection-Small Writing Prompt

Have students reflect on what they have learned about their community, themselves, and the problem and solutions. Was this an effective project? What could be done to improve student learning?

Assessment Opportunities

Task 5 lends itself well to an assessment opportunity. Did students grasp the STEM applications of this assignment? Did they conceptualize present and future implications of waste management? Did their thinking change and was that change reflected in their prototypes and revisions?

Troubleshooting

Be sure to carefully plan the timing. Bus scheduling and facility scheduling will be paramount. Make sure to observe any restrictions or limitations on picture taking, recording, and filming both on your school grounds and off. Council students to be respectful with the community at large and review privacy laws regarding social media.