

## Web Unit Plan

**Title:** Don't Trash the Earth

**Description:** In an interdisciplinary conservation project, middle school students are presented with a scenario that their local landfill is about to close because it is too full. Students play the role of waste management consultants, and analyze past and current waste management practices at their school and community. Teams devise a cost-effective and user-friendly recycling program. In a culminating event, students turn trash into cash as they sell beautiful and useful crafts made from recycled materials at a holiday fair.

### At a Glance

**Grade Level:** 6–8

**Subject sort (for Web site index):** Science

**Subjects:** Language Arts, Science, Math, Arts, Social Studies

**Topics:** Recycling, Conservation

**Higher-Order Thinking Skills:** Critical Thinking, Decision Making, Experimental Inquiry, Creativity

**Key Learnings:** Renewable and Nonrenewable Resources, Statistics

**Time Needed:** 2 weeks, 1-hour class periods, daily

**Background:** [From the Classroom](#) in Port Neches, Texas

### Unit Summary

Due to the increasing garbage people produce, the local community landfill is running out of space. Student waste management consultants are hired to evaluate their school and community recycling and waste management practices. After researching and analyzing past and current methods, teams develop a new recycling plan complete with cost analysis and supporting data. Teams propose recommendations to a committee supported by a slideshow. Brochures inform and persuade the public to take action. A student-designed Web page that promotes recycling is linked to the school Web site. In a final show of social responsibility, student entrepreneurs turn trash into treasure as they divert materials from the waste stream and turn them into attractive merchandise they sell at a holiday business fair.

### Curriculum-Framing Questions

- **Essential Question**  
Social responsibilities—who decides?
- **Unit Questions**  
Why do we need to change how we get rid of our trash?  
Is recycling worth the cost and effort?
- **Content Questions**  
How are different materials (plastic, glass, paper) recycled?  
How can we figure out how much it costs to get rid of our trash?  
Where has all the trash gone in the past?  
How can we learn how people feel about recycling?

## Assessment Processes

View how a variety of student-centered [assessments](#) are used in the Don't Trash the Earth Unit Plan. These assessments help students and teachers set goals; monitor student progress; provide feedback; assess thinking, processes, performances, and products; and reflect on learning throughout the learning cycle.

## Instructional Procedures

### Preparation

*NOTE: This project-based unit assumes a multidisciplinary team of teachers sharing the same students. Smaller-scale versions of this project could be conducted in individual subject-area classrooms.*

Open this unit with a short assembly involving all the students and teachers participating in the project. Have appropriate music playing in the background as they enter the auditorium (such as Oscar the Grouch songs from PBS's *Sesame Street*). Start the assembly with the Essential Question, *Social responsibilities—who decides?* Brainstorm with students examples of social responsibilities. Present the Don't Trash the Earth project through the [project slideshow](#) and introduce the activities students will complete during the unit. As students leave, pass out a memento representing the unit (such as those cheap miniature plastic trashcans that have candy in them). Attach a paper to each memento with the Essential and Unit Questions printed on them.

### Science

Introduce the study of resources and conservation by taking students on a field trip to a landfill or use one of the Internet resources to take a virtual field trip. Instruct students to categorize items that they see in the landfill according to their own choosing. Ask students to give a rationale for the categories they chose and also have them list three to five concerns or questions resulting from this activity. Use this activity to determine students' current thinking about trash management. Discuss differences among renewable, nonrenewable, reusable, and inexhaustible resources. As a homework activity, challenge students to find and list 10 objects comprised of each of the different types of resources.

Explain the fictitious scenario about the local landfill closing due to lack of space unless the community can drastically reduce the amount of garbage being dumped into it. The community leaders would like the students to research possible solutions and answer the Unit Question, *Is recycling worth the cost and effort?* The top five proposals selected will earn extra credit (or some other type of reward). Use this to launch into a discussion about the nation's landfill crisis using some of the sites listed in the [resources](#).

Invite a waste management specialist to school to teach students about recycling opportunities in the community. Using information from the specialist and lectures on resources and conservation, have students research the types of waste the school produces. Some key questions that may be asked include:

- *What is the current recycling plan at the school?*
- *What waste goes where?*
- *What kinds of materials are being recycled?*
- *How many pounds of each recyclable material are being produced?*
- *What are the school's waste management costs?*

Assign students to teams of four. Hand out and review the [team management rubric](#) so students are aware of individual expectations while working in a group. Students will use this rubric at the end of the project to assess themselves and each other on the group process.

Have teams research waste management plans (see the Resources page). This may involve the study of sanitation, manufacturers who use recycled materials, and the process of recycling different types of materials. Tell students their research should answer specifically the Content Question, *How are different materials (plastic, glass, paper) recycled?* Show students how to cite resources in their notes. Encourage teams to divide the topics to research and then compile their information.

After information is collected, have teams develop proposals that outline current practices and provide justifications for new recommendations for either the school, specifically, or the community, in general. Tell teams to seek to answer, *Why do we need to change how we get rid of our trash?*

The recommendations can take several directions:

- REDUCE—A campaign to educate students and staff so less waste is produced (choosing products that come in less packaging, for example).
- REUSE—A plan to reuse more material before it enters the waste stream (printing on the blank sides of used paper, for example).
- RECYCLE—A plan to increase recycling by making it more user-friendly and convenient. (providing recycling bins for cans, for example)

Have teams present their proposal to a mock committee (made up of other teachers, community members, waste management experts, and/or former students) using a slideshow presentation. Data and information from the math, language arts, and social studies activities could also be included. Share the [slideshow scoring guide](#) to help students assess their work. Provide students with the [team checksheet](#) to allow each team member to review the work of the team, making sure all areas are addressed from the [slideshow scoring guide](#).

### Mathematics

Present the question, *How can we figure out how much it costs to get rid of our trash?* Give various examples of how statistics are most commonly used.

If students are not familiar with spreadsheet software, introduce them to the spreadsheet as a tool for organizing, representing, and analyzing data using their statistical work on this unit. Using a projector, provide students with a spreadsheet overview—showing them how to create a new worksheet, type in a title, enter in headings and data, and how to create charts.

Brainstorm ways the school's waste management costs can be analyzed. Ask students to think about data that can be counted or measured, such as monthly fees, month-to-month variations in waste production and removal, the amount of biomass (lawn clippings, cafeteria waste, and so forth) being thrown away versus what could be composted, and so forth. After students gather this information, have them create spreadsheets and input their data. If students need help, provide them with a copy of the [trash spreadsheet instructions](#). Ask them to create a chart or graph of their data, print it, and write a few sentences about what information the chart tells them. If possible, encourage students to compare their data with another local or remote school of similar size. Remind students that this information may also be included in the science proposal.

As a homework activity, have students collect data on how much garbage their family produces in a week (count by the tall kitchen bags), input their data into spreadsheets, and calculate an average per person (for an example, see the [trash sample spreadsheet](#)). Merge the data, and find a class average. Ask the students to choose at least two kinds of charts or graphs to represent the data, write an explanation of the pros and cons of each graph in terms of how it represents the data, and explain which graph best represents the data and why.

The data can be compared to other regions in the country and even internationally using Internet resources (see the Resources page). Discuss possible reasons as to why this data varies so much (especially when comparing the United States to Japan). Remind students that this information may also be included in the brochure for language arts.

Teach about the concept and practical uses of cost analysis. Then, have students work up a cost analysis in a spreadsheet comparing the cost of the proposed plan to current practices using the information and recommendations they developed in science class. Ask students to create graphs to represent how the costs compare. Encourage students to use the data to answer such questions as:

- *Would the new plan save money?*
- *Would the new plan improve the ratio of landfill-bound garbage to recyclable waste?*

Explain to students that if the plan is not cost efficient, they need to conduct further research to determine how they can bring costs down and reduce waste.

Remind students that the spreadsheet data can be presented in charts and used to modify or support the proposal from science class. More spreadsheets and charts can also be created using data from the survey conducted in language arts.

Conference with students and teams three times during this process using the [math project checksheet](#). Instruct students to use this same sheet as a guide when working on their projects.

Allow time to discuss the mathematical interpretations from the survey completed in language arts class.

### **Social Studies**

Present the Content Question, *Where has all the trash gone in the past?* Invite a guest speaker from the city government to discuss the history of waste management in the local community and how new technologies or applications in recycling and conservation have been implemented. Ask students to consider this information for its relevance today, and discuss whether the long view helps us predict future trends.

To gain a more global perspective, assign a country to each student and have students compare the waste management plans of that country to that of the United States. Tell students they can choose the format in which to present the information. Also assign each student an ancient civilization and have them compare the waste management plans of the ancient civilization to today. Have students use a graphic organizer as a visual thinking tool to assist in making comparative statements about the information they collect.

Discuss the environmental effects of not recycling, and have students begin to build a case for why their proposals (in science) need to be undertaken wholeheartedly.

Have students use the historical research to back up claims. Explain to students to use the [trash from past feedback form](#) to document feedback from you and at least one peer.

After information is gathered, help a group of students incorporate it into a Web page linking to the school or to the larger community. The purpose of the Web page is to encourage recycling in schools, businesses, and homes using the research students have compiled as persuasive data. Later, the top five proposals from science are added to the Web site as well as pictures of the craft fair conducted in the art class. A Web page rubric may be used to guide the students who are chosen to work on this project.

Have students individually compose a final reflection piece answering the Essential Question, *Social responsibilities—who decides?* Samples could be posted on the Web site as well. Ask students to explain how their thinking has changed since the beginning assembly.

### **Art**

At the beginning of the project, encourage students in all classes to collect recyclable and reusable waste. Highlight this as a fun, creative solution to reusing materials. Students could even start a small Web-based business by collecting items that can be reused and selling them for craft projects. Materials may include cans, bottles, milk jug caps, cereal box cardboard, wrapping paper scraps, cartons, buttons from old clothes, and so on. With advance notice, local recycling organizations may save specific materials, such as baby food jars, for this purpose.

Set students to work (individually or in small groups) creating an art piece or useful invention out of the waste products. The [Do It Yourself Network](#)\* has many great ideas. Examples might include vases, chimes, handmade paper, pencil holders, and miniature furniture.

When the pieces are completed, have students write an explanation of their pieces, and display the projects in a public place in the school or community.

Alternatively, put on a craft fair to sell trash-to-treasure merchandise and educate the community at the same time. Money earned could be given to a local conservation group, or spent at school to promote conservation and recycling. Suggest that a [brochure](#) is one way that students can provide directions for how their project is made as well as deliver general ideas about how the reader can change habits concerning recycling of materials. A newsletter or flyer can also be an effective format.

### **Language Arts**

Ask students, *How can we learn how people feel about recycling?* Have students construct a survey to assess recycling attitudes and practices in their school. Survey questions may include, *Do you recycle at school? Why or why not? What would cause you to recycle more (choose from a set of options)?* Have each class design the questions for the survey. Then merge all the class surveys into one final survey that will be used, deleting redundant questions.

Discuss delivery modes for the survey (Internet, interviews, phone, mail, and so forth). Divide students into groups, and assign each group a section of the population to survey as well as a delivery mode (Internet, e-mail, phone, interview, mail, and so forth). After students survey students, staff, and community, set them to work in teams to tabulate data for different questions. After data is tabulated and compiled, make a copy of the final results for each student. Instruct students to take

the data to math class for further analysis. After analyzing the data in math, any final conclusions and visuals the students create can be used in the proposal for science.

Direct students to create a brochure using the information collected from the survey and the historical/comparative research from social studies (including data from math) to promote a call to action. The purpose of the brochure is to convince people about the waste management problem by describing the current and past waste management practices of the school and community. The brochure also relates that action needs to be taken before the community runs out of landfill space. The proposal is not included in the brochure, because this is only a call to action and an individual writing assignment. Students will use the same data from the survey, but interpretations, analysis, and how they choose to communicate the information will be unique. Use the [brochure scoring guide](#) to guide and assess student work.

Conduct a mini-lesson about the art of presenting and persuading an audience to help prepare students for their presentations in science. Remind students to incorporate any relevant information from this project into their final science project.

#### **Prerequisite Skills**

- Experience with Web design and multimedia
- Experience conducting research using print and electronic resources
- Basic computing skills, including keyboarding and file management

#### **Differentiated Instruction**

##### **Resource Student**

- Most assignments in this unit are open-ended, which means all students can complete assignments at their own levels
- For the science proposal, have a teaching assistant help groups with a resource student and help the student contribute meaningful work
- Break assignments into small, manageable activities written in a checklist
- Select specific Web sites for the student's readability level and mark the sites so the student has more meaningful sites in which to research
- Modify math assignments to only include the statistical information that is valuable for the student's level
- If technology exposure is low, partner the student with a proficient student

##### **Gifted Student**

- Have the student investigate more complex questions concerning waste management plans and the science behind them
- Encourage the student to design experiments on landfills, demonstrate how different materials can be recycled, and/or build/investigate a new invention that would address certain aspects of the waste management problem
- Require the student to include more advanced technical attributes in the presentation
- Assign the student to a group of students who are in charge of the Web site and responsible for pulling all the information together from the various classes

##### **English Language Learner**

- Have the student study vocabulary and practice oral presentations with an ELL assistant during supplemental instruction outside of class



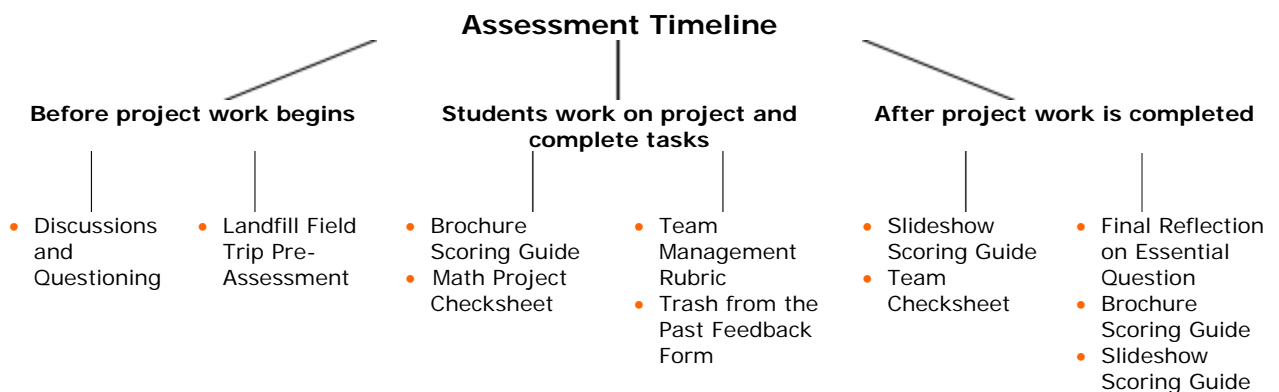
- During class, pair the student pair with others during project work when the language load indicates this, while completing visual parts of the project independently (such as spreadsheets, graphs, illustrations, and so forth)
- Shorten oral speaking and reading activities
- Allow the student to prepare materials in the student's first language to educate others about recycling and then translate it into English with the help of an ELL assistant

### Credits

A sixth grade team made up of Kathy Dugger (science), Tanya Davis (math), and Sue McBride (reading) participated in the Intel® Teach Program, which resulted in this idea for a classroom project. A team of teachers expanded the plan into the example you see here.

### THINGS YOU NEED (highlight box)

#### Assessment Plan



Questioning is used throughout the unit, beginning with the student assembly and landfill field trip pre-assessment, to help students develop their higher-order thinking skills and process content. Students assess their individual project in language arts using the [brochure scoring guide](#). The [trash from the past feedback form](#) is used in social studies to help guide students in understanding and applying the historical research. Students use the [math project checksheet](#) to keep track of tasks that need to be completed and also to receive feedback. The completed group proposal with all its necessary components from all the subject areas is assessed using the [slideshow scoring guide](#) and [team checksheet](#). Students assess themselves and each other on the group process using the [team management rubric](#). The final reflection piece is used to assess students' understanding of the Essential Question in relation to the content. The [brochure scoring guide](#) and [slideshow scoring guide](#) are use to assess final products.

### Targeted Content Standards and Benchmarks

#### Texas Essential Knowledge and Skills (TEKS)

##### Science TEKS

- The student knows that obtaining, transforming, and distributing energy affects the environment
- The student researches and describes energy types from their source to their use, and determines if the type is renewable, nonrenewable, or inexhaustible

## **Math TEKS**

### **Probability and statistics**

- The student uses statistical representations to analyze data  
Underlying processes and mathematical tools
- The student applies Grade 6 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school
- The student communicates about Grade 6 mathematics through informal and mathematical language, representations, and models
- The student uses logical reasoning to make conjectures and verify conclusions

## **Language Arts TEKS**

### **Writing/purposes**

- The student writes for a variety of audiences and purposes and in a variety of forms; to express, discover, record, develop, reflect on ideas, and to problem solve
- The student writes to influence, such as to persuade, argue, and request  
Present information in various forms using available technology

- Use available technology to support aspects of creating, revising, editing, and publishing texts

### **Writing/inquiry/research**

- The student uses writing as a tool for learning and research

## **Social Studies TEKS**

### **Social studies skills**

- The student applies critical-thinking skills to organize and use information acquired from a variety of sources including electronic technology
- The student communicates in written, oral, and visual forms
- The student uses problem-solving and decision-making skills, working independently and with others, in a variety of settings

## **Technology TEKS**

### **Foundations**

- The student demonstrates knowledge and appropriate use of hardware components, software programs, and their connections
- The student data input skills appropriate to the task
- The student complies with the laws and examines the issues regarding the use of technology in society

### **Information acquisition**

- The student uses a variety of strategies to acquire information from electronic resources, with appropriate supervision

### **Solving problems**

- The student uses appropriate computer-based productivity tools to create and modify solutions to problems
- The student uses research skills and electronic communication, with appropriate supervision, to create new knowledge

### **Communication**

- The student formats digital information for appropriate and effective communication
- The student delivers the product electronically in a variety of media, with appropriate supervision

## **Student Objectives**

Students will be able to:



- Distinguish between renewable and nonrenewable resources
- Evaluate past and current waste management practices in the school, community, and country
- Assess current attitudes of students and staff by developing, administering, and analyzing a recycling survey
- Collect and summarize data, analyze results, and develop a persuasive argument for changing the school's waste management practices
- Reuse materials for practical uses and art projects

## Materials and Resources

### Supplies

- Art supplies to use for the craft fair
- Recyclable and reusable materials to create recycled art projects

### Internet Resources

- City of St. Louis, Department of Streets, Refuse Division  
<http://stlouis.missouri.org/citygov/recycle/index.htm>\*  
Explains the benefits and savings of a citywide recycling program
- National Recycling Coalition Inc.  
[www.nrc-recycle.org](http://www.nrc-recycle.org)\*  
An informative site on the efforts of recycling nationwide as well as ideas for recycling
- Annenberg/CPB  
[www.learner.org/exhibits/garbage](http://www.learner.org/exhibits/garbage)\*  
General information about waste management as well as comparisons of waste from different countries
- United States Senate: Conservatism, Liberalism, and Future Generations  
[www.senate.gov/~rpc/releases/1997/BBABURKE.LO.htm](http://www.senate.gov/~rpc/releases/1997/BBABURKE.LO.htm)\*  
Thomas Jefferson quotation used as a resource for quotation
- Throw Away Journal  
[www.geocities.com/EnchantedForest/Creek/3675/Journal.htm](http://www.geocities.com/EnchantedForest/Creek/3675/Journal.htm)\*  
A "Throw Away Journal" in which students can use to keep track of how much and what type of waste is entering the waste stream
- Internet Consumer Recycling Guide  
[www.obviously.com/recycle](http://www.obviously.com/recycle)\*  
Basic information about recycling different materials
- Recycle City  
[www.epa.gov/recyclecity](http://www.epa.gov/recyclecity)\*  
Contains very readable, in-depth information about recycling
- Recycling Manager  
<http://grn.com/grn/prices/rm-prices.htm>\*  
A listing of prices for different recycled materials
- Environmental Kids Club  
[www.epa.gov/kids](http://www.epa.gov/kids)\*  
A very large, readable, and user-friendly site with many links to any topic imaginable about waste management, which includes free materials and a teacher's resource page
- Do It Yourself Network  
[www.diy.net](http://www.diy.net)\*  
A craft and hobby site with ideas for recycling trash in to crafts

### **Technology—Hardware**

- Computer(s) to research information about waste management and to complete multimedia projects
- Digital camera for taking pictures for media projects and to document pictorial research
- Internet connection for research during projects
- Color printer to print brochures to persuade the community leaders to investigate waste management
- Projection system for instruction when presenting lessons on content as well as teaching the technology

### **Technology—Software**

- Database or spreadsheet to input data from surveys and cost analysis information about recycling
- Desktop publishing to design Web pages and brochures to inform the public of the proposal for recycling
- E-mail for communicating during the research process
- Encyclopedia on CD-ROM to access quick information on definitions and concepts concerning recycling
- Image processing to process media documents and pictures
- Internet Web browser for Internet research and Web page creation
- Word processing for written work during the project