

BUILD A TRASH SEPARATOR

PLANNING THE EXPEDITION

You will need to get foam board, posterboard, or cardboard for this expedition. One large corrugated cardboard box cut with a mat knife into 12” square pieces will be enough for several classes.

Assign the homework (if you decide to use it) in advance of doing the activity. Allowing the students to think about design issues before they begin building their models will facilitate the activity.

This is a good opportunity to call in a guest speaker. There are several possibilities: a county recycling official, a state recycling official, a landfill administrator, or a representative from a private waste disposal company.

In advance of completing this expedition, you will either be collecting dry trash yourself or assigning students to this task. Since students are going to be designing and building a model trash separator, you will need to get dry trash for them and have it accessible. One method of facilitating this is to distribute small trash bags to other teachers and asking them to have students place **dry** trash items in it, seal it up, and return it to you at the end of the day. If you have five classes and six groups per class, you will need help in accumulating enough trash. Be sure to include soda cans, however. If your school recycles, this will be an easy matter; otherwise, ask students to bring clean, dry cans from home.

Students will build a model trash separator. Before beginning this expedition you may wish to show your classes a short video on a trash separator already in use that uses magnetism to separate certain types of recyclables. After viewing the video, discuss it as a class, and identify the ways that magnets were used. Then, allow groups to brainstorm ways to adapt their design plans. Students will be modeling decision-making and prototype-building. Previous experiences with building a model from a design will help students make decisions regarding what will and will not be feasible with the supplies available to them.

1. Using either the design plans that students completed for homework or design plans that they create in groups in class, students will be attempting to construct a model of a trash separator. Allow students to consult other groups as they modify their designs.
2. Students record answers to questions in their Alpha Logs as well as draw a design

BACKGROUND INFORMATION

Landfills are currently an issue of great concern to many people. Land is scarce for such use and there is much publicity about building landfills and whether this is the best method for trash disposal. Scientists who study landfills (garbologists) claim that relatively little garbage is actually decomposing. In fact, some organic material that one would expect to be disintegrated exists for decades. An example is a package of hot dogs that dated back 20 years found in a landfill.

Recycling and reusing trash is a subject so much in the news that there are very few students who have not heard of the terms or who do not have an opinion. You will want to define the difference between recycling and reusing

and discuss the merits of each one. Students will have many examples of wastefulness. If they shop with their parents, they should be reminded of how much cardboard is thrown out when the groceries are being put away, for example.

Discuss with students the advantages of trash recycling, the progress that has been made in your area, and ways that students can contribute to the overall effort. Depending upon the level of sophistication of your students, you could compare the United States with other countries. For instance, Japan recycles over 50% of its garbage. Students could research the percentage for other countries.

EXCURSIONS

Students call or visit a local landfill to see firsthand how trash is disposed. Comparing this method of disposal to recycling, students report on which is more desirable and why. Have students brainstorm ways to increase recycling in their community and design a plan for publicizing their ideas. Some students may wish to send their ideas directly to the county landfill administrators or to the local recycling companies.

SC.B.2.3.2, SC.D.1.3.1-4, 2.3.1-4, 3.3.4

LA.A.1.3.1, LA.C.1.3.4, 3.3.2

In an old aquarium or plexiglas box, have students create a mini-landfill. Students place representative items in the landfill,

cover them with soil, occasionally adding to the landfill and putting new layers of dirt on it. On graph paper, students will identify what they placed and where so that in a predetermined amount of time, students can check to see how their garbage did. Did it decompose? If so, why? If the items did not decompose, have students make an educated guess why not. Students should keep track of their graph paper evidence in Alpha Logs and periodically check the landfill and record their observations. Then, students can consult either print resources or call a recycling company to check their predictions. This activity is adapted from the 4Rs Project materials (Florida Department of Education, 1990).

SC.B.2.3.2, SC.D.1.3.1-4, 2.3.1-2, SC.G.1.3.4, 2.3.3-4, SC.H.1.3.1-7, 3.3.4

“The Shot From The Moon,” by Arthur C. Clarke, in Science Fiction Stories edited by Edward Blishen (ISBN 1-85697-889-3)

Expedition 20: *Build a Trash Separator*

is a short story that includes a magnetic launcher from a moon colony. Have students draw an illustration to go along with the story that you have either read aloud or they have read themselves.

SC.E.1.3.1-4

LA.A.1.3.1-4

Have students investigate Arthur C. Clarke's scientific discoveries as well as his contribution to the body of science fiction literature by producing a biographical sketch. Clarke's science fiction novels and short stories have been made into highly successful films, not the least of which is "2001". He has also been involved in a number of environmental issues. The varied experiences that all contribute to his success will point out to students that science is done by different types of people from very different backgrounds. The biographical report could be presented in poster and photograph form, a written report, or a computer presentation.

SC.H.1.3.1-7, 3.3.4-7

LA.A.1.3.1-4, 2.3.1-8, LA.B.1.3.1-3, 2.3.1-4

Have students research the use of permanent magnets in industry by conducting phone or letter interviews with

American Maglev Technology Inc. (AMT), Edgewater, Florida. Obtaining information on research being done that relates directly to classroom activities will help students understand the background information and theory necessary to facilitate technological design. Practical application of concepts addressed in the classroom justifies why the activity is being done.

SC.B.2.3.2, SC.C.2.3.1-5, SC.G.2.3.1, SC.H.3.3.4



Notes:

FOR YOUR PLANBOOK: Build A Trash Separator

Suggested time: 1-3 hrs.

Gear: variety of magnets, cardboard, posterboard, scissors, glue, markers

National Content Standards: A, B, E, F, G

Sunshine State Standards Benchmarks: SC.B.2.3.2, SC.C.1.3.1, SC.C.2.3.1, SC.C.2.3.2, SC.C.2.3.3, SC.C.2.3.4, SC.C.2.3.5, SC.C.2.3.6, SC.C.2.3.7, SC.D.2.3.1, SC.D.2.3.2, SC.G.2.3.1, SC.G.2.3.3, SC.G.2.3.4, SC.H.1.3.1, SC.H.1.3.2, SC.H.1.3.3, SC.H.1.3.4, SC.H.1.3.5, SC.H.1.3.6, SC.H.1.3.7, SC.H.3.3.1, SC.H.3.3.4, SC.H.3.3.5, SC.H.3.3.6, SC.H.3.3.7

Sunshine State Standards Benchmarks -- Language Arts: LA.A.2.3.1-8, LA.B.2.3.1-4, LA.C.1.3.1, 1.3.4, 3.3.2

Homework: You will need to present some information on trash separators before assigning this homework. Explain to students that they will be making a model of a trash separator. Before they can do this, they need a plan. Have students design a plan for a trash separator that includes how they will accomplish their goal of removing certain objects from dry trash. Diagrams should include a materials list. The plan should be on paper only (no models, yet).

Homework Assessment: Students will think through the entire process of designing a model: defining a goal, determining how they can accomplish that goal, and deciding on the materials necessary. Appreciating the complexity of technological design moves students into a sophisticated level of classroom science. Any design possibilities are acceptable. For example, the following rubric can be used: if the student has a design with materials listed and a diagram of how it will look, it has fulfilled all requirements and receives an “A”; if there is a plan and a materials list

but no diagram, it earns a “B”; a materials list and diagram but no plan, a “C”, a plan with no diagram or materials list, a “D.”

Assessment: Have students demonstrate for you the trash separator. If it works, students have successfully completed this task. The separator should follow a plan or diagram that was predetermined by the group. Modifications to the design should be indicated on the original design plan or will be written below it. The fact that students are using a predesigned plan to complete their work models the way that technological design is done in the real world.

Alpha Logs will reflect a number of things. First, all revised design diagrams and materials lists should be included in the Log. Logs will also reflect that students are manipulating one variable at a time, holding certain conditions constant as they try to refine their designs. This provides you with evidence that your students are able to provide explanations for cause and effect and identify criteria by which they will judge their models.

After researching public and private recycling companies in your area, have students contact these sources directly for information on using magnets and other technologies to separate trash. Students can conduct personal or phone interviews, request that information be sent by mail, or conduct on-site visits to observe the technology in operation. After writing up findings, those students that chose to complete this assessment task will report to the rest of the class. Verbalizing and/or writing down the information that they obtain will provide a reusable resource for future classes. Look for clarity of information and thought, depth of research, and a method of presentation (poster, written report, overheads, or photographs) that could be shared with other classes.

BUILD A TRASH SEPARATOR

Itinerary

You will be constructing a model of a trash separator based upon the design plan that you completed for homework. In this activity you perform many of the same tasks that real-world research and development professionals do as they take a product from the design stages to a working model.

1. As a group, discuss your design plans and decide which plan or combination of plans you wish to construct. A Recorder should keep notes in the Alpha Log on the group conversation so that there is a record of all ideas and important information. If, after your discussion, you decide as a group that you wish to design a new trash separator, do so.
2. Enter your decision in your Alpha Log along with any design modifications that you have made.
3. Redo the materials list based upon the changes you made in the design and have the Materials Manager gather everything you will need to build the separator.
4. Construct your model based on your design.
5. Test the trash separator. If it does not work, make modifications to your design. If you are still unable to get it to work, check with another group that has one working and find out what they did to get results. Be sure to write all changes in your Alpha Log so that you can retrace your steps if you have to.
6. Refine your model and test it several times to be sure it is reliable. Record the results of all tests in your Log.

