Introductory Workshop

Overview

This workshop serves both as an introduction to the City Technology curriculum ideas, and as an engaging way of recruiting teachers to participate in the more extensive workshops described later in this chapter. The opening segment consists of a series of "brainstorming/scavenger hunts", which are intended to highlight the range of things in that qualify as "technology" and the myriad of everyday experiences that are examples of design. The scavenger hunt is followed by five self-guided activities, one from each topic, which five groups perform in parallel. In the course of these activities, each group engages in an activity from one of the five topics. In the concluding sharing session, participants introduce each other to all five topics.

Workshop Materials

General Supplies

- Overhead projector & transparency films or flip chart
- Markers

Mapping

- Two sets of checkers games; these can be home-made using two 8 x 8 large grid sheets, and 24 cardboard or construction paper playing pieces of each of two colors, preferably red and black (12 of each color per set). Create a checkers board by coloring alternate squares black.
- Large cardboard box (as shield to prevent the sides from seeing each others' games)

Designed Environments: Places, Practices & Plans

- Graph paper with large grid squares, about 1 in. wide

Packaging & Other Structures

- Two or three small, irregularly shaped objects at least 2 in. per side, and no more than 4 in. on any side, such as wind-up toys, small appliances, coffee mugs, etc
- Butcher paper, large sheets of construction paper and/or large file folders
- Assortment of boxes that can be folded completely flat, and assembled without tape or glue; these are used, for example, to package computer keyboards, rolls of pennies (from the bank), and some office supplies. (If these are not available, the activity can be modified slightly to use boxes that have *one side seam glued*, but otherwise open and close completely without tape or glue. In this case provide a roll of masking tape.)

Mechanisms & Other Systems

- Several hole punchers
- Several pairs of scissors
- Thin cardboard (discarded cereal boxes, file folders or express mail envelopes)
- Brass paper fasteners, 1 or 1 1/2 in. length
- Assorted rubber bands, of varying lengths and widths
- A variety of two-dimensional linkages, suitable for modeling. These should each include more than one lever, and operate mostly in a plane. Examples include a pair of tin snips, a vise grip, a tea-bag strainer, pizza tray holder, and some types of garden shears (see photo below)

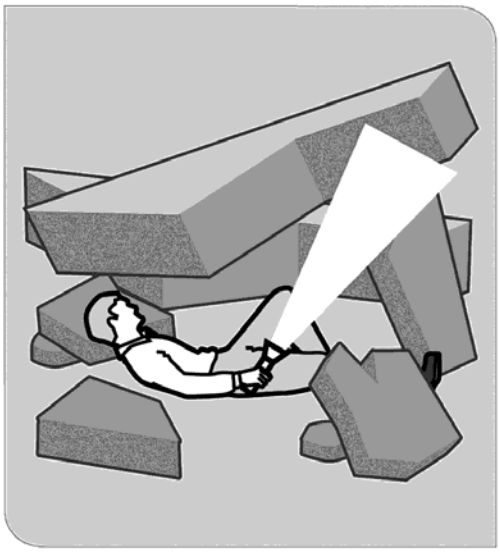
Mechanisms for modeling

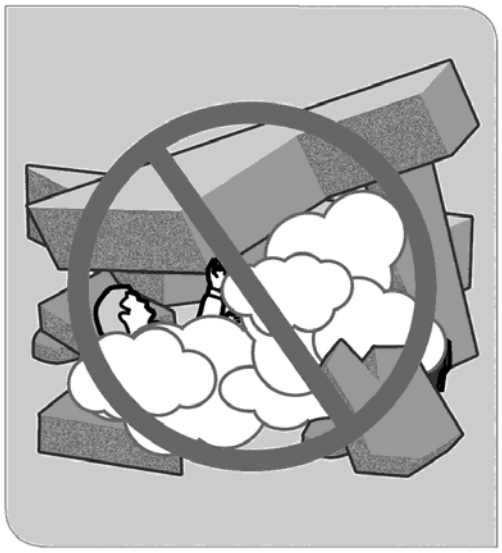
Signs, Symbols & Codes

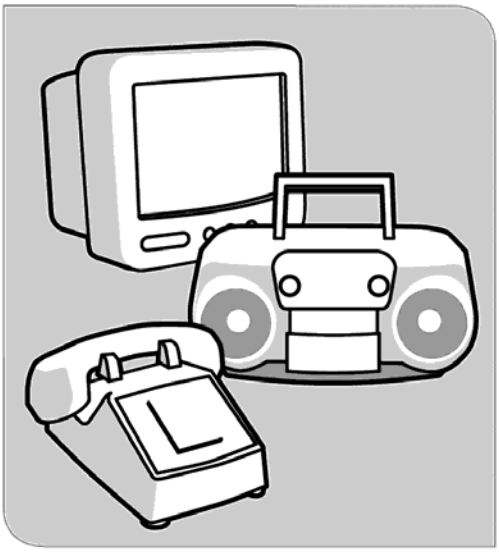
- Deck #1: Eight index cards, each with one of the images taped or glued to it
- Deck #2: Eight index cards, with the same images plus explanations attached
- Deck #3: Blank index cards

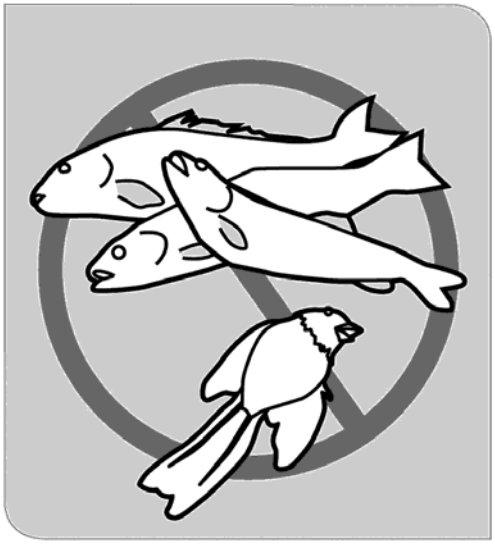
NOTE: Images for Decks #1 & #2 are available on the next four pages.

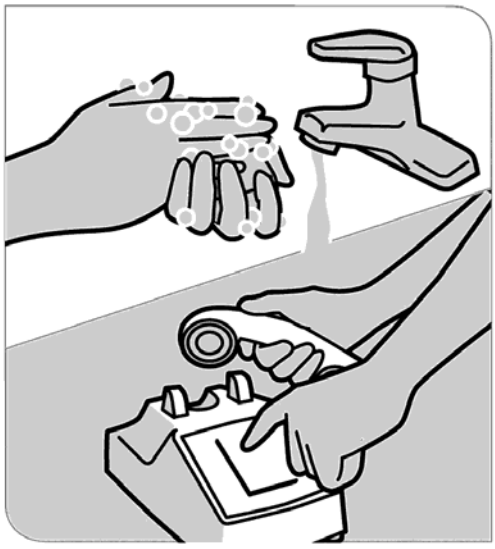
Signs, Symbols & Codes – Deck #1



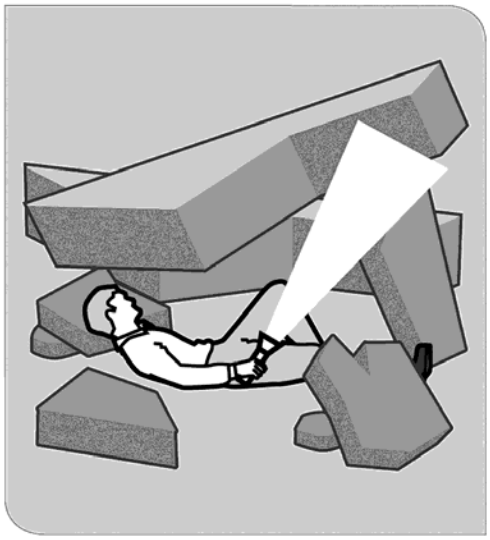




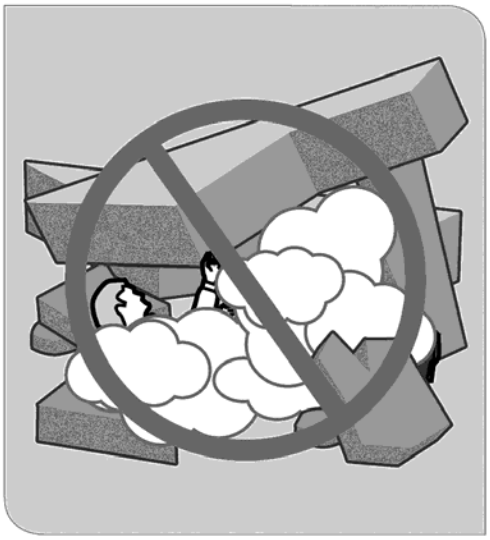




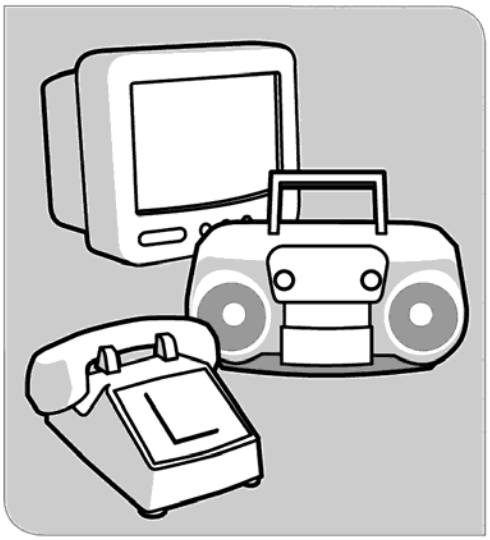
Signs, Symbols & Codes – Deck #2



1. If possible, use a flashlight to signal your location.



2. Avoid unnecessary movement so that you don't kick up dust.

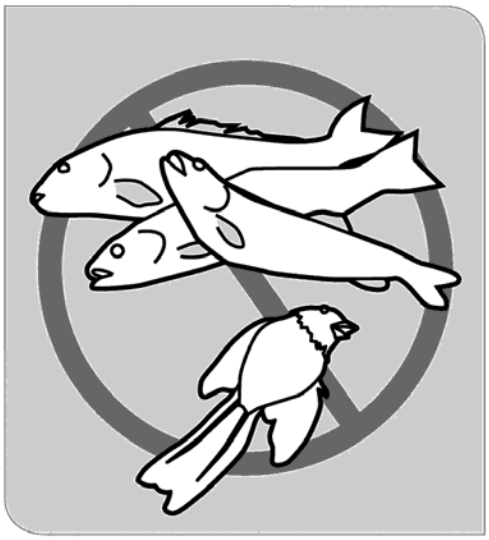


3. You will probably learn of the danger through an emergency radio or TV broadcast.

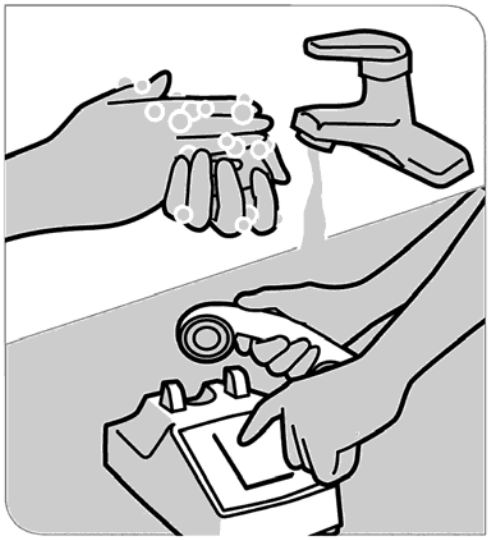
4. Use the back of your hand to feel the lower, middle, and upper parts of closed doors.

5. If you catch fire, do not run!

6. Do not go back into a burning building and carefully supervise small children.



7. Many sick or dead birds, fish or small animals are also cause for suspicion.



8. Wash with soap and water and contact authorities.

Directions to Participants

The next five pages provide a set of instructions for the Smorgasbord activities. One of these pages should be made available to each group. It can be mounted in a picture frame or on an open file folder, and placed on the table. As much as possible, each group should be given a different activity.

Careers in Modeling

1. Select a mechanism.
2. Make a model of it, using cardboard and paper fasteners. Use a rubber band to model a return spring, if there is one.
3. Compare how the original mechanism and the model open and close. Redesign your model to correct any differences.

Symbolic Disasters

1. Begin with Deck #1. Write down what you think each symbol means.
2. Turn over Deck number #2. It shows the meaning of each symbol, according to the U.S. Department of Homeland Security.
3. Use the blank cards in Deck #3 to invent a better symbol (using no words) for one or more of the messages.
4. Show the symbols you've created to members of another group to see if they can figure out their meaning. Listen carefully as they try to interpret your symbols. NO COACHING! Find out what features of your symbols are ambiguous or unclear.
5. Use the information from the testing of your symbols to redesign them. Then try them out again, to see if they work better!

Tactic Toe

1. Play the game of tic-tac-toe a few times. Discuss the experience: what do you dislike about it?
2. Make one change in the way the game is played, for example, in the design of the board, the definition of a "win," or the sequencing of moves. Play it a few times using the new rules, and see what happens.
3. Decide on a criterion for how you would like the tic-tac-toe experience to change.
4. Develop new rules that you think might accomplish this goal.
5. Explain your new rules (but not the criterion) to members of another group. Ask them to play the game using the new rules, and describe the experience. Did it meet your design criterion?
6. Redesign the game to meet the criterion.

Blind Checkers

1. Divide the group into two “teams,” each of which will be one “side” in the same game of checkers. Because the game will be “blind,” each side will need its own board to keep track of the game. Place the box in the middle of table so each side cannot see the other side’s game board.

2. Each side should set up its board with 12 pieces on each side, and decide who will be “black and who will be “red.”

3. Because the game is blind, both sides have to agree on a method for keeping track of each move. Play a few moves, and then compare boards.

4. Revise the method as needed, based on the outcome of #3, and repeat until both game boards consistently look the same. Keep a record of each method you used.

Thinking out of the Box

1. Several boxes are provided on your table. Each of them can be laid flat and is made from a single sheet of cardboard with at most one side glued. Look carefully at how they fold up and flatten out. Compare the different ways these various boxes work.

2. Select one object for packaging. Based on the designs of the fold-up boxes, make a box for your object out of heavy paper. Use tape on no more than one side.

3. Make another design, based on a different fold-up box. Compare the designs. List the pros and cons of each one.

Preparation of Workshop Space

Set up materials for each of the five Smorgasbord activities on one of each of five tables. Using a file folder or self-supporting picture frame, display the directions for the activity at that table (see preceding five pages). To avoid distracting participants, you may want to hide the instructions and supplies during the Design/Technology Scavenger Hunt.

Sample Workshop Agenda

Design/Technology Brainstorming/Scavenger Hunts and Introductions (10 – 30 minutes)

Begin the workshop with as many as possible of the following brainstorming and scavenger hunt activities. These come in two categories, and it is useful to select at least one from each category. They should be conducted one at a time. In each case, ask each group to do make a list collectively, and then have one or more group member share the list with the entire workshop. The first sharing session is a good occasion for all the group members to introduce themselves.

Technology Brainstorming/ Scavenger Hunts:

- Make a list of examples of technology that you can find in this room.
- Make a list of examples of technology that you brought with you today.
- Make a list of examples of technology that could be found in your classroom.

Design Brainstorming/ Scavenger Hunts:

- Make a list of design problems that have come up in the course of your hobbies.
- Make a list of design problems that you address as a teacher.
- Make a list of design problems that students have addressed in your classroom.

Smorgasbord (40 – 60 minutes)

Each group has already been provided with a complete set of instructions and materials at their table (see preceding 5 pages). Explain to each small group that they will have about 45 minutes to work on their task, and then they will be reporting to the entire group. After about 30 minutes, remind each group that they will need to prepare a report to the other groups.

Sharing & Discussion (10 – 30 minutes)

Each group reports briefly on what they did and what they learned. Sharing is followed by a whole group discussion of how these activities would fit in a classroom, including learning goals and addressing of standards.

Workshop Tips and Strategies

Design/Technology Scavenger Hunt

The goal of this activity is to highlight the facts that "technology" includes most of the items that surround us, and "design" is something we do frequently, every day. Avoid trying to define either term. Suggest that they come up with examples first. Encourage debate over particular items from the lists. Some participants may insist that "technology" includes nothing but computers, LCD projectors, cell phones, etc. Ask when these items were invented, and inquire whether there was any kind of technology before that. If participants have difficulty thinking of design activities, encourage them to think of occasions where they had to plan something in advance, or in which children identified classroom problems and suggested solutions.

Smorgasbord

Mechanisms & Other Systems

Encourage the group to look very closely at the moving parts and pivots that make up the mechanism they have selected. They will need to reproduce each of these in their model. A simple method is to trace out each part on a sheet of cardboard, indicating the locations of the pivots. Then they can cut out the pieces, punch the holes for the pivots, and assemble the model. Most of the devices have return springs, which can be modeled using rubber bands, but there is an important difference. Most return springs are made of metal, and operate in compression. In other words, they resist the force of pushing. Rubber bands, on the other hand, operate only in tension: they resist when pulled.

Deciding how and where to attach a rubber band, to create the return spring action, can be an interesting challenge. In evaluating the model, here are some questions to ask:

- Are the directions of motion of the inputs and outputs the same in the model as in the original?
- Is the range of motion similar in both?
- If the device returns to its original position when released, does the model do so too?

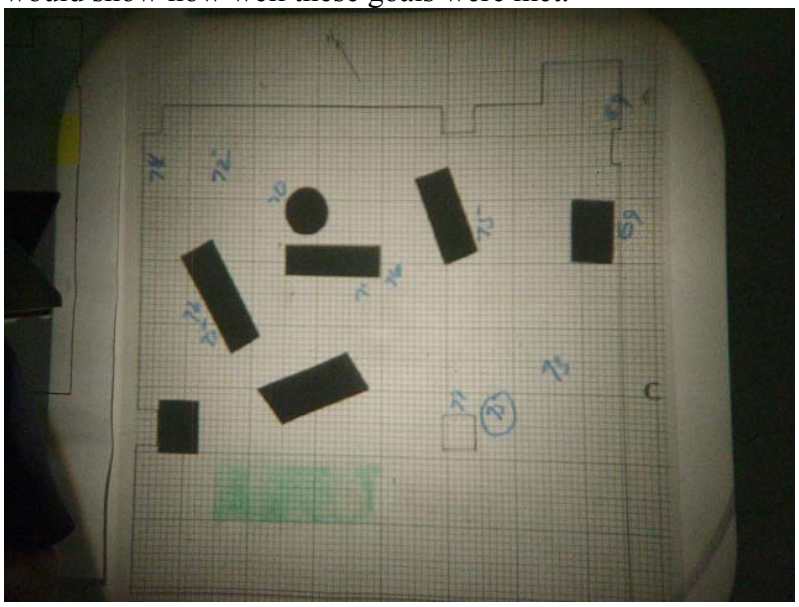
Signs, Symbols & Codes

The most important phase of this activity is the testing of the newly designed symbols. It is likely that at least some of the symbols will fail to convey their messages. The purpose of these tests is to collect the data needed to redesign the symbols to make them more effective. Some participants will have a tendency to "help" the testers "get the right answer," while others will blame the testers for not understanding a symbol they consider obvious. Both of these reactions misread the central purpose of this exercise. The test is of the symbol design, not the testers, and the weakness of the existing design is vital information (see "The Role of Failure in Design," Ch. 4). Encourage the designers to note carefully the components of their design that the testers can't make sense of or that they misinterpret. By observing closely how the design fails, participants will collect the data they need to improve upon their first design.

Designed Environments: Places, Practices & Plans

A game is a miniature environment, which can be evaluated based on some criteria, and redesigned to remedy ways in which it falls short. Tic-tac-toe is a very simple game that most adults do not find very interesting. This activity challenges participants to be explicit about how they would like the experience of play to improve, and then redesign the game to meet these criteria. The first problem is the establishment of clear criteria: Should the game be harder to win, be less predictable, take longer, require more complex strategy, or some combination of these? Next, participants have to determine how they want to change the rules to accomplish this goal. They may decide

the expand the playing board from 3 x 3 to 4 x 4, decide that only vertical and horizontal lines qualify for winning, include more than two players, invoke gravity (as in Connect Four), and/or allow each player two moves at a time. Any of these changes will have a major impact on the experience of playing the game. Finally, there is the issue of determining how well the redesigned game has actually satisfies the design goal. Challenge participants to be very specific about their goals, and about the evidence that would show how well these goals were met.



Mapping

The group will probably begin by inventing some sort of grid system. This system may be like giving directions in terms of city blocks, e.g., "six squares over and three squares up," or more like the grid system on a road map, such as "F3." They may not notice initially that each side has turned the board around so that their pieces are closest to them. This is an orientation problem that they will need to deal with either by turning the board around, or modifying the grid system to have different starting points and opposite directions. Another issue is how to communicate both the starting point and end point of a move in the game: should this be done using absolute positions (e.g., "from F3 to E4") or directions relative to the starting point (e.g., "from F3 one square forward and to the left"). Emphasize that the object of this activity has nothing to do with winning the game. The design task is to come up with a way of describing locations on a checker board that you can't physically see.

Packaging & Other Structures

In this activity, participants need to look carefully at an existing design, and use it as a basis for redesign. Encourage participants to look carefully at the various styles of folding boxes before deciding which one to use as the basis for their own design. Sometimes, they will simply reproduce the existing design, without changing its dimensions. Suggest that they redesign their box so the object fits more snugly. This will require them to examine how the dimensions of the various sides will correspond to the dimensions of the box when folded up. They will also need to be attentive to the various tabs and slots that enable the box to stay together without tape or glue. Encourage participants to explore how different materials compare in their ability to both fold and also hold their shapes. Materials can include cardboard, butcher paper and construction paper.

Sharing & Discussion

Because each of the groups is engaged in a different task, their report will need to include a summary of their task, as well as how they accomplished it and what they learned. Encourage them to be as specific as possible about the process they went through, including not only successes, but also bad ideas, false starts, dead ends, and redesign challenges. These illustrate design processes far better than some neatly packaged "finished product."

Encourage the groups to reflect on their process in other ways as well. How well did their group function, and what did they learn about themselves and their group members? What did they learn about design? What thoughts do they have about how this sort of activity could contribute to elementary education?

If the room is crowded, and an overhead projector is available, you may want to have the groups create transparencies and make presentations from the front of the room.

Otherwise, it is easier and less formal to conduct a science-fair style walk around to each table, using the objects themselves as visual aids.