

Designed Environments: Places, Practices & Plans

Summary of Key Concepts

People design things all the time, but most design activity is not particularly systematic. Usually, there is only a vague notion of what the design is supposed to accomplish; few if any alternatives are considered; and there is little if any effort to test the design. As a result, there is an accidental, unplanned quality to many of the environments we live and work in. These include not only the organization of space, but also the procedures that govern activity, and the plans and schedules that regulate the use of time. Most of this environment is the product of “everyday” or “casual” design, made with little or no analysis and evaluation. By contrast, we advocate for what we call “technological design,” which requires an explicit statement of the problem, examination of alternatives, and evaluation of the design to see how well it meets the original objectives.



Designed Environments differs from the other ***Stuff that Works!*** topics in that there is little if any predetermined knowledge base. The background information needed to carry out a design project is particular to the problem at hand. For example, a project to increase display space for children’s work draws on different kinds of knowledge from a project to reformulate the rules governing children’s access to the bathroom. The common feature guiding Designed Environments projects is that each one draws on and develops systematic design methods. The following are important elements of design:

- **Identify the problems:** Technological design activity arises from the sense that our lives could be improved by changing an existing product, procedure, or plan, or by creating new ones. The vague feeling that something needs to be changed is only a first step in a design process. The more information you have, the better

you can define the problems. For example, most people are not very satisfied with the ways their desks (or other workspaces) are organized. However, redesign of a workspace requires an explicit statement of the problem to be solved. You might realize that your desk has a large pile of items that get in the way of any work you need to do. “My desk is cluttered” is not nearly as useful a problem statement as “I need a place to put each of these types of things.”

- **Gather and analyze information about the problems:** One way to approach a problem is to analyze it thoroughly into its component parts; for example, by sorting the kinds of items found in the desk clutter. Another useful type of information describes the ways others have dealt with similar problems. For example, in addressing desk clutter, it might be helpful to look at other people’s desks, or study an office supply catalog showing various types of “desk organizers.”
- **Establish criteria for a redesign to meet, determine constraints that must be observed, and identify resources that are available:** Unlike everyday design, technological design takes clear account of criteria and constraints. Setting criteria for a design means being explicit about what a design is supposed to accomplish. Constraints are limits on the design choices. In the case of a desk redesign, criteria might include easy access to a telephone, a keyboard, a pencil sharpener or a stapler; adequate space for filling out forms; or ability to find important documents within a reasonable amount of time. Constraints could include a budget for office supplies, the total available amount of desktop area, or the need to share it with others. Resources include the knowledge a desk user has about what does and doesn’t work, total amount of space, available drawers and shelves for storing things, etc.
- **Formulate possible solutions:** There are a variety of solutions to any design problem. These alternatives usually differ in how well they meet the criteria and respect the constraints. Casual or everyday design typically selects one solution without examining how other possibilities compare. Technological design calls for specifying several possible alternatives, and then considering how well each one addresses the criteria and the constraints. For example, possible solutions to desktop clutter might include throwing away everything on top of the desk, clearing out some files to make room for the stuff on top, buying additional storage space, or making cabinets or shelves from recycled cardboard.
- **Select the best solution:** Given different possible solutions, how do you choose the “best” one? The selection is based on a prediction of how well each possible solution would respond to the design criteria and constraints. Often, the best choice combines useful ideas from a variety of proposed designs.
- **Implement the chosen solution:** The realization of any design is itself a design problem. Sometimes implementation is relatively easy, as in making changes in one’s own desk. It takes much more planning to institute a new design in a large, shared space such as a classroom or a cafeteria.

- ❑ **Evaluate the new design:** Evaluation is the most difficult part of a design project. There is a strong tendency to stop with the new design, regarding it as the end point of the process. But the question then remains: *Is the new situation better or worse than the old one, and in what ways?* Design criteria inform the evaluation, by telling what the new design is supposed to accomplish. Perhaps the new design simply doesn't meet the criteria, and the prediction that it would was wrong; or maybe other alternatives would have worked better. Sometimes a design meets the explicit criteria, but is clearly inferior to the former situation. The criteria should then be modified. In any of these cases, there is an obvious need for going through some or all of the process again; i.e., a need for *redesign*.

Preparation of Workshop Space

Arrange the furniture of the workshop space in an *inappropriate* way. It should not be so bad that workshop activities are impossible, but bad enough that it is difficult to conduct some of the workshop activities. One of the workshop activities will be to identify some of the issues raised by this bad design, and to correct these problems by redesigning the space.

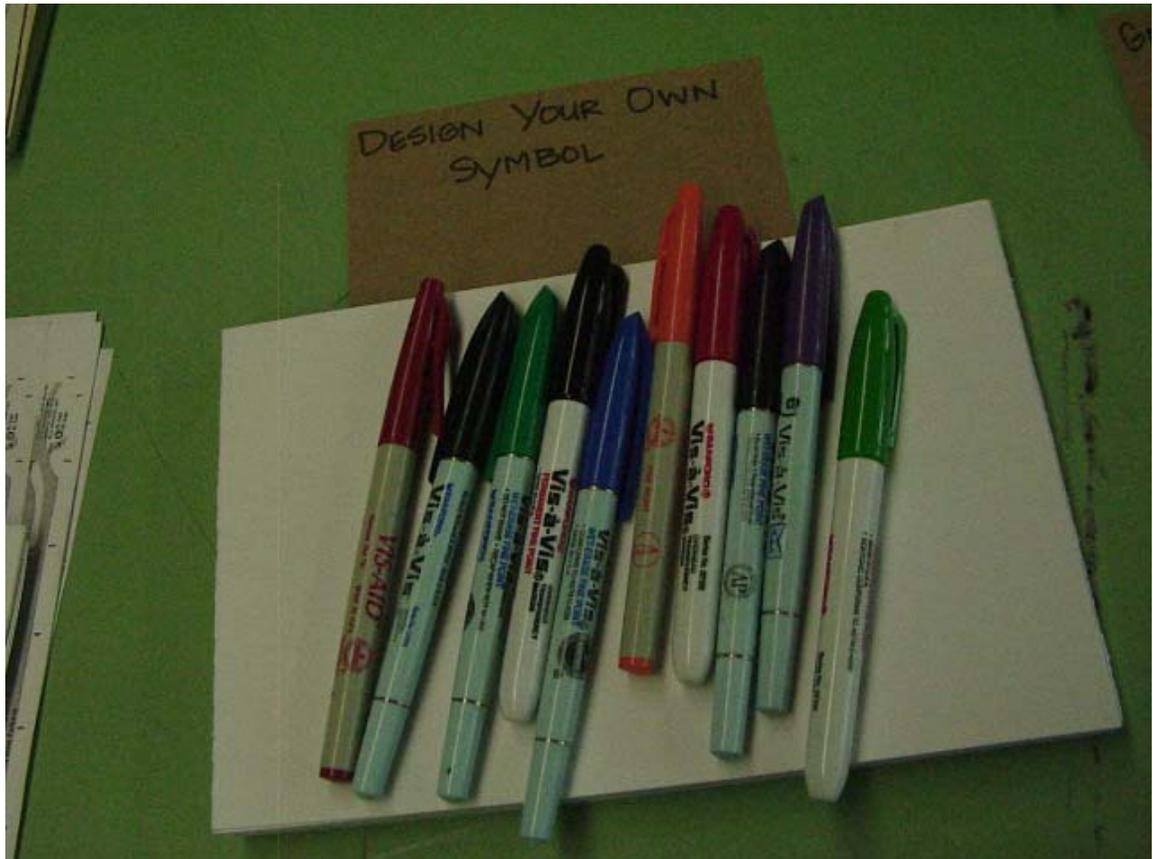
For the redesign activity, you will need outline maps of the room, drawn to scale, one per group, and measurements of the major pieces of furniture, reduced to the scale of the map. These maps may be done on 8 1/2 x 11" graph paper, and then duplicated onto transparency films or plain white paper using a photocopier. Otherwise, they could be done on large sheets of chart paper, but you will need to create one of these maps for each group. This is the same kind of outline map used in the Mapping workshop; and the furniture will be represented the same way as in the concluding activity "Scale Maps." Therefore, it is useful to precede the Designed Environments workshop with the Mapping workshop, if at all possible.

After making the maps, survey the tables in the room that are movable, to find out how many different sizes exist. Then measure one of each size, record the length and width, and convert these to the scale of the outline map. Later, you will provide these measurements to the participants, so they can make scale cutouts and attach them temporarily to the outline map.

Workshop Materials

- ❑ Scale map of the workshop space, on chart paper and/or transparency film (see above)
- ❑ Chart paper
- ❑ Markers
- ❑ Rulers

- ❑ A Connect Four game set
- ❑ Large collection of counters, checkers, or coins, in at least two colors or sizes, for playing Connect Four. Alternatively, you can make playing pieces by cutting squares of cardboard approximately $(3/4)'' \times (3/4)''$ in two colors.
- ❑ Approximately 11'' x 14'' sheets of graph paper with 1'' x 1'' grid squares, for making Connect Four. These can be cut out from a larger pad, or made with a ruler on a sheet of legal-size paper and then photocopied.
- ❑ Copies of Room Redesign Worksheet and Game Redesign Worksheet (see next two pages)



Room Redesign Worksheet

Original Design	
Problems with this design:	Criteria for a better design:
Resources available for redesign:	
Constraints that limit design options:	
Evidence that you could use to evaluate a new design:	
After Redesign	
Evaluation of how well new design worked:	
Criteria that were missed in evaluating the design:	
Changes that you might make for next redesign:	

Game Redesign Worksheet

Design Goal (Describe what you wanted the experience of playing the game to be like):	
Rules and Game board (Describe how you redesigned the game each time to accomplish your design goal; include a sketch or description of the game board)	Observations & Outcomes (Describe how well each redesigned version worked to meet your goals)

Directions to Participants

The following five pages provide a set of instructions for the workshop activities, suitable for copying to transparency films, PowerPoint slides, or chart paper, for use during the workshop.

DESIGNED ENVIRONMENTS

1. What's Wrong with this Room?

Use the Room Redesign Worksheet to list:

- The PROBLEMS with the current arrangement of furniture
- The CRITERIA a good classroom design should meet
- The RESOURCES available for redesign
- The CONSTRAINTS that would limit a new design
- Some EVIDENCE that a new design would be better than the current design

DESIGNED ENVIRONMENTS

2. Making it Better

- Design an arrangement of furniture that will:
 - Address the current problems.
 - Meet the criteria for a good design.
 - Work within the resources and constraints.
- Map your design on a transparency or chart paper.
- Develop a composite design that incorporates the best features of all the designs presented.
- Decide how to implement the new design.
- Rearrange the room.

DESIGNED ENVIRONMENTS

3. The Game Plan

- Learn the game of CONNECT FOUR.
- Divide into pairs. Each pair should then use a 6" x 7" piece of grid paper to play CONNECT FOUR.
- Decide on a criterion for redesign of the game. Develop a set of rules that you think will meet your criterion.
- Provide the rules to another pair of players, and watch as they play. Determine the effect of the new rules on their experience of playing.
- Redesign the game, as needed to meet your criterion. Use the Game Redesign Worksheet to keep track of each design cycle and its effects.

DESIGNED ENVIRONMENTS

4. Classroom Design Challenges

- Describe occasions when students identified classroom problems, and/or suggested ways of handling them.
- Make a list of things that get in the way of teaching and learning in your classroom.
- Identify items on your list that could be addressed by children; e.g., room arrangement, procedures, rules, methods of organization.
- For one item in number 2, list criteria that would tell you a new design was working better than the old.

DESIGNED ENVIRONMENTS

5. How Did We Do?

Use the Room Redesign Worksheet to list:

- Your EVALUATION of the redesign of the room: How well did the redesign of the room meet each of our criteria?
- Any CRITERIA that should have been included in the original list, but were not
- Based on the evaluation, any additional CHANGES that should be made in the room

Sample Workshop Agenda

Introductions (10 minutes)

Brainstorm: What's Wrong with this Room? (20 minutes)

Introduce the idea that reorganizing a room appropriately is an example of a design problem. Reveal that you have set up the workshop space using a deliberately bad design. Lead a brainstorming session to elicit the problems with the current space. Then, make additional brainstorming lists of the criteria a good design would have to meet, the constraints that limit the design, and the resources available for design. Conclude with a list showing the kinds of evidence that would indicate that a new design was working better than the current one. Post all five lists (Problems, Criteria, Constraints, Resources, and Evidence) so they are visible to the participants. Alternatively, each group can be asked to come up with its own list, using the [Room Redesign Worksheet](#), and the information from all the lists can then be shared. This and the next activity are based on Activities #5 and #6 in [Designed Environments](#).

Redesign: Making it Better (45 minutes)

Based on the brainstorming results, ask each group to develop plans for the rearrangement of the workshop space. They should make an effort to address the problems that have been identified, and meet the criteria while observing the constraints. Provide each group with an outline map, either on chart paper or transparency film, and post the measurements of the various table sizes, converted to the scale of the map. Each group should then make paper cutouts representing the tables, and place these on their map, to model various furniture arrangements.



Once the designs are complete, ask each group to present their design, and to explain how and why they think it will meet the criteria. From among the ideas presented,

the whole group should develop a composite design they believe will work best. If there is no consensus, sort the issues into a small number of basic decisions, and ask them consider each of these design elements separately, and take a vote on each one. For example, the arrangement of the worktables, the location of the supply table, and the position of the workshop leader, might each be handled separately, if there is disagreement about these issues. Then discuss how to move the furniture efficiently, and actually rearrange the room using the composite design as a basis. This design will be evaluated at the end of the workshop.

Design: The Game Plan (60 minutes)

A game is a miniature environment with its own spaces, rules, and procedures. Games are easy to redesign because they are self-contained and relatively simple. This activity explores redesign processes within this very restricted environment. It is based on Activity #4 in Designed Environments.

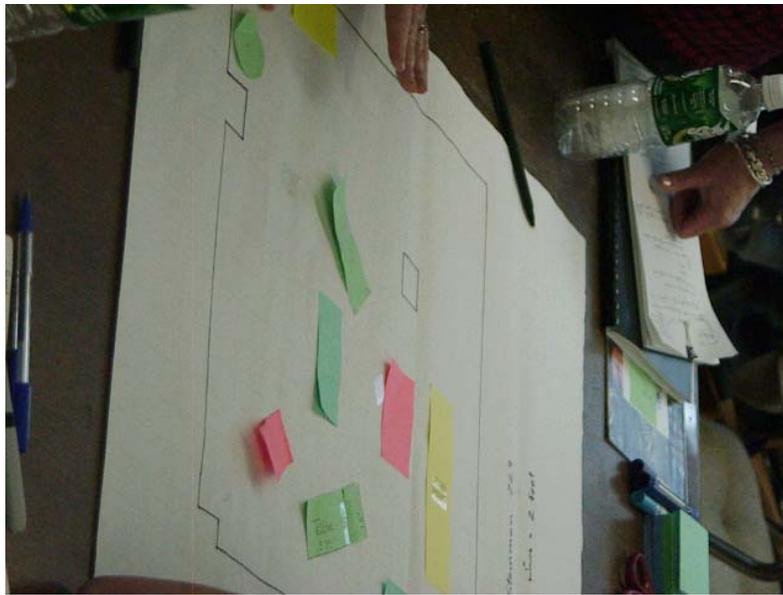
1. Introduce the game of Connect Four and invite two volunteers to demonstrate how to play. Make sure everyone learns the rules: each player uses a different color; players alternate; four-in-a-row wins; the winning line can be horizontal, vertical, or diagonal.
2. Organize the participants into groups of two. Distribute the sheets of graph paper and the playing pieces in two colors. Each group rules off a 7" x 6" rectangle on their graph paper, to make the playing area have the same number of positions as the commercially available Connect Four game. They then spend a few minutes playing Connect Four using these materials instead of the pre-fabricated game set. Ask how this "homemade" version of the game is different from playing on the manufactured Connect Four frame.
3. Discuss how one could change the rules of Connect Four. By using the grid squares, they are free to change the size of the board, number and arrangement of squares needed to win, simulation of gravity, etc.
4. Ask them to make one change in the way the game is played, and then try playing the game a few times using the new rules, and see how this change affects the experience of playing the game. Was it easier, harder, more frustrating, more boring, or more fun? Did the game take more time, less time, involve more strategy or less?
5. Ask each group to identify one design criterion to be met by changes in Connect Four, and to design a version of the game with this basis in mind. When they are satisfied that the new design meets this criterion, they should then write down the rules for this new version of the game.
6. Each group is to provide its new set of rules to another group, which then plays the modified game. As they do, the designers should find out whether the new rules had the intended effect. Then they should redesign the game and try again, keeping track of all changes and their effects on the Game Redesign Worksheet.

Brainstorm: Classroom Design Challenges (30 minutes)

Lead a very brief discussion about how children have identified and/or helped in solving problems in the classroom. For example, children may have suggested new procedures for lining up, sharpening pencils or organizing lunch, new methods for handling interruptions, or new ways of using classroom space. Ask the teachers to describe examples of their own. This discussion will lay the groundwork for the following brainstorming session.

Next, ask each group to make a brainstorming list of things that get in the way of teaching and learning in the classroom. Then, they should mark items on this list that could be open to redesign by children. Many of the items on these lists will be well beyond the control of teachers, let alone children. However, there will very likely be some problems for which children really could design and implement solutions. Ask each group to identify such items from their list. These might include procedures for distributing lunch, handling of classroom interruptions, or redesign of the furniture arrangement.

Once these items have been identified, ask each group to select one item on their list to develop further. Let them imagine that they had involved students in redesigning that aspect of classroom life. What would they look for to demonstrate how well the new design was working, compared with the old arrangement? See Activities #1, #2 & #3 in Designed Environments



Evaluation: How did we do? (15 minutes)

Discuss how well the redesigned workshop space has been working. Does it promote small group activities? Is it conducive to whole-group brainstorming? Then post the original list of criteria that the redesign was supposed to achieve. Does the new design meet these criteria? What evidence is there to show its level of effectiveness? Are there

criteria that should have been on the list, but are not? What further changes should be made to improve the design of the room?

Reflecting on Classroom Possibilities (15 minutes)

Lead a whole-group discussion on how the teachers might plan and implement classroom design or redesign projects. These projects could address the organization of space, or on the redesign of rules or procedures. Focus on how a project could be initiated, and to what extent it would include the design stages outlined under “Summary of Key Concepts” (pp. 38-39).

Workshop Tips and Strategies

Preparation of Workshop Space

When you set up the room, include some obvious design flaws that could be mildly irritating to the participants, but which will provide obvious room for redesign. Don't go overboard; the space should still be somewhat usable. For example, you might put the tables too close together, making it difficult to circulate around the room. Alternatively, the tables could be distributed so widely that some are not visible from one another, making it hard to have whole-group discussions.

Brainstorm & Redesign of Workshop Space

This activity is an example of user involvement in design. You are turning over to the teachers a task usually reserved for workshop leaders: the arrangement of the workshop space. In a similar way, Designed Environments calls on teachers to relinquish some of their traditional control of the classroom environment, by involving students in the redesign of spaces and rules. Some teachers may resist this idea, so it is important to model the process, by demonstrating that you are willing to let them modify their own workshop space.

The new arrangement will not be perfect, but it will probably be an improvement over your deliberately bad design. Encourage the participants to see design as an ongoing process, where improvements are made incrementally, with each new design based on the flaws in the previous one. Some participants may object that there are still problems with the furniture arrangement, and may want to modify it again immediately. Point out that there is no such thing as a perfect design, and that every redesign should be based on data showing the deficiencies of the previous design. Suggest that by living with the design for a while, they could collect additional data. Thus, it is better to wait, than to do another redesign immediately.

Design: The Game Plan

Children (and adults) frequently make changes in sports and games to accommodate particular situations. There may not be enough players, not enough playing

space, or not enough time, so the rules and/or playing areas have to be modified. For example, baseball is often adapted to a small playing area by reducing the number of bases and/or restricting where the ball may be hit. Checkers can be speeded up by allowing kings to advance the length of the board in one move, like bishops in chess. Monopoly is another game that is often redesigned. If participants are unclear about what it means to redesign a game, solicit some examples like these.

Develop the idea that games are miniature environments, and that we can redesign them to meet our own needs. Then, in playing and redesigning Connect Four, help teachers understand how criteria are established to guide a new design, and how that design can be evaluated to see how well it meets the criteria. For example, a simple change in the number needed for victory will make the game go much faster or slower. “Connect Five” is much harder to win than Connect Four, and many games end in a draw. “Connect Three,” on the other hand, ends very quickly.

Brainstorming: Classroom Design Challenges

The first list of problems could include anything at all: behavioral issues, administrative decisions, state requirements, budget cuts, physical plant, etc. Many of these issues are clearly beyond the control of teachers and students. These might be identified as *constraints*. On the other hand, teachers (and students) could actually make changes in the arrangement of furniture, the storage and/or distribution of materials and supplies, procedures for handing in or returning homework, and perhaps even handling of interruptions. Typically, teachers, not children, undertake these design problems. Participants will need to see that children can and should become involved in much of the design work that teachers routinely do. To develop this idea, it is useful to elicit examples of suggestions that children have already made for improving the classroom environment. Then they can look at their own lists of classroom problems to find opportunities for involving children in solving them.

The goal of these brainstorming activities is for participants to become aware of possible redesign activities in their own classrooms. Some important outcomes are the understanding that children can think creatively about their classroom environment, and that these projects can help students develop design skills and a sense of responsibility. List some of the more promising ideas on chart paper so teachers can refer to them during the concluding discussion on “Classroom Possibilities.” See Chapter 2 of Designed Environments for a wide variety of possible projects.

Evaluation of Workshop Space Redesign

The workshop space design should first be measured against the original design criteria. Often, it will turn out that the original criteria may have been met, but there were additional criteria that were never considered. These may actually be more important than the criteria that were met! When this occurs, use the example to point out that real design processes may fail to conform to an idealized design cycle. Design is messy, and testing a design often reveals that the problems were not understood well at the outset. Furthermore, design is an ongoing process, and that the first attempt at design rarely

provides a completely satisfactory solution. By evaluating a design, you uncover weaknesses that should serve as the basis for the next iteration.

Reflecting on Classroom Possibilities

The purpose of this final reflection is to make it more likely that teachers will engage children in a Designed Environments project. Be open to the teachers' misgivings and the problems they foresee, for many teachers find it difficult to "relinquish control." Emphasize that students' design ideas will still be subject to teacher review, and will affect the classroom environment in controlled ways. Then help them see possible starting points in their own classrooms, and the benefits for their students. Often design issues arise spontaneously, based on a suggestion by a student, or a problem that makes itself obvious. Participants should become able to recognize these as opportunities for Designed Environments projects.