Chapter 4

STORIES

Yes, I'm sold on *Designed Environments*. I want to do it. This is where I would like to end up with my class, but how is it possible? Where can I begin? My kids don't know how to follow rules, let alone improve them. They are barely able to find their own seats. How can they plan where things should go in a room? And all they know about time is school dismissal and the TV schedule.

You are not unique. You would quickly find common ground with the teachers who helped develop this guide. Their stories are here to help you see ways to proceed. The teachers who helped develop *Stuff That Works!* teach kindergarten through eighth grade. All work in public schools in low-income areas of New York City. One is a bilingual special education teacher. A few are quite new to teaching. You may see your own story in their stories.

The first part of this chapter presents teachers' stories about their work with children in analysis and design of procedures and rules: classroom procedures, school rules, and the rules and designed environments of games.

The second part of the chapter focuses on spatial environments: a classroom, a school cafeteria, and environments for class pets.

Part I: Rules and Procedures

Classroom Procedures

A procedure organizes how things are done. Classroom procedures give structure to activities as diverse as lining up for gym, sharpening pencils, and preparing to go home. Classroom procedures guide students just as rules do. But they differ in the way students perceive them. Rules often prohibit students from doing what they would do if left to their own desires. The threat of punishment is often used to enforce rules. Procedures, on the other hand, specify ways of doing things that students would as soon do one way as another.

Rules and procedures differ in another significant way. Rules often control behavior all the time: no hitting, no hats in class, no chewing gum in school. Procedures govern particular situations such as taking attendance, responding to a fire drill, or handing in homework. These differences between rules and procedures make it easier to involve children in changing procedures than in changing rules.

The starting point for a procedure-changing activity is a procedure that is not working well. All you need to do is be sensitive to a situation that is not working, and then involve the students in finding the solution.

Tonia Bailey, a third grade teacher, did several *Designed Environments* projects. Two of them focused on classroom procedures:

- Children forget to put their chairs up after school. The custodian will not sweep the classroom if chairs are not placed on tables at the end of the day.
- The children's coats often wind up on the floor of the closet. When this occurs, the coats get dirty, the doors cannot be closed, and the room looks disorganized.

As she worked on *Designed Environments* projects, Tonia found it difficult to engage the whole class from the beginning, so she developed an approach that worked better for her and her students. She had a small group of students do the initial analysis

of the problem which they then shared with the rest of the class. From that point on it became a class project. Tonia tells how this worked out with the "Chairs Up and Down" project.

"Chairs Up and Down"

I had three students collect data. I explained to them that they were working on a top-secret assignment and that they could not mention it to any of their classmates. They were to create a way to check the chairs at the end of each day. They decided to tally each day and record the number of chairs up and down. I did not change the structure of the day and simply told the children to put up their chairs as I always did. This went on for four days.

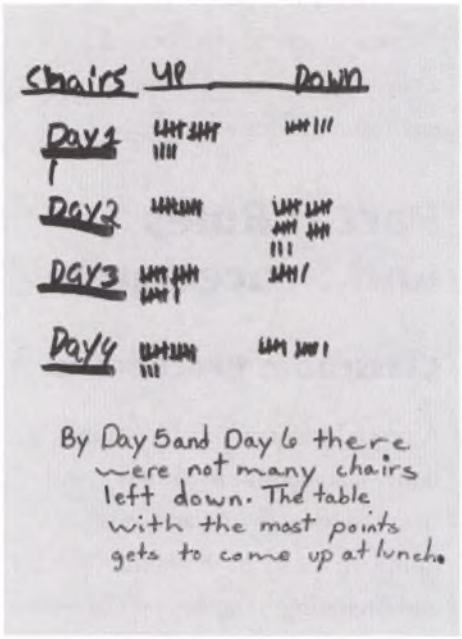
The children presented their data to the class. Two children presented a tally graph (Figure 4-1) and the other one presented a double bar graph.

The class was then divided into five groups and each group was told to develop a way to encourage children to put up their chairs. The groups generated many ideas. They put them on chart paper in small groups (see Figure 4-2), then we met as a group to discuss and share. The children came up in groups and shared their solutions.

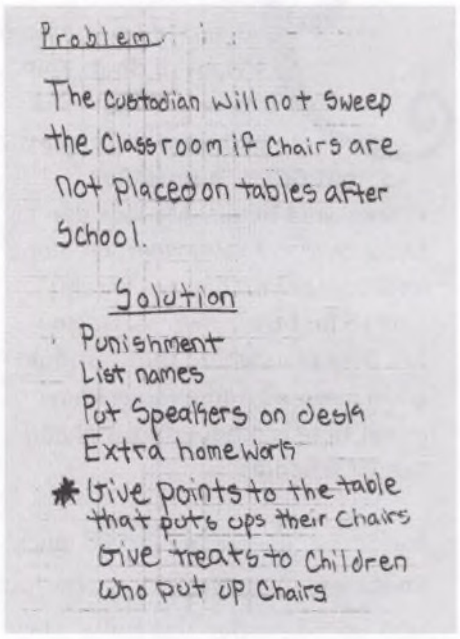
The children decided to try out one of the solutions for two days: "Give points to the table that puts up their chairs, then let the winning table come up at the end of the week for lunch." (Figure 4-3 is a graph showing four days of secret record-keeping and two days after a solution was tried.)

Tonia had another problem situation that she brought to the attention of a small group: coats on the coat closet floor. None of the children had presented this as a problem, even though it involved their coats. Tonia helped students recognize the problem by asking them to collect some data. Here is her story about what she called "Hook Mania."

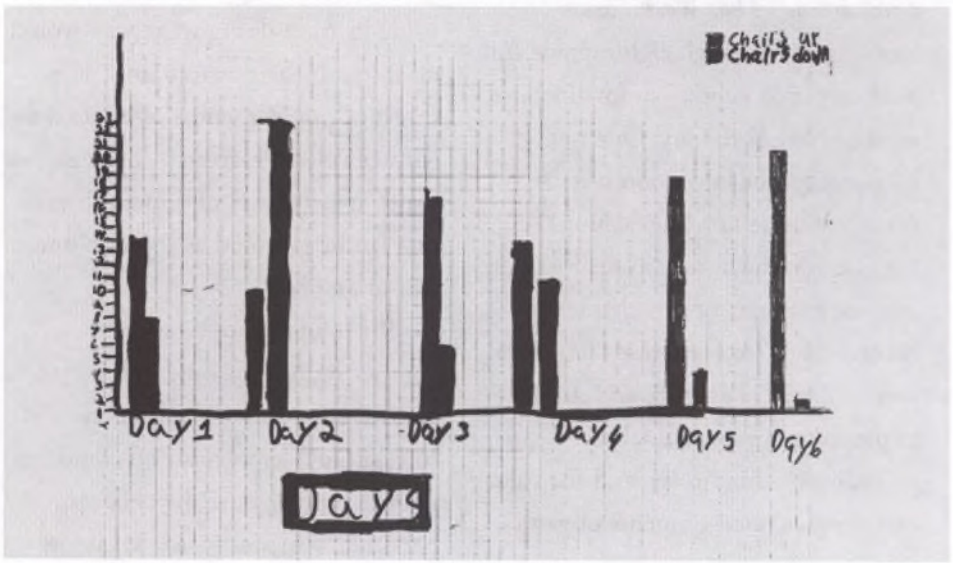
4-1: **A tally graph documenting the extent of the "Chairs Up and Down" problem**



4-2: **One group's brainstorming list about solutions to the "Chairs Up and Down" problem**



4-3: **Bar graph showing the number of chairs up and down before record-keeping became public (Days 1-4) and after a solution was tried (Days 5-6).**



"Hook Mania"

I gathered four children to consider a problem: the coats that belong to the children are often thrown on the floor of the closet. When this occurs, the doors cannot be closed, and the room looks disorganized. The four children had the task of counting the coats on the floor in the morning after the children unpacked and began their day. The group charted the number of coats for five days (Monday-Friday).

They presented their data to the class. The children had a brainstorming session where they listed possible solutions. They were to discuss the solutions and list the ways they would solve the problem.

The groups varied in their solutions (see Figure 4-4 for one group's solutions) and the class had difficulty determining which solution they would try first. I had to explain that only one solution can be tried out at a time. I let children explore possible solutions even if it seemed to me they would fail. I discouraged solutions which directly involved me (e.g., detention, keeping children upstairs. etc.)

The children decided to put a number next to each hook. Every child received a hook number (alphabetical order). The data was collected again for five days, Monday through Friday. The results are seen in Figure 4-5.

4-4: **One group's proposed solutions to the coat problem**

Coats on the Floor

Problem:

The children's coats are getting dirty because they are thrown in the closet.

Solutions:

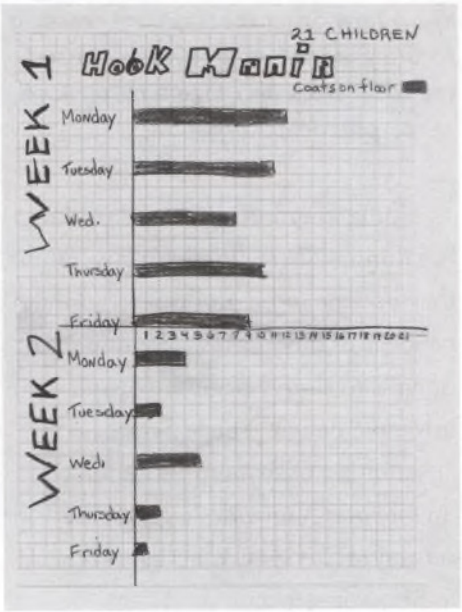
1. Closet monitor
2. Detention
3. Put smallest coats first
4. Assign numbers to students that correspond to hooks.
5. Put names on wall next to hooks.

The graph of "Hook Mania" (see Figure 4-5) shows a marked decrease in coats on the floor after children had become aware of this as a problem and after they had designed their own solution. Again, the results underline how important it is to have children collect and represent real data-data that represents their behavior. Such data are a major impetus for changing behavior.

If you have planned instruction that meets national and/or state standards, you are probably saying "Hey, this meets many of my Mathematics standards and English Language Arts standards." Indeed, *Designed Environments* projects tend to meet standards of several disciplines. When children think about real problems, plan ways to collect and represent data on those problems (i.e., do analysis), then plan, implement, and evaluate solutions (i.e., do design), they are engaged in integrated activities that meet many goals. (See Chapter 3, "Activities," for the national standards addressed by these activities.)

When you allow children to do these kinds of projects you need to consider the amount of time this sort of learning takes. There are also effects on you as a teacher. Tonia Bailey gives voice to these concerns in her reflections on *Designed Environments.*

4-5: **Number of coats on floor before (Week 1) and after (Week 2) hooks were numbered**



Tonia's Reflections on *Designed Environments*

Each of the projects took more than two sessions and many are ongoing (try it out, design, try it out, redesign, ...) Because of this I was not able to cover all the topics I intended.

I realized that because the children were more engaged and relied less on me (after the first *Designed Environments* lesson), I wasn't the center of their development. This is something I am trying to do less of (being teacher-centered). As an eighth year teacher, I am attempting to become less of an instructor and more of a facilitator. Because we tend to want control, we as teachers usually feel uncomfortable as facilitators.

The process involved in the *Designed Environments* unit really makes the children accountable. *They* gather the data, *they* analyze the material, and *they* design. I don't know how other teachers are reacting to the experience, but it has caused me to sit back and take a closer look at my practice.

Tonia found that as she involved her third graders in designing solutions, they became more proficient and independent in the process. The important thing is to simply begin involving them in simple design. The activity "Examining Classroom Procedures" in Chapter 3 provides a generalized version of Tonia's two design projects to help you get started.

Classroom Rules

A good way to help children become better observers is by having them count things or instances of an event. Tonia's children became more sensitive to coats on the floor and chairs left down by counting them. Similarly, as children tally incidents of rule-breaking, they become more sensitive observers of these events and, usually, more concerned about these infractions.

The next two stories are about school rules. Mary Flores is a resource room teacher, who teaches language arts to bilingual special education students. They range from second to fifth grade and come to her tiny room in groups of six or seven. This project, a study of rule-breaking behavior, was carried out over a ten-week period. Mary fit this project around reading and language arts activities, which were her major focus. The work described below was done with each of two fifth grade groups. It was late September when the class began discussing who controls their behavior.

NICOLE:
My mother, father, aunt, uncle and neighbors control me.

RICARDO:
Clean-up people (sanitation).

TRACY:
Clean-up people control the Earth.

RICARDO:
Police control gangs when they shoot people.

JONEE:
The fireman controls the fires.

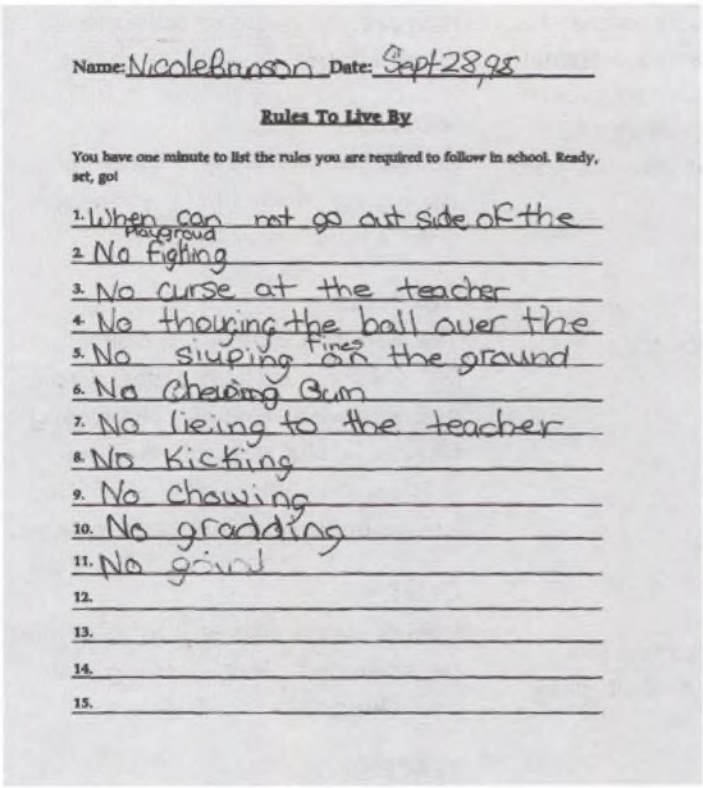
TRACY:
My teacher controls me.

TEACHER:
How does the teacher control her class?

TRACY:
We got rules. We gotta follow them rules.

I decided that this was the time to introduce the initial activity. I handed out the inquiry sheet "Rules To Live By." (See page 64 in Chapter 3, "Activities.") I informed the students that they would have one minute to list all the rules they are required to follow in school. I quickly realized that a minute was not enough time. I allotted an additional four minutes. When they completed the sheet (see Figure 4-6), I gathered them in a group for sharing. I listed the rules on a chart tablet. Some of the rules were particularly interesting. For example, I asked Ricardo to elaborate on his "no walking with food in your hands" response. He explained that in the lunchroom, "The students are not allowed to walk while picking food from their trays."

4-6: **"Rules to Live By"**



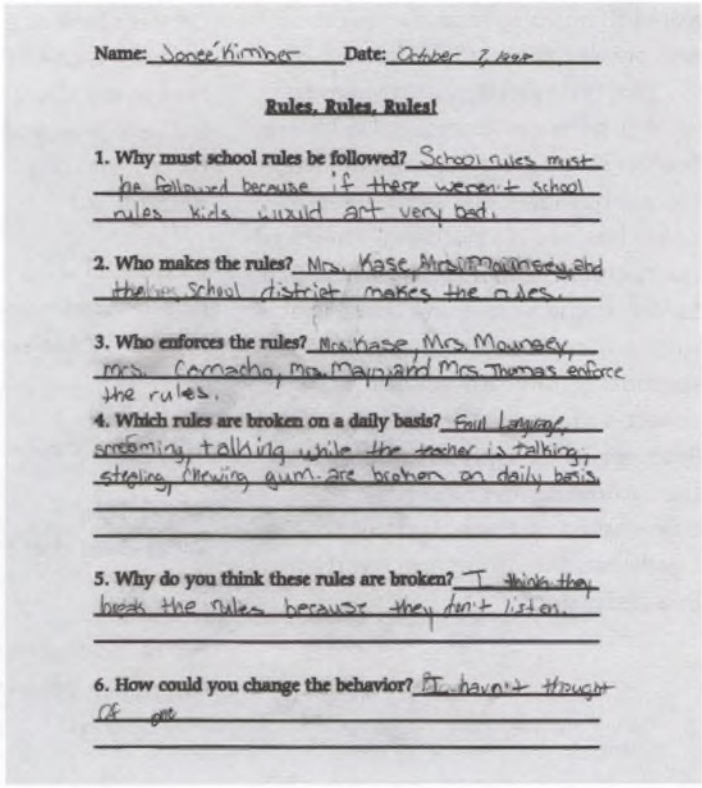
Name: Nicole Branson Date: Sept 28 98

Rules To Live By

You have one minute to list the rules you are required to follow in school. Ready, set, go!

1. When can not go out side of the Playgroud
2. No fighting
3. No curse at the teacher
4. No thowing the ball over the
5. No siuping fines on the ground
6. No Chewing Gum
7. No lieing to the teacher
8. No Kicking
9. No Chowing
10. No gradding
11. No gind
12.
13.
14.
15.

4-7: **Jonee's responses to "Rules, Rules, Rules"**



Name: Jonee' Kimber Date: October 7 1998

Rules, Rules, Rules!

1. **Why must school rules be followed?** School rules must be followed because if there weren't school rules kids would act very bad.
2. **Who makes the rules?** Mrs. Kase, Mrs. Mawney, and the school district makes the rules.
3. **Who enforces the rules?** Mrs. Kase, Mrs. Mawney, mrs. Camacho, Mrs. Mapp, and Mrs. Thomas enforce the rules.
4. **Which rules are broken on a daily basis?** Foul Language, screaming, talking while the teacher is talking, stealing, chewing gum. are broken on daily basis.
5. **Why do you think these rules are broken?** I think they break the rules because they don't listen.
6. **How could you change the behavior?** I haven't thought of one

I thought about some of the rules the students listed and wondered whether these are spoken rules or rules the students automatically know. How many educators allow the students to determine the rules for their classrooms? I am convinced that if students are allowed to partake in designing the rules, they will think twice before breaking them. In the past, I have allowed students to decide the consequences for breaking the rules. In some cases, their punishments for these infractions were worse than mine.

October 7, 1998

I handed out the "Rules, Rules, Rules" worksheet. I had different students read the questions. After each question we took time to clarify it. Then I gave time for them to write full responses to the questions. (See Figure 4-7 for Jonee's responses.) When we finished "Rules, Rules, Rules," I informed the students that we would be "spies." I told them that we would be investigating the rules that are broken the most. Of course, they will have to do this covertly. They became excited by the challenge. I've got them now!

October 26, 1998

My fifth grade group has been asking when they would have the opportunity to "spy." I think that is what motivates them.

I told them to begin thinking about which rules are broken on a daily basis. I informed the group that we would be going on an outing. I handed them the inquiry sheet entitled "Peek-A-Boo, I'm Watching You." We read the questions for clarification. I told them to think about these questions as we walked around. The students were thrilled to be out of the room. As we toured the school building, Heriberto looked up at one of the closets in the hallway and said, "I could hide up there. Nobody will know I am spying on them." They are beginning to think about the prospects of this inquiry.

We returned to the class and I asked them to re-read the questions and answer them. (See Figure 4-8.)

The first question asks them to predict where in the school rules are broken the most. No problem. The second question asks what rules are being broken. No problem. The third question asks them to develop a plan to determine how many times the rules are broken. It also asks the students to indicate how they will collect and record the data. Problems! I foolishly assumed that they would understand what was being asked of them. Not so! So, I gathered the group and led them in a discussion:

TEACHER:
OK, let's look at the question together. It says, "Develop a plan to determine how many times the rules are broken. Indicate how you will collect and record the data." What does the word data mean?

HERIBERTO:
I think data means like writing it in a little notebook?

MOISES:
Information.

TEACHER:
What does that mean?

MOISES:
We're collecting information on other people and what they are doing.

TEACHER:
How are you going to collect that information?

MOISES:
I'm gonna write everything they do wrong in my little notebook that I have at home.

DERRELL:
The way I'm going to collect my data is look and see, look and see who's doing the wrong things in the school. And by writing the information of the human beings doing their things.

CYNTHIA:
I think data means you're spying on someone that's doing the bad things.

TEACHER:
Let's backtrack a little bit. Let's think about the rule that you think is being broken the most.

EBONY:
Gum chewing?

TEACHER:
How are you going to prove to someone how many kids are breaking that rule?

CYNTHIA:
By tape recording it on some small camera.

TEACHER:
We don't have access to a camera. Remember, you don't want anyone to know you're spying on them. If you use a camera people will know you're watching them.

4-8: **"Peek-A-Book, I'm Watching You"**

Name: Moises Barra Date: 10/26/96

Peek-A-Boo. I'm Watching You

Everyday school rules are broken. In this study, you will be observing your fellow students to determine which rules are being broken. These observations may be done in your classroom, in the schoolyard, in the hallways, in the lunchroom, etc. DO NOT let anyone know what you are doing, as this may affect the outcome of the study. First, think about where in the school building are the most rules being broken.

I predict that rules are broken most in the: Bathroom and class and school yard. (classroom)
What rules are being broken? The rules that are being broke the most is no chewing gum in the classroom.

Develop a plan to determine how many times the rules are broken. Indicate how you will collect and record the data

This is how I plan to collect and record the data: I am going to collect the data in my little notebook that will be in my pocket.

(Things to think about: Are rules broken most at a particular time? Who breaks the rules more often, boys or girls?)

ALL:
Yes!

DERRELL:
How do we know if other people are spying on us, when we're spying on them?

TEACHER:
How are you going to collect numbers, if it is numbers that you want to collect? How are you going to prove to me that so many students broke the rules? I'm going to ask you at the end of the week to show me your data. What will you use?

MOISES:
A graph.

TEACHER:
What will the graph show?

MOISES:
One that says, um, number of people chewing gum, the other one will say number of people fighting, number of people cursing, number of people running. Then it can be a tally mark.

HERIBERTO:
You can make a chart that says, "Rules that are broken in the classroom"

MATTHEW:
We'll collect a big calendar and bring it in to teacher, to tell them how many people have been cursing at the teacher.

TEACHER:
How will you use a calendar?

MATTHEW:
We'll just write how many people are breaking the rule on the calendar. Like on the first day, you'll put it on the first date, then the second then the third.

HERIBERTO:
That's what I was going to say.

TEACHER:
What other ways are there of collecting data besides tally marks?

HERIBERTO:
Number graphs. Like you put 5, 10, 15, 20 going up and then you put the rules that are broken on the bottom and you go coloring like that until the last number. I think that's called a bar graph.

MOISES:
Like a line graph. You do the same thing like 5, 10, 15, 20 or you can do 10, 20, 30, It doesn't make any difference, going down this way and then you write a dot and then you make another dot and then you connect it.

HERIBERTO:
We can use a color graph.

TEACHER:
What is that?

HERIBERTO:
Like you're coloring on the graph. That you go coloring up and you stop at what number the rules are broken in different colors and all that.

MATTHEW:
Can't we just put the numbers for the week? We'll put one week for how many days if the rates are getting higher from what it was the first day. Or if the rates are dropping, it will be good.

TEACHER:
How else can you collect information?

HERIBERTO: *Taking a notebook and writing it down, everything they do bad.*

TEACHER:
Once you collect all the information what will you do with the information?

HERIBERTO:
You write it down nice and neat on a piece of paper? Um, when we finish spying, then we could tell, like, the teacher and they could, like, help us spy on them.

MOISES:
The teachers wouldn't help.

HERIBERTO:
They will help us spy on them and then everything they do wrong they'll tell us and we'll write it in our handy dandy notebook.

EBONY:
I will save it and write all the information of the bad things they used to do and the things they doing now.

CYNTHIA:
It's like um, um the government or something like that. You know what I mean. And you have all this stuff and we let them know all the stuff we're doing in this school.

HERIBERTO:
You can copy it down on the computer and then after that you can give it to the teacher and the teachers can give it to the kids and see what they been doing wrong and they can adjust, change their behavior and stop doing things cause there's consequences for these things. You could, like, get suspended and get in trouble.

We ended the discussion here. But, I must say this discussion gave the group food for thought. Touring the building was a good idea. Although they know where rules are broken the most, they confirmed their predictions as they observed students breaking the rules. I believe that further understandings came as the discussion unfolded. They wanted to continue the discussion, but time ran out. I'm glad that they are excited by the project. It remains to be seen whether they will collect the data independently. They are pretty much on their own. If it doesn't work, then I will have to go to plan #2, which is to do an observation with the group. Will they be disciplined enough to see this through?

November 4, 1998

Two of the students, from my fourth group, were excited about getting the investigation started. I decided to have them write the step-by-step directions for their inquiry. (See Figure 4-9.)

Moises and Heriberto decided to work together. They are investigating what goes on in the fourth floor boys' bathroom. As soon as they had written their detailed account of the study, Heriberto asked if they could begin. I allowed them to go on their mission. They were ready. They walked up to the fourth floor bathroom with the "spy book" they created. I could not leave the remainder of the group, so I couldn't see first-hand what they were doing. I had to trust that they'd do the right thing. At some point, a colleague, Al Camacho, happened to come into my classroom. I asked him if he would check in on the boys and photograph them engaging in their study. He did. He reported later that the boys were indeed involved in documenting the behaviors. When they returned I asked them to write a reflection about their study. (See Figure 4-10). The journal entries will be used to determine what, if anything, they are gaining from this study.

4-9: **Moises' plans for a project on rule-breaking**

Moises Baez' Step-by-Step Directions

Step 1: Get a notebook that can fit in your pocket.

Step 2: Get a good pencil.

Step 3: Go and spy in the bathroom for 5 minutes.

Step 4: Spy in the four floor bathroom because the kid like to play what the paper tolits.

Step 5: Give the note to Mis Flores.

Step 6: Give the notes to the teacher of the class

Step 7: Make a big, big graph.

Step 8: Put it where every one can see it.

Step 9: The graph will show what the people did wrong, I will be in the first floor.

4-10: **Heriberto's and Moises' reflection on the rule-breaking study**

Heriberto and Moises 11-5-98

Reflection

Today no one have Broken the rules to day. H siting on the Radator and his butt got hot. M was pretending to go to the Bathroom. We are not spending a lot of time in the Bathroom. that is why we have no data.

During November Mary realized that, in spite of the children's enthusiasm, they did not spend enough time with her in the resource room to both do the resource room work and be out of the room to collect data for the project. She began to move toward closure.

December 1, 1998

I engaged my fourth group in a directed writing activity. The way it works is that I pose questions for students to use as prompts. These prompts are meant to nudge their thinking with regards to their learning:

- **What did you learn by conducting this study? Elaborate.**
- **Who breaks the rules more often, boys or girls?**
- **Based on your observations, which rule is broken the most?**
- **If you had to do it again, what would you do differently?**
- **How would you attempt to influence positive behavior?**
- **Did you enjoy this study? Why or why not?**

They wrote uninterrupted for about 30 minutes (well, almost uninterrupted), I could tell that they were engaged in the activity because you could hear a pin drop. When I posed the question, "Who breaks the rules more, boys or girls?" the boys yelled out, "The girls!" and, of course, the girls yelled out, "The boys!" I called the class to order and they wrote down their responses to the question. Interestingly enough, all except one indicated that boys break the rules more often. Derrell claims that boys and girls break the rules equally.

Final Reflection

Although, the students in my fourth group continue to be interested in the project, I have decided to move on. Why the sudden exit from this project? One of the reasons is that they only document rule infractions when they are in my room. Also, they spend time out of the classroom and return with limited data. How many students could they possibly observe breaking the lavatory rules, in a 15 minute period in the afternoon? The students could not implement a plan for changing behavior, because there was not enough data on which to base a change.

However, in reading their final reflections I've assessed that they've drawn their own conclusions and thus gained new understandings in the area of social controls. The students' final evaluations show they were able to respond thoughtfully to the questions posed. When I initially asked students to answer the question, "How would you change the behavior?" (in October), many of them could not answer the question or wrote responses without giving the question careful thought. However, when I posed the question again, in their final reflection, all of them offered a solution. They were not able to affect a school-wide change in behaviors, but they were able to reflect on their own behavior. Will they now think twice before breaking a rule? I would hope so.

Two students indicated that they'd write a newspaper article in the "Green Pages" (our garden newsletter) indicating the rules that are being broken on a daily basis. This was their method of influencing behavior. They are integrating technology into another area of the curriculum, language arts. Others reflected on their lack of data. They came to the conclusion that more data would be needed in order for it to be a conclusive study.

Mary's resource room had little space, there were only a few students in each group, and Mary had little time with each group. These factors led Mary to focus the study of rule-breaking on areas outside her classroom. Classrooms in which children are together for most of the day are better settings for studies of rule-breaking. In regular classroom settings the object of study can be simple classroom rules such as no interrupting, no calling out, or whatever else children may choose. After the children have designed the study, data collection can be carried out by designated data collectors. Children are able to keep track of simple rule-breaking-interrupting, for example-alongside their normal classroom work. In Chapter 3, the plans for "Peek-a-Boo" are Mary's plans, modified for use in comprehensive elementary classrooms.

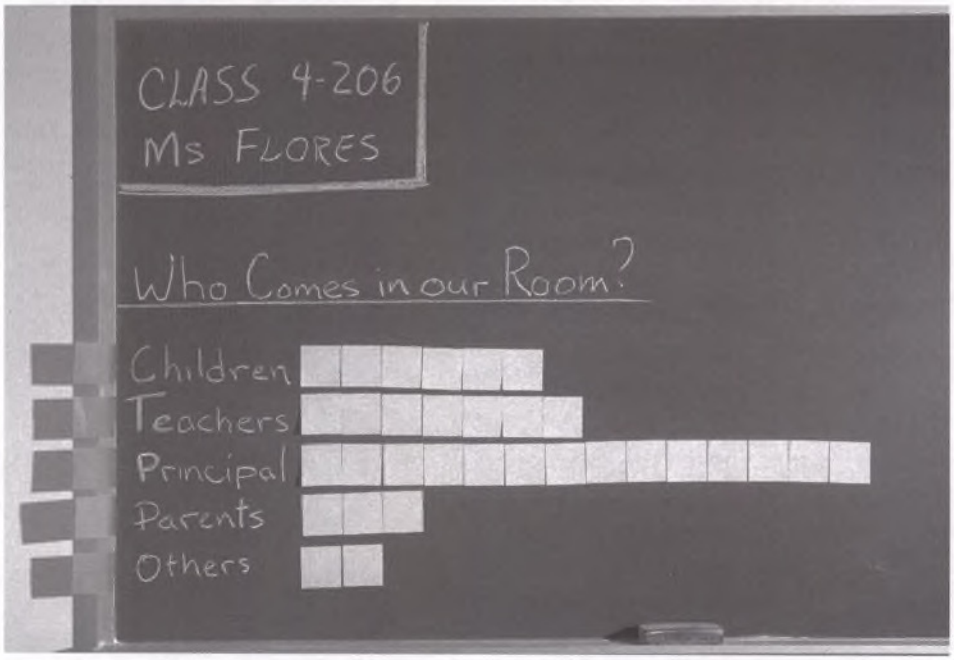
Recording Behavior

Mary knew that counting instances of particular behaviors was an excellent way to make children aware of the behavior. Two years earlier in another special education class, Mary engaged her students in a study of their time outside the classroom. Students left the room for many reasons. Some went on errands to the principal's office or other

4-11: **Keeping track of time out**

Name	Time out	Time in	Destination
Jose	10:05	10:10	Toilet
Maria Sonia	10:10	10:15	Office
Moses	10:30	10:40	Bathroom
Shawn	10:48	11:01	Water
Gerardo	10:50	11:07	bathroom

4-12: **Interruption data**



classrooms. More left the room for water or the bathroom. For some, it never was clear why they had left the room. The study Mary had them do was simple. On a chart posted next to the door there were four columns: name, time out, time back, and destination. When a student left the room he recorded his name, the time and the destination. Upon returning he wrote the time he returned. (See Figure 4-11.)

At the end of the week they looked at the data on trips outside the room. Mary helped them look at the data in different ways. How many trips were to the bathroom? To other destinations? How much time was spent on trips to each destination? How much time was spent by boys? How much by girls? In the successive weeks the trips changed, especially the time spent on them. Students became self-conscious about the time spent out of class. They cut the time they were gone. One boy made trip to the bathroom in no time: the time when he left and the time when he got back, to the nearest minute, were the same!

The consciousness-raising effect of recording behavior is not limited to special education students. It works for adults too. In fact, Mary's first experience with this technique involved her principal. Mary's room had many special programs which attracted many visitors. Each visitor, no matter how well behaved, was an interruption. The class decided to do an interruption study. They developed categories of interruptors: children from other classes, other teachers, the principal, parents, and others. (See Figure 4-12.) One day when the principal entered, she noticed a child get up and put another mark at the end of a long line of tallies that followed the word "principal." "What are you doing?" the principal asked. "Oh, this is our interruption study and I'm the recorder today." Mary's principal cut back on her visits. Even principals are not aware of their behavior and its effect. Recording behavior helps raise consciousness about that behavior. Such awareness is a prerequisite to changing behavior and to changing the rules applying to the behavior.

One answer to the question "How do I begin?" is to create situations where the students' behavior is recorded in a public way. This will help them become better observers of their own behavior. Another answer is to engage them in a project where they observe (tally) the behavior of others. When students carry out a study of other students' behavior, they are doing analysis. Analysis projects may or may not become design projects at some later date. Often the more we know about a situation, the more we want to do something about it. This is what leads analysis into design. "An Introduction to Data Collection" and "Interruptions" in Chapter 3 are good places to begin.

Rules of Games

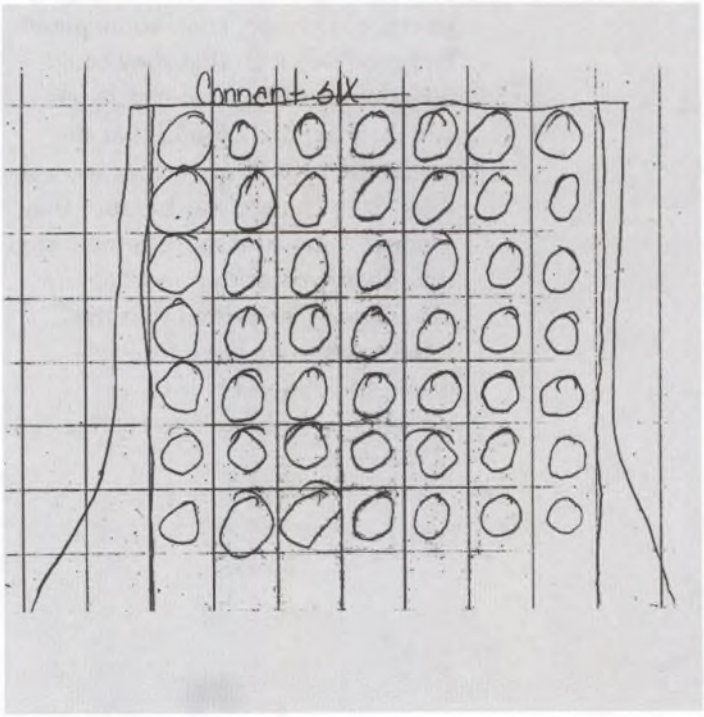
Games create their own miniature environments. Once you enter a game, you play according to its rules. Sometimes you want to change the rules, thus changing the way you do things in the world of the game. To do this, you step outside the game, reach agreement with other players as to the new rules, then step back into the newly redesigned environment of the game. The winner is the one that is best adapted to perform within the game (if the game does not depend on luck).

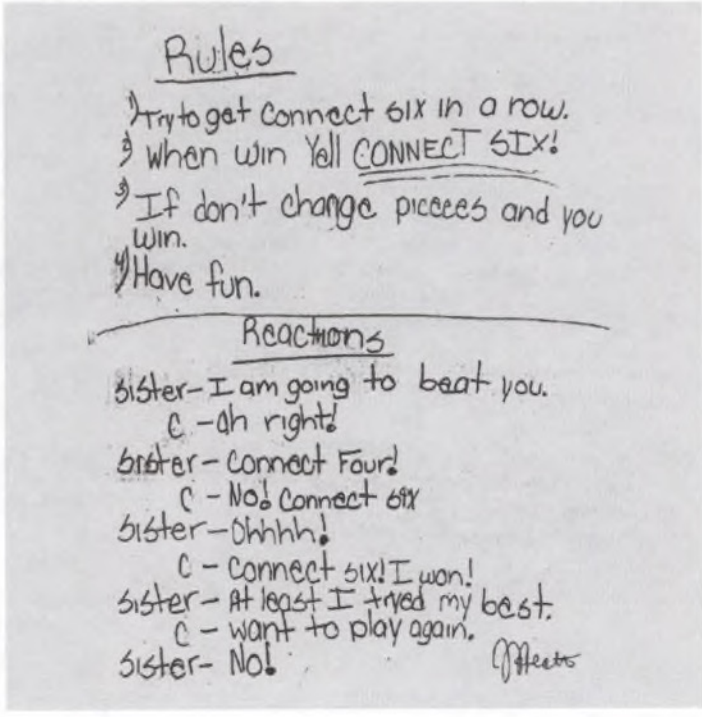
Games are wonderful vehicles for studying the rules that govern an environment. Children know the rules of many games. They have probably modified the rules of games to make them easier to play. And they know about breaking the rules: they call it "cheating."

What children don't know about games is how to plan the rules you want to change, and how to tell if the new rule is an improvement. They don't know about the analysis and design of the game environment. But since they already are familiar with games, a game environment offers one of the best ways to study *Designed Environments.*

Minerva Rivera, a fifth grade teacher in a small alternative school, was fascinated with the notion of having children make modifications of games and invent new games. So she embarked on an extended unit on games. In the first part she had children modify existing games. The activities in Chapter 3 (pages 67-71) are based on this part of her work. The second part of her work is itself a unit. In this unit Minerva's students designed their own games and evaluated them.

4-13A-B: **"Connect Four" redesigned as "Connect Six"**





Modifying Games

October 16, 1999

Minerva began with games of Checkers, Connect Four, Chess, Mancala, and Bingo.

I decided to let the children play the games first, before requesting that they change a particular rule. I gave them approximately half-an-hour to play according to the rules of the game. This was done at the end of the day on Friday, the period allotted for "choice time." The children paired up and spent the full half-hour playing with the games. I told them they could play more than one game during that time. Many of the children decided to play their games more than once instead of switching to another one. I noticed that many of the children didn't bother to examine the rules of the games because the children were so familiar with them.

October 19, 1999

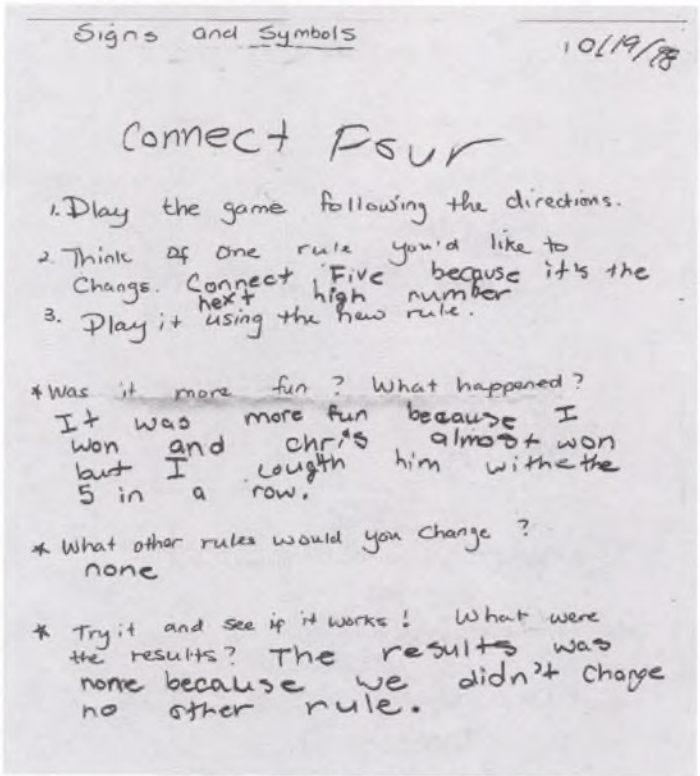
I requested that the students work in pairs again with the same games they had used on Friday. This time I instructed them to take one rule and change it. They were to decide which rule they would change and explain the new rule. They were then to play the game according to the new rule. (See Figure 4-13.)

As I went around to check on their progress, I found those students who had elected to play Chess, Checkers, Mancala, and Bingo had an extremely difficult time finding a rule that would be different from the official rules. What I found was that Connect Four was the only game that lent itself readily to this activity. The other games posed difficulties for the children in that it was harder for them to come up with a change that they could implement with ease. (See Figure 4-14.)

One set of partners playing checkers kept coming up with rules that were similar to the original rules; for example, when I asked Stephanie what new rule she and her partner had decided upon, she told me that you couldn't play on the black squares, you could only play on the red ones. I pointed out that meant the rules were unaffected because it would still be played the same. Then she suggested that the pieces could only be played diagonally. After discussing the fact that this too was already a rule, I suggested that she and her partner think about other games they have played and that it might be fun to try one of those other rules with this game.

The other children were playing games of Connect Four. Some people had modified it so that they could play Connect Five, Connect Three, and Connect Six. I found that the reason that the other games were so difficult to change was because they seemed to be a bit more complicated than the game of Connect Four. In other words, it seemed that the fewer rules there were to play a game, the easier it was for my students to find a rule to change.

4-14: **Reflections on the redesign of Connect Four**


Signs and Symbols 10/19/99

Connect Four

1. Play the game following the directions.
2. Think of one rule you'd like to Change. Connect Five because it's the next high number
3. Play it using the new rule.

* Was it more fun ? What happened ?
It was more fun because I won and chris almost won but I coughth him withe the 5 in a row.

* What other rules would you change ?
none

* Try it and see if it works ! What were the results ? The results was none because we didn't change no other rule.

After three weeks with no games, Minerva told her class:

1. Pair up with a classmate.
2. Using the materials provided, create a game like Connect Four,
3. Change one rule in the game,
4. Play it once through with your partner,

Minerva provided them with 1-inch grid paper, pencils to mark off a playing area, and objects (such as pattern blocks) to serve as playing pieces. These new games were played on a horizontal surface like a checkerboard. Since gravity did not pull the pieces to one side, as with the vertical Connect 4 board, the children decided whether to play "with gravity."

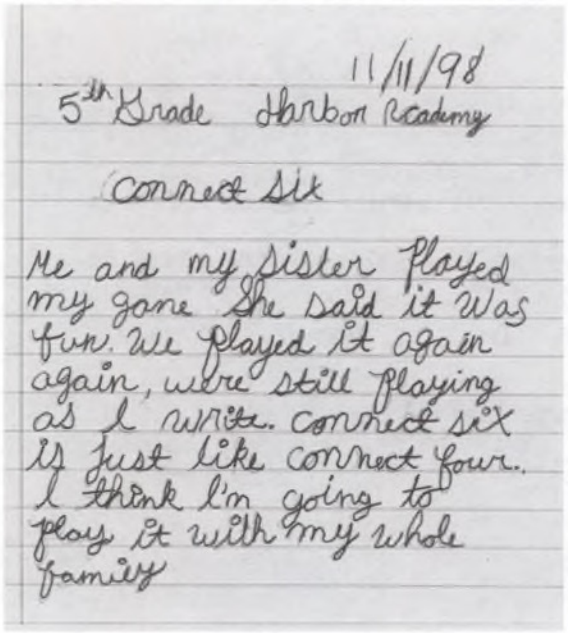
For homework, the students were asked to try out the games they redesigned in class with their families.

I requested that they write about what the results were. It is interesting to note that many of the students felt that this exercise was extremely fun and that it did not feel like homework at all. Quite a few (see Figure 4-15) even told me that they were going to continue playing the games even though they were not required to do so.

Inventing New Games

Minerva now shifted the focus of game-making from the redesign of existing games to the creation and evaluation of a new game. The games were created in November then played, evaluated, and revised in December and January. Minerva began this project with the following homework assignment:

4-15: **One student's homework about Connect Six**


11/11/98
5th Grade Harbor Academy
Connect Six
Me and my sister Played my game She said it Was fun. We played it again again, were still playing as I write. connect six is just like connect four. I think I'm going to play it with my whole family

Create a blueprint for a new game, including instructions. Come up with a design for a wonderful new game that children can play.

November 17, 1998

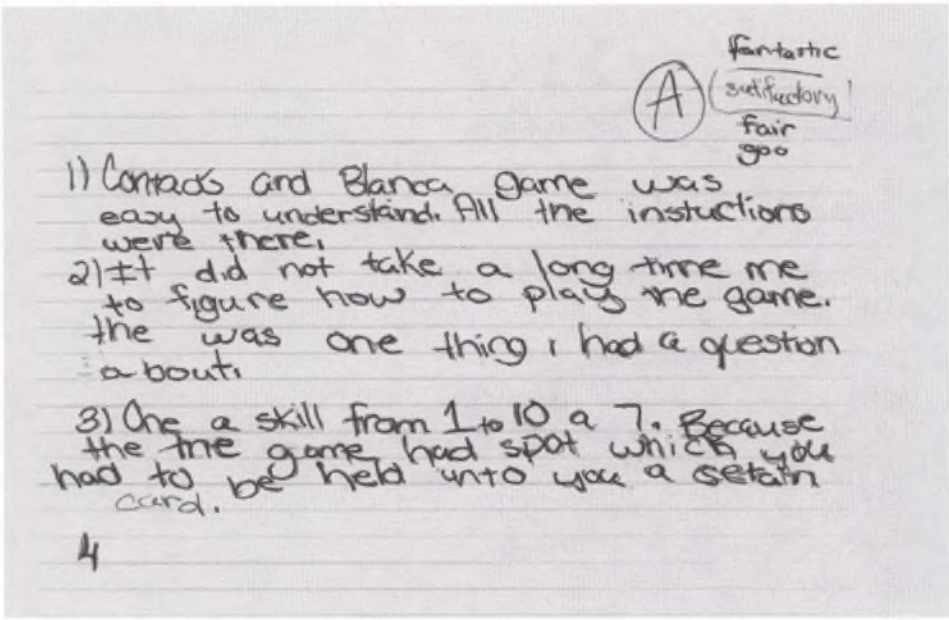
Almost everybody came back to class the following morning with a design and some idea of what the procedures would be to play the game. Most of the designs were quite simple and not very detailed. The session went very quickly because I did not want the students to get bored with the discussion going on. I also wanted the children to let their own ideas come out and didn't want the discussion to produce a slew of games that were too similar.

Following this session Minerva told the students to work in pairs to develop the games. They were to be clear about the main point of the game, organize the details they wanted to include in the game, plan the design of the board (all the students intended to make board games), and pay special attention to the rules of the game. She provided them with various colors of oak tag and construction paper, rulers, pencils, glue sticks, and tape. The students completed most of the initial work in the 30 minutes following the brief discussion. They finished their game boards and directions in free time during the following days. By December 8 the games were ready to be played.

Evaluating Student Designed Games

Minerva wanted to engage students in the evaluation process. The games seemed an ideal vehicle for evaluation because of the children's high level of interest in playing them. Her goal was for children to become more and more specific about the criteria for a good (or bad) game. She outlined these plans.

4-16: **One student's evaluation of Speed Racer**



fantastic
A satisfactory
fair
poo

1) Contacts and Blanca game was easy to understand. All the instructions were there.
2) It did not take a long time me to figure how to play the game. the was one thing i had a question about.
3) One a skill from 1 to 10 a 7. Because the the game had spot which you had to be held unto you a setain card.

4

4-17: **New evaluation instrument for redesigned games**

	Rules of the Game				
	Clear	Unclear	Easy	Hard	Interesting
Length of game					
Who starts first					
How many people play					
Who wins					

- **Have students play the games according to the rules written by the students.**
- **Equip each student with a sheet that has a few questions for the evaluators to answer.**
- **Give evaluation papers to creators of games to review.**
- **Discuss what changes need to be made.**

Minerva was trying to have her students develop criteria for deciding what was a successful design. She listed three questions for the evaluators to answer:

- Were the rules easy to understand? Why?
- Did it take a long time to figure out how to play?
- Did the game maintain your interest?

In figure 4-16 is one student's evaluation of the game "Speed Racer."

I kept revisiting this part of the process because I wanted to see what the students would say each time. Every time the students reviewed the games, the information served to help the creators to work on their designs and correct any areas that needed work. There were some students, however, who did not care what was said about their games. They weren't going to tamper with what they felt was perfection.

For the next session of playing each other's games and evaluating them, Minerva modified the evaluation instrument to be a table. (See Figure 4-17.)

With their responses to this evaluation instrument, students were starting to pinpoint some difficulties that they encountered playing the games. Many students mentioned the fact that they had to keep asking the creators of the game what to do next because it was not included in the instructions or not very clearly stated. There were some games that were clearly more popular than others. Everybody wanted to play "Get Off My Property." It was the most requested game. I think this was so because of the fact that it was colorful, the directions were rather clear, the set-up of the game was familiar, and it was fun as well as challenging. Most of the children borrowed ideas from other games in creating their rules, in the physical look of the game as well as the objective of the game.

After all the evaluations the children made, I found that the results were still not as conclusive as I thought they would be. I kept revisiting the material because I hoped that the answers would be more

organized, detailed, and explicit. What I found was that I needed to help many students by asking questions and taking down their responses. I found they were able to elaborate with less difficulty. Asking the students to respond in written form gave me an opportunity to assess their writing skills.

Minerva felt the last evaluation instrument she had given the children was too complicated. She would modify the chart to include only the first two response columns, "Clear" and "Unclear." The other information she would get from questions:

- Was the game hard or easy? Why?
- What captured your interest?
- What would you change, if anything?

Minerva understood how important it is to have children evaluate what they have done, then to make the evaluation results the basis for further changes. This is fundamental to technological design and a major goal of *Designed Environments*. In spite of her efforts, she was not satisfied with the results. What she tried may simply have been too difficult. The difficulty lay in the diversity of games being developed, and in the open-endedness of designing a whole new game. It is much easier to take a game that exists, make a small change, then evaluate the effect of that change.

Evaluation requires, first, that the evaluator have a frame of reference for understanding the thing being evaluated. In the case of a game that has been modified, the frame of reference is the game as it was played in its original form. This is the reference to which the modified game is compared. When looking at a new game, an evaluator has to seek an appropriate frame of reference. This is a difficult task for any evaluator, let alone for one just learning about evaluation.

Secondly, the evaluator needs to know what to look at during the evaluation and what criteria need to be met by the new design. We encourage teachers to have students consider the criteria to be met by their designs before they begin designing. This is much easier if there is an existing game or design that is being modified. The criteria can then be stated in terms of how the new design compares with the old—e.g., "Connect Five will be slower and harder to win than Connect Four." Minerva's students invented different games with no explicit criteria. Minerva's solution was to develop criteria that were generic such as, "Were the rules easy to understand?"

4-18: **Connect Four game with some pieces in place**

Activity Connection

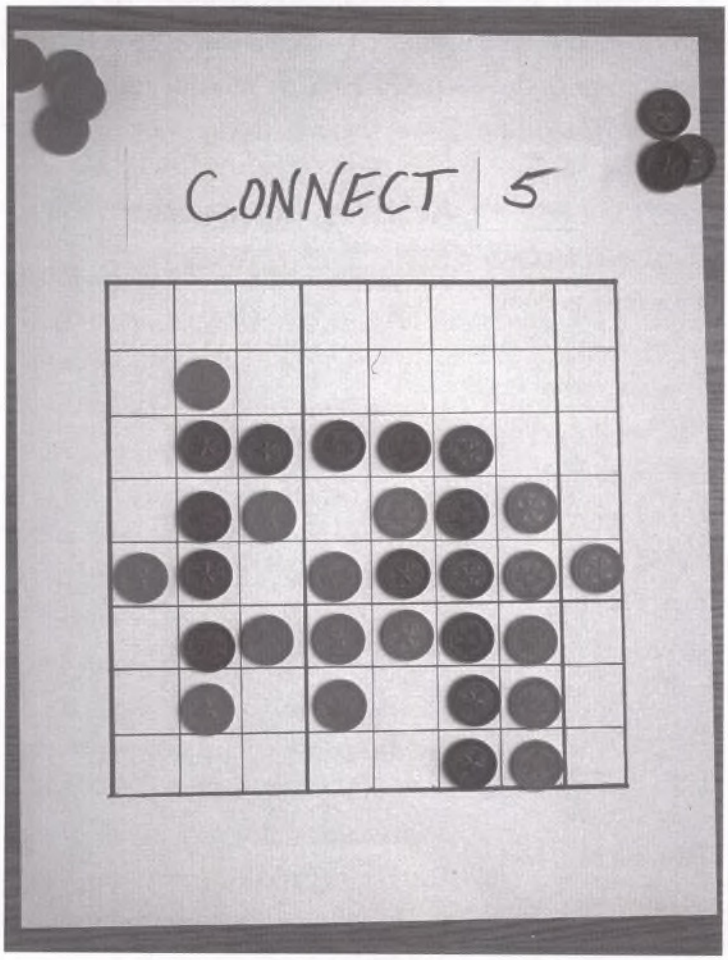
The activity in Chapter 3 that is based on Minerva's work involves modifications to the game which Minerva's students found easiest to change: Connect Four. This is the game that, when her students changed it, they enjoyed so much they continued to play it at home.

We found Connect Four works equally well with adults. The game is played on a 6 x 7 vertical, checkerboard-like "playing field" in which two players drop checkers down any one of seven columns. The goal is to be the first to get four checkers in a row horizontally, vertically, or diagonally. (See Figure 4-18.)

The homemade varieties of Connect Four boards are more like checkerboards, played on the horizontal. Players decide the size of the playing field. Do they stay with 6 x 7? Do they play the game "with gravity"—i.e., is there a "top" and "bottom" and do all pieces go to the "bottom?" If not, are there any limits on where you can place your pieces? How many must you have in a row to win? Do you play until one person has four in a row, or do you use all the pieces, then see who has the most rows of four? Figure 4-19 shows a homemade Connect Five game being played "without gravity."

After trying such variations, players get a sense of how different kinds of changes affect the game. They are then in a position to think about redesigning the game to meet specific criteria. When a game is designed to meet a criterion, it is much easier to evaluate. The evaluator can tell if it meets an objective goal such as "it takes a shorter time to win." The evaluator can also compare it to the unchanged game to see if it meets more subjective goals such as "it is more fun."

4-19: **Homemade Connect Five being played "without gravity"**



Part II: Analysis and Redesign of Spatial Environments

The teachers' stories in this section are about designing and changing spaces. The first two accounts are about school spaces: a classroom and a cafeteria. In both cases you will see students deeply involved in projects that recognize their ability to make real contributions to the environments of their daily lives.

The next two accounts are of animal habitats. There are many good science units through which children investigate the behavior of classroom animals. A natural extension of such studies is to use the information learned about the animal to guide the design of an animal environment. For example, what children learn about the behavior and preferences of a mealworm can be translated into the design criteria for mealworm environments.

Redesign of a Classroom

Angel Gonzalez is the science cluster teacher at the Family Academy School, a small school-within-a-school in central Harlem. He is the science teacher for most of the children in the mini school. Children in his classes had done a lot of mapping earlier in the semester. They began work in environmental design in December with discussion and brainstorming about what "environmental design" might

mean. After batting it around for a while, Andreas, a third grader, came up with this:

First you draw a map of your house like it is. Then you make a map of how you are going to change it. Then you change your house.

The class added:
Then we check to see if we like the changes. We check what works better and what doesn't work.

Angel explained:

After discussion and brainstorming, I developed a working definition of environmental design for students:

"Environmental design is the planning and organizing of your surroundings to meet certain needs of people or animals. Surroundings can include space, time, and physical things."

Angel experimented with different possibilities for *Designed Environments* activities. Second graders proved to be too young to do a habitat design project. Their work with mealworms stopped with observation and recording of mealworms' behavior. Most successful was a project to rearrange the desks in fourth and fifth grade classes.

December

I spoke to all the classroom teachers before the holidays to request permission to do environmental design in their classrooms. The desks would be rearranged based on students' thinking and criteria that they felt would work best for them. I explained to them that changes would remain as long as the felt it was working productively.

January

Students were asked to determine what factors were important in setting up the seating arrangement. After that discussion, I asked groups of four students to draw blueprints of their proposed desk setups. The class then voted on the proposal that they wanted to adopt. The method of voting, which is also an issue of environmental design, was decided by me because to engage in this discussion would be lengthy and would divert us from the room rearrangement task. Time was of the essence. I decided that students would vote with a show of hands and that a simple majority would be decisive. After their decision, we proceeded to rearrange their room according to their map.

One of the fifth grade teachers, Ms. Hicks, had already arranged her classroom desks in a "U" shape pattern, with some desks individually separated for behavior management reasons. Ms. Hicks' students defined the following as important needs to consider in setting up a classroom:

- **Walking space**
- **Visibility**
- **Space for the pet areas**
- **Play area**
- **Teacher area**
- **Personal breathing space**
- **Storage**
- **Safety**
- **Health**
- **Behavior**
- **Compatibility with neighbors**

I suggested that we could go back to these as criteria for evaluating whether the new setup was better or not.

Five teams of four students each made their separate design proposals. All wanted to increase the open walking and play space. Most groups felt that by separating the class into clusters based on gender would help improve behavior They felt that taunting and bickering between boys and girls would diminish. One team, "W," felt that students should group themselves based on friendships.

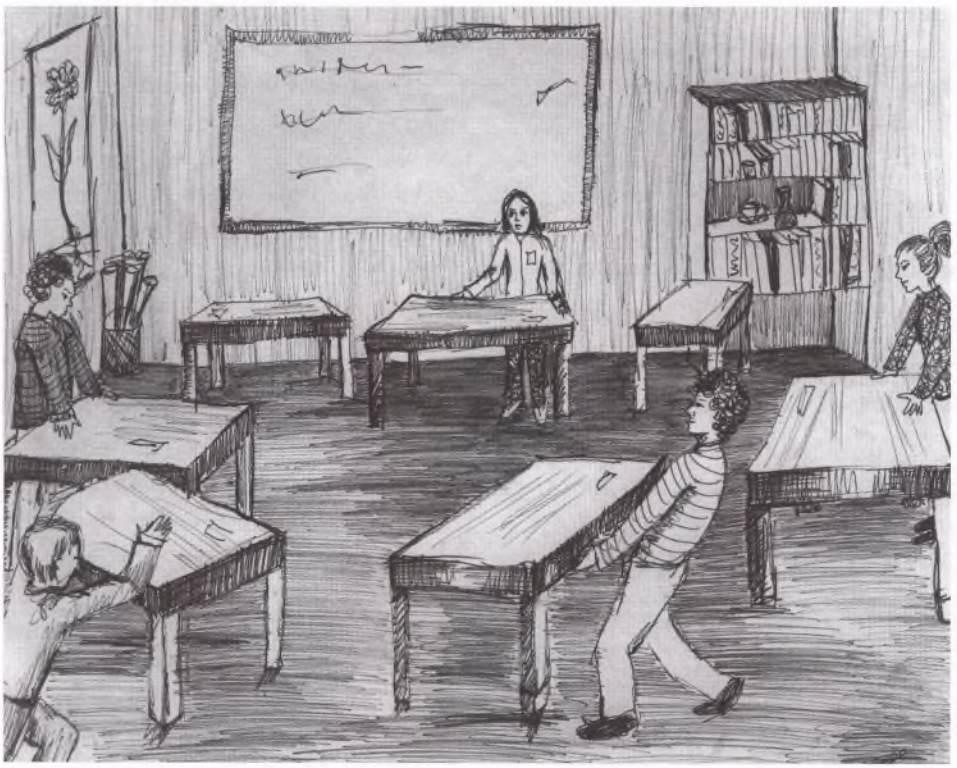
After each team made its proposal and received feedback from the rest, we held a vote. The majority decided that clustering desks based on friendship was best and the "W" proposal was adopted. They felt that this setup would create more play and walking play space, and that grouping by friends would improve behavior and work.

I then had students regroup in the four corners of the room and the center into clusters of 4 to 6 students based upon those who wished to sit next to each other.

This process took two sessions of 90 minutes each. One session allowed them to draft and draw up their proposals and the second was dedicated to their debating over what was the best plan and the actual reorganizing of the desks. Ms. Hicks class seemed so elated that they were empowered to decide their fate and appeared determined to make it work so that Ms. Hicks would not veto their decision.

The room rearranging was somewhat chaotic and one student, Shatika, disagreed with the new setup and insisted that she be alone. Materials were falling out of desks and paper ended up strewn over the floor. Changing the room was messy

4-20: **Rearranging desks**



and the raucous behavior initially threw Ms. Hicks for a loop when she returned to take the class to lunch.

She quickly took up my offer to take them to lunch after all had helped to tidy up the room. It took 20 minutes more into the lunch period until we were ready to depart. All, except two or three students, were excited about the changes.

After lunch, I cautioned them that the five students who were absent on the day we decided on the rearrangement might be resentful of the changes, which had taken place without them. Also, they might dislike the new groupings in which they found themselves. I also warned them that large clusters of friends could result in more talkativeness. One group of boys was situated too close to the pet tanks and I advised them to move close to the center to allow more space for movement. I didn't want their rearrangement to be nullified by Ms. Hicks.

January, a week later

I visited Ms. Hicks' fifth grade class to observe their classroom seating redesign. It is the only classroom where the students' rearrangement continued successfully. Apparently both the students' and the teacher's criteria for seating arrangements were satisfied. The students definitely are happier with their "empowered" choice of room design. When a student acts out, Ms. Hicks just isolates that particular student's desk without penalizing the entire group.

What Angel accomplished was impressive. With his help, the children redesigned their regular classroom and the room of another teacher. Some aspects of this project are much easier if the room being redesigned is your own. For example, planning how to move the desks, and carrying out the move, is more manageable if it can be done on your own schedule. In the activity sheets based on Angel's work, we suggest that teachers have their students actually walk through the expected change of position of their own desks (without moving the desk). This allows them to visualize what is to happen. If children disagree about where they will end up, it is much easier to sort out when the desks have not yet been moved.

When the redesign is in your own room, it is also much easier to follow up with the evaluation. Angel suggested that the children use the criteria they had established to evaluate the new design, but he was not in the room to lead the evaluation.

Redesign of a Cafeteria

We turn now to the story of cafeteria planning by Felice Piggott's fourth grade class in a large school in Manhattan Valley, New York City. It began in December 1997 following several months in which mapping had been a continuing theme. The mapping project culminated in mapping the classroom to scale (see *Stuff That Works!: Mapping*). The kids now wanted to go on to bigger things. Cafeteria redesign was definitely a bigger thing. They didn't know what they had gotten into. The project continued through the winter and spring, not on a regular basis, but as an already packed schedule would allow. Felice wrote the following in early spring.

This is an ongoing project. This is a HUGE project. This is a project that I rue the day I ever started it. WHY? Because the kids are very excited about having their opinions count for something—they want to effect change—the Administration is sincerely hoping for some solutions to what they essentially refer to as a "prison cafeteria" with an unpleasant atmosphere and routine. SO solutions are hoped for and, I think, expected.

I told the kids that opinions weren't enough—we had to have evidence: observations and data that show why things don't work or need to be changed. And we had to have alternatives. (I made it sound grim, but they were still game.) So that's what we are doing.

We've done the mapping and the observing and what is still to be done is the redesign (with mapping) and a presentation to the Administration.

I'm not entirely happy with their observation/data recording skills and there was also a problem with the scale map of the cafeteria. I feel that I'm slamming past them due to time constraints (missed teaching opportunities), and thereby cheating the kids...BUT, they are wildly excited about making their lunch time more pleasant and I think they hope that they, in fact, will.

A wonderful thing about *Designed Environments* is that teachers see how students can use the knowledge and skills they have "learned." Projects of this kind are self-assessing because they clearly reveal gaps in students' knowledge and skills. They can be problematic for the same reason: when students don't know something they should, or can't do something they ought to have learned, teachers often want to take time to teach the knowledge or skill. This is the pressure Felice felt. Now we will back up to December for more detail on what happened during the project.

December 10, 1997

The kids were looking to continue mapping and had suggested that a larger space would be challenging. Mapping and then analyzing the activities within the space seemed a natural progression. Since none of the humans in P.S. 145 like the current operations in the cafeteria it seemed an apt site.

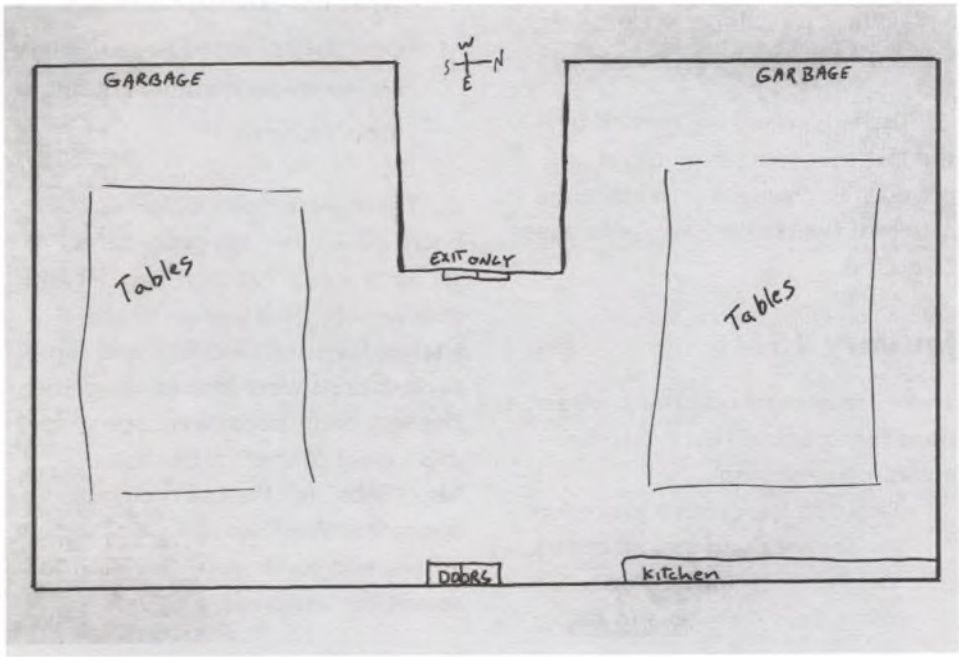
Felice got out the classroom map to begin the brainstorming and discussion that would lay the groundwork for the cafeteria redesign project. They reviewed what they knew of mapping, then switched to the cafeteria. Here are some of the ideas about what was wrong with the current design:

- It is too crowded.
- You have to cut through the line to get to the garbage and you always bump someone.
- There are fights because you bump and spill stuff.
- The lines are too long.
- It's too slow.

January 14, 1998

This was the day to begin redesign work. Felice recalled the brainstorming of a month ago and the previous work on mapping the classroom. They would begin by mapping the cafeteria in its current condition. The map would assist in planning observations and data

4-21: **The U-shaped cafeteria**



collection. It would also be the baseline for redesign.

Before the class, Felice made arrangements both for visiting the cafeteria this afternoon for the mapping activity and she cleared future times for the children to make observations in the cafeteria.

The observations and sketches in the cafeteria were confounded because appearances were at odds with tile counts. The cafeteria is shaped like a "U." (See Figure 4-21.)

Due to the arrangement of objects, the room appears larger on the left side than right. We had a long discussion about this which was only modulated by the "tile" counts and the custodian's intervention. "You know, contractors come in here and say, 'Hey, you know you got one side bigger here?' and I have to tell them, no, the room is symmetrical. It's an optical illusion because of the way the tables are arranged."

CLASS:
Oooooohhh. . .

The kids were very excited by the fact that something could possibly be changed through some action of theirs. They are quite eager to do this.

January 15

There are general questions/ directions for all teams that are to be answered in writing:

- **Describe the current procedure for the area you are observing.**
- **What do kids have to do?**
- **What does staff have to do?**
- **What aspects of current procedure work well? What aspects do not work well?**
- **What is our biggest problem with the current procedure?**
- **Based on observations, brainstorm solutions with your group.**

The teams met as requested. Some teams had difficulties describing the "existing routine" while others could not come to a consensus on team members' jobs.

The children met with their teams and decided what they would observe and who would do what. For example, the Garbage Team had the following questions:

- **Who will watch the left side and who will watch the right side?**
- **Who will count how many children throw out their garbage "correctly" and who does not?**

When we met as a group again we heard reports from each team as to:

- **What the existing routine is**
- **How they planned to position or employ team members during observations.**

There were many opinions heard about existing procedures for each area ("No, first you get your milk carton, then you go to the kitchen for your lunch!!!") and some explanations were junked altogether. Consequently, notes were scarce for this aspect of the "instructions." Also, "jobs" for the team members appeared "fluid" as some kids were absent and some were unwilling to accept the assignments given.

This was a prickly lesson because there was a lot of simultaneous management required and a lot of heated discussion about team "jobs." Again, keeping kids focused on how to observe and what to observe rather than discussing what's wrong with how things are was difficult.

January 16

On January 16, teams were sent to the cafeteria for 10-minute intervals to observe the lower grade lunch period; first the Traffic Team, then the Food Service Team, next Garbage Team, and last, the Seating Team. This was a time to work out some of the difficulties they might face in collecting their data.

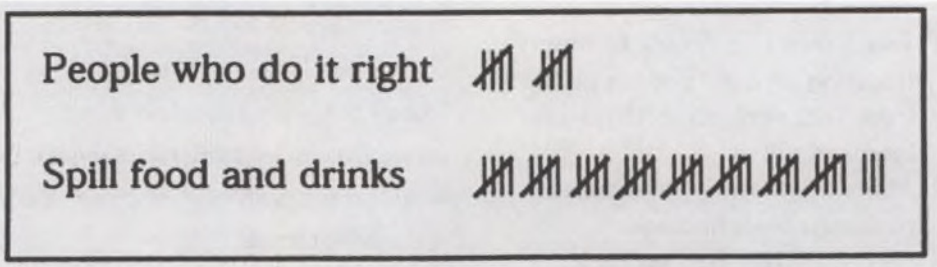
The Traffic Team was the first team sent to observe and they were one of two teams with good evidence of observations.

SHANDRA:
The kids were staring at me with my clip board, but I just ignored them-they were so noisy! But I saw a lot of things about the line-up and when they came in! God! Those little ones are something else!

Although their observations also include their opinions, this team did a lot of writing to support what they saw. Shandra was stationed by the garbage to observe the traffic. She noted:

1. **The line moving, kids trying to put stuff in the garbage.**
2. **Kids talking on line.**
3. **People not watching where they are going.**

4-22: **Orlando's data on throwing out garbage**



4. Skipping, dancing, playing on line.
5. Nobody to guide them when they put in garbage.
6. Don't put garbage in carefully.
7. Pushed by people in line.
8. They throw in garbage, in rush, dump it.
9. Not watching where they are going.
10. Running and jumping.

The Garbage Team was quite eager to observe because they had a lot of ideas about what they would see and how they would keep track of it all.

STANSKY:
Finally Orlando agreed. He will cover the NE corner of the cafeteria, Shanon the NW, Derek SE, and me, SW. We hope to be able to see everything that way.

And with that kind of organization, they were the team with the best-written evidence of their observations. They were also the only team with any kind of quantitative data as they tried to track who "did it right" (garbage disposal) and who did not. (See Orlando's data, Figure 4-22.)

Stansky took these notes:

1. There is food all over the floor.
2. Kids were running, food fell.
3. Kids are talking and food comes out of their mouth.
4. Kids get two trays and go throw them in the garbage. It falls.
5. Kids can't throw all their food away so they take it outside.
6. Sporks are all over the table and floor.
7. They take the milk and put it in a slop sink.

The Seating Arrangement Team was not able to do much of anything, as when they arrived most classes had already left the cafeteria.

Problems started occurring after this first class trip to the cafeteria. Felice had planned to send students in teams to do follow-up observations. They were told by cafeteria workers they couldn't be there alone. A few days later Felice wrote:

January 22

Whole class went down early to observe grade 1-3 lunch hour. We planned to split into teams and observe/record data.

FIRST the lunch card lady starts screaming at the kids like a mad woman until finally I have to tell her to "back-off and let them do their assignment." AT WHICH POINT the principal has to speak to her and then tell me that we can't be there all together because "there is no room to stand and all the tables are used," and clearly she is right because I watch while kids collide with each other and with my kids (who are in the way), spilling milk and food and whatever. SO, we retreat to a stairwell and designate team members to go back in to observe and then realize we are in the way of arriving classes.

SUBSEQUENTLY, we "rotate" observing team members to observe. I give my student teacher instructions to "observe and protect" remaining team workers in the cafeteria, and I give another kid the camera and ask her to take pictures. The rest of us go back to the classroom. Once there the kids broke into team groups and discussed what they had observed. When remaining team members returned, they contributed their observations to the group.

Groups were then asked to report on what they saw as the most problematic areas within their scope. ("What was the biggest problem you saw happening today?") After all groups shared their observations, I encouraged the children to remember to focus on that particular thing when we observed again.

4-23

Recommended changes in the cafeteria

Food Service

1. Lunch should be self-serve.
2. Classes should be called one at a time for food collection.
3. Food selection should be more varied, with more vegetables and fruit.

Garbage

1. They should have two tray cartons to put trays in.
2. There should be directions telling where to put your garbage.
3. Kids should be able to go to either garbage station.
4. There should be people at each garbage station to keep it clean.

Seating Group

1. Put class name on table.
2. Put arrows on the wall so people know which way to go in the line.
3. Make the line to get to lunch different.
4. Arrange the tables differently to make more spaces between them.

Traffic Group

1. Assign times to go to the lunchroom and to leave there.
2. Signs to tell where to go.
3. One entrance, one exit.
4. Move tables away from columns.
5. Make the line in the cafeteria shorter

January 27

1. Teams sent to cafeteria to observe (focusing on that "one big problem' from 1/22 session) at 15-minute intervals.
2. Afterwards teams reassembled to discuss their findings.
3. Each team reported on their observations.

January 28

1. Teams sent out at 10-minute intervals for final observations.
2. Teams reassemble and discuss observations.

I tell them that I would now like a list of the things, based on team observations, that need to be changed in the cafeteria. The list should be one page and should include everyone's ideas. One member from each team should "share" the list and then meet with me. See Figure 4-23 for each group's recommended changes.

After each team shared their list and met with me, I instructed the teams to think about how we could show these changes on a map. Would all the changes be able to be shown visually? Are all changes suggested physical changes or changes in routines or procedures?

The next assignment (January 29) was to make individual maps of the changes they would like to see in the cafeteria and to write about the changes. Amanda knew what she would like (see Figure 4-24), and she knew its limitations. "This is an example of what I would like the cafeteria to be like. Ten kids can sit at each table. I know that's not enough and there would have to be more tables, but it would be nicer." Matt (see Figure 4-25) was more practical.

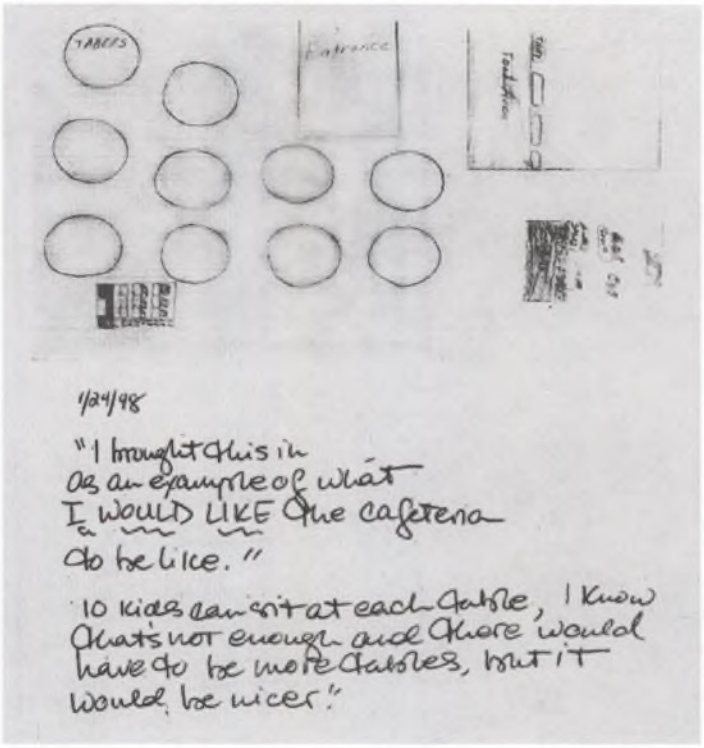
Children were very eager to redesign seating arrangements using round tables. Currently there are 47 tables in the cafeteria (none of which are round), which seat four kids on either side. Proposed round tables would have to seat as many. "How could you be sure they would fit in the space we have now?" I tried to make the point that the redesign should have some element of reality to it, which some children found hard to incorporate in their redesigns.

February

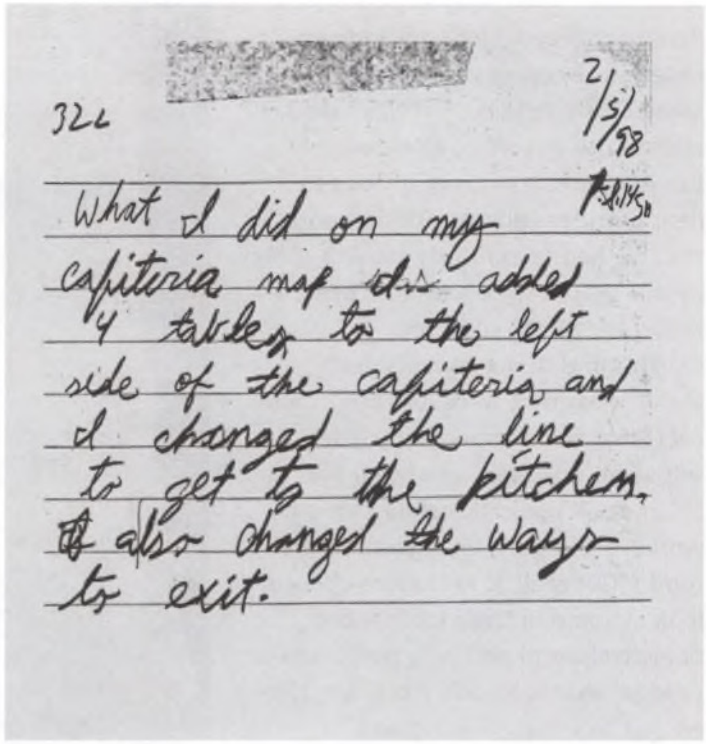
We had many discussions as to procedures observed-redesign is not just a redesign of the physical space, but of the procedures in that space as well.

- "Family-style service would be better because then there wouldn't be as much traffic-the lunch ladies are too slow."
- "I think the food itself contributes to the traffic because sometimes kids go back for seconds, or sometimes, when there is a choice, they take too long to decide."

4-24: **Amanda's recommended changes in the cafeteria**

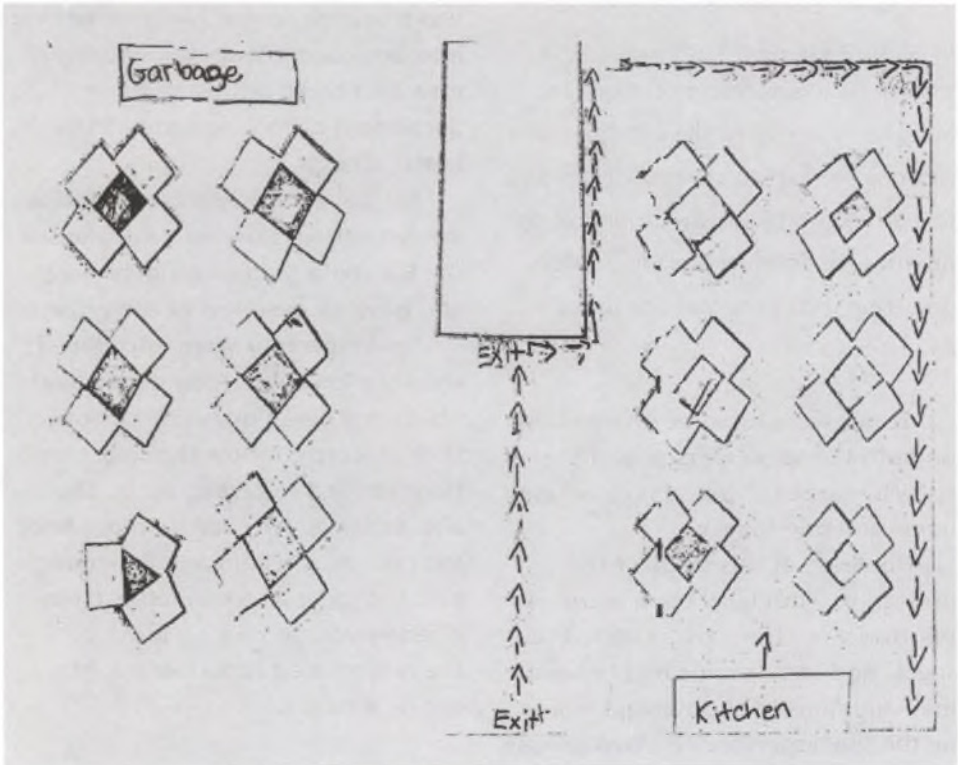


4-25: **Matt's recommended changes in the cafeteria**



- "I made my tables into a square leaf clover arrangement, but I don't think that it will work, because I noticed today that the tables are attached." (See Figure 4-26.)

4-26: **One proposed cafeteria redesign**



As time went on, students became more aware of how the cafeteria was operating, and what they didn't like about it. Even though we had done individual maps of redesigns, there were more ideas each time we returned to a discussion about procedures or physical space. We were getting more information about what was possible to be changed and what was not, what was mandated by law, and so on. Clearly, we had to rethink things...

March 11 and 12

"I'm giving you back your individual redesigns because we need to rethink some of the details..." That's how I started the lesson. I explained that the Administration was curious to hear our ideas about redesign and that we had to seriously rethink some details before we could do a presentation to "pitch" to them.

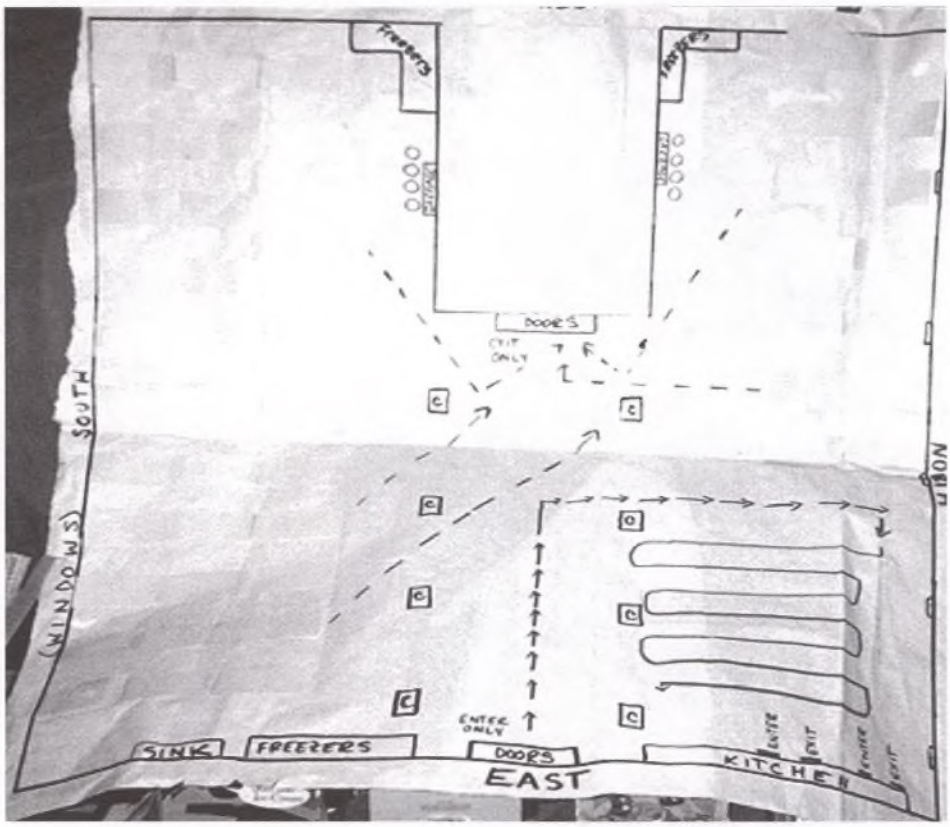
This initiated a conversation about ideas that were just not practical (table arrangements in circles), self-serve salad and sandwich bar ("Get real!"), additional lunchroom workers (budget), or higher quality food ("Get real!"). Kids were able to look at some of their ideas more objectively, and add new perspectives to ideas that wouldn't work. So then we got to brainstorming and " distilling" some common ideas, and agreeing on new solutions.

Out of the brainstorming came the need for more information, but they were in basic agreement on a design. Students interviewed the custodian and cafeteria workers to clear up details and to get their opinions. By the end of the month each group was ready to begin preparing their presentations to the administration.

Teams were to agree unanimously on both the spokesperson and the speech-meaning I would receive one name and one speech.

However, at this stage of the project, practically all team members felt they were the most qualified to speak, and some teams had to have mini-auditions to choose who would be the spokesperson. Also two groups had to merge several pieces of writing into one coherent speech because members could not come to an agreement as to who had written the better speech.

4-27: **The plan to redesign the cafeteria**



Ms. Lesley, the Assistant Principal, arrived and was seated. I introduced the Cafeteria Map (see Figure 4-27) and gave an overview of the project.

Spokespersons were introduced and they took over. After each speech, Ms. Lesley asked questions about their research or how their observations had led to certain ideas. She also explained why certain procedures must remain a certain way. For example, milk has to be a certain temperature when served, so moving it out of the refrigerated container might not be possible.

After the spokespersons finished, then all the children in the class began asking questions, or rethinking ideas ("Well, maybe the utensils and the milk should be near each other so children could move out of the kitchen faster"). A back-and-forth dialogue began between Ms. Lesley and the children... AND THEN, much to my surprise and delight, Ms. Lesley suggested that we implement our redesign on Friday, to see if it actually works!

In fact, enacting a plan as ambitious as this one takes time. In a week (it was May 29) the children were ready for a dress rehearsal. They met the custodian in the cafeteria early in the day and,

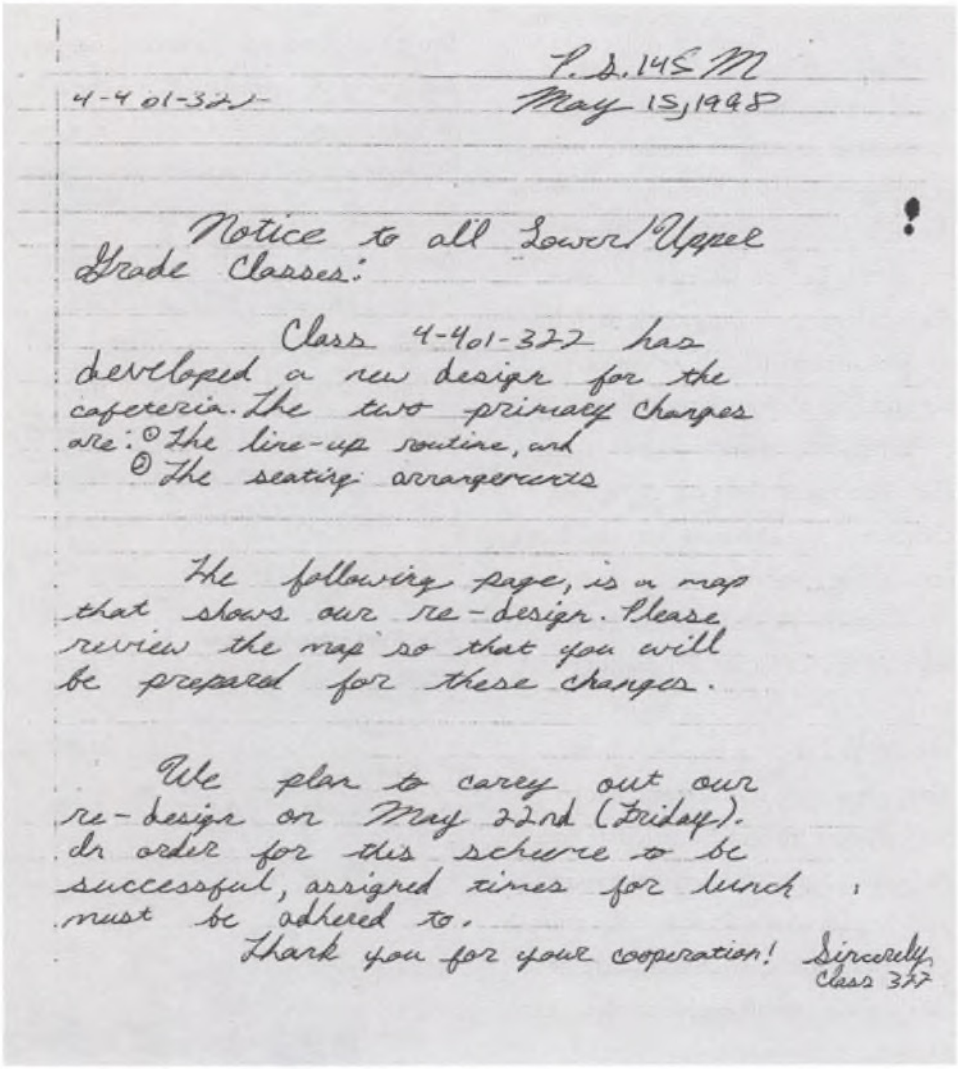
with his help, began moving tables. They set up the guides for the snake-like cue that was to replace the old mode of lining up, and then began to have some questions. This was the first time they had actually seen their ideas take shape. The possibility of conflicts while waiting on line for food was real. They also wondered whether the instructions they had sent around to the other classes would be adequate. (See Figure 4-28.)

They decided that instead of trying out the new arrangement that day, they would think more about the design, or perhaps get more adequate guides that would really separate children on the line. This was too much to do, however, before the end of the year.

In Felice's work, we see a long-term project that doesn't accomplish its stated goals, namely to improve the cafeteria. Interestingly, this did not seem to upset the children; the teachers themselves appeared to have more invested in achieving a solution.

The development that took place in these children was far more important than whether the particular problem was solved. Felice's students gained markedly in their abilities to plan and carry out projects. They began to think of the implications of their ideas. They began to see the cafeteria as a system with interacting sub-systems. They became more proficient in presenting ideas visually and in words. And when they saw what their redesign looked like in real life, they were able to evaluate it in terms of its likely consequences, because now they really understood their problem. We don't want to underplay the satisfaction of designing a solution that really works. In smaller scale classroom projects such as "Hook Mania" and "Chairs Up and Down" at the beginning of the chapter, it is much easier to implement successful solutions. Felice took on a school-wide project. This involves the children deeply, has many satisfactions along the way, and is an integrated learning experience. But it does not always lead to a solution that can be implemented. We believe the value of the process far outweighs the product of an implemented solution.

4-28: **Instructions for using the redesigned cafeteria**



P.S. 145 M
4-401-327 May 15, 1998

Notice to all Lower/Upper Grade Classes:

Class 4-401-327 has developed a new design for the cafeteria. The two primary changes are: ① The line-up routine, and ② The seating arrangements

The following page, is a map that shows our re-design. Please review the map so that you will be prepared for these changes.

We plan to carry out our re-design on May 22nd (Friday). In order for this scheme to be successful, assigned times for lunch must be adhered to.

Thank you for your cooperation! Sincerely, Class 327

Designing Environments and Solving Problems for Classroom Pets

In Felice's story you see the motivational power of a design problem whose solution has a direct effect on children's lives. Projects such as this engage children's best thinking and stretch

their capacities. For many children, projects involving pets motivate them in a similar way.

Many teachers keep pets in their classrooms because of children's interest in living things. Children are drawn to the busy activity and furry warmth of the gerbil. The initial frightfulness of the Madagascar hissing cockroach has its own attraction, pulling children beyond first responses to a close examination of their anatomy, habits and preferences. Animals engage children. They also draw out children's care-taking responses.

Teachers use children's interest in animals as motivation for reading and writing. Animals are the focus of mathematics and science investigations. They are a long-term resource for projects that integrate curricular areas and goals. Some teachers have found that the characteristics that make animals such a valuable curriculum resource also make them an excellent focus for *Designed Environments* projects.

The next two teacher stories are about analysis and design projects with classroom animals: frogs, crickets, and mealworms. Tonia and Angel, teachers you met earlier, each had animals in their classrooms for other curricular purposes. They saw opportunities to have children use them for analysis and design projects.

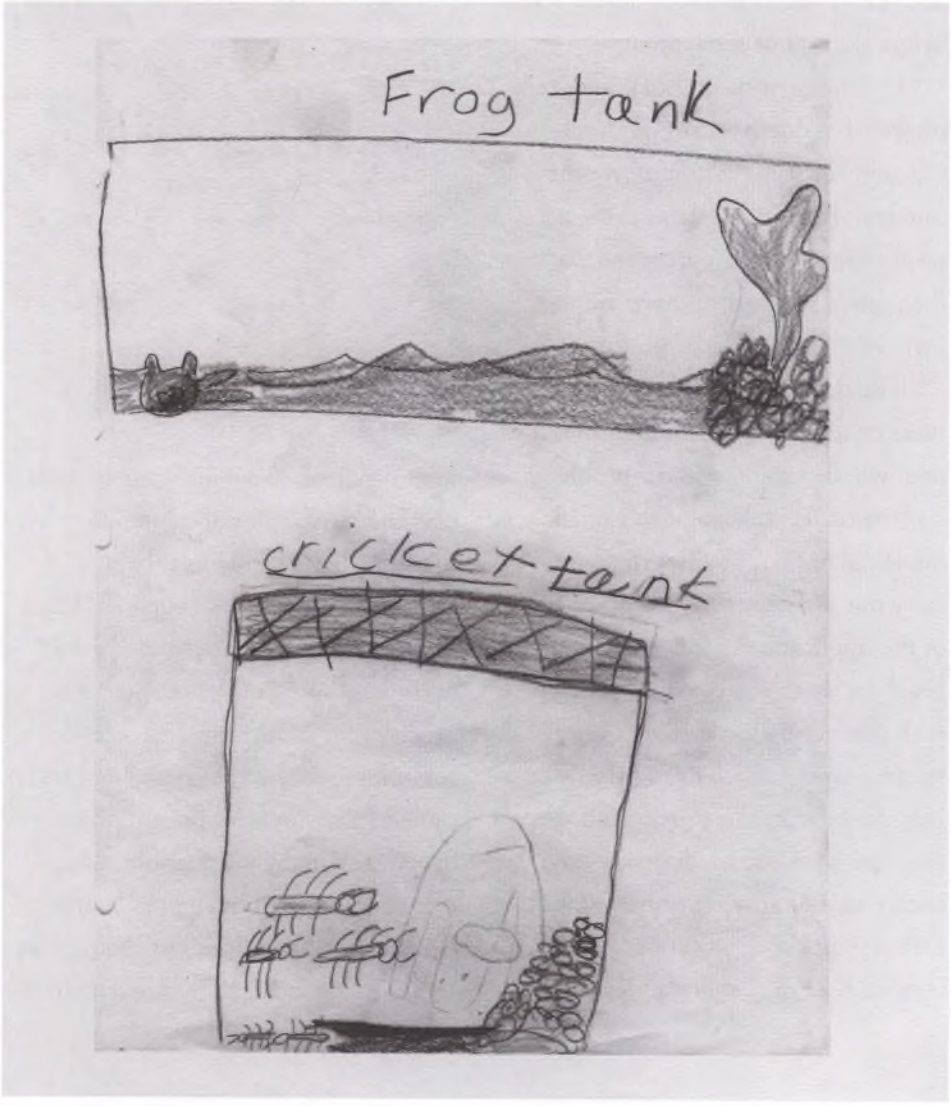
Cricket Suicide

Tonia Bailey's third-grade class has an assortment of animals, among them a frog. During the third month of school children noticed that there were many dead crickets in the frog tank. They questioned why the frog hadn't eaten the dead crickets. Tonia saw this as the beginning of an investigation. As you saw at the beginning of the chapter, Tonia has a knack for turning a classroom problem into an analysis-and-design opportunity.

First, Tonia directed children to the library. There they discovered that frogs prefer live food (mealworms or crickets were suggested). Then she led them to observe more closely. An excellent way to sharpen observational skills is through drawing. They drew the habitats of the frog and cricket. Figure 4-29 shows the essential difference: there is no water in the cricket tank and almost no dry land in the frog tank.

Further observation revealed that after a short time in the tank, the crickets' jumping landed them in the water. Clearly they could not swim. If

4-29: **Two environments**



the frog did not eat them quickly, they died and were beyond eating. The students discussed possible ways to determine the number of crickets that die at each feeding. The class decided that the crickets should be counted after feeding every other day. They chose the monitors who would do this.

Note that the children have already been involved in a miniature analysis and design project. They have done an initial analysis through a qualitative observation and determined the data that they needed. Then they designed a procedure to gather the data.

The data collection phase of the project began. On Wednesdays and Fridays the monitors fed ten live crickets to the frog, and at the end of the day counted and threw out the dead ones. They organized the data and made charts of the results.

The monitors shared the results with the rest of the class. After a brief initial discussion, the class broke into groups to discuss the problem further, and then to brainstorm possible solutions. The class gathered together to discuss the solutions of the various groups. They came up with three solutions.

Tonia writes:

The children chose to place a piece of driftwood in the tank. Through the discussion, I was able to tell that the children understood the process. Because this was not our first *Designed Environments* project, they created a format, and I merely served as the facilitator. There was no data to collect after the solution was tried out because no crickets were found in the water.

Solutions to Save the Crickets

1. Place the crickets in a box and instead of placing the crickets in the frog tank, put the frog in the cricket tank. While the frog is there he can feed. Then return him to the frog tank.
2. Make a safe spot for the crickets so they won't die so fast.
3. Put a piece of wood in the frog tank so the crickets can jump on the wood.

Designed Environments for Mealworms

Tonia Bailey began with a problem that faced the children. Angel Gonzalez (a science cluster teacher) made use of a familiar curricular unit, the behavior of mealworms, and extended it into a design project. Angel's children had already been introduced to mealworms and had carried out initial observations. Here he describes how he continued.

I explained that in exploring animal preferences, their likes and dislikes, we would in fact be helping to determine what would go into creating an environment for a particular animal. I linked it to what zoologists must do in order to create zoo habitats for animals.

As with many ***Stuff That Works!*** units, Angel began with brainstorming as a way of helping students recall what they already knew and to extend the applications of their knowledge. They brainstormed the sorts of things that mealworms might react to. (See Figure 4-30.)

In exploring food preferences, I told students that it was important that they not disturb the critters because their actions could inhibit their eating habits. I also posed these questions:

- **Do they refuse to eat because they are not hungry or because they are intimidated by the huge overbearing stature of alien-monster-students?!**
- **How long did you observe the mealworms? Do you need more time?**
- **Does the room temperature effect the animals' behavior and preferences?**

4-30: **Mealworm preferences**

Do mealworms prefer particular...

- **Foods?**
- **Liquids?**
- **Colors?**
- **Terrain?**
- **Wet or dry areas?**
- **Temperatures?**
- **Music?**

Students were given the freedom to choose one of these areas and develop a question and plan an exploration to find out what the mealworm preferred. During the following week, all classes explored animal preferences as a way to determine the habitat design features for a critter. I made plastic Petri dishes available with mealworms or beetles in them. These were used by those who were interested in specific food choices. Magnifiers were also available.

In addition to food preferences, they designed experiments to answer whether mealworms/beetles prefer:

- **Darkness or light?**
- **The colors blue or red?**
- **Wet or dry soil?**
- **Hot or cold temperatures?**
- **Loud or low music?**

With regard to music and temperature, I asked how would one determine whether a mealworm/beetle is showing a like or dislike of it? What body language would demonstrate a preference? Also, I mentioned the importance of doing several trials before reaching conclusions.

Angel collected the data on animal preferences from all his classes and combined it on one large chart. During the next session they discussed the overall picture of mealworm preferences. As a final activity he asked the students to write down the five things that they would place in a mealworm zoo habitat.

During the work with mealworms, Angel's students were regularly involved in designing experiments that tested preference for heat or cold, apples or bananas, wet or dry, and other such environmental variables. Mini environments were integral to these experiments. From these little experiments, students are guided to create new environments. They can test this new environment by evaluating how the mealworms' behavior has changed in it.

The Stories

These teacher stories present a wide range of the *Designed Environments* projects. They range from simple classroom procedures, such as ways to get coats hung up properly, to the very complex task of rearranging the cafeteria space and procedures. They range from these real life environments to the environments of games, from human environments to animal environments.

What all of these projects provide is an opportunity to be engaged in design projects that really make a difference. They are design projects that can be tested by actually living with them and seeing if we (or our animals) like them, or if the environments need further redesigning.

There are common features shared by these projects. All have deeply engaged students' interest and their energy. They have provided real-life introductions to the core processes of technology: analysis and design. In the process, the projects have provided contexts in which students can practice and develop a wide variety of skills. These go well beyond the immediate skills of technology to the skills of:

- working collaboratively in groups,
- expressing one's self to one's peers,
- writing through all stages of the project,
- using mathematics in real life contexts,
- developing responsibility for things which shape everyday life.

Chapter 3 includes activities developed from these teachers' experiences. You will find it useful to refer back and forth between the activity and the narrative, which provides images of doing *Designed Environments* with children.