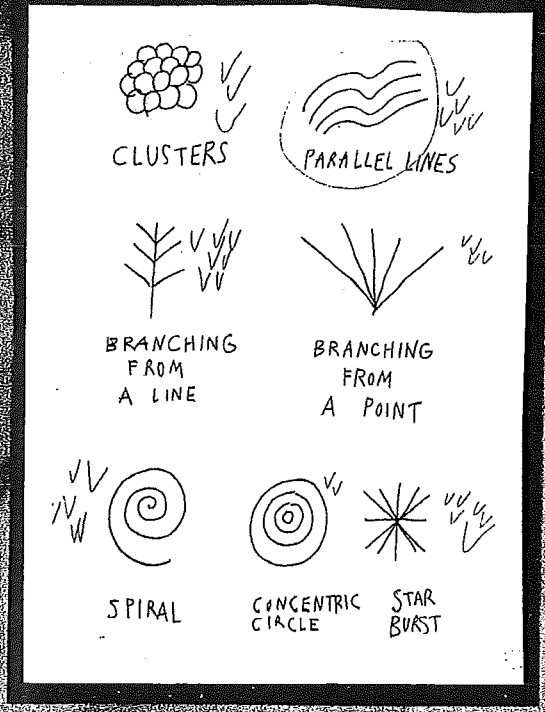
A Layer of Design Basics

Session One:



First we focused on design.

We searched for basic structural designs in images from nature:

spirals, clusters, branches, etc. In a scavenger hunt, students tallied how many

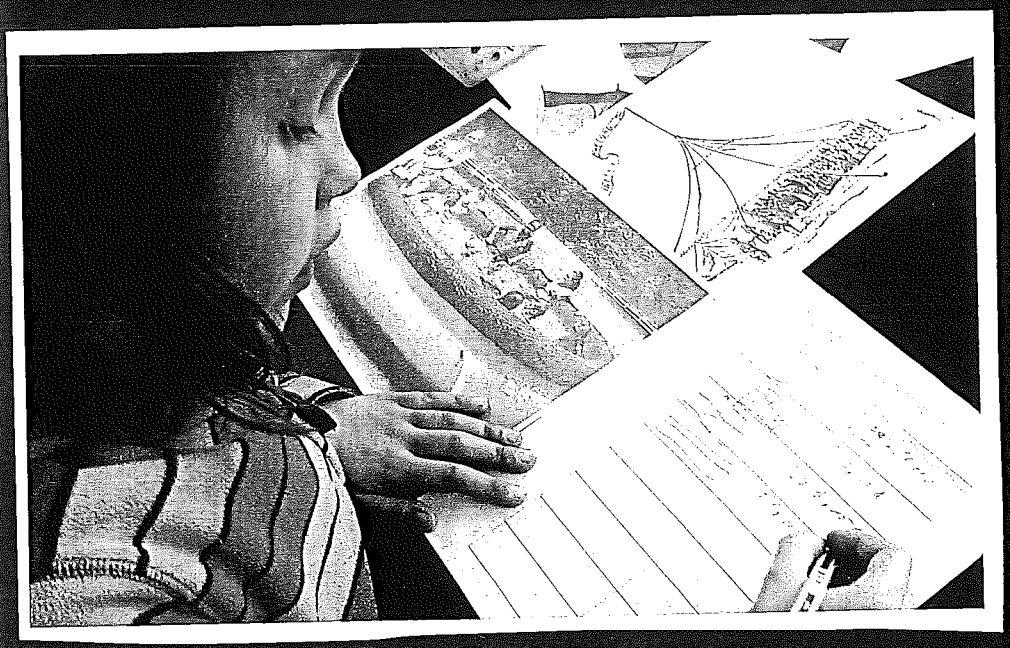
nature designs they could find.

I explained one architect's definition of a structure.

"A structure is built to keep its shape."

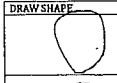
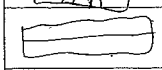
A Layer of Design Basics

Session Two:

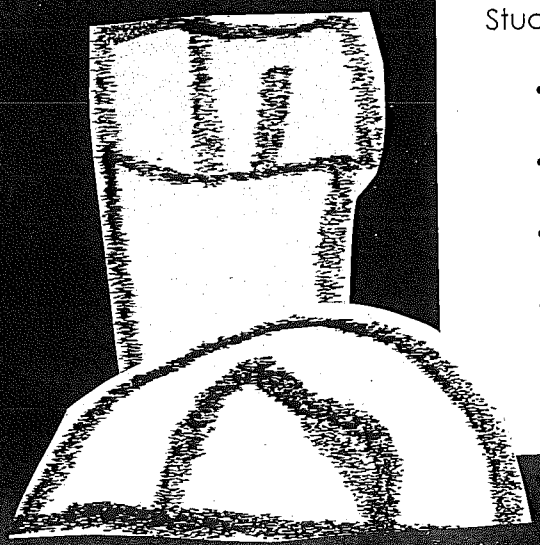


Name Aja

A STRUCTURE IS BUILT TO KEEP ITS SHAPE

DRAW SHAPE	WHAT HELPS IT KEEPS ITS SHAPE?
	rubber, air and knot
	Ice, cold
	sand, water
	air, water

Students analyzed all kinds of structures from photos: ancient temples, new airports, treehouses, toys, etc. They drew the structures and wrote what they thought was keeping that structure's shape.



Student Inferences:

- Air helps a balloon keep its shape.
- Freezing temperatures help ice cream keep its shape.
- Columns and lintels help a building keep its shape.
- Triangular clusters help a geodesic dome keep its shape.
- Tethers and tension help a tent keep its shape.

A Layer of Engineering

Session Three

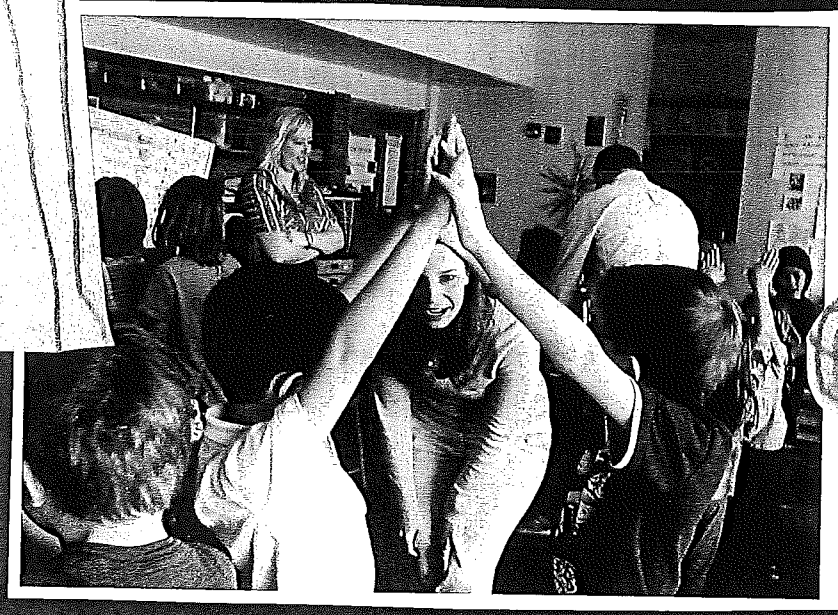
We practiced building structures that keep their shape. We used newspaper rolls and tape and after that, drinking straws and push pins. Window fans and weights tested the strength of our structures.

Through trial and error, students discovered that:

- Triangular shapes hold up the best under pressure.
- Structures need some kind of anchor to hold them to the ground.
- Fasteners between parts need to be fixed and reliable.
- The lower parts of structures need to be stronger than the top parts.

A Layer of Architectural Design

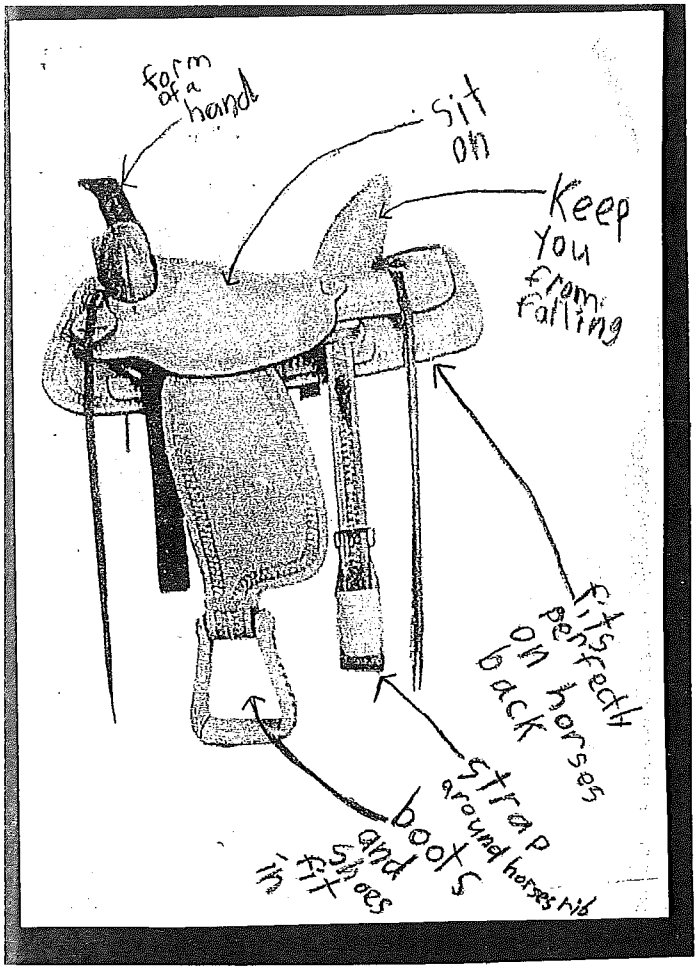
Session Four



The architects came to visit and showed students how different kinds of building elements helped structures keep their shape.

They led a workshop on different kinds of structures like post and lintel, arch, dome, and tunnel. Students made the shapes with their bodies and then went on a scavenger hunt inside and outside of our school building, looking for architectural structures.

Bringing "embodied-makers" to my students or taking students to visit such people helps students know that buildings don't build themselves. Culture doesn't magically appear. Real people design and make culture. This is an important part of teaching democracy. Students need to know that they can be makers of culture rather than just consumers of culture. Having students create relationships with architects isn't just about art appreciation or career education. It is about agency and empowerment.



A Layer of Form and Function

Session Five

We looked at how well designed objects have functions. Students analyzed photos of tools like nutcrackers, wheelchairs, and saltshakers and labeled and wrote about how specific parts of the form made the tools work.

Then I posed several of my own design problems. Groups came up with contraptions:

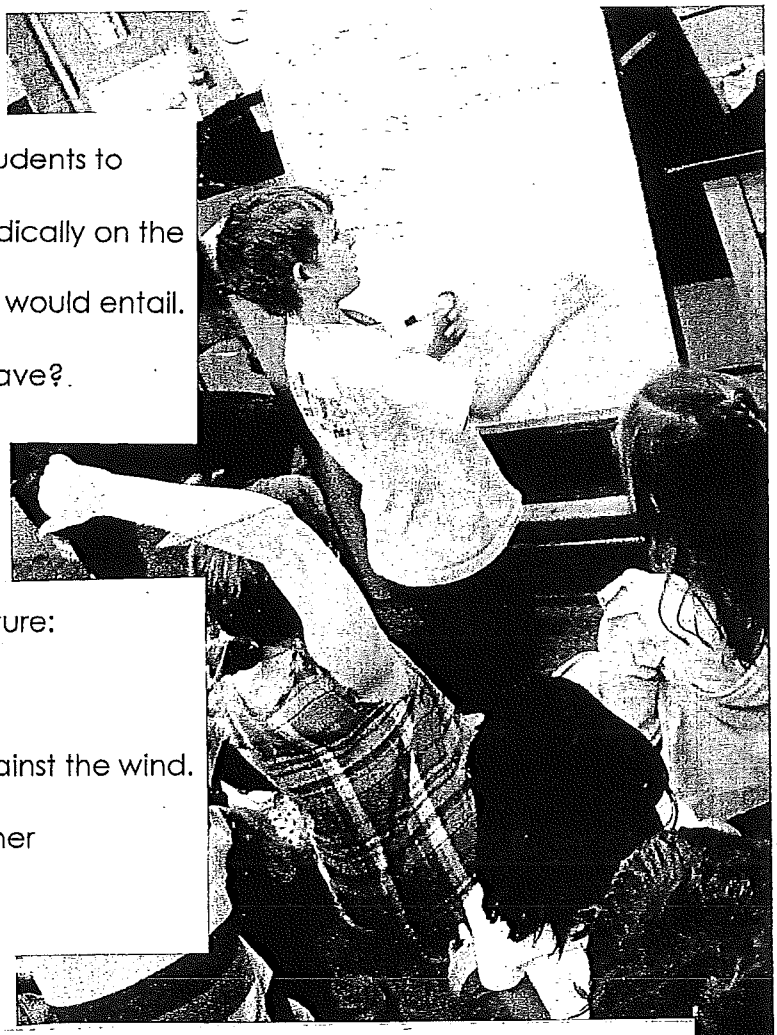
- to help my dog keep a bandage on his head
- to locate my lost bookmarks when I'm reading in bed
- to protect my knuckles when I grate cheese

These inventions were annotated in the same way as the tool photos. Students shared their ideas with one another, using their diagrams to explain their thinking.

. A Layer of Social Studies

Session Six

Now it is time to talk to the students about the project. I tell them that I've been thinking about how the Plains Tribes people traveled with their homes across the plains. The students told me about things they knew about this topic from their study in their other classroom. I listed the facts they knew on large paper.

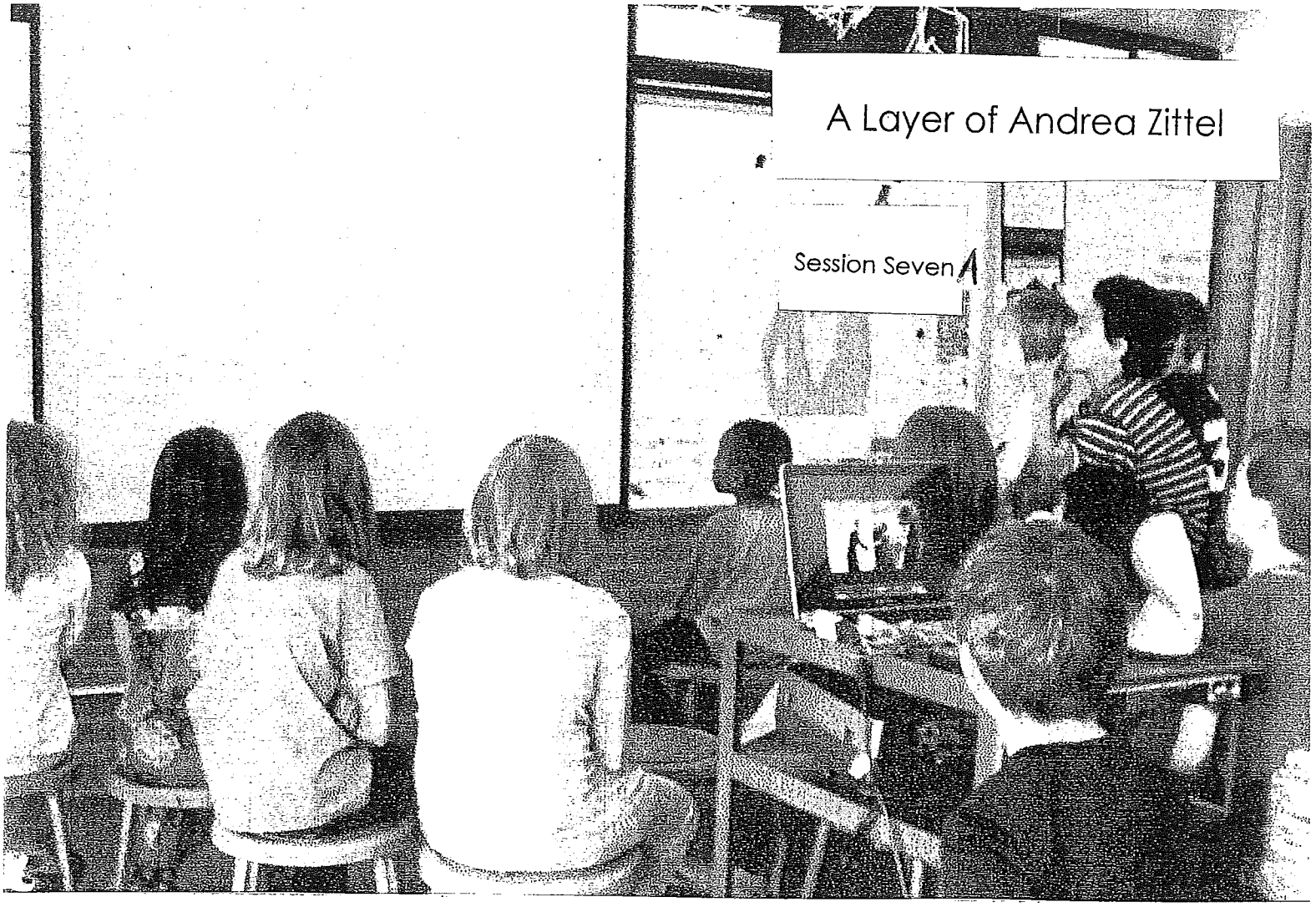


After we compiled a list of facts, I ask the students to imagine. What would it be like to live nomadically on the plains year round? We talk about what that would entail. What kind of structure would you need to have?

Students came up with criteria for this structure:

- It needs to come apart and set up.
- It needs to stay strong and stand still against the wind.
- It needs to protect them from the weather
- It needs to be able to move well.

Art teachers often bemoan the lack of time to integrate content with other teachers. A time saving device for me is to ask the students what they have studied with the other teacher. They competently fill me in. At the end of the day, I quickly check in with their teacher. Ninety nine percent of the time, the students have given me all the content I need. They are the experts for me, which takes the load off of the cooperating teacher.



Then we looked at nomadic shelters made by contemporary artist, Andrea Zittel. Zittel makes small units for living where everything you need is scaled down to fit into a small closet like cluster of pop-out rooms as well as traveling units and island shelters that float on real lakes.

Zittel's design work is called *"An Institute of Investigative Living"* which *"encompasses all aspects of day to day living. Home furniture, clothing, food all become the sites of investigation in an ongoing endeavor to better understand human nature and the social construction of needs."*

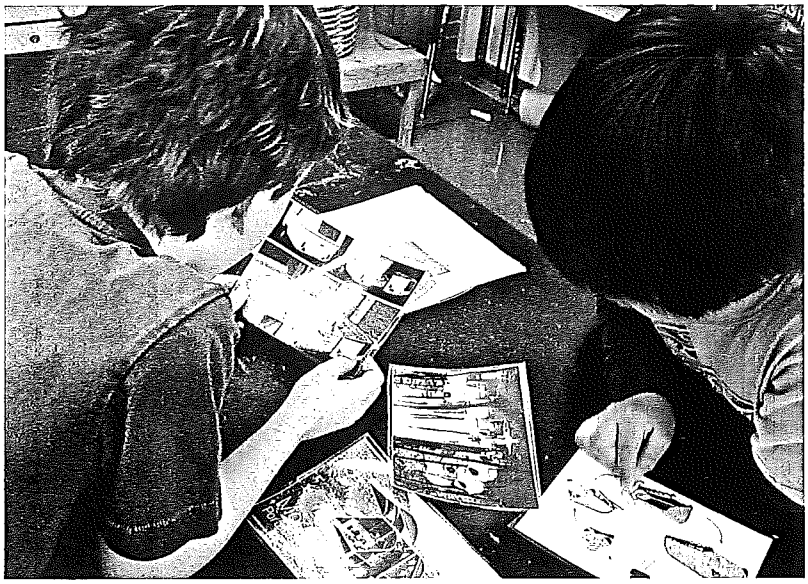
Discussing Zittel's work started us thinking about what it would be like to live with only what we need. What is a need? What is a luxury? Who lives nomadic lifestyles today in our city? Do they have everything they need?

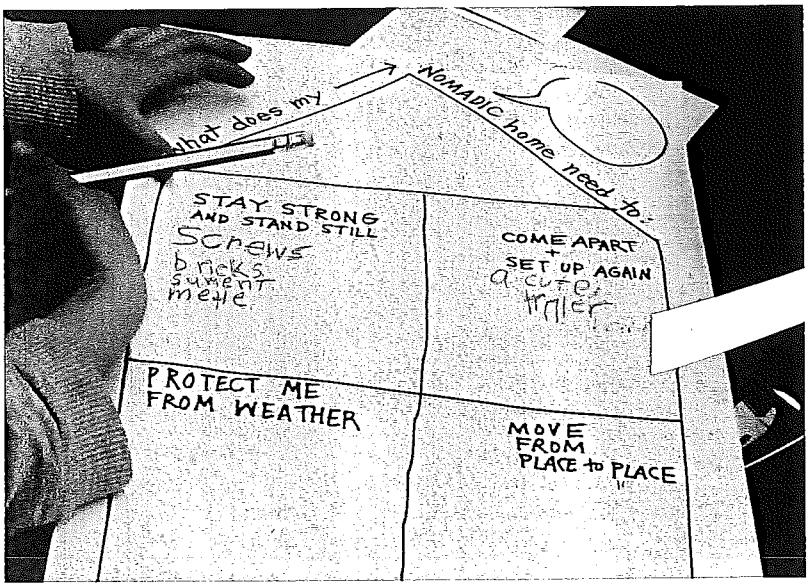
A Layer of

Contemporary Designers

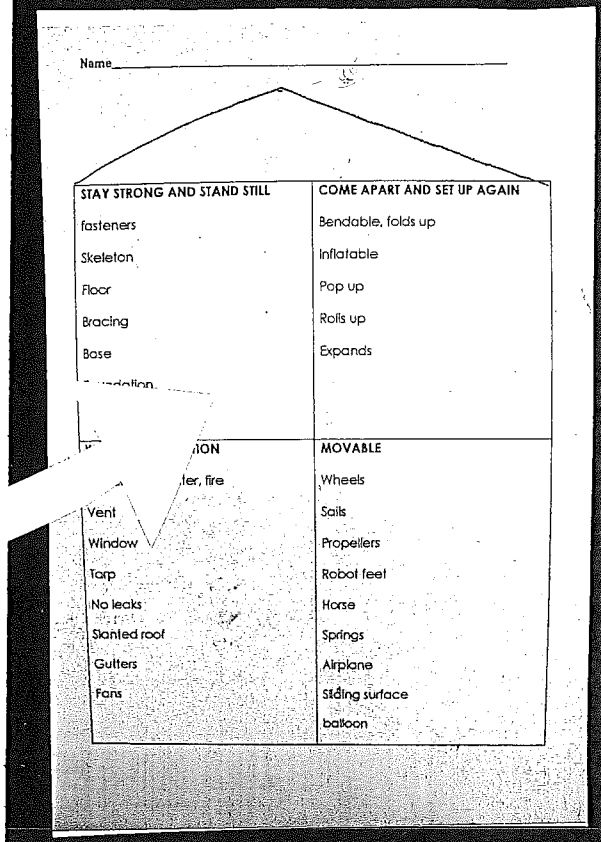
Session Seven B

The next time we met, students look at contemporary nomadic structures like inflatable neon colored tubes, aluminum folding walls, altered grocery carts, giant slinky-shaped homes, and sci-fi looking tents.





Pairs of students use a note-catcher divided into four sections, based on the criteria they came up with last time for nomadic shelter design. They analyze the examples of contemporary nomadic shelter design and write down specific ways these shelters met their criteria.



Name_____

STAY STRONG AND STAND STILL	COME APART AND SET UP AGAIN
fasteners	Bendable, folds up
Skeleton	Inflatable
Floor	Pop up
Bracing	Rolls up
Base	Expands
...ION	MOVABLE
...ter, fire	Wheels
Vent	Sails
Window	Propellers
Tarp	Robot feet
No leaks	Horse
Slanted roof	Springs
Gutters	Airplane
Fans	Sliding surface
	balloon

I synthesized a list of their ideas from their note-catchers. They will refer to these later as a planning guide when they build their nomadic shelter models.

A Layer of Objects and Necessity

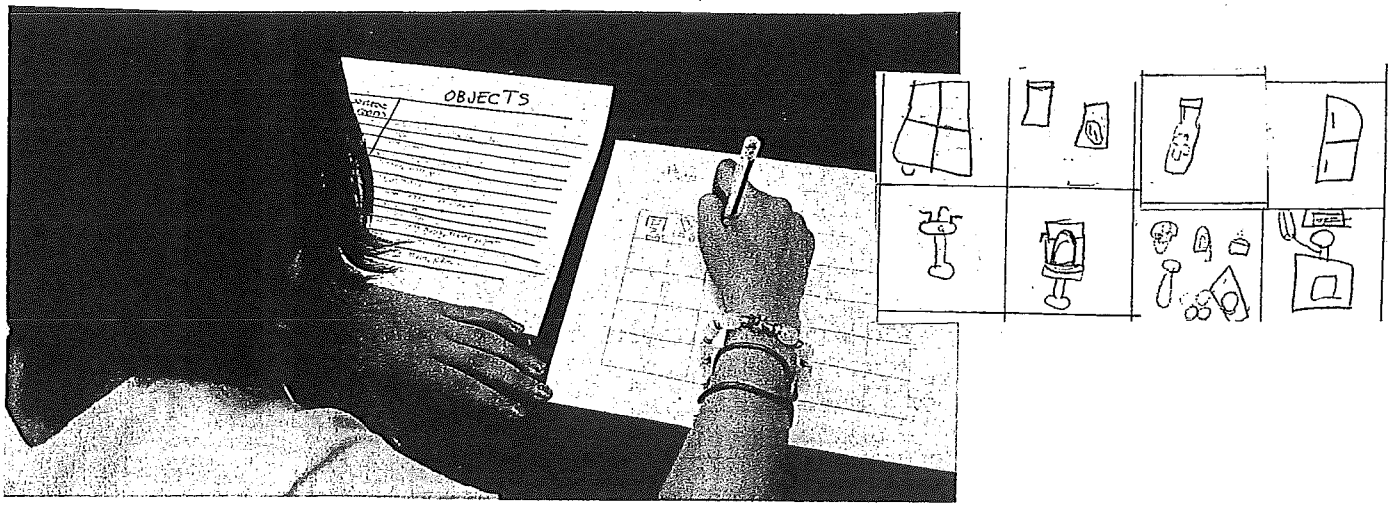
Session Eight

What would we need to live? What could we do without?

As a whole group we complied a list.

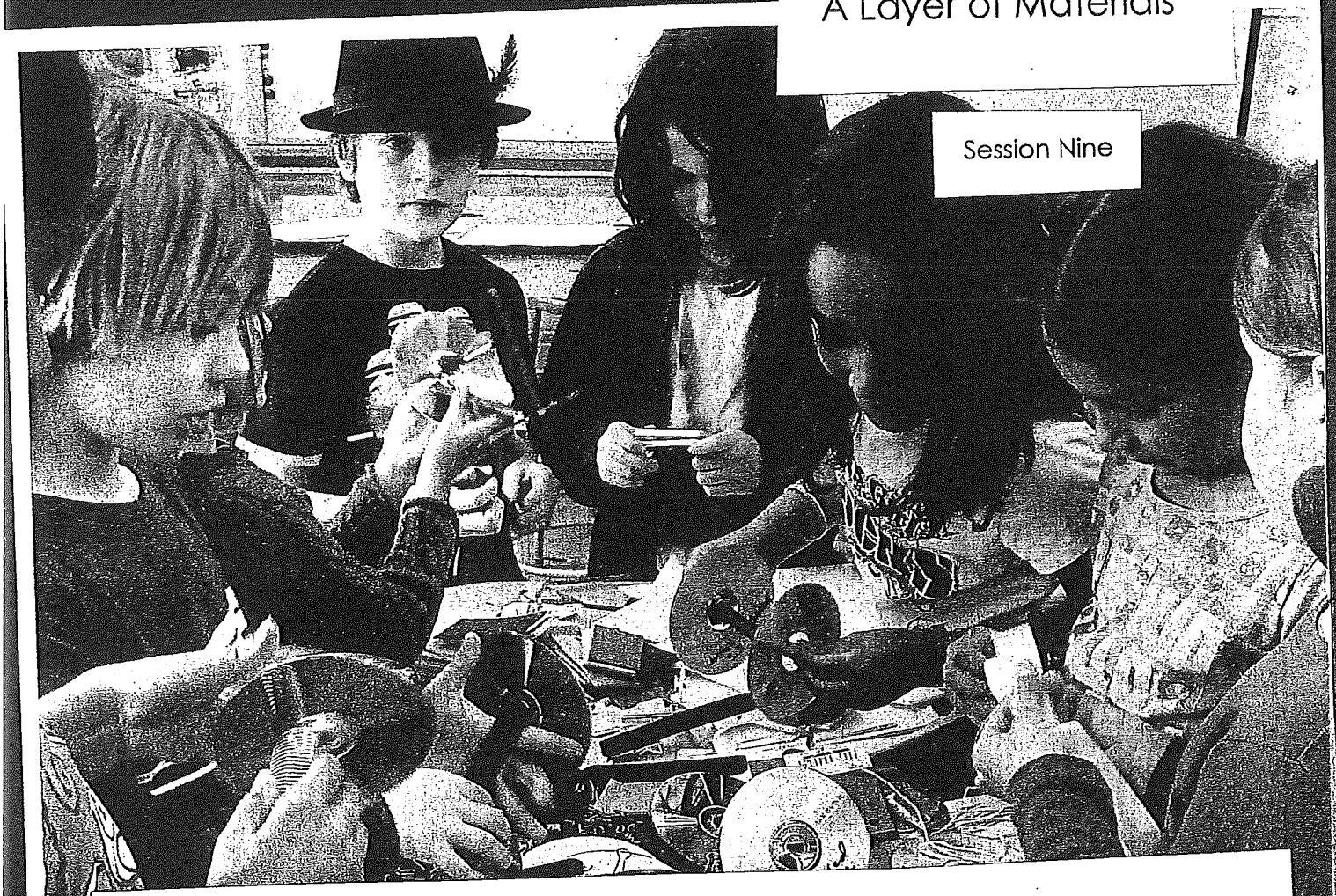
Space → own room	
food	stove, fridge, storage, dishwasher, spice rack
air oxygen	window
water	glasses, stove,
bed	sheets, pillow, warmness
shelter	refrigerator, Door,
clothes	storage, T-shirts, shirts, pants, shoes
education	books, Home work, worksheets
medicine	to help you get h
parent	to take care of you
bathroom	to go on toilet, wash hands, toi
entertainment	TV, computer, window
safe	money, Bat, lock, fire alarm, phone

From that list I asked individual students to write what that specifically meant for their nomadic shelter. What objects would they specifically pack? So for some students medicine meant "inhaler." Safety meant "money, bat, lock, or phone."



A Layer of Materials

Session Nine



Finally our last step before building was an introduction to the materials. I just filled a shopping cart at our local, repurposed-stuff store the night before... dvds, wires, tubes, rods, springs, washers, bolts, clips, paper board, netting, string, etc.

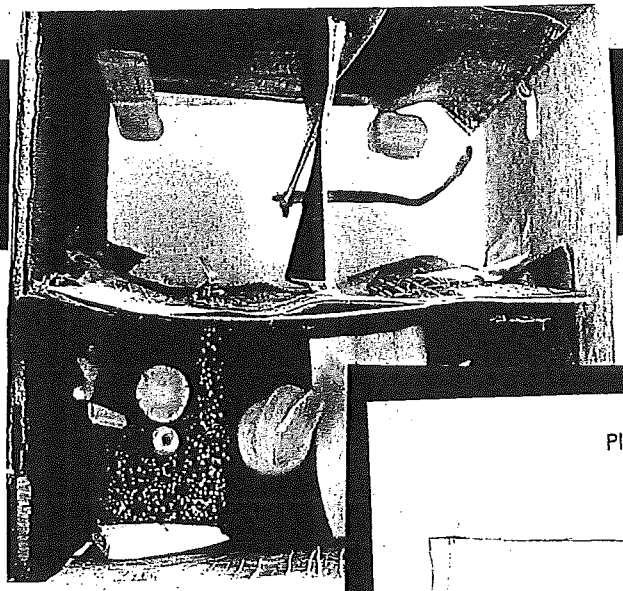
I explained the categories of the "stuff" and asked students what would work for building. What could be used as fasteners? Clips, knots, rubber bands. What could be used as structural supports? Wire, tiles, rods, sticks. What could be used as skin for our buildings? fabric, paper, netting, bubble-wrap.

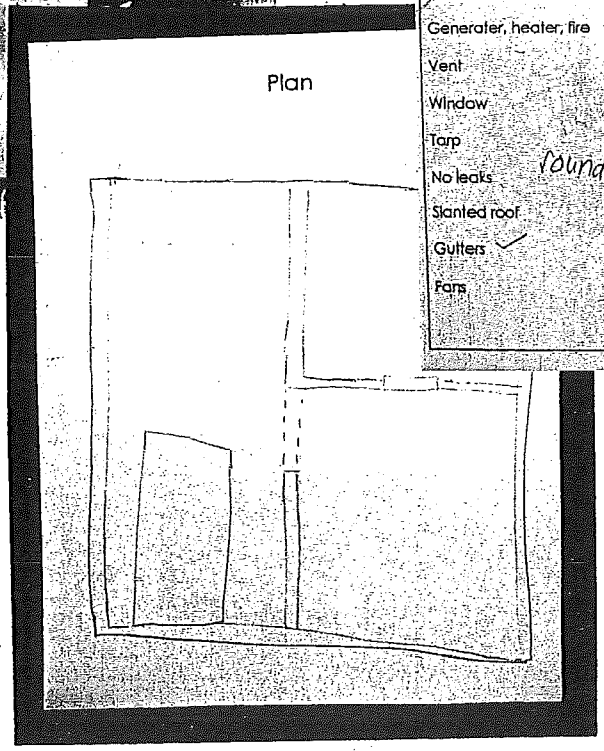
Layers of Making and Thinking and Making

Session 10

Equipped with these four essential guides, students begin to build

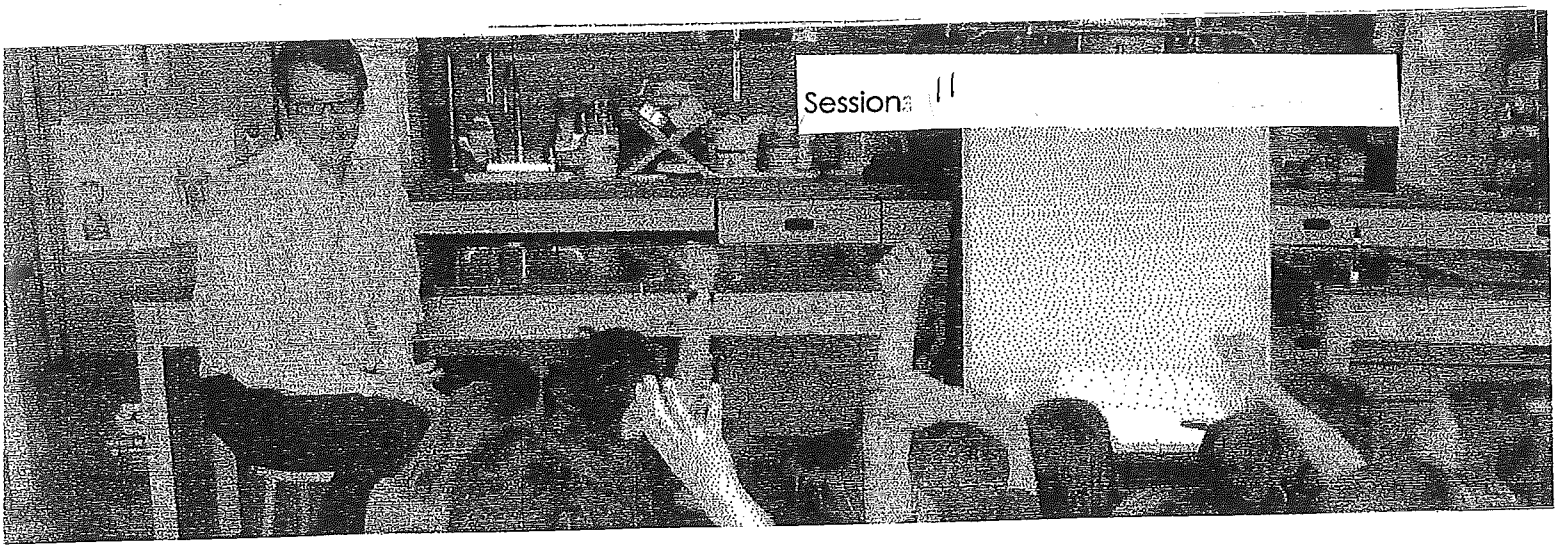
- their floor plan
- a list of their four criteria they created
- essential clay objects that needed to be packed into their model
- one another



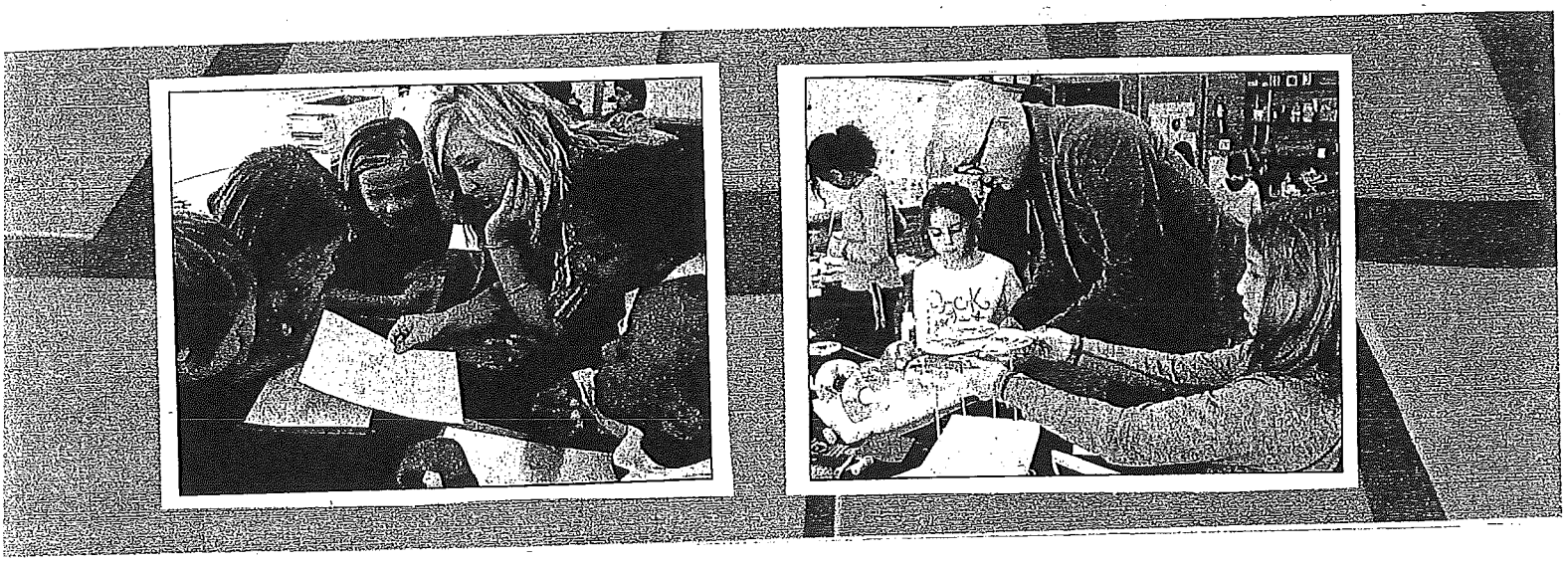


STAY STRONG AND STAND STILL	COME APART AND SET UP AGAIN
fasteners ✓	Bendable, folds up
Skeleton ✓	Inflatable
Floor ✓	Pop up
Bracing	Rolls up
Base	Expands
Foundation	
WEATHER PROTECTION	**MOVABLE**
Generater, heater, fire	Wheels
Vent	Sails
Window	Propellers
Tarp	Robot feet
No leaks round hard	Horse wings ✓
Slanted roof roof ✓	Springs
Gutters ✓	Airplane
Fans	Sliding surface
	balloon ✓

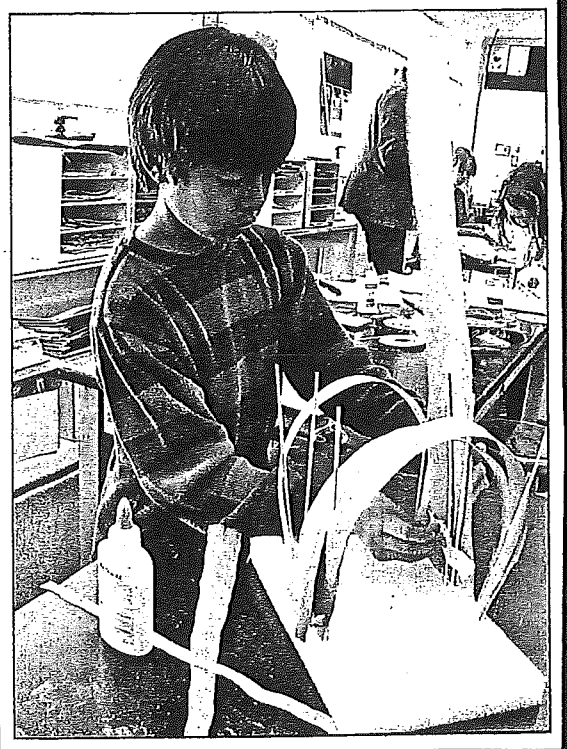
Layers of Making and Thinking and Making



During our making time, the architects came twice to help. Having experts in the classroom and having children in charge of their own learning, frees me up to do those things that are often hard to find the time to do in a busy classroom. While the architects move from student to student, instructing on arch span and leverage or elegant design; I can document student thinking, confer with individual students, differentiate broadly for students, and conduct formative assessments.



In order to attend to these things, I need to let go of some of my control and trust the architects and the students to do good work on their own. The only way for me to do reflective research in my classroom, is to set up the layers for students to be working independently. If I am micro-managing and controlling every last means in which they access the learning objectives, there is no space for my own reflection and research.



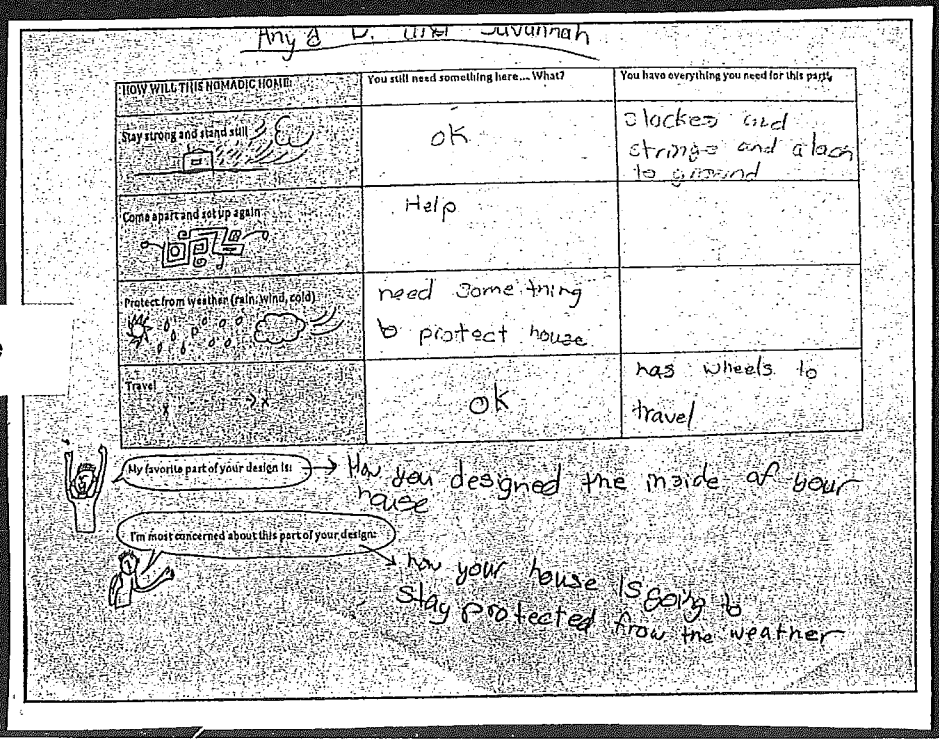
Layers of Making and Thinking and Making

Session 12

These layers, along with the physical materials, keep students true to their original intent, but at the same time, alter their thinking as they work. Some plans are scrapped. New ideas are added. Some clay objects are jettisoned.

Several times in their making, students assess their models with one another, with the architects and with me, using the rubric based on their four criteria. This brings about more alterations and revisions. All of these interruptions form a path for students to create the best design possible.

peer critique



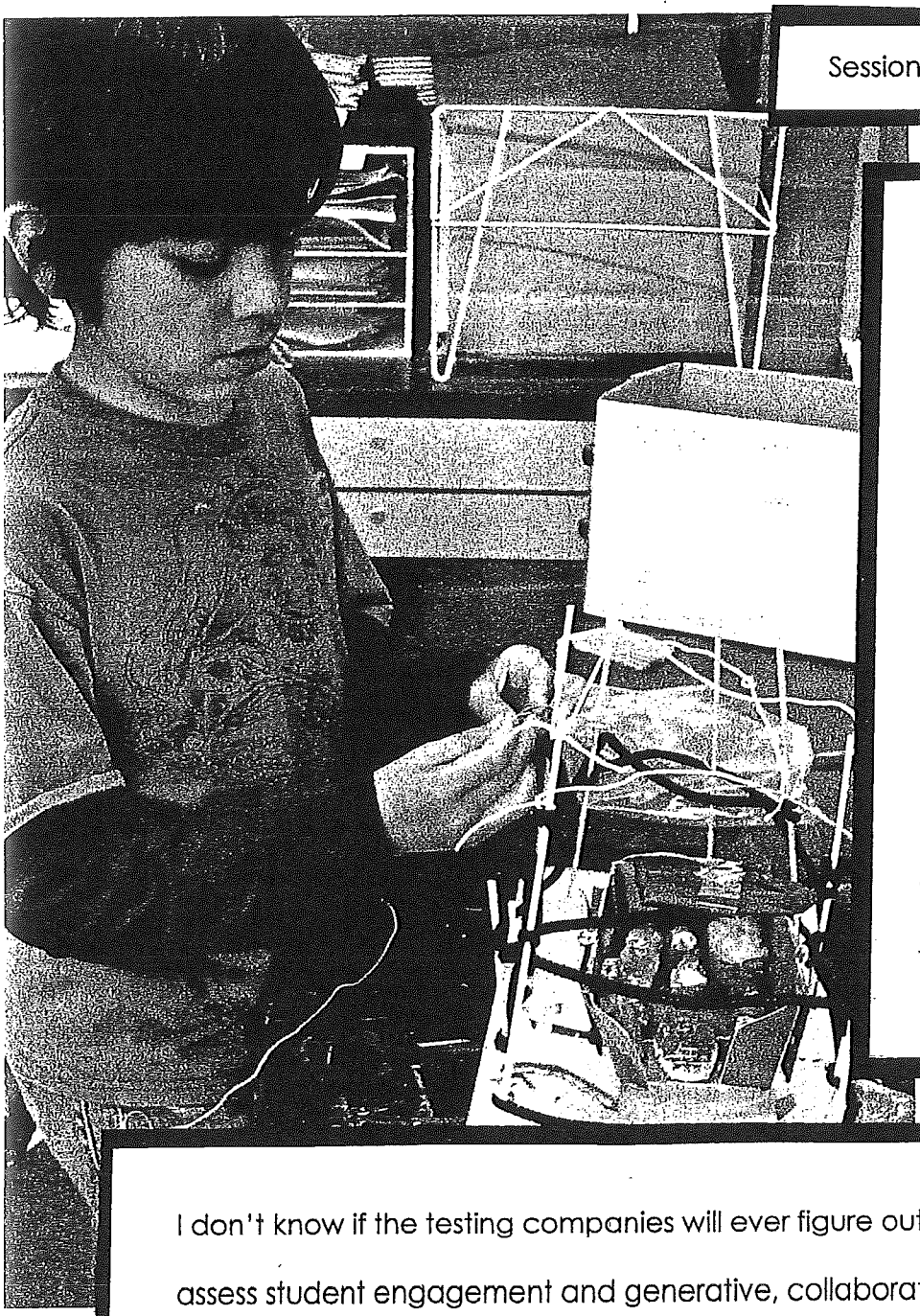
Amy & D. and Savannah

HOW WILL THIS NOMADIC HOME:	You still need something here... What?	You have everything you need for this part.
Stay strong and stand still	ok	clocker and strings and a lock to ground
Come apart and set up again	Help	
Protect from weather (rain, wind, cold)	need something to protect house	
Travel	ok	has wheels to travel

My favorite part of your design is: → How you designed the inside of your house

I'm most concerned about this part of your design: → how your house is going to stay protected from the weather

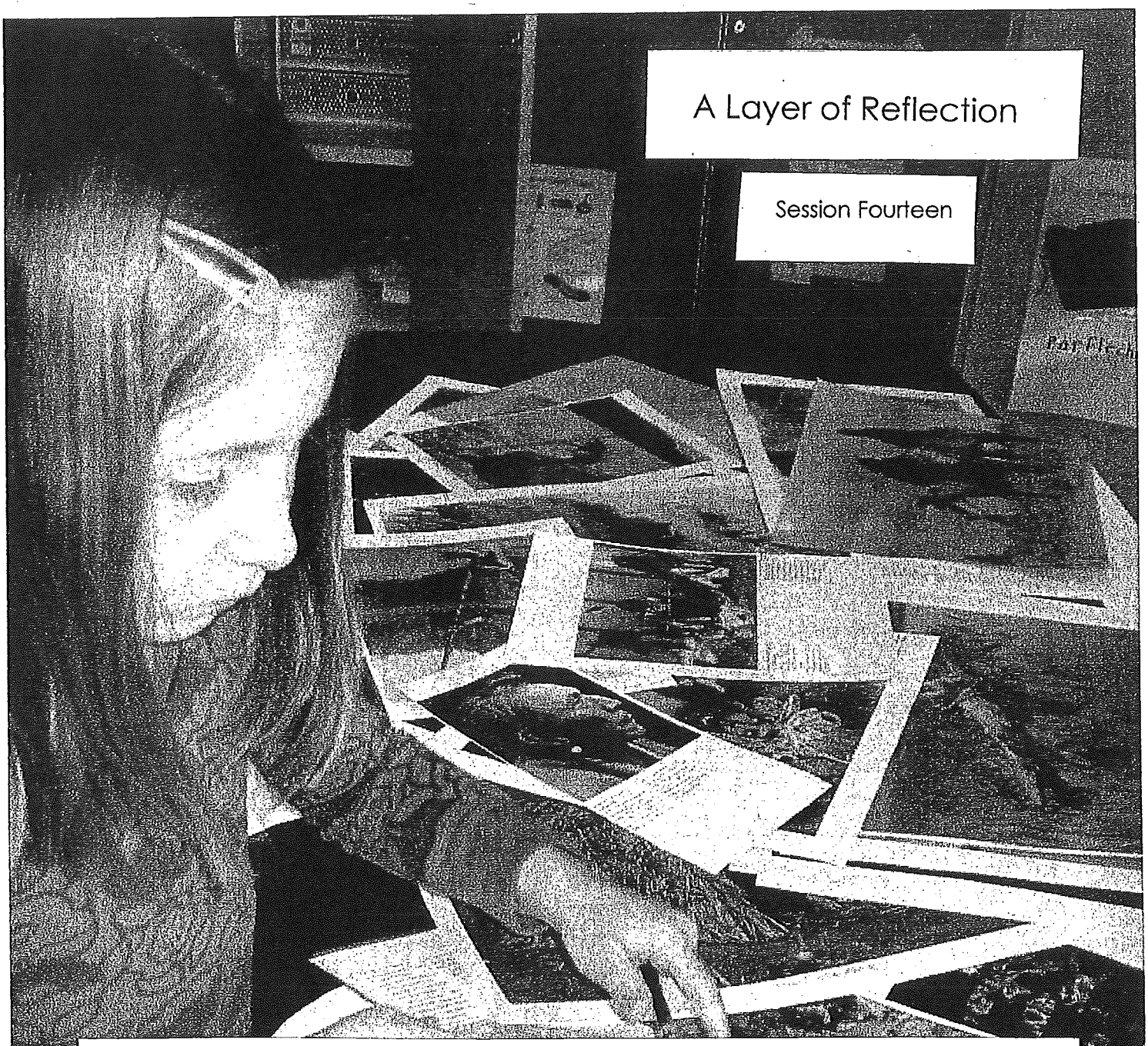
Layers of Making and Thinking and Making



Sessions Thirteen

Students finalized their nomadic shelter models. We celebrated them together as a class, sharing our work in small groups. We displayed them in the halls. Some classrooms showed this work, along with their Plains Tribes research, at a parent event. Many students used their models as evidence in their classroom portfolios to show their habits of inquiry and revision.

I don't know if the testing companies will ever figure out how to authentically assess student engagement and generative, collaborative, and divergent thinking. The best way to find out these things is by observing students while they work and by observing the work they do. I knew students were developing those 21st century skills in this project because they were applying their criteria with enthusiasm, cared deeply about the quality of their work, and influenced one another's designs. I also knew because the final products offered diverse solutions to the criteria through surprising, tangential ideas.

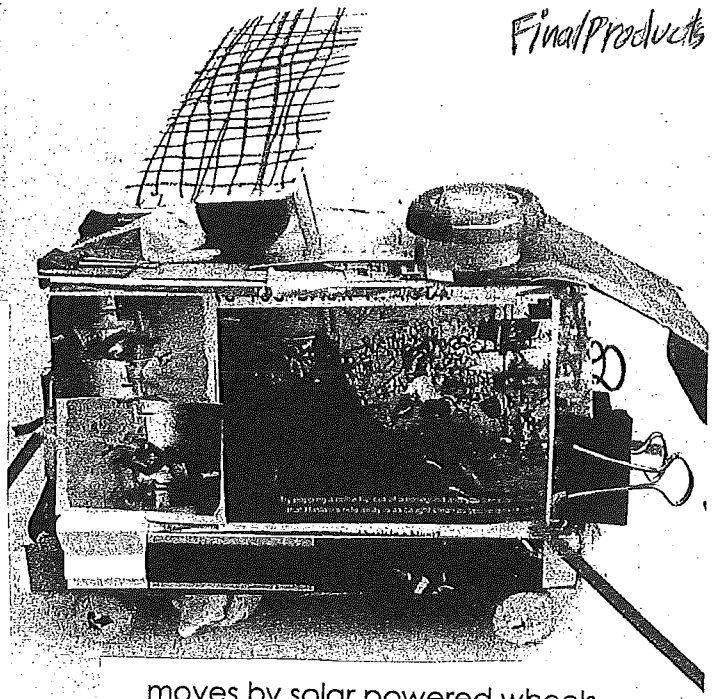


A Layer of Reflection

Session Fourteen

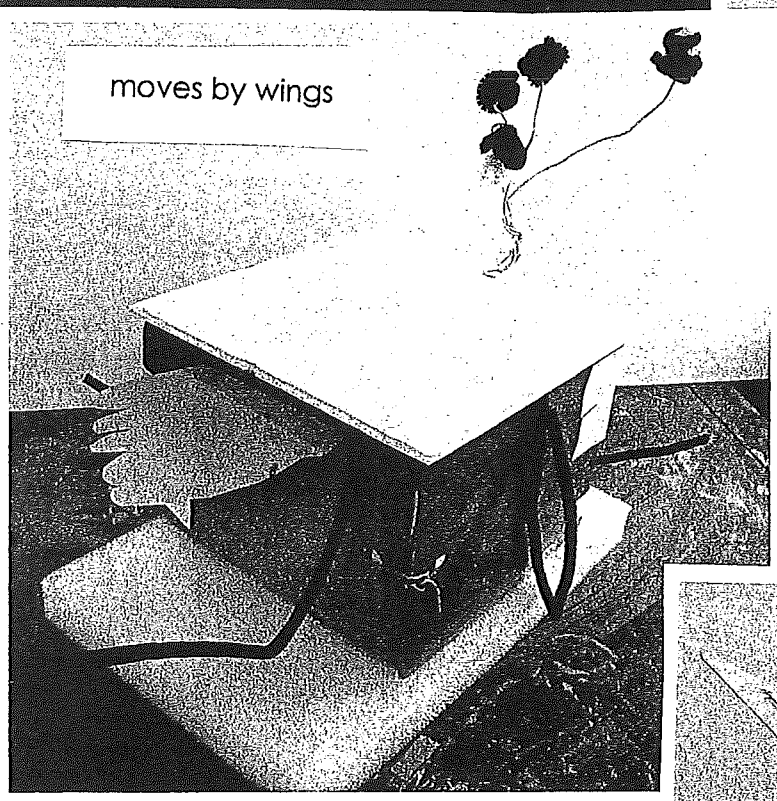
We reflected on our process throughout, but on our last day we returned to the teepee. We discussed the traditional 19th century teepee design of the Native Americans who lived on the plains of Colorado. Because of their investigation and creation of this design solution, students could understand why the teepee's design is elegant and intelligent. They could appreciate it as a brilliant architectural solution to nomadic travel on the plains, instead a backdrop to a Disney movie or an inauthentic prop in a Thanksgiving play. The teepee, is a brilliant, historical and contemporary idea: here, now, and always.

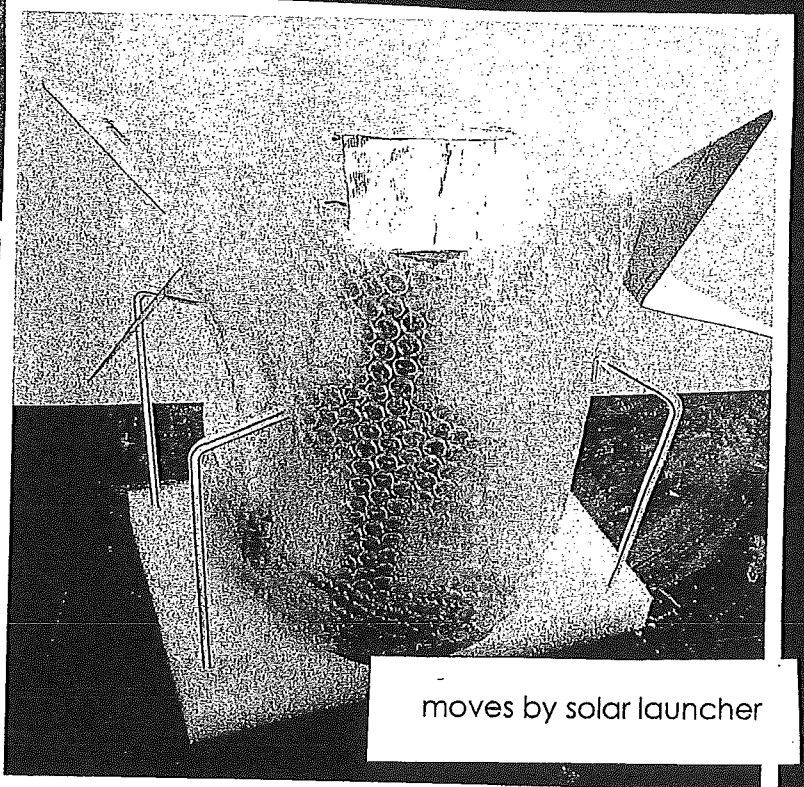
Final Products



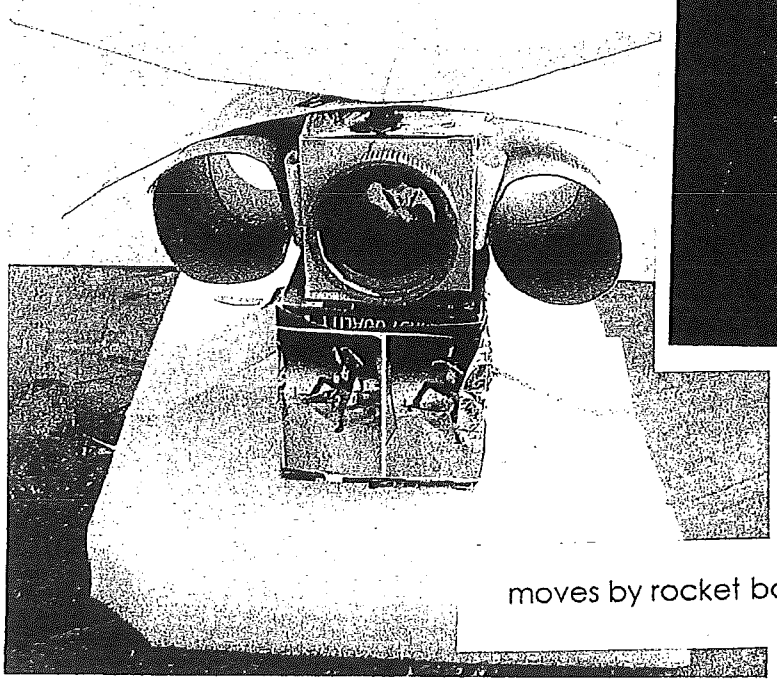
moves by solar powered wheels

moves by wings





moves by solar launcher



moves by rocket booster