

**“On the Moon Design  
Challenge”  
Touchdown**

Michelle Tucker

The “E” in STEM

November 28, 2009

# Introduction

## (i)

- **i—List four tasks on board**

- 1. Think creatively**
- 2. Work with great people**
- 3. Solve problems and design things**
- 4. Change the world and make a difference**

**Design model retrieved *Design Squad* at [pbs.org/design-squad](https://pbs.org/design-squad)**

# Key



**The key to success: Engage students**

**Key question:**

**How do engineers make the world a better place?**

**Examples:**

**Build spacecraft**

**Develop cell phones**

**Construct bridges**

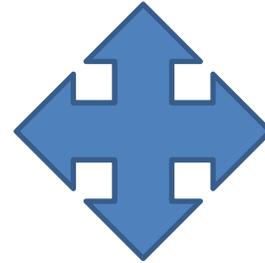
**Create fuel efficient cars**



# **Imagine !**

- **!—You have been hired to design and build a spacecraft that can land without injuring astronauts or damaging the spacecraft.**

# Plan



**Discuss the questions**

**Q: What kind of shock absorber can you make from these materials to help soften a landing?**

**Q: How will you make sure the lander doesn't tip over as it falls through the air?**

**Brainstorm ideas**

- **Fluency and flow are encouraged**
- **Students used colored markers to identify contributors and discourage groups from choosing one idea or concept**

# Identifying the Problem & Brainstorming

10.23.09 Tucker

- Problem/Challenge

Need shock-absorbing system for spacecraft

- Brainstorm

Shock Absorbers

- accordion-style folds
- straws w/ flex *material*

Landing

- balance
- weight distribution
- stability



Diana, ~~Robert~~ ROBERT

Identify the Problem

Problem To get two astronauts to land safely.

Brainstorming

- bongy cords
- g. cage
- capsal
- water
- food
- air
- oxygen

# Identifying the Problem & Brainstorming

Jamil, Joseph, Chelsi, Joey

P: To design a space craft for 2 people to land on the moon safely.

Identify the Problem

Brainstorming

2 floors  
soft middle  
Sturdy outside  
Cage  
Capsule



SS, #4  
10/23/09

Omar A. <sup>Ⓢ</sup>, Brandon <sup>Ⓢ</sup>, Kyle <sup>Ⓢ</sup>, Elizabeth <sup>Ⓢ</sup>

Identify the Problem

How can we protect astronauts and help with a softer landing?

Brainstorming

Shock absorbers

Lrd  
Capeute  
Soft metal  
Walls that come up  
Cage  
Rocket  
Parachuet  
Rolling

# Identifying the Problem & Brainstorming

Sean, Kaley, Binh An, Nhi

problem: Need to build a landing that can absorb the shock of a space craft.

Identify the Problem

Brainstorming

Index cards will bounce like springs.  
Metals hold shock absorbers up. Fold cards to make springs.

matress  
pillow  
lots of pads  
sponges

Tatum, Estephany, Fabio, Minh

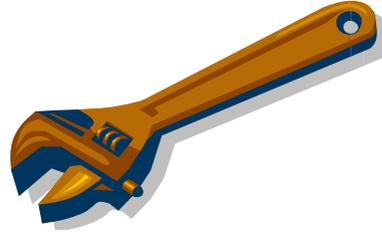
1. Problem - need to build something that helps astronauts land safely (absorb the shock)

Identify the Problem

Brainstorming

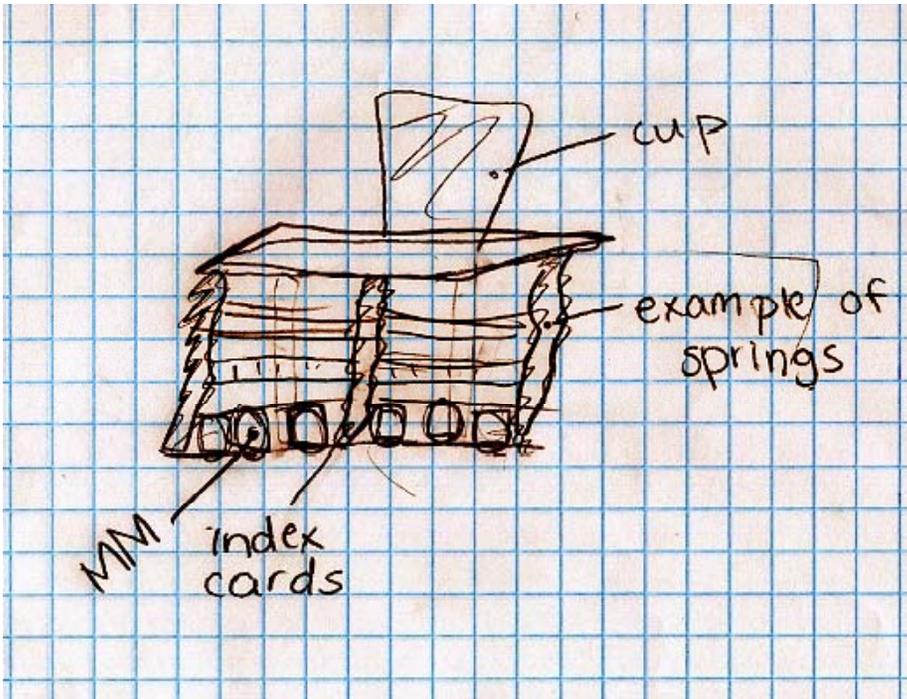
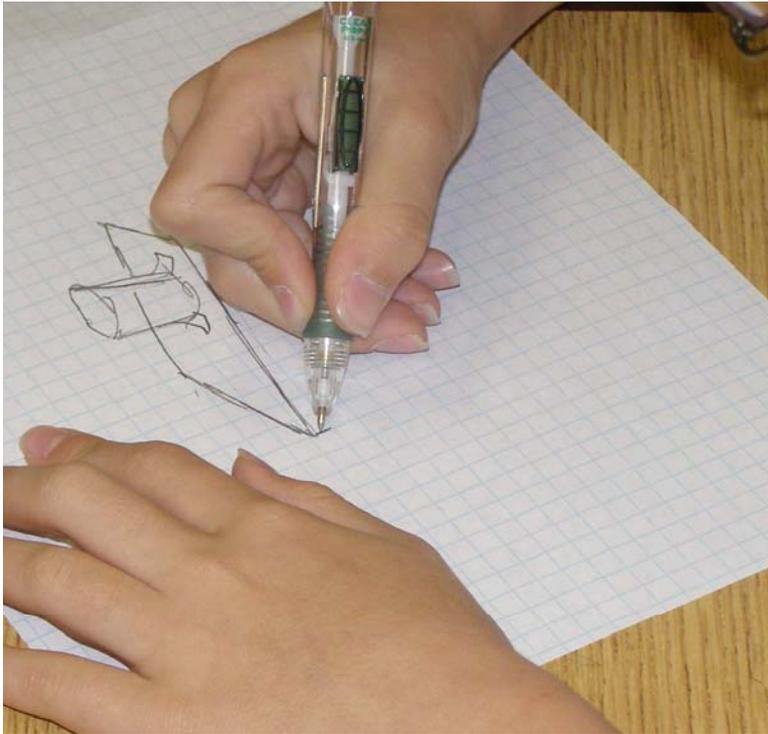
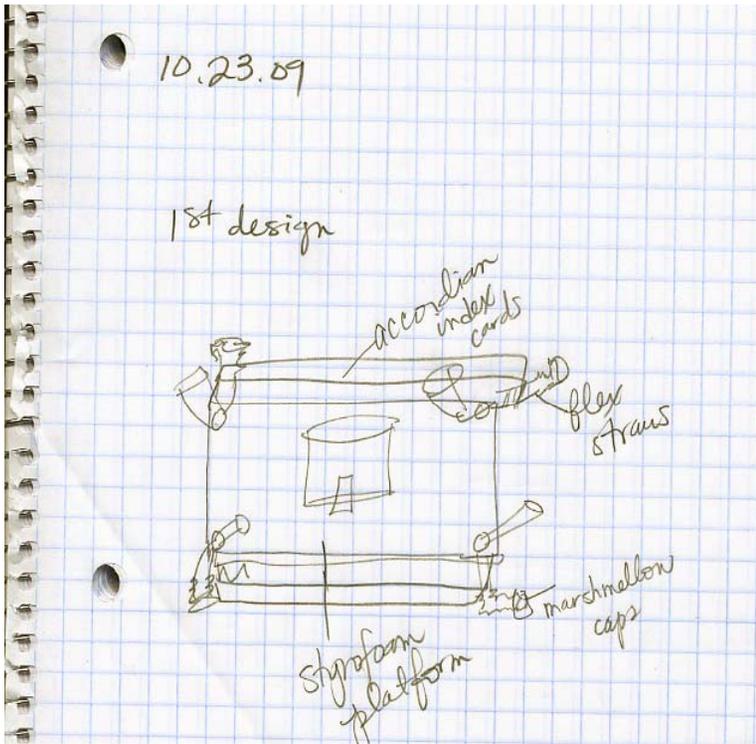
bouncing  
cushion  
holder  
Safety strap  
Shock absorber  
cage  
bongys  
soft metal  
capped  
moving walls

# **Create and Construct Model**

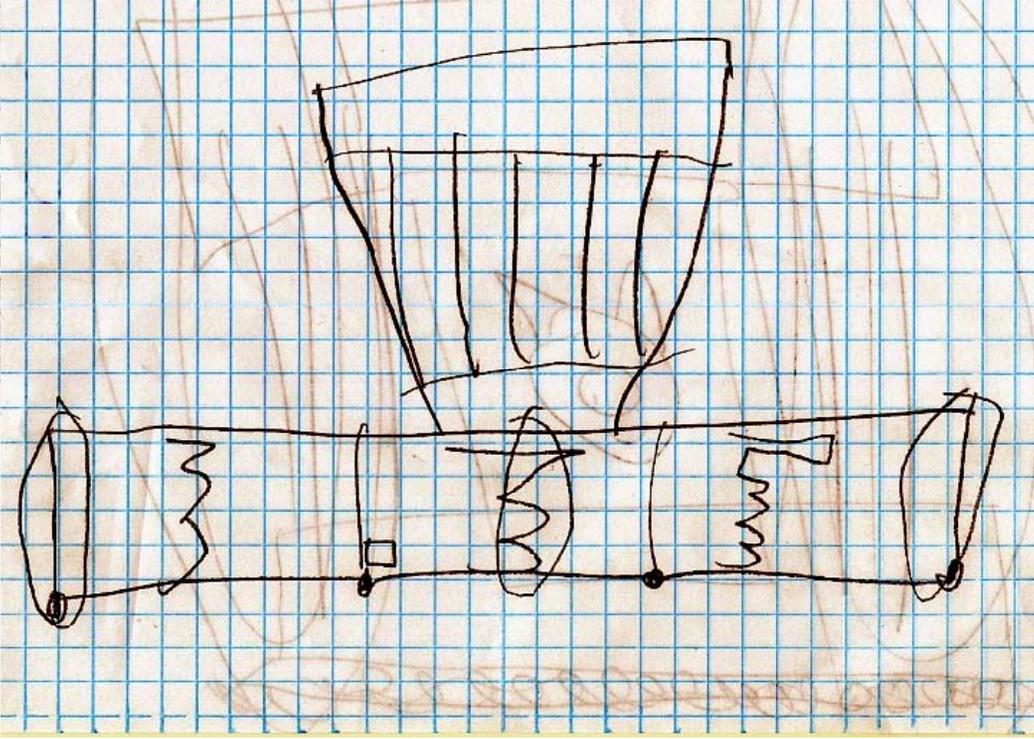
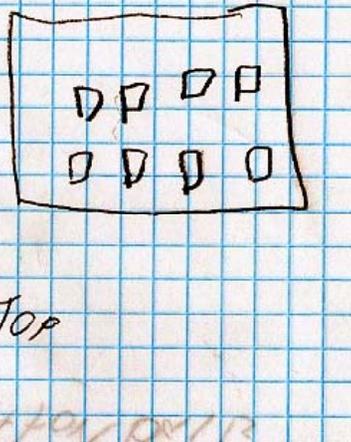
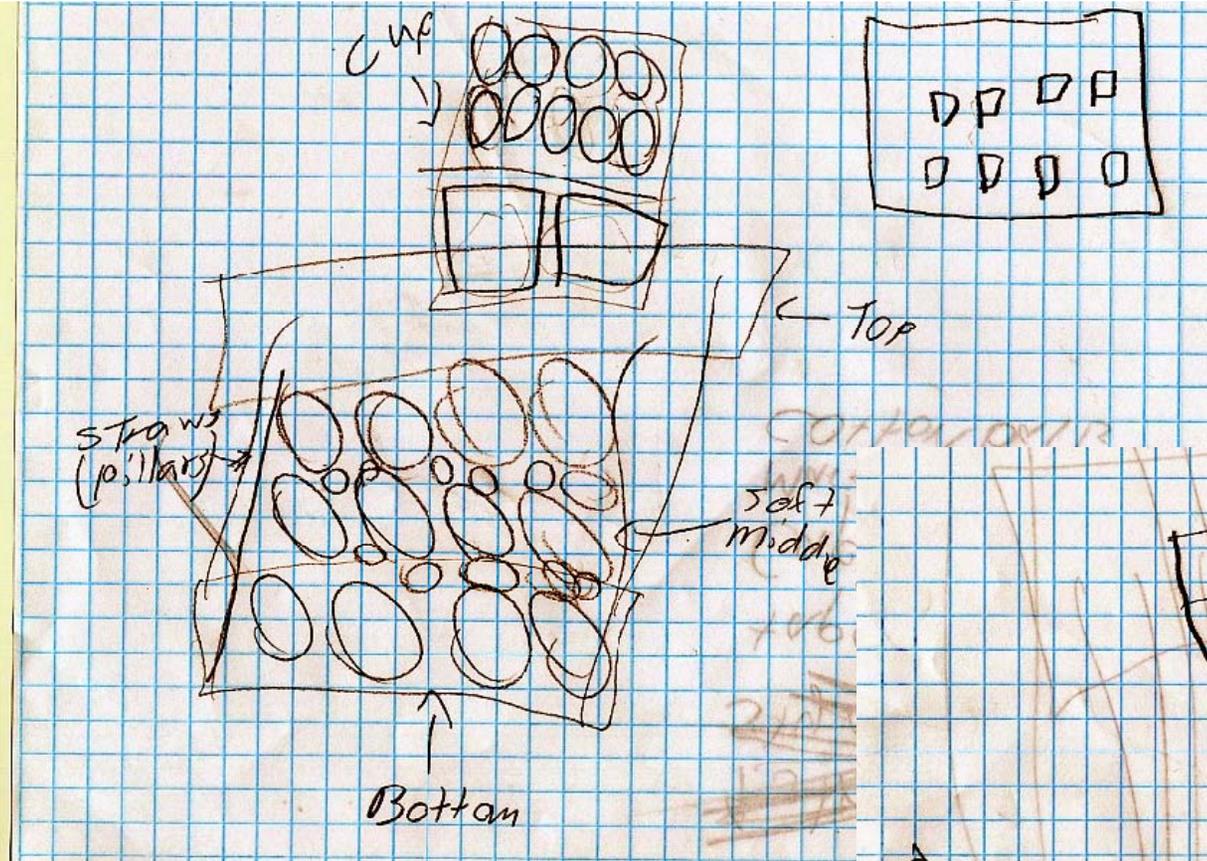


**The students design the spacecraft.  
They are encouraged to focus on the  
purpose of the design.**

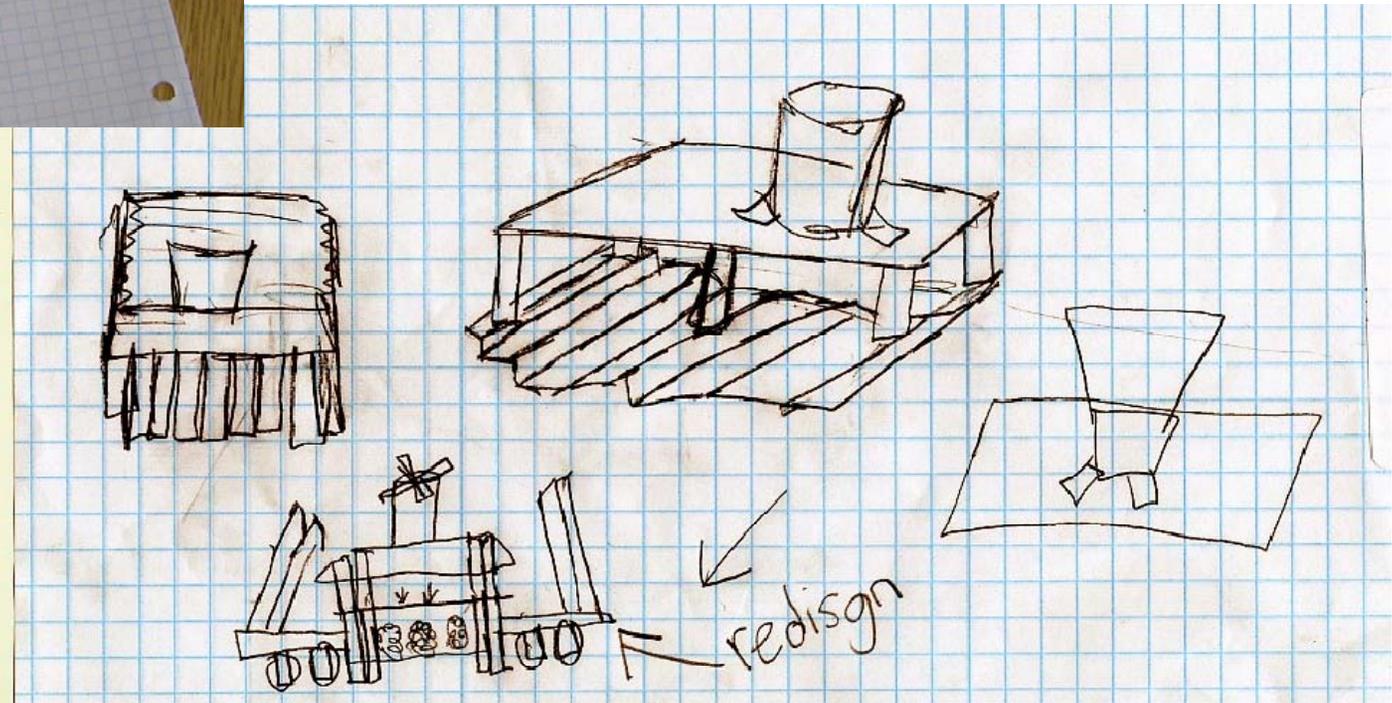
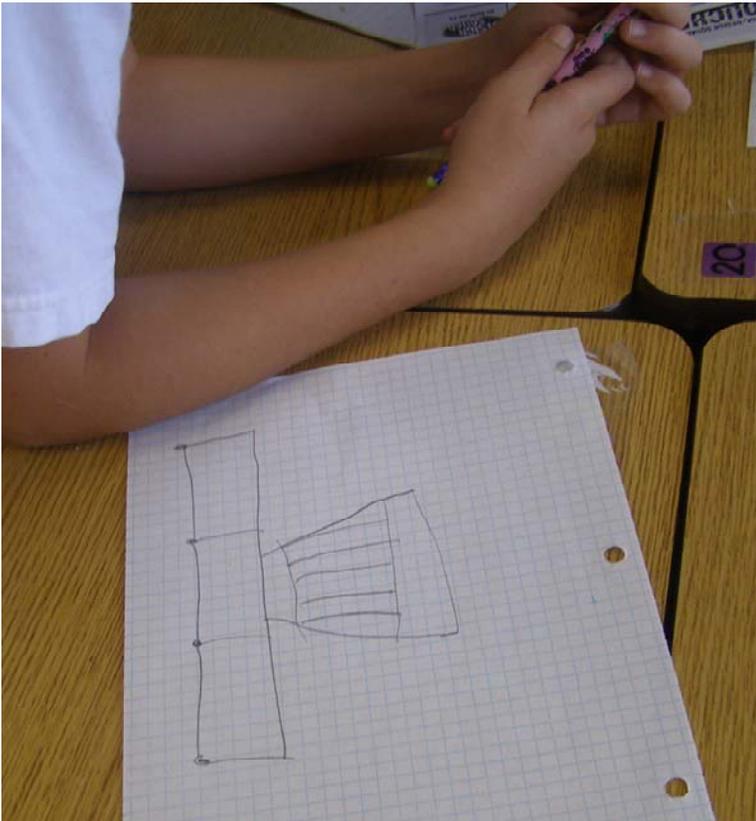
# Design



# Design



# Design



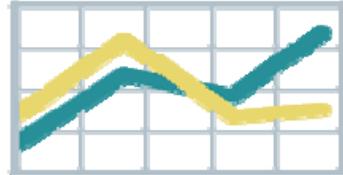
# Build



# Build



# Experiment and Test

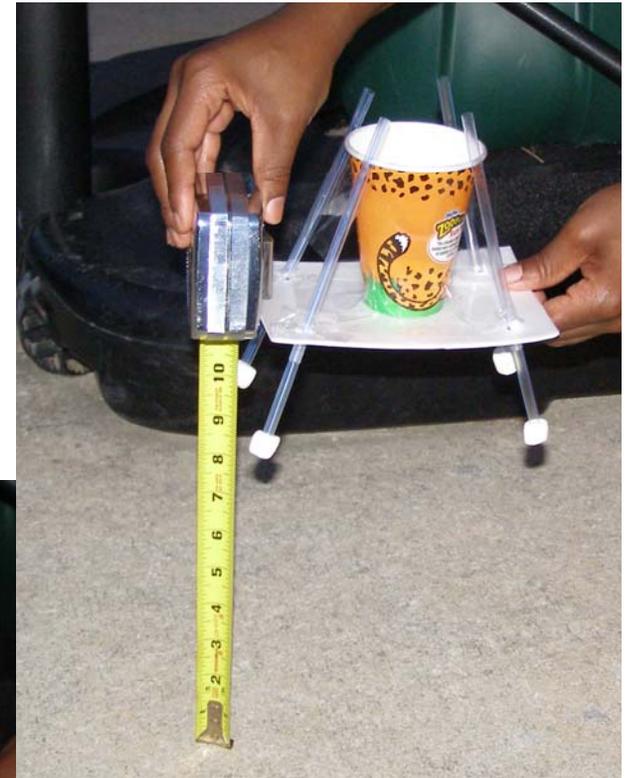


- The students gather the materials and build the prototype.
- When the timer sounds, I go to each group with a ruler and test the prototype. I reward the first group to volunteer with the first opportunity at redesigning.
- Watching other students make mistakes helps improve the design process. Academic risk-taking is encouraged.

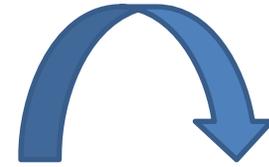
# Test and Evaluate



# Test and Evaluate

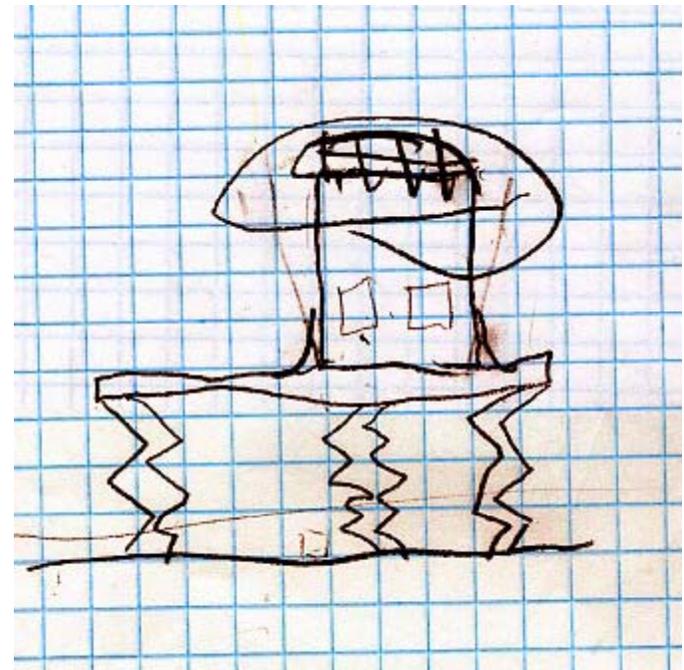
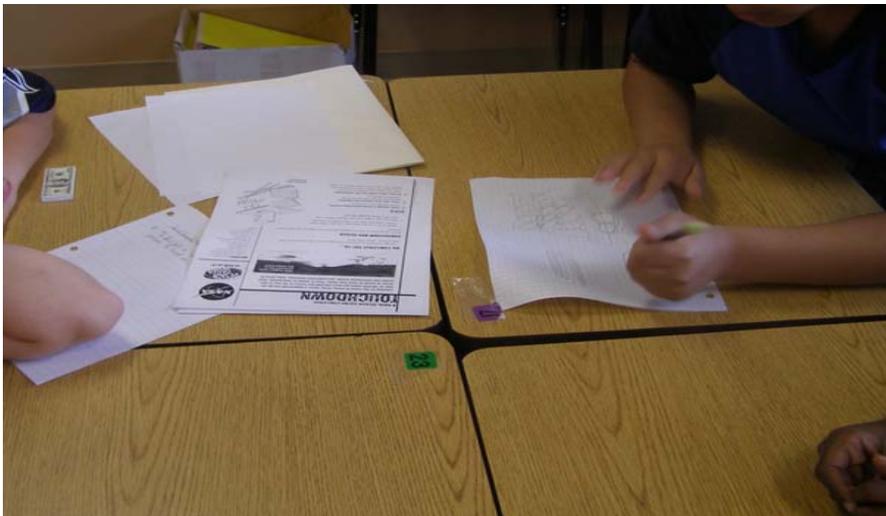
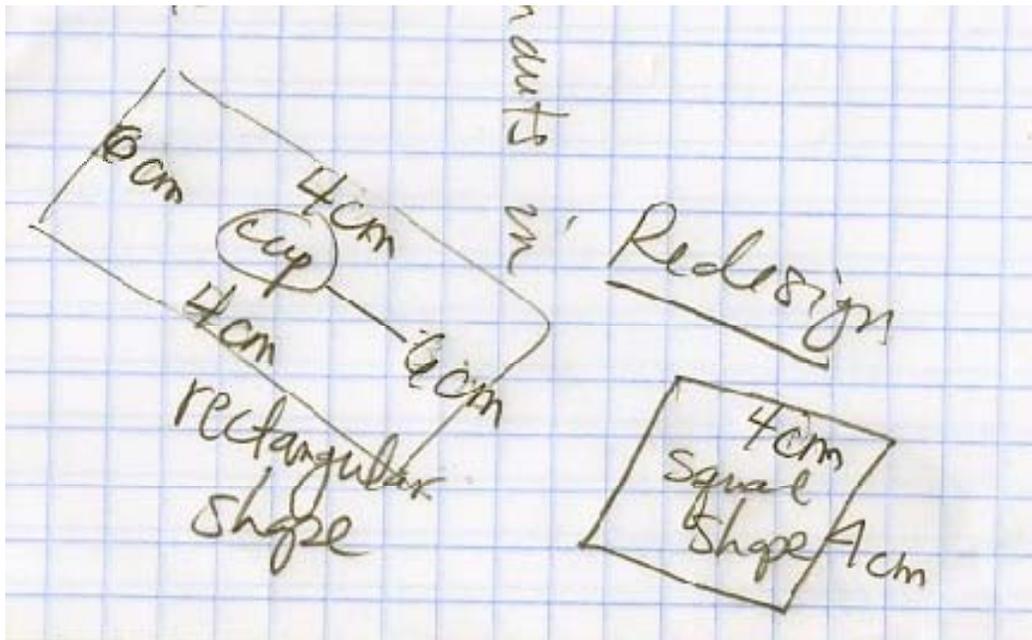


# **Improve**



- The students discuss the results and evaluate the original design.**
- They make adjustments to the design and try to improve the prototype.**
- They gather additional materials as needed.**
- Test and evaluate the improved prototype.**

# Redesign

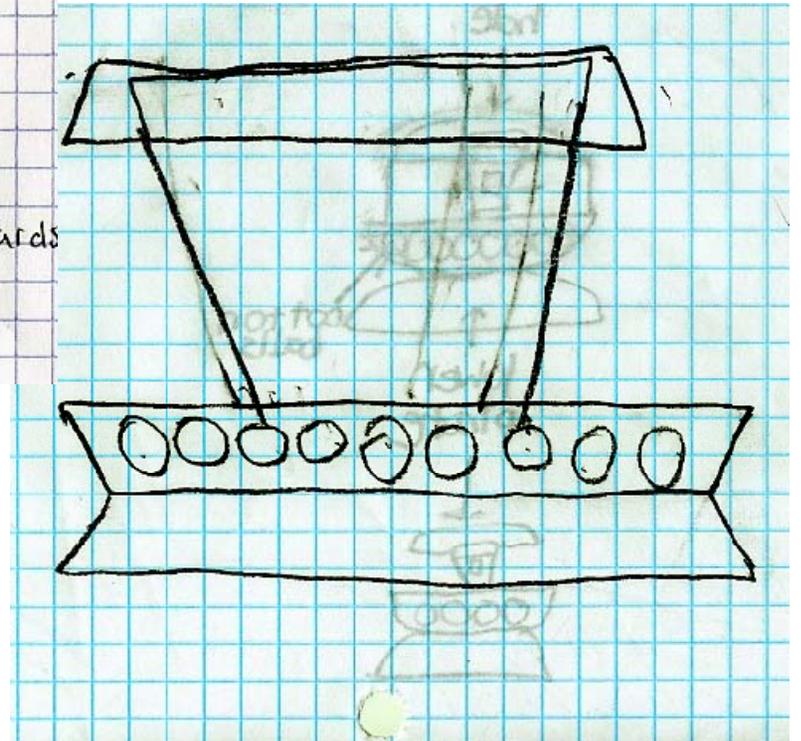
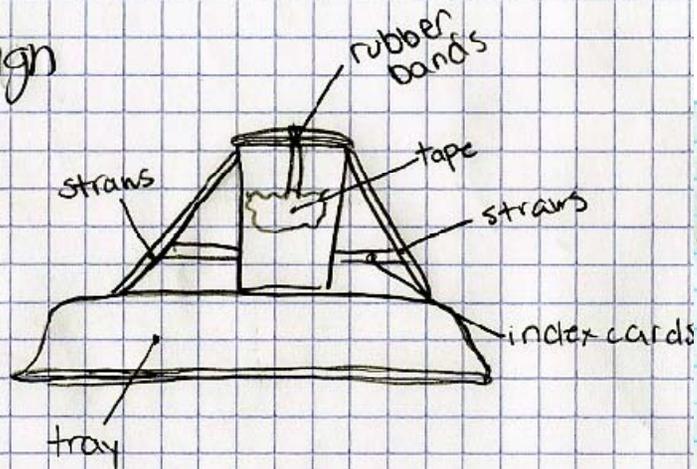


# Redesign

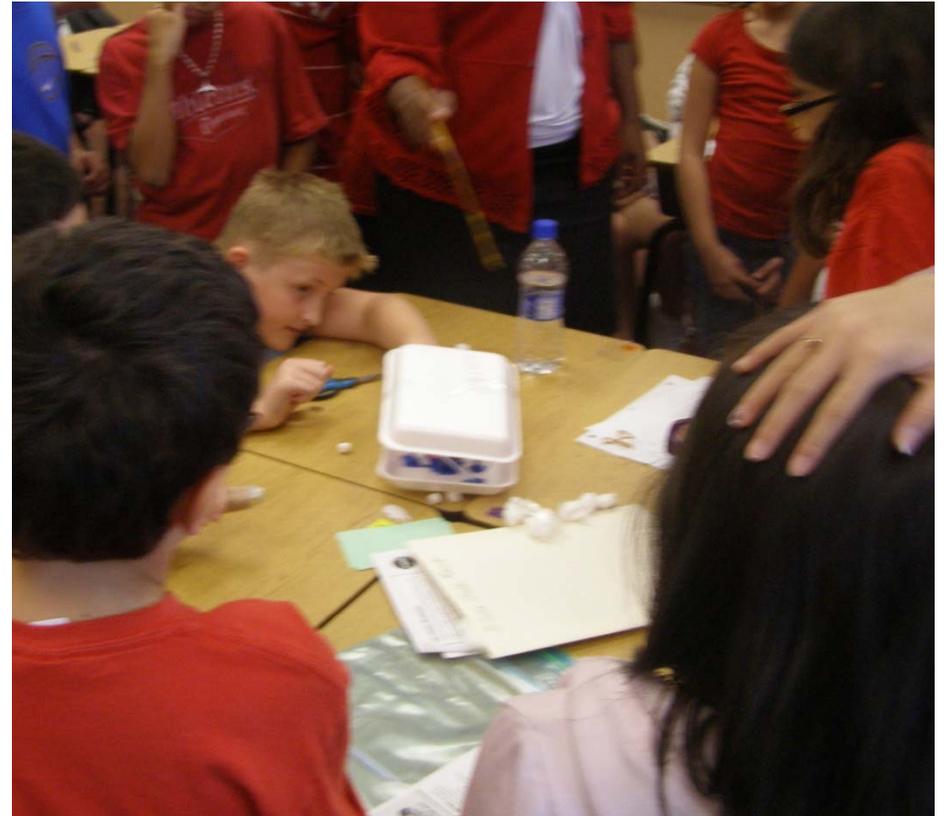
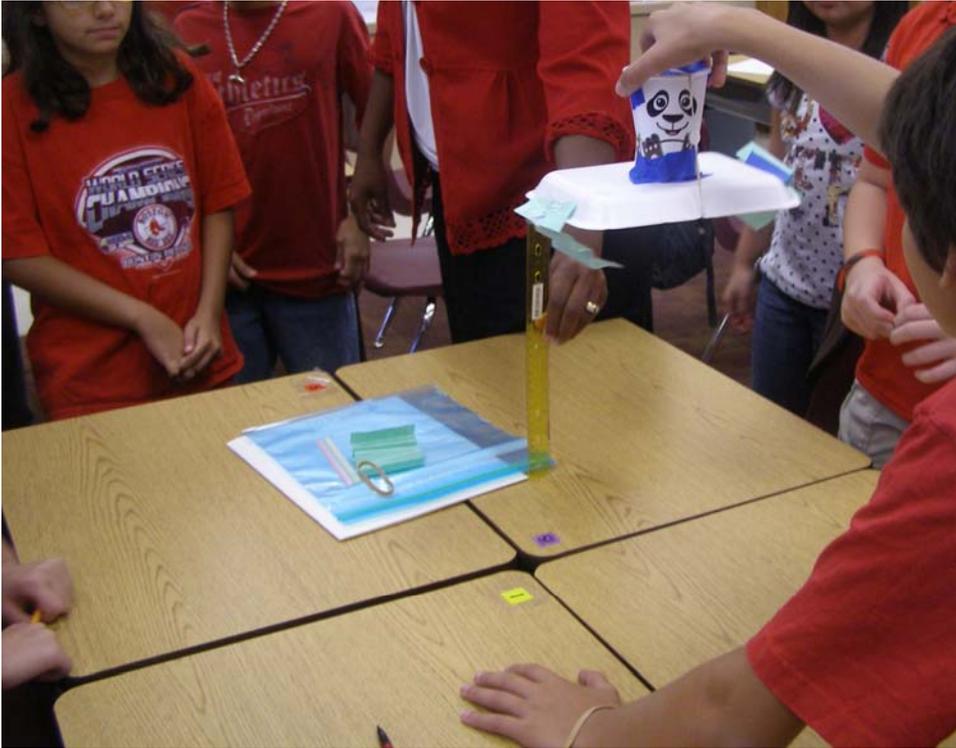
Nhi S#4

November 2, 2009

Redesign



# Test & Evaluate



# Share Solution

- **Best Features—flexible straws with marshmallow feet created effective shock absorbers**
- **Common design features— cup in the center of the platform, marshmallows to soften the landing**
- **Design improvements—making sure the cup was stable by adjusting the center of the cup and distributing the weight equally, stacking the “astronauts” in the and placing cotton balls around them to secure them in place.**