Educational Design Kit for Children with Disabilities

Disability Heroes
Cassi Janakos
Janhavi Vartak
Alessia von Erb

The Team

Janhavi
Senior, STS

Cassi
Grad Student, MS&E

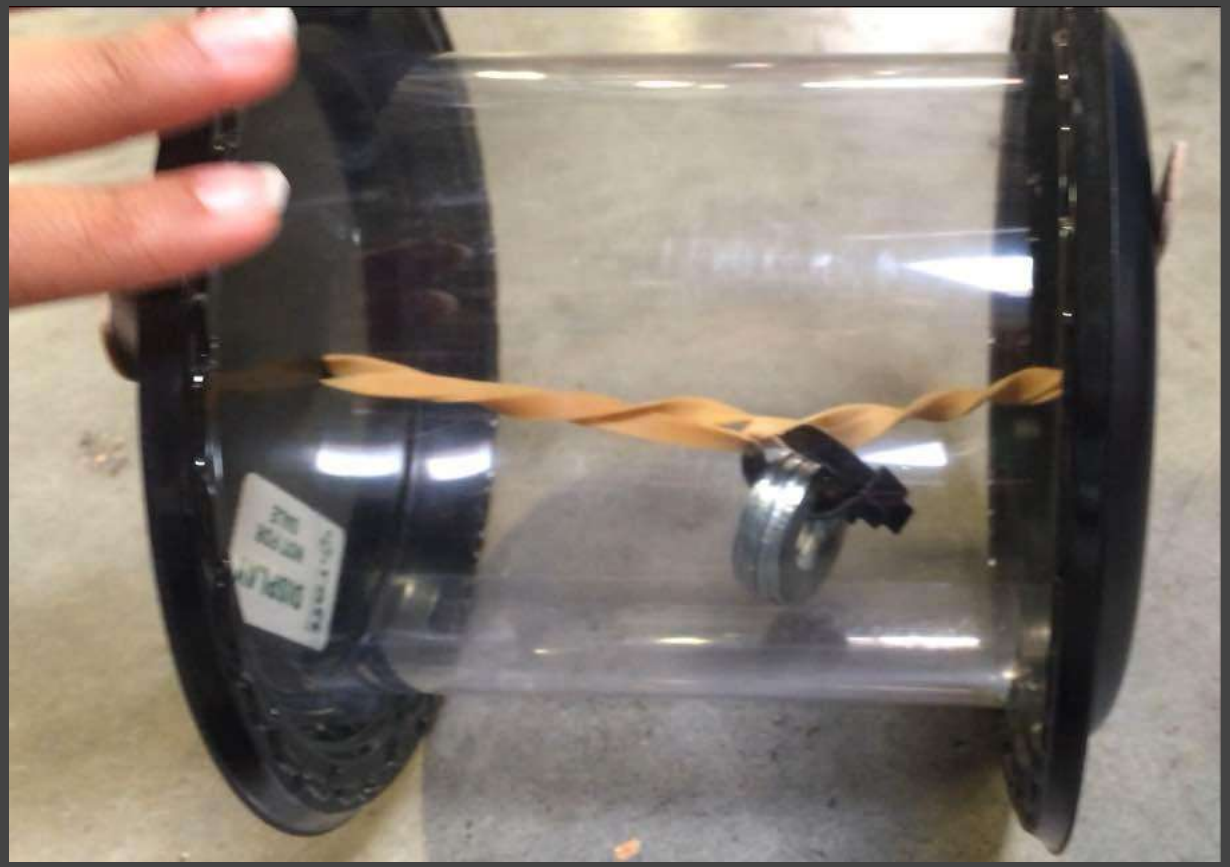
Alessia
Senior, STS


raft
esource area
for teaching
1355 Ridder Park Drive, San Jose CA 95131

RAFT Visit

“Bulk Bins”: Everything we could ask for, and more!

Existing Educational Kits



Rollaway Can

Close-ended activity

Statement of Problem

Problem: These Educational Design Kits need to be **accessible** to all children, both with and without disabilities, to engage them in learning, teamwork, and creative thinking.

Our Goal: Explore ideas for a kit that will engage children including those with moderate sight, mobility, or dexterity limitations and evaluate their effectiveness in a classroom setting.

Design Criteria Kits Must:

- **Promote learning, teamwork, and creative thinking**
- **Low cost and safe kits**
- **Appropriate for the intellectual and disability level of the students**
- Compact, easy to store, setup, explain, use, and ship
- Address at least two subject areas such as science, math, art, language, engineering, programming, etc.
- In the form of a toy, product, game, story, etc.
- Must include a comprehensive instruction guide and educational plan for teachers

Brainstorm: Over 40 ideas, narrowed down to 3

Project Brainstorm Ideas

1. Keep 5 marbles afloat
2. Pulleys: an interesting application to distribute weight to perform a set of tasks
3. use rings on binders to make music (attach components to rings, use plastic front or back covers
4. Make a bottle cork sink or ping pong ball without simply attaching it to something
5. **Create a surface that enables the square block to rotate on the ground smoothly**
6. **Make a game: have an overarching theme, and each level serves one stage of the overarching goal. For example, level 1: learn how light interacts with a CD, level 2: learn about reflection and refraction, level 3: illuminate this object in a box**
7. **Sundial with foam and lids**
8. Make a sailboat! Using a cork; sail;
9. Bubble wrap: Use plastic to recreate the protective attribute of bubble wrap - Mass transfer/collisions
10. **make a music box with the pipette boxes**
11. Make a ping-pong ball sink
12. **Find a way to recycle water (make a fountain) using the candy boxes and a straw/hollow device that will recirculate the water back up. Higher levels can talk about entropy**
13. Make an illusion, lights or sun reflection. Make something inside dark box use cds/light to view
14. Resistor jewelry
15. Destroy candy instead of eating it - water, or sun with magnifying glass, crush
16. Leverage to lift something heavy
17. Demonstrate gears by making them out of foam and having them wind up a string to lift something
18. make a volcano
19. make a film canister rocket
20. Memory game
21. Blindfold or cover hand - simulate empathy
22. Explore senses ie sense of touch with only using touch and not sight to explore bag of

Design Alternatives: Analysis

Idea	Learning, Teamwork, Creative Thinking	Design for Disability	2+ Academic Area	Form of Toy, Product, Story, Art, etc.	Low Cost and Safe	Easy to Store/Ship, Explain, Use	Instruction Guide/Plan	Cool Factor	Total Score
Bottle Cork & Buoyancy	3	4	5	3	3	1	2	2	23
Square Block Rolling	4	4	5	4	4	5	5	5	36
Light and CD Interacting	5	5	5	4	4	5	5	5	38
Sundial	4	5	5	4	5	3	5	4	35
Pipette Music Box	3	3	3	5	5	3	4	5	31
Recycled Water	3	3	4	4	3	1	4	2	24
Foam Gears	2	3	5	3	1	2	5	3	24
Film Canister Rocket	2	4	3	4	3	5	4	5	30
Rotating Disk Illusion	2	2	3	5	5	2	4	5	28
Water Refraction Game	3	3	5	4	3	1	5	4	28

Description & Visualization of Top Selected Designs

Prototype 1: Make Square Wheels Roll

Prototype 2: Interaction of Light with CD

Prototype 3: Sundial

Prototype 1: Make Square Wheels Roll

Design

- Promotes
  - Teamwork, Brainstorming, Rapid Prototyping
- Teaches
  - Science and Mathematics
- Teaching Plan Includes
  - Recognizing and creating patterns
- Cost
  - Low cost “Bulk Bin” items: bottle corks, plastic sheet

Prototype 2: Interaction of Light with CD

Design

- Promotes
  - Learning, Teamwork, and Creative Thinking
- Teaches
  - Art and Science
- Teaching Plan Includes
  - Relationship between light and reflectic
  - Scientific Method
  - Design
- Cost
  - Low cost “Bulk Bin” items: Three CDs, 1 CD case, a small pencil, etc.

Prototype 3: Sundial

Design

- Promotes
  - Learning, Teamwork, and Creative Thinking
- Teaches
  - Math, Art, Science, History, and Engineering
- Teaching Plan Includes
  - Relationship between Sun and Earth
  - Interpolation
  - History of Timekeeping
  - Design
- Cost
  - Low cost “Bulk Bin” items: bottle lids, corks, CD holder, paper

Design for Physical Disabilities

- Missing an Upper Extremity
  - Activities can be completed with one hand
  - Sundial can be constructed with elbows only
- Limited Motor Control
  - Can push pieces into place
  - No fine motion is required
  - Square wheel can be modified to include handles
- Limited Physical Strength
  - Material are lightweight
  - Does not require force

Insights from Interview

Interviewee: Eve Sutton
Classroom teacher, individual consultant

Prototype 1:

- Non-round wheels aren't a real-world application.
- BUT scope for collaboration, learning design concepts

Prototype 2:

- RAFT provides similar activities involving splitting sunlight, and sells inexpensive prisms.
- Could specialize by focusing on why a CD creates rainbows

Prototype 3

- Remember: Classrooms have multiple overhead lights
- Needs additional markers to make a more detailed sundial
- Should give the students a tangible goal.

Future Work & Challenges

- Week 6 (This Week)
  - Choose 1 idea to move forward with
  - Finish midterm report
- Week 7
  - Refine prototype
  - Flesh out educational concepts
  - Complete an additional interview - Challenge
- Week 8
  - Craft a comprehensive instruction guide for teachers
  - Ensure applicability to multiple age groups and levels of disability - Challenge
  - Interview additional stakeholders (teachers, parents, or students) - Challenge
- Week 9
  - Incorporate Stakeholder Interview Feedback
  - Work on Final Report
  - Prepare Demonstration
- Week 10
  - Complete Final Report

Questions?

Works Cited

- Interview with Eve Sutton
- http://westmichiganconference.org/news/detail/3325
- http://bestdesk.co.uk/height-adjustable-desk-disabled-children/