Stories and Recipes: Sharing Design Process

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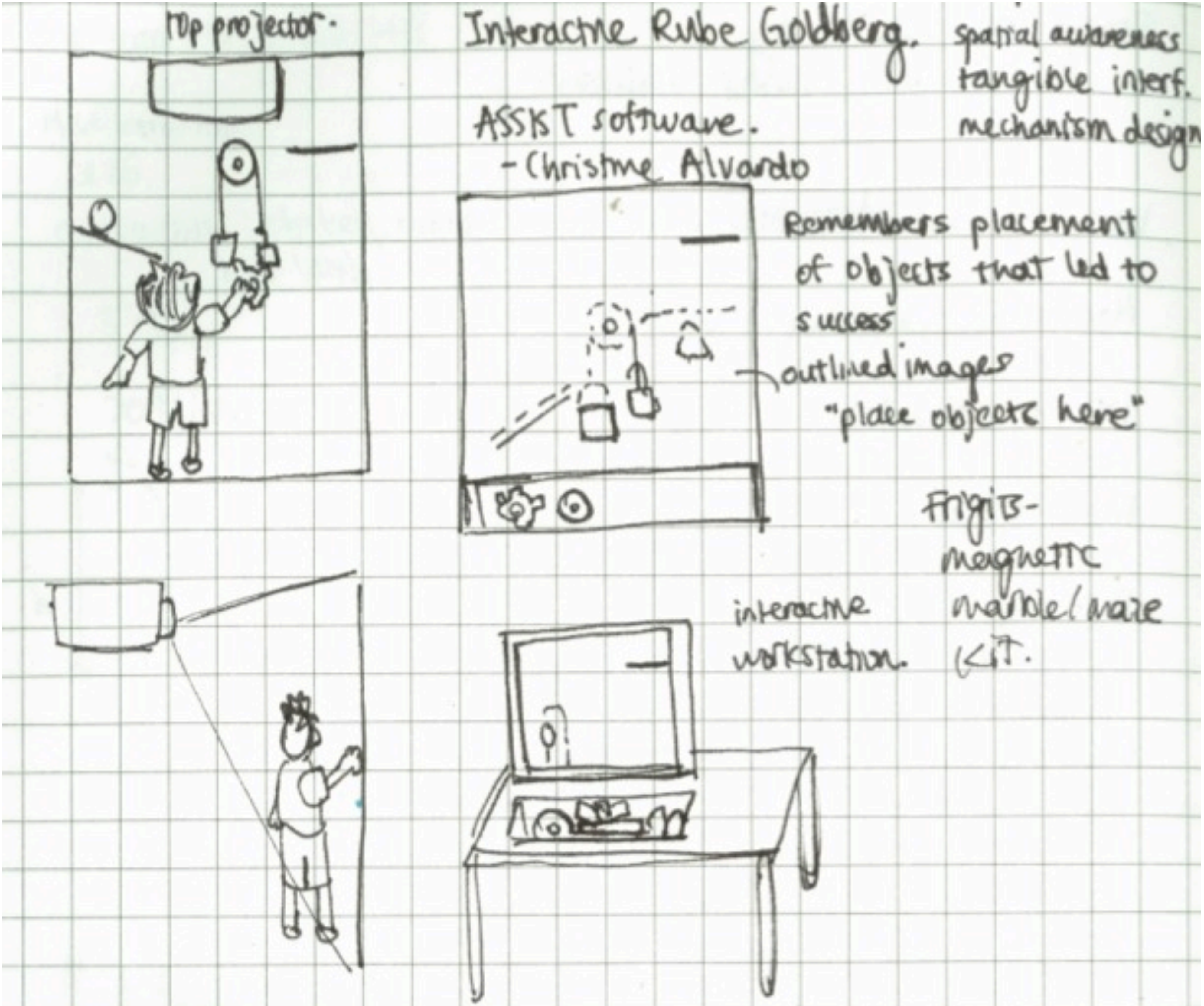
MIT Media Lab
Sketching 2013



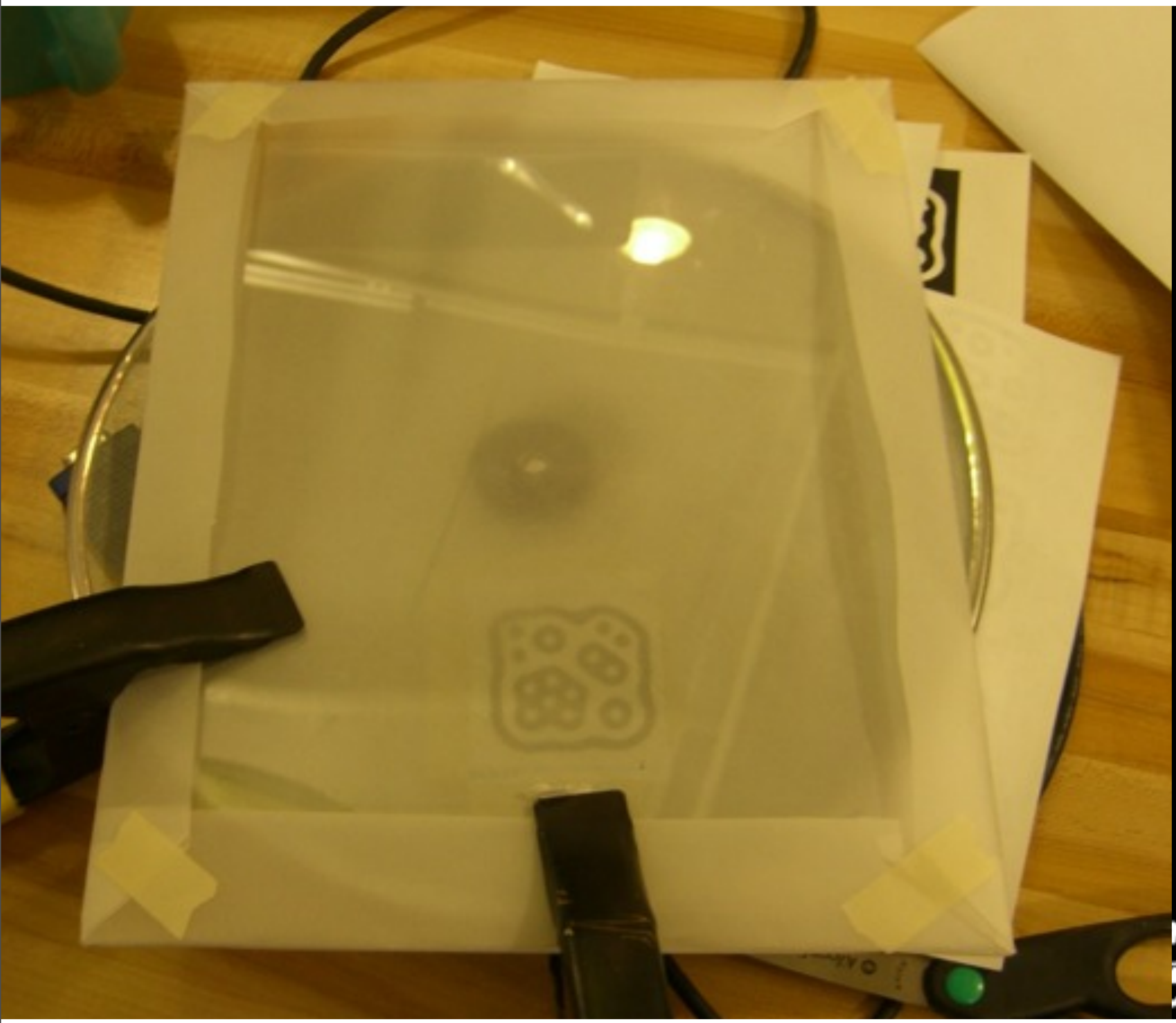
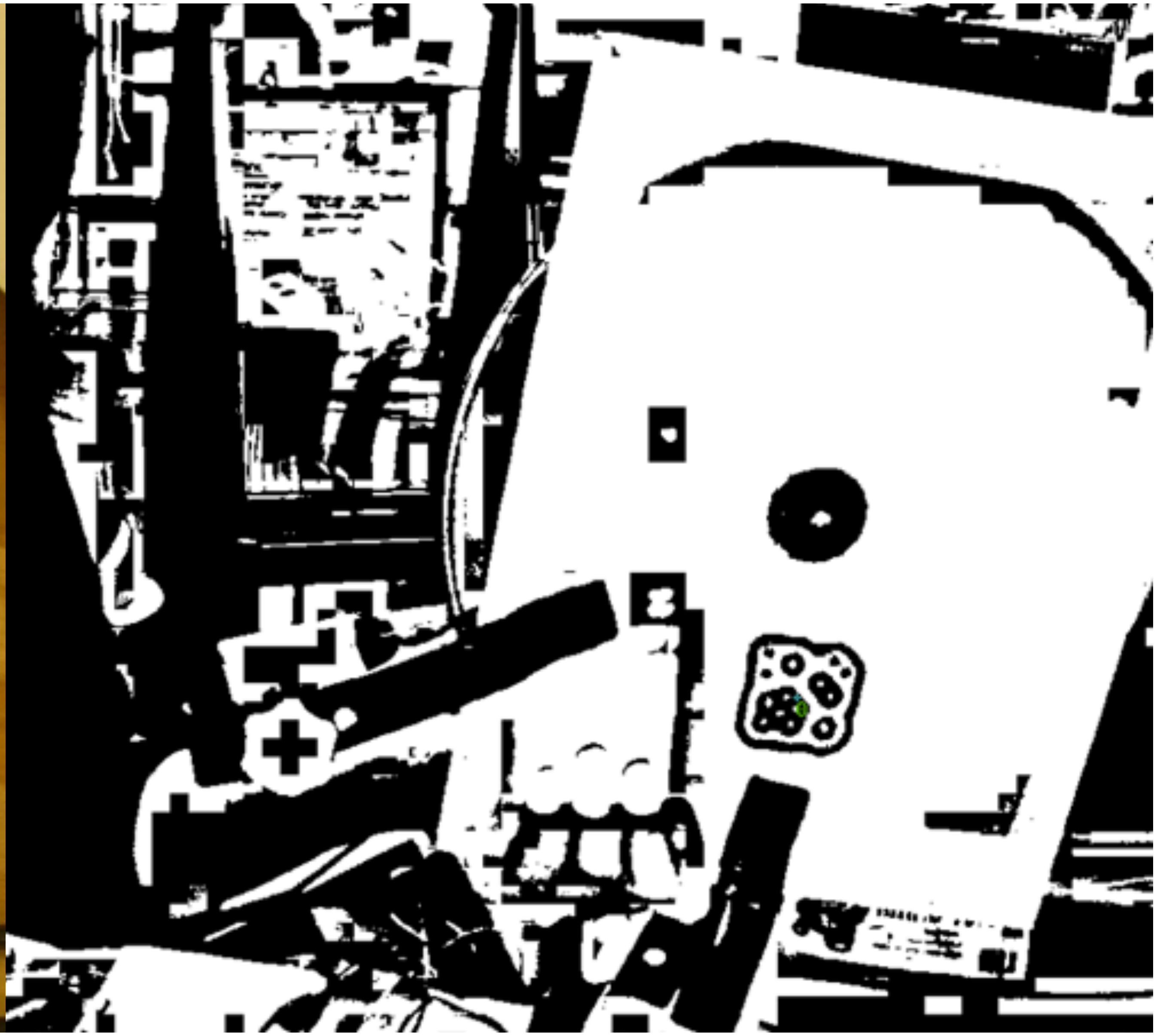
top projector.
Interactive Rube Goldberg.
spatial awareness
tangible interf.
mechanism design
ASSIST software.
- Christine Alvarado
Remembers placement of objects that led to success
outlined images
"place objects here"
Frigits-
magnetic
marble/maze
kit.
interactive
workstation.

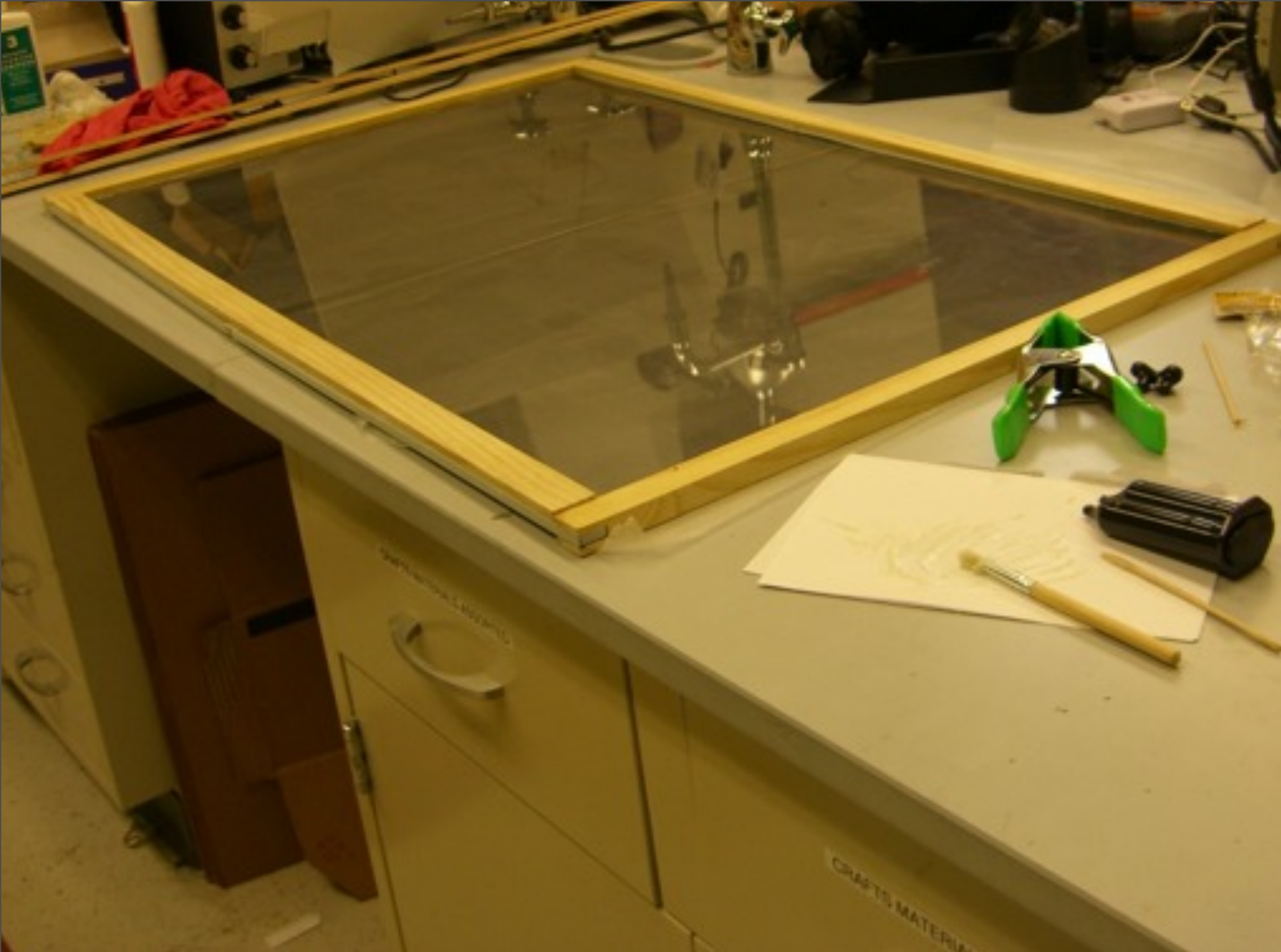
Requirements

vertically hold objects

clear (for image recognition from rear)

but not too clear (for rear projection)

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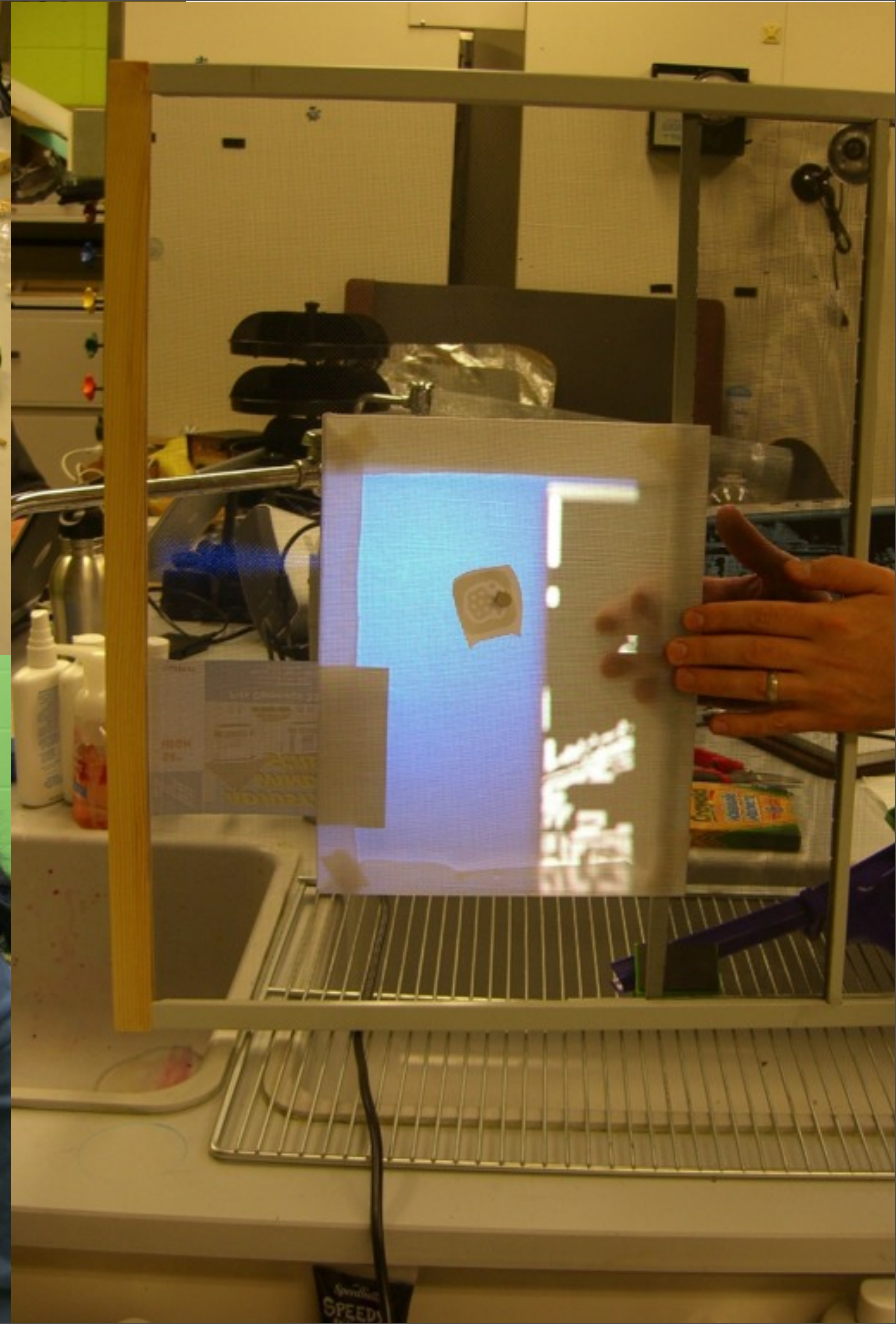
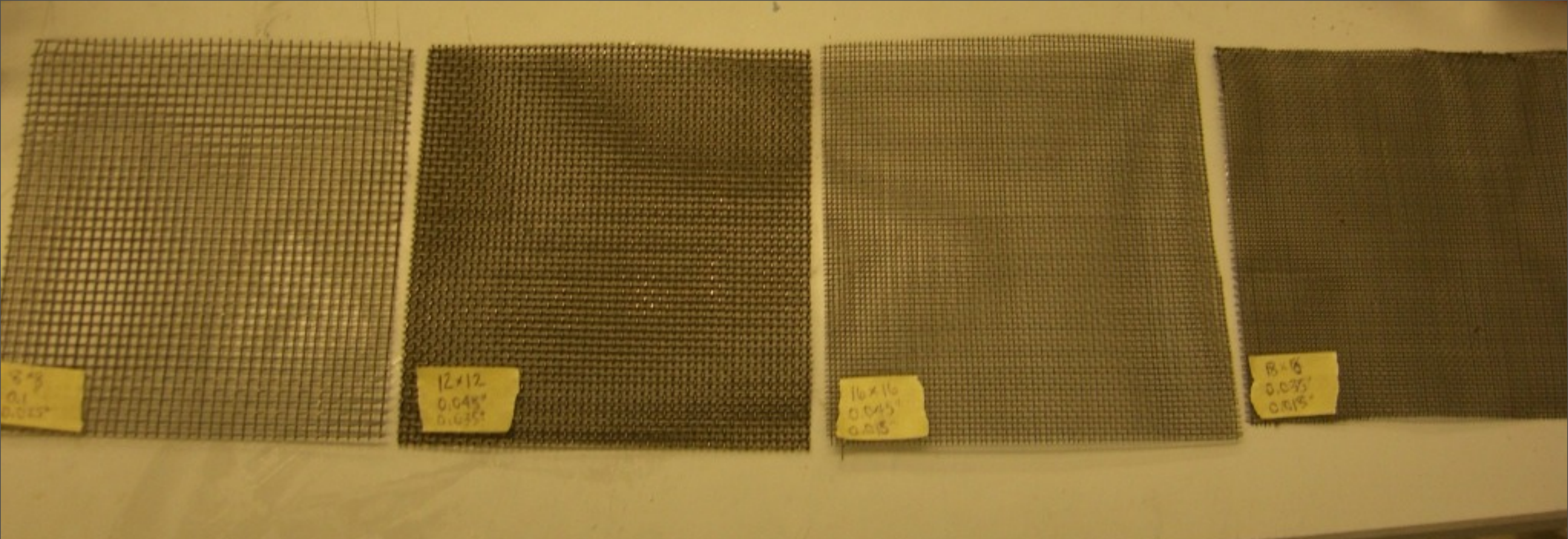



12×12
0.045"
0.035"
16×16
0.045"
18×18

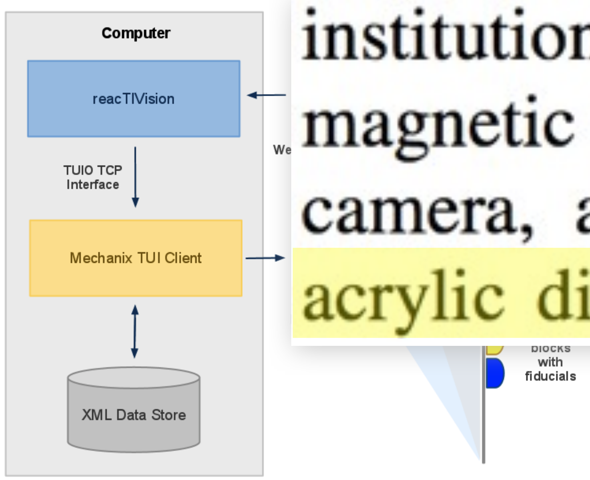

Challenge
save

support for larger groups, as they allow users to share a common viewpoint [33]. Furthermore, vertical surfaces enable interactions influenced by the force of gravity, which is not possible with horizontal displays. Techniques for vertically-oriented interactive surfaces include resistive touch screens (e.g. SMART board [35]), infrared and ultrasonic sensors, computer imaging (e.g. Collaborage [24]), and RFID tags (e.g. Senseboard [20]). Similar to tabletop surfaces, many of these implementations require significant, specialized hardware for each tangible piece.

Prior work indicates the potential for a low-cost, interactive display for young children to explore physics concepts through a gravity-based tangible interface. Furthermore, there are opportunities to incorporate example-based learning using an automated documentation system.

4. MECHANIX

Mechanix is a system for children to build, test, explore, and share engineering systems designs. With Mechanix, children combine and configure tangible simple machines on a vertical magnetic display to guide a physical marble between two points. Successful designs may be saved into a library of user-generated examples which can be accessed by subsequent children seeking assistance or inspiration in their own design process [37].



institutions. Mechanix is instrumented with a set of acrylic tangible magnetic components, a low-cost LED projector, a standard web camera, a laptop computer, and an inexpensive wire-mesh and acrylic display. Each simple machine component is marked by

Figure 2: Mechanix system overview

With Mechanix, we were deliberate in designing a low-cost system that would be readily accessible to most educational institutions. Mechanix is instrumented with a set of acrylic tangible magnetic components, a low-cost LED projector, a standard web camera, a laptop computer, and an inexpensive wire-mesh and acrylic display. Each simple machine component is marked by a unique fiducial image, allowing its location and orientation to be recorded via ReacTIVision, an open-source image recognition engine [21]. A custom Java-based client was developed to process the ReacTIVision events, manage the library of user-generated content in an XML data store, and project the interactive visual content onto the screen. This constitutes significantly fewer resources than analogous museum-based exhibits employing large and costly touch surfaces [19].

4.1 Interaction Design

Mechanix was designed to simultaneously support exploration of simple machines components in a gravity-based system, multiuser collaboration, seamless recording of user designs, and unobstructed projection of virtual content. This combination of design considerations necessitated the development of a novel interactive display for the Mechanix system.

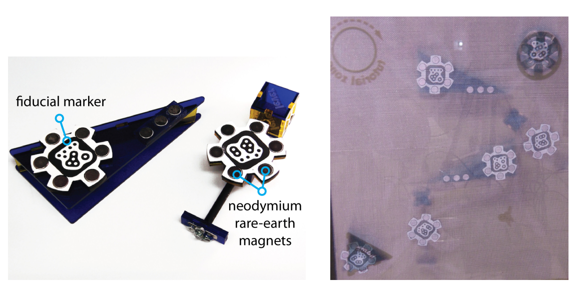
4.1.1 Interactive Display

The Mechanix interactive display is a large (2' x 3') vertical, semi-transparent, magnetic surface composed of steel mesh, projection paper, and clear acrylic. Its large size and vertical orientation is intended to facilitate synchronous collaboration and co-construction among multiple users. The steel mesh allows for the magnetic front-attachment of simple machine components in a system utilizing gravity while providing sufficient transparency to perform image tracking and project visual content from behind the surface. This arrangement allows children to interact with the system without disrupting the underlying image recognition and projection of virtual content.

4.1.2 Tangible Components

The Mechanix tangible toolkit consists of two types of tangibles: simple machines and command pieces.

The available simple machines include inclined planes, levers, wheel & axles, and a home piece (Figure 3a). The center of gravity of the lever can be altered by adjusting a configurable set of weights on its base, which changes the direction of rotation. Each piece is labeled with its name etched clearly on the front. Command pieces are used to access play modes, save designs, and view the designs of others (Figure 3b). Challenges and designs are revealed by rotating the appropriate command piece on the display and are selected by removing the command piece from the surface.



(a) Fiducial markers (b) Rear view of display

Figure 4: Fiducial markers on components

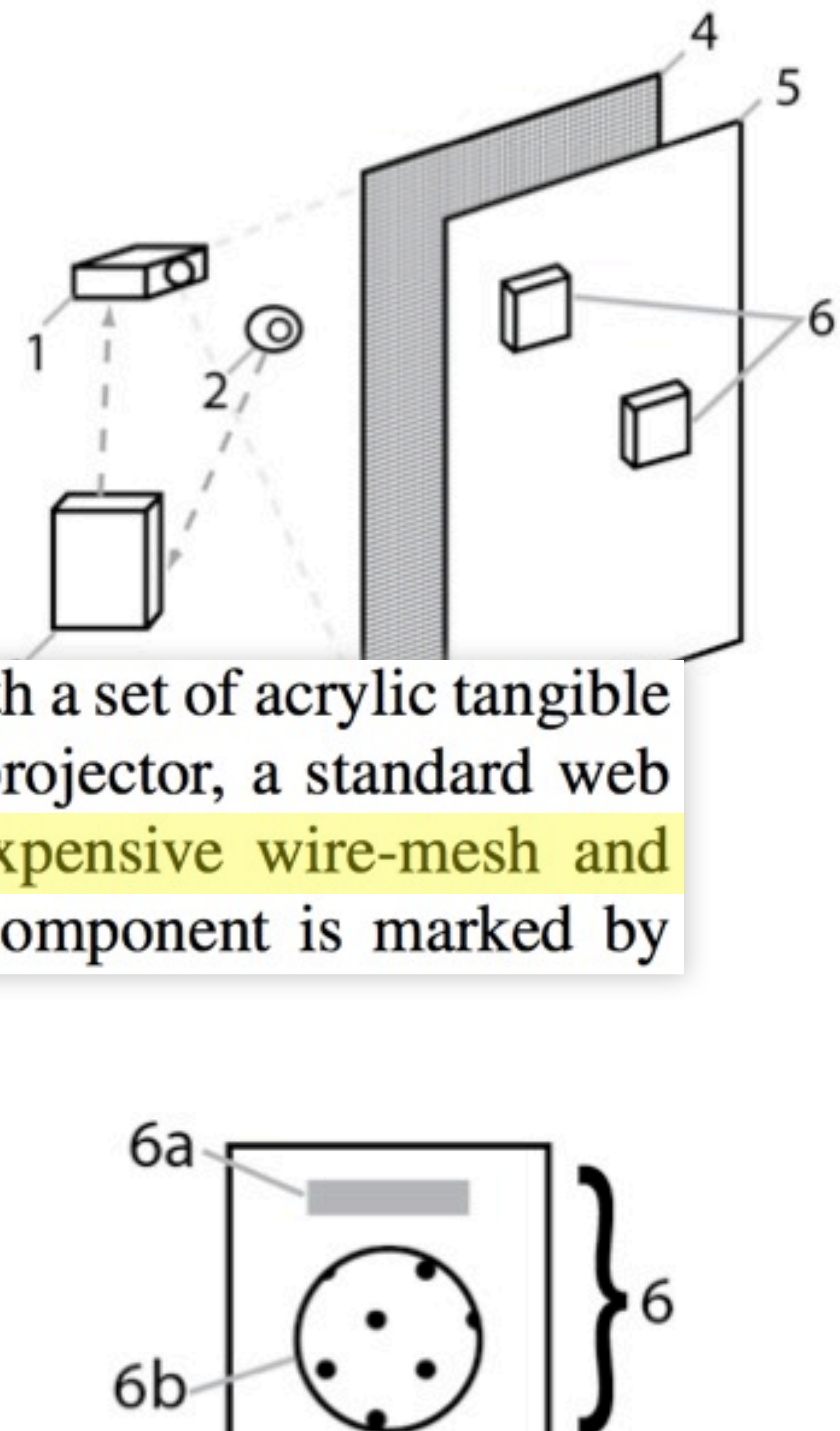


FIGURE 2

1.2 Display Setup

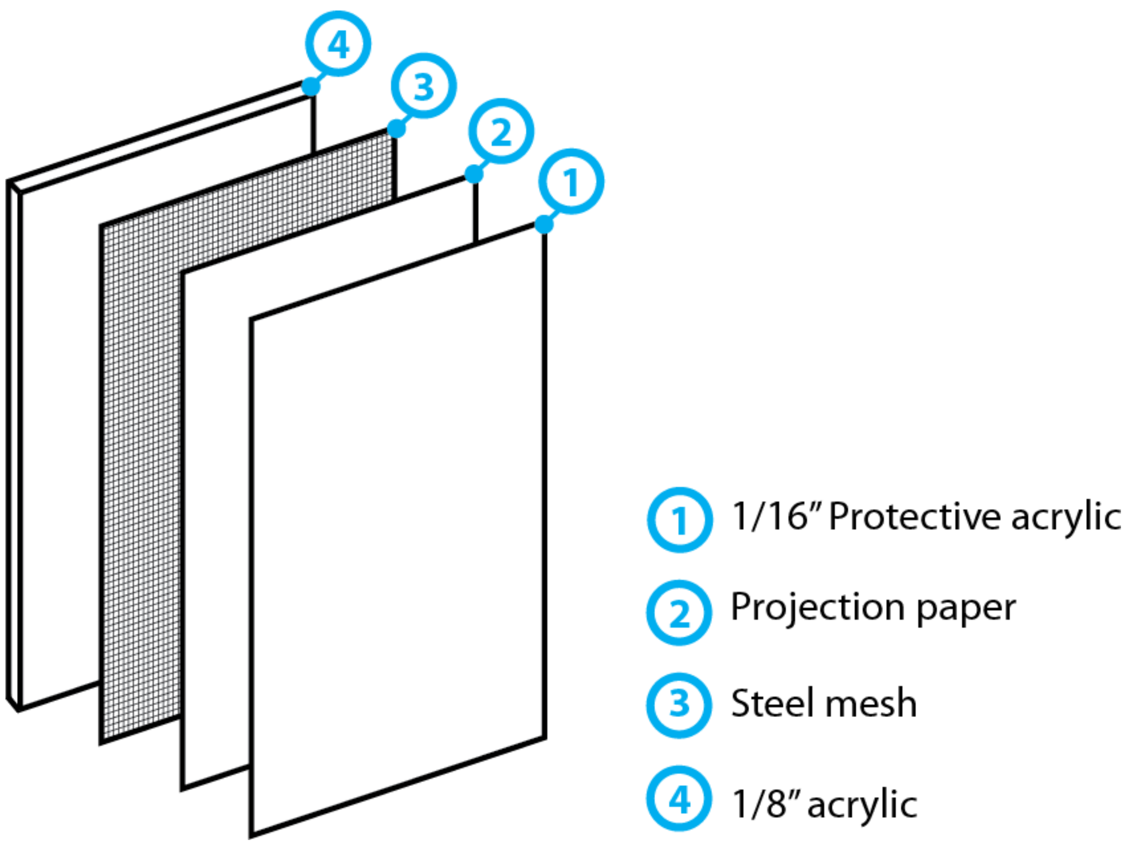
The SLATE interactive display provides a semi-transparent magnetic surface that simultaneously supports:

- attaching and arranging the magnetic tangible toolkit components
- rear projection of the SLATE visual content
- rear camera recording of the placement and movement of the tangible toolkit components.

The following materials comprise the display:

- 3’ x 2’ x ⅛”-thick clear acrylic (Tap Plastics or McMaster)
- 3’ x 2’ steel mesh (McMaster P/N 9641T231)
- 3’ x 2’ tracing paper (purchased in rolls)
- (Optional) 3 ’x 2’ x 1/16”-thick clear acrylic as a protective coating (Tap Plastics or McMaster)

The display should be assembled in the following order (from the back surface to the front):



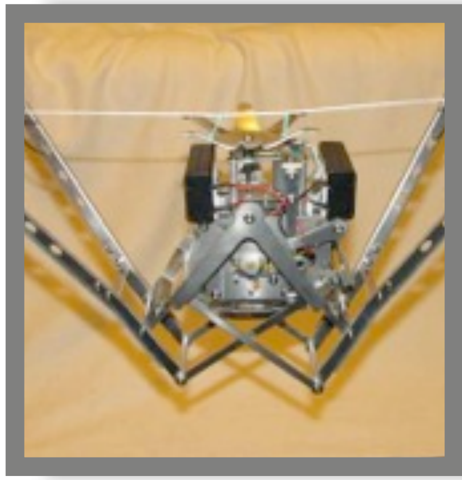
You can apply some tape to the edges of the display to temporarily hold the pieces together.

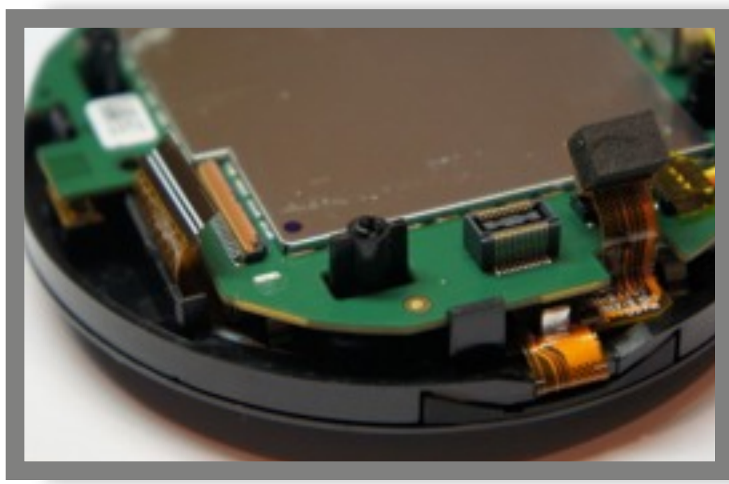
Why it matters

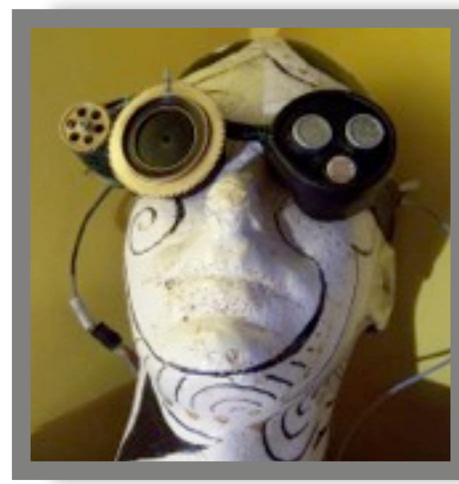
our stories + inspiration can be lost

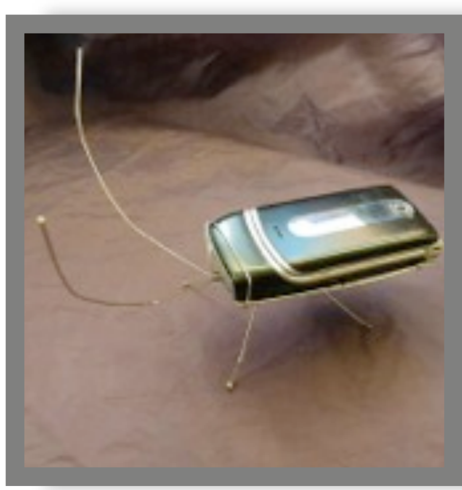
misleading representation of our design process

only really useful for (close) replication









Interviews

7 Makers

Instructables User Survey

This survey is part of a research study on the use of online project documentation, particularly use of the Instructables site. If you have any questions, please email ttseng@mit.edu.

* Required

How often do you use the Instructables site? *

- ○ Multiple times a day
- ○ Once a day
- ○ Multiple times a week
- ○ Once a week
- ○ Multiple times a month
- ○ Once a month

Which categories of Instructables projects have you looked at? *

- ☐ Food
- ☐ Living
- ☐ Outside
- ☐ Play
- ☐ Technology
- ☐ Workshop

Have you ever recreated an Instructable? *

- ○ Yes
- ○ No

If so, can you describe your process?

Did you change any steps? Was any information missing from the Instructable that made it hard for you to recreate it? Did you personalize your project?

Have you ever applied part of an Instructable to one of your projects? *

Example: Looking at an Instructable to learn how to solder and applying tips from the Instructable to your own project.

- ◉ Yes
- ○ No

If so, can you describe what you used and how you applied it?

Survey

230 respondents

Findings

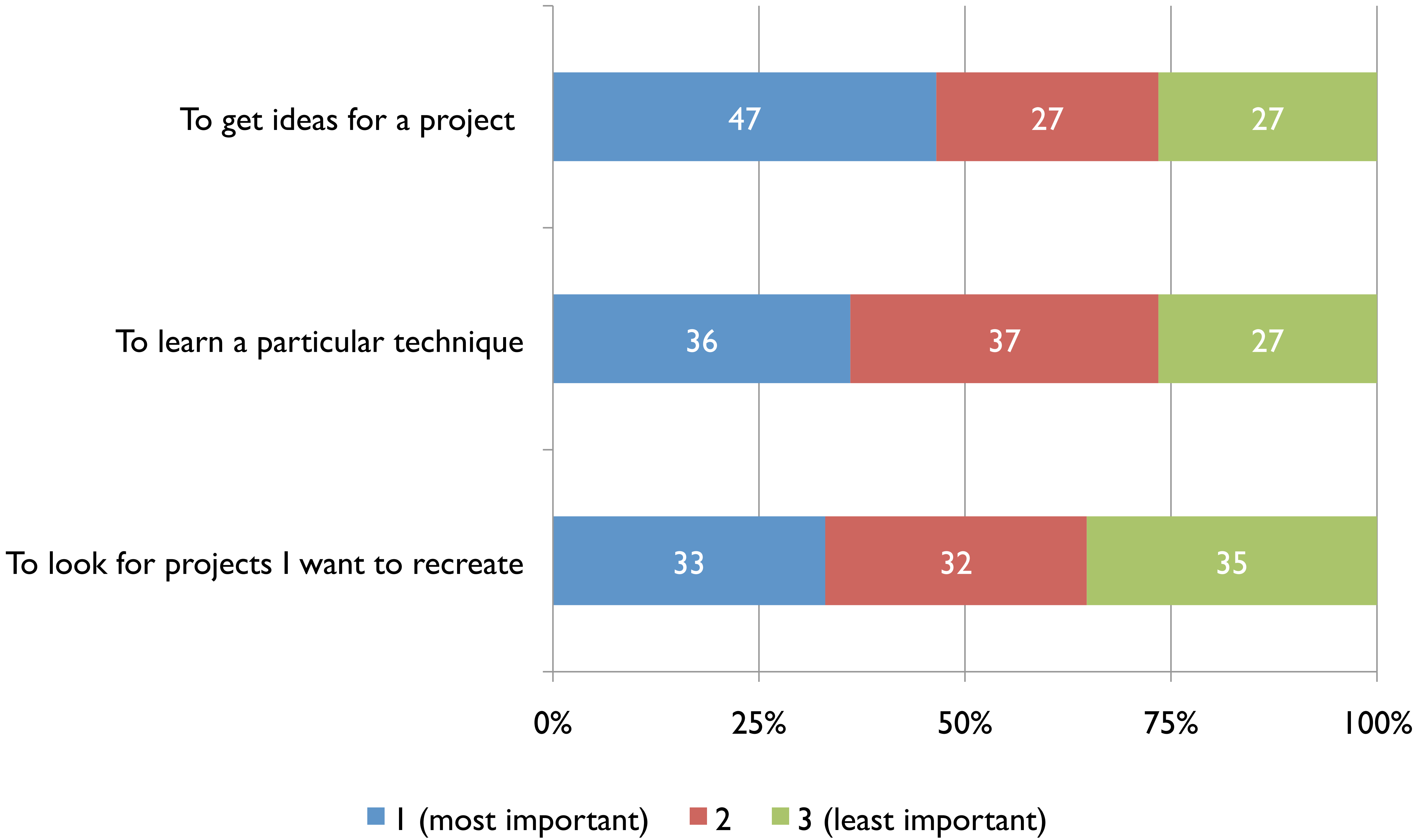
Please rank, in order of importance, the reasons why you look at Instructables. *

1: Most important, 3: Least important

	1	2	3
To look for projects I want to recreate	○	○	○
To learn a particular technique	○	○	○
To get ideas for projects	○	○	○

Any other reasons you use Instructables?

Please rank, in order of importance, the reasons why you look at Instructables.



Personalization

“I do try to change steps or personalize my project, since that's the fun part. Just replicating seems a little pointless / boring.”

Modification

“‘I usually do not have all the materials or tools required, so I have to improvise on the steps that require [these] things. Sometimes this works out... interestingly. But it also adds some personal touch."

Modification

"I modified the original post so it was cheaper and not unnecessarily complicated."

Readers...

Aren’t necessarily looking to replicate projects

Personalize, substitute, and optimize

Don’t have good ways to sharing these design changes

Authoring Practices

Recipes

Stories

Authoring Practices

Recipes

"When I make the Instructable, it's the one goal of you making the thing. So I don't want to cloud it with too many words or too much information"

Authoring Practices

Recipes

"It's always been about ... how do I get from point A to point B ignoring all the ways that I could not get from point A to point B."

Authoring Practices

"If you explain where you went wrong, it saves them [readers] from going down the wrong path."

Stories

Authoring Practices

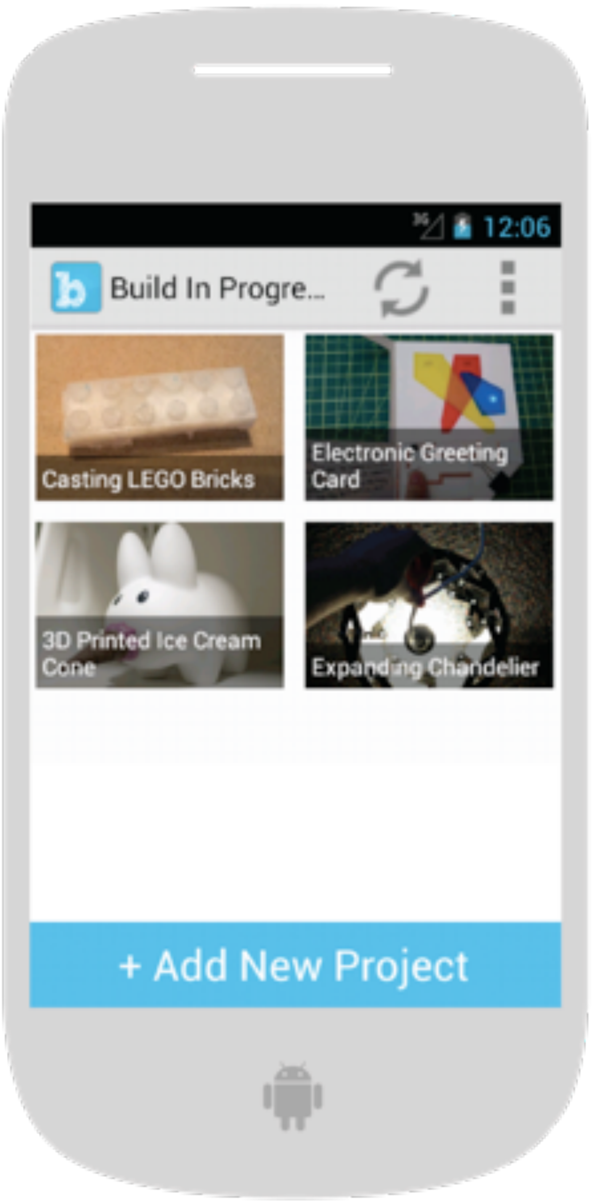
"So many people think it's like magic from on high; I had this idea and I made it and it's brilliant and there was no struggle. And that's not really accurate."

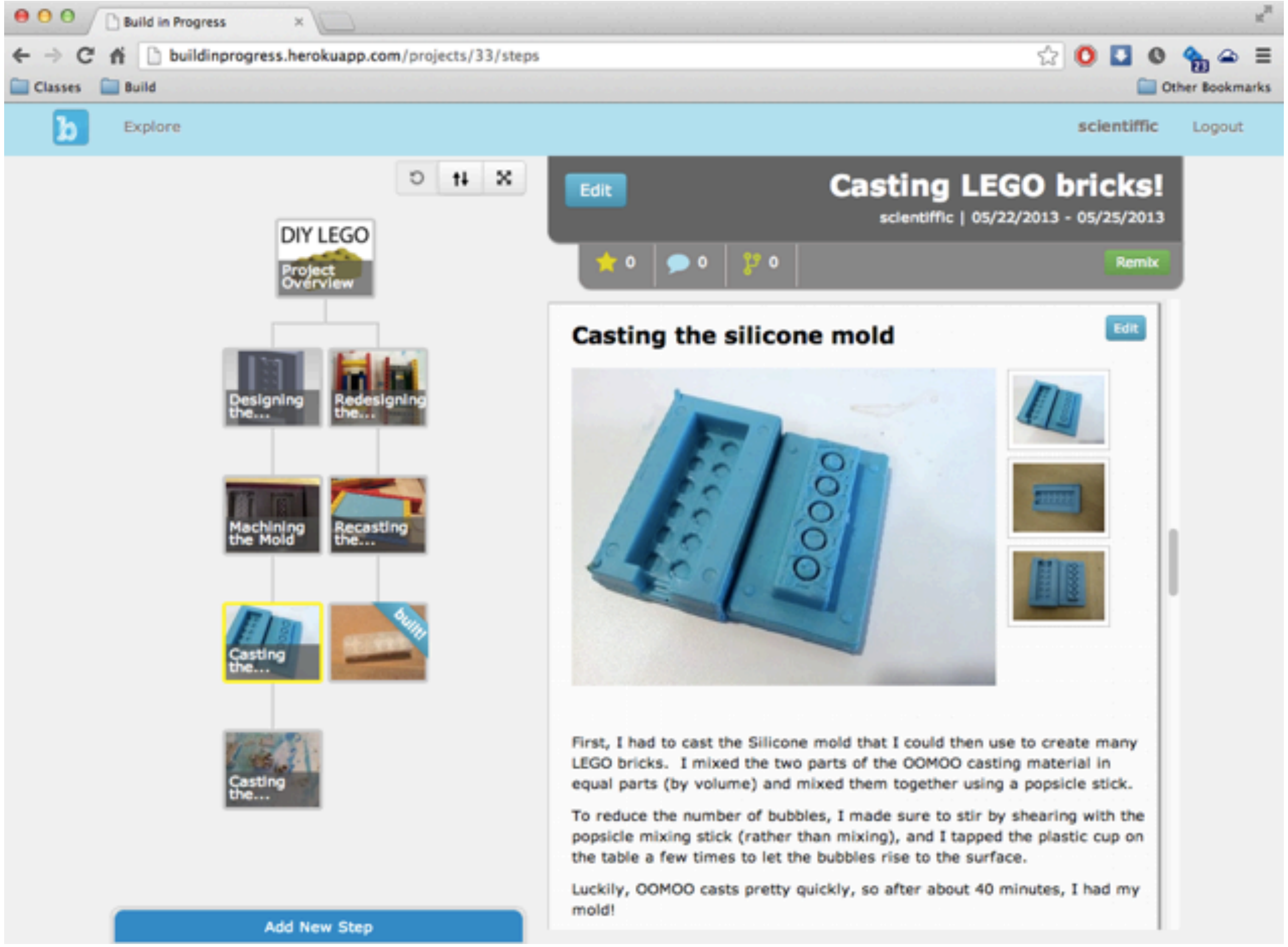
Stories

Story-based documentation

New tools for contributing remixes and alternative design approaches

Build in Progress





Build in Progress

Remix

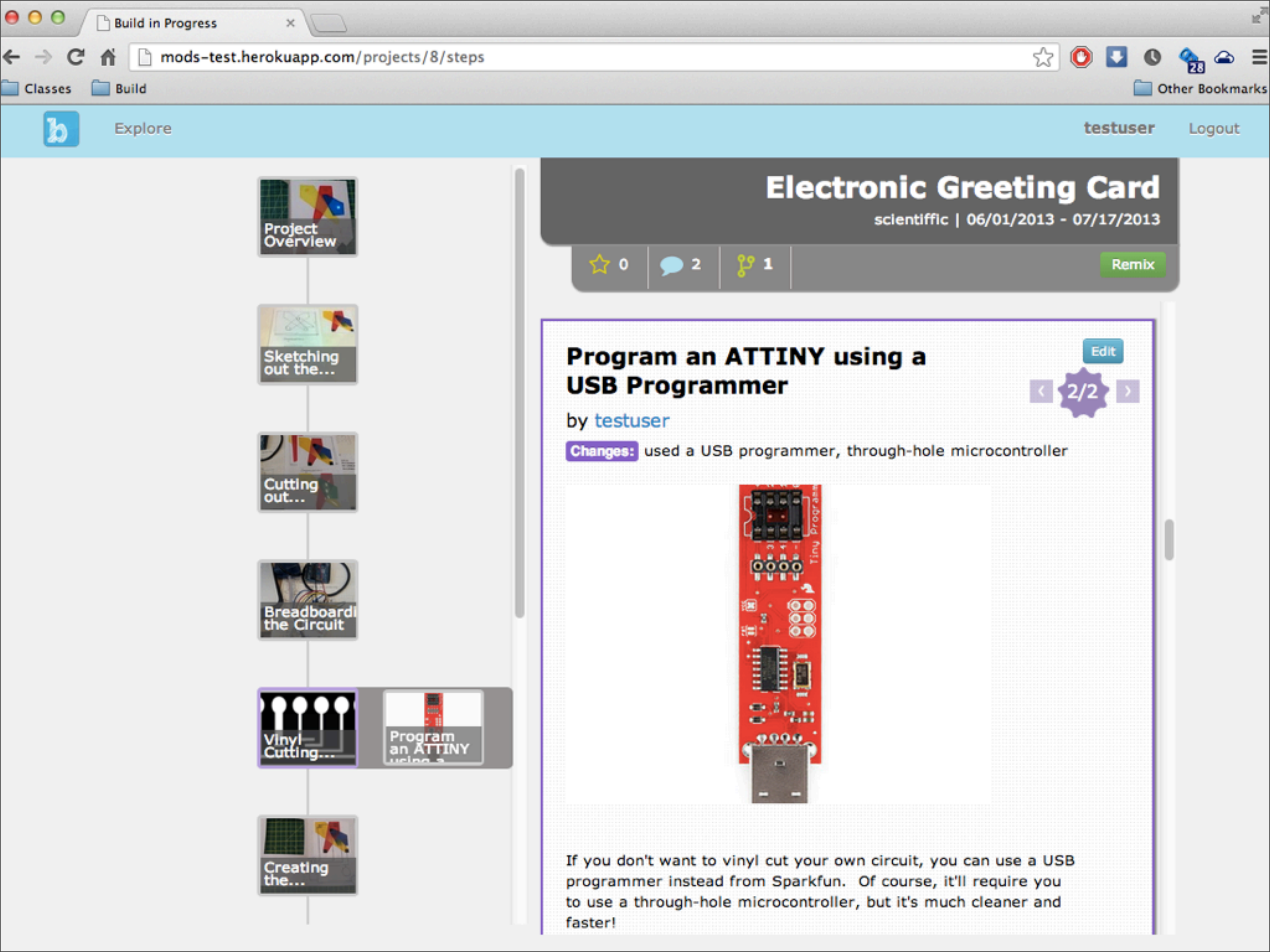
Taking inspiration from an existing project and making it your own

Remixes

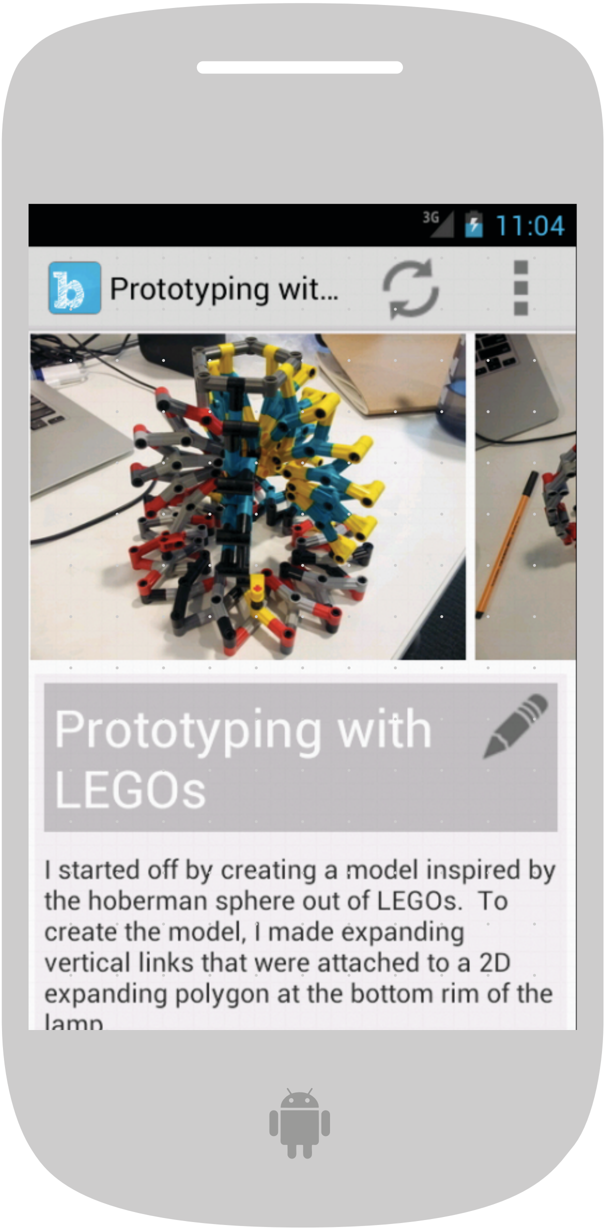
Mod

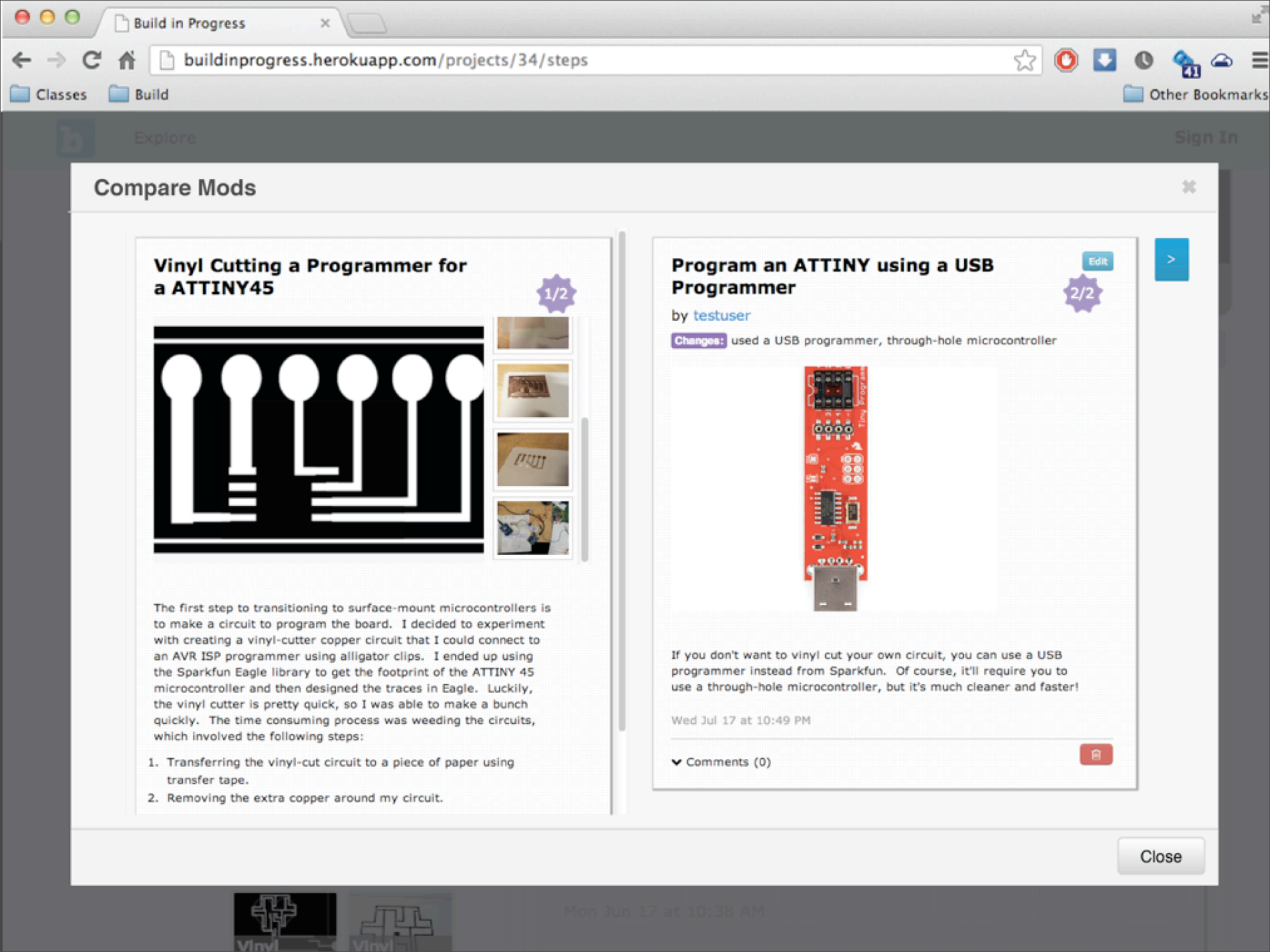
Adding an alternative technique to an existing project

Mods


Build in Progress
mods-test.herokuapp.com/projects/8/steps
Classes
Build
Other Bookmarks
Explore
testuser
Logout
Project Overview
Sketching out the...
Cutting out...
Breadboarding the Circuit
Vinyl Cutting...
Program an ATTINY using a...
Creating the...
Electronic Greeting Card
scientiffic | 06/01/2013 - 07/17/2013
0
2
1
Remix
Program an ATTINY using a USB Programmer
Edit
2/2
by testuser
Changes: used a USB programmer, through-hole microcontroller
Tiny Programmer
If you don't want to vinyl cut your own circuit, you can use a USB programmer instead from Sparkfun. Of course, it'll require you to use a through-hole microcontroller, but it's much cleaner and faster!

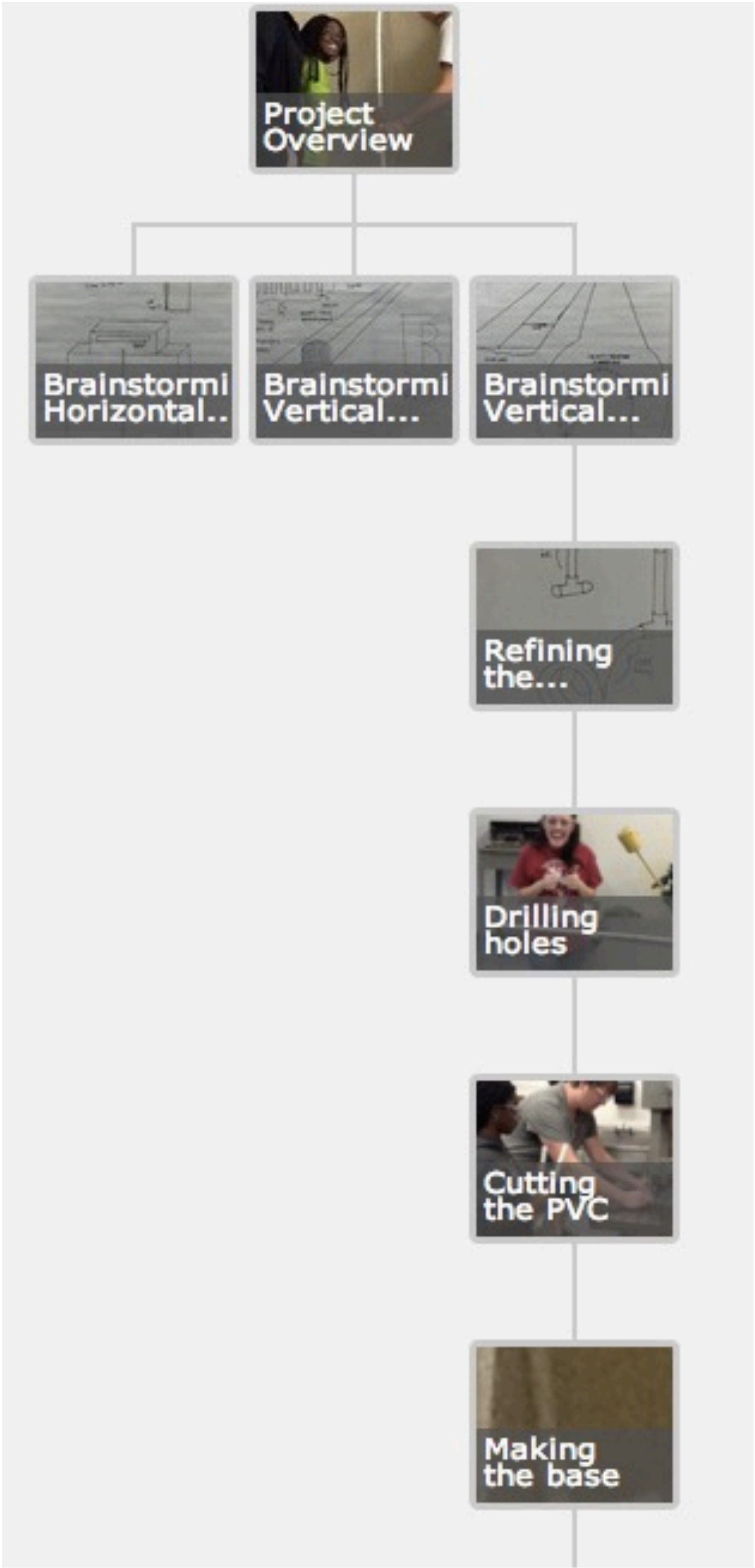
Next Steps


3G
11:04
Prototyping wit...
Prototyping with LEGOs
I started off by creating a model inspired by the hoberman sphere out of LEGOs. To create the model, I made expanding vertical links that were attached to a 2D expanding polygon at the bottom rim of the lamp.

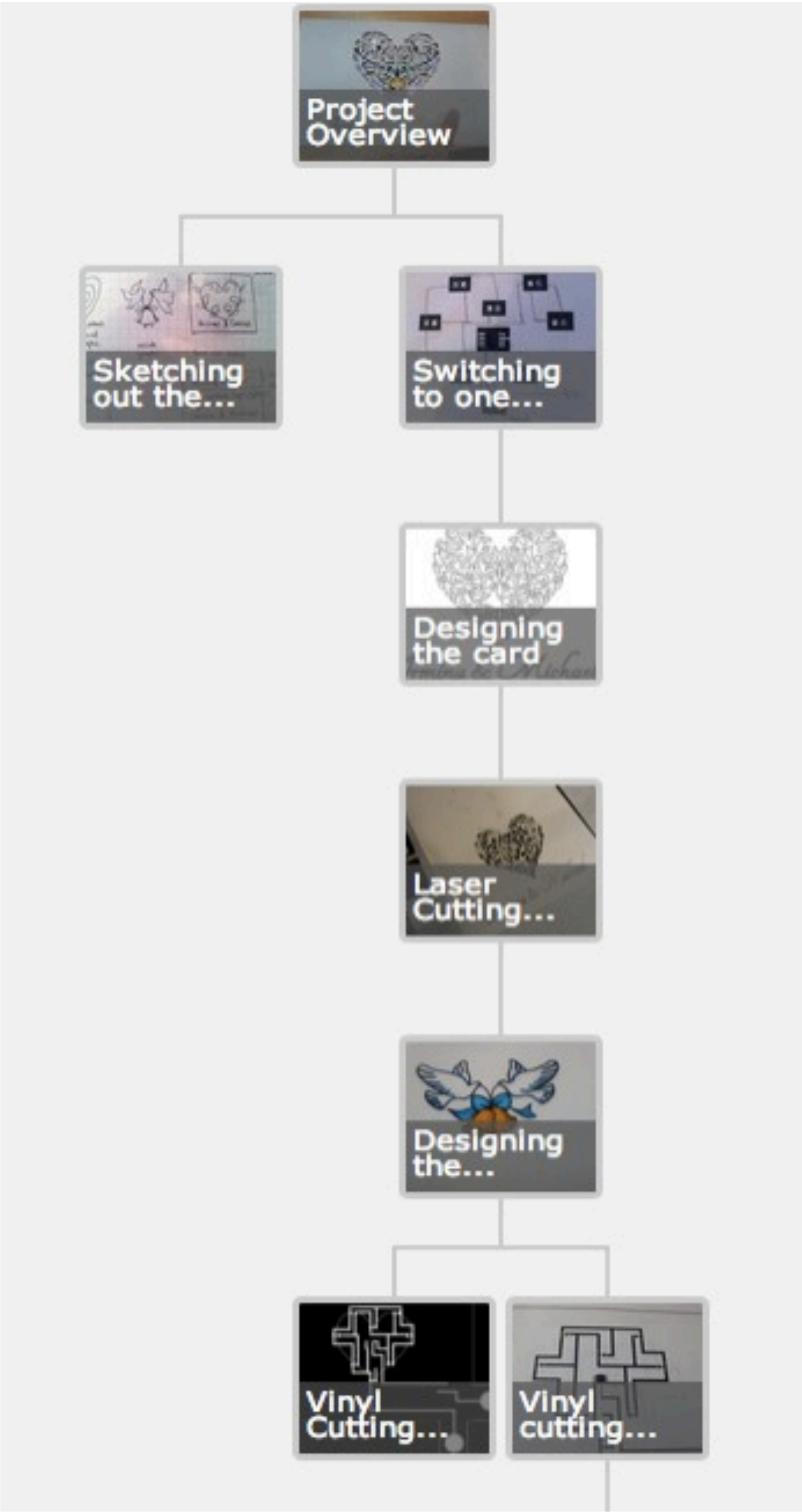


Build in Progress
buildinprogress.herokuapp.com/projects/34/steps
Classes
Build
Other Bookmarks
Compare Mods
Vinyl Cutting a Programmer for a ATTINY45
1/2
The first step to transitioning to surface-mount microcontrollers is to make a circuit to program the board. I decided to experiment with creating a vinyl-cutter copper circuit that I could connect to an AVR ISP programmer using alligator clips. I ended up using the Sparkfun Eagle library to get the footprint of the ATTINY 45 microcontroller and then designed the traces in Eagle. Luckily, the vinyl cutter is pretty quick, so I was able to make a bunch quickly. The time consuming process was weeding the circuits, which involved the following steps:
1. Transferring the vinyl-cut circuit to a piece of paper using transfer tape.
2. Removing the extra copper around my circuit.
Program an ATTINY using a USB Programmer
Edit
2/2
by testuser
Changes: used a USB programmer, through-hole microcontroller
If you don't want to vinyl cut your own circuit, you can use a USB programmer instead from Sparkfun. Of course, it'll require you to use a through-hole microcontroller, but it's much cleaner and faster!
Wed Jul 17 at 10:49 PM
Comments (0)
>
Close

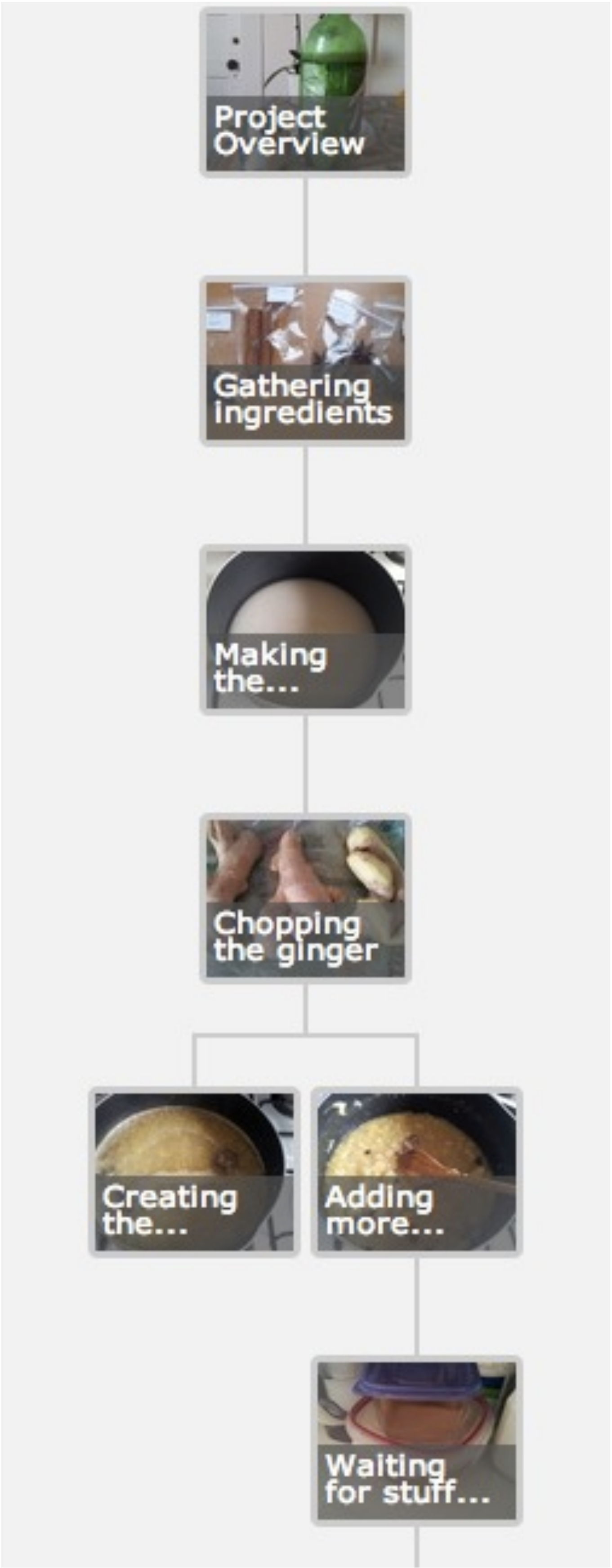
Lane Assistance for Visually Impaired Swimmers



Electronic Wedding Card



Homemade Ginger Ale



thanks!