

Cranky Box session outline for E4 Conference, November 2013
Jane Snell Copes, Science Outside the Box

What we're doing this morning

intro: get the playshop up and running
What does it mean to help? to ask for help? Why are mistakes important?
Quickest directions - white sheet
We'll try to show some videos from the blue Biblio/Webography sheet.
Clean up AT 10:25 AM EVERYONE stops, EVERYONE helps clean up.
How can this work in your setting? What needs to be different? How are your work
and learning habits similar to and different from those of your students?
Show off TAKE PICTURES!
Take what you make plus extra stuff

What is a Cranky Box? Why is it fun? What can it teach?

START here <http://tinkering.exploratorium.edu/cardboard-automata/> , but see
more complete reference list on blue sheet.
Simple machines: lever, wheel & axle, belts/pulleys, cams, linkages
It's art AND science AND engineering AND story telling
What makes things work?

Start With the Stuff

materials: frames, axles, rods, bushings, cams, handles, decorations
saving vs. buying (Ax-Man, Art Scraps, craft supply sources)
tools (below)

What's Your Story?

poem to illustrate
quotation about books, cats, earmuffs, etc.
school topic
make a box, tell/write your story, write your author bio

Mechanism Madness

tool safety
basic mechanisms
What needs to move easily? What fixed firmly?
trouble-shooting

More ideas

Make a **closed box** Cranky Box and ask what makes it work.
Put cranks on both sides → connected automata
Edible Automata! Add sound
Add electric circuit Make it from wood
Make it smaller, bigger People Machine

Table Directions for Cranky Box Playshop at E4 Conference, 18 Nov 2013

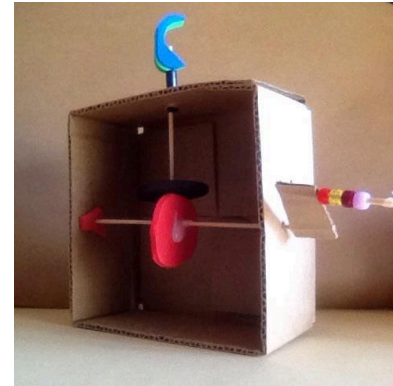
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Your goal: make and take two automata with different frames
and different motions

Best picture directions:

<http://tinkering.exploratorium.edu/cardboard-automata/>

Click on Try It! at the bottom of the page to download directions.



- **Choose a frame**
 - paper milk/juice carton
 - corrugated cardboard half-box
 - white gift box
 - tissue box
 - miscellaneous boxes and food containers

- **Think about your story**
 - There's no crying in baseball
 - Open a book, you fall in
 - When Pigs Fly!
 - An idea from a poem or song
 - A character from a book, myth, folk tale
 - A favorite animal or plant
 - An abstract decoration

- **Pick your motion—see examples to help you choose**
 - Spin + up/down
 - Up/down
 - Wagging (2-way spinning)
 - Just spin (easiest, but not very interesting)
 - Two jumper rods from one drive axle
 - Wire drive mechanism (a good bit harder; look here, and try florist's wire <http://www.thinkingfountain.org//s/shoebox/shoebox.html>)

- **Prepare your frame**
 - Milk carton: cut off peaked top, mark and cut window in one side, use upside down
 - Corrugated cardboard half box: inter-fold the flaps to stabilize the box
 - White gift box: cut off the bottom flaps, close the top of box, window faces viewer
 - Tissue box: fold together and tape ends loosely, window faces viewer
 - Other containers: how will you use/display this style?

- **Build the drive train**
 - Construct axle (chopstick or skewer), drive cam, handle
 - Punch holes for axle in middle of two sides of frame
 - Check to be sure your cam clears all sides of the frame as it turns
 - Don't glue down parts yet

TURN OVER >

- Add the jumper rod
 - rod, cam follower, bushing in box top
 - will be more stable if you let the "tail" of the jumper rod extend down past the drive axle
- What needs to be firmly fixed? What should be loose?
 - Drive cam must not slip on the drive rod, but wait to glue or fasten it down!
 - Handle should not slip on the drive rod, but again wait to adjust its length!
 - Drive rod should turn easily in holes in the frame sides.
 - Jumper rod's bushing should be glued into the frame top.
 - Cam follower should be firmly fixed on the jumper rod.
- Try it out! What works smoothly? What needs adjusting? Try turning crank both ways—one way may be better. Does the jumper rod work better in front of or behind the drive axle?
- NOW glue and fasten the mechanism. Add "stoppers" to keep the drive rod from slipping sideways (little pieces of cardboard or foam up against the frame sides).
- Tell your story with the decorations!

Your notes:

How can you use this activity with your students?

Automaton Bibliography/Webography

Jane Snell Copes, Science Outside the Box November 2013 for E4 Conference
[e-mail me profsepoc@scienceoutsidethebox.com for an electronic copy with live links]

AUTOMATON is singular; AUTOMATA are plural.

Start here!

All links checked 6 Nov 2013

- <http://tinkering.exploratorium.edu/cardboard-automata/> Click on Try It! for picture directions using 6x6x6 cardboard boxes.
- <http://studentz.squidoo.com/paper-automata-free-downloads-templates-fun-examples-and-mechanism-info> A great site with lots of info on mechanisms, books, and a wonderful list of free downloads.

A few sample free downloads

- Mechanical Bat <http://ravensblight.com/Bella.html>
- Agreeable Sheep http://www.robives.com/blog/agreeable_sheep_come_and_get_it
- At the Duck's Pond (harder!) <http://www.walterruffler.de/Download/teich2.html>
- Some very nice Italian paper automata <http://paperpino.net/category/paper-automata/>

Books

- Cabaret Mechanical Movement by Gary Alexander and Aidan Lawrence Onn, available here <http://www.cabaret.co.uk/store/books/cabaret-mechanical-movement/>
- Paper Models that Move by Walter Ruffler, available from www.doverpublications.com
- Paper Automata, Amazing Paper Pets, and Paper Engineering and Pop-ups for Dummies all by Rob Ives.

Blogs

- A fine resource from master maker Dug North <http://www.cabaret.co.uk/categories/dugs-automata-tips/>
- A teacher's blog about making automata with 5th graders (Sept 15, 2012 entry) http://simplemachineschs.blogspot.com/2012_09_01_archive.html

Videos Oh, where to start? Or stop!

- Edible automata at the Science Museum; you might recognize me in the last video. <http://www.cabaret.co.uk/education/making-automata-with-food/>
- A fine gallery of wooden and cardboard automata by Robert Addams. <http://www.mechanical-toys.com/gallery.htm>
- See-through Automata in deli boxes! <http://stuffyoucanthave.blogspot.com/search/label/automata>
- Making Automata with adults <http://www.youtube.com/watch?v=HyW9E-U-MJI>
- Making Automata outdoors at a big public event in the UK winter 2012 <http://www.youtube.com/watch?v=TUi0cXM6BSM> "You need to be careful; don't glue your hand," says a small builder!
- Cabaret Mechanical Theater exhibit in Glasgow, 2009. Don't start here or you will be overwhelmed with wonderfulness. <http://www.youtube.com/watch?v=kv1CpJi60xQ>