

**Kids Just Gotta Build! presentation for E4 Conference, 12 Nov 2012**  
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WHAT do we learn from building? WHY is it so urgent that kids physically build things in school? HOW can we modify classrooms to allow this important work? WHAT KINDS of projects really engage kids? WHY NOT this year at your school?

### **Tops**

**general idea** Use used CDs with hardware items or marbles to make spinny tops. Public libraries will save unneeded software CDs for you if you ask.

**more info here** [Gizmos & Gadgets](#), Jill Frankel Hauser, Williamson Kids Can! series, 1999; pp 90-96.

**tricky bits** Tops are most stable if they are perfectly symmetric, so center the bolt carefully in the CD hole. Some marbles will fall through the CD hole, so get the right size!

#### **stepping it up a notch**

- Time top spins with stop watches and think about what STOPS a top spinning.
- optical tops (B&W patterns that seem to generate colors as they spin)

<http://www.archimedes-lab.org/workshoptop.html> Page has downloadable patterns. Resize to 4.25" diameter for CD top.

Black and White Makes Color, activity from Resource Area for Teaching RAFT.

<http://www.raft.net/raft-idea?isid=305> This design uses a marble as bearing for the top.

- Tetrahedron top made from 4 spheres. These really spin a long time!

<http://www.archimedes-lab.org/workshoptetratop.html>

**book connections** [Tops: Building and Experimenting with Spinning Toys](#), Bernie Zubrowski, William Morrow & Co, 1989.

### **Jiggle Bots**

**general idea** A small DC motor is UNbalanced by gluing an object off-center on the motor pin. Vibrations make the bot jump and bump.

**more info here** <http://www.pienetwork.org/a2z/j/jitterbug/>

**tricky bits** I struggle to find small, cheap motors that work. AA battery holders are worth the \$. You may need to attach wires to motors and battery holders—I find it too hard for kids to do.

#### **stepping it up a notch**

- Make the legs from markers, and you have a Drawing Bot!

[http://www.pienetwork.org/a2z/c/cup\\_draw\\_nocricket/](http://www.pienetwork.org/a2z/c/cup_draw_nocricket/)

- 5 more cool projects <http://cratel.wichita.edu/blogs/tommcquire/category/simple-fun/> video in Jan 28, 2009 post.

### **Cranky Boxes**

**general idea** These are cardboard automata—little devices powered by a crank. . . turn the crank, something else happens. They use cams (wheel + off-center axle). I make them in paper milk or juice cartons.

more info here [http://www.exploratorium.edu/pie/downloads/Cardboard\\_Automata.pdf](http://www.exploratorium.edu/pie/downloads/Cardboard_Automata.pdf)

Here's another approach, but I think it's harder. It has a horizontal drive rod with bends in it. Try florist's wire instead of coat hanger wire.

[www.thinkingfountain.org/s/shoebox/shoebox.html](http://www.thinkingfountain.org/s/shoebox/shoebox.html)

**tricky bits** Getting things lined up properly and not getting frustrated!

**stepping it up a notch** Cabaret Mechanical Theater! <http://www.cabaret.co.uk/>

## Games in a Box

**general idea** Game boards + flat marbles or other "counters" for solitaire games, games with a partner, and Nim games. Older kids can make board games and card games.

**more information here** [http://www.archimedes-lab.org/game\\_nim/nim.html](http://www.archimedes-lab.org/game_nim/nim.html)

**tricky bits** Getting boxes: try shoe boxes, pizza boxes (these you may have to pay for), or save cereal boxes and "turn them inside out"

**stepping it up a notch** Tic tac toe is a VERY hard game to find a winning strategy. Ask students what games are fun for them: competitive, one winner only, more cooperative, solitaire games? Is it fun if you can always win? Change a rule to make a game more interesting.

## Marble Maze

**general idea** Small, flat box with a marble to roll through a maze.

**more information here** Nice little maze made from a CD jewel box and wax "sticks"

<http://bkids.typepad.com/bookhoucraftprojects/2011/05/project-85-cd-case-labyrinth.html>

**tricky bits** Are your students OK with hot gluing? If so, make maze with plastic straws glued into a box. If not, try flat wooden skewers as the maze "sides." Kids can cut them with wire cutters and use white glue.

**stepping it up a notch** Could you make your whole classroom into a maze of paper tubes, using balls to travel through?

## Tool Safety

- Try every project first at least twice before you plan to teach it. Don't forget that you can work faster than kids do and you probably have better manual dexterity.
- Take your time! Accidents happen when you try to force a tool to do a job too fast.
- Don't start a complicated project late in the day or on the last day of the week.
- Kids can use awls safely. Be sure to have a cork or stopper to protect the sharp point. A large nail is also a good tool for starting a hole. You can enlarge a hole with a scissors blade or a pencil. Be sure your fingers are not behind the sharp point.
- Sometimes you can avoid hot glue by using press-fit components and a little modeling clay. Think about glue dots and other double-sticky materials.
- Please do not hot-glue something you are holding in your hand.
- If you must pre-assemble most of the project for kids, it's probably too hard for this group this year.

## A few more favorite books about building and inventing

Steven Caney's Ultimate Building Book, Running Press Kids, 2006

Marvelous Mattie, Emily Arnold McCully, Farrar, Straus, Giroux, 2006

Build it! Gear up! Shape it! and Zap it! series by Keith Good, Lerner, 1999

Flight of the Dodo, Peter Brown, Little, Brown 2005