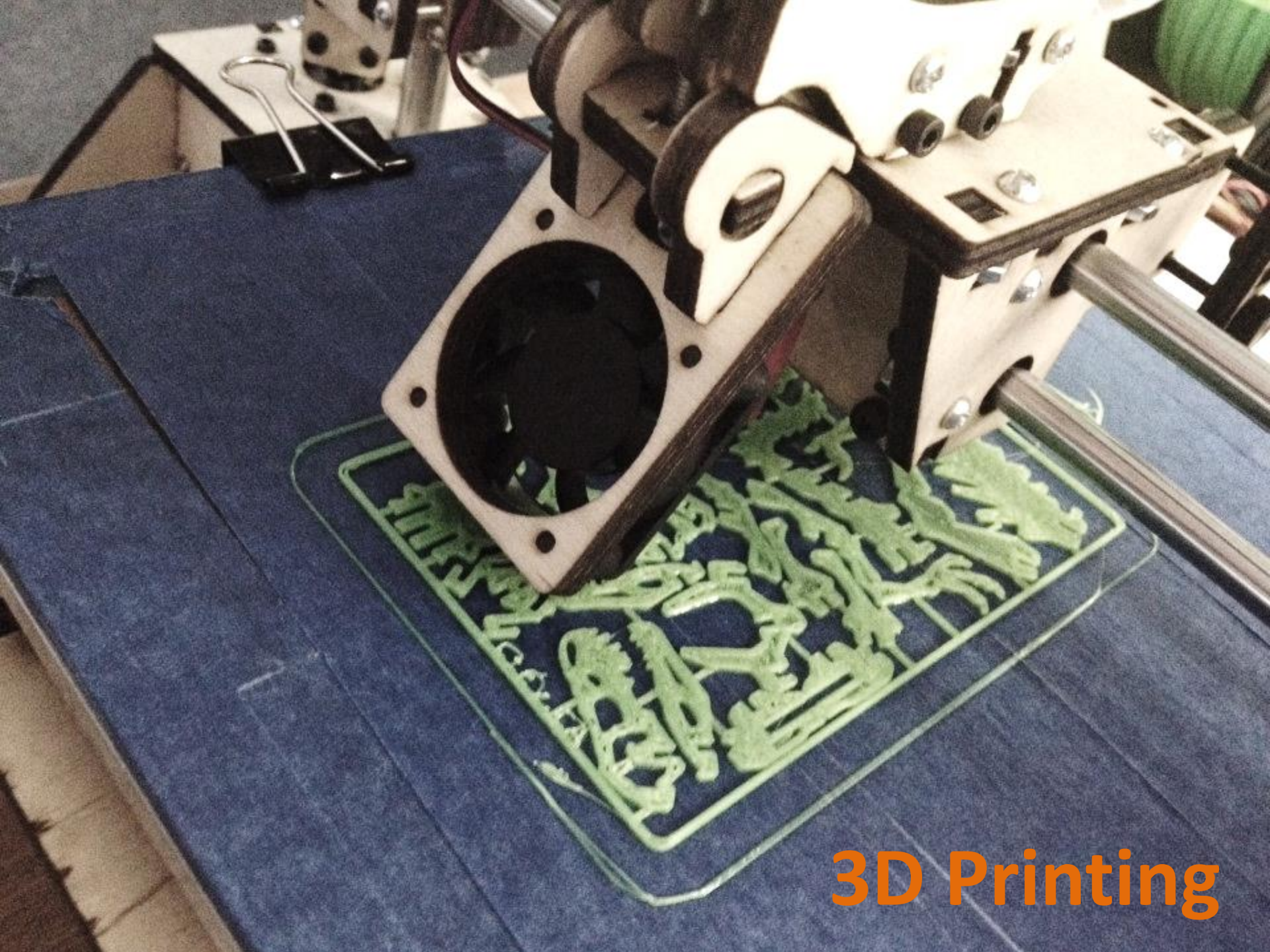

3D Printing

Who We Are

Kristi Sadowski, M.L.S.

Co-Director & Head of Teen Services

Booth & Dimock Memorial Library

Christopher Carney, M.L.I.S.

Information Services Assistant/
Makerspace Supervisor

Booth & Dimock Memorial Library

Assistant Librarian

Wilbraham & Monson Academy

Who Are You?

- Who has used a 3D Printer?
- Who has been to a Makerspace?
- Who has a Makerspace in their Library?
- Who is going to create a Makerspace in their Library?
- What are you hoping to learn?

Why 3D Printing Matters to You

- Community Response & Support
- Library Perception & Science Fiction
- Innovation & Imagination
- STEM/STEAM/STREAM
- Publicity
- Funding & Sustainability

3D Printing Isn't Scary!

All you need is:

- A Willingness to Learn
- Excitement to Try
- Failing ≠ Failure

http://buffysays.com/tag/healthy-relationships-2/

But What About…

- Money?
- Space?
- Staffing?
- Experience?

The Booth & Dimock Memorial Library Makerspace:

Fundraising

Fundraising	
Special Used Book Sale	$500.00
Other Donations	$100.00
Matching Donation	$600.00
Total Raised	$1,200.00

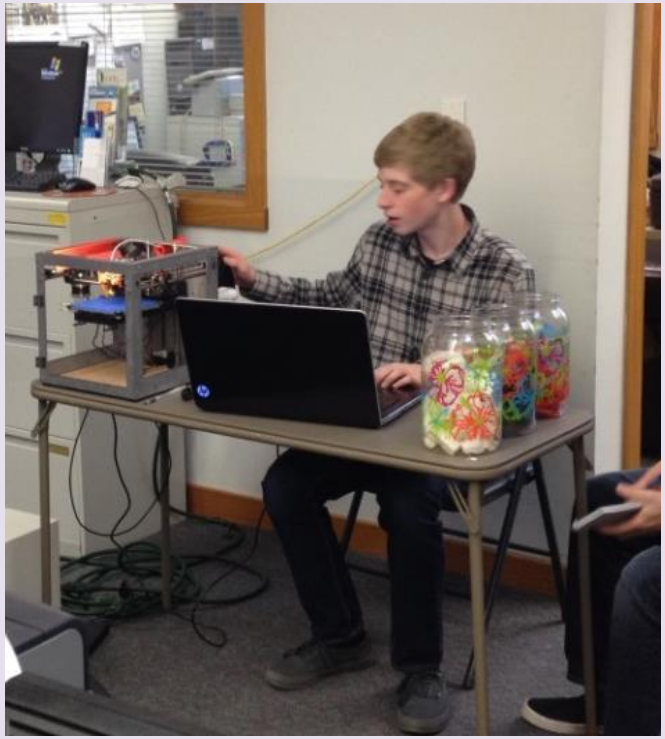
Expenses	
PrintrBot Printer + 4 Spools of Filament	$1,190.00
Other Misc. Supplies	$100.00
Total Spent*	$1,290.00

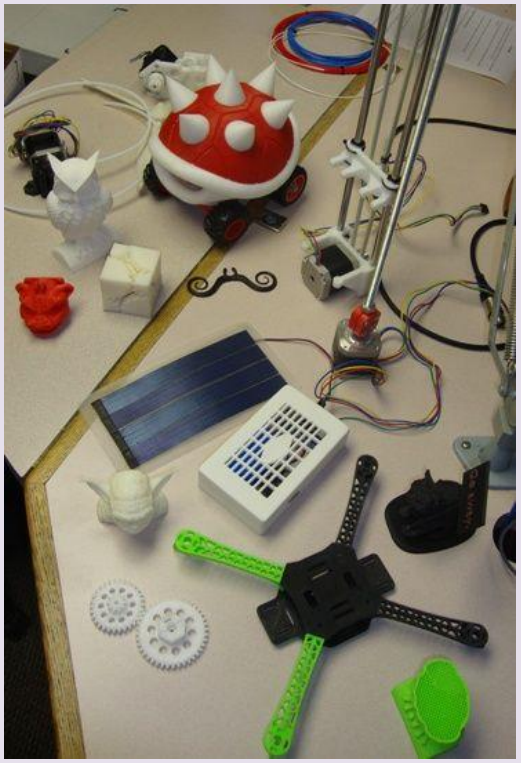
*at time of instillation

The Booth & Dimock Memorial Library Makerspace

How Did We Move This Fast?

- Buzzwords
- Publicity
- Passion
- Facts



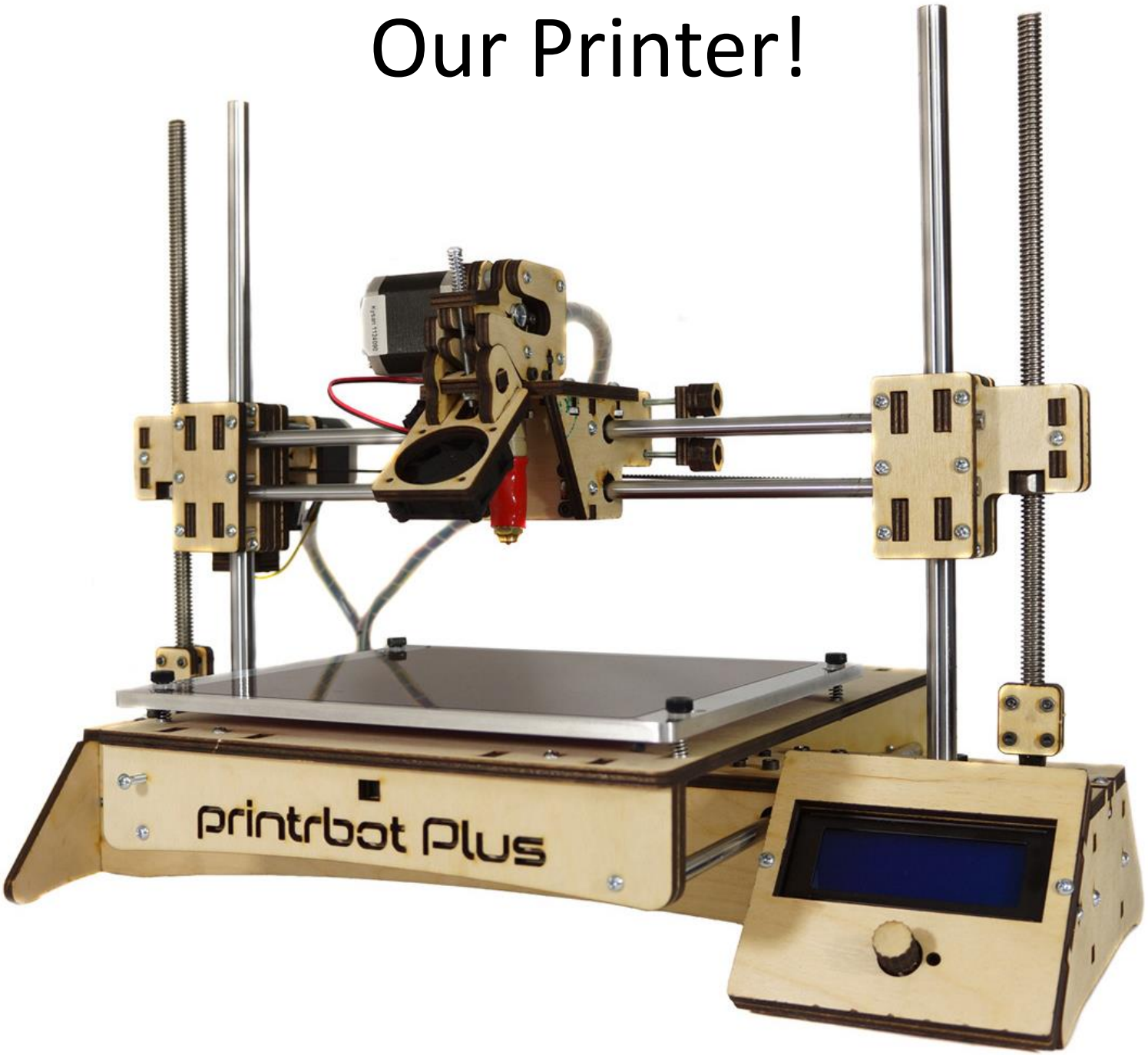


http://www.wili-am.com/guests.htm?guest=n6b8ga3b

How We Picked Our Printer

http://makezine.com/volume/guide-to-3d-printing-2014/

Our Printer!



What We Were Looking For

- Reliability
- Customization Potential
- Affordability
- Quality

For the tech-savvy, Printrbot offers expandability, speed and acceptable prints at a reasonable price.

Torture test print. Click to view large.

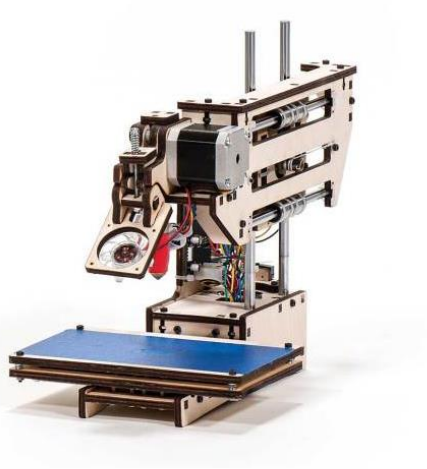
THE PRINTRBOT IS A RELATIVE NEWCOMER to the field of consumer- grade 3D printers and is touted by its creator, Brook Drumm, as "your first 3D printer." After a wildly successful Kickstarter campaign in December 2011, where they received over $800,000 in funding, Printrbot has been working to develop low-cost printers that can maintain quality while increasing portability. They've produced a few different models to suit a variety of user needs, from the Printrbot Plus with its 8″×8″×8″ print volume, to the compactable Printrbot Jr.

http://makezine.com/review/make-ultimate-guide-to-3d-printing/printrbot-lc/

PrintrBot Reviews 2014

The Best From Our Tests

See the full reviews in the MAKE Ultimate Guide to 3D Printing 2014, on newsstands now!



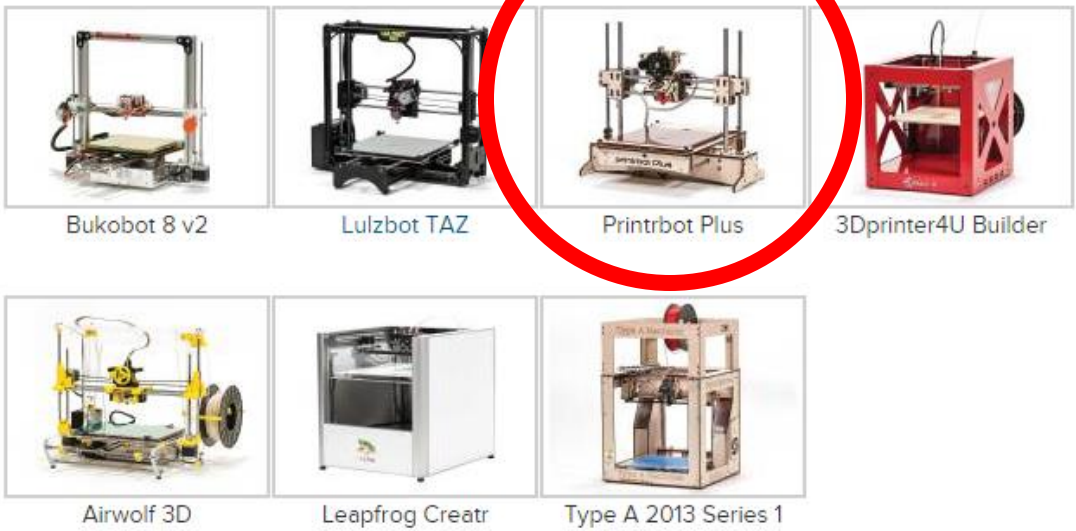
BEST VALUE

PrintrBot Simple

Runner-Up: Ditto+

MIDDLE OF THE ROAD

Not standouts in our testing, but deserving consideration. We were unable to dial these in satisfactorily during testing but look forward to their continued improvement.



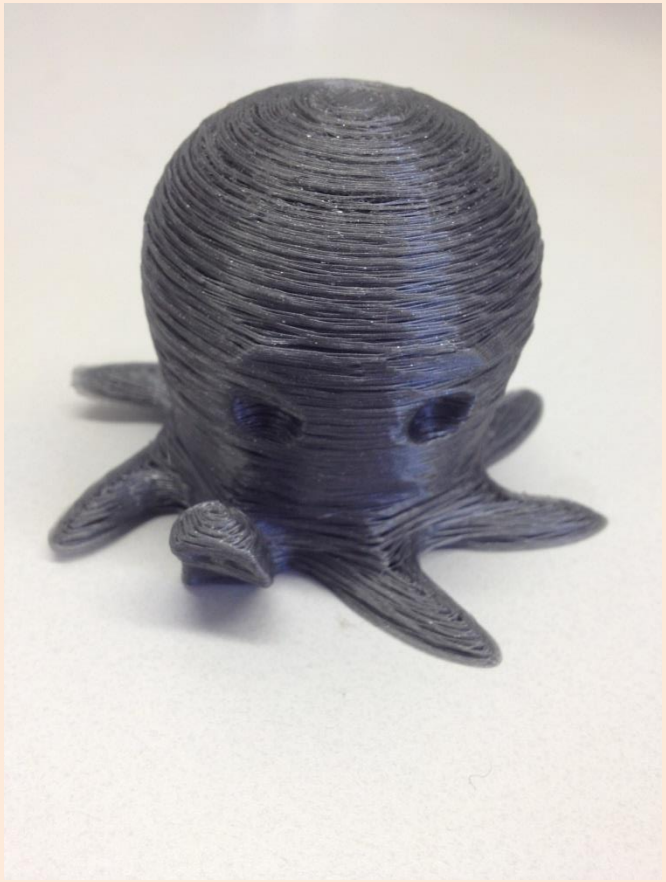
http://makezine.com/magazine/guide-to-3d-printing-2014/3d-printer-overview-how-they-compare/

Starting Our Makerspace

What is in the Makerspace:

- Printer
- Computer that will run needed freeware
- PLA & ABS filament
- Printer plates
- Tools
  - Screwdrivers, scissors, tweezers, hex key, wire cutters, tape, hairspray

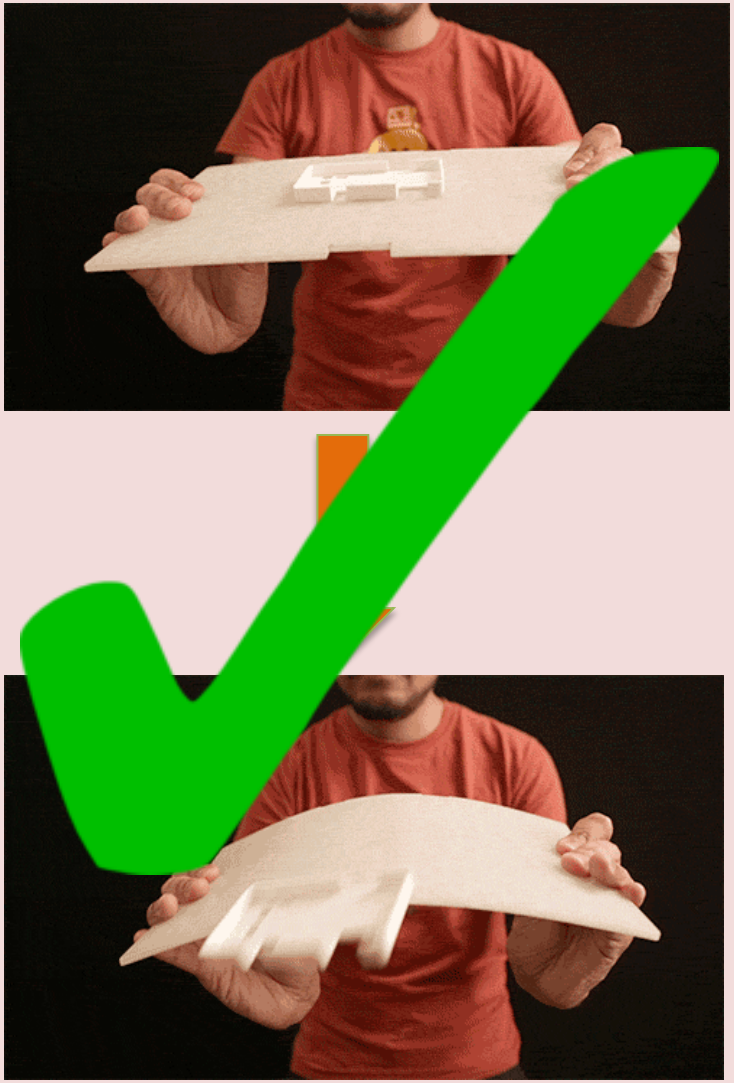
Finessing and Set Up



General Maintenance

- Bed leveling
- Cleaning extruder
- Cleaning stepper motor
- Weekly down time for maintenance: +/- 30 minutes

Modifications!



Our Makerspace Now:

Printer Use and Costs

Schedule

Most small print jobs take 20-45 minutes.

Some can take 3+ hours.

Account for time to set up print job and to for the printer head to reach temperature.

Costs

Like printing or photocopying, charge for the materials

Filament is approx. $30.00 for a 35oz or $1.17 per oz.

We charge $1.00 per oz.

Plastic!

ABS	PLA
Extrude at ~225°C	Extrude at ~180-200°C
Requires heated bed	Benefits from heated bed
Works reasonably well without cooling	Benefits greatly from cooling while printing
Adheres best to polyimide tape	Adheres well to a variety of surfaces
Filament tolerances are usually tighter	Finer feature detail possible on a well calibrated machine
Prone to cracking, delamination, and warping	Prone to curling of corners and overhangs
More flexible	More brittle
Can be bonded using adhesives or solvents (Acetone or MEK)	Can be bonded using adhesives
Fumes are unpleasant in enclosed areas	More pleasant smell when extruded
Oil Based	Plant Based

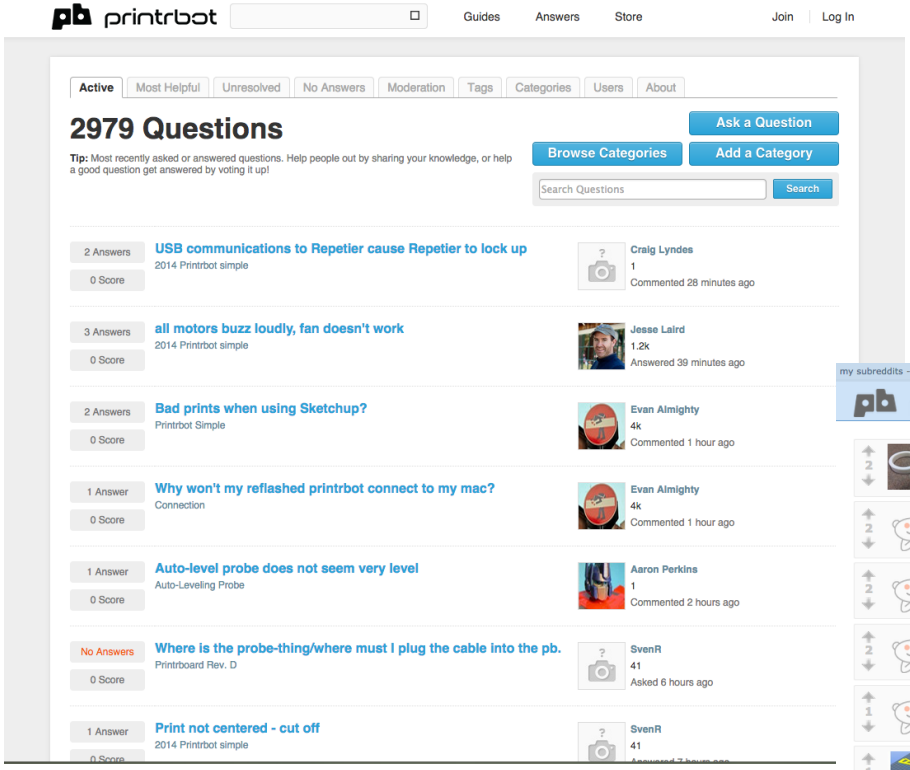
http://www.protoparadigm.com/news-updates/3d-printer-filament-buyers-guide/

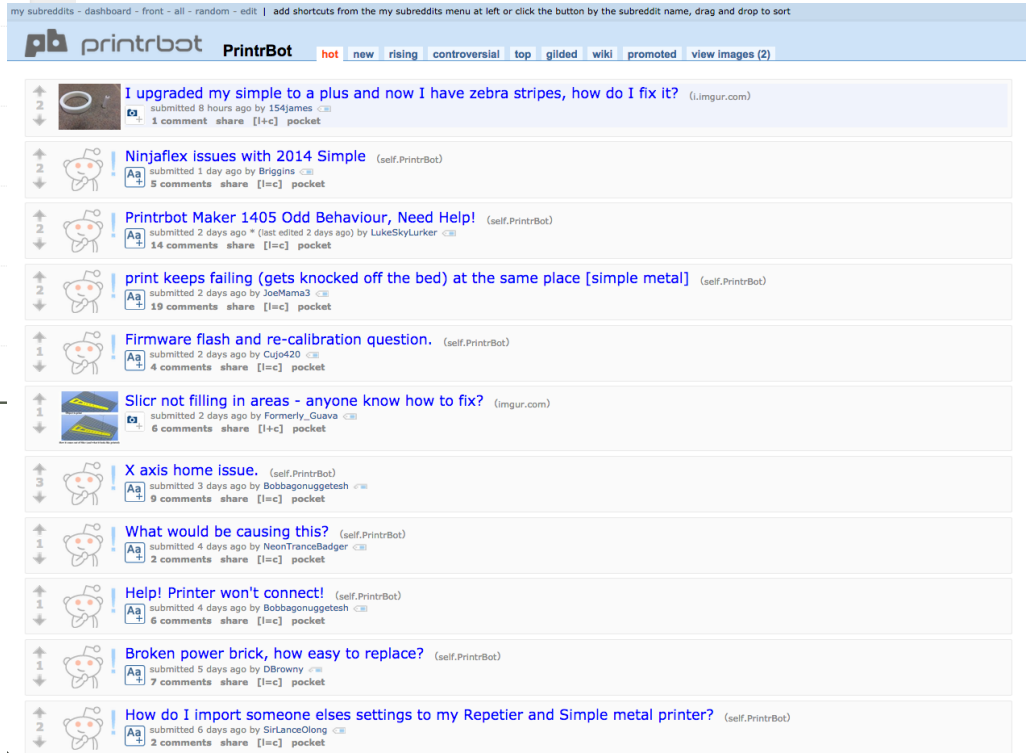
Software: Repetier-Host + Slic3r

- Easy to learn
  - Learning curve
- Easy to use
- Relatively foolproof
- Redundant controls

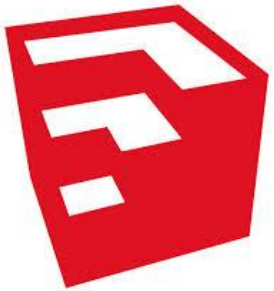
- G-code generator
- Steeper learning curve
- Setup multiple settings for multiple prints

Support Community





3D Design Software



- Tinkercad
- Google Sketch Up
- Auto Desk 123D Design
- Blender
- MeshLab

Look for File Export Format

.stl

.obj

.3ds

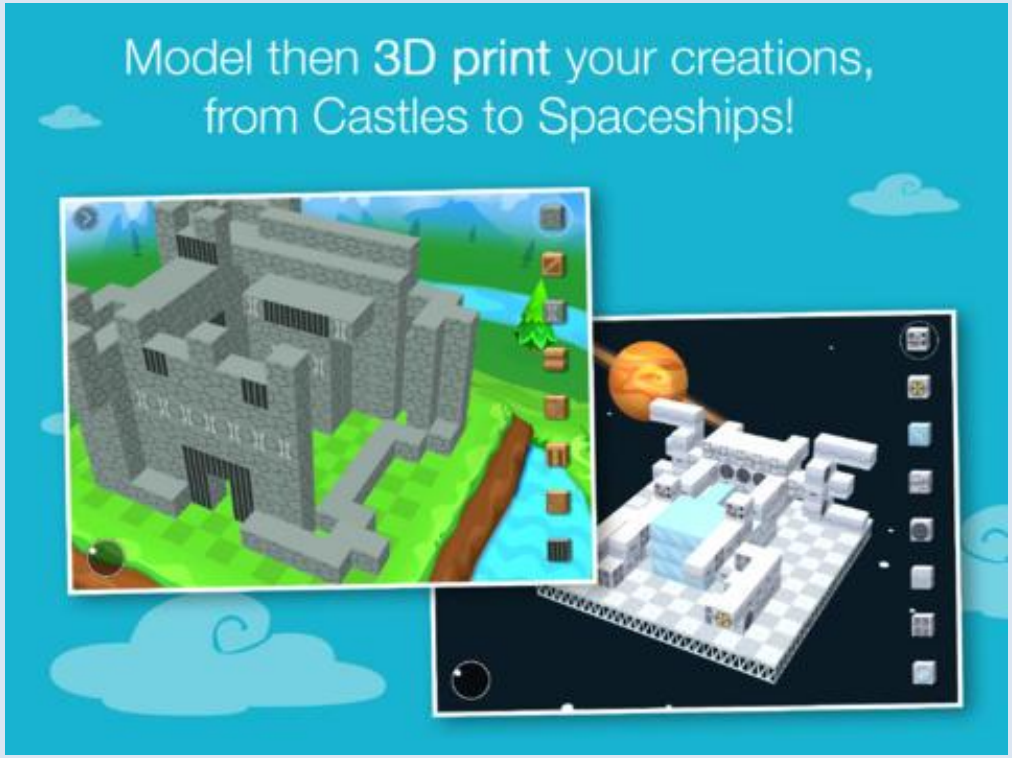
.wrl

Cubify Draw

Cubify Draw
UNDO
REDO
CLEAR
THICKNESS
CONNECT
CHOOSE IMAGE
MAKE IT 3D

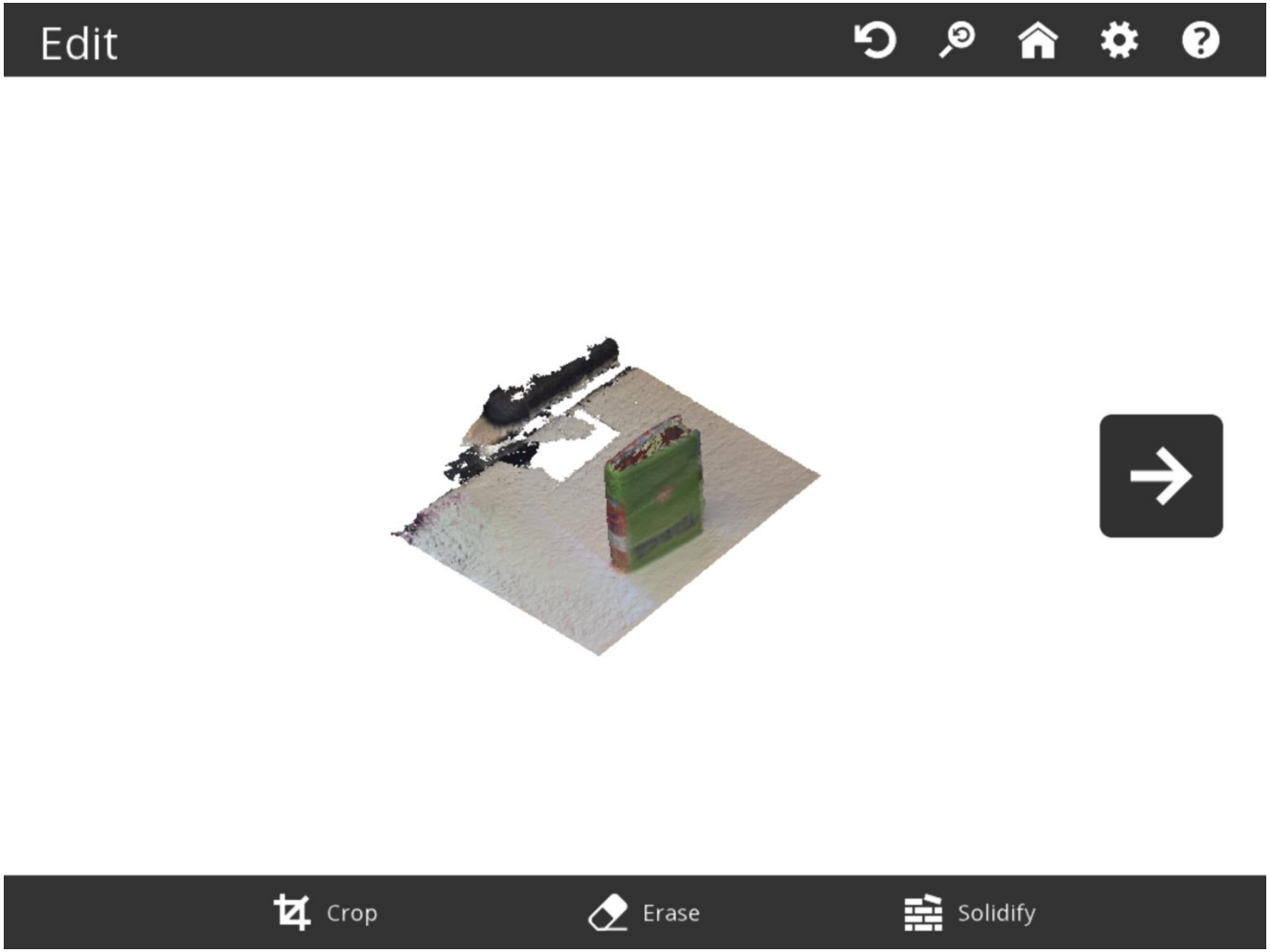
Cubify Draw (cont'd)

Blockify


Model then 3D print your creations,
from Castles to Spaceships!

3D Scanning
iSense

3D Scanning
iSense



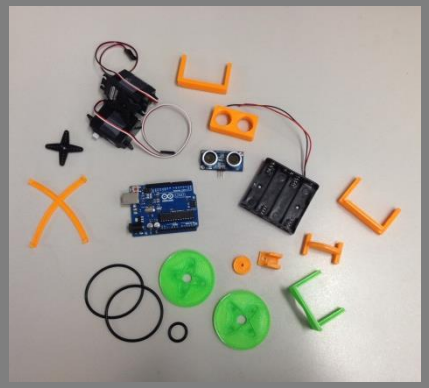
What We Have Done

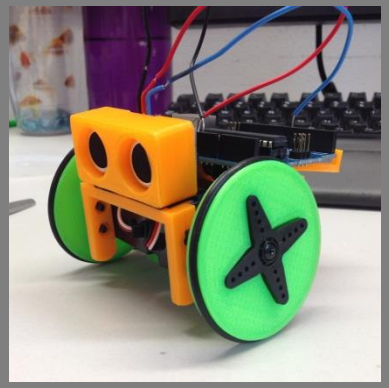
- Collaborative Programming
  - Class Visits
  - Boy Scouts
  - Socially At Risk Youth
- Individual Training
- Demonstrations
- Print on Demand
- Maker Morning/Camp & Other Maker Programs
- Design Items and Print Prototypes

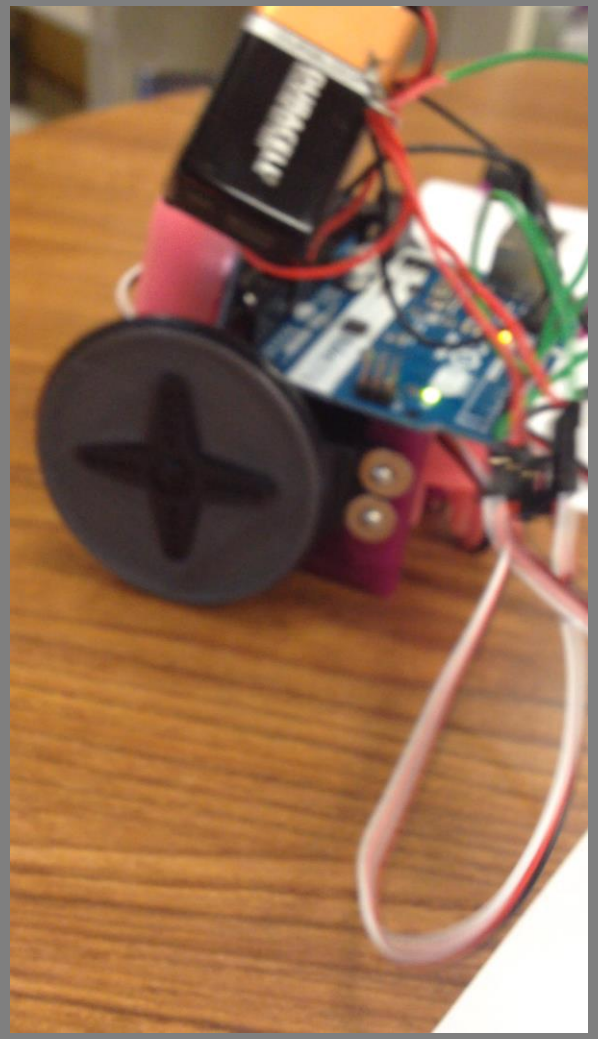
http://makeitatyourlibrary.org/play-technology/make-scribbling-machine#.VD6kyvldV8E

Robot Project

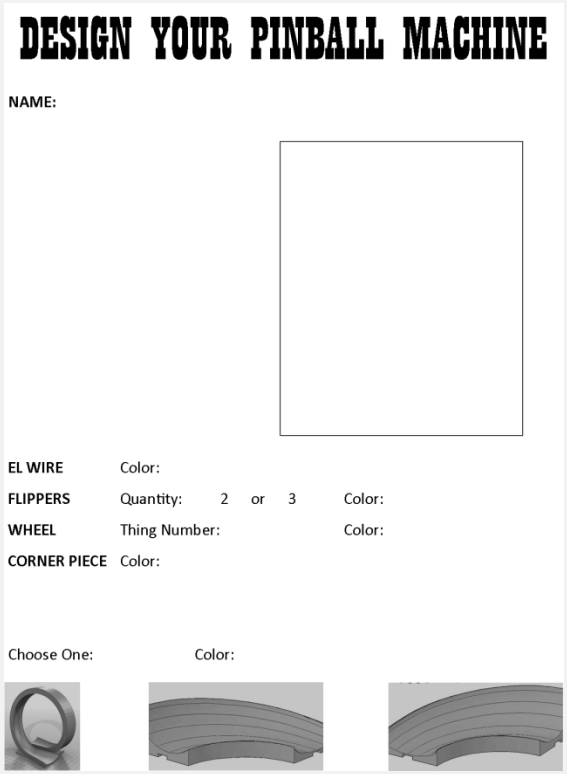
- Cooperative Programing with Town Youth Services Department and Dean of Students at Middle School
- They wanted an afterschool project for socially at risk boys.
- Robot project was chosen because it taught: circuitry, soldering, programming and incorporated 3D printing.







Pinball



DESIGN YOUR PINBALL MACHINE

NAME:

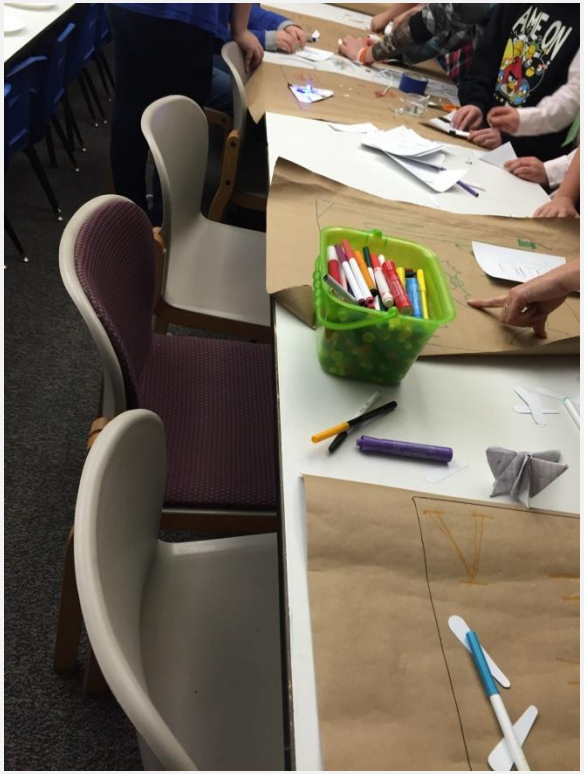
EL WIRE Color:

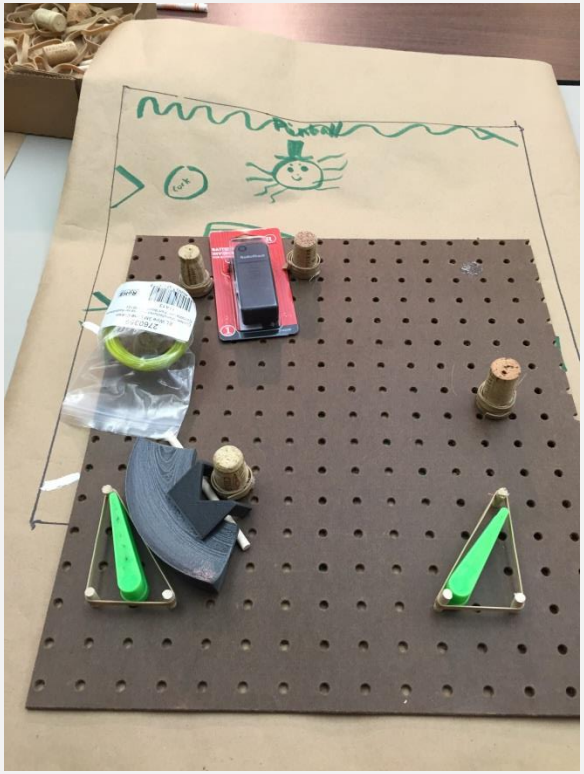
FLIPPERS Quantity: 2 or 3 Color:

WHEEL Thing Number: Color:

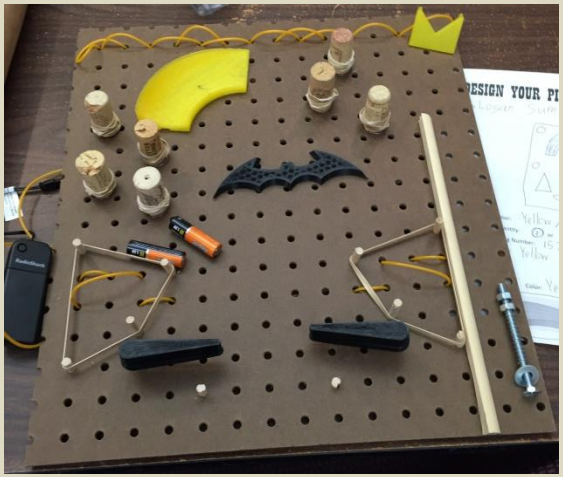
CORNER PIECE Color:

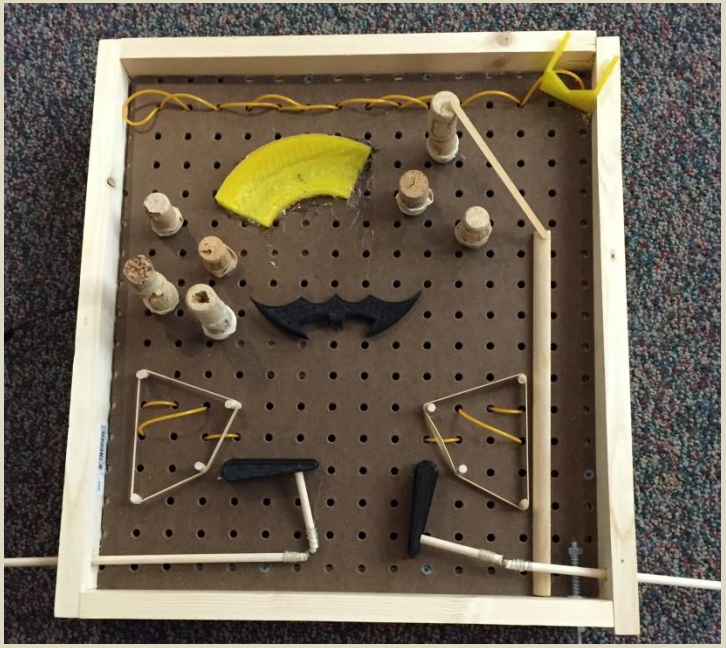
Choose One: Color:

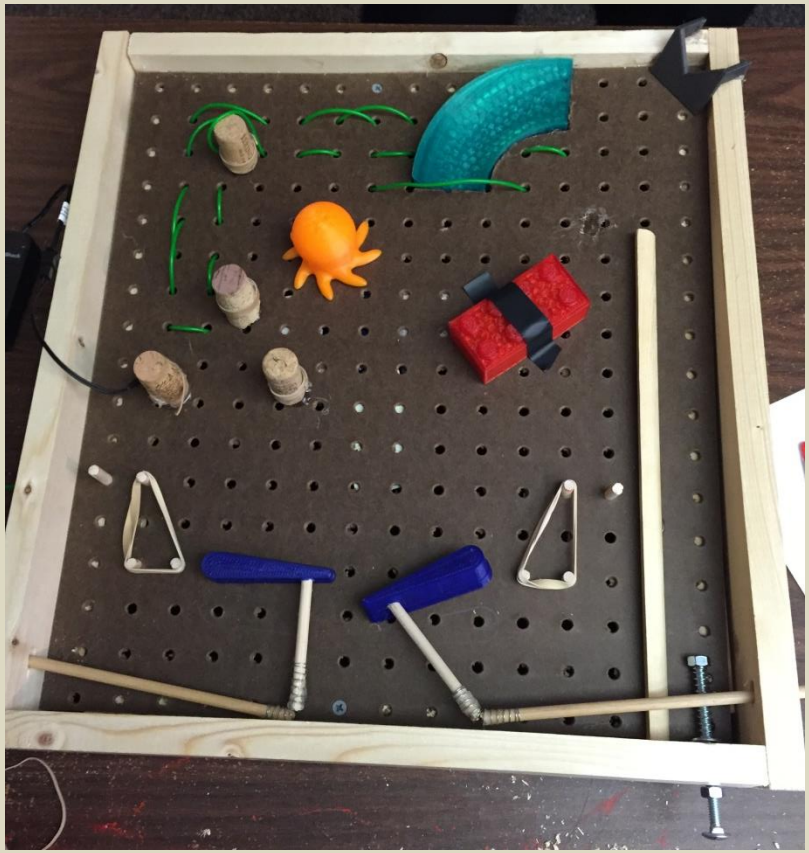




Pinball (cont’d)





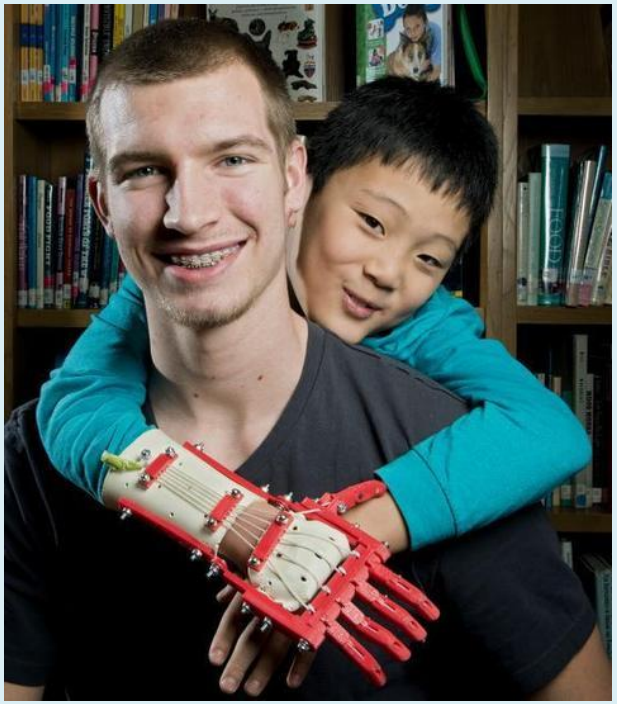


Training & Demonstrations

- On demand individual or small group sessions
- Lots of teens and families
- Create new relationships and empowered members of community
- Enable persons to work the printer themselves and some to teach others

What Others Have Done

- Replace parts from favorite games
- Make pieces for school dioramas and projects
- Design and print your own creation
- Print a second, third or fourth printer
- Print a hand or other prosthesis



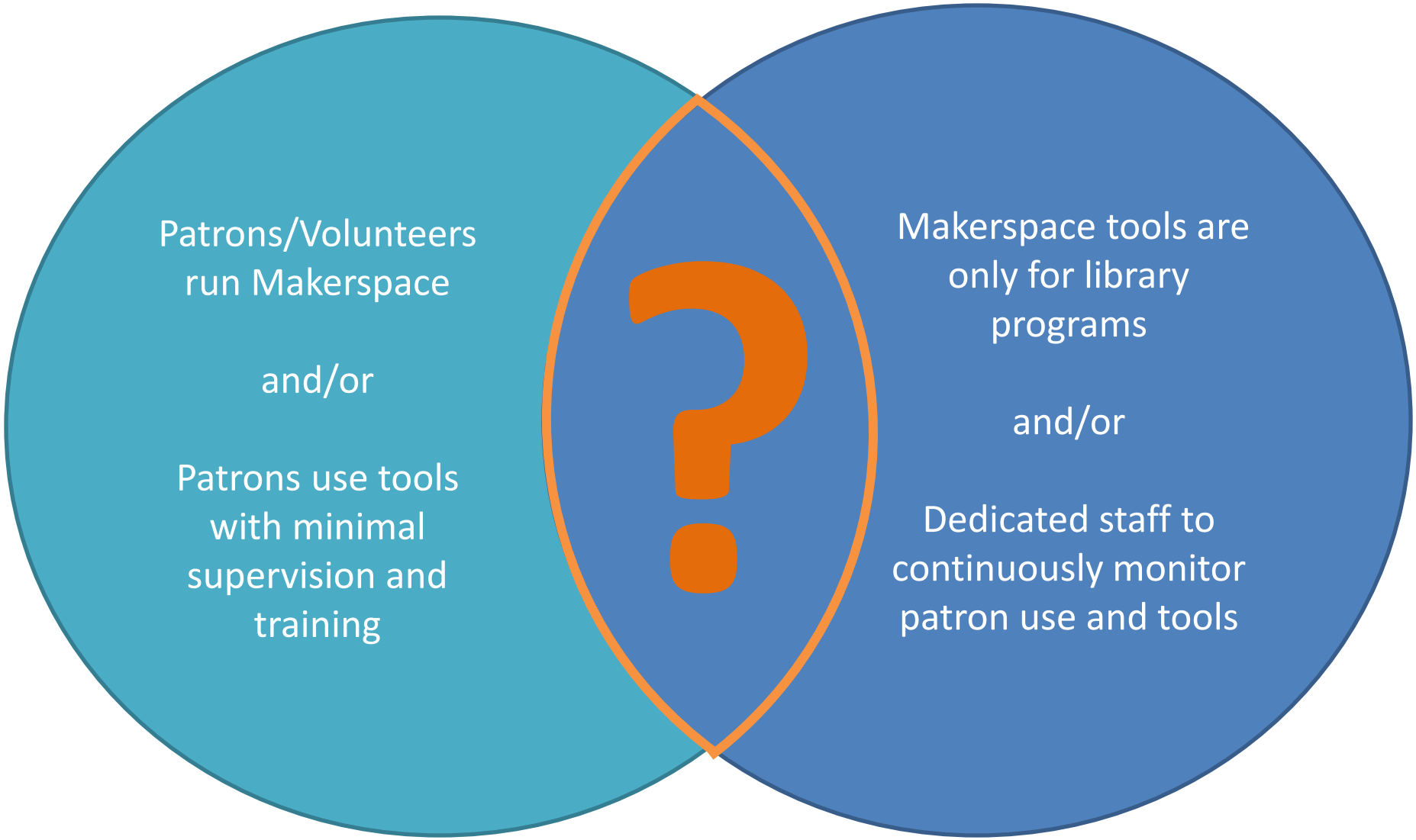
http://www.3ders.org/articles/20140206-teen-uses-3d-printer-to-make-a-robohand-for-third-grade-boy.html

What Do You Really Need?

"The amount or quality of space is not important, nor is the level of technology and expensive equipment that the library provides. What matters most in the world of making is the spirit of DIY creation and discovery."

-Dale Dougherty of Make Media in The Digital Shift

What Do You Want From Your Makerspace?



Legal Issues

- Safety for Patrons
- Safety of Equipment
- Copyright
- Printing Weapons
- What Else?

Booth & Dimock Memorial Library
Maker Space User Agreement

By using and working in the Booth & Dimock Maker Space I agree to the following:

- To respect and protect other people's work
- To help one another do better—be open, inclusive and encouraging
- To pick-up after yourself and leave the Maker Space clean for the next user. This includes
  - Returning all tools to where they came from
  - Placing your trash and waste into appropriate receptacles
- To not bring food or drink into the Maker Space
- The Maker Space may be booked for individual or group use by contacting the library. When available it will be on a first-come, first-serve basis. Time limits may apply.
- Material fees may apply and current costs will be posted in the Maker Space.

- Safety is the top priority and the facilities, tools and materials must be used in a safe and appropriate manner
- If a tool requires training, it will not be used until training has been provided by library staff
- To not make items that will be used as or fit the definition of weapon as deemed by library staff
- To comply with the Internet Acceptable Use Agreement and Patron Behavior Policy which states: *Disruptive, destructive, dangerous, or illegal behavior will not be tolerated*
- Children under the age of 12 will be accompanied by and supervised by an adult

The Booth & Dimock Memorial Library is not liable or responsible for any loss, damage or injury caused by the Maker Space or its users.

It's all right if you fail, as long as you use it as an opportunity to learn and to make something better

By signing you acknowledge that you have read this agreement and understand the rules and regulations expected of Makers in the Booth & Dimock Memorial Library. Failure to comply can result in suspension or termination of access to the Maker Space.

Name: _____ Library Barcode Number: _____

Signature: _____ Date: _____

I agree to the terms of this agreement on behalf of my child(ren), and give them permission to use the Booth & Dimock Memorial Library Maker Space.

Name: _____ Library Barcode Number: _____

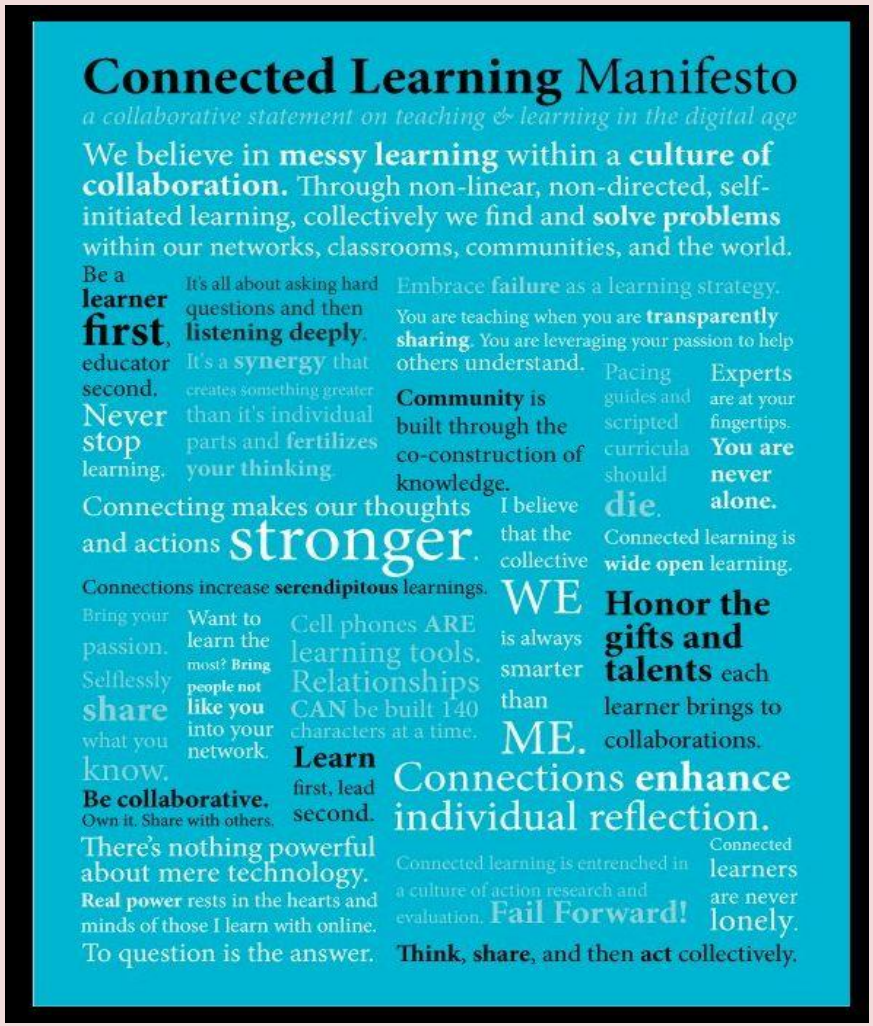
Name: _____ Library Barcode Number: _____

Name: _____ Library Barcode Number: _____

Name: _____ Library Barcode Number: _____

January 2014

Crafting an Agreement



Resources:

Makerspaces in Libraries: Legal Considerations

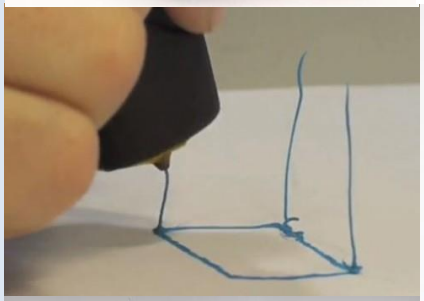
An Infopeople webinar from 7/2014

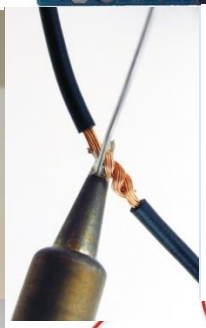
Slides and Handouts Avaliable

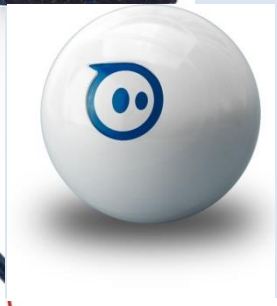
https://infopeople.org/civicrm/event/info?id=416&reset=1

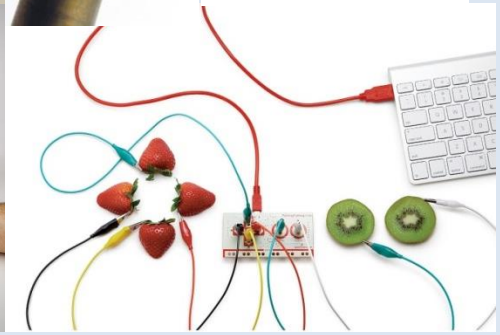
http://bib20.blogspot.com/2012/07/makerspaces-connected-learners-and-data.html?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed:+blogspot/Lahj+(Bib+2.0)&utm_content=Google+Reader

Some of Our Other Gadgets









- Sphero
- Brushbots
- 3Doodler
- Makey Makey
- Soldering Irons
- Snap Circuits
- Arduino
- Scribble Bot
- RobotiKits

http://www.coventrypl.org/cen61015.html

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