

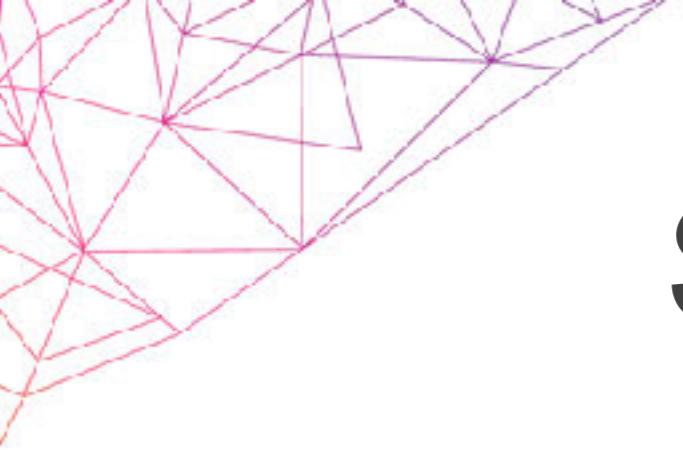
You have a makerspace, now what? Four ways forward

Sylvia Martinez

sylvia@inventtolearn.com

@smartinez





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Please take a moment to evaluate this session. Your valuable feedback helps make the overall program stronger and ensures we're meeting your learning needs. Evaluations are also used by the conference program committee to provide feedback to presenters and inform future presentations.

To provide feedback and rate the quality of this session, please use the ISTE19 app or locate the session online using the program search at isteconference.org.

Thank you!

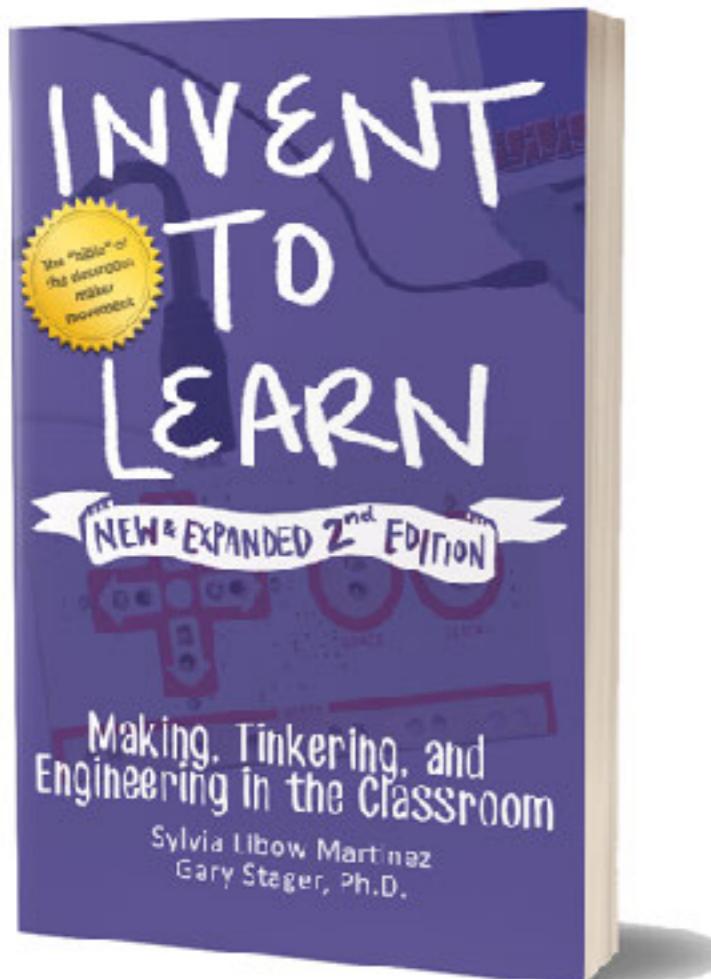
#ISTE19
isteconference.org

ISTE
2019

Invent To Learn:

Making, Tinkering, and Engineering in the Classroom

www.InventToLearn.com

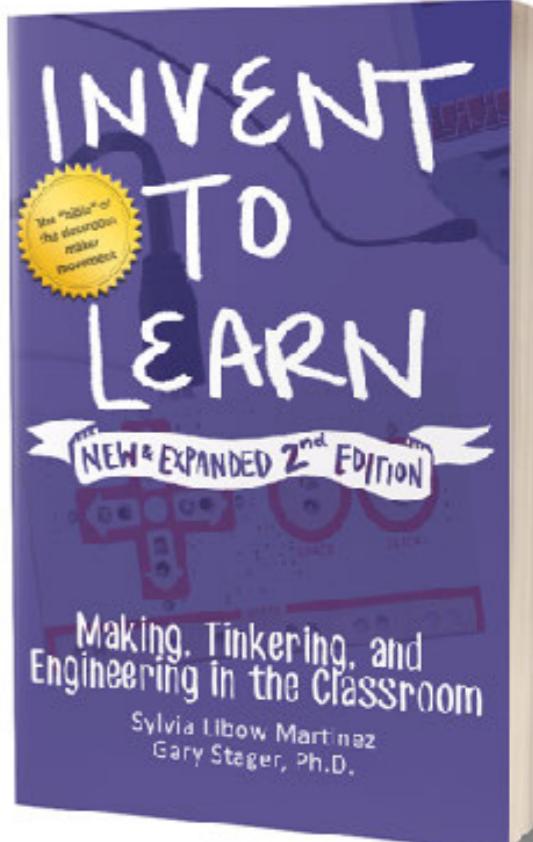
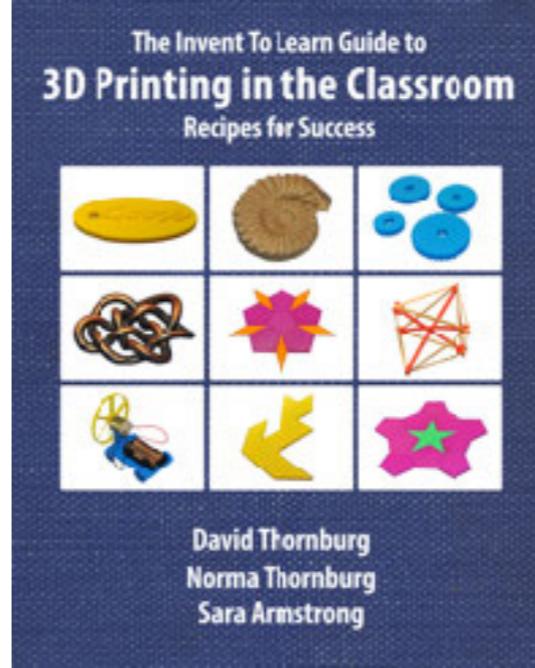
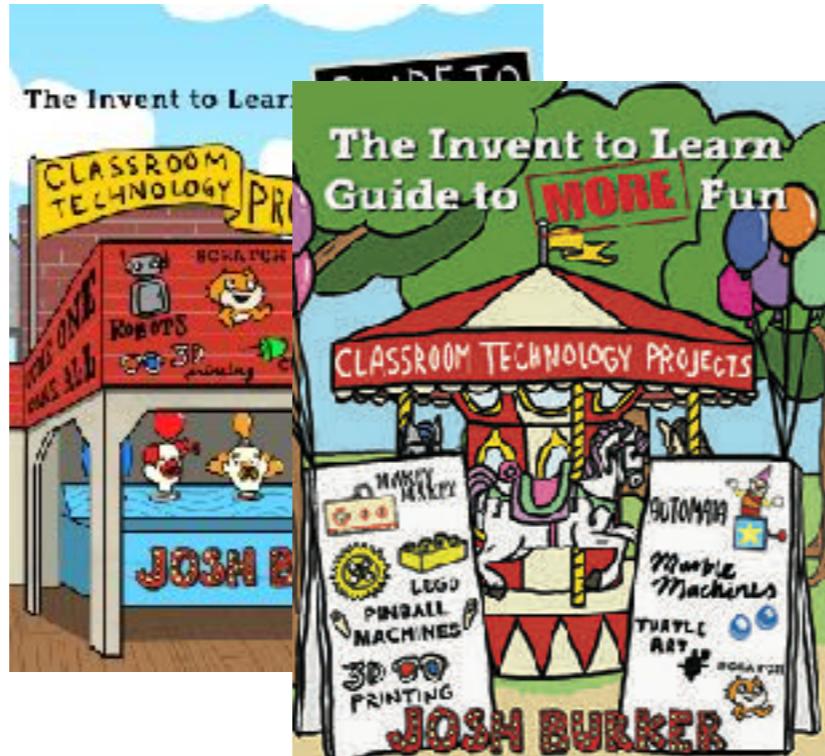
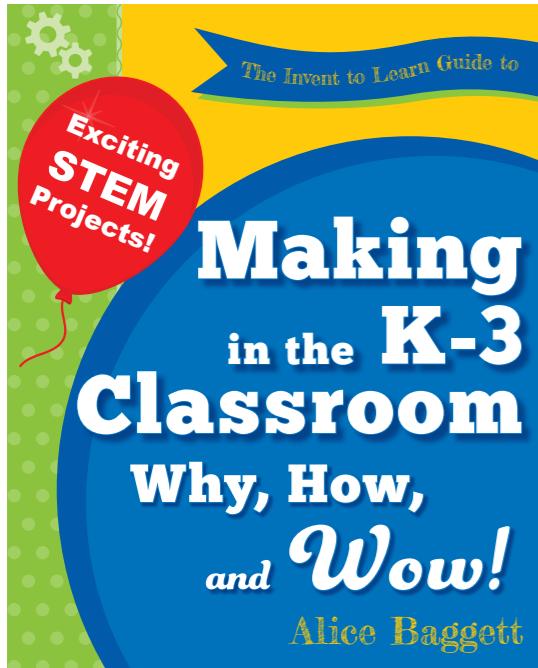


- 💡 Maker tools, materials, & tech
- 💡 Tinkering mindset
- 💡 Engineering design
- 💡 How to make the case for “making” in the classroom

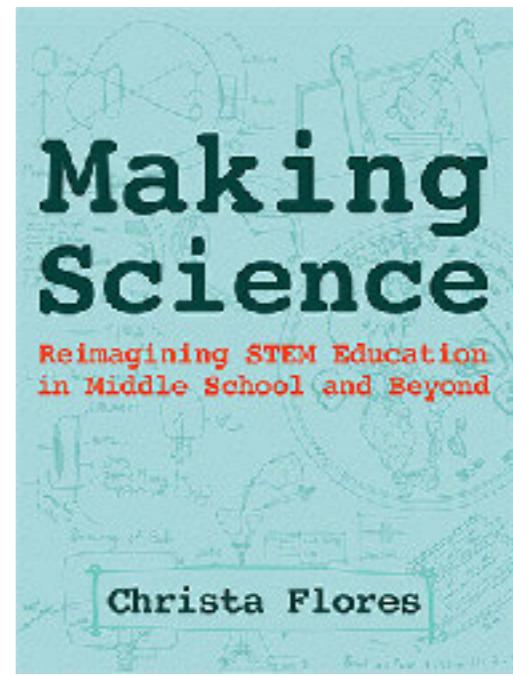
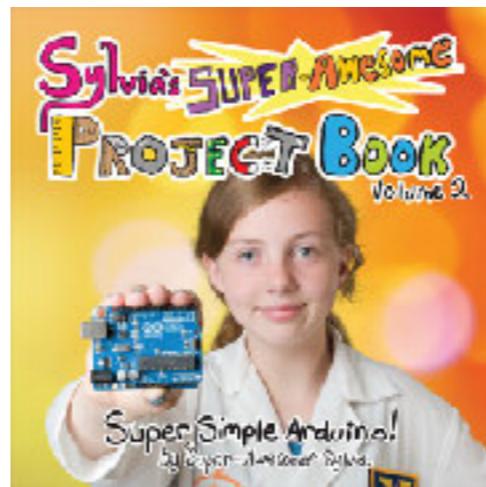
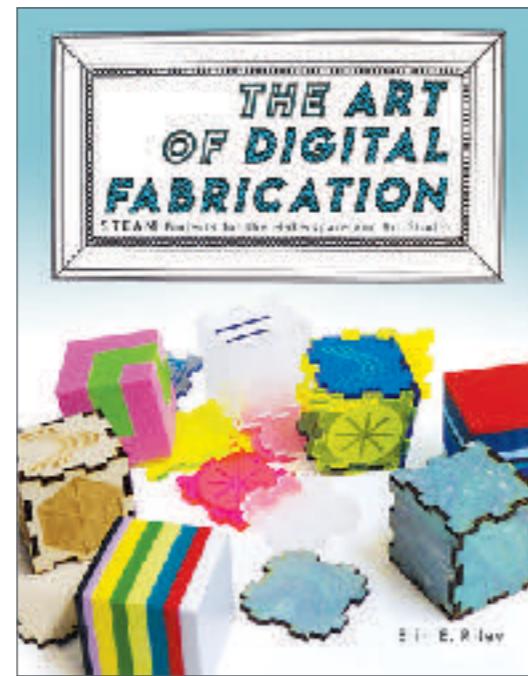
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programming electronics sensors laser cutters STEM/STEAM

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The Maker Movement



Who has heard...

- Makerspaces are hot, let's get some 3D printers
- A makerspace will mean better STEM education
- Making = learning
- We'll just add a little making to what we have
- Let's do makerspace

If you build it, they will come

ONLY IN THE MOVIES



Why Hoboken is Throwing Away All of its Student Laptops



Tuesday, July 29, 2014

By Jill Barshay : The Hechinger Report



Mothballed laptops locked inside a storage closet at Hoboken Junior Senior High School. School staff will inventory them and hire a recycling company to discard them. (Jill Barshay)

Inside Hoboken's combined junior-senior high school is a storage closet. Behind the locked door, some mothballed laptop computers are strewn among brown cardboard boxes. Others are stacked one atop another. Dozens more are stored on mobile computer carts, many of them on their last legs.

That's all that remains from a failed experiment to assign every student a laptop at Hoboken Junior Senior High School. It began five years ago with an unexpected windfall of stimulus money from Washington, D.C., and good intentions to help the

SHOP
You can't **or** **BUILD** your way
out of something you
behaved your way into.

-Steven Covey

Problems I hear

- Not being used, or only in trivial ways
- Only some teachers
- Only some students
- Not connecting to curriculum
- Parents don't understand
- Students don't understand
- *This too shall pass*



Lots of options

- **Place** - Makerspace, hackerspace, FabLab, Techshop, shop, science lab, open classroom, studio, *your name here*
- **Culture** - Maker, hacker, crafter, entrepreneurial, green, economic self-determinism, artisanal, citizen science, farm/food, skunk works
- **Process** - Making, tinkering, Design Thinking, design, Genius Hour, PBL
- **Underlying belief about teaching & learning** - Instructionism, behaviorism, constructivism, constructionism

**Skunk Works
Entrepreneur Zone
Maker Library
Green Power
Community Chest**



Skunk Works

Make your school better, make the world better

A large, light-colored wooden cabinet stands in a room. It has two doors on the left side and two doors on the right side, all of which are currently open. The interior of the cabinet is dark wood paneling. The cabinet sits on a dark brown base. In the background, there is a stack of papers or books on the left, a desk with various items on it, and a chair on the right.

Matias Wunderlich

i'olani





Online / Social Media

* = video

Travis - SOCIAL MEDIA

8th gr. class Day 10/11 IG
Pumpkin Patch 10/19 1G/SC

9th-11th gr. class Day 10/19 1G/SC

9th: Jayson
10th: Liam
11th: Eve / Alisha

Senior Camp 10/19-21 1G/SC
Senior Editors

Nana - Advanced 10/28 1G
Broden - Theatre Perf. Infographic
October Concert 10/31 1G/SC

VIDEO / CINEMATICS

8th gr. class day 10/11

9th gr. class day Travis & Noah 10/19

10th gr. class day Jayson & Joseph 10/19

Liam

11th gr. class day 10/19 - Eve

Plastic Free

Senior Camp

10/5-6 due 10/13

- Alisha
- Senior Editors

Online:

News:

Dreams - Christina

- Sullivan 3rd storage

- College Visit Stats

- Admissions Process

Iolani - Luciano

Lower School:

- October Concert (Oct 31)

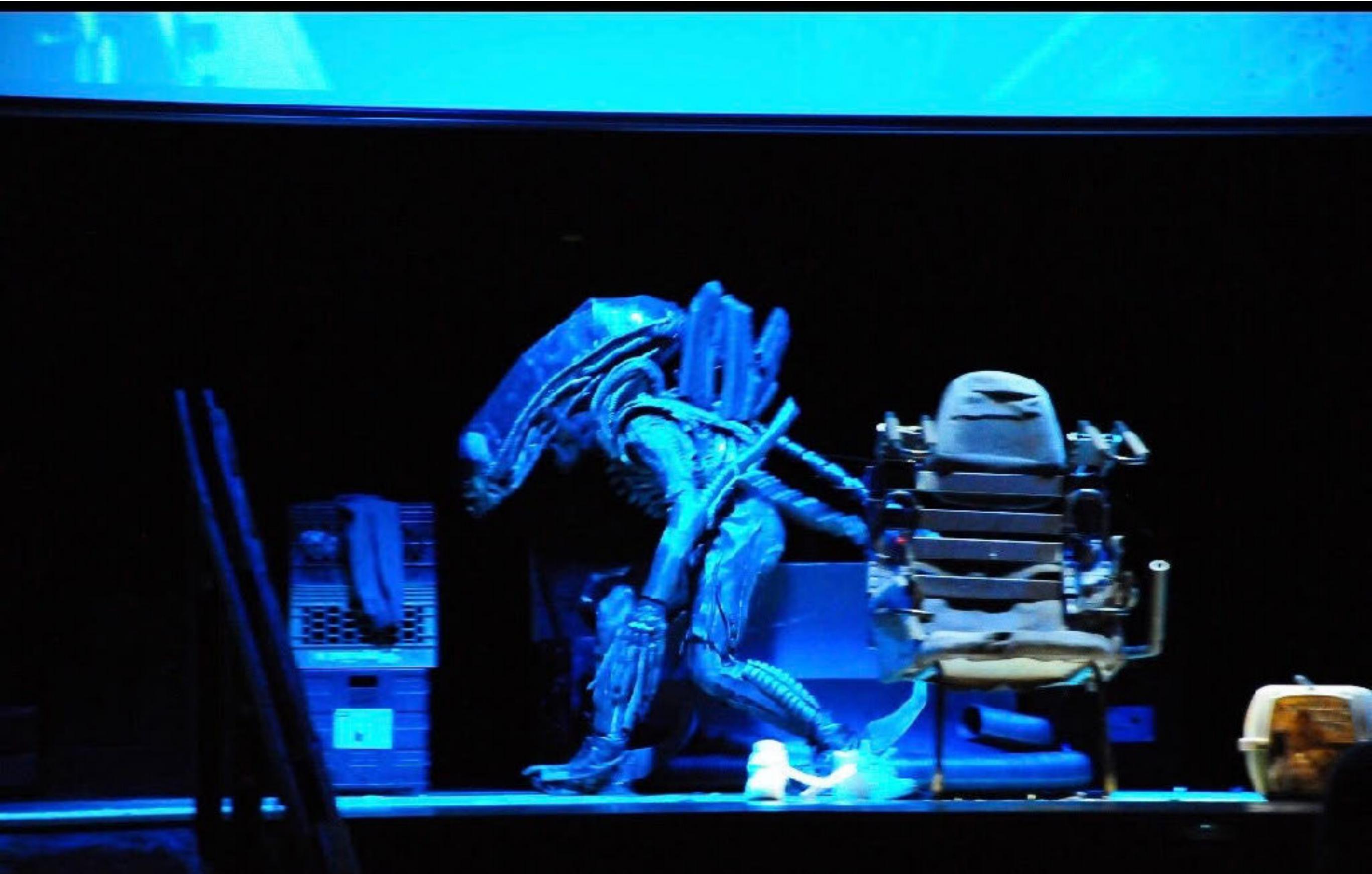
- Braden

Sports:

- Water polo

Alec

i'olani



North Bergen HS - Alien

To help save paper, please try to return the newspaper when you're done reading!

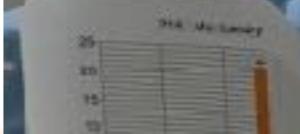
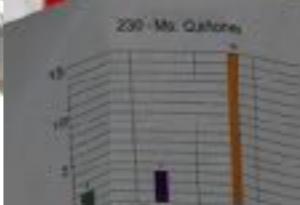
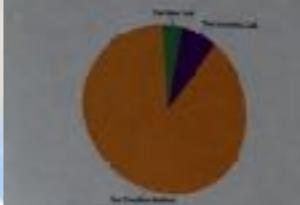
ESHI TIMES

Please take one!

Makerspace Voting Results

$$16+43+192+22=273 \text{ TOTAL VOTES}$$

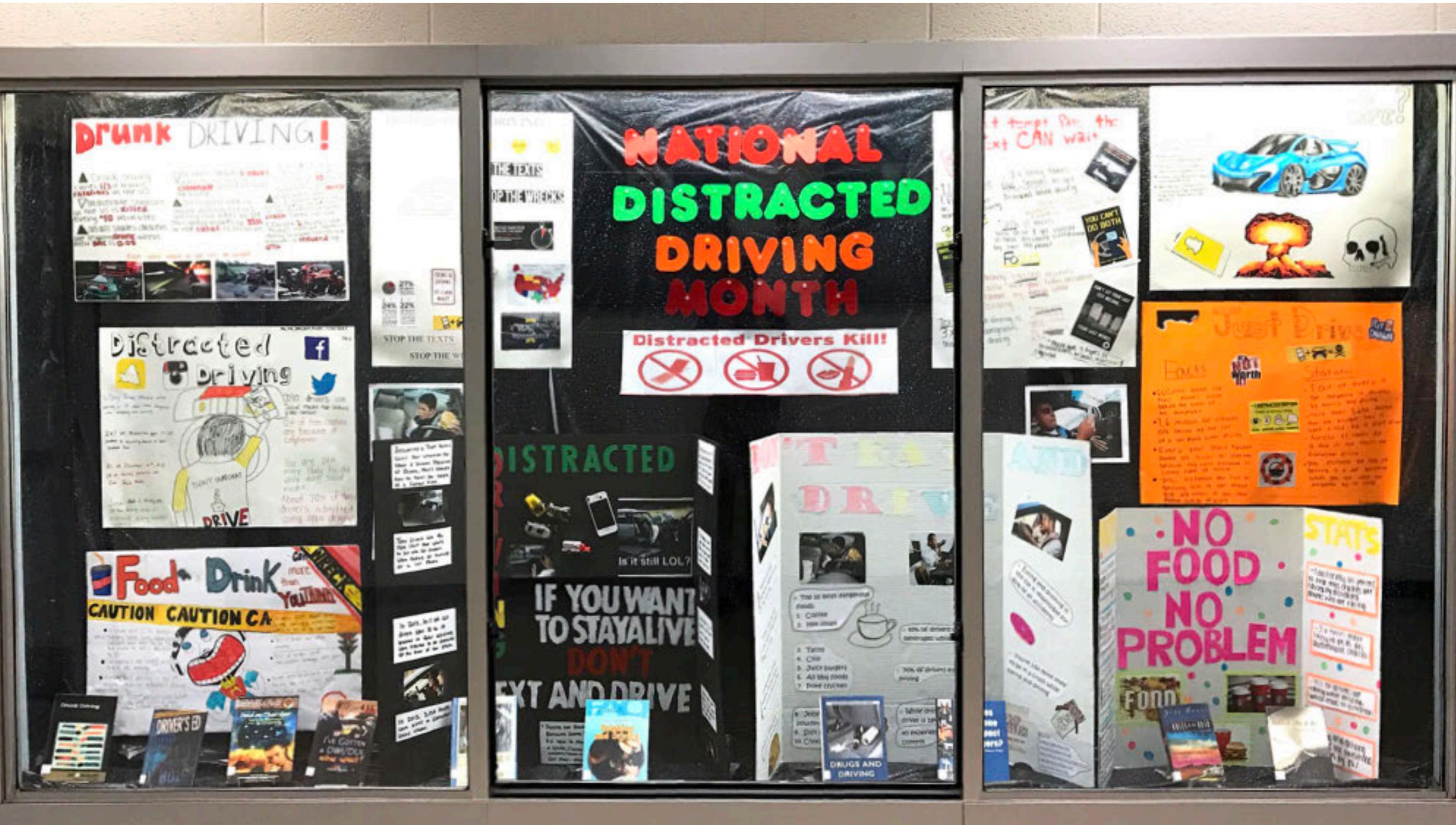
How can you use these numbers in your own number story?



$$\begin{array}{r} 16 \\ 43 \\ 192 \\ + 22 \\ \hline 273 \end{array} \text{ TOTAL VOTES}$$

Voting closed and the votes were counted on November 3rd, 2016.

Josh Ajima - Zero Things



Josh Ajima - Zero Things

Thingiverse

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Thingiverse Featured

FREE WEBINAR THURSDAY

5 Tips - Functional Prototyping with 3D Printing

Hurry, don't miss this chance to learn how you can leverage functional prototyping to test ideas faster, eliminate down time, and create better products in days instead of



Global Feed

Latest Thingiverse Activity



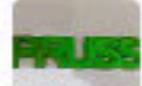
shebaak liked Overly Complicated Adjustable Marker Organizer



Grimtooth collected Pathfinder Location Deck



JackLaPocs collected N Scale Corn Syrup Tank



ata221 remixed Customizable name keychain

Featured Collections

Download and print today

see more



BOW 2019 6...



Father's Day



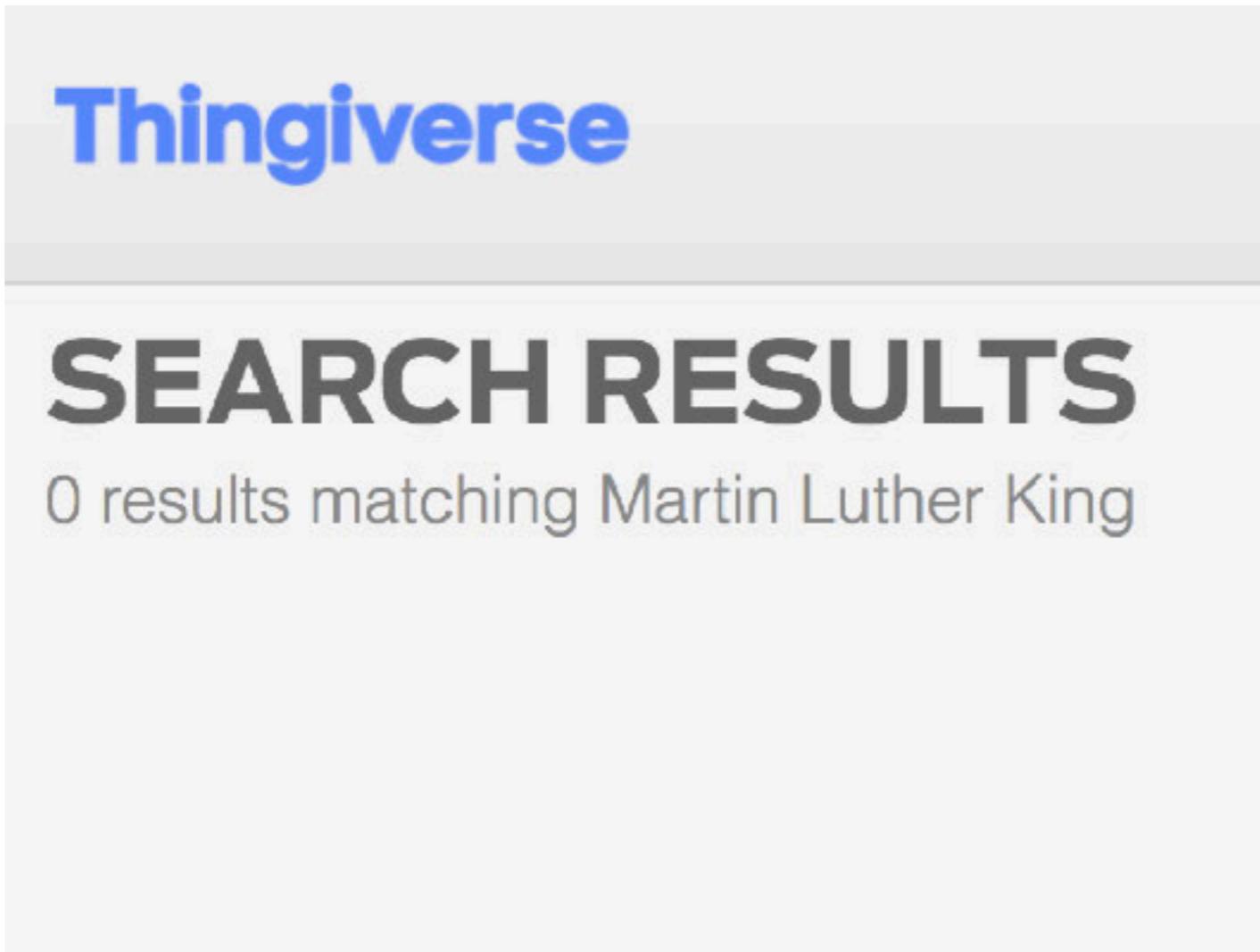
BOW 4/28-5/...



Mother's Day

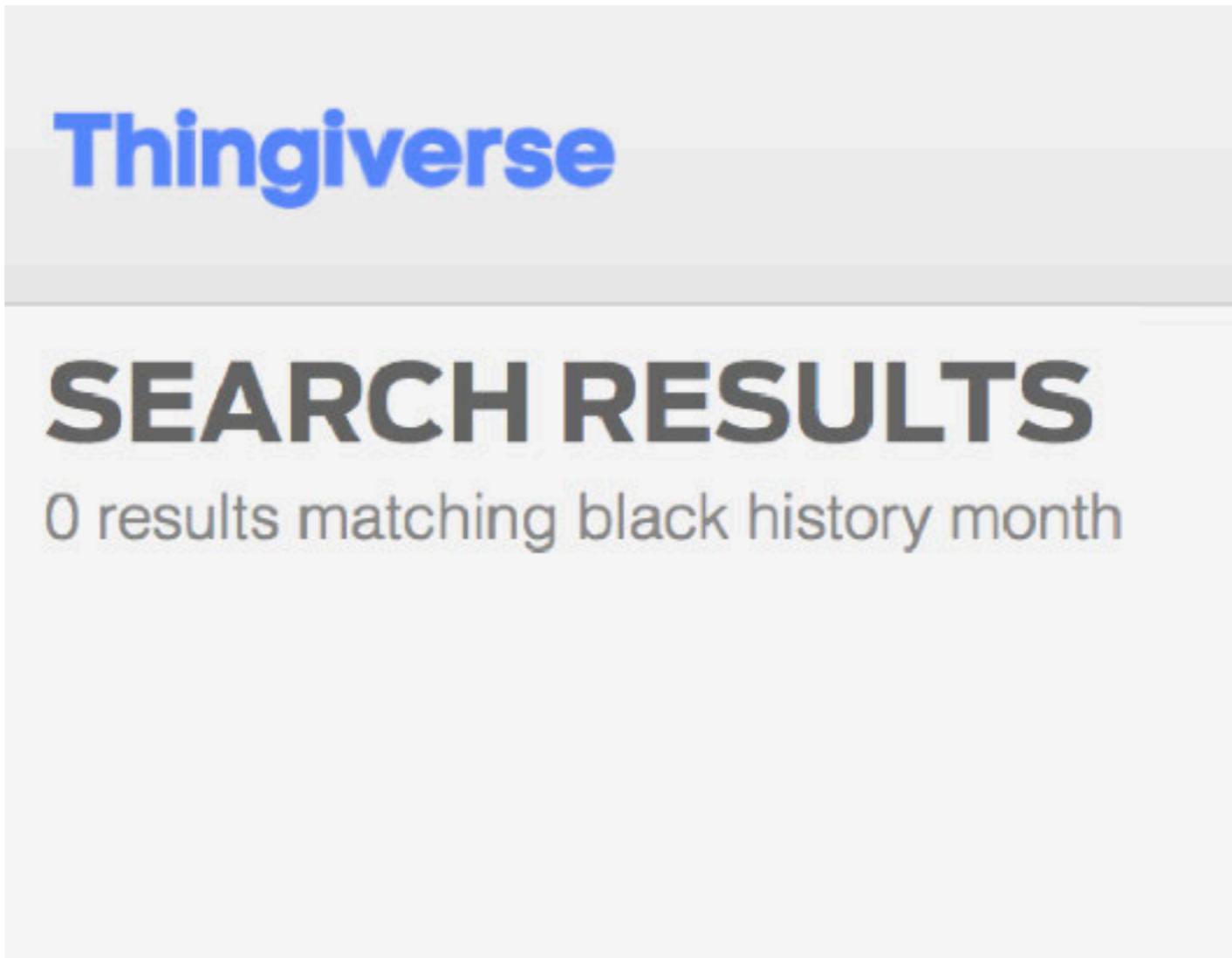


Josh Ajima - Zero Things



@designmaketeach

Josh Ajima - Zero Things



Josh Ajima - Zero Things

Thingiverse

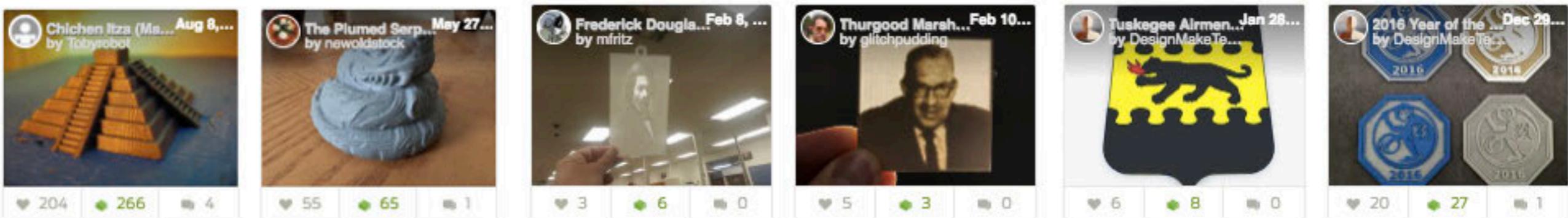
SEARCH RESULTS

269 results matching yoda

The image shows a search results page from Thingiverse for the query "yoda". The results are displayed in a grid format with 13 rows and 21 columns. Each row contains 21 thumbnails, each representing a different 3D model of Yoda or related characters. The thumbnails are arranged in a staggered pattern. Each thumbnail includes a small preview image, the model's name, the creator's name, and some numerical data (likely file size and download count). The overall layout is clean and organized, typical of a digital catalog or marketplace.



Page 5

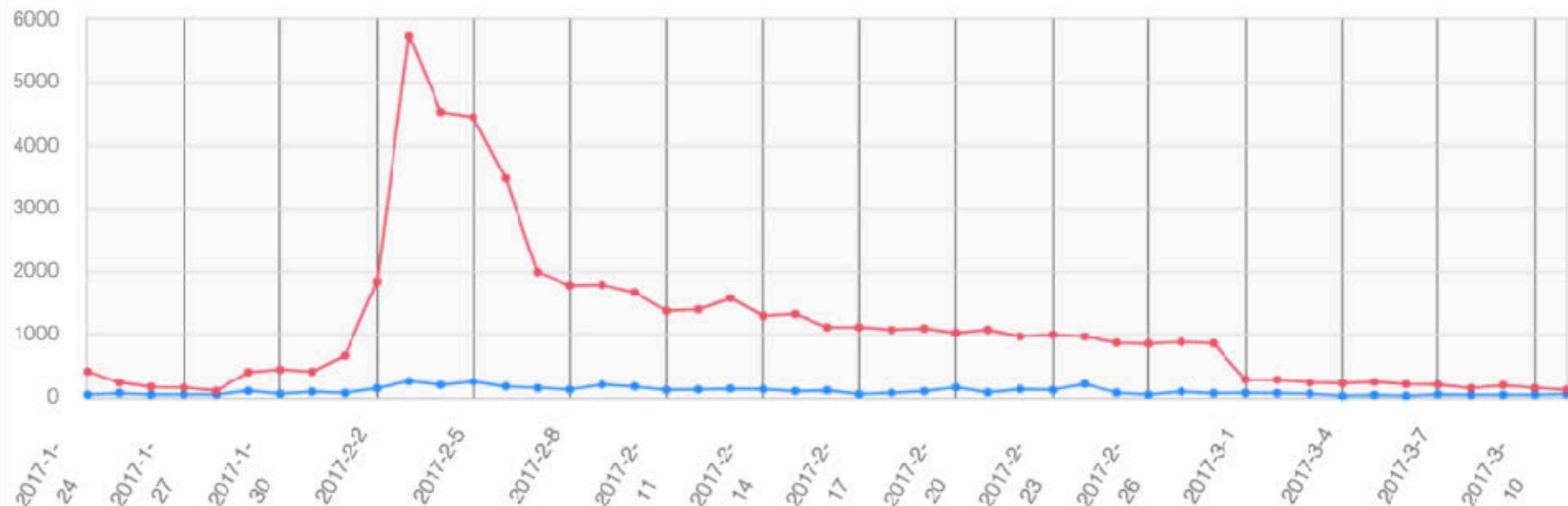




Thingiverse

Featured

@DesignMakeTeach placed portraits of NASA mathematicians Dorothy Vaughan, Mary Jackson, and Katherine Johnson in bas relief on the this Friendship 7 capsule. The story of their pivotal role in the first orbit of Earth by an American is told in the [book and movie](#) Hidden Figures. Print one, then see the movie!

[Learn More](#)

Tags

Add Tags

African American

Airmen

Black History

Tuskegee

Tuskegee Airmen

WWII



Summary

Challenge: Create and share a 3D design that celebrates the contribution of the Tuskegee Airmen and/or other African American Pioneers in Aviation and Space with the hashtag #TuskegeeAirmen. List this design as a source for your model.

A search for 3D printable models related to the Tuskegee Airmen or other African American pioneers in aviation or space returns 0 hits. This is no surprise given previous experience searching 3D repositories for models related to Martin Luther King, Jr.

<http://designmaketeach.com/2014/01/16/3d-printing-martin-luther-king-jr/>

The lack of models provides a rich opportunity for students, educators and 3d designers to make a significant contribution to the world.

My contribution is a 3D printable version of the patch of the 332nd Fighter Group. The design uses an image from Wikimedia https://commons.wikimedia.org/wiki/File:Shield_of_the_332nd_Fighter_Group.svg which was edited in Inkscape and then imported and remixed in Tinkercad.

Read the whole story about this design challenge at <http://designmaketeach.com/2016/01/27/tuskegee-airmen-3d-design-challenge/>

This thing was made with Tinkercad. Edit it online

<https://www.tinkercad.com/things/3Tgmnet8pUf>



National Hispanic Heritag... Sep 12, 2015
by DesignMakeTeach

NATIONAL
HISPANIC
HERITAGE
MONTH

3 1 0



2 2 0



El Salvador Outline
by DesignMakeTeach

2 days ago



2 1 0



1 1 0



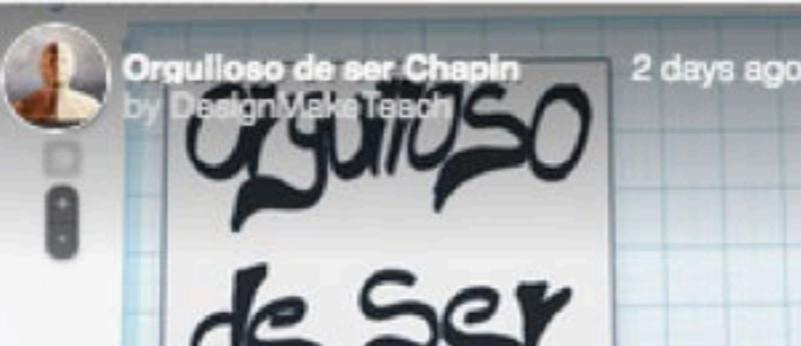
1 1 0



0 1 0



2 days ago



2 days ago



2 mins ago



Hispanic/Latino Heritage and Culture

by DesignMakeTeach, last updated Oct 3, 2016

Like

Watch

Share

Description

A collection to celebrate Hispanic and Latino heritage and culture. National Hispanic Heritage Month is celebrated in the United States from September 15 – October 15. Please join the National Hispanic Heritage Month group and contribute to the discussion and suggestions for addition to this collection <http://www.thingiverse.com/groups/hispanic-heritage/>

The purpose of this project is to encourage students to contribute to the diversity of models on Thingiverse by designing and posting models featuring Hispanic and Latino culture. Read more about this project at <https://designmaketeach.com/national-hispanic-heritage-month/>

CORDOBES - Hernan Cortes'...
Nov 19, 2015
by malopezn

Rendimiento COI
caballo de Hierro
Castilla la Vieja de la Cuna
Waf

7 7 0

Skull Candy Mold
Oct 21, 2015
by mfritz

29 29 2

Castanets
Sep 23, 2015
by 005

25 29 1

Torre Latinoamericana
by MiniWorld
Mar 14, 2016

28 27 0

Castle of Alcalá del Júcar
by MiniWorld
Aug 29, 2016

59 50 0

Santa Rosa de Viterbo
by MiniWorld
Mar 14, 2016

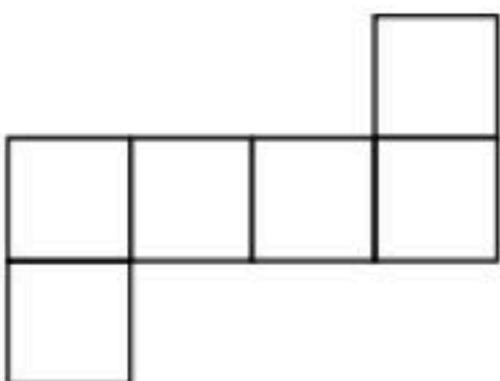
57 78 0

36 Which of these nets would form a cube when folded?

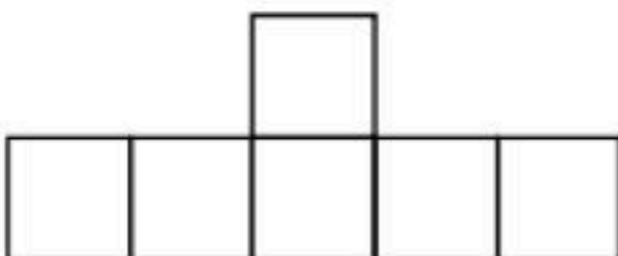
VIRGINIA STANDARDS OF LEARNING

Spring 2010 Released Test

F



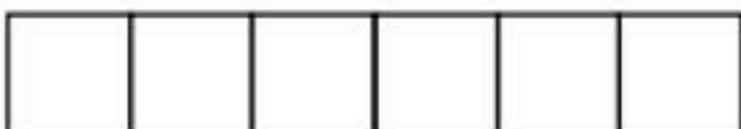
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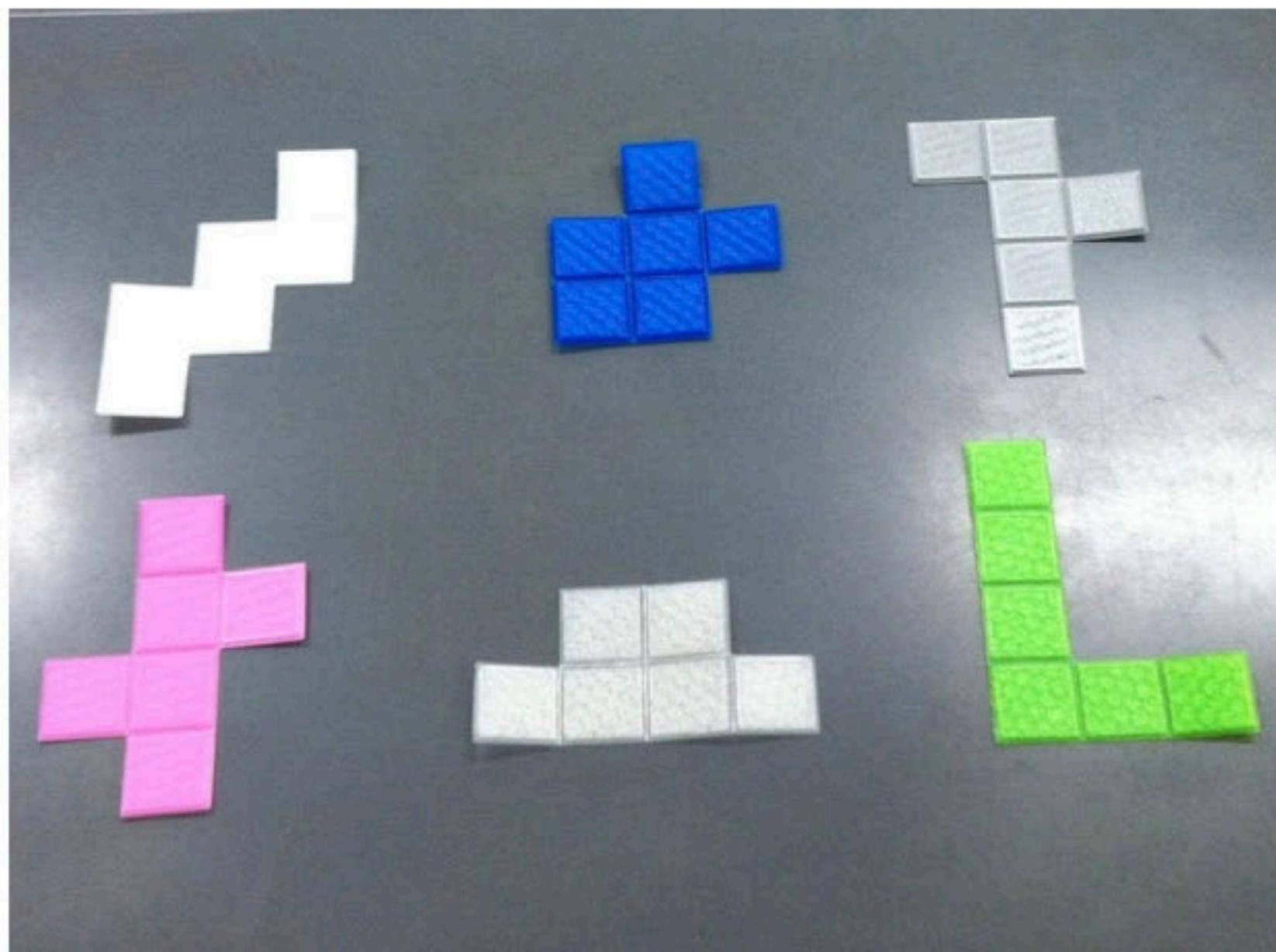


J



**END OF COURSE
GEOMETRY**

Form M0110, CORE 1





Entrepreneur Zone

Innovation, invention, and business learning



"Invention Convention" at Stuart Country Day School of the Sacred Heart



OC **Maker**
Challenge

STEM Education
through **3D Printing**



Fundraising

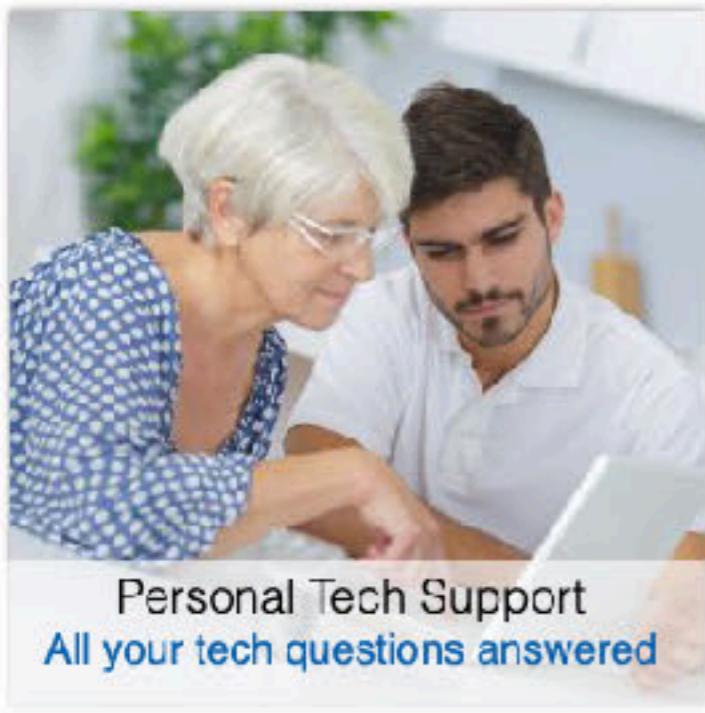


Generation Tech Support

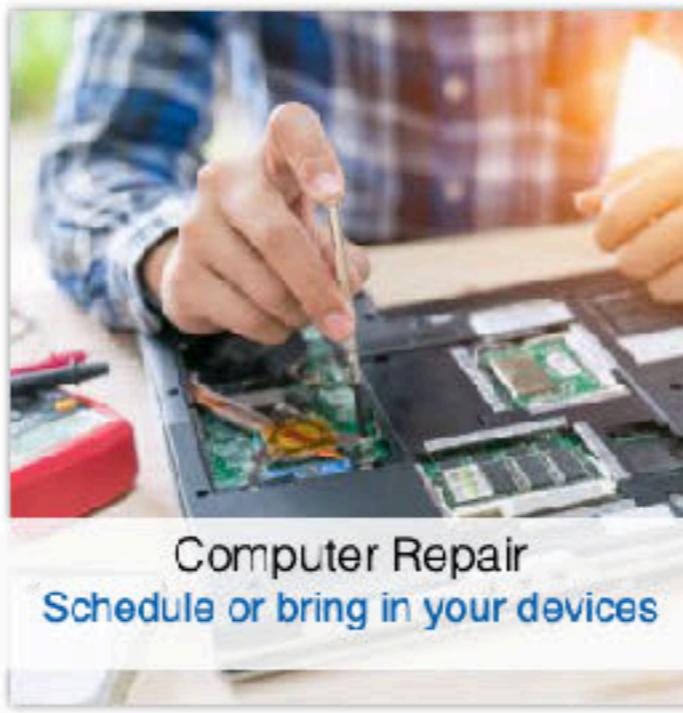
[Home](#)[Tech Services](#) ▾[KidsTech Summer](#) ▾[Contact Us](#)

GenTech is a full service tech center designed to serve all your tech needs
generationtechsupport.com

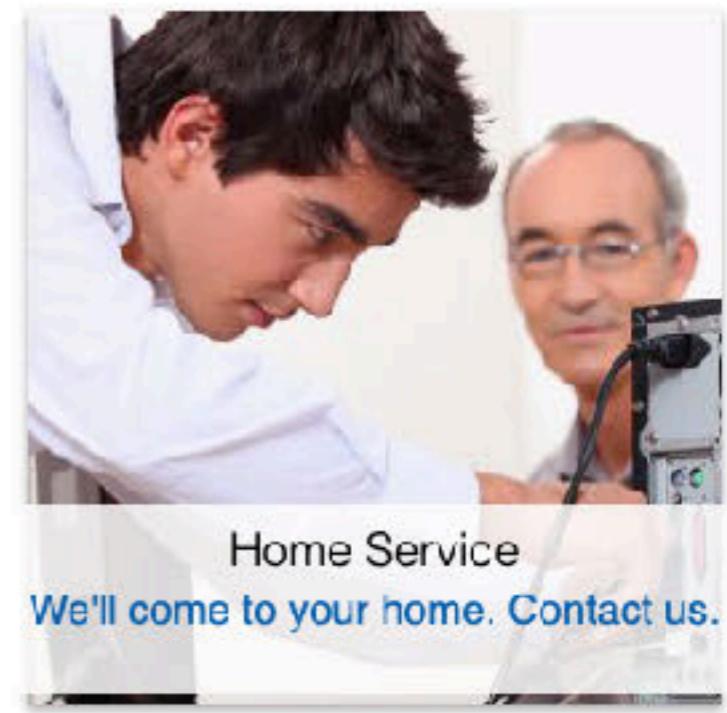
Generation Tech Support



Personal Tech Support
All your tech questions answered



Computer Repair
Schedule or bring in your devices



Home Service
We'll come to your home. Contact us.



KidsTech
Schedule your Summer Camp now!



GenTech in Schools
STEM KidsTech Programs are awesome



ProTech
Small group tech instruction. Coming soon!

Mesa Middle School Shark Tank



Pirate Plank



Libraries: Making Meaning Before Making was Cool



The library of the future, whether the physical space or its digital resources, can be the place where you put things together, make something new, meet new people, and share what you and others bring to the table. It's peer-to-peer, hands-on, community-based and creation-focused.

[Miguel Figueroa](#), the Center for the Future of Libraries

Library of the Future Makerspace

peer-to-peer

make connections

hands-on

make things

community-based

make the world a better place

creation-focused

make sense of the world

Warwick Public Library is First Library In Rhode Island to Create a "Makerspace"

8/25/2014

"Idea Studio' provides Warwick library-goers with high-tech gadgets for do-it-yourself projects, as well as space for community learning projects



MAKERSPACE CONNECTION - Eric Wineman explains household electronics to Audrey and Stephen Snow during a "Community Workshop" at the Warwick Public Library's "Idea Studio," the state's first library "makerspace." Listening in at far left is Librarian Evan Barta, coordinator of technology. All photos by Gina Macris, Library Report unless noted

The LIBRARY LINE

This blog is a principal news outlet of the *Library Report*.

Archives

[January 2016](#)
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[August 2014](#)
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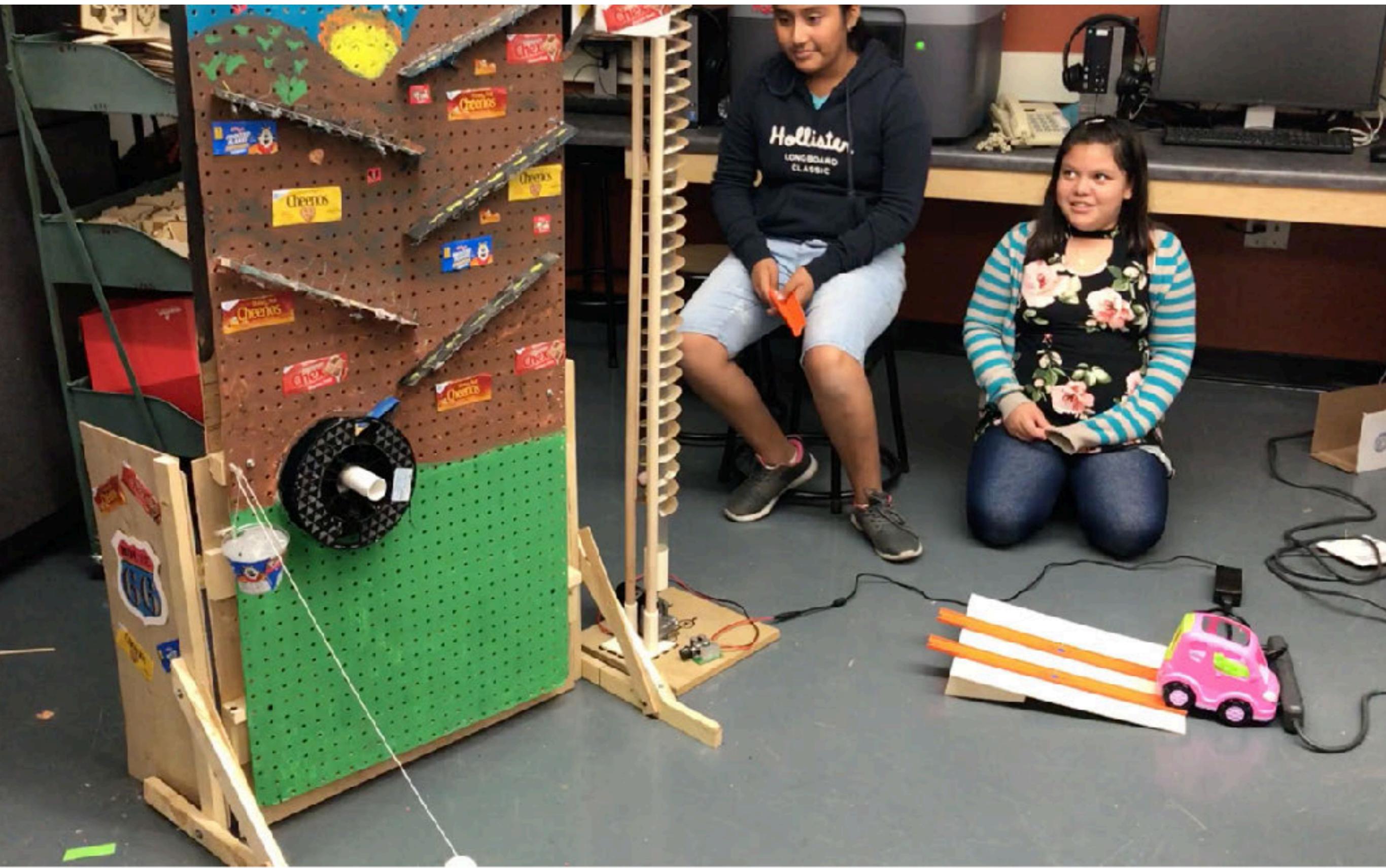
All

[RSS Feed](#)

Many aspects of the best makerspaces already exist in school libraries

- Libraries are community spaces that offer learning outside classroom structures and time limitations
- Libraries model cross-grade, cross-curricular experiences
- Libraries are about making meaning and making sense of the world, the most important aspects of making in an educational context
- Last but not least, libraries have librarians

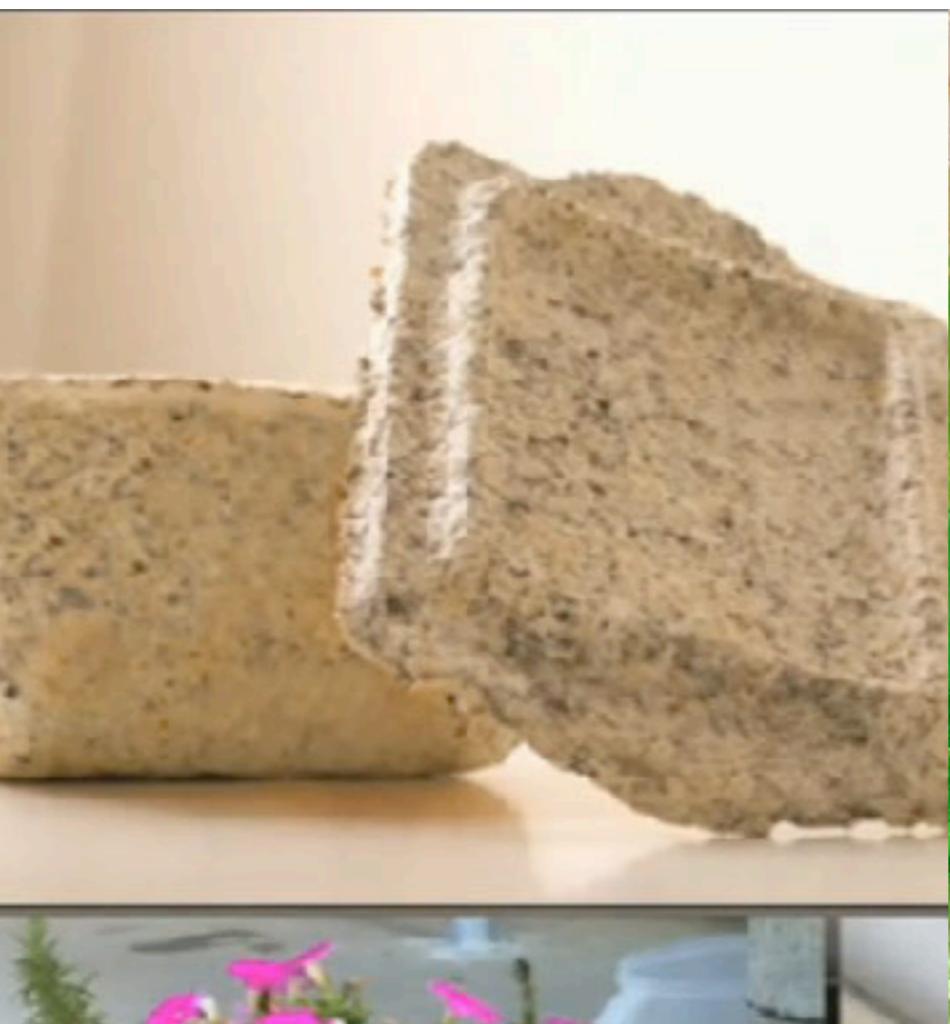
Go Green



Go Green

Reduce pollution, trash, and fix or prevent environmental damage

Fungus-based materials



Bioplastics



Eco-Friendly filament





Elena Amato creates sustainable cosmetics packaging from bacteria



Natashah Hitti | 28 February 2019 | [Leave a comment](#)

Guatemalan designer Elena Amato has created sheets of bacterial cellulose with paper-like qualities as a [sustainable](#) alternative to the [plastic](#) packaging used in personal care products.

The bacterial cellulose sheets were developed using a mixture of water and a [bacteria](#) ([link](#)) culture, which is blended together before being spread out on a flat, dry surface and left to dry.



DAVIDE GROPPY

Top design stories

[Most popular](#)

[Most recent](#)



1 [IKEA and Design Indaba launch Overallt furniture by African designers](#)



Corinne Okada Takara @CorinneTakara · Mar 26

Nest Makerspace team wondering where their kombucha leather wings are around the globe now. If you got one these at #FabLearn, could you share a photo of your wings & where you are? Thanks @titojankowski for this idea of a sort of Flat Stanley sharing! @Biodesigned #biotinkering



Corinne Okada Takara Retweeted

Caitlin Nealon, PhD @ BDC @benchadjacent · Jun 20

The GIY Biobuddies gave an awesome presentation of their biodesign toy kits @Biodesigned. It's been amazing to watch these young women grow their project this year! #bdcsummit2019



5

14



RESOURCES

SCHOOLS

SPONSORS

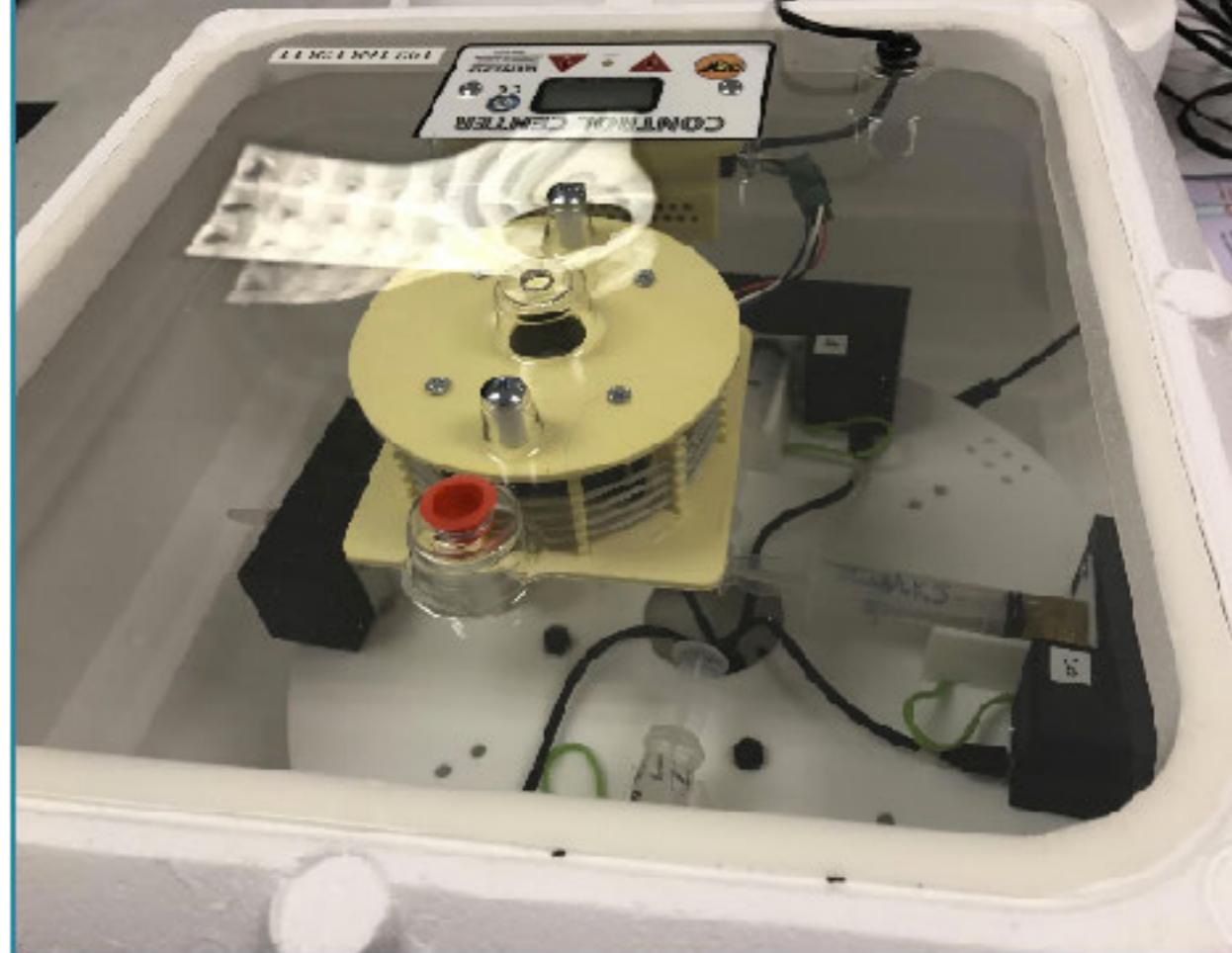
LEARN. CREATE. GROW.

Biodesign Challenge

biodesignchallenge.org

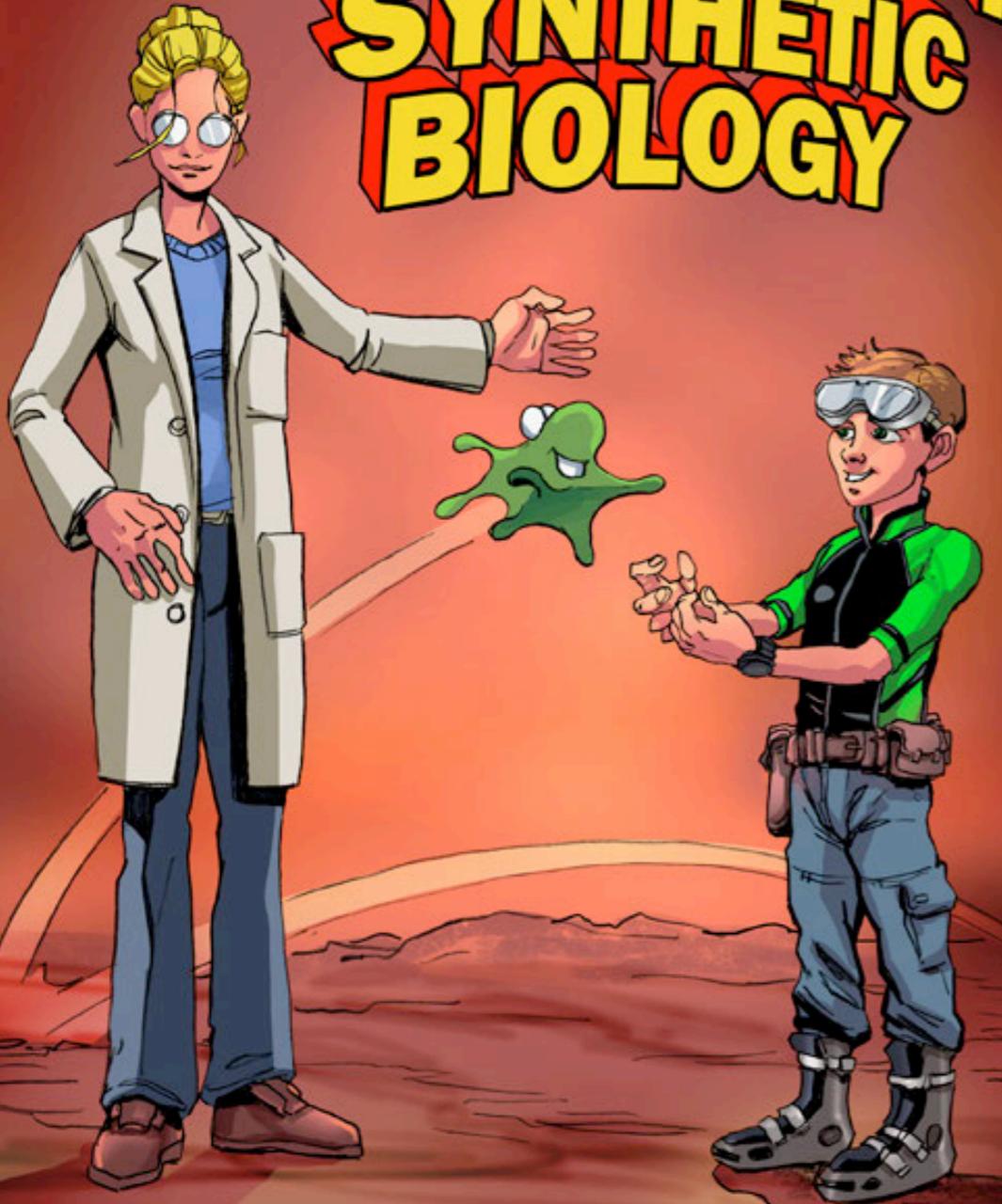
biomakerlab

- Prototype stage: a low cost mobile lab device used to genetically modify and fabricate (grow) bacterial or yeast cells
- 3 units of HS curriculum being developed with UPenn (PennDesign Emerging Design Practices, and Grad School of Education)

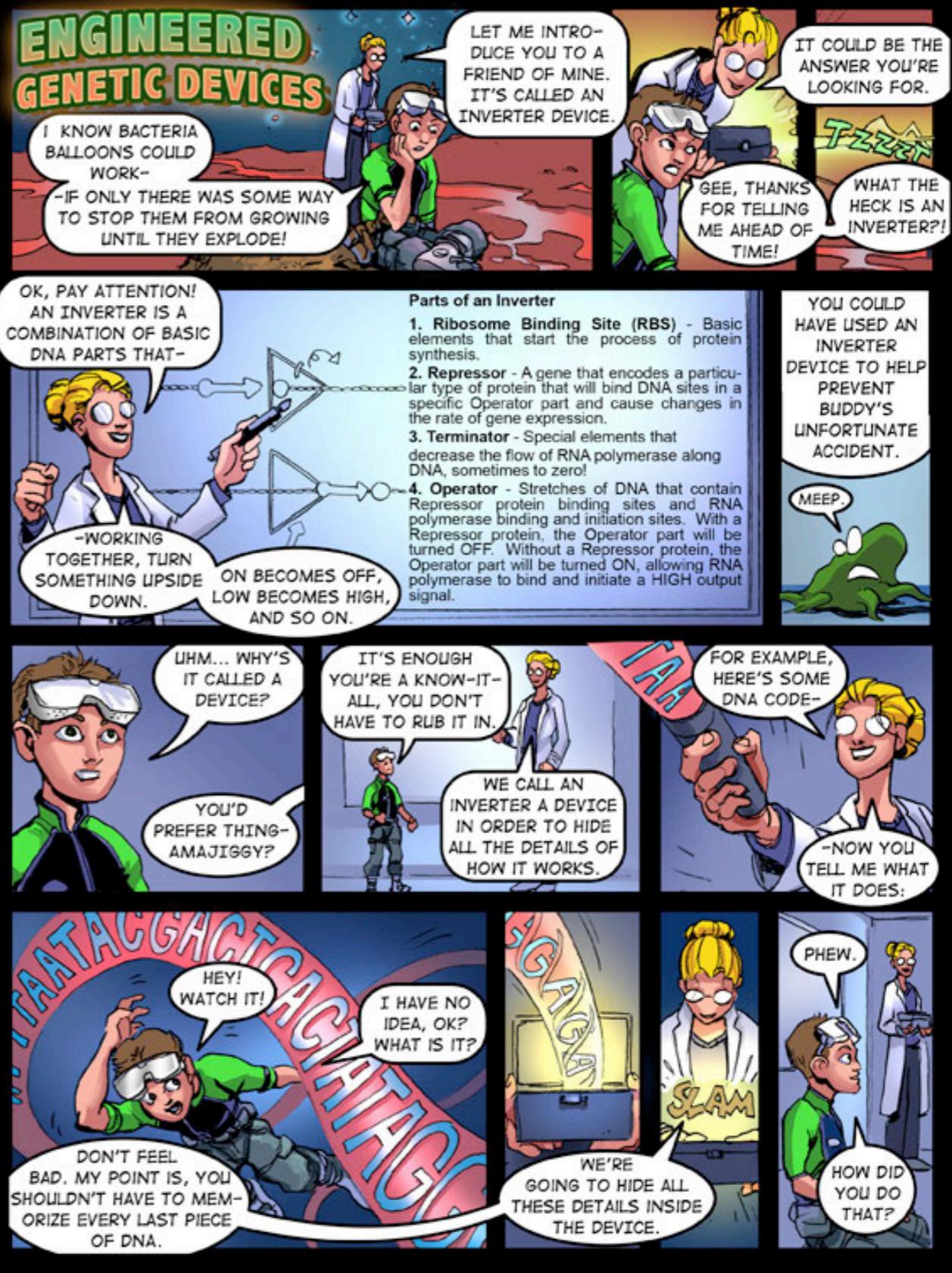


Justice Walker, grad student, teaching HS
sylviamartinez.com

ADVENTURES IN SYNTHETIC BIOLOGY



STORY: DREW ENDY ISADORA DEESE
THE MIT SYNTHETIC BIOLOGY WORKING GROUP
ART: CHUCK WADEY www.chuckwadey.com



biobuilder.org

Resources, lab kits, workshops

Community Chest



diesen Freitag 15-18 Uhr





Blackstone Bicycle Works

[OVERVIEW](#) [YOUTH EDUCATION](#) [RETAIL](#) [LOCATION AND HOURS](#) [RACING](#) [PROGRAMS](#) [FRIENDS AND SUPPORTERS](#) [FAQ](#)

OVERVIEW

Blackstone Bicycle Works is a community bike shop and youth education program of the Experimental Station. The mission of Blackstone is to provide educational and vocational opportunities to youth from some of Chicago's most underserved neighborhoods. Blackstone is structured as a retail, full-service bike shop that offers an "earn and learn," hands-on bicycle mechanics curriculum to its participants. Our year-round program teaches participating youths on-the-job training in mechanics and repair, customer service and management, and peer-education. Participation in our program is voluntary, free of charge, and open to any child, age 8 to 18.

Blackstone operates on an apron system. Kids earn colored aprons indicating five achievement levels—gray, green, red, purple, and black. These aprons function much like the colored belts in martial arts, with black signifying mastery. Those kids who have achieved purple and black aprons are selected for promotions, such as paid internships and paid externship positions.



Blackstone Bicycle Works

Spring Break Workshops

Free bike workshops for 8-12 year olds!
Space is limited, apply early at exp.st/springbike

ABCs of Bike Safety

Wednesday, April 17, 2019 1pm-3pm

Summer is almost here! Learn what is needed to keep your bike safe and working through fun, hands on activities.



Learn to Ride a Bike

Thursday, April 18, 2019 1pm-3pm

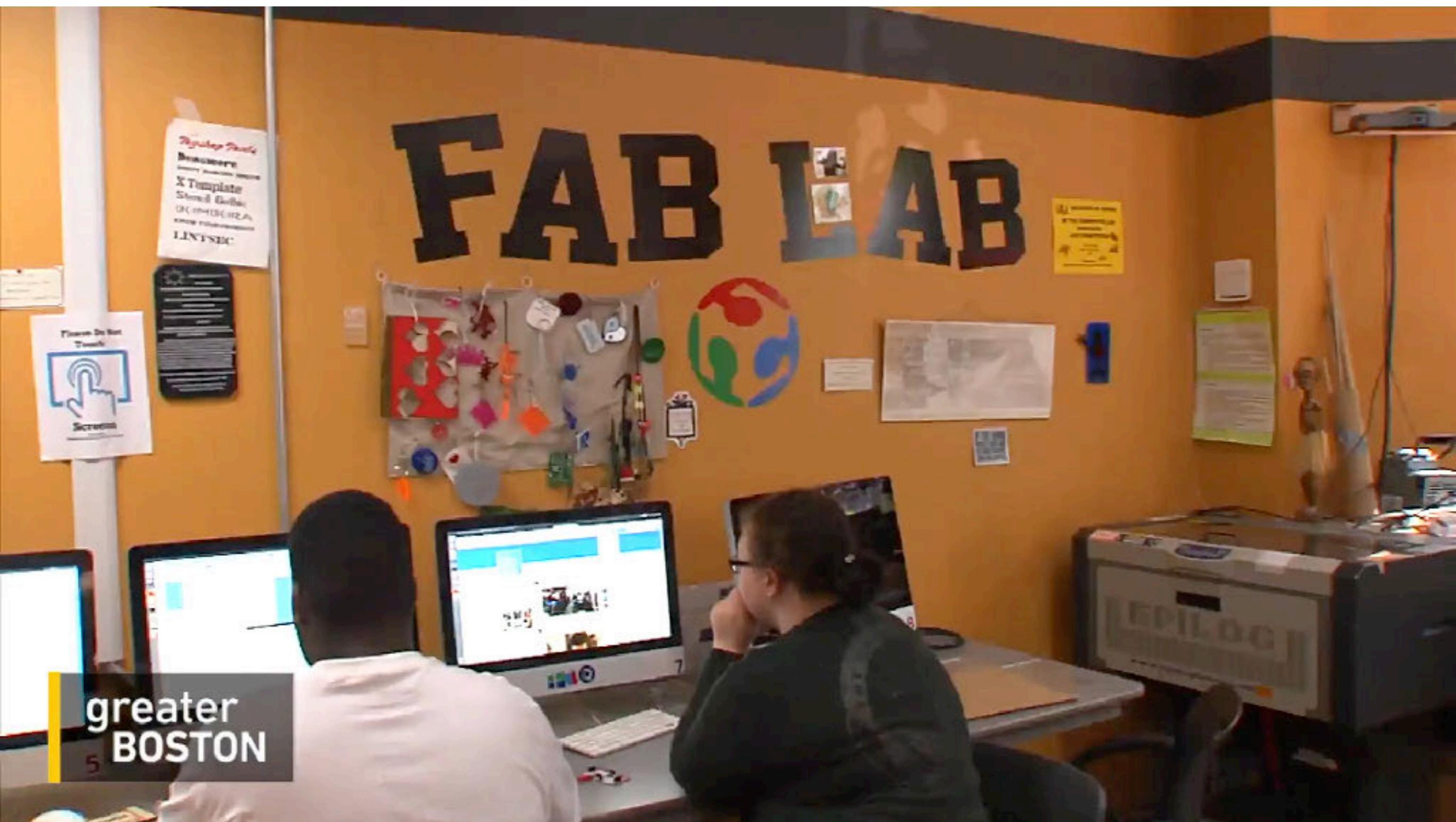


Blackstone Bicycle Works



Blackstone operates on an apron system. Kids earn colored aprons indicating five achievement levels—gray, green, red, purple, and black. These aprons function much like the colored belts in martial arts, with black signifying mastery. Those kids who have achieved purple and black aprons are selected for promotions, such as paid internships and paid externship positions.

Learn 2 Teach Teach 2 Learn



Stream Outreach Statistics

Lessons (238): Lesson 1 (111)
Lesson 2 (64)
Lesson 3 (64)

Total animals captured (9598):

Invasive (99.2%)
Native (0.8%)

Total removed weight: ~525 lbs



Research:

- Is it necessary to know the distribution of mosquito populations of the genera Aedes & Culex to better understand disease? Zika and Chikungunya.
- Is it better to identify potential risk factors for being mosquito-free? Climate, vegetation, land use, etc.
- An ecological niche model can predict mosquito activity with temperature, humidity, elevation, soil chemistry, rainfall, humidity, rainfall, longitude, latitude, species richness, etc.

Research questions:

- What mosquitoes are located within the school walls?
- How can we minimize the number of mosquito larvae collected?

Purpose:

- To determine the location of different mosquito populations within the school grounds by collecting mosquito larvae.
- To determine beneficial uses of mosquito larvae through the production of mosquito repellent.

Approaches:

- To conduct surveys and monitor the environment to predict the distribution and density of mosquito larvae.
- Then, visit the field to take mosquito larvae samples through mosquito collection.

Values:

- Citizens in Miami Beach City, St. Louis Height, Webster and Naples have suffered the presence of Aedes aegypti.
- It is believed that Aedes aegypti is a mosquito that spreads dengue fever and Zika virus.
- The production was used in mosquito repellent.

Process of the Project:

Materials and Methods:

Rearing mosquito Aedes aegypti (mosquitoes). For this, we used direct GPS model examples or Google Earth, (Google Earth).

I produced a procedure for collecting samples of larva and adult mosquitoes using 'Jax trap', water traps, and mosquito nets.

Long-term:

evaluated the presence of Aedes aegypti in areas of local heights, schools and local neighborhoods for more than one year. Neighborhoods completely correlated with each other. Comparisons between the neighborhood distribution in areas of residence. Patterns of mosquito distribution suggested the importance of temperature, relative humidity, and P. vivax in C. jacchini. Significant rates of loss of life were observed in areas of low habitat quality. Impacts of insecticides on mosquito larvae were also assessed.

Further Research:

A 2016 science project using data from the United States Environmental Protection Agency's National Mosquito Control Program to show that mosquito larvae are collected from data sets. Using a mobile app or smartphone, Mosquito larvae can easily be collected, parse, and analyze. This project can reduce public health risks by reducing collected data sets.

Conclusion:

Collection in Miami Beach City, St. Louis Height, Webster and Naples have suffered the presence of Aedes aegypti.

References:

- 1. Aedes aegypti classified as Aedes.
- 2. Aedes aegypti was found in Webster and Naples.
- 3. Comparison of mosquito data presented in 2016, were compared to the world map.

Information:

Information about mosquito biology, life cycle, and control methods. Information about the impact of mosquito bites on human health, including dengue fever, chikungunya, zika virus, and yellow fever. Information about the role of mosquitoes in the spread of diseases, including malaria, filariasis, and leishmaniasis. Information about the impact of mosquito control measures on the environment and ecosystem.



Stream Outreach Statistics:

Lessons (238): Lesson 1 (111)
Lesson 2 (64)
Lesson 3 (64)

Total animals captured (9598):

Invasive (99.2%)
Native (0.8%)

Total removed weight: ~525 lbs

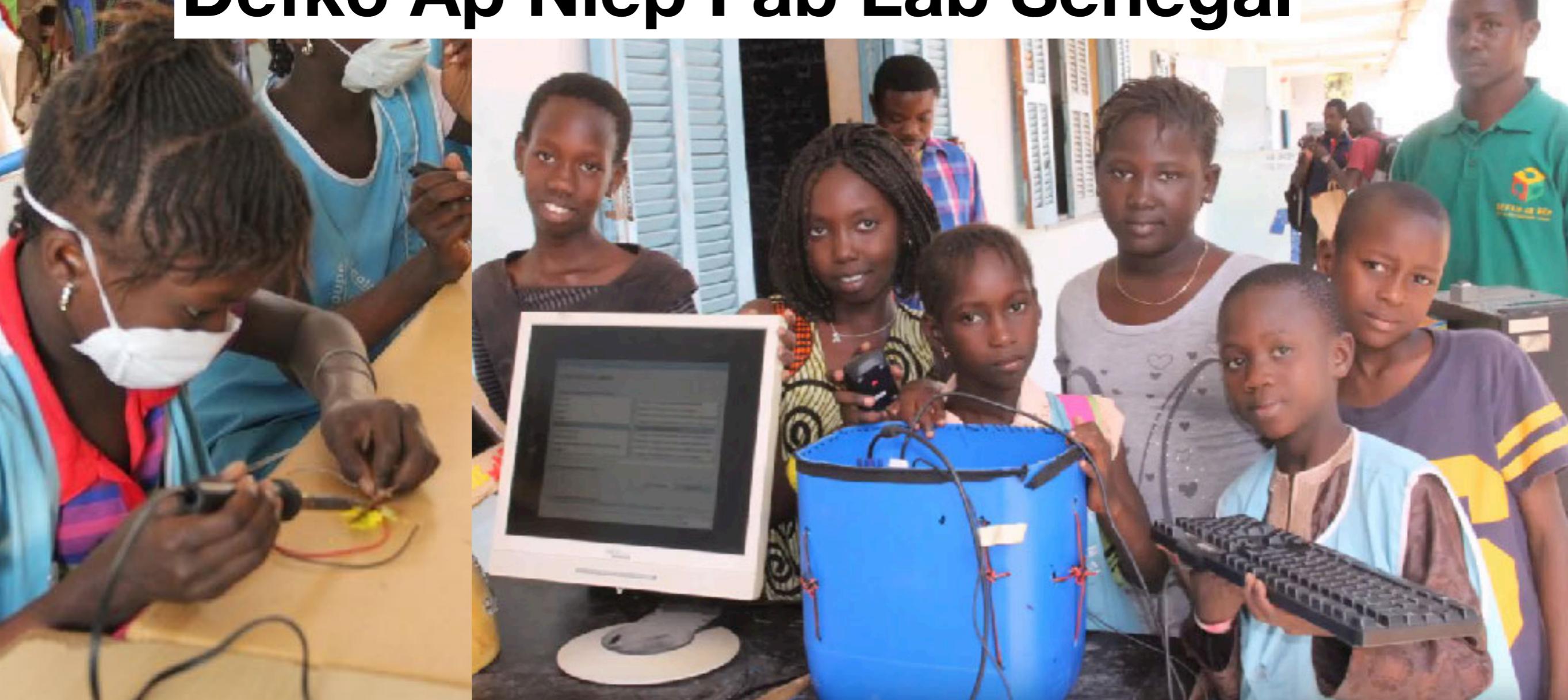
Mahalo!

Ioani School
Yvonne Chan
Tim Gottrell
Michael Itoh
Linda Koch
Jennifer Ho
Kim Kamashiro
ABC Stars
Volunteers
Roxana Anna
NHS
DCEP
JANIS
ASTRISE CENTER

ALL PARTICIPATING SCHOOLS, EDUCATORS, AND STUDENTS!!



Defko Ap Niep Fab Lab Senegal



**“The role of
the teacher is
to create the
conditions for
invention
rather than
provide
ready-made
knowledge.”**

- Seymour Papert



Creating conditions for invention

- 💡 Interesting materials
 - ▶ Choice
 - ▶ Engage with (not learn from)
- 💡 Engineering design
- 💡 Expertise in many forms
- 💡 Iterative design (time)
- 💡 Teacher as curator, observer, instigator



Spaces That Invite...

- Artistic expression
- Flexibility & serendipity
- Sense-making (not making stuff)
- Agency



Analyze, measure, predict

How cold? How long will the ice last? Why?



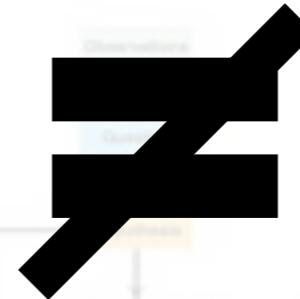


Next Generation Science Standards

- Elevates engineering design to same level of importance as scientific inquiry
- Why?
 - Aspirational: Scientific challenges are motivating and kids want to make the world a better place
 - Practical: Real tools, real research, real projects are relevant and sustain interest
- This calls for a different approach to science

Engineering

is a design process



The Scientific Method

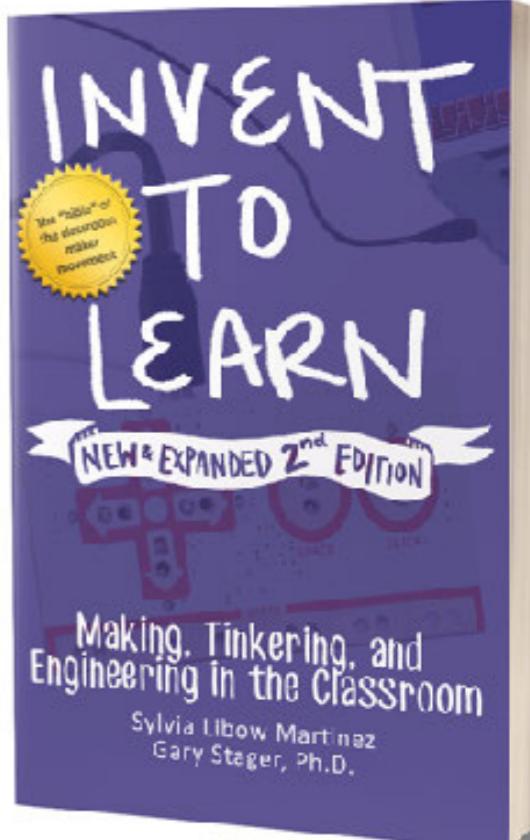
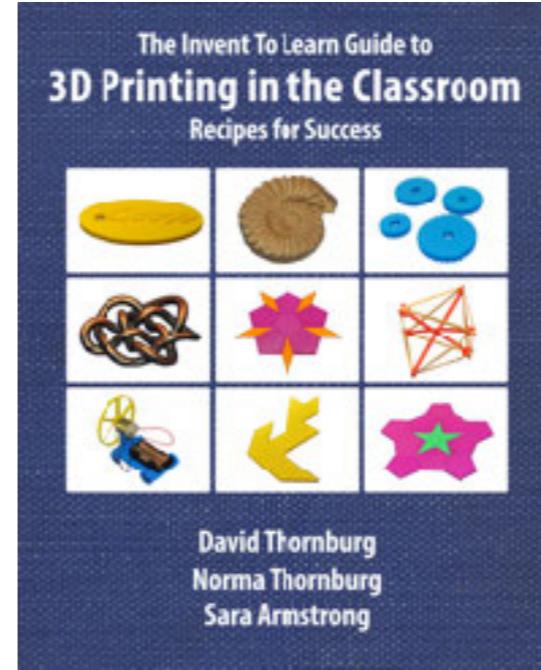
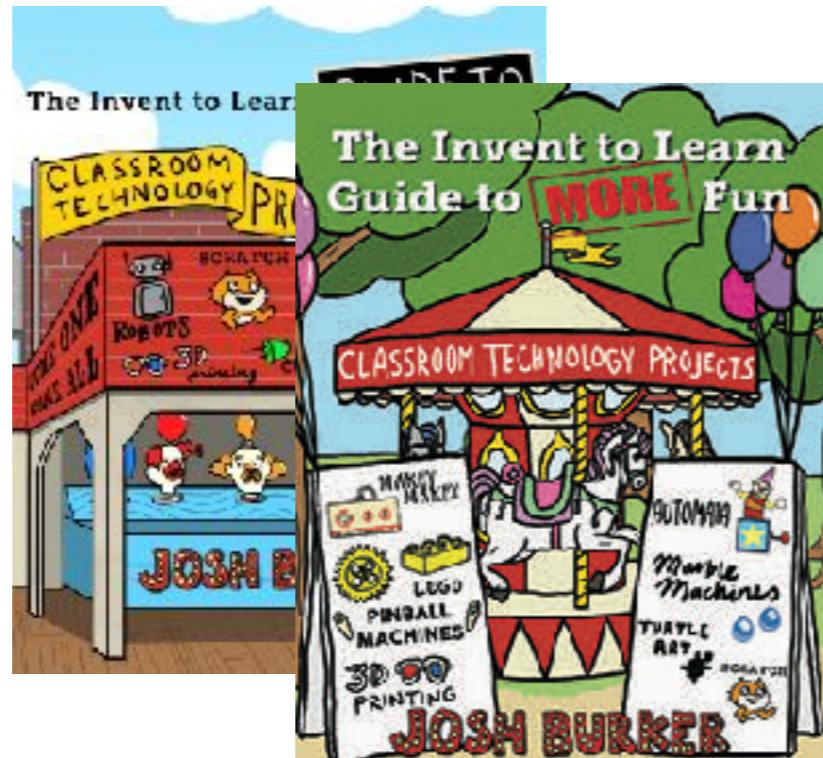
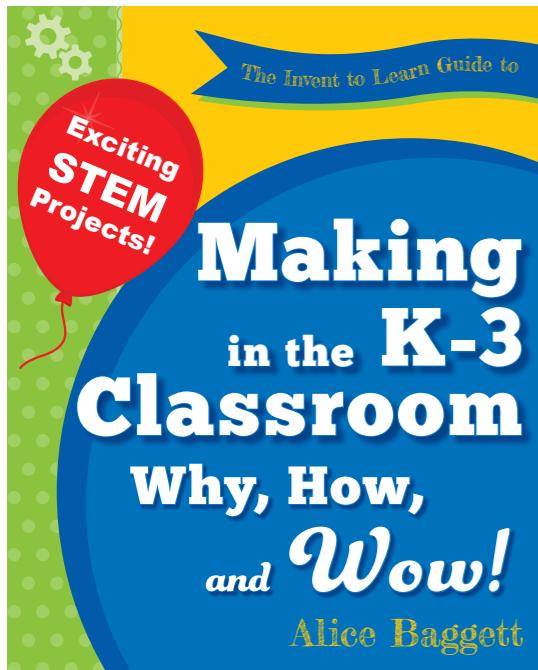
is a testing process

So what do we do?

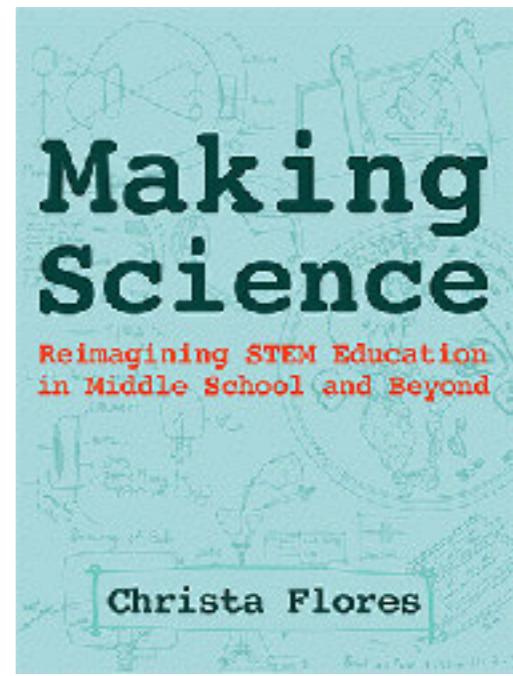
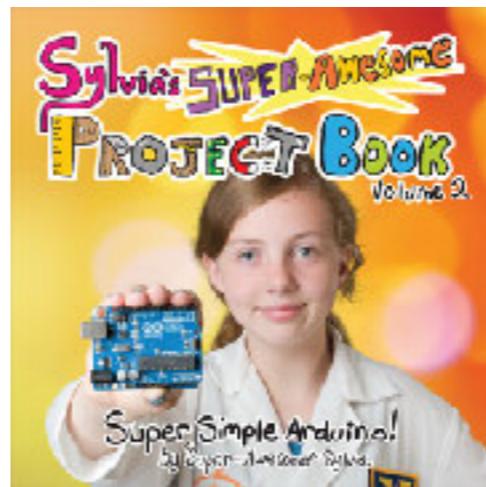
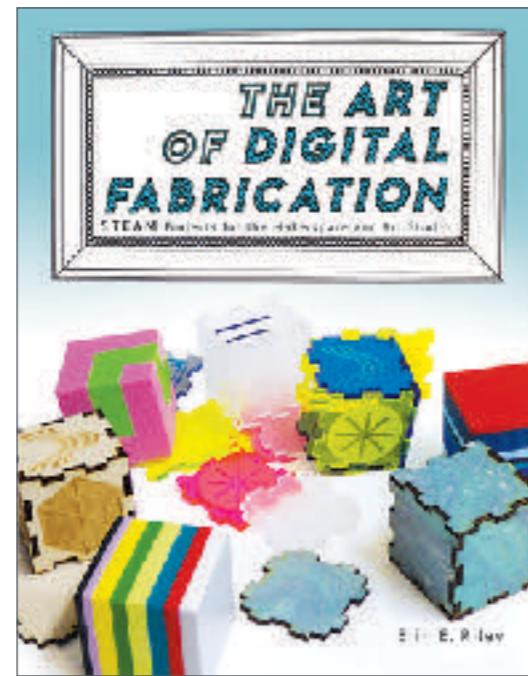
We learn from each
other

Books from CMK Press cmkpress.com

Invent to Learn Guides



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amazon.com



So what do we do?

We learn from each
other

We do R&D

FAILURE IS NOT AN OPTION

R & D

IT IS A *REQUIREMENT*

What else do we do?

We co-create with
students

Your best allies and advocates



What else do we do?

We co-create with
students

We stand on the
shoulders of giants

The real cause of
failure in formal
education is...
that one begins
with language
instead of
*beginning with
real and material
action.*

- Jean Piaget





Never help a
child with a task
at which he feels
he can succeed.

- Maria
Montessori



Never help a
child with a task
at which he feels
he can succeed.

*Unless it's taking a
long time, then
just tell them what
to do.*

- NOT Maria
Montessori

NEW RESEARCH FINDINGS

The road from Maker to computer science and engineering for girls and women

Making is a great way to interest girls and women in computer science and engineering activities.



Research suggests that girls involved with making, designing, and creating things with electronic tools may build a stronger interest—and greater skills—in computer science and engineering.

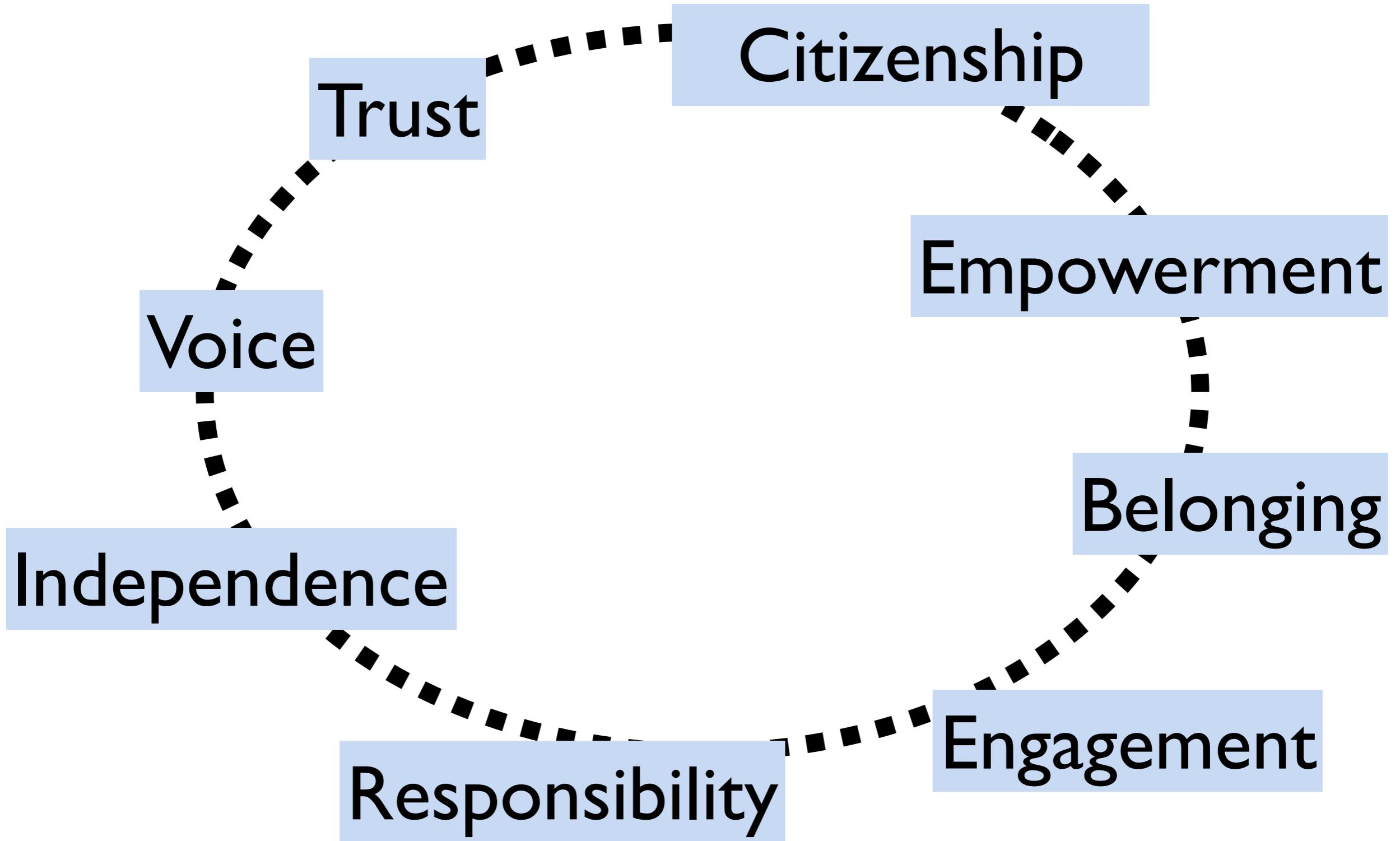
Maker Empowerment

“A sensitivity to the designed dimension of objects and systems, along with the inclination and capacity to shape one’s world through building, tinkering, re/designing, or hacking.”

- *Agency by Design, Harvard Graduate School*



"Everything is a lot more simple to make. I can do things really quickly now that I know how to look at stuff."
- Talon, 11 years old





How do teachers learn to teach this way?

<http://www.inventtolearn.com/workshops/>
<http://constructingmodernknowledge.com>



Where
educators
invent the
future!

Constructing Modern Knowledge

July 15-19, 2019 Manchester, NH USA

constructingmodernknowledge.com

Seize this moment in history to give kids the mindset, tools, and techniques to ***make sense*** and ***take charge*** of their world.



Let's MAKE it happen!



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