

Resources for Educators and Students

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Lesson Resources

- [Library of Congress Teacher Resources](#)
- [Smithsonian Learning Lab](#)
- [MIT Invention Education](#)
- [NASA STEM Engagement](#)
- [Giant Mars Map](#)
- [NAVSEA STEM Outreach](#)
- [Coding with Cup Stacking](#)
- [Army Educational Outreach](#)
- [Geographic Information System Software for Schools](#)
- [Junior Botball Challenge](#)
- [NASA OPSPARC](#)
- [NASA Design Challenges](#)
- [Cubit](#)
- [Tinkercad 3D Design](#)
- [Scratch Programming](#)
- [Ozobot Lessons](#)
- [Because Learning!](#)
- [Little Bit Lessons](#)
- [Simple Machine Lessons](#)
- [Mindstorms](#)
- [Buck Institute](#)
- [Code/fwd](#)

- [FabSLAM](#)
- [National Geographic Resources](#)
- [AEOP eCybermission](#)
- [PBS Learning](#)
- [NASA Future Engineers](#)
- [USPTO Science of Innovation Video Series](#)
- [IEEE Reach](#)
- [Civil Air Patrol Educator Resources](#)

Conferences

- ITEEA
- NSTA
- NCTM
- ISTE
- IETA
- NCCE
- Space Exploration Educators Conference
- AGU
- ASCD
- NARST

Professional Development Opportunities

- [Albert Einstein Distinguished Educator Fellowship Program](#)
- [SEEC Crew Member](#)
- [USPTO National Summer Teacher Institute](#)
- [The Library of Congress Summer Teacher Institutes](#)

- [TEACH EARTH, UNITED STATES](#)
- [National Geographic Grosvenor Teacher Fellowship](#)
- [NOAA Teacher at Sea](#)
- [i-STEM Summer Institutes](#)
- [K-12 Professional Development Grant Application](#)
- [Space Center U Educator Program](#)
- [Fullbright for STEM Teachers](#)
- [Fund for Teachers](#)
- [Travel for Teachers](#)
- [Donorschoose.org](#)

Elementary Engineering at Galileo

Curriculum

Beginning of the year, start with a lesson/s that allows you enough time to teach the routines and practice claim, evidence, and reasoning. (I have used Ozobots, NASA lessons, etc.)

K- Bricks (instructions and free build)

1-Brick (more complex instructions and challenges), WeDo, and 3D printing

2-K'NEX, WeDo, 3D printing

3-LEGO Technics, Mindstorms, 3D printing (City X Project), Rube Goldberg project

4-LEGO Technics, Mindstorms, Raspberry Pi, 3D printing (City X or other), real-world project

5-FischerTechniks, Mindstorms, Raspberry Pi, 3D printing (City X or other), real-world project

Post-it notes

I use certain colors of post-it notes to identify different grade levels (I purchased extra, so you have plenty)

The color coding makes it easy to identify

Post-it notes are used to store projects that are being saved

Post-it notes are also used to indicate when 3D designs are ready to be printed

Folders

Students may decorate the cover of their folders but not their names

Students use the folders to take pictures of their builds on, so if they accidentally choose the wrong name in Seesaw, you can correct it

K- draws a picture of their build

1st - sketch, claim, and evidence

2nd - sketch, claim, and evidence

3rd - sketch, claim, evidence, and reasoning
4th-sketch, claim, evidence, and reasoning
5th-sketch, claim, evidence, and reasoning

Deck of Cards

Use cards to help mix up the seating when students are not working on a continuing project
K-3 – 24 cards, tables 2-7
4-5 – 32 cards, tables 2-9

Google Drive (May be able to replace with Teams, but 1-5 use Drive)

I created a google account that I use for Tinkercad.com and for a drive to share files with students

It's easy to access and can be used by all classes

All the build instructions, except for kindergarten, are on the Google Drive app

The files can be accessed on the laptops and the iPads (I only use it on iPads with 1-3 grades unless there are special circumstances)

Seesaw Digital Portfolio

I put class codes in order of how the classes come to engineering

After each class, I move the top code to the back to prepare for the next class

Students are not allowed to take pictures with faces in them

Exceptions are sometimes during project presentations, but then it is only the group's faces

Tinkercad.com

Create a class account with an easy login

You may want to create a gmail account for this purpose

All students use the same account

Create new design – start a new design

Search under the left-hand side under the account name to find prints in your account

Search only by one word of the name at a time

Search by part of the word if it still isn't showing up

File naming convention – student's first name, any other people's first names working on the build, and teacher's last name ex. - Hailey Tyler Nazario

3D Printing 3-5

Use clay before designing on Tinkercad

Tinkercad design should be the same shape and size as the clay model

Students should measure in cm and convert to mm for Tinkercad

Things to check and see if a print is ready

No shapes should be out off the workplane

All pieces of the design should be connected and meet criteria

Design should be flat (at 0.00) on the workplane

Students place a post-it note on the corner of my desk when they think their design is ready to be printed

Post-it notes are stacked one on top of the other, so I know the order they were received
When I print multiple projects, I place the post it notes by the printer in the order they are arranged to print. Then I will know who the print belongs too. Finally, once the print is complete, I place it on the post-it note so it can be given to the correct student.

3D Printing 1-2

Students are given criteria for their designs including size

They start right away with Tinkercad

Things to check and see if a print is ready

- No shapes should be out off the workplane

- All pieces of the design should be connected and meet criteria

- Design should be flat (at 0.00) on the workplane

3D Printing City X Project (3-5 grades)

3rd grade works with a partner (I print two of the final designs, so they each can take one home)

4th and 5th grades can complete the project independently

Students use design workbook

After completing workbook, students create a clay model

Use the clay model to help design on Tinkercad.com

- Clay model and print should be the same shape and size

Material used in Engineering Lab

Ozobots

Breakout EDU setup <https://www.breakoutedugames.com/startergames/>

Microgravity table (NASA)

Foam rockets

https://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Foam_Rocket.html

<https://www.jpl.nasa.gov/edu/teach/activity/foam-rocket/>

LEGO Bricks

K and 1 use bricks to build

ABC build for K

1st grade curriculum builds for 1

Use literature connections to create challenges (Goldilocks and Three Bears, building a bed that is just right)

K'NEX

2nd grade uses K'NEX to build from pictures

Requires more visual spatial abilities since no step-by-step instructions

LEGO Technics

3rd and 4th grades build
Instructions and challenges
Idaho TECH Challenge uses these materials too with kits in closet
Curriculum on Shared Drive
Book 1 is for 3rd grade
Book 2 is for 4th grade

FischerTechnik

5th grade instruction builds
Will use these in our middle level engineering
Curriculum on Shared Drive
Book 3 FT is for 5th grade

Simple Machine LEGO Kits

Yellow kits in upper cupboards and back closet
Each kit is designed to have instructions for builds
Several different models of the kits

NASA Rocket Launcher

Use with caution
Do not pump up higher than 40 psi
Do not use air compressors

LEGO WeDo 2.0 (and WeDo)

<https://education.lego.com/en-us/lessons?pagesize=12>

Always work in partners
The top of the tub comes off and is the work area to help prevent lost parts
Could be used with the Giant Mars Map

LEGO Mindstorms <https://education.lego.com/en-us/downloads/mindstorms-ev3/curriculum>
<https://education.lego.com/en-us/lessons?pagesize=12>

Usually work in partners
Students don't necessarily use the tubs
Half the class can be programming while the other half builds (after being introduced to the robot and programming)
There are also enough robots that everyone can be programming at the same time
Could be used with the Giant Mars Map curriculum

Ozobots <https://ozobot.com/stem-education/stem-lessons>

Raspberry Pi <https://projects.raspberrypi.org/en/>

Students work with a partner
Half the class works on the Raspberry Pi while the other half builds
Students work through the projects that fit our materials on the Raspberry Pi site

Students use iPads to access the Raspberry Pi site since we are not allowed to connect to the internet on the Raspberry Pi for security reasons

Makey Makey <https://makeymakey.com/lessons/>

Giant Mars Map and curriculum (4-5 New!) This would be a great option to replacing the robots projects I have done in the past since curriculum is included

Scratch <https://scratch.mit.edu/>

Free Time (exploration time)

Free time cart

Use most of the materials in the room as long as they know how to treat them appropriately and put them away

Makerspace

Our philosophy for makerspace has been it is a time of student exploration

We do not put out prescribed activities for students to complete

We put out a variety of non-consumable materials for students to make with ranging from high tech to low tech

We do not put out all the same materials every week and may rotate materials through

Current materials include:

Keva Planks

Gears

Snap Circuits

Cardboard boxes

Makedo kits

Red Solo Cups

LEGOS (minifigs, duplos, bricks, technics, etc.)

Hexbugs

Ozobots

Computers for Hour of Code, Scratch, and Tinkercad

iPads for Scratch Jr., Ollies, Spheros, Space 4D, etc.

Ollies/Spheros

Straw Builders

Dominoes

DIY Win Tunnel with cups and small binder clips

Edison robots

WeDo robots

Marble track