

K12 Engineering Resources for Home

Classic engineering activities with materials you may have at home.

Feel free to use other materials if you don't have the exact ones listed. You can also make the activities easier or more challenging in order to adjust them for different ages.

Civil Engineering

- How tall can you build a tower out of cups?
- Make a boat out of tinfoil float. How many pennies can it hold?
- Spaghetti Tower Marshmallow Challenge (there are lots of variations available): <http://www.juniorachievement.org/documents/193773/563462/The+Marshmallow+Challenge+Instructions.pdf>
- Make towers + with newspapers: <https://stemactivitiesforkids.com/2017/06/19/3-amazing-newspaper-stem-challenges/>
- Egg Drop: <https://gems.education.purdue.edu/wp-content/uploads/2019/01/DB-EggDrop-1.pdf>
- [Build a Bridge](https://tryengineering.org/wp-content/uploads/popsiclebridge.pdf) (ages 8-18): <https://tryengineering.org/wp-content/uploads/popsiclebridge.pdf>
- [Build a structure that can hold a load \(8-14\)](https://tryengineering.org/teacher/critical-load/): <https://tryengineering.org/teacher/critical-load/>

Mechanical Engineering

- Air-Powered Car (grade 2-6): <https://gems.education.purdue.edu/wp-content/uploads/2019/01/aircarfromzoom.pdf>
- Make a solar cooker: <https://www.homesciencetools.com/article/how-to-build-a-solar-oven-project/>
- Marble Rollercoaster (4th,5th grade): <https://gems.education.purdue.edu/wp-content/uploads/2019/01/DontLoseYourMarbles.pdf>
- Parachute Design: <https://gems.education.purdue.edu/wp-content/uploads/2019/01/parachute.pdf>
- Build a Hand Crank Winch: <https://littlebinsforlittlehands.com/build-a-winch-simple-machine-recycled-stem-activity/>
- [Trebuchet Toss \(ages 8-14\)](https://tryengineering.org/wp-content/uploads/trebuchettoss.pdf): <https://tryengineering.org/wp-content/uploads/trebuchettoss.pdf>

Electrical Engineering

- Make a Salt Water Circuit: <https://www.homesciencetools.com/article/saltwater-circuit-project/>
- Make a simple motor (high school): <https://www.wikihow.com/Make-an-Engine-from-a-Battery,-Wire-and-a-Magnet>

Chemical and Environmental Engineering

- Make a homemade Lava Lamp: <https://www.homesciencetools.com/article/how-to-make-a-homemade-lava-lamp-science-project/>
- Make a water filter: https://www.teachengineering.org/activities/view/water_filtration; <https://tryengineering.org/wp-content/uploads/filtration.pdf>

- [Sugar Spill-Bioremediation Cleanup \(MS, Spanish\)](https://www.teachengineering.org/sprinkles/view/cub_sugarspill): https://www.teachengineering.org/sprinkles/view/cub_sugarspill
 - [Desalination Plant](#) (6th grade) Solve an important engineering challenge for the world.
- Computer Science** (do not need a computer to do these; see below for coding resources)
- 3D Printing by hand (age 8-14): <https://tryengineering.org/wp-content/uploads/3dprintingbyhand-2.pdf>
 - Writing in HTML(age 8-14): <https://tryengineering.org/wp-content/uploads/writinginhtmlStudentHandout.pdf>
 - [Solve a Maze, algorithmic thinking \(age 14-18\)](https://tryengineering.org/teacher/solving-simple-maze/): <https://tryengineering.org/teacher/solving-simple-maze/>

Great Websites for STEM at Home

- [Exploratorium](#). The original hands-on, creative STEM museum has wonderful videos and activities for all ages.
- [Try Engineering](#) (4-12) lots of amazing resources and activities, beautifully arranged, especially for COVID19.
- [TeachEngineering.org](#). This is the homeschool link, but they have short activities to complete units on a huge number of hands-on engineering subjects. Some were created in NM! (K12)
- [SciGirls](#) videos, activities for girls in elementary and MS: <https://pbskids.org/scigirls/>
- Sci Girls [en espanol](#)
- [eGFI](#)-Great eMagazine with Information on Engineering Careers, Scholarships and Research (K12)
- National Science Foundation [Page](#) of STEM links.
- Photovoltaics (Solar Cells) [class](#) (High School/College):
- [YouCubed Math at Home](#): Explore and learn math in rich and creative ways
- [Science News](#) is offering free news stories and resources for [students](#) and high school [educators](#).
- IEEE [World of Robots](#). Activities, game, videos.

Virtual Field Trips, Webinars and Videos

- [Virtual Field Trips](https://tryengineering.org/news/virtual-field-trips/): <https://tryengineering.org/news/virtual-field-trips/>
- National Air and Space Museum [STEM in 30](#), videos and webinars for Middle School students.
- [National Nuclear Museum Virtual Exhibit Plus Activities](#)
- Check out Explora's Facebook for weekly at home challenges and story times.
- See Cultivating Coders below.

Learn to Code!

- [Girls Who Code at Home Activities](https://girlswhocode.com/code-at-home/): <https://girlswhocode.com/code-at-home/>

- [Boolean Girl. Free live instructor-led online classes \(age 8-18\):](https://tryengineering.org/news/boolean-girl-presents-full-stem-ahead/)
https://tryengineering.org/news/boolean-girl-presents-full-stem-ahead/
- [Amazon Future Engineer](https://gocoderz.com/amazon-future-engineer/) – robotics and coding classes: <https://gocoderz.com/amazon-future-engineer/> (temporarily free)
- [Cultivating Coders](#) (NM; Ages 9-99). Free Daily live instruction M-F 10 am Mountain Time, 4 week class. K-5 students must be assisted by someone 12 years or older. Questions? Email infor@codecrushcrew.com.
- [Scratch](#). Create stories, games, animations. From MIT.
- [Computer Science Teachers Association](#) has more Currated coding and computer science resources free for the duration
- [Great Annotated Computer Science Resources for NM Educators and Families](#) from Paige Prescott and PED
- [Tinkercad](#) (High School/College) Free online software tools for designing circuits, 3D printing, Arduino Programming. Intro to AutoDesk: <https://www.tinkercad.com/circuits>

STEM Games (Computer and internet required)

- [Try Engineering Games](#)
- [Free math games:](#)
https://www.education.com/games/?msclkid=665ea2caff701967c237fc4882d5dd95&utm_source=bing&utm_medium=cpc&utm_campaign=Search%20-%20Games%20-%20Exact&utm_term=learning%20games&utm_content=Learning%20Games
- [Engineering Games for Younger Kids:](https://pbskids.org/games/engineering/) <https://pbskids.org/games/engineering/>
- [What kind of Engineer are You?:](https://tryengineering.org/what-kind-of-engineer-are-you/) <https://tryengineering.org/what-kind-of-engineer-are-you/>
- [Make a Circuit Game:](https://www.brainpop.com/games/circuitconstructionkitdc/) <https://www.brainpop.com/games/circuitconstructionkitdc/>

Selected Free Online Engineering and Computer Science College Classes

- Course materials for New Mexico [Computer Science 4 All](#)
- Brown University: [Introduction to Engineering and Design](#)
- Free Carnegie Mellon [CS Course for High School Students](#)
- Amazon Future Engineers Free (for a time) [Computer Science Class](#) (MS, HS)
- Harvard [Energy within Environmental Constraints](#)
- Princeton: [The Art of Structural Engineering: Bridges](#)
- Dartmouth: [The Engineering of Structures Around Us](#)

Explore Engineering Careers

- [Engineering girl](#)
- [eGFI](#)
- [Try Engineering Meet an Engineer](#)
- [Nerd Girls](#)

- [Discover Engineering](#)
- [What kind of Engineer are You? Game](#)
- [5 Tips to Introduce Engineering to Your Kids](#)

Competitions and Challenges

- [Engineering Tomorrow Instagram Challenges](#) for High School Students. Use materials in your home to find creative solutions to engineering challenges. Standards-based virtual lessons for teachers. Contact Megan Barrett, Engineering Tomorrow Program Director, at megan.barrett@engineeringtomorrow.org.
- Explora Facebook has weekly challenges
- [Other Engineering Contests at Engineering Girl.](#)

STEM Sites to Learn about COVID-19

[Education Resources](#) for Parents and Educators

How to spot COVID19 Misinformation. [Time Magazine](#). 3/16/20.

Corona Virus [Comic for Kids](#)

[Exploratorium](#) (<https://www.exploratorium.edu/learn>) Younger Children

[Computer Science Teachers Association](#) has a ton of epidemic simulations (some made by K12 students), great resources on COVID-19 especially how computer science is used to fight the disease

- Outbreak Squad Game: <https://outbreaksquad.org>
- Scratch Epidemic Simulation: <https://scratch.mit.edu/projects/376656449/>

Soap and Sanitizers

- Video: How Soap Interacts with a Virus: <https://www.exploratorium.edu/video/how-does-soap-inactivate-coronaviruses>
- Chemistry of why soap kills viruses video: <https://www.youtube.com/watch?v=-LKVUarhtvE>
- How Hand Sanitizers attack viruses and bacteria and what's in them. [YouTube Video](#). PBS Studios. (3:21) Middle School-Adult

Products and Behaviors In the News

- Why Do People Hoard Toilet Paper? A Look At Irrational Behaviors In Uncertain Times. [NPR Interview](#) (7:02)
- How Toilet Paper is Made. [YouTube Video](#) (Discovery Channel). (5:47) Elementary-Adult.
- How Soap is Made. [YouTube Video](#). (4:59) Elementary-Adult.
- UCLA Student Makes Ventilator with Parts from Home Depot. [CBSN News Spot](#). (0.31)

Viruses

- Video: How Big is a Virus. Exploratorium Video. : <https://www.exploratorium.edu/video/how-big-virus?autoplay=true> Elementary-Adult
- Where Do New Viruses Come From? Feb.27, 2020. [YouTube Video](#). (10:09) Middle School/High School/College. There is more certainty now that the virus did not escape from a lab.
- Corona Virus Explained and What You Should Do About It as of March 19, 2020. [YouTube Video](#). (8:34) Middle School/High School/College.
- Why Bats Carry So Many Viruses and How Studying Them Can Help Us. [YouTube Video](#). (12:44) High School/College.

Infographics and Data

- New Mexico COVID19 Graphs from the [Daily Lobo](#).
- OPINION: Bad graphs suck: A primer on COVID-19 data coverage. [Daily Lobo 3/23/20](#).
- Using internet linked thermometers to show social distancing is reducing infection rates. [New York Times](#). 3/30/20. Direct [link](#) to Health Temperature Map.
- Simulations of different responses and how they affect infection rates. [Washington Post](#). 3/14/20.
Por qué brotes como el del coronavirus crecen exponencialmentey cómo ‘aplanar la curva’ [En Espanol](#).
- Projections of case peaking for each state and US from University of Washington. [Institute for Health Metrics and Evaluation](#).
- Using cell phone and other data to track the health emergency progress. [Vox](#). 3/26/20.
- [Our World in Data](#) has great graphs. Compare linear and exponential graphs to isolate growth rates independent of population size.

NM COVID19 Research

- UNM researchers work to find COVID-19 vaccine. [Daily Lobo](#). 3/17/20
- Coronavirus [Clinical Trials Launched at UNM](#) Hospital. 3/30/20.