

STEM AT HOME ACTIVITY GUIDE:

Candy Dispenser Challenge



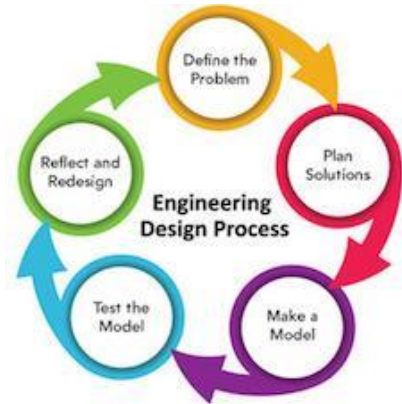
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STEM AT HOME GUIDE: Candy Dispenser Challenge Background Knowledge

Aim: Design a functioning candy dispenser prototype that can hold at least 2 types of candy, have an opening with a door that opens, closes and latches to refill candy designed with household materials.

Problem & Career Focus: Have you seen the candy dispensers that are located near the doorways of all grocery stores? Besides being a sweet treat, did you know candy dispensers are a great example of edible engineering? Candy dispensers use forces of motion, energy and simple machines to make your day sweeter. Using the engineering design process, your task is to work with your team of data scientists, industrial engineers, and computer hardware engineers to design, model, and prototype a candy dispenser with your 2 favorite candies that can open and close a latch to refill candy into the dispenser.



Educational Standards Correlations: Engineering Design, Motion, Energy, Simple Machines, Physics, Mathematics

Engineering Design Process: STEM professionals use the engineering design process as steps to help solve real-world problems. With your team: define the problem, discuss solutions, design, build, test, and improve a prototype of your solution. One of the most important steps of the engineering design process are reflect and redesign- if your team notices your candy dispenser prototype isn't working- improve the design! Use the engineering design process steps to guide your exploration during the Candy Dispenser Challenge.

Investigating Questions

- What do you know about how dispensers, such as gumball machines, work? What are some ideas you and your team can try as you design your dispenser?
- How can you create a small enough opening so that only a few pieces of candy come out at a time?
- How can you create the latch to release the candy?

Materials

- Construction paper, Poster board or cardboard
- Masking tape and plastic tape, scissors
- Wooden skewers
- Craft sticks, toothpicks
- Coffee stirrers
- Rubber bands
- Pipe cleaners, wooden dowels
- Legos
- Any other household item you desire

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Background Knowledge

Vocabulary:

Force: the measurement of a push or a pull on an object. Force is measured in newtons.

Energy: the ability to do work. The standard unit of measure for energy is the joule.

Simple Machines: a mechanical device that changes the direction of a force. Examples are: pulleys, inclined planes, screw, lever, wheel and axle, wedge.

STEM Career Connections:

Data Scientist

Are professionals that use their skills in technology, scientific methods, and math to improve systems.

They: have a great understanding of math, computer science, statistics, and modeling.

Industrial Engineer

Are engineers that focus on enhancing systems, equipment, and organizations to improve performance.

They: work in transportation, manufacturing, as research scientists, and with other important resources we use every day.

Computer Hardware Engineer

Research, design, develop, and test computer systems such as processors, circuit boards, memory devices, and more.

They: need creativity, critical thinking skills, problem-solving skills, knowledge of computers, and teamwork.

Literacy Connections:

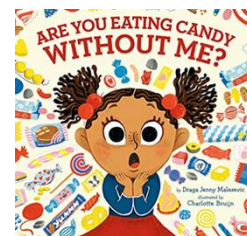
An Engineer Like Me
 by Dr. Shini Somara and
 Nadia Somara



Awesome Dawson
 by Chris Gall



You are Eating Candy Without Me?
 by Draga Jenny Malesevic



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STEM AT HOME GUIDE: Candy Dispenser Challenge

Background Knowledge

Real World Applications

You can see candy dispensers in your everyday life. They are a great example of force, motion, energy, and simple machines through engineering. Take a trip to your local grocery store to see for yourself or watch the video links provided to see edible engineering in action.



Engineering & Science Connections

Vending machines are a large type of dispensers. Because the vending machine owner makes money from each item it sells, it is extremely important to limit the amount of candy that comes out of the machine! The design must be precise- some use gravity, simple machines, or electronics to give you the goodies.



Candy and gumball dispensers use simple machines to control how much candy comes out at a time. The machine uses **gears** and turning mechanisms where you insert the coin to pay for the candy. The **gear** turns to let the pieces of candy through an opening. Then an **inclined plane** lets the candy roll down a "slide" out of the machine. But before you can enjoy your candy, you have to lift a **lever** to grab it.

Everyday Science: The 1st Candy Dispenser, PEZ!

First invented in the 1920s, PEZ candy was an idea by Eduard Haas III in Austria, Germany. As the candy gained popularity, in the 1930's and 1940's, PEZ candy was sold in a small mechanical box for dispensing the candy tablets instead of a metal tin used before.



Today, PEZ dispensers can be found in the shapes and themes of your favorite cartoon, movie, or superhero figures! It helps that they are just as fun as they are delicious.



Candy Dispenser and Vending Machine Fun Facts!

- The 1st vending machine was invented in Egypt in 215 BCE.
- The U.S. has over 7.1 million vending machines.
- Round candy-coated gumball vending machines were introduced in 1907.
- Everyday 7 out of 10 people will place money into a vending machine!

Check out these video links!

Modeling and Simulation Engineer
<https://youtu.be/0JeCrMqDwbY>

How Does a Gumball Machine Work
<https://www.youtube.com/watch?v=Q3ZeUNDg4fQ>

Gumball Coaster

<https://www.youtube.com/watch?v=TK9k-txfAcA>

Billy Nye the Science Guy: Simple
Machines

<https://www.youtube.com/watch?v=t5iD75C1wyg>

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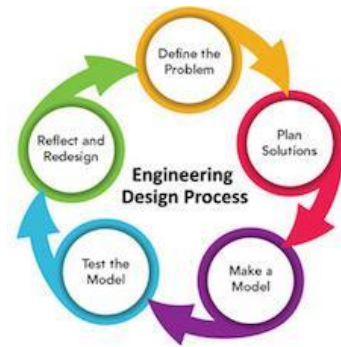
STEM AT HOME GUIDE: Candy Dispenser Challenge Activity Directions

Aim: Design a functioning candy dispenser prototype that can hold at least 2 types of candy, have an opening with a door that opens, closes AND latches to refill candy designed with household materials.

Instructional Video: https://youtu.be/5NMdVo_1Y7c

Investigating Questions

- What do you know about how dispensers, such as gumball machines, work? What are some ideas you and your team can try as you design your dispenser?
- How can you create a small enough opening so that only a few pieces of candy come out at a time?
- How can you create the latch to release the candy?
- What materials can you use to refill the candy inside your machine?



Materials

Construction paper, Poster board or cardboard
 Wooden skewers
 Coffee stirrers
 Pipe cleaners, wooden dowels
 2 types of candy

Masking tape and plastic tape, scissors
 Craft sticks, toothpicks
 Rubber bands
 Legos
 Any other household item you desire

Criteria & Constraints:

Engineering design challenges (EDCs) are great opportunities for open-ended activities to grow critical thinking and problem-solving skills. EDCs do not use a list of directions to build a specific design, rather suggest a framework of designing a solution based on the problem and goal. How your team chooses to address the problem and goal is entirely up to you!

- Lay out all materials and items available for the challenge. Plan to give time for your team to discuss the problem relating to your background knowledge. What materials will you use to create your candy dispenser? (*Define the Problem*)?
- Discuss, sketch, and determine what materials your team will use to create the simple machines for your candy dispenser (*Plan Solutions*).
- Using your sketches and discussions, begin creating the simple machines from your model from materials available. Family adults: allow your child(ren) to experiment with the materials and help them build problem-solving skills (*Make a Model*)

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- As you are building your candy dispenser, test out the model with the candy you have chosen! Are the candies getting stuck? Does it provide enough force to move the candies down the inclined plane? (*Test the Model*)
- With your team, continue to discuss and work through problems with your designed models along the way. What adjustments can your team make to improve your design? If you were to make a candy dispenser, what materials would you use or how would your model be different? (*Reflect and Redesign*)

Ideas to Increase Difficulty:

-Add a 3rd candy to the dispenser!

-Limit the number of materials that will be used!

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Sample Ideas



Photos Courtesy of: Ignite Ingenuity, Frugal Fun 4 Boys, Science Schoolyard, and Lucky Belly

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STEM AT HOME GUIDE: Candy Dispenser Challenge Extension Activity

Make A Snack Vending Machine

Materials:

Snack mix ingredients
 Milk cartons
 Cups/bowls

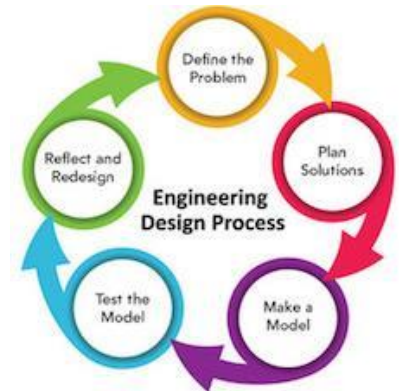
Paper/Pencil/Crayons
 Paper towel rolls
 Tape/glue

Cardboard
 Rope or twine
 Scissors

*Other household materials

Criteria & Constraints:

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-In this challenge you are designing a machine that will store and dispense snacks (similar to a candy machine).

-To increase level of complexity- add more snacks to be dispensed.

- Research and brainstorm designs of snack machines. How do they work? What materials can you use to create solutions to the problem (Define the Problem)?
- Sketch your prototype and design of key aspects of the snack machine using simple machines. (Plan Solutions)
- Use research and the sketches from habitat to start brainstorming your prototype (What will the snack dispenser look like? What materials can you combine to make the simple machines? (Plan Solutions and Make a Model)
- Plan your prototype: draw or sketch the design. Watch some videos on snack machine mechanics! (Plan Solutions and Make a Model).
- Use your household materials to make a model of a snack machine (Make a Model).
- Test your design! Will you have to modify it? Talk with your team about ways you could improve the design of your models (Reflect and Redesign)

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