Rutherford County Schools

Individual Learning Modules

Course: Physical Science **April 13th – April 17th**

Main Idea/Focus:	**Aligned resource**
Design and build a Rube Goldberg machine to complete a simple task (e.g., brush your teeth, feed the dog, flip an egg, etc. - use your imagination!)	CPO Foundations of Physical Science (Ch 9 -Simple Machines)

Standard(s):
How does this align with your state standards?

PSCI.PS3.3 – Design, build, and refine a device within design constraints that has a series of simple machines to transfer energy and/or do mechanical work.

Resource(s):
What do you need? Text, data sets, tools, etc.

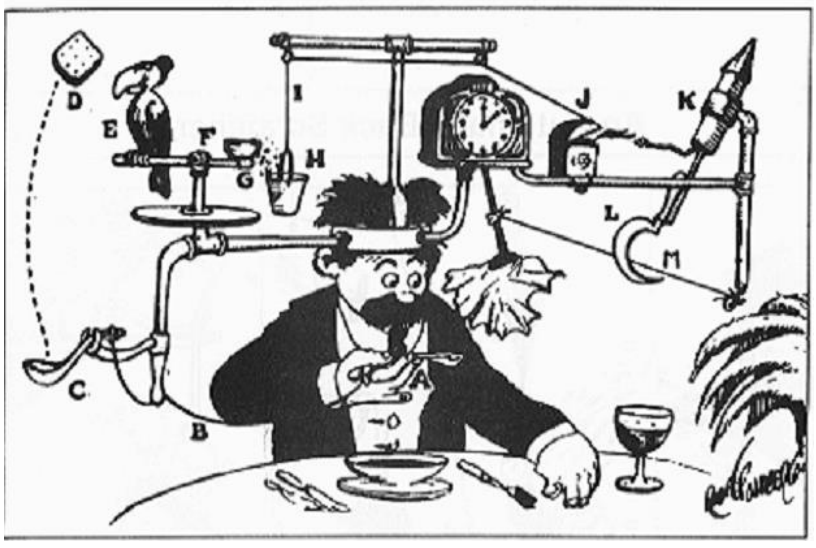
Textbook: (CPO Foundations of Physical Science, CPO Science)

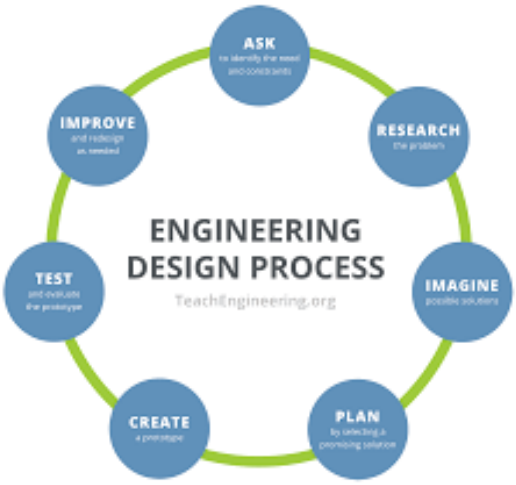
- https://curiosityplace.schoolspecialty.com/homelinks
- Code: COVIDFPS20

In addition to the textbook, the following links may prove useful or of interest:

- https://www.teachengineering.org/activities/view/cub_simp_machines_lesson05_activity1
- https://www.youtube.com/watch?v=6aFVbjwA_y4&feature=youtu.be

Task(s):
What will you do? What will you investigate?





Remember that Rube Goldberg was a cartoonist that made fun of overly complicated machines. A Rube Goldberg machine is some sort of contraption that accomplishes a simple task in a fantastically complicated way. Make sure your machine has many different steps and motions in order to complete the end function and look like a Rube Goldberg.

Part 1. Design the Rube Goldberg Machine
- Decide on a simple task that you will create a machine to accomplish.
- Research machines that may serve as models or solve similar problems.
- Create a machine drawing/sketch and include dimensions and supplies/materials.
- Show your design to an adult in your home, your teacher, or a classmate for approval and feedback on the design.
- Take feedback/research and apply revisions to your design/sketch, as needed.

Part 2. Building the Rube Goldberg machine
- Gather all materials needed.
- BUILD! Test. Revise. Repeat…

Part 3. SHARE YOUR RESULTS! Show your family members, friends, teacher.

Final Product(s):
What will you answer? What will you create? What will you communicate?

(Adapted from Teach Engineering: https://www.teachengineering.org/activities/view/cub_simp_machines_lesson05_activity1)

Now that we have designed a machine. Let's break it down and review some concepts studied earlier this year in your physical science course.

Remember the following equations:

Work (in Joules, J) = ***Force*** (Newtons, N) x ***Distance*** (m)

$$Mechanical\ Advantage\ of\ a\ lever = \frac{Distance\ of\ load\ (weight) to\ fulcrum}{Distance\ of\ effort\ (applied\ force) to\ fulcrum}$$

$$Mechanical\ Advantage = \frac{Force\ out\ (that\ is, resulting\ force)}{Force\ in\ (that\ is, the\ force\ applied\ initially)}$$

Analysis and Conclusion.
1. Use a Model – Using the cartoon above (Rube Goldberg machine), answer the following questions -OR- alternatively, answer questions about your machine:
   a. You raise your spoon filled with soup 0.15 meters high with 2 Newtons of force. How much work did you do?
   b. The spoon is attached to a string that gets pulled as you move the spoon. How much work is transferred?
   c. The string jerks the ladle which is a lever. A cracker is sitting inside the ladle. The string (that gets pulled) is attached 10 cm from the fulcrum and the cracker is 0.5 m from the fulcrum. What is the mechanical advantage?
   d. The ladle draws a cracker past a parrot. (E) The parrot jumps after the cracker, applying force to the perch he sits on. (F) The perch spins around, throwing the seeds into a pail. The perch is another lever. It has a mechanical advantage of 2. If it takes 0.5 J of work to move the seeds 0.1 m without the lever, how much force is needed with the lever?
2. Communicate Information – How does society use machines to make tasks easier or more efficient? Research (or think about) machines around your house and discuss with your family, friends, or classmates. What would your life "look like" without machines?