Lesson Plan 1

Rebecca Dellinger-Johnston

Teacher: Kesandra Farmer

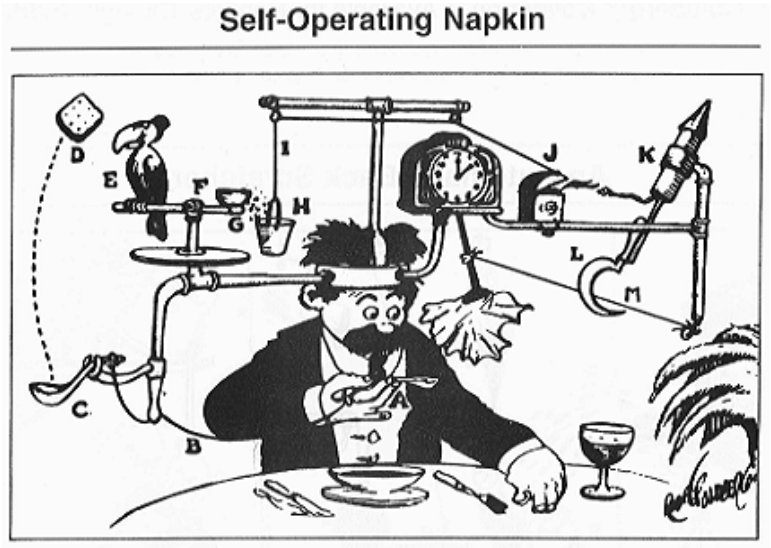
Grade level: High School

Subject: Physical Science

Rube Goldberg Machines

Background:

Rube Goldberg was a Pulitzer Prize winning author, cartoonist, sculptor, and engineer. He was born in 1883 and graduated from Berkley with a degree in engineering. While working as an engineer, Goldberg abruptly shifted his focus to cartooning. He is well-known for his inventions that preform a mundane or easy task, but require multiple steps in a complicated machine.



Purpose:

While Rube Goldberg did not actually create his machines, many others have. In fact, contests are held in his honor, giving students the chance to recreate and reimagine his zany inventions. While Rube Goldberg machines are complicated, they are composed of simple machines. This experiment explores an application of those simple machines.

Student Learning Goals:

Students will be able to ;

- identify real-world examples of machines
- observe and apply simple machines into action
- understand and explain momentum and other properties of the laws of motion
- participate in the scientific process of planning
- rework and evaluate an experiment

Materials:

Students can choose any or all of the materials, but must include a pulley in their machine.

Dominoes	wooden planks	string	toy cars
Paper towel tubes	rulers	pulley	plastic bottles
Jenga blocks	marbles	plastic cups	block and tackle

(Students can also add additional materials from around the classroom or at home.)

Instructions:

Students are to construct a Rube Goldberg machine. Students will work in groups of three or four. The machines must be self-perpetuating, that is it must stay in constant motion without any additional forces other than the initial start. The machines must include at least 3 of the 6simple machines covered in class: incline plane, wheel and axle, pulley, lever, block and tackle, wedge, and screw. At the end of the activity, students will demonstrate their machines and identify the simple machine components of the machine (i.e. second class lever). Students also calculate the work performed by at least one of their components.

Day 1: planning and conceptualizing phase. Students are required to demonstrate their prototype and obtain feedback before changing and revaluating their experiment.

Day 2: Students work on changes to their machines and finalize the design

Day 3: Students finish and present their machines to the class. Each group is given 3 tries to demonstrate their machine. Audience members critique their work using a rubric designed by the instructor that identifies the components of their peer's machine, describes how smoothly the machine worked, and how unique the machine is.

Length of activity:

2-3 days within 1.5 hour periods. What does this mean? 90 minute blocks?

Going Further:

Have students calculate the velocity of their moving components.

Have students enter their machine in a contest.

Have students identify points of energy transfer; points of kinetic and potential energy; points of acceleration and deceleration.

Have students connect simple machines from their own experiment to simple machines present in the classroom or in their everyday activity.

Students can connect the challenges of this activity to a discussion on the challenges of engineering.

Using the 5 E's:

1. Engage:

    Show video of Rube Goldberg machine in action:
    https://www.youtube.com/watch?v=6FzUx2EFk8s

    Introduce who Rube Goldberg was

    Introduction to types of simple machines (previous class period)

2. Explore:

    Have students create their own Rube Goldberg machine out of simple materials.

3. Explain:

    Show students how each type of simple machine works and how it reduces work load.

4. Elaborate:

    Have students make improvements to machines.

Have students connect to previous lessons on: momentum, kinetic and potential energy, velocity, and acceleration.

5. Evaluate:

Have students label the types of simple machines they used and do the same for the types used by other groups.

Have students calculate the work load of the machines, velocity of moving components.

Use rubric to grade the requirements of the machine. Oh – yes to the above, but you might want to state this above too