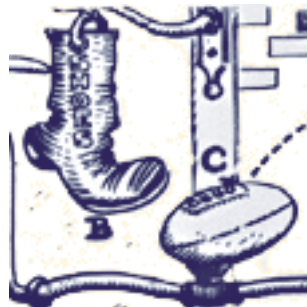


Games Machines Play

Activity 3: Grades 5-8 **Rube Goldberg Challenge**

In this episode of FRONTIERS, you saw how creativity and lots of imagination are the fuel behind invention. From the soccer-playing machines in "[Worldcup for Robots](#)," to the devices fighting for triumph on a giant seesaw in "[Teetering to Victory](#)," each of these creations started out as a clever idea in someone's head.



Here's your chance to be creative, and a little wacky too. In the next set of activities, you'll follow in the footsteps of Rube Goldberg™, an American cartoonist with a unique and popular style. His best known works were cartoons that depicted spectacularly complex machines designed to perform very simple tasks. Often a task would require several unrelated, and often bizarre and humorous events to accomplish a goal. First, you'll use your creativity to dream up some fantastic machines. Then you'll get to put your building skills, and your machine, to the test!

This activity page will offer:

- A humorous approach to simple machines and the transfer of energy
- An arena for creative cartooning
- A connection between art and science
- A hands-on experience in contraption building

PROCEDURE

Part 1- Wacky Connections

1. Log onto <http://www.rubegoldberg.com/html/gallery.htm> to view a variety of Rube Goldberg machines.
2. Check out the following diagram. As you can see, it begins with a weight being dropped and ends with a bowling pin being knocked over.

3. Create a "machine" that uses at least ten separate events to connect the dropping of the weight to the knocking over of the bowling pin. Be creative, and don't worry. You won't have to assemble this wacky device!

Questions

1. How many separate steps did your machine have?
2. What energy transformation occurs when the weight is released?
3. List each step and describe the energy transformation that occurs.



1 lb



Part 2- A Crazy Contraption Contest

Here's your chance to actually dream up and build a complex machine that performs a simple task.

MATERIALS

- A rich assortment of construction materials
- Zany ideas and creative thoughts!
- Paper and pen

PROCEDURE

1. Work with a partner. Select any task listed here:
 - a. Turning on a computer.
 - b. Flipping a light switch.
 - c. Rolling a bowling ball.
 - d. Strumming a guitar.
2. Create a machine that would complete the task in no less than three steps. Sketch out your design in a set of blueprints. Compile a list of materials. Although the contraption should be eccentric, it should be easy to build with everyday materials.
3. Share your blueprints and materials list with your instructor.
4. With your instructor's approval, construct your Rube Goldberg machine.
5. Share your final design with your classmates and discuss the design process.

EXTENSIONS

National Rube Goldberg Contest

If you're a high school student with an interest in competing in the National Rube Goldberg Contest, check out: <http://www.rubemachine.com/> Sites in locations including Milwaukee, Chicago and Pittsburgh offer local competitions that lead to the national challenge.

Wacky Water Racers

Why not apply your Rube Goldberg creativity to designing a watercraft? Here's the challenge: create the blueprints and a materials list for a boat that is powered by a Rube Goldberg engine. If you don't intend on constructing the craft, the blueprints must include at least ten events. If you intend on building it, then all you need are three steps. But the completed craft must work!

Time Keeper

Can you create a wacky time keeping device? Without using a clock or electric motor, construct a time-keeping device. Keep with the Rube Goldberg theme and make sure that the timekeeper includes at least three separate and novel steps in its operation.

WEB CONNECTION

Rube Goldberg Gallery

<http://www.rubegoldberg.com/html/gallery.htm>

Rube Goldberg Links

<http://www.anl.gov/OPA/rube/rubeinfo.html>

A wealth of information provided by the US Department of Energy.

Rube Goldberg Contest Rules

<http://license.cae.uwm.edu/rube/rubeMakingMachine.asp>

Official contest rules posted by the University of Wisconsin at Milwaukee.

National Contest

<http://www.rubemachine.com/>

Information for students interested in competing in the National Rube Goldberg Contest.

The activities in this guide were contributed by Michael DiSpezio, a Massachusetts-based science writer and author of "Critical Thinking Puzzles" and "Awesome Experiments in Light & Sound" (Sterling Publishing Co., NY).

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Games Machines Play

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Answers

Questions

1. How many separate steps did your machine have?
(Answers will vary.)
2. What energy transformation occurs when the weight is released?
(The potential energy of the weight's position is changed into the kinetic energy of its fall.)
3. List each step and describe the energy transformation that occurs.
(Answers will vary.)

CURRICULUM LINKS

Physical Science:

Energy Transfer, Potential and Kinetic Energy, Forces (Gravitational), Simple Machines

NATIONAL SCIENCE STANDARDS (Grades 5-8)

Physical Science - Content Standard B

Student will further their understanding of energy as a property of many substances associated with mechanical motion, heat and sound. The transfer of energy from potential to kinetic is also investigated.

Students will understand how gravity gives an object potential energy.

Science and Technology- Content Standard E

Students will communicate design ideas with drawings.

Students will propose a preplanned design that completes a specified task using simple materials.