

18. Rube Goldberg Machines

Classroom Activity: Design and build a "Rube Goldberg" type machine (i.e. an overly complicated apparatus to accomplish a simple task).

Grade: 4

Strand(s): Understanding Structures and Mechanisms

This task addresses the following overall expectations:

- investigate ways in which pulleys and gears modify the speed and direction of, and the force exerted on, moving objects;
- demonstrate an understanding of the basic principles and functions of pulley systems and gear systems.

and the following specific expectations:

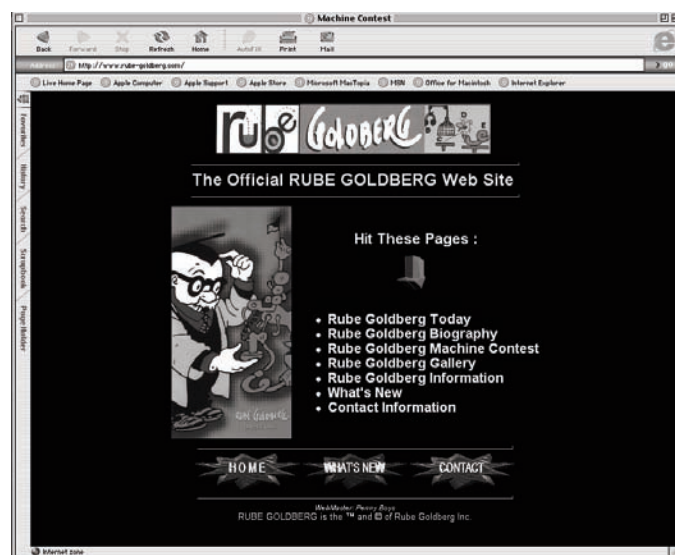
- use scientific inquiry/experimentation skills to investigate changes in force, distance, speed, and direction in pulley and gear systems;
- use technological problem-solving skills to design, build, and test a pulley or gear system that performs a specific task;
- use appropriate science and technology vocabulary, including pulley, gear, force, and speed, in oral and written communication;
- use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes;
- Describe the purposes of pulley systems and gear systems;
- describe how rotary motion in one system or its components is transferred to another system or component in the same structure;
- describe how one type of motion can be transformed into another type of motion using pulleys or gears.

Assessment Categories:

- Knowledge and Understanding
- Communication
- Thinking and Investigating

Type of Activity: Classroom and small group work

Preparation: (approx. 300 minutes- this includes to



plan and map out the task and gather information)

Assemble materials

Time needed to complete the task: 200 minutes of class time together and 400 minutes for each group

Materials/Resources for teachers:

No additional materials required

Materials/Resources for students:

Rube Goldberg cartoons

examples of Rube Goldberg type machines (e.g. Mouse-trap Game, K'Nex Big Ball Factory)

tools (saws, hammers, screwdrivers, scissors, glue gun)

plywood sheets

planks (2x4, 2x2)

popsicle sticks

metal angles (various sizes)

screws

nails

hinges

springs

gears

pulleys

18. Rube Goldberg Machines (continued)

pipe

k'nex

wood glue

found materials (toilet paper rolls, cans etc.)

Activity Description:

Session 1: (approx. 45 minutes)

Introduce the concept of Rube Goldberg machines to the whole class. Show cartoons on an overhead projector and post copies in the classroom for future reference. If possible, show an example of a Rube Goldberg-type machine.

Outline the task: working in groups, students will be required to design and build a Rube Goldberg-type machine, and submit a written report complete with drawings detailing what they have learned. Provide the students with a list of available tools and materials.

Session 2: (approx. 30 minutes)

Divide the students into groups of six. As a group they will select what task their machine will accomplish. After obtaining teacher/EIR approval, they begin planning the sequence of events their machine will need to perform in order to accomplish its task.

Session 3: (approx. 30 minutes)

Students will complete their plans and identify the student(s) responsible for construction of the machine. The group will draw the plan and produce a list of materials required. The plan must include detailed drawings of each individual step. Each student in a group should plan one step.

Session 4: (approx. 45 minutes)

Continue with the work from the previous session. Each group meets with the EIR to obtain approval of the plan as well as the materials list.

Sessions 5 and 6 (time varies)

Students build their machines and prepare their reports for submission.

Presentations:

Each group demonstrates and explains their machine to their class as well as the other students in the school, either by going to individual classes or at an assembly.

Tips:

- Students may assemble part of the machine at home. This saves considerable class time and encourages parental assistance.
- Ask anyone doing renovations to save scrap materials.