MIDDLE AGES - *Catpult Operation*

LESSON PLAN

Objective:
Given a certain target distance, the student will design a catapult by choosing different values for the variables of rock weight, lubrication of the pivot point, and the number of spring coils.

Course / Grade Level:
Middle school general science (Grades 6-8)

Pre-Activities:

- Study the physics chapter on force, motion and energy.
- Become familiar with the formula for Kinetic Energy=1/2 m v^2
- Study Newton's 3 laws of motion.
- Do a demonstration of first, second, and third-class levers.

Activity Procedure:

1. Listen to the audio explanation and/ or read the information section for the *Catapult Operation* activity in the *Time Engineers* game. Explain to the students the goal of the activity.
2. Allow students time to play with the *Catapult Operation* activity. Make copies of the *Recording Sheet* (found at the end of the lesson) for the students. Have them add the following headings:

   ROCK SIZE, LUBRICATION, # OF COILS, TARGET DISTANCE, ACTUAL DISTANCE

   As the students do the activity, have them keep track of each trial using the recording sheet.
3. If the students miss the target tell them to continue adjusting their variables until they hit it.
4. Once they have hit the target, they can choose RESET to change the target distance and can then repeat the activity.

Discussion / Questions:

- If you short of hitting a target, what adjustments can be made to increase your distance? Why?
- If you overshoot the target what adjustments can be made? Why?
- What is the potential energy for this catapult?
- How is shooting a free throw like using a catapult?

Extensions:

- Make a catapult by using a spring or a counter weighted lever to power it to shoot a tennis ball. Calibrate it to hit targets of 2,3,4,5, and 6 meters on the floor. Launch off the floor.
- Research a trebuchet and design or make a prototype. Give an oral report to the class.
- Give an oral report on the proper technique of shooting a free throw and compare to a catapult launching a rock. Use terms like potential energy, kinetic energy, and parabola.

TIME ENGINEERS™

Recording Sheet
