Work, Energy, and Power
New Jersey Section, American Association of Physics Teachers (NJAAPT)
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Tom Meyer and Benilda San Jose, Passaic High School
tmeyer@passaic-city.k12.nj.us, bsanjose@passaic-city.k12.nj.us
Borislaw Bilash II, Pascack Valley High School
bbilash@pascack.k12.nj.us
Dave Maiullo, Rutgers University
maiullo@physics.rutgers.edu

Galileo Conserves Energy (B. Bilash)
A v-shaped ramp is made from shelving tracking (available at Home Depot) and mounted to a wooden frame made of 1' x 3". A ball is raised up one side of the ramp and released. The ball travels up the opposite side to nearly the same elevation illustrating the law of energy conservation. This is based on a device proposed by Galileo.

Work is Going My Way (B. Bilash)
A box is lifted upwards against the force of gravity as an example of the person doing work on the object. The box is then lowered illustrating how gravity does the work. In the second case, although the person is holding the box, they are not doing work on the box, since their force is upward, while the motion of the box is downward. Work is done on an object is the same direction as the force that causes the object to move.

Friction is Doing Work (B. Bilash)
A zero-friction dynamics car is placed upside down on the hand of the demonstrator. The demonstrator moves forward; so does the car. Does the demonstrator do work on the car? No! To prove this – do the following: Place the car upside down on a dynamics ramp resting on an AV cart (or some other vehicle). The cart is pushed. Does the AV cart do work on the car? No! Friction does the work! Place the car right side up on the dynamics ramp and push the AV cart. The car does not move, because friction is not present and cannot do the work. For work to be done on the car, a force must be applied in the direction of motion.

Conservation of Energy Pendulum (D. Maiullo)
A pendulum swings from a rod mounted to a ring stand. Another rod is mounted horizontally to a second ring stand at a height about ¼ above the pendulum. The pendulum is raised then released such that the string collides with the rod. Despite the collision, the pendulum bob rises to nearly the same elevation as the release height – illustrating the conservation of energy.

Nose to Nose (D. Maiullo)
A bowling ball is suspended securely from the ceiling using braded wire or airplane cable. The ball is raised to height of a volunteer's nose. The ball is released, moves away from the volunteer and then approaches the volunteer's nose, but does not touch it. Use this to illustrate the law of conservation of energy. The ball cannot rise higher than its release point when it is simply released (do NOT push it).

Loop the Loop (D. Maiullo)

A model of a roller coaster loop: The loop is fashioned from shelving tracking (available at Home Depot) and mounted to a wooden stand made of 1" x 3" wooden board. A golf ball is released from the hill attached to the loop the loop. The ball will only loop through the device successfully if released from a minimum height summarized by the following equation: $h_{min} = 2.5r$

Rubber Band Potential Energy Powers Beakmobile (T. Meyer)

Source: "You Can" by Jok Church, 9/16/07 Star-Ledger (PO Box 30177, KC, MO 64112). Concept: Wound up rubber band potential energy powers 2 wheels rigidly attached to an axle.

Materials: 2 paper plates, toilet paper tube, candy like Lifesaver™, long stick like a chopstick, short stick like from a Popsicle™, tape, rubber band.

Instructions: 1. Punch a hole in the center of each plate (make sure the tops of the plates face toward each other. 2. Pull the rubber band throught the toilet paper tube. 3. Pull the rubber band through the hole punched in 1 of the plates. 4. Place the short stick through the rubber band loop and tape that stick to the outside of that plate. 5. Tape the toilet paper tube up against the first plate. 6. Thread the rubber band through the second plate. 7. Put the rubber band through the Lifesaver (this candy will be the ball bearing equivalent), and then place the longer stick through the rubber band loop. This stick must reach out past the edge of the plate on one edge only. 8. Tape the toilet paper tube to the second tape. 9. Rotate the longer stick to wind up the rubber band. 10. Place on ground, let go of long stick, and stand back. The wheels-axle apparatus will rotate and move forward, dragging the long stick behind as they travel. The inventor claims the apparatus will go up to 300 yards on a flat playground. I saw on the web that students in a 4th grade class enjoyed building these. If the candy is stuck against the plate, give the wheels a little push.

Falling Masses Power NewtonCar Jr. (T. Meyer)

www.TheNewtonCar.com, developed by Applied Physics, LLC.

This versatile wheeled metal cart is gravity-powered. Pulleys transfer the potential energy of falling masses into the horizontal motion of the cart. A 100+ page teacher's manual includes 19 experiments on motion, forces, momentum, and energy.

AstroBlaster: Elastic Potential Energy in Dropped Stacked Balls Shoots Top Ball High (T. Meyer)

The AstroBlaster, www.fascinations.com, is a good example that when a stack of balls is dropped, the top ball will rebound much higher than the height from which the stack was initially dropped. In the AstroBlaster the 4 decreasing size balls are stacked on a rod. When it is dropped vertically, the elastic potential energy of all of the collisions is transferred to the smallest ball at the top, so that it flies up. Cautions: goggles needed for eye safety for any but the shortest drops; perform in an uncluttered confined room to avoid losing the top ball. Fascinations provides 2 extra top balls (presumably because they are so often lost).

Elastic vs. Inelastic collisions using Happy/Unhappy balls (T. Meyer)

www.ArborSci.com. Also called "happy and sad" or "smart and stupid," one reference says these black spheres are made from neoprene and polynorbornene. Although the two balls appear the same, when dropped one rebounds nearly 80% of the height but the other thuds without rebounding. If cooled, they reverse roles as elasticity changes.