Science in Motion - Ursinus College

https://www.ursinus.edu/offices/science-in-motion/

Physical Science Activities – Middle School

Buoyancy

Students measure and compare the buoyant force on an object and the weight of the displaced water.

Crash Dummies

Students study the relationship between car velocity and the distance a "crash dummy" is thrown during a collision.

Density

Students will predict if a material will sink or float. Then they will measure mass and volume to determine density of a variety of cubes (metals, woods, plastics).

Dew Point and Relative Humidity

Students learn how to calculate dew point and relative humidity, then perform experiments in the classroom to determine the dew point and relative humidity at that time.

Earth's Layers Introduction or Review – using Spheros

We have large maps of the layers of the Earth available. Students modify a provided Sphero program to add different facts about the layers of the Earth, then show off their knowledge when their Sphero drives around the layers of the Earth. Contact us for suggestions / help planning a unique lesson or review session!

Earthquake Tower Challenge – K'nex

Students design, build, and test out towers on an earthquake shake table. Tower minimum size criteria, budget constraints, and specific building capacity are all imposed to give a greater challenge.

Exploring Machines – K'nex

This K'nex kit has the students build a variety of machines that use levers, pulleys, wheels and axles, inclined planes, and gears. Kit comes with a teacher's guide and CD. We have four kits, which accommodates 16 groups.

Falling Objects

Students measure the velocity of falling objects to investigate air resistance and terminal velocity.

Forces

We have a Vernier Force Plate – a larger force plate for use with human interactions. It can be used to measure the change in normal force during an elevator ride, the impulse delivered by the floor during

a jump, the reaction force as a student leans against a wall, and even to test Newton's 3rd Law: Equal and Opposite Reactions. If you have other ideas to test, by all means let us know!

Forces, Energy, and Motion – K'nex

This K'nex kit has the students build a variety of machines to study forces, energy, and motion. Kit comes with a teacher's guide and CD. We have one kit, which accommodates 4 groups.

Friction

Students study the effects of surface smoothness and the nature of materials in contact on sliding friction.

Friction – Friend or Foe? – a Sphero activity

Students study the beneficial effects of friction on movement, by racing programmable Spheros around an oval path. First, the Spheros have just their normal plastic cover. Then, students use a provided cover to compare, and finally they make their own cover to compare the speed, time, and ability of the Sphero to stay on track. Who will make the most effective Sphero cover? (This activity does not require any prior programming experience.)

Graphing Your Motion

Students use a motion detector to measure position and velocity of their own motion, produce graphs of their motion, and analyze and interpret these graphs.

Levers

Students measure the resistance force and effort force of first-class levers.

Ocean Floor Mapping

Students use Vernier Motion Sensors to determine the terrain of an "ocean floor". Activity uses the property of echosounding, and students learn to read the information that comes back to the computer. The activity concludes with a challenge for the students to describe a hidden "ocean floor".

Pendulums

Students use a photogate to measure the effects of amplitude, length, and bob mass on the period of a pendulum.

Periodic Table Review – using Spheros

We have large periodic tables available. Teachers can ask a question, and students can drive Spheros to the correct location on the periodic table. Students can also program the Spheros to display the answer (up to two characters). Contact us for suggestions / help planning a unique lesson or review session!

Picket Fence Freefall

Students use a picket fence and photogate to measure the acceleration of a falling body. Extensions involve the students calculating g from distance vs time data, adding additional force to the falling body, and changing the air resistance acting on the picket fence.

Pulleys

Students measure the force needed and efficiency of three different pulley systems.

Review / Test prep activities

We can design fun, unique review sessions for nearly any topic using our programmable Spheros. (No prior programming experience needed.) Ask us for suggestions for your next review session!

Ski Jump – Energy and Distance – a Sphero activity

Students use programmable Spheros to determine how far a Sphero can jump given its speed and kinetic energy. After they analyze the relationship between energy and jump distance, they pick their own distance, make a prediction, and test it out. (No prior programming experience needed.)

Sound

Sound waves and beats: Uses a Vernier microphone to measure the frequency, period, amplitude, and beats of sound waves from tuning forks.

Speed of sound in air: Uses a Vernier microphone to measure how long it take sound to travel down and back in a long tube. Students then calculate the speed of their sound, and compare their calculated value to the accepted value for the speed of sound in air.

Speeding Up

Students measure the speed of a cart as it rolls down a ramp from different starting positions. Then then determine the relationship between velocity and release point. A possible follow-up to this activity (an additional class period) is to race cars down the ramp.

Speedy Slide

Students measure their velocity going down a slide, then experiment with different ways to increase your velocity going down the slide. This activity can tie in with both friction and air resistance.

Spheros

Spheros are paired with a Kindle Fire (provided) through the SpheroEdu app. Beginners can draw a path for the Sphero robot to follow, intermediate users can drag and drop blocks of code, and advanced users can write text programs using JavaScript. Provide your own activities, or use one of the SpheroEdu prepared modules aligned to NGSS, CCSS, and various state standards.

Tractor Pull: Power, Mass, and Velocity – a Sphero activity

Students use programmable Spheros to investigate the relationships between power, mass, and speed. The students are challenged to build a tractor that Sphero will drive. Then they vary the power of the Sphero and the mass of the tractor, and measure the velocity of their tractor for each variable. (No prior programming experience needed.)

Other Equipment:

Vernier LabQuests
- Vernier LabPros
- Vernier sensors:
  - Voltage
  - Magnetic field
  - Barometer
  - Light
  - Motion detectors
  - Flow rate
  - Photogates
  - Dual force
  - Gas pressure
  - Temperature
  - Low-g Accelerometer
  - Force plates
  - Microphone

- Radiation
- Sound Level Meter
- Watts Up Pro
- Pendulum hooks
- Bobs
- Picket fences
- Hooks & weight sets
- Carts
- Single & double pulleys
- Fulcrums
- Mini black lights
- Density equipment

We are always working on new activities to bring to your classroom. If you have any curriculum for which you do not see an activity, please let us know! We may be able to design one for you.