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Educational Innovations Inc.®

Bo!nks

POP-200

Some background:

Sir Isaac Newton's ideas about gravity and motion changed the way we think about our world. After seeing an apple fall from a tree in his garden, Newton realized that gravity was the force causing the apple to fall—and keeping us on the ground. Today we understand that gravity is a universal force that applies to everything around us.

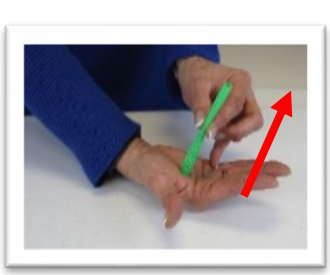
Newton's Laws are fundamental for young scientists to understand. For instance:

Newton's Third Law

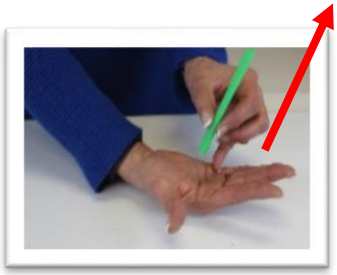
For every action, there is an equal and opposite reaction.

In other words, when you push an object, it pushes back! This law explains how rockets are able to launch off the ground and into outer space. And it is the basic principle behind our Bo!nks—which, admittedly, is a rather silly name for a very serious concept in physics.

Up…



up…



and away!

These colorful little tubes will help your students understand Newton's Third Law as well as the concepts of potential and kinetic energy.

Potential energy *is energy that's stored in an object. For example, when you stretch a rubber band, you give it potential energy.*

Kinetic energy *is energy of motion. As the rubber band is released, the potential energy is changed to motion—so it becomes kinetic energy.*

5 Francis J. Clarke Circle, Bethel, CT 06801

Phone (203) 74-TEACH (83224)
www.TeacherSource.com

NGSS Correlations

Our Bo!nks and these lesson ideas will support your students' understanding of these Next Generation Science Standards (NGSS):

Elementary

4-PS3-4
Students can use Bo!nks to design, test, and refine a device that converts energy from one form to another.

3-5-ETS1-3
Students can use Bo!nks to plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Middle School

MS-PS3-5
Students can use Bo!nks to construct and present arguments or experiments to support the claim that when the motion energy of an object changes, energy is transferred to or from the object itself.

MS-ETS1-4
Students can use Bo!nks to develop a model or experiment to generate data for iterative testing and modification of a proposed object, tool or process such that an optimal design can be achieved.

High School

HS-PS3-4
Students can use Bo!nks to design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

HS-ETS1-2
Students can use Bo!nks in an investigation to design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Suggested Science Idea(s)

4-PS3-4
3-5-ETS1-3
Students can get creative in their techniques to activate the Bo!nks to better understand the action-reaction concept.

HS-PS3-4
Bo!nks present a simple and dramatic demonstration of energy transfer and that just for starters.

HS-ETS1-2
Using Bo!nks in a physical model to convert energy from one form to another is engaging in the engineering of a device.

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Experimenting with Bo!nks

Bo!nks are colorful, stretchy tubes that will provide your students with a fun and fascinating chance to find out what happens when **potential energy** gets turned into **kinetic energy**.

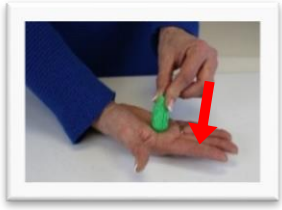
Directions:

1. Discuss these questions with your students. Tell them to write down their predictions.

If you compress the Bo!nk to half its size,
what do you think is going to happen when you release it?
How high do you think it's going to jump?

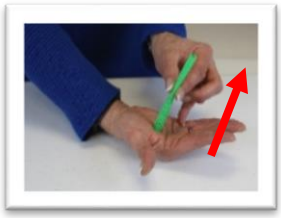
2. Next, students should measure the length of the tube. Instruct them to write down their measurement.

3. Here's where students will do the "work" that gives the Bo!nks their potential energy. Working in pairs, have one student hold the tube so that one end rests on his or her palm. Holding the top lightly between two fingers, the student should push the tube down until it is compressed to AT LEAST half its original size.



4. The second student in the pair should measure the tube again, and write down the compressed measurement.

5. **FIRST TEST:** The first student in each pair should hold the compressed Bo!nk. Then let go and see what happens!



6. If possible, students should measure the actual height (or distance) that the tube has traveled. If rulers are not available, students can make their best guesses. As before, they should write down their measurements and record the traveled height (or distance) on a data sheet.

7. **SECOND TEST:** Students should push the tube down even further. Again, they should record their measurement of the compressed tube and write down their predictions before launching. Ask students:

Do you think it's going to jump higher, lower or the same as the first time?

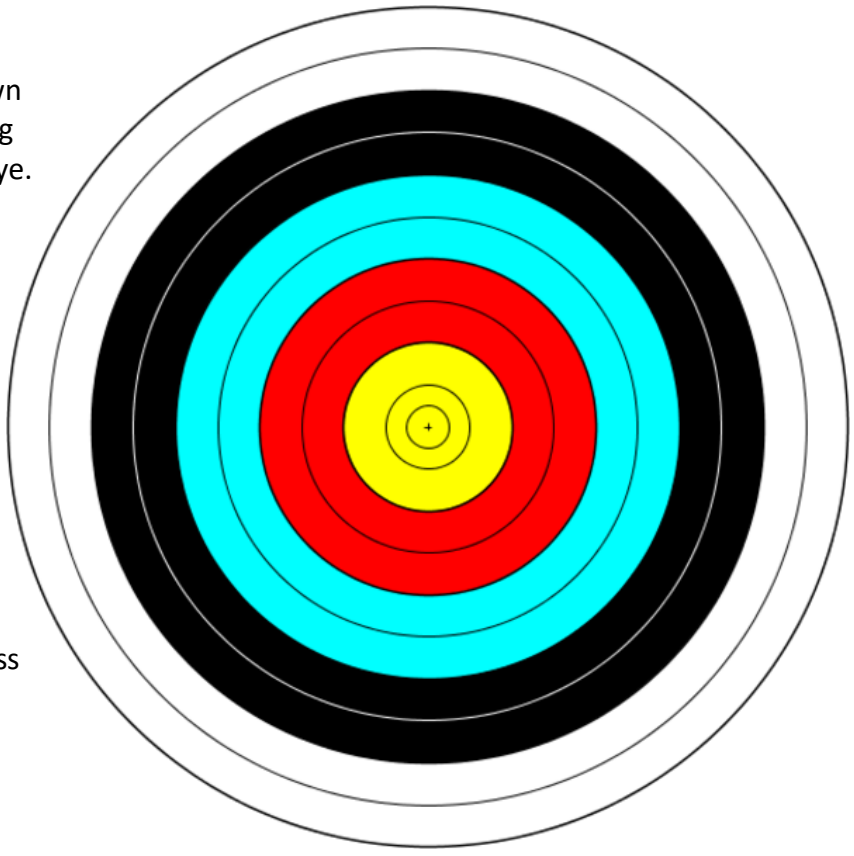
8. **REPEAT:** As time permits, allow students to try new variables. Students can decide how far they should compress the Bo!nk tube. In each case, remind them to measure the compressed Bo!nk before launching it, and measure how high it springs up when released.

Try This!

Instruct students to design their own bull's eye target and practice aiming their Bo!nks so they hit the bull's eye. Encourage them to try different variables to see what works best.

For instance, their results will change depending upon:

- how far away they stand from the target
- the angle of the Bo!nk
- how much they compress the tube



Take Your Lesson Further

As science teachers ourselves, we know how much effort goes into preparing lessons. For us, "*Teachers Serving Teachers*" isn't just a slogan—it's our promise to you!

Please visit our website for more lesson ideas:

TeacherSource.com/lessons

Check our blog for classroom-tested teaching plans on dozens of topics:

http://blog.TeacherSource.com

To extend your lesson, consider these Educational Innovations products:

Watch It Go! Energy Conversion Bundle (RKT-625)

Converting potential energy to kinetic energy is always amazing—and fun! Drop a Reaction Rocket and see how high it flies. Wind up a Flying Butterfly or a ZeCar and watch them go. Watch your Putt Putt Steam Boat chug along, powered by steam. In this exclusive bundle you'll get eight different demonstrations of forces and energy. A selection of goodies that Newton himself would enjoy!

Dropper Popper (POP-100)

Dropper Poppers are more than just half of a rubber ball. This incredible device seemingly defies the laws of physics by bouncing higher than where you dropped it! Requires a small amount of 'activation energy' to work. It is molded into a very special shape that allows it to store elastic potential energy and then convert it to kinetic energy with a POP when dropped from a low height. Dropper Poppers make a great 'activation energy' demonstration. An engaging activity for any Physics or Chemistry class!

Seismic Accelerator (SS-150)

Several balls are threaded on a wire. When the apparatus is dropped straight downward onto a hard surface, the top ball can rebound to a height equal to five times the original drop. WOW! Leads into an interesting discussion of what has happened due to the Law of Conservation of Energy. Comes with safety glasses.

Reaction Rocket (RKT-625)

This rubber ball launcher and foam rocket may look simple, but they're a sure-fire way to provoke a WOW reaction—and introduce students to Newton's Laws. Hold the launcher by its straw and drop straight down onto a hard surface. The rocket shoots up dramatically higher than its original drop height. Explaining energy conversion was never this easy... or this much fun! Comes with one launcher, two rockets. Class Kit includes 15 launchers and 40 rockets.

3-2-1 Blast Off! Kit (PHY-321)

Over the years, hundreds of teachers have asked us to develop a kit that bundles our much-loved demonstrations of things that go "bump" in the day! Kit includes comprehensive teaching instructions and enough hands-on components for up to 10 students. (Safety glasses recommended.) We've also created memory-refresher videos that walk you through each of the demonstrations, so you'll be up to speed and ready to Blast Off in just minutes!