Rock-A-Bye Pendulum

Summary

Students will use the scientific process to explore the effects of force on an object in motion.

Materials

For each group:

- Ruler
- Tape
- 2 feet of string
- 2" ball
- *Rock-A-Bye-Pendulum* worksheet
- Marble
- Popsicle sticks
- Large straw
- Yard or meter stick

Additional Resources

Books

- *The Handy Science Answer Book*
  , by the Carnegie Library of Pittsburgh; ISBN 0810394510
- *Gizmos & Gadgets: Creating Science Contraptions That Work (and Knowing Why)*
  , by Jill Frankel Hauser; ISBN 1-885593-26-0
- *Machines: Mind-Boggling Experiments You Can Turn Into Science Fair Projects*
  , by Janice Pratt VanCleave; ISBN 0-471-57108-3
- *Forces and Motion (Hands on Science)*
  , by Sarah Angliss and Maggie Hewson; ISBN 0-7534-5348-7
- *Eyewitness Force and Motion*
  , by Peter Lafferty; ISBN 0789448823

Background for Teachers

Newton’s first law of motion describes the tendency of all objects and matter in the universe is to stay still, or if moving, to continue moving in the same direction, unless acted on by some outside force. The teaching of force and motion in third grade sets the foundation for further understanding when its principles are revisited again in sixth and seventh grades, and with a more in-depth focus in eighth grade.

This lesson plan uses a pendulum, as when a pendulum is set in motion it remains in motion, thus allowing time to perform experiments on an object in motion. Many universities exhibit large pendulums that actually show the rotation of the earth, hence they are important instruments having to do with force and motion.

This activity requires students to practice a basic scientific process. A question is given to them and they make predictions before setting up an experiment to prove or disprove their prediction. Students record their results and analyze their findings.

Intended Learning Outcomes

1. Use Science Process and Thinking Skills
2. Manifest Scientific Attitudes and Interests
3. Understand Science Concepts and Principles
4. Communicate Effectively Using Science Language and Reasoning

Instructional Procedures

Invitation to Learn

Pinball

What happens when force is applied to an object in motion? Two similar activities compare the effects of a gentle force and a harder force on an object in motion.

Explore effects of a soft or gentle force. Demonstrate by setting up a track between two yardsticks and having students take turns rolling the marble down the track. Blow on it through the straw from the front, side, and behind. Students discuss what they saw and why it happened.

Demonstrate the effects of a hard force. Have students take turns rolling the marble down the track. As the marble is rolled down the "lane," hit it with the "flipper" (popsicle stick) from the front, side, and behind. Students discuss what they saw and why it happened.

Discuss as teams what effect forces have on objects in motion.

Instructional Procedures

Explain that students will be building a machine to help further explore the effects of force on an object in motion. Each group is responsible for building a machine and using it to experiment with applying force to an object in motion.

Demonstrate how to build the pendulum by placing the ruler on a desk so that four inches are on the desk and eight inches extend over the side. Tape the ruler to the desk.

Wrap one end of the string around the ball once. Wrap a piece of tape around the ball, covering the string. Put two pieces of tape where the string hangs off the ball so it won't tear through the tape.

Tie or tape the other end of the string around the ruler, three inches from the end.

Show how to set the pendulum in motion by pulling it up and letting it go.

Help students build the pendulum and begin the activity.

Groups predict what will happen when a force acts on the pendulum and write the prediction on the *Rock-A-Bye-Pendulum* worksheet.

Extensions

Integrate with Math Standard V (Probability) by predicting what will happen to the pendulum when acted upon by other forces. Extend by trying other forces and record the results. Assessment includes the students stating that their prediction is most likely/least likely to happen in specific circumstances.

Integrate with Physical Education by teaching coordination of moving with a partner in dancing and tag. Dribbling a basketball also demonstrates the effect of force on a moving object.

Adapt by using the activity as a demonstration only. Student volunteers may use the pendulum. Responses may vary, including verbal, written, or pictorial.

Family Connections

Students observe forces in nature. Compare the effects of a strong wind and a light breeze on a shrub or tree. Observe cars going by their house. If they live near an intersection, watch and compare the force necessary for the car to slow down to turn. Do cars traveling at higher speeds have to brake sooner and harder than cars traveling slower? What else did they discover that changed its motion as a result of being acted on by a force? Report findings to the class.

Assessment Plan

Have students record results on the *Rock-A-Bye Pendulum* worksheet and discuss. Include an explanation of the effects of various forces on objects in motion in their science journals. They will articulate, demonstrate, or draw.

Bibliography

Research Basis

King, Kenneth. (2005). Making Sense of Motion. *Science Scope*. p. 22-26.
"Making Sense of Motion" begins with a general statement that interest in motion comes at an early age as exhibited by a very young child playing with a car and making the vrooomm sounds that suggest speed. All students need to develop an understanding of motion and force. Activities including hands-on investigation involve use of higher order thinking skills.

Authors

Utah LessonPlans