ENERGY EDUCATION

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ENERGY FUNDAMENTALS – LESSON PLAN 1.2

Newton's First Law of Motion

This lesson is designed for 3rd – 5th grade students in a variety of school settings (public, private, STEM schools, and home schools) in the seven states served by local power companies and the Tennessee Valley Authority. Community groups (Scouts, 4-H, after school programs, and others) are encouraged to use it as well. This is one lesson from a three-part series designed to give students an age-appropriate, informed view of energy. As their understanding of energy grows, it will enable them to make informed decisions as good citizens or civic leaders.

This lesson plan is suitable for all types of educational settings. Each lesson can be adapted to meet a variety of class sizes, student skill levels, and time requirements.

Setting	Lesson Plan Selections Recommended for Use
Smaller class size, higher student ability, and /or longer class length	• The "Modeling" Section contains teaching content. • While in class, students can do "Guided Practice," complete the "Recommended Item(s)" and any additional guided practice items the teacher might select from "Other Resources." • NOTE: Some lesson plans do and some do not contain "Other Resources." • At home or on their own in class, students can do "Independent Practice," complete the "Recommended Item(s)" and any additional independent practice items the teacher selects from "Other Resources" (if provided in the plan).
Average class size, student ability, and class length	• The "Modeling" Section contains teaching content. • While in class, students complete "Recommended Item(s)" from "Guided Practice" section. • At home or on their own in class, students complete "Recommended Item(s)" from "Independent Practice" section.
Larger class size, lower student ability, and/or shorter class length	• The "Modeling" Section contains teaching content. • At home or on their own in class, students complete "Recommended Item(s)" from "Independent Practice" section.

Electrical Safety Reminder: Teachers should remind students that electricity is dangerous and that an adult should be present when any recommended activities or worksheets are being completed at home. Always obey instructions on warning labels and ensure one has dry hands when touching electronics or appliances.

Performance Objectives

By the end of this lesson, students will be able to:

- **Describe motion.**
- **Describe what causes changes in motion.**
- **Identify the characteristics of objects in motion.**

Public School System Teaching Standards Covered

State Science Standards

- AL GLE 3.4.1 3rd
- AL 3.PS.4 3rd
- AL 4.PS.4 4th
- AL 5.PS.6 5th
- GA S4P3 4th
- KY 3.PS.2.A 3rd
- NC 3.P.1 3rd
- NC 5.P.1 5th
- TN SPI 0307.11.1 3rd
- TN SPI 0307.11.2 3rd
- TN SPI 0407.11.2 4th
- TN SPI 0507.11.3 5th
- VA 4.2 4th

Common Core Language Arts/Reading

- AL RI.3.1 and 2 3rd
- GA ELA.CC4.RI.1,2,and 8 4th
- KY 3.RI.1,2, and 8 3rd
- CCR.R.10 5th
- NC Integration and Knowledge of Ideas-Cluster 7, 8, 9 5th
- NC Key Ideas and Details-Cluster 1,2, 3 3rd

I. Anticipatory Set (Attention Grabber)

Essential Question

What must happen in order for objects to move? Stop moving?

Videos

Newton's First Law of Motion Video: http://www.youtube.com/watch?v=OHw80HXSuAQ

II. Modeling (Concepts to Teach)

Isaac Newton (a 17th century scientist) put forth a variety of laws that explain why objects move (or don't move) as they do. These three laws have become known as Newton's Three Laws of Motion.

Newton's First Law of Motion states that objects at rest tend to stay at rest and objects in motion tend to stay in motion unless a net force acts on the object. This is referred to as **inertia**. Inertia is an object's resistance to changes in motion. Another way to put this is "objects tend to keep doing what they are already doing" unless acted upon by a net force.

This explains why a person shifts forward when a car comes to a sudden stop. Even though the car is coming to a stop due to an unbalanced force working on it, there is no such force acting on the rider in the car. Without a net force acting on the rider, the rider continues to do what he/she was already doing (moving forward) until a net force acts upon him/her. This net force would be provided by a seat belt, which eventually brings them to a stop, too. What about when the car is at rest and then a net force acts on it? The car is set into motion, but there was no net force applied to the rider, so the rider stays at rest and is pulled back into his/her seat.

The more mass an object has, the more inertia it has. For example, if an object like an elephant sits in a wagon and an object like a mouse sits in another wagon, the elephant wagon will need more net force to set it into motion from rest (accelerate it) than the mouse wagon. Once the elephant wagon is in motion, it will require more net force to slow it down (decelerate it) than the mouse wagon. Mass and inertia are directly proportional. The more mass an object has, the more inertia it has, and the less mass an object has, the less inertia it has.

Additional Information

http://science.howstuffworks.com/innovation/scientific-experiments/newton-law-of-motion1.htm

III. Checking for Understanding

Teachers can ask students these questions to determine understanding of concepts.

REMEMBER	Restate Newton's First Law of Motion. (Class discussion)
UNDERSTAND	Explain Inertia. (Class discussion)
APPLY	Together, make a list of everyday events that use Newton's First Law of Motion. (Teachers can list these on the board with help from students.).
CREATE	Compose a story involving Newton's First Law of Motion providing examples that illustrate students' understanding. (Teachers can ask students to write their stories on a sheet of paper.)

IV. Guided Practice Ideas

Recommended Items

Inertia Egg Drop (see below)
Ball Bounce Experiment (see below)

Experiments

- Inertia Egg Drop: **http://www.stevespanglerscience.com/lab/experiments/egg-drop-inertia-trick**
- Ball Bounce Experiment: **http://www.metrofamilymagazine.com/July-2012/Simple-Science-Experiments-Newtons-First-Law-of-Motion/**
- Penny on a Card Experiment: **http://www.metrofamilymagazine.com/July-2012/Simple-Science-Experiments-Newtons-First-Law-of-Motion/**

V. Independent Practice Ideas

Recommended Item: Inertia Worksheet

- Inertia Worksheet and Answer Key provided
- Journal (if the students have a journal): Teachers write the following questions on the board and ask students to copy and answer the questions in their journals: What puts objects into motion? How do they stop? What if there was never a force that stopped the object from moving?

VI. Assessment

These items provide a check for understanding so teachers can easily determine whether concepts need to be reinforced. These items can be graded, if grades are desired.

- Inertia Worksheet and Answer Key provided
- Journal (if completed as Independent Practice, as shown above)
- Essential Question (see below)

VII. Materials Needed

The following materials are needed for the **Inertia Egg Drop** in “Recommended Items” in the Guided Practice Ideas section.

- Cardboard tube
- Pie pan
- Eggs
- Water
- A large drinking glass
- Tray (optional)
- Coloring tablets (optional)

VIII. Closing the Lesson

In addition to the Essential Question shown below, teachers can reference Performance Objectives at the top of the Lesson Plan.

Essential Question

What must happen in order for objects to move? Stop moving?

WORKSHEET FOR NEWTON'S FIRST LAW OF MOTION LESSON 1.2

Inertia

NAME: _____

Objective: Students will be able to describe motion, describe the changes motion causes, and identify the characteristics of objects in motion.

1. Give an example of an object resisting a change in motion.

_____

_____

_____

_____

2. Draw and label two objects with different masses:

3. How are inertia and mass related?

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4. Define *inertia* in your own words.

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5. How did Isaac Newton influence the field of science?

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Answer Key

ANSWER KEY FOR WORKSHEET: INERTIA

1. **Give an example of an object resisting a change in motion.**

   Ex. A chair sliding across a floor, pressing against keys on a keyboard, etc.

2. **Draw and label two objects with different masses:**

   Example

3. **How are inertia and mass related?**

   Ex. The more mass an object has, the more inertia the object has.

4. **Define *inertia* in your own words.**

   Ex. An object will continue acting as it is until a force persuades it to move.

5. **How did Isaac Newton influence the field of science?**

   Ex. Isaac Newton discovered a set of laws that explain why objects move as they do.