

NTTI Media-Rich Lesson Template

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YOUR NAME

Obey The Laws (Of Motion)

LESSON TITLE

Sixth – Eighth Grades

GRADE LEVELS

Two 45-minute class sessions

TIME ALLOTMENT

OVERVIEW

In 1686, Isaac Newton published his book, Principia. In Principia, he discusses three laws that relate forces to the motion of objects. He was not the original discoverer of all three of the laws, but he is credited for his way of explaining them in a way many people could understand. Therefore, the three laws are known as Newton's Laws of Motion. These laws of motion explain the many forces of motion that take place in the world we live in. In this lesson, the students will get an opportunity to see Newton's laws of motion in action on video, create hands-on demonstrations of the laws of motion in cooperative learning groups, and utilize the internet to find information by completing a question scavenger hunt on Isaac Newton.

SUBJECT MATTER

Science/Technology

LEARNING OBJECTIVES

The students will be able to:

- State Newton's Laws of Motion.
- Give real life examples of Newton's Laws of Motion



- Use the internet to gather research about Newton's laws of Motion.
- Create objects that demonstrate the laws of motion

STANDARDS

The Georgia Quality Core Curriculum objectives are available online at <http://www.glc.k12.ga.us/> for the content areas of Science and Technology Integration for grade 6.

The students will be able to:

- Recognize different examples of forces. (GQCC, Science, 9.3)
- State and describe Newton's three laws of motion. (GQCC, Science, 9.4)
- Use technology and telecommunications tools to locate, analyze, synthesize, evaluate, apply, and communicate information. (GQCC, Technology Integration, 6.16)

MEDIA COMPONENTS

Exploring The Laws of Motion

Running Time: 18 minutes

By AGC/United Learning

Website: <http://www.agcunited.com>

E-Mail: agc@mcs.net

Web Sites

Sir Isaac Newton

<http://www-groups.dcs.st-andrews.ac.uk/~history/Mathematicians/Newton.html>

The Web Site examines the life and events of the life of Sir Isaac Newton. There is biographical information as well as explanations of the scientific philosophies and ideas studied by Newton. Several other philosophers and scientists are also discussed.

Sir Isaac Newton: The Universal Law of Gravitation

<http://csep10.phys.utk.edu/astr161/lect/history/newtongrav.html>

The Web Site discusses how Isaac Newton discovered and created the Universal Law of Gravitation. It includes how an observing how an apple falls from a tree helps explain the 2nd Law of Motion. There are pictures and diagrams to assist in the understanding of Universal Law of Gravitation, Mass/Weight, as well as Kepler's Law.

Newton, Isaac (1642-1727)

<http://scienceworld.wolfram.com/biography/Newton.html>

The Web Site offers biographical information and information about the scientific theories and laws studied by Isaac Newton as well as many other philosophers and scientists. There are links available to retrieve more information about specific scientists and theories.

Sir Isaac Newton-Scientist and Mathematician

<http://www.lucidcafe.com/library/95dec/newton.html>



The Website gives basic biographical information such as the dates Newton lived and died. It offers links to other available resources for finding related books, video, and other web sites related to Isaac Newton.

Newton, Isaac

<http://es.rice.edu/ES/humsoc/Galileo/Catalog/Files/newton.html>

The Web Site offers an outline of basic facts about Isaac Newton such as important dates, family, religion, education, technological involvement, etc.

MATERIALS

For each student

- Notebook paper
- Drawing paper
- Colored pencils/crayons
- Scissors
- Clear tape
- Computer or Laptop
- Scavenger Hunt Question Sheet

For each Lab Activity Group

Group Activity 1 (Balloon in Motion)

- various shaped balloons
- string
- stirring (coffee) stirrers
- colored paper

Group Activity 2 (Floating Clay Ball)

- clay
- plastic spoon

Group Activity 3 (Be a Magician)

- coins (pennies, nickels, etc..)
- index cards
- paper/plastic cups

PREP FOR TEACHERS

Prep for Teachers

1. Prepare a transparency or make posters demonstrating Newton's Third Law of Motion as a visual. Include the written definition and a drawing of the law in action.

2. In preparing for the group activities (1 - 3), the teacher should have materials collected in baskets (Basket 1, Basket 2, Basket 3) with all materials available inside. Make sure there are enough materials for more than one class if you teach the lesson to more than one class period.



3. Provide a sample note sheet on the board or overhead showing 3 separate sheets of paper, each titled as Law #1, Law #2, and Law #3.

4. **BOOKMARK** the websites on the computers that your students will be use instead of having students type out the actual URL address to save time. To bookmark (Netscape Navigator) or add a web page to a Favorites (Internet Explorer) list:

- a. Go to the page that you want to Bookmark or add to the Favorites list.
- b. On the Bookmark menu or Favorites menu, click or Ad to Bookmarks. Add to Favorites.
- c. To open one of your Bookmark or Favorites pages, on the Bookmarks or Favorites menu, click the page you want to open.

5. The **FOCUS FOR MEDIA INTERACTION** is the focus or purpose for viewing a segment of video or utilizing a particular internet site. Before allowing the students to view a segment of a video or visit a website, the teacher should give specific instructions on what the students are supposed to write, record, or think about. Newton's Laws of Motion are being demonstrated.

INTRODUCTORY ACTIVITY: SETTING THE STAGE

Begin class by having the students respond to the following journal topic: *If your are sitting still on a school bus traveling at 55 miles per hour on the highway, is your body at rest or in motion?*

Allow the students to write their explanations and to draw a picture to illustrate their response. This activity should take approximately 15 minutes (10 to write and 5 for sharing responses).

Depending on the class size you may choose one of the following ways to have students share their responses.

- select volunteers to share their opinions
- group students according to their responses, give students collaboration time, then allow one or two representatives to speak for the group
- select names from a cup such as wooden sticks randomly
- think/pair/share (have students share responses with a neighbor)

LEARNING ACTIVITIES

Step 1

Prepare the students for the viewing the video, Exploring the Laws of Motion. Instruct the students to take out three sheets of notebook paper. Have them write *Law 1, Law 2, and Law 3* at the top of each page (one law on each page). Inform the students that they will view a video on Newton's Laws of Motion and that the **FOCUS FOR MEDIA INTERACTION** will be to look for examples of each Law. On the notebook paper the students should write a brief sentence or phrase of 2-3 examples of each Law of Motion.



Tell the students to leave space below each phrase/sentence for a drawing or sketch.
Note: It is very important to tell the students that there should be no drawing during the video. The time spent drawing will cause them to miss other important information in the video.

Step 2

Viewing the Video

*Before starting the first segment, ask the students to mentally record the different movements taking place and their causes. **MUTE** the Sound and **START** the video at the beginning of the video.

(You will see the title, *Exploring the Laws of Motion followed by children riding go-carts, a remote control car, etc.*) **PAUSE** the video at the woman pushing the silver Maxima. Ask the students to tell what objects they recall and what were some of the causes of the motion. (answers may be go carts/motor, remote control car/battery, cars/train/engine, bicycle/boy, car moving/person or engine).

***FAST FORWARD** the video to the little boys playing on a red see-saw in a playground. The narrator states Newton's first law of motion. Restate Newton's First Law of Motion (*An object and rest will stay at rest and an object in motion will remain in motion unless acted upon by an outside force*). **PAUSE** the video when you see the red stop sign and the narrator talks about answering questions from a worksheet (ignore those instructions). Allow students to write examples of the First Law of Motion in action on their note sheets.

***FAST FORWARD** the video to when Isaac Newton's face appears with the words Newton's Second Law of Motion, **RESUME PLAY**.

***PAUSE** the video when you see the image of the train/the half image of the planet earth from outer space by the definition of momentum. Discuss the definition of Newton's Second Law of Motion (*The acceleration of an object depends on the mass of the object and the amount of force applied*) and allow students to explain how the examples of the people sliding down the hill on their sleds apply to law #2.

***RESUME PLAY** (The narrator will prompt you to answer questions on a question sheet. Disregard/Ignore those instructions and **FAST FORWARD** the video when Isaac Newton's face appears with the words Newton's Second Law of Motion, **RESUME PLAY**).

Step 3

Once the video is over, allow the students approximately 15 minutes to complete the drawings/sketches that go along with the phrases. Give the students an opportunity to be creative and colorful. Emphasize to the students to show details in their drawings. After drawings are complete, the students will take turns holding up their work and sharing the example or drawing that they find most interesting with the rest of the class.

Step 4

CHECK FOR COMPREHENSION: Follow-up the presentations by reviewing each Law of Motion. Ask the following questions after restating each Law of Motion. *Who can state the Newton's Law #__ (1,2,3)? Can you name 2 - 3 examples of that law viewed in the video? What is another example of that Law that was not seen in the video?*



(Answers may be: Law #1- sledding in the snow, pool balls on a billiard table, satellite in space; Law #2- hitting a baseball with a bat, train vs. a car stopping; Law #3- space shuttle or rocket taking off, Carbon Dioxide powered model cars)



CULMINATING ACTIVITY

Step 1

Assign the students to groups of 2-3 per group. Assign the groups to a particular Lab Station. Place note cards including written instructions by each set of materials at the Lab Stations. Allow the groups to have approximately 10-12 minutes at each station to complete the activity. Complete 3 rotations allowing for all students to have visited each station once. You may have 2 or 3 groups at one station at a time. Remember to make sure that there are enough materials are available at the Lab Stations.

(See the Laws of Motion Activity Sheet for the directions to the Lab Stations.)

Step 2

CHECK FOR COMPREHENSION. Follow-up the complete rotation through the Lab Stations with a class discussion of the complete activities. Ask the following questions: *What law of motion was demonstrated in each Lab Station? (Lab 1-law #3, Lab 2-law #2, Lab 3-law 1).* Did any Lab Station demonstrate more than one law of motion? You may display the balloon structures in your classroom as student work.

Step 3

Administer the Laws of Motion Assessment Test.

CROSS-CURRICULAR EXTENSIONS

TECHNOLOGY INTEGRATION

Allow the students to conduct an Isaac Newton Scavenger Hunt using 5 given web sites. The scavenger hunt will ask biographical and scientific information about Isaac Newton. You may allow students to complete the scavenger hunt in the school computer lab or on school laptops. If given in advance, it may also be a homework assignment that the students may work on at home or in the public library.

LANGUAGE ARTS

Write a different journal topic each day that asks students to discuss the laws of motion in action in several unique locations such as an amusement park, the beach, at school, or inside an airplane.

COMMUNITY CONNECTIONS

- Have students to create a Newton Law of Motion Log by writing down laws of motion taking place at home beginning from the time they leave school. Students may write the time that each action takes place. Encourage the students to have one entry for each hour they are awake.
- Visit a science museum such as Sci-Trek to further explore how Newton's Laws of Motion and forces are in action.
- While getting dressed for school, think about what laws of motion are taking place and write them down during your ride to school.



Laws of Motion IN ACTION!!

Group Activity 1 (3 Groups of 2-3)

Create a rocket using the following materials.

- Balloon
- String
- Stirring straw
- Colored paper

Group Activity 2 (4 groups of 3)

Create a Floating Clay Ball using the following materials. (The clay ball must float in the air using centripetal force.)

- Clay (approximately the size of a marble)
- Plastic spoon

Group Activity 3 (4 groups of 2-3)

Be a Magician and duplicate the “pull the tablecloth from underneath the dishes” trick, using the following materials.

- Penny
- Index card
- Paper/plastic cup



Simple Machine Website Activity Sheet

1. **Go** to the Bookmarks or Favorites list and select this website:

<http://www.cosi.org/onlineExhibits/simpMach/sm1.html>

2. **Click** on the inclined plane icon. Read about the example and how to find the mechanical advantage. Answer the following question.

What is the mechanical advantage for an inclined plane with a box moved 24 feet along the slope to increase the vertical distance by 4 feet?

3. **Click** on the lever icon. Read about the 3 classes of levers. Answer the following question. List 2 examples of each of the 3 classes of levers.

First Class -

Second Class -

Third Class -

4. **Click on the pulley icon. Answer the following question.**
What is the mechanical advantage of a pulley system called?

5. **Click on the wedge icon. Answer the following question.**
Draw a picture of the wedge from the website and draw an example of your own.

6. **Click on the screw icon. Answer the following questions.**

What is the meaning of the pitch?

What other types of simple machines are often used in with a screw?



Isaac Newton's Scavenger Hunt



MOTION / FORCE / FRICTION

1. What year did Isaac Newton die?

2. What school/college did Newton attend?

3. Name 2 philosophers Newton was influenced by.

4. What did Newton discover because of the falling apple?

5. What was Newton's religion?

6. Did Newton have any children? If so, how many?

7. What year was Isaac Newton born?

8. Why did Newton leave school?

9. What was Newton's purpose for going to school in the first place?

10. Describe Newton's life as a child.

