

**BRINGING TOOLS THAT SCIENTISTS USE  
INTO THE CLASSROOM  
ADDING TECHNOLOGY AND RESOURCES**

IMITATING SOME OF THE THINGS SCIENTISTS DO TO ORGANIZE THEIR THOUGHTS,  
REPRESENT DATA, AND PRESENT THEIR FINDINGS. TAPPING TECHNOLOGY AND  
SCIENCE RESOURCES.

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## **Bringing Tools That Scientists Use into the Classroom Adding Technology and Resources to Lessons**

Chae Meadows RET2

Overview: My goal was to develop a standards aligned unit that incorporates some of the tools I used during my RET1 experience. During that experience, my mentor encouraged me to “write down everything,” dates, times, data, observations, diagrams, questions, and thoughts in a logbook. Data was then transferred to a spreadsheet program where it was organized, analyzed, and graphed. For this unit I have chosen several activities that allow for the same process to be imitated. Students will keep a running log of their activities. Students will set-up an Microsoft Excel spreadsheet and use it to organize, analyze, and represent the data in graphs. In addition, I have tapped resources from the Internet, the county education office, and a local teacher resource center. Students will use a bridge-building program downloaded from the Internet, view videos from the Santa Barbara County Education Office that address specific standards, engage in rocket building activities from the NASA Teacher Resource Center located in Lompoc at Vandenberg Air Force Base. Finally, work and activities throughout the unit, some of which students will document with a digital camera, will culminate in student created Microsoft PowerPoint presentations shown to the class. The unit spans about fourteen weeks and addresses the standards for grade 8—Motion 1a-f and Forces 2a-g. The unit will include numerous hands-on discovery and inquiry labs.

- A. Matter in Motion, Forces in Motion, Forces in Fluids
- B. Physical Science—Focus on 8<sup>th</sup> Grade Content Standards
- C. Duration: approximately 45 days of 45 minute periods or about 14 weeks
- D. Equipment and Materials
  - Text: Holt Science & Technology—Physical Science
  - Technology: computers with Internet access, West Point Bridge Building program, Microsoft Excel, Microsoft PowerPoint
  - Other Materials: Electric Vehicle Classroom Kit; Rockets—An Educator’s Guide with Activities in Science, Mathematics, and Technology; Holt Science & Technology Science Kit
- E. Content Standards: This unit will address the 8<sup>th</sup> grade content standards with a focus on the physical sciences as follows:

- 1. Motion—The velocity of an object is the rate of change of its position.
- 2. Forces—Unbalanced forces cause changes in velocity needed to achieve the same rate of change in motion.
- 8. Density and Buoyancy—All objects experience a buoyant force when immersed in a fluid.
- 9. Scientific progress is made by asking meaningful questions and conducting careful investigations.

#### F. Learning Objectives

1. Identify the relationship between motion and a reference point.
2. Identify the two factors on which speed depends.
3. Determine the difference between speed and velocity.
4. Analyze the relationship of velocity to acceleration.
5. Interpret a graph showing acceleration.
6. Give examples of different kinds of forces.
7. Determine the net force on an object.
8. Compare balanced and unbalanced forces.
9. Explain why friction occurs.
10. List the types of friction, and give examples of each.
11. Explain how friction can be both harmful and helpful.
12. Define *gravity*.
13. State the law of universal gravitation.
14. Describe the difference between mass and weight.
15. Explain how gravity and air resistance affect the acceleration of falling objects.
16. Explain why objects in orbit appear to be weightless.
17. Describe how an orbit is formed.
18. Describe projectile motion.
19. State and apply Newton's laws of motion.
20. Compare the momentum of different objects.
21. State and apply the law of conservation and momentum.
22. Describe how fluids exert pressure.
23. Analyze how fluid depth affects pressure.
24. Give examples of fluids flowing from high to low pressure.
25. State and apply Pascal's principle.
26. Explain the relationship between fluid pressure and buoyant force.
27. Predict whether an object will float or sink in a fluid.
28. Analyze the role of density in an object's ability to float.
29. Describe the relationship between pressure and fluid speed.
30. Analyze the roles of lift, thrust, and drag in flight.
31. Give examples of Bernoulli's principle in real-life situations.

#### G. Instructional Design

- Introductory Activities: Quick Labs, Investigate! Demonstrations, Lab Demonstrations, videos.
- Teacher Activities: Demonstrations
- Student Activities: Skill Builder Labs, Discovery Labs, Inquiry Labs, Making Models Labs, PowerPoint, West Point Bridge Building program
- Culminating Activities: Electric Car activities, Rockets activities, PowerPoint presentations

#### H. Assessments

- Pre-Assessment Activity: section quizzes given before a lesson, questions on Quick Labs and demos
- Monitoring Student Progress: check ScienceLogs periodically
- Final Assessments: chapter tests, performance-based assessments

# **Bringing Tools That Scientists Use into the Classroom**

## **Adding Technology and Resources to Lessons**

Chae Meadows RET2  
PowerPoint Presentation

- I. Introduction
  - a. Summary of RET1 Experience
  - b. Overview of Unit
    - i. Content Standards
    - ii. Textbook
    - iii. Timeline
- II. Elements of Research Experience Integrated with Unit
  - a. Keeping a Log
  - b. Using a Spreadsheet to:
    - i. Record Data
    - ii. Analyze Data
    - iii. Present Data
  - c. Student PowerPoint Presentation of Unit
- III. Resources Integrated with Curriculum
  - a. WestPoint Bridge Design Program
  - b. Electric Cars (SBCAPCD)
  - c. Rockets (NASA Teacher Resource Center)
  - d. SBCEO Standards Correlated Online Catalog
- IV. Results
  - a. Sample Logbooks
  - b. Excerpts From PowerPoint Presentations
- V. Conclusion
  - a. Reflections
  - b. Questions

## Physical Science Curriculum

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### 1<sup>st</sup> & 2<sup>nd</sup> Quarters

#### Motion—8<sup>th</sup> Grade

1. The velocity of an object is the rate of change of its position. As a basis for understanding this concept:
  - a. *Students know* position is defined in relation to some choice of a standard reference point and a set of reference directions.
  - b. *Students know* that average speed is the total distance traveled divided by the total time elapsed and that the speed of an object along the path traveled can vary.
  - c. *Students know* how to solve problems involving distance, time, and average speed.
  - d. *Students know* the velocity of an object must be described by specifying both the direction and the speed of the object.
  - e. *Students know* changes in velocity may be due to changes in speed, direction, or both.
  - f. *Students know* how to interpret graphs of position versus time and graphs of speed versus time for motion in a single direction.

#### Forces—8<sup>th</sup> Grade

2. Unbalanced forces cause changes in velocity. As a basis for understanding this concept:
  - a. *Students know* a force has both direction and magnitude.
  - b. *Students know* when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces.
  - c. *Students know* when the forces on an object are balanced, the motion of the object does not change.
  - d. *Students know* how to identify separately the two or more forces that are acting on a single static object, including gravity, elastic forces due to tension or compression in matter, and friction.
  - e. *Students know* that when the forces on an object are unbalanced, the object will change its velocity (i.e., it will speed up, slow down, or change direction).
  - f. *Students know* the greater the mass of the object, the more force is needed to achieve the same rate of change in motion.
  - g. *Students know* the role of gravity in forming and maintaining the shapes of planets, stars, and the solar system.

#### Density and Buoyancy—8<sup>th</sup> Grade

8. All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept:
  - a. *Students know* density is mass per unit volume.
  - b. *Students know* how to calculate the density of substances (regular and irregular solids and liquids) from measurements of mass and volume.
  - c. *Students know* the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid the object has displaced.
  - d. *Students know* how to predict whether an object will float or sink.

#### Holt Science & Technology—Physical Science

##### Chapter 5 Matter in Motion

- **Chapter Opener:** Investigate! “The Domino Derby” (Excel)
- **Section 1** Measuring Motion (1a-f; 9e-g)
  - **Skill Builder Lab:** “Detecting Acceleration,” Datasheet 17

- **Video:** Motion (428288),  
[http://media.sbceo.org/htbin/wwform/www/?TEXT=R10347513-10351689-  
/www/documents/242/cat/wwi770.htm](http://media.sbceo.org/htbin/wwform/www/?TEXT=R10347513-10351689-<br/>/www/documents/242/cat/wwi770.htm)
- **Section 2** What Is a Force? (2a-f; 9)
  - West Point Bridge Designer 2002, <http://bridgecontest.usma.edu/>
- **Section 3** Friction: A Force That Opposes Motion (2a, b, d, f; 9a)
  - **Quick Lab:** “The Friction 500,” p. 120
  - **Video:** Inclined Planes (424377),  
[http://media.sbceo.org/htbin/wwform/www/?TEXT=R7849339-7852407-  
/www/documents/242/cat/wwi770.htm](http://media.sbceo.org/htbin/wwform/www/?TEXT=R7849339-7852407-<br/>/www/documents/242/cat/wwi770.htm)
  - **Discovery Lab:** “Science Friction,” Datasheet 18
- **Section 4** A Force of Attraction (2a, b, d-g; 9a, e)
  - **Skill Builder Lab:** “Relating Mass and Weight,” (Excel), Datasheet 19

## Chapter 6 Forces in Motion

- **Chapter Opener:** Investigate! “Falling Water,” (Demo)
- **Section 1** Gravity and Motion (1a, e; 2a, b, e-g; 9a, b)
  - **Inquiry Lab:** “On the Fast Track,” Lab 18
  - **Quick Lab:** “Penny Projectile Motion,” p. 144
  - **Discovery Lab:** “A Marshmallow Catapult,” (Excel), Datasheet 20
  - **Video:** Gravity and Weightlessness: Measuring G’s  
[http://media.sbceo.org/htbin/wwform/www/?TEXT=R6699027-6702345-  
/www/documents/242/cat/wwi770.htm](http://media.sbceo.org/htbin/wwform/www/?TEXT=R6699027-6702345-<br/>/www/documents/242/cat/wwi770.htm)
- **Section 2** Newton’s Laws of Motion (2a-f; 9a, b, f)
  - **Quick Lab:** “First-Law Magic,” p. 147
  - **Lab:** “Inertia-Rama!,” Datasheet 22
  - **Skill Builder Lab:** “Quite a Reaction,” Datasheet 23
  - **Discovery Lab Demo:** “Newton’s Eggciting Experiment,” Demo 43
  - **Making Models Demo:** “Inertia Can Hurt Ya,” Demo 44
  - **Discovery Lab Demo:** “Fountain of Knowledge,” Demo 45
  - **Video:** Force and and Newton’s Laws  
[http://media.sbceo.org/htbin/wwform/www/?TEXT=R6028958-6033416-  
/www/documents/242/cat/wwi770.htm](http://media.sbceo.org/htbin/wwform/www/?TEXT=R6028958-6033416-<br/>/www/documents/242/cat/wwi770.htm)
  - **Video:** Energy and Force: Part 1  
[http://media.sbceo.org/htbin/wwform/www/?TEXT=R5101985-5104372-  
/www/documents/242/cat/wwi770.htm](http://media.sbceo.org/htbin/wwform/www/?TEXT=R5101985-5104372-<br/>/www/documents/242/cat/wwi770.htm)
- **Electric Cars**
  - **Video:** Automotive Design (501248),  
[http://media.sbceo.org/htbin/wwform/www/?TEXT=R1245444-1248430-  
/www/documents/242/cat/wwi770.htm](http://media.sbceo.org/htbin/wwform/www/?TEXT=R1245444-1248430-<br/>/www/documents/242/cat/wwi770.htm)

## Chapter 7 Forces in Fluids

- **Chapter Opener:** Investigate! “Out the Spouts,” (Demo)
- **Section 1** Fluids and Pressure (2a, b, d, e; 3d, e; 8a; 9f)
  - **Discovery Lab Demo:** “The Rise and Fall of Raisins,” Demo 46
  - **Discovery Lab Demo:** “Going Against the Flow,” Demo 47
- **Section 2** Buoyant Force (2a, b, d, e; 8a-d; 9b)
  - **Quick Lab:** “Ship-Shape,” p. 171
  - **Skill Builder Lab:** “Fluids, Force, Floating,” (Excel), Datasheet 24
  - **Discovery Lab:** “Density Diver,” Datasheet 25
  - **Video:** Buoyancy (501838)  
[http://media.sbceo.org/htbin/wwform/www/?TEXT=R2160876-2163619-  
/www/documents/242/cat/wwi770.htm](http://media.sbceo.org/htbin/wwform/www/?TEXT=R2160876-2163619-<br/>/www/documents/242/cat/wwi770.htm)

- **Section 3** Bernoulli's Principle (2a, b, d, e; 3d, e; 8a; 9f)
  - **Quick Lab:** "Breathing Bernoulli-Style," p. 173
  - **Motivate Demonstration:** Straw Fountain, p. 173
  - **Making Models Lab:** "Taking Flight," Datasheet 26
- **NASA Rockets**
  - <http://www.spacelink.msfc.nasa.gov/Instructional.Materials/NASA.Educational.Products/Rockets/index-text.html>
  - **Video:** Flight to the Planets (423899),  
[http://media.sbceo.org/htbin/wwform/www/?TEXT=R5915756-5917973-  
/www/documents/242/cat/wwi770.htm](http://media.sbceo.org/htbin/wwform/www/?TEXT=R5915756-5917973-<br/>/www/documents/242/cat/wwi770.htm)
- ❖ **Unit PowerPoint Presentation**

### Physical Principles in Living Systems (Physical Science)—7<sup>th</sup> Grade

6. Physical principles underlie biological structures and functions. As a basis for understanding this concept:
- a. *Students know* visible light is a small band within a very broad electromagnetic spectrum.
  - b. *Students know* that for an object to be seen, light emitted by or scattered from it must be detected by the eye.
  - c. *Students know* light travels in straight lines if the medium it travels through does not change.
  - d. *Students know* how simple lenses are used in a magnifying glass, the eye, a camera, a telescope, and a microscope.
  - e. *Students know* that white light is a mixture of many wavelengths (colors) and that retinal cells react differently to different wavelengths.
  - f. *Students know* light can be reflected, refracted, transmitted, and absorbed by matter.
  - g. *Students know* the angle of reflection of a light beam is equal to the angle of incidence.

### 3<sup>rd</sup> & 4<sup>th</sup> Quarters

#### Structure of Matter—8<sup>th</sup> Grade

3. Each of the more than 100 elements of matter has distinct properties and a distinct atomic structure. All forms of matter are composed of one or more of the elements. As a basis for understanding this concept:
- a. *Students know* the structure of the atom and know it is composed of protons, neutrons, and electrons.
  - b. *Students know* that compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements.
  - c. *Students know* atoms and molecules form solids by building up repeating patterns, such as the crystal structure of NaCl or long-chain polymers.
  - d. *Students know* the states of matter (solid, liquid, gas) depend on molecular motion.
  - e. *Students know* that in solids the atoms are closely locked in position and can only vibrate; in liquids the atoms and molecules are more loosely connected and can collide with and move past one another; and in gases the atoms and molecules are free to move independently, colliding frequently.

#### Physical Sciences—5<sup>th</sup> Grade

1. Elements and their combinations account for all the varied types of matter in the world. As a basis for understanding this concept:
- a. *Students know* that during chemical reactions the atoms in the reactants rearrange to form products with different properties.

- b. *Students know* all matter is made of atoms, which may combine to form molecules.
- c. *Students know* metals have properties in common, such as high electrical and thermal conductivity. Some metals, such as aluminum (Al), iron (Fe), nickel (Ni), copper (Cu), silver (Ag), and gold (Au), are pure elements; others, such as steel and brass, are composed of a combination of elemental metals.
- d. *Students know* that each element is made of one kind of atom and that the elements are organized in the periodic table by their chemical properties.
- e. *Students know* scientists have developed instruments that can create discrete images of atoms and molecules that show that the atoms and molecules often occur in well-ordered arrays.
- f. *Students know* differences in chemical and physical properties of substances are used to separate mixtures and identify compounds.
- g. *Students know* properties of solid, liquid, and gaseous substances, such as sugar (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>), water (H<sub>2</sub>O), helium (He), oxygen (O<sub>2</sub>), nitrogen (N<sub>2</sub>), and carbon dioxide (CO<sub>2</sub>).
- h. *Students know* living organisms and most materials are composed of just a few elements.
- i. *Students know* the common properties of salts, such as sodium chloride (NaCl).

### Reactions—8<sup>th</sup> Grade

- 5. Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept:
  - a. *Students know* reactant atoms and molecules interact to form products with different chemical properties.
  - b. *Students know* the idea of atoms explains the conservation of matter: In chemical reactions the number of atoms stays the same no matter how they are arranged, so their total mass stays the same.
  - c. *Students know* chemical reactions usually liberate heat or absorb heat.
  - d. *Students know* physical processes include freezing and boiling, in which a material changes form with no chemical reaction.
  - e. *Students know* how to determine whether a solution is acidic, basic, or neutral.

### Investigation and Experimentation

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- 9. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:
  - a. Plan and conduct a scientific investigation to test a hypothesis.
  - b. Evaluate the accuracy and reproducibility of data.
  - c. Distinguish between variable and controlled parameters in a test.
  - d. Recognize the slope of the linear graph as the constant in the relationship  $y = kx$  and apply this principle in interpreting graphs constructed from data.
  - e. Construct appropriate graphs from data and develop quantitative statements about the relationships between variables.
  - f. Apply simple mathematic relationships to determine a missing quantity in a mathematic expression, given the two remaining terms (including speed = distance / time, density = mass / volume, force = pressure x area, volume = area x height).
  - g. Distinguish between linear and nonlinear relationships on a graph of data.

# Timeline

## Holt Science & Technology—Physical Science

**Day = one 45 minute block**

### Chapter 5 Matter in Motion

- **Section 1** Measuring Motion—**2 days**
  - **Skill Builder Lab:** “Detecting Acceleration” —**2 day**
  - **Video:** Motion—**20 minutes**

**Total 4 ½ days**
- **Section 2** What Is a Force?—**2 days**
  - West Point Bridge Designer 2002—**1 day**

**Total 3 days**
- **Section 3** Friction: A Force That Opposes Motion—**3 days**
  - **Video:** Inclined Planes—**13 minutes**
  - **Discovery Lab:** “Science Friction”—**1 day**

**Total 4 days**
- **Section 4** A Force of Attraction—**2 days**
  - **Skill Builder Lab:** “Relating Mass and Weight”—**1 day**

**Total 3 days**

### Chapter 6 Forces in Motion

- **Section 1** Gravity and Motion—**2 days**
  - **Inquiry Lab:** “On the Fast Track” —**1 ½ days**
  - **Discovery Lab:** “A Marshmallow Catapult”—**1 ½ days**

**Total 5 days**
- **Section 2** Newton’s Laws of Motion—**3 days**
  - **Lab:** “Inertia-Rama!”—**½ day**
  - **Skill Builder Lab:** “Quite a Reaction”—**1 day**
  - **Demos: Discovery Lab:** “Newton’s Eggciting Experiment”; **Making Models:** “Inertia Can Hurt Ya”; **Discovery Lab:** “Fountain of Knowledge”—**1 day**

**Total 5 ½ days**
- **Electric Cars—3 days**
  - **Video:** Automotive Design—**15 minutes**

**Total 3 days**

### Chapter 7 Forces in Fluids

- **Section 1** Fluids and Pressure—**2 days**
  - **Demos: Discovery Lab:** “The Rise and Fall of Raisins”; **Discovery Lab:** “Going Against the Flow”—**1 day**

**Total 3 days**
- **Section 2** Buoyant Force—**3 days**
  - **Skill Builder Lab:** “Fluids, Force, Floating”—**1 day**
  - **Discovery Lab:** “Density Diver”—**1 day**

**Total 5 days**
- **Section 3** Bernoulli’s Principle—**3 days**
  - **Making Models Lab:** “Taking Flight”—**1 day**

**Total 4 days**
- **Rockets—2 days**
  - **Video:** Flight to the Planets—**11 minutes**
- ❖ **Unit PowerPoint Presentation—3 days**

**Grand Total 45 days**

## **Step Sheet: Creating a Data Table**

### **Using Microsoft Excel Spreadsheets with Data.**

This step sheet will help you create a data table to compare changes in temperature over time.

### **Using Microsoft Excel**

To set up a document for your data, follow these steps.

### **Opening Microsoft Excel**

#### **Step 1**

Click the Start menu button then point to Programs. The programs submenu appears containing the Microsoft Excel icon.

#### **Step 2**

Click the Microsoft Excel icon to open the program.

#### **Step 3**

A new blank workbook should automatically appear. If not, then click File and the New in the menu bar. Select a new blank workbook from the dialog box.

When the new workbook opens, you will have a blank spreadsheet ready to accept your text and data.

### **Setting up the Data Table**

#### **Step 1**

Find cell number D1 and click the cell with the cursor.

#### **Step 2**

Click font size in the toolbar and choose size 18.

#### **Step 3**

Click the “**B**” icon in the toolbar then type “Finding Thermal Equilibrium.”

#### **Step 4**

Click the center align button in the tool bar and hit return.

#### **Step 5**

Click in cell A3 and type the word “Time”

#### **Step 6**

Click in cell A4 and type the words “H Temperature”, then press return.

**Step 7**

In cell A5 type the words “C Temperature” press return.

**Step 8**

Put the cursor over the “A” at the top of the column and click to select the whole column.

**Step 9**

Click the “B” icon in the toolbar to make all the text in the column bold print.

**Step 10**

Click in cell B3 and enter the first recorded time.

**Step 11**

Click in cell B4 and enter the first recorded temperature from the film canister.

**Step 12**

Click in cell B5, enter the first recorded temperature from the beaker of cool water.

**Step 13**

Repeat steps 9 through 12 for the rest of the data. In row 3 you should have all the times recorded. In row 4 all the hotter temperatures and in row 5 all the cooler temperatures.

## **Step Sheet 2: Creating a Graph in Excel**

### **Using Microsoft Excel Spreadsheets with Data**

This step sheet will help you convert the data from your lab into a line graph.

### **Using Microsoft Excel**

To set up a document for your data and charts, follow these steps:

### **Opening Microsoft Excel**

#### **Step 1**

Open your spreadsheet with data using Microsoft Excel.

### **Converting the Data Table to a Line Graph.**

Before you can use the Chart Wizard to create a graph from your data table, you must use the cursor to drag through the information you need in your table. You will need to include the title in the cells you highlight for your line graph.

#### **Step 1**

Click on the upper left cell of data in the spreadsheet and drag through all the data on the page.

#### **Step 2**

Click the Chart Wizard icon on the toolbar or go to Insert-Chart in the menu bar.

#### **Step 3**

A series of windows will appear asking you for information about your chart. The first thing you must decide is which type of graph you would like. For the line graph select "line" and use the one already selected in the second row first one. Click the Next button.

#### **Step 4**

The next window will show you a sample of your data as a line graph. Click the Next button.

#### **Step 5**

Click the field under Chart Title and type in "Thermal Equilibrium." Click the Tab button.

#### **Step 6**

In the Category (X) axis field type "Time." Click the Tab button and in the Value (Y) axis field type "temperature." Click the Next button.

**Step 7**

The final step of the Chart Wizard asks you to decide if you want your chart to be an object in your current workbook or a new workbook page. Leave it as an object in and click Finish

**Step 8**

From the menu bar click File-Print Preview. Note the layout of the page, then select Close. Move the graph as needed.

## **“Step Sheet: Creating a PowerPoint Presentation”**

### **PowerPoint Presentation**

This step sheet will help you create a Microsoft PowerPoint presentation.

### **Using Microsoft PowerPoint**

To create a presentation, follow these steps.

#### **➤ Opening Microsoft PowerPoint**

(Note: If the Clip Gallery installed with your Microsoft suite does not include the images you need, use the step sheet titled “Gathering and Inserting Electronic Images” to find the images through other avenues.)

#### *Step 1*

Find the Microsoft PowerPoint icon, which could be in your application folder or in a Microsoft Office folder.

#### *Step 2*

Double-click the Microsoft PowerPoint icon to open the Project Gallery.

#### *Step 3*

In the file menu choose Format and Apply Design Templates. If the designs automatically appear choose the first slide, top row and click OK. This will be your Title Slide.

#### **➤ Inserting Text and Clip Art**

#### *Step 1*

On the title page, click in the text field and type: “HIV/AIDS.” Click in the bottom dialogue box and write a catchy subtitle.

#### *Step 2*

From the Insert menu choose New Slide or command “M” on the keyboard and choose a layout for your first slide.

#### *Step 3*

Repeat Step 2 three more times for a total of five slides. (You may choose to do more than 5 slides for your presentation.)

#### *Step 4*

In Normal View, toggle between slides by clicking on the thumbnail icon displayed to the left on the screen.

*Step 5*

Return to the second card. Click the text field and enter the data for your slide.

*Step 6*

To add clip art, click beneath the text field. From the Insert menu choose Picture, then Clip Art.

*Step 7*

Adjust the size of the clip art by clicking it until the box handles appear around it. From the file menu select Format, then Picture, then from clipart.

*Step 8*

Choose the picture from the clipart file you would like to insert and click Insert.

*Step 9*

To change the size of your clipart, click on the picture so that there are small black boxes surrounding the picture. Choose Format, then Picture from the file menu. Click on the thumbnail Size and choose percentage of height and width you would like to scale the picture to.

*Step 10*

Continue with each slide.

➤ **Insert a Picture From a File**

*Step 1*

Choose Insert, then Picture, then From File.

*Step 2*

Navigate to file folder where the picture is currently located.

*Step 3*

Click on the picture you would like to insert then choose Insert. To size the picture follow step 9 in “Inserting Clipart.”

➤ **Inserting Electronic Images**

See Step Sheet: “Inserting Electronic Images.”

➤ **Animating Text**

*Step 1*

Toggle to Slide 1. Click the text box. From the Slide Show menu choose Animation, Custom. Click the Effects tab. From the Entry effect pull down menu choose an Entry effect.

*Step 2*

From the Entry sound pull down menu, choose an Entry sound.

*Step 3*

Click the Order and Timing tab. Click the radio button Automatically. Select three seconds.

*Step 4*

Click the Options tab. From Text entry options, select “By word.” Click OK>

*Step 5*

Toggle to each slide and repeat the steps above, choosing your own animations for each slide.

➤ **Creating a Slideshow**

With the PowerPoint presentation open and the text and clip are in place, it is time to connect the slides and create the slideshow.

*Step 1*

From the Slide Show menu, choose Slide Transition. From the pull down menu beneath the picture of the dog choose a transition for the slides.

*Step 2*

Select “On a mouse click” for slide advancement. This allows you to manually move the slides at your pace, which allows for discussion.

*Step 3*

Select a sound from the pull down menu to accompany the transition if desired.

*Step 4*

From the upper right corner of the dialog box, select Apply to All. Save your presentation.

*Step 5*

To show the presentation, return to the Slide Sorter View. Click the title page. From the slide presentation control menu (bottom left corner) click the small screen icon (last one on the right). The presentation will open and begin as you click the mouse.

## **Physical Science Presentation**

### **Matter in Motion, Forces in Motion, Forces in Fluids**

1. Create a PowerPoint presentation to present what you have learned and done during this unit.
2. Include your biography on a significant figure from this field of science.
3. Include at least two of the following: timeline (e.g. important dates and discoveries), chart, graph, or drawing. Use graphs, data, etc. from your Excel files.
4. As needed, import text, images, scan maps, graphs, drawings, etc.
5. Look at the PowerPoint rubric for further guidelines.
6. Work-up presentation to the class.

Name of Presenter(s): \_\_\_\_\_

Name of Reviewer: \_\_\_\_\_

## "Rubric for Power Point Presentation"

<b>Score</b>	<b>Content</b>	<b>Presentation</b>	<b>Tools</b>
<b>High</b>	<ul style="list-style-type: none"><li>• All information is correct and accurate</li><li>• No spelling/grammar errors.</li><li>• Includes all necessary information</li></ul>	Contains six + slides of the following: <ul style="list-style-type: none"><li>• Title Slide</li><li>• Question slide</li><li>• Hypothesis</li><li>• Experiment/research</li><li>• Analysis</li><li>• Conclusion</li></ul>	<ul style="list-style-type: none"><li>• Different transition to each slide.</li><li>• Contains 5 different animations with sound.</li><li>• Contains 4 different slide layouts.</li><li>• Contain 4 different clip art pictures.</li><li>• Contains a graph/chart</li></ul>
<b>Medium</b>	<ul style="list-style-type: none"><li>• Information is mostly correct and/or accurate</li><li>• 5 or fewer spelling/grammar errors.</li><li>• Most information is included</li></ul>	Contains five of the six slides mentioned in High Category	<ul style="list-style-type: none"><li>• Two slide transitions are the same</li><li>• Contains 4 different animations with sound.</li><li>• Contains 3 different slide layouts</li><li>• Contains 3 different clip art pictures.</li><li>• Contains a graph/chart</li></ul>
<b>Low</b>	<ul style="list-style-type: none"><li>• 70% or less of the information is correct.</li><li>• More than 5 spelling/grammar errors.</li><li>• Less than 70% of the information is included</li></ul>	Contains four of the six slides mentioned in High Category	<ul style="list-style-type: none"><li>• More than two slides have the same transition</li><li>• Contains 3 different animations with sound.</li><li>• Contains 2 different slide layouts.</li><li>• Contains 1 clip art.</li></ul>
<b>Not Acceptable</b>	<ul style="list-style-type: none"><li>• Information is largely inaccurate</li><li>• More than 10 spelling/grammar errors.</li><li>• Less than 50% of information is included.</li></ul>	Contains less than four of the five slides mentioned in High Category	<ul style="list-style-type: none"><li>• All transitions are the same.</li><li>• Contains less than 3 different animations.</li><li>• All slides have the same layout.</li><li>• Contains no clipart.</li></ul>

\_\_\_\_\_ **Content Comments:**

\_\_\_\_\_ **Presentation Comments:**

\_\_\_\_\_ **Tools Comments:**

# West Point Bridge Designer 2002

Go to <http://bridgecontest.usma.edu/> for free program download

## Lesson Plan—Extension Discovery Activity

### Section 2: What is a force?

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#### Pacing

1 Block = 45 minutes

#### Materials

Computer with downloaded bridge design program.

#### Objectives

1. Design a bridge that will carry a specified load.
2. Make adjustments to design to decrease cost and/or strengthen the bridge.
3. Identify the forces acting on their bridge.

#### Procedure

Students will be shown the basic functions of the West Point Bridge Designer program. Working in pairs or individually, students will choose design templates and design a bridge. The goal is to create a bridge that will support the mass of a heavy vehicle without collapsing. They will test their design by running a vehicle (load) across the bridge. Students will identify points of stress and weaknesses in their design. They will modify the components of the bridge to produce a bridge at the lowest cost that will support a load. Students will identify the forces acting on their bridge.

#### Standards Addressed

Students will know that multiple forces are at work at the same time including:

- Rolling friction caused by the wheels of the vehicle moving across the roadway's surface.
- Gravity pulling down on the roadway and counteracted by the support of the beams and joints of the bridge.
- Tension and compression depending on the design chosen.

#### Assessment

This will not be a graded assignment. Students' knowledge will be assessed by ability to identify forces acting on their bridge, by evaluating the bridge design for functional integrity, and whether the goal of low cost versus strength has been met.

**Electric Cars**—based on the Electric Vehicle Classroom Kit from the Santa Barbara County Air Pollution Control District (805) 961-8833, [www.sbcapcd.org](http://www.sbcapcd.org)

**Lesson Plan—Discovery Activity**—adapted from The Teacher’s Electric Car Book that is included with the kit.

## **Motion and Forces**

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### **Pacing**

3 Blocks = 45 minutes each

**Video:** Automotive Design (501248) 15 minutes,

<http://media.sbceo.org/htbin/wwform/www/?TEXT=R1245444-1248430-/www/documents/242/cat/wwi770.htm>

### **Assessment**

See rubric “**Building an Electric Car.**”

## **Block 1**

### **Building an Electric Car**

#### **Processes**

- Observe characteristics of parts.
- Communicate with group members.
- Arrange gears and axles.

#### **Objectives**

The central activity in this section is to build a working model electric car.

- Students will experience:
  - Changing energy from one form to another.
  - Building a powered machine.
- Students will know:
  - Energy is changed from one form to another in order to make use of it.
- Students will:
  - Trace the flow of energy in an electric circuit.

#### **Materials**

Electric Vehicle Classroom Kit from Santa Barbara County Air Pollution Control District (materials for five cars per kit). Two to three AA batteries per car, double-faced tape, film bottles with sufficient sand to fill them for weights, and a weighing scale. A detailed description of materials is found in The Teacher’s Electric Car Book.

## Procedure

Divide the class into groups according to the number of car kits. Pass out the assessment rubric and allow time to read it. Give each group a set of parts and ask them to use the parts to build a car that moves. Ask students to write in their ScienceLogs three questions that they have about how to build their car with the given materials. Ask students to record their answers to the following questions in their ScienceLogs:

1. How many turns does the motor have to make for each turn of the wheel?
2. What happens if you reverse the connections to the battery?
3. How much weight can be added to your car before it won't move? How does the extra weight prevent the car from moving?
4. Could you make a four-wheel drive car? How? Make a drawing.
5. How is energy changed from one form to another?
6. Draw a diagram that shows the circuit you have made and that shows the flow of energy in the circuit.

## Standards Addressed

9. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.

## Blocks 2 & 3

### Quantifying the Car's Performance

#### Processes

- Observe performance, effect of modifications.
- Communicate results for team's car.
- Compare and contrast trial runs.
- Relate model characteristics to performance.
- Infer effect of changes in design on performance.

#### Objectives

- Students will experience:
  - An iterative design process.
- Students will know:
  - We can use gears to increase torque (force) or revolutions per minute (velocity).
- Students will:
  - Measures distances in meters.
  - Measure an angle.
  - Devise a way to measure speed.
  - Calculate the circumference of a circle.

## Additional Materials

One stopwatch for each group. Materials for a pivot to create a circular course; depending on available surface, e.g. a table leg can act as a pivot although distance between legs will restrict the radius of the circle, or a nail in driven into asphalt can be a pivot. A ramp and a protractor to measure angle of climb.

## Procedure

**Speed Trials:** Ask students to build the fastest car they can using the given materials (different gear arrangements, rubber bands tires for traction). They will have to devise a way to measure speed; if unable to, suggest a circular track and explain how to calculate speed. Have students determine what data to record in their ScienceLogs for each of four trials. Students will diagram and describe the forces acting on the car. Ask students to hypothesize what effect adding weight to the car will have. Have students add weight to the car for one trial and record the results.

**Hill-Climbing:** Ask students to build a car that can climb the steepest angle up a ramp (different gear arrangements, rubber bands tires for traction). Have students record data for each of four trials in their ScienceLogs. Students will also describe the forces acting on the car. Ask students to hypothesize what effect adding weight to the car will have. Have students add weight to the car for one trial and record the results.

Discuss results with class.

## Standards Addressed

2. The velocity of an object is the rate of change of its position. As a basis for understanding this concept:
  - a. *Students know* position is defined in relation to some choice of a standard reference point and a set of reference directions.
  - b. *Students know* that average speed is the total distance traveled divided by the total time elapsed and that the speed of an object along the path traveled can vary.
  - c. *Students know* how to solve problems involving distance, time, and average speed.
  - d. *Students know* the velocity of an object must be described by specifying both the direction and the speed of the object.
  - e. *Students know* changes in velocity may be due to changes in speed, direction, or both.
2. Unbalanced forces cause changes in velocity. As a basis for understanding this concept:
  - a. *Students know* a force has both direction and magnitude.
  - b. *Students know* when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces.
  - c. *Students know* when the forces on an object are balanced, the motion of the object does not change.
  - d. *Students know* how to identify separately the two or more forces that are acting on a single static object, including gravity, elastic forces due to tension or compression in matter, and friction.
  - e. *Students know* that when the forces on an object are unbalanced, the object will change its velocity (i.e., it will speed up, slow down, or change direction).
  - f. *Students know* the greater the mass of the object, the more force is needed to achieve the same rate of change in motion.

9. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations.

Name \_\_\_\_\_

1. Did your group measure your car’s performance?  Yes  No
2. Did your group modify your car to improve its performance?  Yes  No
3. Rate how well your group worked together with 1 low and 5 high. \_\_\_\_\_

4. The table below describes three different levels of accomplishment. Discuss your work with your group and have them check the level the majority thinks you reached in this unit. Then, in the next column, check the level you think you reached. Your teacher will use the last column.

	<b>As a Learner</b>	<b>As a Class Member</b>	<b>Group’s Evaluation</b>	<b>My Evaluation</b>	<b>Teacher’s Evaluation</b>
1	Can assemble a model car that moves. Traces energy flow in the car. Collects and records data in a usable form.	Is ready to work when other group members are. Respects other’s roles in the group. Conserves materials (not wasteful).			
2	<i>Everything in Level 1 plus:</i> Can redesign a gear train to make it produce more speed or more torque. Can connect dry cells to make them produce more current. Distinguishes between force and mass. Can use arithmetic in analyzing data.	<i>Everything in Level 1 plus:</i> Keeps focused on task in hand. Performs some roles well. Does his or her share.			
3	<i>Everything in Level 2 plus:</i> Suggests ideas no one had thought of. Can describe accurately the function of each part of the car.	<i>Everything in Level 2 plus:</i> Performs most roles well. Helps keep group organized. Evaluates ideas without criticizing people. Does more than his or her share.			

5. Use the space below for any comments you, your group, or your teacher want to write.

**NASA—  
Rockets—An Educator’s Guide with Activities in Science, Mathematics,  
and Technology**

This publication contains a brief history of rockets, principles of rocketry, and lesson plans for numerous activities. It can be obtained from the NASA Teacher Resource Center at Vandenberg AFB in Lompoc or printed from the following address:

<http://www.spacelink.msfc.nasa.gov/Instructional.Materials/NASA.Educational.Products/Rockets/index-text.html>