“Teaching is an art, not a science.”

True?

False?

The main goals for the workshop are: Teachers will

- Use PhET simulations for class activities
- Use the guidelines for inquiry approach provided by the PhET team in the activities
- Share their activities on the PhET educators’ database
- Share their experiences during the workshop
- Try Clickers

PhET Workshop Series

2006-2007

At EHS

Who are we?

Handouts for Series

Guidelines

Moving Man worksheet showing alignment

Activity design

How We Learn

CCK worksheet with 2 types of lessons (assigned as homework)

Writing learning goals

Carl W.'s article "Minimize your Mistakes"

Masses and Springs worksheet with 2 types of lessons

Notecard for reflecting

Take home about research

Bloom's revised

King before and after

Dubson article

Chem ed article

Scientific Abilities (just the ability to design page)

Chapter 6 summary from Mayer

1. How many years have you taught?

A. 0-3 B. 4-8   C. 8-15 D. 16 or more

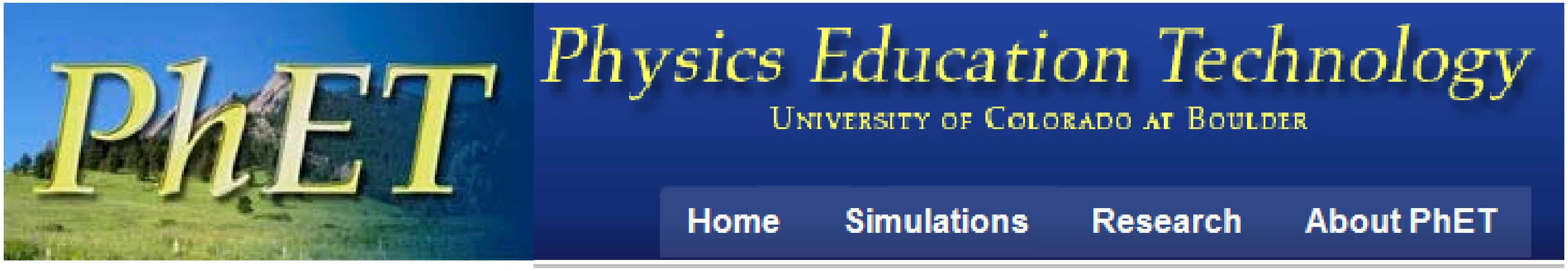
2. How many years have you taught your subject?

A. 0-3 B. 4-8 C. 8-15 D. 16 or more

Getting $500

- Attend and collaborate at meetings
- Design lessons for your classes using the simulations & the research ideas
- Use the lessons
- Reflect on the experience
- Publish your lessons in the Educators’ database for PhET.

http://phet.colorado.edu



Funding

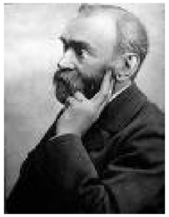
NSF

The William and Flora Hewlett Foundation Hewlett Foundation

Kavli Foundation

University of Colorado

Alfred Nobel



Funding slide

Tonight’s Goals

- Explore some PhET simulations
- Think about how you could use them in class
- Explore the guidelines for inquiry approach provided by the PhET team
- Chose a simulation to use this next month
- Pick a partner for this month

3. My experience with the PhET simulations is

A. I just heard about them from the flyer

B. I have been to the web site and played with some of the simulations

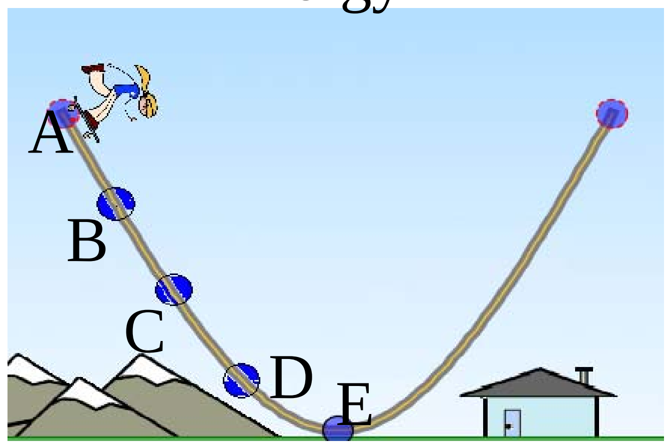
C. I have used one in my course

D. I have used several in my course

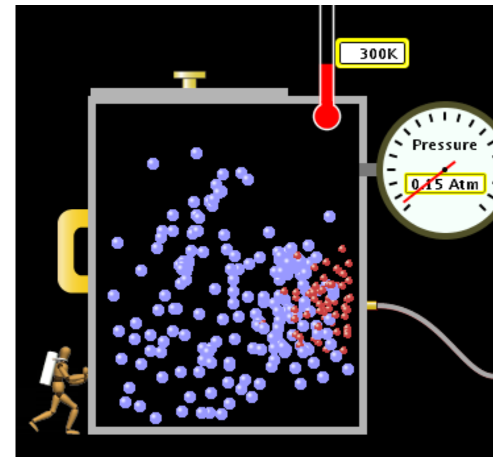
Simulations- Research based

- Motion
- Work, Energy & Power
- Sound & Waves
- Heat & Thermo
- Electricity, Magnets & Circuits
- Light & Radiation
- Quantum Phenomena
- Chemistry
- Math Tools
- Cutting Edge Research

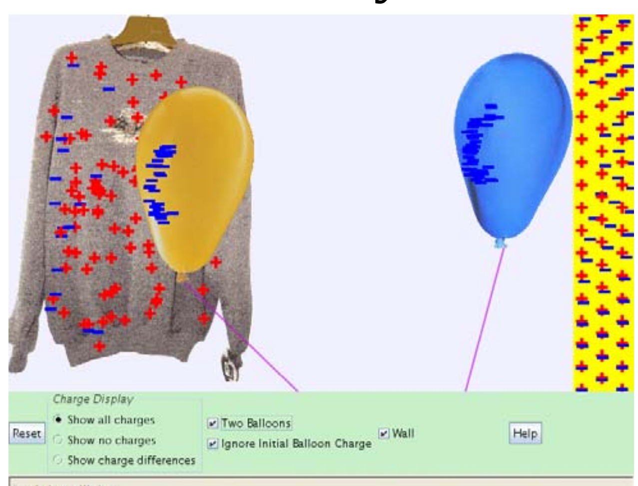
Energy



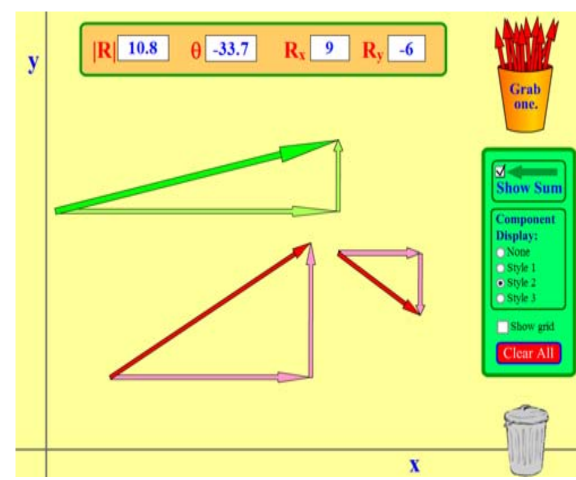
Heat & Thermo

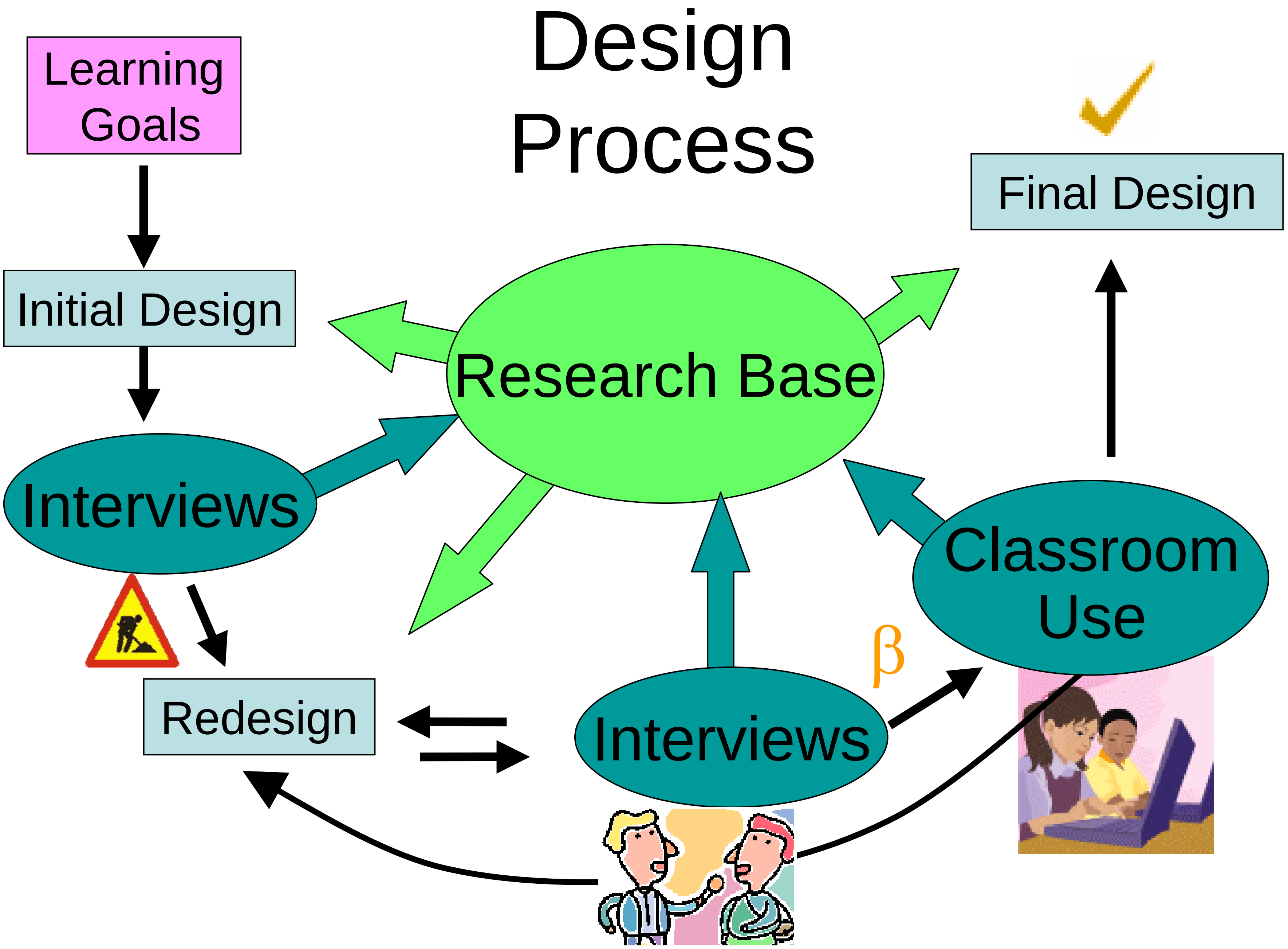


Electricity



Math




Design Process
Learning Goals
Final Design
Initial Design
Research Base
Interviews
Classroom Use
β
Redesign
Interviews

Investigate the PhET website

On your note card:

1. Record how long it takes you to open a simulation
2. Record how many Quantum sims there are without talking to anyone else

4. How much control do you have over your curriculum?

A. I follow a school curriculum with few modifications

B. I am part of a team of teachers who agree on the curriculum

C. I write my curriculum using some district guidelines

D. I write my curriculum

Dinner break

Be ready to work again at 5:25

5. How would you describe your understanding of Inquiry Based Teaching (IBT)?

A. I have been to an in-service where IBT was covered for about an hour.

B. I have been to several in-services about IBT.

C. I have read several books or articles about the IBT.

D. I have been to several in-services and read several books/articles about the IBT

6. How would you describe your experience with inquiry based teaching?

A. I have not used inquiry based lessons.

B. I try to have an inquiry based lesson once a year.

C. I use inquiry based lessons a couple of times a semester.

D. I use inquiry based lessons frequently.

Inquiry Guidelines

Research Based

- ✓ Specific learning goals
- ✓ Students reason and make sense
- ✓ Connect to students’ knowledge
- ✓ Connects to students’ real world experiences
- ✓ Collaborative activities
- ✓ Minimal directions
- ✓ Students self-check understanding

Comparing Activity Design

Make the man start at

-5 meter mark, move with constant speed to the 2 meter mark and then accelerates to the 8 meter mark.

A. Sketch the position, velocity and acceleration graphs that you see.

B. How do the three graphs relate?

Sketch what you think the graphs will look like for this story that Jill told:

"Bobby was talking to me on his cell phone standing by his car. The phone signal was poor, so he walked toward his house trying to get a better signal and then stood still so we could talk."

A. Explain why each part of your graph makes sense.

B. Test your ideas using the simulation

Writing an activity

- Find a partner that agrees to try the same sim this month.
- Decide which guidelines you want to meet
- Discuss if you are going to write individual activities or collaborate on one.
- Decide how you will communicate to reflect on how well the lesson meets the guidelines.
- Meet in large group at 6:20

7. If I want to have my students use computers

A. I have to expect them to do the work at home

B. I need to plan three weeks ahead to sign up for a computer lab

C. I can usually get the computer lab within a short time

D. I have computers in my classroom

8. If I need to have something loaded on the students' computers like Flash or Java

A. I need to fill out a request form three weeks in advance
B. I ask the tech to do it and she does it within a week
C. I have to make time to load it myself
D. I give up because it is too much trouble at my school to have anything loaded.

What’s next?

- Sept 17 4:00-6:30
- Be prepared to share your experience using a simulation and the guidelines
- Bring lesson plan and student directions in separate digital documents

Welcome

1. Get name tag and clicker
2. Fill out and turn in: W-9 & Scope of Work forms
3. Explore the Teaching Ideas pages, make a login, and enter your activity
4. Record the number of Quantum sims
5. Play with sims

The main goals for the workshop are: teachers will use

1. PhET simulations for class activities
2. The guidelines for inquiry approach provided by the PhET team in the activities
3. Concept questions to check for learning after the activity
4. Share their activities on the PhET educators' database
5. Share their experiences during the workshop
6. Try clickers

9. The best way to describe my use of the activity I worked on is:

A. I won’t be able to use it this year
B. I haven’t used it yet, but I will in the near future
C. I used it with one class
D. I used it with more than one class

10. I thought that the simulation was _________ USEFUL for helping my students meet their learning goals

A. very
B. somewhat
C. barely
D. not at all
E. I didn’t use a simulation

11. I thought that the simulation was _________ ENJOYABLE for helping my students meet their learning goals

A. very
B. somewhat
C. barely
D. not at all
E. I didn't use a simulation

12. Next year,

A. I will use the activity with little revision
B. I won’t use this activity again, but I’ll use the sim in a different activity
C. I won’t use this activity again, and I won’t use the sim again
D. I will use the activity with significant revision

13. This activity fit into my unit plan

A. As part of the introduction to a new topic
B. After a lab or homework lesson to reinforce a concept
C. To introduce and develop a concept fully
D. To review before an evaluation
E. As part of the test

14. The students participated in the activity

A. With equipment as part of a lab
B. Instead of using equipment
C. In a group discussion where the simulation was only demonstrated
D. I didn’t use a sim

Reflection on use of sim

Talk about your activity

- Which guidelines did you apply?
- How you used the sim
- How using the simulation affected student learning

Work on Circuit Construction Kit guideline handout in pairs

Dinner break
Be back to room at 5:20

Learning goal writing

The learning goals need to:

•Be specific

•Use action verbs that can be measured

•Challenge the students to learn something from the sim

Writing an activity

- Find a partner that agrees to work on same guidelines or sim
- Discuss if you are going to write individual activities or collaborate on one.
- Use design sheet
- Meet in large group at 6:25

Homework

- Post activity to the PhET Teaching Ideas
- Write a new activity
- Oct 15 4:00-6:30 Be prepared to share your experience using a simulation and the guidelines

Warm-up

- The Physics teacher article

CCK homework discussion

- Share answers
- Reviewing note card:

How does this activity rate?

PhET Workshop 3

- Reflect on writing activities
- Explore some PhET simulations:

  Forces 1D and Masses & Springs
- Chose a simulation to use this next month
- Work on designing an activity

Reflection on use of sim

Talk about your activity

- Which guidelines did you apply?
- How you used the sim
- How using the simulation affected student learning

Features of simulations

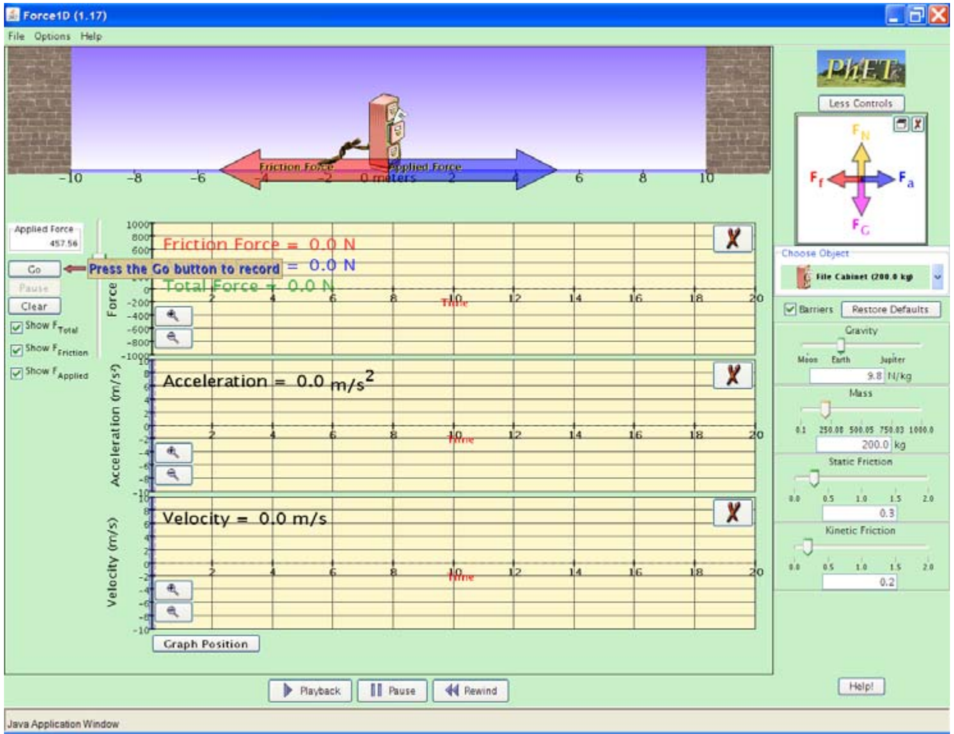
Forces 1D

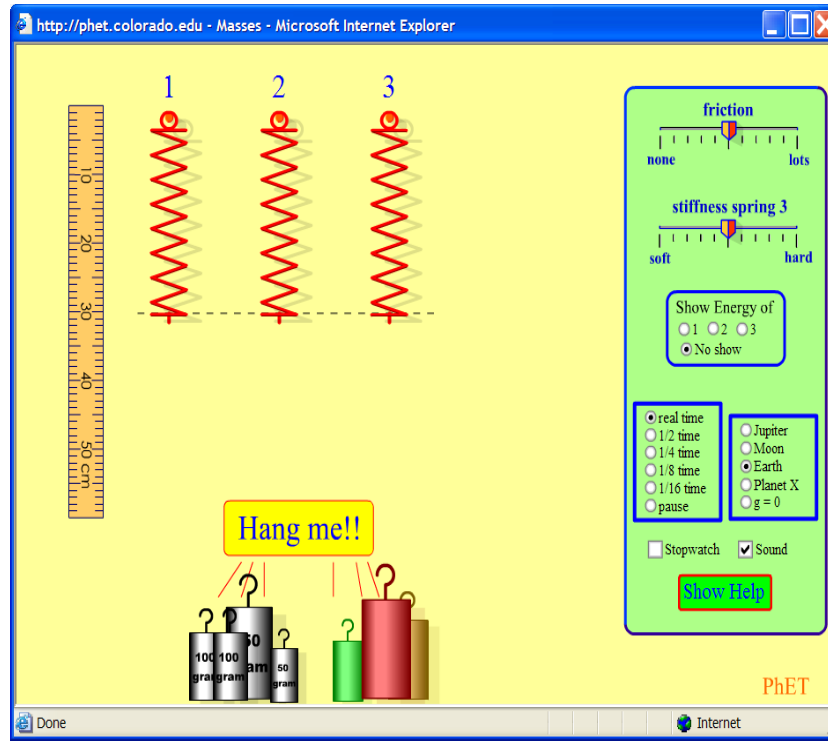
- Sliders, dragging and typing for values
- Playback features
- Variety of graphs: minimize, zoom, select what to view
- Advanced features

Masses and Springs

- Less complex
- Slider controls with no units
- Game-like: determine the unknowns; find PE reference line

How does the simulation design effect your lesson?





Writing another activity

- Pick a partner who wants to use the same sim
- Chose the guidelines that you are going to focus on
- Work until 6:20

Getting $500

- Attend and collaborate at meetings
- Design lessons for your classes using the simulations & the research ideas
- Use the lessons
- Reflect on the experience
- Publish your lessons in the Educators’ database for PhET

PhET Workshop 4

Share activities

Digital Science Library presentation

Reflect on lessons using the guidelines

Explore some PhET simulations

Chose a simulation and guidelines to work on tonight

Warm-up

Discuss in small groups the Masses and Springs homework

Share use of sim

Talk about your activity

- Which guidelines did you apply?
- How you used the sim
- How using the simulation affected student learning

National Digital Science Library

- nsdl.org/
- **NSDL** is the Nation's online library for education and research in
  Science, Technology, Engineering, Mathematics.
- NSDL was established by the National Science Foundation (NSF) in 2000 as an online library which directs users to <u>exemplary resources</u> for science, technology, engineering, and mathematics (STEM) education and research.

Reflect on Activity

- Exchange lessons
- Make suggestions in writing in regards to align the lesson
- Discuss ideas

Homework

Continue to work on lessons

Enter your lessons in the database!!

Robert Payo
Education & Outreach Specialist
National Science Digital Library

According to the 2006 Speak Up Survey: Where do students learn about new technologies?

a) From their teachers
b) From their parents
c) From their peers
d) On their own

http://www.tomorrow.org/speakup/

The 2006 Project Tomorrow Speak Up Survey polled students on their interest in science. At what grade level did student interest begin to drop off?

a) 3rd grade
b) 6th grade
c) 9th grade
d) 12th grade

http://www.tomorrow.org/speakup/

What is the biggest barrier keeping you from using technology in your teaching?

Digital libraries can help!

comPADRE
Digital Resources for Physics & Astronomy Education

Collections | Partners | About comPADRE

Search the Site... Go!

advanced search

What can comPADRE do for you?

This is the comPADRE Pathway

comPADRE and its users are building collections of resources and tools for Physics & Astronomy education communities.

Mouse over the boxes to the left to find collections designed for your needs.

An NSDL Pathway

Welcome to comPADRE!

The comPADRE Pathway, a part of the National Science Digital Library, is a growing network of educational resource collections supporting teachers and students in Physics and Astronomy. As a user you may explore collections designed to meet your specific needs and help build the network by recommending resources, commenting on resources, and starting or joining discussions. To recommend a web resource, log into the Physical Sciences Resource Center and select the *Submit Resources* link.

You may use the user selector above to go to collections of physics materials targeted at you, whether you are a K-12 teacher, college faculty member, student, education researcher, or someone generally interested in Physics and Astronomy.

Or if you would like to learn more about ComPADRE, its events, collections, and partnerships, please choose an option below.

- Collections
- Partnerships
- Workshops and Conferences
  - Calendar
  - Hosted Events
- Community News
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- Technology
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Password: Forgot Password?

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Remember Me

Partnerships

ComPADRE is working with multiple groups interested in facilitating physics educators. New partnerships with the Astrophysics Data System and the Science Education Resource Center are designed to provide educational context to ComPADRE linked materials.

- Adopt-a-Physicist
- ADS Education Service
- MERLOT
- NSDL
- Physlets/Open Source Physics

http://compadre.org

Welcome to the Physics Front!

The Physics Front provides high quality resources for the teaching of physics and physical sciences courses.

You may search or browse the Physics Front in order to find materials appropriate for your physics classes. Additionally, registering will allow you to share your experiences using materials.

The Physics Front is a free service provided by the American Association of Physics Teachers in partnership with the NSF/NSDL.

In 1918, Dr. Lise Meitner, together with Otto Hahn, discovered the radioactive element protactinium (element 91). In December 1938, Lise provided the physical explanation of results obtained by Otto Hahn and Fritz Strassmann in their chemical experiments. Her contributions helped lead to the discovery of nuclear fission and to our understanding of the fundamental structures of nature

Featured Resources

High School Self Assessments

Topics and Units by Course

- Physical Sciences K-8
- Physics First
- Conceptual Physics
- Algebra-Based Physics
- AP-Calc Based Physics

Lesson Plan Central

- NOVA Online-Teachers
- TOPScience
- Hands on Physics Activities with Real World Applications
- Busy Teacher's WebSite/Physics
- The Calendar

Archive »

Recent Additions

Nov 9	Canadian In-Class Question: Hanging Oscillator Energy
Nov 9	Canadian In-Class Question: Forces (Oscillations)
Nov 9	TeachingDVD.com
Nov 5	An Introduction to Assessments in K-12 Science Curricula

Dynamics: Forces and Motion

This topic is broken into units to help in formulating cohesive, effective lessons. Clicking on each unit title below will display appropriate activities, lesson plans, or labs.

Unit materials are a subset of all possible materials available for this topic, selected especially with the new physics teacher in mind. You may instead browse all materials for this topic here.

Physics First *Dynamics: Forces and Motion* Units

A branch of mechanics that deals with forces and their relation primarily to motion but also sometimes to the equilibrium of bodies. Units are not listed in a prescribed order.

- **Newton's First Law & Inertia (3)**
- **Newton's Second Law & Net Force (6)**
- **Newton's Third Law (1)**
- **Applications of Newton's Laws (6)**
- **The Universal Law of Gravitation (2)**
- **Frictional Forces (4)**
- **Force Diagrams (3)**
- **Rotational Motion (6)**
- **Special Collections (1)**

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Physics First *Dynamics: Forces and Motion* Units

A branch of mechanics that deals with forces and their relation primarily to motion but also sometimes to the equilibrium of bodies. Units are not listed in a prescribed order.

⊟ **Newton's First Law & Inertia (3)**

Lesson Plans:

How to find out coefficients of friction through an inclined plane
This inquiry-based lesson plan shows beginning students how to collect experimental data and calculate corresponding coefficients of friction. (Open Website)

Activities:

PhET: Masses & Springs
This fun and realistic simulation helps students gain an understanding of force and motion, springs, and friction. Students manipulate spring constant, mass, and damping. (Open Website)

Inertia Games
This collection of applets explores the physics of force and momentum through simulations of a spaceship moving through space. By rotating the spaceship and firing the engines, the user can navigate the ship around simple obstacles. (Open Website)

⊞ **Newton's Second Law & Net Force (6)**

⊞ **Newton's Third Law (1)**

Detail Page

How to find out coefficients of friction through an inclined plane

written by Youning Wang

This website provides teachers with activities allowing students to understand how to determine a coefficient of friction via an inclined plane. The page also includes a brief background and information on how the activity should be used to promote teamwork.

http://www.scienceteacherprogram.org/physics/wang03.html

Subjects	Levels	Resource Types
Classical Mechanics - Applications of Newton's Laws	- High School - Middle School - Lower Undergraduate	- Activity - Laboratory

Appropriate Courses	Categories	Intended Users
- Physics First - Conceptual Physics - Algebra-based Physics - AP Physics	- Lesson Plan - Laboratory	- New teachers - Teachers

Primary Details | **Citation Formats** | **Suggestion?**

Intended User:	Teacher
Cost:	Does not have an associated cost.
Restriction:	Copyright 2003: Copyright, Youning Wang
Format:	text/html
Record Creator:	Metadata instance created Jul 29, 2004 by Stephanie Tchatchoua
Last Record Update:	Feb 01, 2005 by Bruce Mason

Summer Research Program for Science Teachers

How to find out coefficients of friction through an inclined plane

A Practical Method To Measure Coefficients For Frictional Force

Youning Wang
Murry Bergtraum HS, Manhattan
August 2003

Subject: Physics.
Time Allocation: Thirty-five minutes.

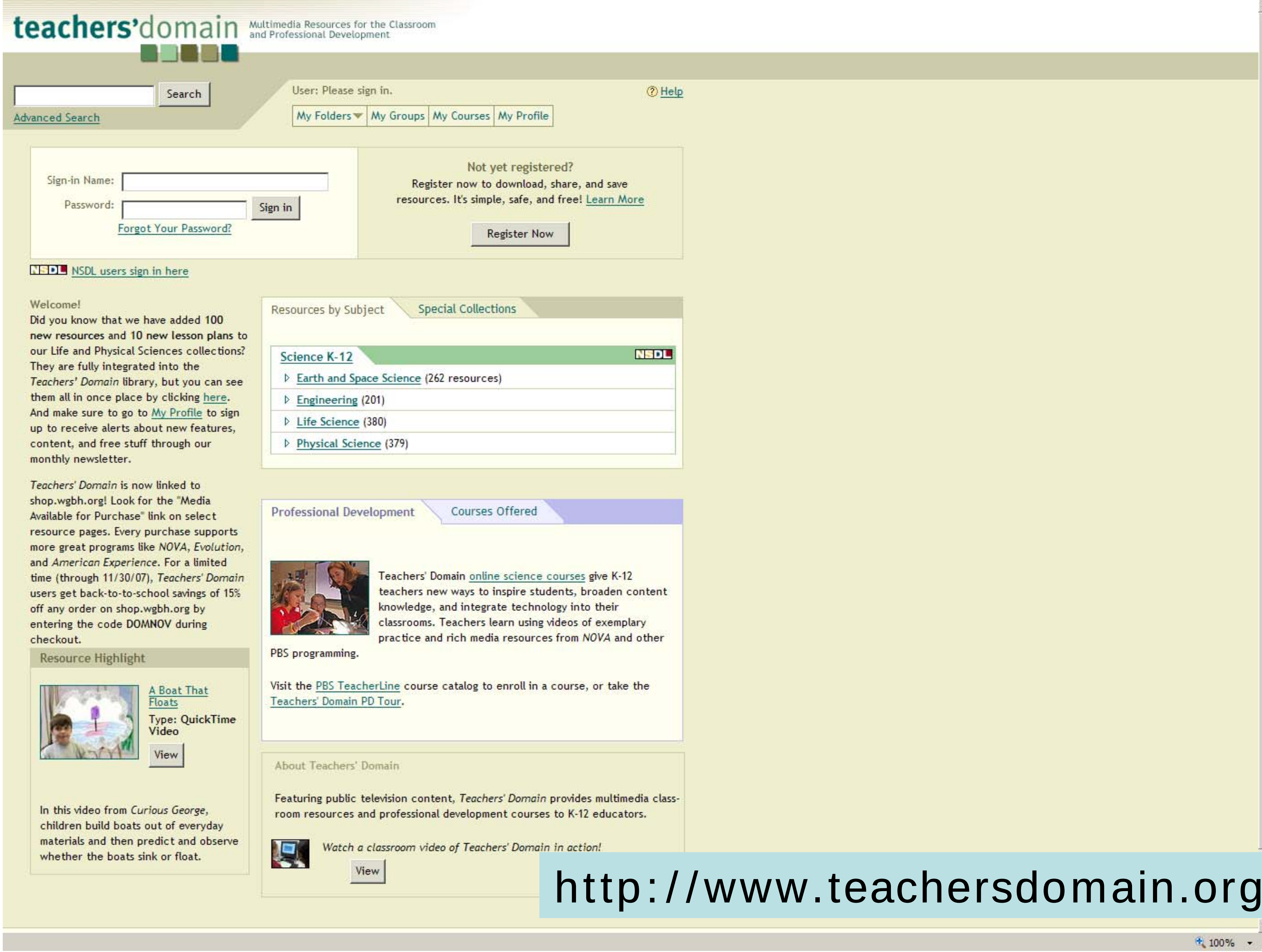
Performance Objectives

Applying the skills of teamwork, students work cooperatively to find out coefficients of friction for surfaces of metal on wood and metal on metal. After completing this class activity, students should be able t

1. understand that a coefficient of friction could be determined via an inclined plane;
2. collect experimental data and calculate the corresponding results of coefficient;
3. compare the values of coefficient generated from different pairs of surfaces.

Components for Cooperative Learning

1. Team size: four students.
2. Assignment to team: If there are thirty-two students in the class, teacher will assign a number to each student starting from 1 to 8. Next, all the "one"s will make up a team, all the "two"s will make up another team, all the "three"s will make up the third team, and so forth. Teacher will also ensure that the students are equally distributed among the teams depending on their talents.
3. Roles in each team:
   Messenger ---- reading the class instructions to direct this activity;
   Handler ---- to pick up and return all class activity materials for his/ her team;
   Operator ---- following the given procedure to carry out the experimental trials;
   Recorder ---- to record the observation results and to calculate the related data.
4. Positive interdependence: This class activity should be done cooperatively. Thus, every team member must be assigned a role to make a positive contribution for the completion of the class activity. Each team should fill in the data sheet for the results of this activity; its team members should agree with the team observations and should be able to explain the results.
5. Individual accountability: While doing this activity, each team member is expected to write down the common observations for the experiment. Furthermore, every student must be able to explain the purpose of the class activity. Teacher may call individuals to come to the board and to present their results.
6. Expected behaviors and monitoring: Teacher will expect to see all team members



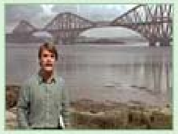
http://www.teachersdomain.org

Subject: # Engineering

Explore the wide world of engineering with innovative multimedia resources from *NOVA*, *Building Big*, *ZOOM*, NASA, and more. From the air bag and hydrogen car to radio waves and DNA, you will find new ways to illustrate engineering concepts and inspire your students.

For more engineering ideas and classroom activities, check out *Design Squad*, a new reality show that plugs eight teenagers into fun, competitive engineering challenges.

Resource Highlight



Firth of Forth Cantilever Bridge

Type: **QuickTime Video**

View

This video segment from *Building Big*: "Bridges" demonstrates the basic design of a cantilever bridge by looking at Scotland's Firth of Forth Railway Bridge.

Permitted use:
Download and Share

Engineering Design

- Applying the Design Process (81 resources)
- History and Impact of Technology (49)
- Innovation and Invention (25)
- The Design Process (22)
- What Is Engineering? (8)

See all resources and lesson plans

Materials and Tools

- Materials (33 resources)
- Tools (16)

See all resources and lesson plans

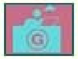
Systems and Technologies

- Biotechnologies (24 resources)
- Communication and Information Technologies (12)
- Construction Technologies (50)
- Energy and Power Technologies (25)
- Manufacturing Technologies (4)
- Transportation Technologies (23)

See all resources and lesson plans

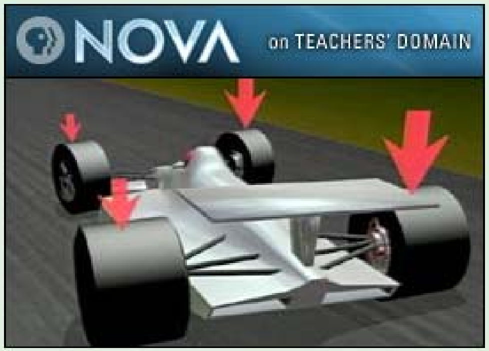
Subtopic: Innovation and Invention

25 out of 25 resources are within your selected grade band.

	Resource	Grade Level	Media Type
	Air Bag Design Using automobile crash test footage, this video segment adapted from *NOVA* shows some of the challenges in designing the air bag.	3-12	QuickTime Video View
	Air Power: Making a Hovercraft In this video segment adapted from *ZOOM*, cast members make their own hovercraft and demonstrate how the air leaking out of a balloon can make a plastic plate hover above a table.	K-8	QuickTime Video View
	Ask an Engineer Explore some of the wonders of modern engineering in this video from the Sciencenter in Ithaca, New York. Hear a diverse selection of engineers explain how things work.	3-12	QuickTime Video View
	Design Inspired by Nature In this stills collage produced for *Teachers' Domain*, see several examples of everyday inventions that were either inspired by nature or are similar in form and function to plants or animals.	3-12	Flash Image View
	Engineering Career Options It's a profession that can take you from the depths of the ocean to the far reaches of outer space, from within the microscopic structures of the human cell to the top of the tallest skyscrapers. In this stills collage adapted from The American Society for Engineering Education, learn about some of the most popular engineering fields.	3-12	Flash Image View
	Forgotten Inventors This illustrated feature from the *American Experience* Web site highlights the frequently forgotten inventors of several useful, innovative technologies.	3-12	HTML Interactive View
	Global Warming: The Hydrogen Car Is the hydrogen car the answer to global warming? This video segment adapted from *NOVA/FRONTLINE* looks at the pros and cons of this developing technology.	3-12	QuickTime Video View
	Hoover Dam and Hydroelectric Power		

Resource: To Survive at High Velocity

Recommended for: Grades 6-12



Save to a folder

Media Type:
QuickTime Video

Length: 6m 28s
Size: 8.9 MB

View
or
Download

Permitted use:
Download

Racecar teams look to reduce the time it takes their cars to complete a circuit. They focus most of their efforts on improving what's called cornering speed, because it's in the corners, where cars must reduce speed, that precious time is lost. Using a mix of practice lap and actual race footage, this video segment, adapted from *NOVA*, highlights the forces at work on a racecar as it travels around a track.

Background Essay | Discussion Questions | Standards

Speed is the rate at which something moves. Fast-moving objects have high speeds, slow-moving ones have low speeds, and objects with no movement have zero speed. Velocity, on the other hand, is speed in a particular direction. Velocity is what's called a vector quantity, which is any quantity -- velocity, force, acceleration, torque -- that has both magnitude and direction. Racecar teams are most interested in improving average speed around a track. Because all cars can move quickly along the straight sections of a track, racecar designers modify a car so that it performs best especially when cornering.

Designers take into account the forces that act upon the car as it moves around the track. Downforce keeps a car stuck to the road by increasing friction and stability, while drag is the air resistance that slows a car. Maximizing downforce and minimizing drag are the primary

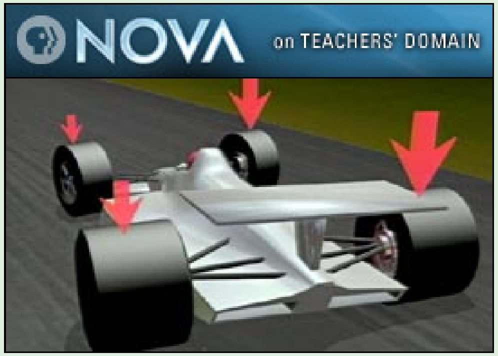
Topics Covered:

- Motions and Forces
- Engineering Design

Professional Development Courses Using This Resource:

- Teaching Elementary Physical Science
- Teaching High School Physical Science
- Building Understanding

Source: *NOVA:* "Fast Cars"



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Background Essay | Discussion Questions | **Standards**

Standards Available: **NSES** | State | MCREL

National Science Education Standards (NRC, 1995)

US.NSES.5-8.sci.A

CONTENT STANDARD A:

US.NSES.5-8.sci.A.1

ABILITIES NECESSARY TO DO SCIENTIFIC INQUIRY

US.NSES.5-8.sci.A.2

UNDERSTANDINGS ABOUT SCIENTIFIC INQUIRY * Different kinds of questions suggest different kinds of scientific investigations. Some investigations involve observing and describing objects, organisms, or events; some involve collecting specimens; some involve experiments; some involve seeking more information; some involve discovery of new objects and phenomena; and some involve making models.

US.NSES.5-8.sci.B

CONTENT STANDARD B: Physical Science

US.NSES.5-8.sci.B.2

MOTIONS AND FORCES

US.NSES.5-8.sci.B.2.a

* The motion of an object can be described by its position, direction of motion, and speed. That motion can be measured and represented on a graph. [See Content Standard D (grades 5-8)]

US.NSES.5-8.sci.B.2.b

* An object that is not being subjected to a force will continue to move at a constant speed and in a straight line.

US.NSES.5-8.sci.D

CONTENT STANDARD D: Earth and Space Science

Topics Covered:

Motions and Forces

Engineering Design

Professional Development Courses Using This Resource:

Teaching Elementary Physical Science

Teaching High School Physical Science

Building Understanding

Source: *NOVA:* "Fast Cars"

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The Book of Phyz: Momentum

comPADRE

This item is a chapter from "The Book of Phyz," an educator's guide to teaching introductory high school physics. It features easily understood content support in the fundamentals of momentum, the rel...

Keywords: Physics, Science, Classical Mechanics, Linear Momentum, conservation of momentum, momentum

Format: PDF, Text/html

http://homepage.mac.com/phyzman/phyz/BOP/1-05MOM/

View all related information

A Java Game Using Linear Momentum

NEEDS Engineering Pathway

Game Using Linear... >> Learning Resource: A Java Game Using Linear Momentum Comments (0) Reviews (0) Save to Workspace Title: A Java Game Using Linear Momentum Download URL: http... a Java gam...

Keywords: momentum

Format: Text/html

http://www.engineeringpathway.com/view.jhtml?id=E91CD6C...

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Conservation of Energy and Momentum

comPADRE

NASAexplores 9-12 Lesson: Conservation Of Energy And Momentum (Teacher Sheets) Conservation Of Energy And Momentum Teacher Sheet(s) Objective: To predict the relationship between energy and velocity.....

Keywords: Physics, Science, Classical Mechanics, Linear Momentum, Work Energy, conservation of energy, conservation of momentum, energy, momentum

Format: Text/html

http://nasaexplores.com/show_912_teacher_st.php?id=0301...

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Collisions and Momentum Conservation Lab

iLumina

The purpose of this lab is to investigate the conservation of linear momentum and energy in one dimensional collisions.

Keywords: Physics/Mechanics/Energy Momentum

Format: Text/html

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The Book of Phyz: Momentum

This item is a chapter from "The Book of Phyz," an educator's guide to teac... comPADRE

A Java Game Using Linear Momentum

This site contains a Java game that involves some concepts of linear moment... NEEDS Engineering Pathway

Conservation of Energy and Momentum

This webpage is part of NASA Explores, an online resource providing express... comPADRE

Collisions and Momentum: Bouncing Balls

As a continuation of the theme of potential and kinetic energy, this lesson... TEACH Engineering Engineering Pathway

Momentum and Its Conservation

This web site contains a number of tutorials relating to momentum. Each tut... comPADRE

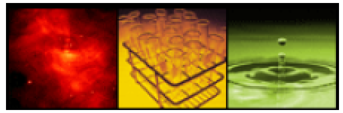
Quantized Angular Momentum (Physics)

This site provides a simulation for the concept of the quantization of angu... NEEDS Engineering Pathway

Momentum and Its Conservation

Done | Internet | 100%

NSDL Pathways



ChemEdDLib: Chemistry
High School to Graduate
Led by the American Chemical Society (ACS)
and the Journal of Chemical Education (JCE)
(http://jchemed.chem.wisc.edu/)

ComPADRE: Physics & Astronomy
High School to Graduate
Led by the American Association of
Physics Teachers
http://compadre.org

Math Gateway: Mathematics
Undergraduate
Led by the Mathematical Association
of America
http://mathgateway.maa.org

BiosciEdNet (BEN): Biological Science
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Advancement of Science
http://www.biosciednet.org

CSERD: Computational Science
K-12 to Graduate
Led by the Shodor Education Foundation, Inc.
http://www.shodor.org/refdesk

Teachers' Domain:
Life, Earth, Space, & Physical Science
K-12
Led by WGBH
http://teachersdomain.org

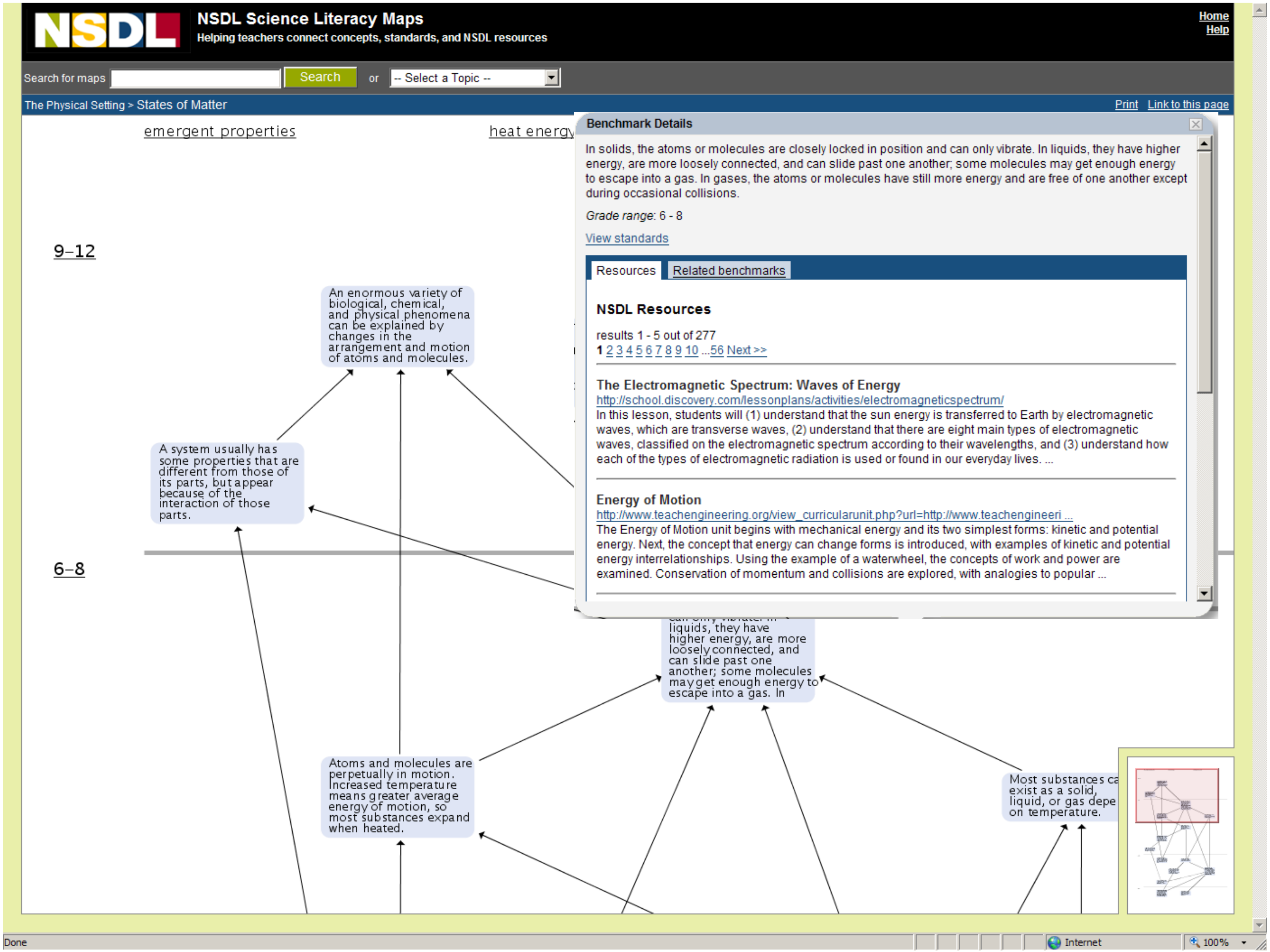
MatDL: Materials Science
Undergraduate to Graduate
Led by Kent State University
http://matdl.org

NSDL Engineering Pathway
K-12 to Graduate
Led by UC Berkeley, University of Colorado
http://engineeringpathway.org/ep

AMSER: Applied Math & Science
Community Colleges
Led by Internet Scout Project,
University of Wisconsin
http://amser.org

MS Portal: Science & Math
Middle School
Led by the Digital Library Projects at
Ohio State University
http://msteacher.org

NSDL welcomes the **Science and Math Informal Learning Educators (SMILE) Pathway** (Fall 2007), led by the University of California at Berkeley's Lawrence Hall of Science in partnership with the Exploratorium, the New York Hall of Science, Science Museum of Minnesota, Children's Museum of Houston, and the Association of Science and Technology Centers (ASTC).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emergent properties
heat energy
9–12
6–8
An enormous variety of biological, chemical, and physical phenomena can be explained by changes in the arrangement and motion of atoms and molecules.
A system usually has some properties that are different from those of its parts, but appear because of the interaction of those parts.
liquids, they have higher energy, are more loosely connected, and can slide past one another; some molecules may get enough energy to escape into a gas. In
Atoms and molecules are perpetually in motion. Increased temperature means greater average energy of motion, so most substances expand when heated.
Most substances ca exist as a solid, liquid, or gas depe on temperature.
Benchmark Details
In solids, the atoms or molecules are closely locked in position and can only vibrate. In liquids, they have higher energy, are more loosely connected, and can slide past one another; some molecules may get enough energy to escape into a gas. In gases, the atoms or molecules have still more energy and are free of one another except during occasional collisions.
Grade range: 6 - 8
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Resources
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NSDL Resources
results 1 - 5 out of 277
1 2 3 4 5 6 7 8 9 10 ...56 Next >>
The Electromagnetic Spectrum: Waves of Energy
http://school.discovery.com/lessonplans/activities/electromagneticspectrum/
In this lesson, students will (1) understand that the sun energy is transferred to Earth by electromagnetic waves, which are transverse waves, (2) understand that there are eight main types of electromagnetic waves, classified on the electromagnetic spectrum according to their wavelengths, and (3) understand how each of the types of electromagnetic radiation is used or found in our everyday lives. ...
Energy of Motion
http://www.teachengineering.org/view_curricularunit.php?url=http://www.teachengineeri ...
The Energy of Motion unit begins with mechanical energy and its two simplest forms: kinetic and potential energy. Next, the concept that energy can change forms is introduced, with examples of kinetic and potential energy interrelationships. Using the example of a waterwheel, the concepts of work and power are examined. Conservation of momentum and collisions are explored, with analogies to popular ...
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Elluminate

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Web Seminar Series Year 2

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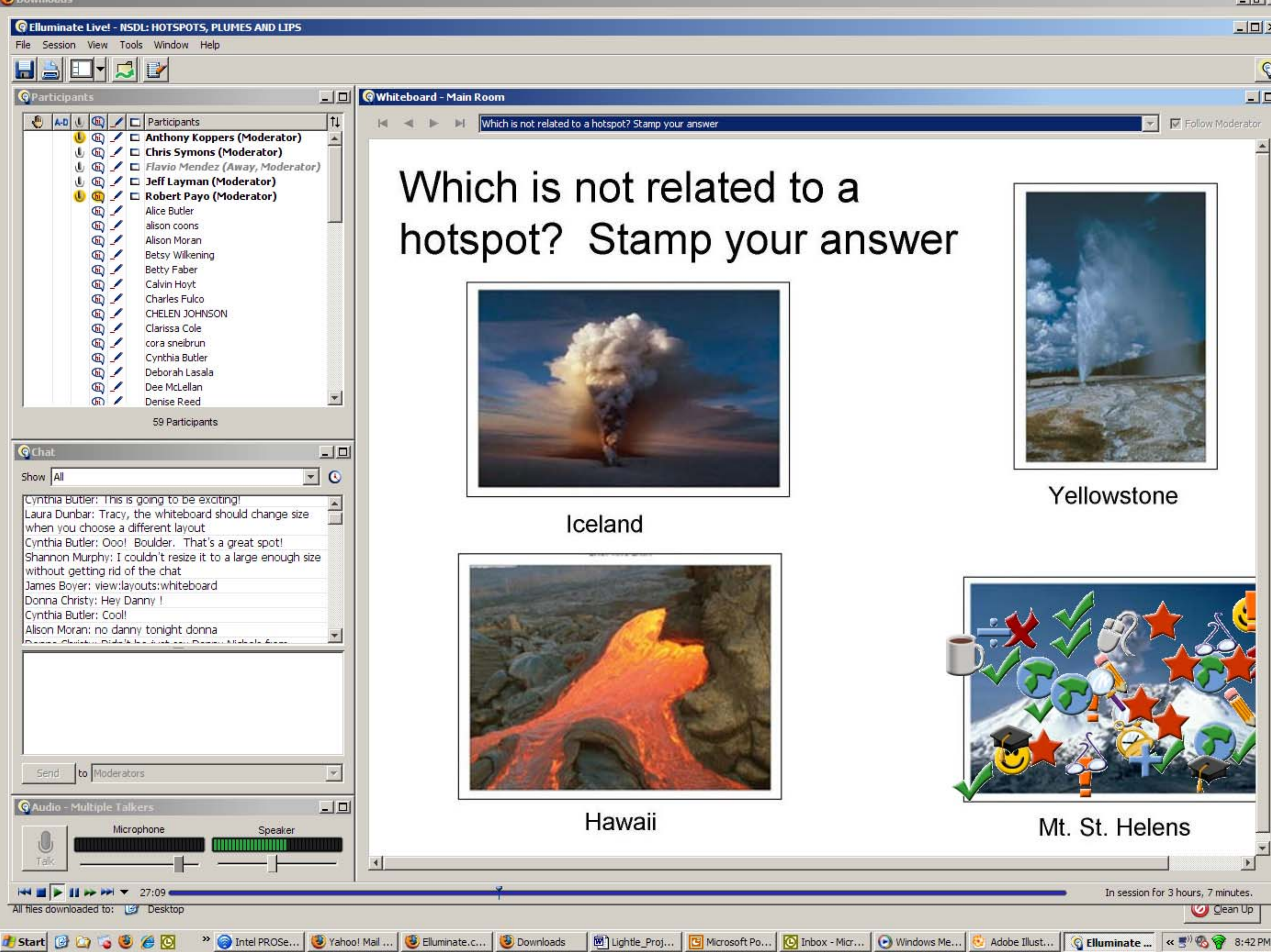
Join us for a series of Web Seminars developed in collaboration with the National Science Digital Library (NSDL) focusing on a variety of science topics and targeting K-12 grade level educators. All web seminars will include information and resources for educators available on the NSDL website. Presenters are well-respected, veteran educators from NSDL and other professional organizations with diverse backgrounds and experience. During the live web seminar presenters share their science expertise and answer questions live from the participants. See the schedule below for specific topics and the presenter's biographical information. Register today!

Each web seminar is a unique, stand-alone, program. Archives of these web seminars and the presenters' PowerPoint presentations will be available on this web page. Learn more about the features of the Web Seminar and read answers to frequently asked questions from participants.

Schedule

Web Seminar 3
Date: Tuesday, October 23, 2007
Time: 6:30-8:00 p.m. Eastern
Title: Chemistry Comes Alive! II
Presenters: Dr. John Moore and Dr. Lynn Diener

NSDL Web Seminar Series



Elluminate Live! - NSDL: HOTSPOTS, PLUMES AND LIPS
File Session View Tools Window Help
Participants
Participants
Anthony Koppers (Moderator)
Chris Symons (Moderator)
Flavio Mendez (Away, Moderator)
Jeff Layman (Moderator)
Robert Payo (Moderator)
Alice Butler
alison coons
Alison Moran
Betsy Wilkening
Betty Faber
Calvin Hoyt
Charles Fulco
CHELEN JOHNSON
Clarissa Cole
cora sneibrun
Cynthia Butler
Deborah Lasala
Dee McLellan
Denise Reed
59 Participants
Chat
Show All
Cynthia Butler: This is going to be exciting!
Laura Dunbar: Tracy, the whiteboard should change size when you choose a different layout
Cynthia Butler: Ooo! Boulder. That's a great spot!
Shannon Murphy: I couldn't resize it to a large enough size without getting rid of the chat
James Boyer: view:layouts:whiteboard
Donna Christy: Hey Danny !
Cynthia Butler: Cool!
Alison Moran: no danny tonight donna
Send
to Moderators
Audio - Multiple Talkers
Microphone
Speaker
Talk
Whiteboard - Main Room
Which is not related to a hotspot? Stamp your answer
Follow Moderator
Which is not related to a hotspot? Stamp your answer
Iceland
Yellowstone
Hawaii
Mt. St. Helens
27:09
In session for 3 hours, 7 minutes.
All files downloaded to: Desktop
Clean Up
Start
Intel PROSe...
Yahoo! Mail ...
Elluminate.c...
Downloads
Lightle_Proj...
Microsoft Po...
Inbox - Micr...
Windows Me...
Adobe Illust...
Elluminate ...
8:42 PM

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Tuesday, November 13th:

Studying Genomes: From the Lab to the Classroom

Dr. Rob DeSalle,
Author and Curator in the Sackler Institute for Comparative Genomics,
American Museum of Natural History

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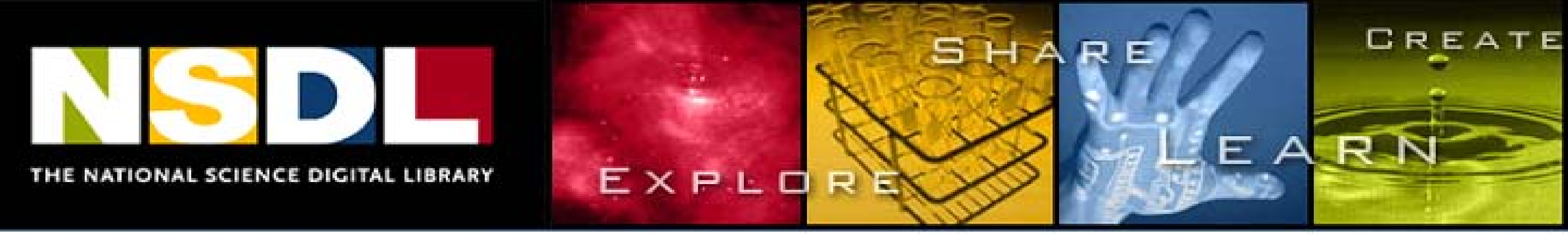


Robert Payo
NSDL Education & Outreach Specialist
rpayo@nsdl.ucar.edu
http://nsdl.org

THANK YOU!

February Workshop 07-08

Before/After lessons

1. Which is which?
2. How did Karen change her lesson to improve alignment with guidelines?

Workshops Recap

Explore PhET simulations

Discuss science ed research

Discuss and share PhET uses

Reflect on lessons using guidelines

POST LESSONS

Variety of Uses

- Labs
- Lecture
- Homework
- Extension opportunities
- Application test questions

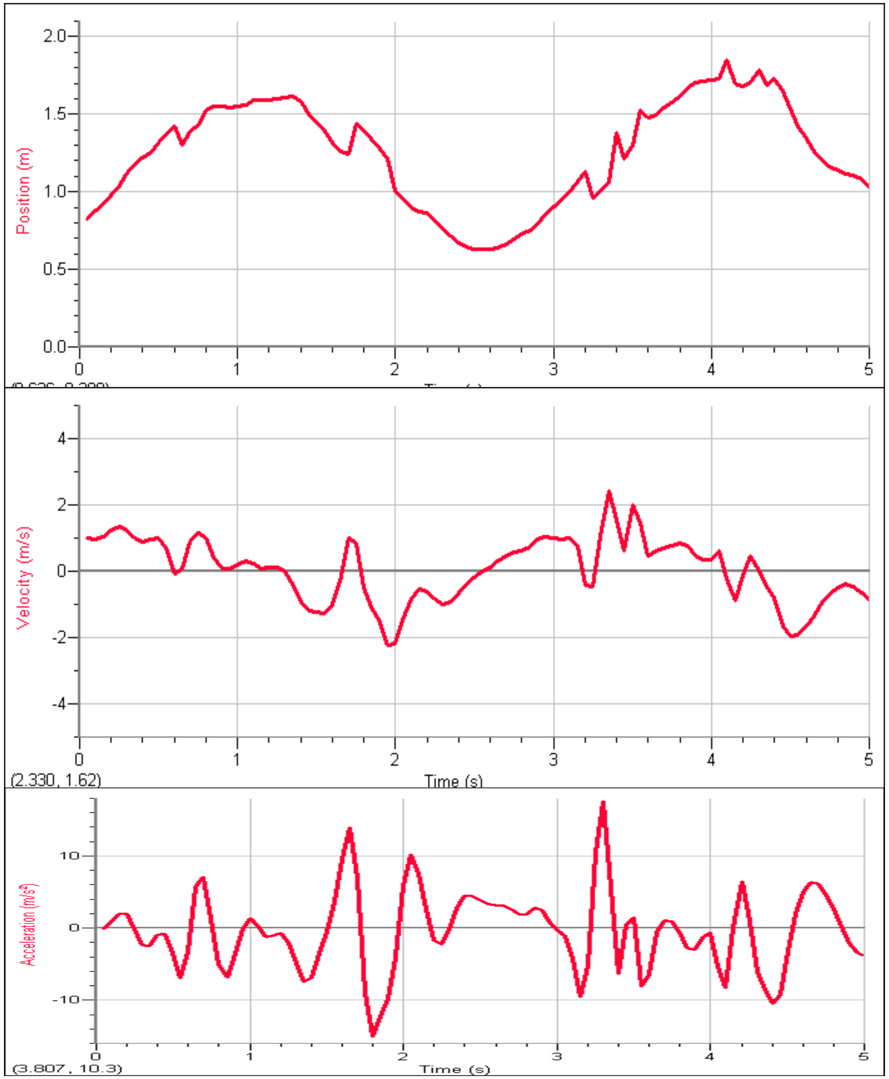
Simulation Extends Lab Concepts

- **Qualitative lab**: Use the motion probe to graph position and velocity of some motion, also make motions to fit given graphs

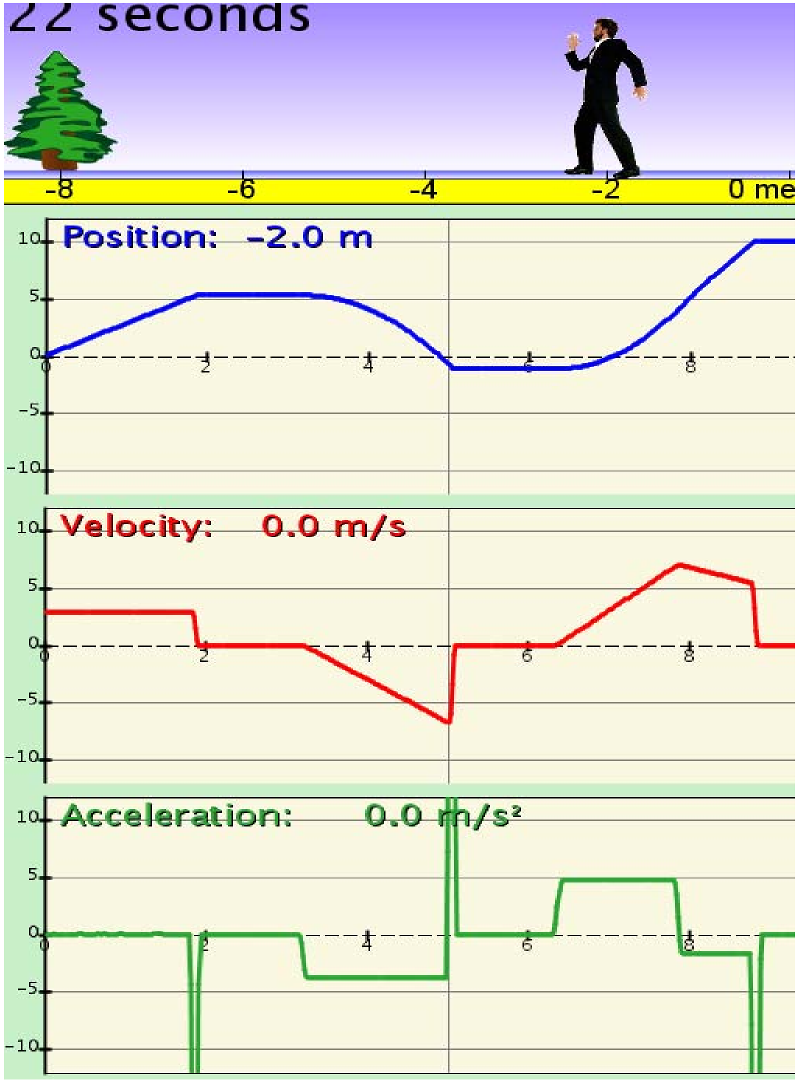
- **Quantitative lab:** Use Moving man to accurately interpret and draw position, velocity and acceleration graphs for common situations and explain reasoning.

Simulation Extends Lab Concepts

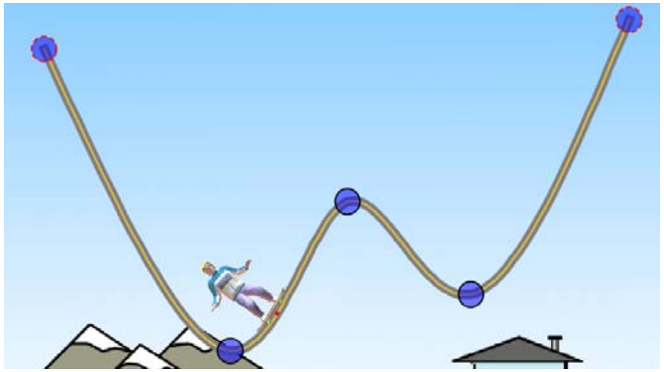
Vernier Labpro



Moving Man



Enables Inquiry Labs

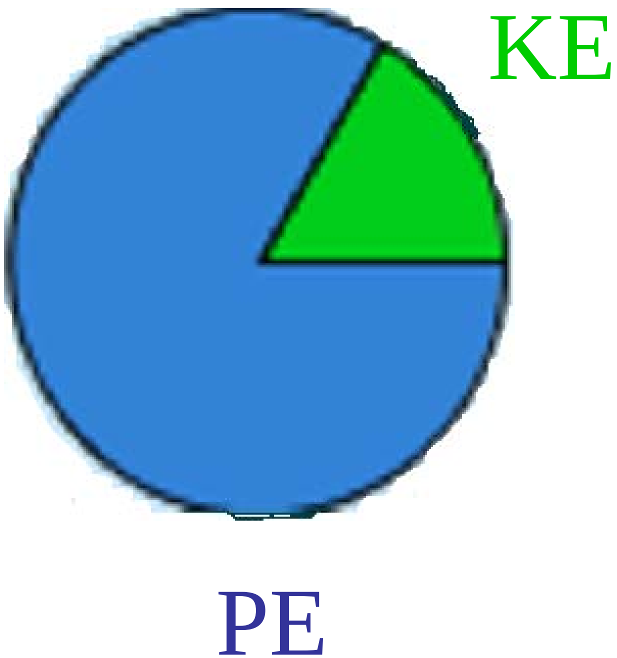


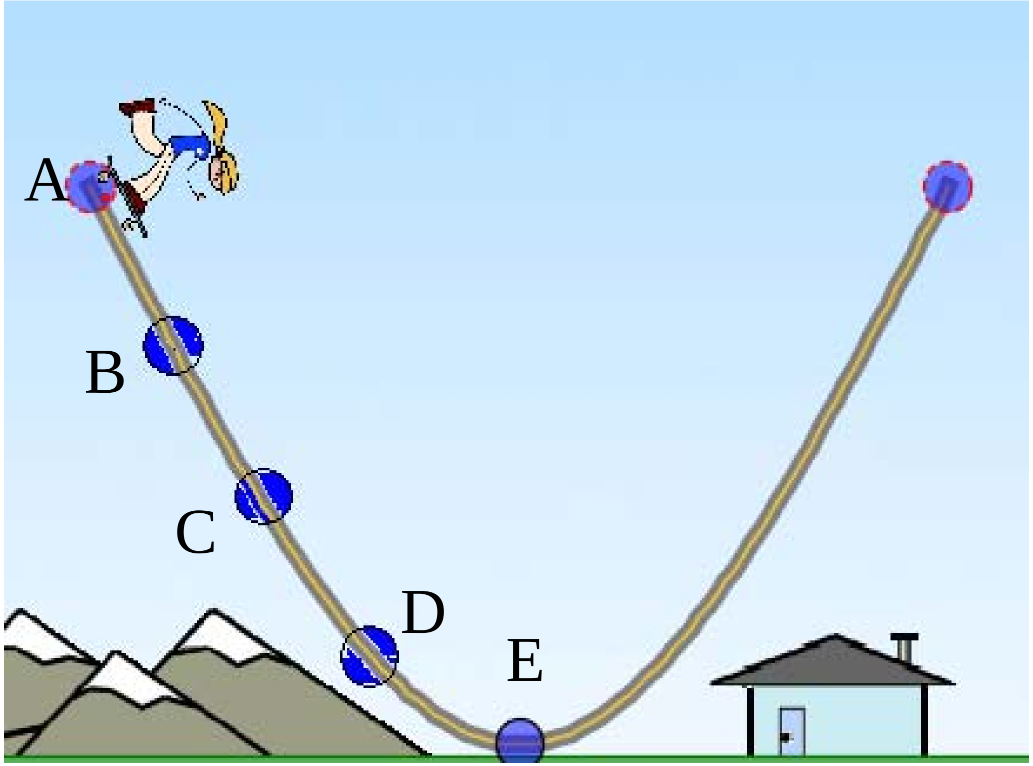
Energy Skate Park

- Multiple variables, but easily isolated
- Easy to repeat experiments
- Variables beyond classroom
- Multiple representations
- Relates to students experiences

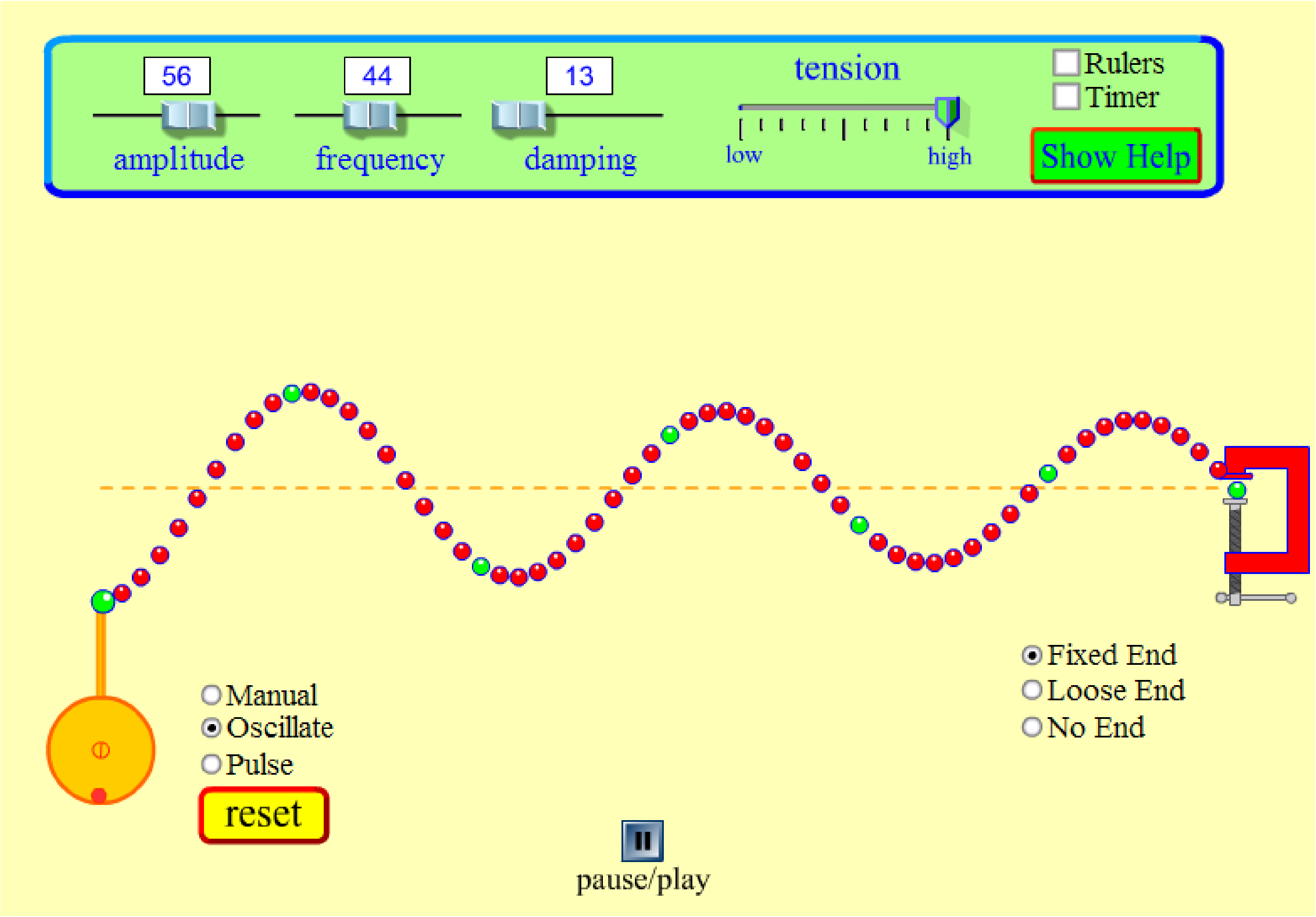
Concept tests

The pie graph shows the energy of the Skater, where could she be on the track?





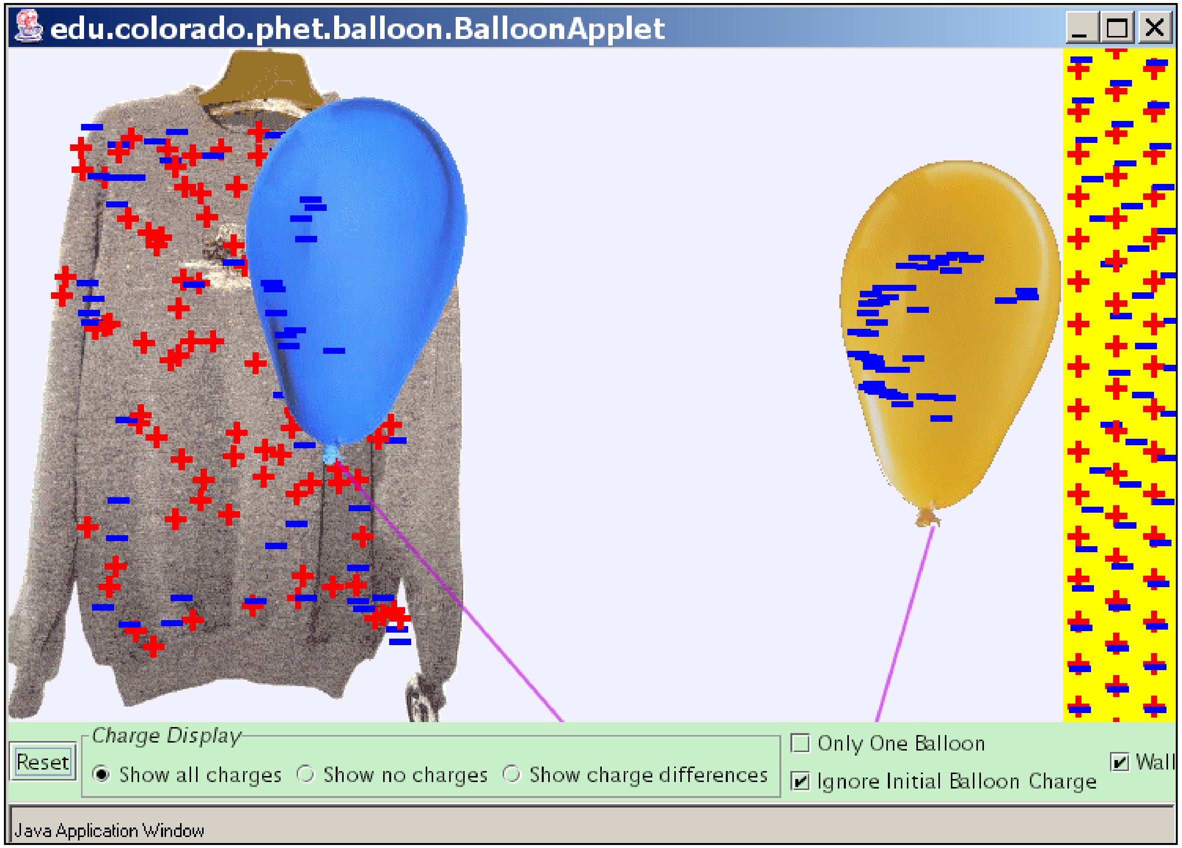
Demonstration in Slow Motion



Demo Scientific Model

Electrostatics – Traditional balloon demos

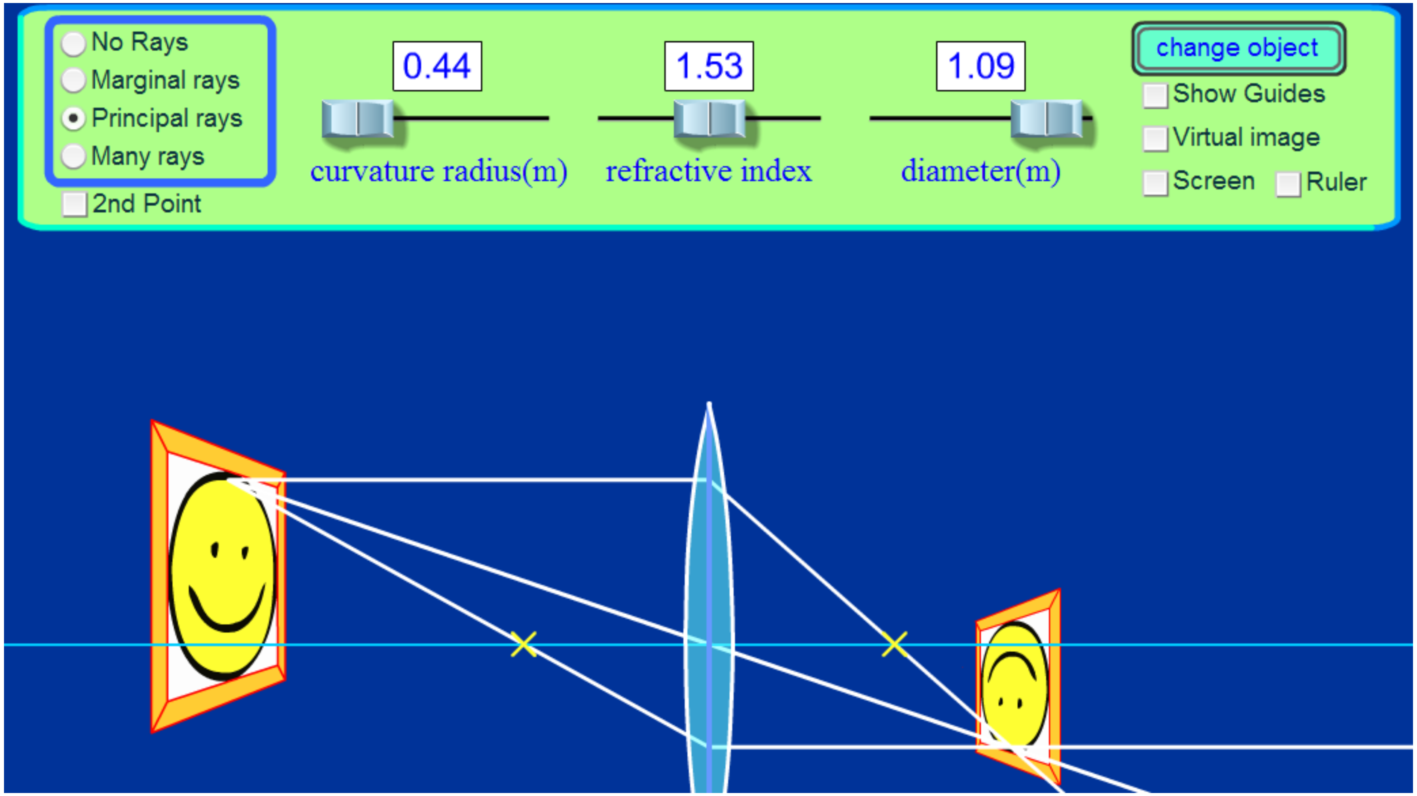
- Charge transfer, Coulomb attraction, Polarization



Simple,
but effective

Replace Expensive Equipment

Challenge: Use the simulation to see how the design of a lens effects how it works.



Writing and Reflection Handouts

Guidelines

Activity design

How We Learn

Writing learning goals

Reflecting note card

Bloom’s Revised

How could this information be used?

Share use of sim

Talk about your activity

- Which guidelines did you apply?
- How you used the sim
- How using the simulation affected student learning

Reflect on Activity

- Exchange lessons
- Make suggestions in writing in regards to align the lesson
- Discuss ideas

Homework

Continue to work on lessons

Enter your lessons in the database!!

March Workshop

- Read Dubson Article
- How do his ideas fit with our goals to have inquiry based lessons?

Organize handouts

- Research
- Tools for Writing
- Examples of writing

Writing and Reflection Handouts

Guidelines

Activity design

How We Learn

Writing learning goals

Reflecting note card

Database Reflection

- Entering lessons
- Editing lessons
- Browsing
- Downloading

Share use of sim

Talk about your activity

- Which guidelines did you apply?
- How you used the sim
- How using the simulation affected student learning

Reflect on Activity

- Exchange lessons
- Make suggestions in writing in regards to align the lesson
- Discuss ideas

Dinner

Workshops Recap

Explore PhET simulations

Discuss science ed research

Discuss and share PhET uses

Reflect on lessons using guidelines

POST LESSONS

Homework

Read Chem Ed article

Continue to work on lessons

Enter your lessons in the database!!

Warmup

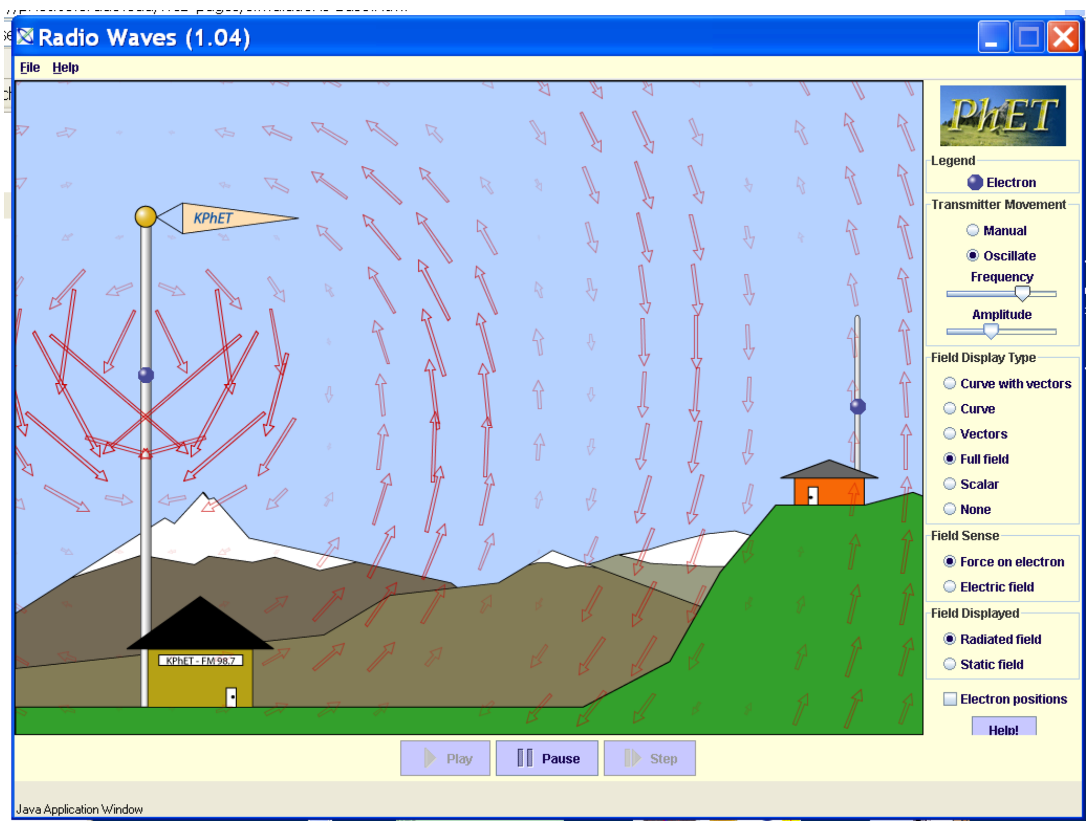
1. Discuss Chem Ed article
2. Enter “comments” into Teaching idea Database

April Workshop topics

- Scientific Thinking and skills
- Add Database comments
- Share activities for reflection

Koch’s presentation

- Linda surveyed students about their understanding of thermodynamics and the gas laws
- Gas laws can interfere with understanding Laws of Thermodynamics
- Girls seem to want to make sense more and boys look for an equation



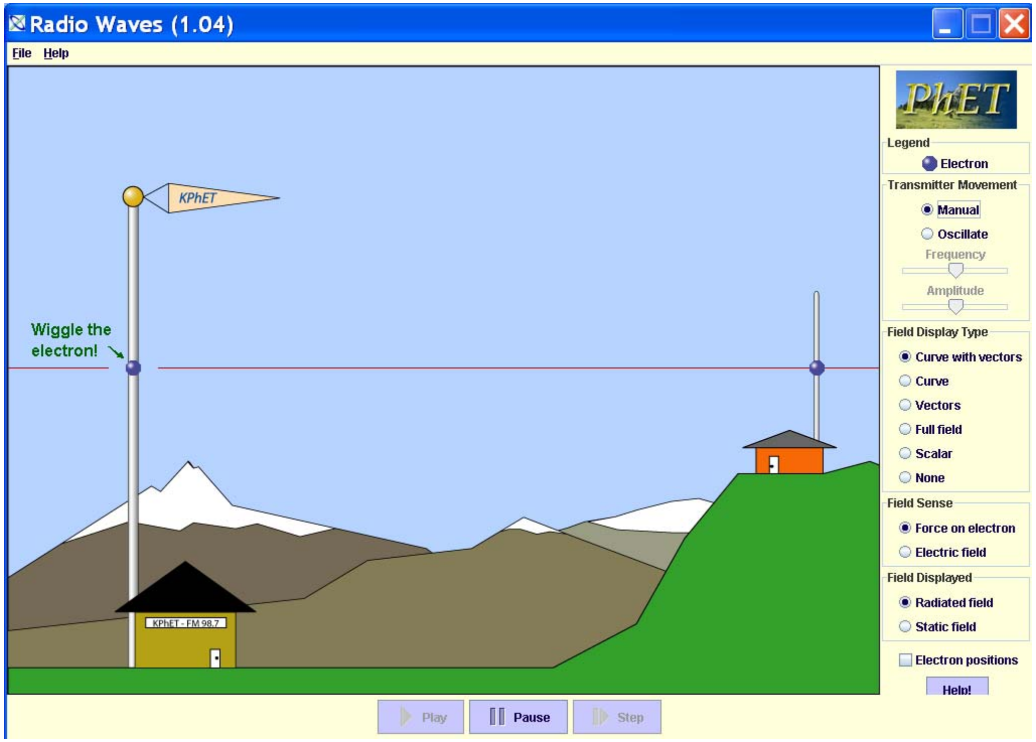
Example- of what revealed by interview studies.

Radio waves. Initial startup.

Experts- - really like.

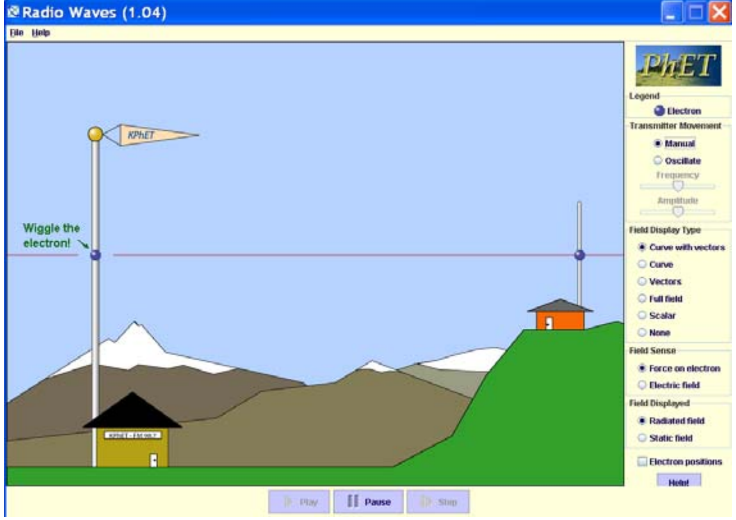
Students--Watch without interacting. Don't like. Misinterpret.

Start with curve view, manually move electron.
Very different result.
Later move to full field view, manipulate, like, and understand.



Correctly interpret.

Why starting this way works
so much better?



<u>Matches research on learning.</u>

•Cognitive demand. *Novices don't know what to focus on. treat everything equally important. Much more than short-term working memory can handle, overwhelming*

• Construction of understanding.

<u>Other important features:</u>

Visual model-electrons in transmitting and receiving antennas, display of waves

Interactivity

Scientific Abilities-Etkina

- http://paer.rutgers.edu/scientificabilities/
- the ability to represent information in multiple ways
- the ability to use scientific equipment to conduct experimental investigations and to gather pertinent data to investigate phenomena, to test hypotheses, or to solve practical problems
- the ability to collect and represent data in order to find patterns, and to ask questions
- the ability to devise multiple explanations for the patterns and to modify them in light of new data
- the ability to evaluate the design and the results of an experiment or a solution to a problem

Homework

- Use sims and post (fix any that are not complete from March)
- Add comments to some activities
- Prepare a 5-8 minute presentation on one of your activities or anything about using the sims that you would like to share. Bring a handout or slide show
- Complete evaluation