

# PhysicsQuest Beyond Physical Science:

*Ideas for connecting PhysicsQuest to other subject areas*

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As we have tried to illustrate within the PhysicsQuest activities, science is not an isolated or sterile field. Personalities and historical events have had significant influence on our modern understanding of science. This is important for students to know because it puts science in context and dispels the myth that you have to be an Einstein to work in or understand physics.

Communication skills, creativity, math skills, reading skills, knowledge of history, and logical thinking are all important in the pursuit of science. Here we suggest ways that you can connect the ideas in PhysicsQuest to these other areas.

If you have suggestions for activities to be added to this list, please email them to [physicsquest@aps.org](mailto:physicsquest@aps.org).

### **Activity 1: Opposites Attract (Static Electricity)**

Paper / presentation prompts

- How did street performers and others in the entertainment industry use static electricity? What are some of the factors that helped people see the practical value in electricity?
- How is lightning formed?
- People had all kinds of theories about what lightning and thunder were before they discovered the scientific explanations. Describe some of these theories and where they came from.
- How do the sheets that you put in the dryer with your clothes eliminate static cling? What are they made out of?
- Experiments on static electricity don't work as well in humid weather. Why?
- Describe the roles that charges play in the biology of cells.
- Think of common reasons that people get shocked. What are some things that you can do to prevent being shocked?

Pretend you work in the entertainment industry. Design a trick that gives people a small shock and demonstrate it to the class.

Make a time line of the important developments in electricity from before Ben Franklin to the present.

Design an experiment (that doesn't use charged pieces of tape) to figure out the charges on objects.

Think about how a charged object would react if you brought another charged object nearby. Now think about what would happen if you brought together a bunch of objects with charges of all different strengths and signs. Draw a picture that represents what you think that would be like.

Create models of objects with different charges out of clay. Use these models to show younger students what happens when charged objects are brought near one another.

### **Activity 2: Traveling Charges (Insulators and Conductors)**

Paper / presentation prompts

- Discuss the terms “insulator” and “conductor.” Where do their meanings come from? In what other contexts are they used?
- Visit the International Dark Sky Association website ([www.darksky.org](http://www.darksky.org)) and investigate the consequences of the “light pollution” in the sky due to electric lights. How could we reduce light pollution?
- Look up the conductivity of different materials on the internet and discuss how this affects the way we use them.
- Write a biography of a person who was important in the development of electricity.
- Investigate the differences between AC and DC current and where they are used.
- Light bulbs are classified according to their number of watts. Research what “watt” means and explain the difference between a 60 watt light bulb and a 100 watt light bulb.
- Investigate the power grid. How does power get from the power plant to everywhere it needs to be?

Create a poster illustrating how electrons move through a wire when an appliance is turned on.

Get a circuit building kit from a hobby or electronics store and build a motor or other project. Give a presentation about what you made and the components of the circuit.

Make a timeline of important developments in electricity from before Ben Franklin to the present.

Design an experiment to rate materials from the best conductor to the worst.

Find a news story related to electricity.

### **Activity 3: Soak up the Sun (Color and Heat Absorption)**

Paper / presentation prompts

- Research Ben's Franklin's experiment on color and heat absorption. Compare and contrast your method with his.
- Look into the biology of why we see color. What are some of the causes of colorblindness?
- Investigate how the relationship between color and heat absorption is useful in climatology, astronomy, or energy production (see the PhysicsQuest manual for a few examples).
- How does color affect people's moods?
- Certain colors have come to symbolize causes – for example red is AIDS awareness, pink is breast cancer awareness, yellow is support for the troops, etc. Choose one of these colors and explore the history of how it came to represent the associated cause.
- Choose a type of thermometer (mercury, alcohol, infrared, liquid crystal, etc.) and explain how it works.

Make a timeline of the important developments in heat measurement.

Create a poster that visually presents your results from Activity 3 but does not use a traditional graph.

Pretend that you are newspaper reporter around the time that Franklin did his experiment on color and heat absorption. Write an article explaining his result and why it is important.

Write (or find) a poem or short story about the influence of temperature on daily life.

Explain and compare the different temperature scales (Kelvin, Fahrenheit, Celsius). How do you convert a temperature given in one scale to each of the others?

Explore color mixing. What are the main differences between color mixing in light and color mixing in paint? Try both.

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### Activity 4: Bring it into Focus (Optics)

Paper / presentation prompts

- What is the percentage of people in the United States who wear glasses or contacts? What are the most common vision problems? About how many people wear bifocals?
- For one day keep a list of all of the places that you see mirrors or lenses.
- Compare and contrast the way that mirrors and lenses affect light.
- Pick a piece of equipment that uses lenses, such as a telescope or microscope, and explain how it works.
- Choose a woman or minority important in the history of optical equipment (glasses, telescopes, microscopes, etc) and write about her or his contributions.
- Compare and contrast the human eye with an insect eye.
- What does it mean to have 20/20 vision? How does the average person's vision compare to the vision of different types of animals?
- How does LASIK work?

Interview an eye doctor about her or his career.

Make a model of the human eye and label the parts.

Pretend that you are part of a marketing company that has been hired to advertise a new office of eye doctors. What would be your selling points? Design an ad and write a marketing proposal.

Make a time line of the important developments in optometry (the study of eyes).

Make a collage of vision-related pictures.