MUSEUM OF SCIENCE AND INDUSTRY

Date: October 25, 2007
To: MSCOPE team
From: Bridget Basta, *Manager Evaluation & Planning*, Todd Gieseke, *Sr. Evaluator*, Olivia Castellini, *Sr. Exhibit Developer*, & Brett Nicholas, *Floor Development Coordinator*
Re: Evaluation projects

The ***goals*** of the evaluation projects are as follows.

- Work within a small team to complete the project.
- Assist in the design and build of the prototype to be tested.
- Draft an evaluation tool to be used with museum visitors.
- Create an evaluation plan.
- Implement the evaluation plan.
- Present your findings to rest of the group and Museum staff.

Project 1: Moving Charge: Wimshurst Machines
Summary: Visitors separate charge using historic Wimshurst static electricity machines that produces high voltage current by electrostatic induction.
Potential Interactive Opportunities:

- Operate the small Wimshurst machine artifact to generate static electricity and a discharge of sparks.

Evaluation questions:
> Can people understand how it works? What contextual information (graphics or text) are most effective in promoting conceptual understanding?

Project 2: Heliostat: The Sun Live - Heat from Sunlight
Summary: Visitors focus sunlight from the heliostat and direct this energy to heat water and observe convection patterns.
Potential Interactive Opportunities:

- Focus the beam of light on the tank of water by adjusting the position of an overhead with a Fresnel lens.
- Control a thermal imaging camera and observe the convection patterns in the water.
- Measure water temperature using a thermometer
- Measure time taken to heat/boil the water using a digital stopwatch.

Evaluation questions:
> If an IR camera is used, do people associate color change with temperature change? (could be testing in Imaging)

Project 3: Heliostat: The Sun Live - Electricity from Sunlight
Summary: Visitors use a portion of the heliostat's beam to illuminate and operate photovoltaics and power toy cars on a racing track.
Potential Interactive Opportunities:

- Direct and manipulate a photovoltaic cell array in the path of the heliostat or artificial light source to generate electricity.
- Measure and record the amount of the electrical current and power generated.
- Power toy cars on a track with electricity generated by photovoltaic cells.

Evaluation questions:
> How much of the science of solar cells do people need to understand in order to understand the concept that sunlight contains energy?
> What contextual topics related to solar cells are people interested in? (e.g. physics 'how it works', green energy applications, etc.)

Project 4: Inclined Plane
Summary: Visitors experiment with the forces of gravity by interacting with a modern recreation of Galileo's classic inclined plane experiment.
Potential Interactive Opportunities:
- Change inclined plane angle/height
- Trigger object release mechanism
- Change object mass, shape, material, and inertia characteristics
- Measure time taken for the object to roll down the plane
- Calculate objects velocity and acceleration

Evaluation questions:
>If visitors measure or observe a speed, can the visitor make the conceptual leap to forces/gravity?
>What sorts of labels/graphics most effectively promote conceptual understanding?

Project 5: Harmonic Pendulum
Summary: A series of ten large horizontally aligned pendulums with different tether lengths are suspended from the Grainger Hall ceiling. Visitors cause the pendulums to swing and create harmonic wave-like patterns, going in and out of synchronicity.
Potential I*nteractive Opportunities:*
Controls:
- Initiate motion

Measurements:
- Observe/record changes in velocity and direction for each pendulum
- Record period/frequency
- Record position of each pendulum
- Visually compare patterns
- Explore relationships between tether length, amplitude, period and mass. (Note: if we move forward with this objective, there needs to be some way for the visitor to manipulate the mass of the pendulums, either through a simulation or a small scale set-up).

Evaluation questions:
> Do visitors connect that the tether length is effecting the period of the swing if they just observe that the strings are different lengths?
> What is the best way to make the point that forces (gravity) are effecting the movement when you can't see anything directly interacting with the pendulum?

Project 6: Ring Launcher Coil

Summary: Visitors learn the principles of EM induction and Lenz's Law and while observing a dramatic display of a ring fitted on a solenoid flung into the air.

Interactive Opportunities:

- Could have stand-alone and facilitated modes. The former reuses the same projectile ring and the later interchanges the projectiles.
- Alternate rings of different sizes and thicknesses. Include one with a split that just sits there
- Measure height of ring fling.
- Connect a wire loop containing an 18V light bulb. The induced EMF lights the bulb when the ring is lowered over the iron core and its brightness increases as the ring is moved down.
- Dip the ring in liquid nitrogen for a more spectacular fling by lowering the resistance of the ring and increasing the size of the induced current in it.
- Measure the magnetic field around the solenoid and the ring when it is stationary.
- Measure the current.

Evaluation questions:

>Test eddy current tube with text/graphics and see if people can explain what is happening

> Do animations have an advantage over static graphics in promoting conceptual understanding?

Project 7: Multi-Wavelength Astronomy

As part of the Deep Space Adventure Gallery in Adler, a focus on multiwavelength astronomy will be included. Almost everything that we know about the universe comes from studying the light that is emitted or reflected by objects in space. Astronomers look at objects that are both visible and invisible to the human eye. The invisible objects emmit light like gamma rays, X-rays, ultraviolet, infrared or microwaves. These kinds of light are different only because they have different wavelengths. The light from each wavelength provides valuable and unique information.

Museum staff is currently exploring meaningful and engaging ways to present this type of information to the public. Attaining visitor feedback on what learning goals will be effective in communicating the basic principles of the field is essential.

This evaluation project will include gathering visitor's conceptions, misconceptions and understandings of invisible light and how it can be used to study the universe. Concept mapping, interviews and questionnaires may be used to gather this information. There is also a set of prototypes and already existing installations at Adler that could potentially be used to probe visitors.

Contact: Karen Carney, kcarney _at_ adlerplanetarium.org
