# 30th ANNIVERSARY COLLECTION

## EDUCATOR RESOURCE GUIDE

DISCOVERY
Center of Idaho

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# 30th Anniversary Collection Overview

The Discovery Center is celebrating 30 years of inspiring lifelong interest and learning in STEM with our 30th Anniversary Collection—a brand-new take on some of our most popular exhibits. At over 2,000 square feet, with twelve engaging exhibits designed and built by the Discovery Center team, the 30th Anniversary Collection is the quintessential Discovery Center experience. We hope you, and your students, join us as we celebrate a new era of Discovery Center "classics!"

# How to Use the Educator Resource Guide

We hope the resource guide provides a starting place for ideas on how to design a meaningful, informative, and fun visit to the Discovery Center. We have first included a list of potential connections between the exhibits and the Idaho Science Content Standards to help draw connections between your visit to the Center and your classroom. With the 30th Anniversary Collection, we are unveiling our new exhibit signage. This resource guide will help orient you to the exhibit signage and how it might be used as a tool during your visit. Copies of exhibit signage are included to help provide background information about the main concepts covered at each of the interactive exhibits. Lastly, we have included a field work planning guide to help you set goals and prepare your students for their visit to the Discovery Center.

# Science Content Standard Connections

The Idaho Science Content Standards identified below are an overview of some of the science standards addressed through our Classic exhibits. Please remember, this is just a place to start! There are many additional connections, including those across disciplines and among many fields of science that can be addressed during a visit to the Center.

**Kindergarten**
PS1-K-1

**First Grade**
PS1-1-1, PS1-1-2, PS1-1-3

**Second Grade**
PS1-2-1

**Third Grade**
PS1-3-1, PS1-3-3

**Fourth Grade**
PS1-4-1, PS1-4-2, PS4-4-4, PS2-4-1, PS2-4-2

**Fifth Grade**
PS2-5-1

**Middle School (6th-8th)**
PS1-MS-4, PS2-MS-1, PS2-MS-2, PS2-MS-3, PS2-MS-5, PS4-MS-2

**High School (9th-12th)**
PSP1-HS-1, PSP1-HS-5, PSP2-HS-5, PSP3-HS-1, PSC1-HS-5

# How to Use the Exhibit Signage as a Tool

1 AIR CANNON

2 FORCES & MOTION

3 TEST & OBSERVE

- How far can you stand from the cannon and still feel the force of the air?
- How could you redesign the cannon to make the air travel faster and farther?
- Can you calculate the speed of the cannon's projectile?

5 FUN FACTS

Volcanoes, like the Etna volcano in Italy, can blow "vortex rings", some more than 600 feet in diameter. These vortex rings are caused by an explosion of steam from a small opening in the volcano's crater.

4 What's Happening?

Even though we cannot see it, air is full of freely moving, randomly colliding molecules that have mass. The air cannon applies a quick, concentrated force to the air molecules in the cannon's barrel. This creates a gaseous projectile you can both see and feel.

Signage, we believe, is a way to help prompt learning and discovery at an exhibit. This section of the resource guide helps explain our intent behind the signage and how you might be able to use the signage as a tool during your visit.

1. Exhibit Name
2. Content Area
3. Test & Observe
4. What's Happening?
5. Fun Facts

The top banner of the exhibit sign includes the Exhibit Name (1) and Content Area (2). The nine key content areas represented at our exhibits are noted both by name and color. Below is a table showing which colors correspond to which key content area. The second column outlines examples of specific topics you might see covered in an exhibit. The clearly denoted content areas are intended to give greater clarity to which concepts are covered at each exhibit and how the exhibit can connect to Idaho Science Standards.

| Key Content Areas | Example Exhibit Topics |
|---|---|
| Forces & Motion | Mechanics, Gyrations, Vibrations, Simple Machines |
| Electricity & Magnetism | Motors, Electricity, Magnetism |
| Waves | Sound, Light, Optics, Vibrations, Perception |
| Matter | Materials Sciences, Chemistry, Thermodynamics |
| Earth & Space Sciences | Weather, Natural Resources, Earth Systems, Geology, Solar System |
| Engineering | Design, Build, Test |
| Life Sciences | Physiology, Memory, Perception |
| Technology | Robotics |
| Math | Patterns |

The Test & Observe (3) section includes a list of questions to help guide and facilitate deeper learning and engagement at each of the exhibits. Our intent is to provide questions that will prompt a student to observe, reflect, build understanding, and test their ideas through further experimentation and conceptualization.

What's Happening (4) explains the scientific concepts behind the exhibit, helping students to better understand what they are experiencing and observing.

Fun Facts (5) are included to give real world examples of the concepts on display. Our intent is to spark a new thought, connection or moment of wonder.

# Copies of Exhibit Signage

As you review the exhibit signage consider additional experiments, writing prompts, or classroom learning moments that could support these concepts before or after your visit to the Center.

## AIR CANNON

Content Area: **Forces & Motion**

***Test & Observe***

- How far can you stand from the cannon and still feel the force of the air?
- How could you redesign the cannon to make the air travel faster and farther?
- Can you calculate the speed of the cannon's projectile?

***What's Happening?***

Even though we cannot see it, air is full of freely moving, randomly colliding molecules that have mass. The air cannon applies a quick, concentrated force to the air molecules in the cannon's barrel. This creates a gaseous projectile you can both see and feel.

## BERNOULLI BLOWER

Content Area: **Forces & Motion**

***Test & Observe***

- As you adjust the angle of the cone, what do you notice about the ball's movement?
- What happens if you pull the ball partially out of the airstream? Why?
- Can you make a ball spin while floating in the airstream?

***What's Happening?***

The Bernoulli principle states when air speeds up, pressure drops and vice versa. When the air stream hits the bottom of the ball, the air slows down, generating an area of high pressure. The high-pressure air under the ball holds it up, while the air moving around the ball keeps it centered in the air stream.

## MAGNET RACE

Content Area: **Matter**

***Test & Observe***

- Which track is the most conductive?
- What would happen if you cut slots in the conductive tracks? Why?
- How would the speed of a wooden track compare to the others?

***What's Happening?***

When a magnet rolls down a conductive track, it creates an electric current in the shape of an eddy. The eddy currents create a magnetic field that opposes the downward movement of the rolling magnet. The more conductive the track material, the stronger the eddy currents, and the slower the magnet will roll.

## PLASMA BALL

Content Area: **Electricity & Magnetism**

***Test & Observe***

- Turn the flourescent bulb to the vertical position. What do you observe? Now grasp the bulb in your hand. What do you observe?
- Can you make the bulb shine brighter? Dimmer?
- Would an incandescent bulb work in place of the fluorescent bulb? Why or why not?

***What's Happening?***

The plasma ball has a small Tesla coil at the center of the sphere. The coil emits high-frequency, high-voltage alternating electric currents. The glass sphere also contains a mixture of noble gases. When the current moves through the plasma, it creates colorful tendrils of light. Some electrical activity extends past the sphere which is why you are able to light up the fluorescent bulb.

## DOWNHILL RACERS

Content Area: **Forces & Motion**

***Test & Observe***

- Which wheel is the fastest? Slowest? Why?
- If the ramp went on into infinity, which wheel would be the fastest?
- Which wheel takes the longest to stop spinning at the end of the race? Why?

***What's Happening?***

An object has inertia, meaning it resists a change in its position or state of motion. When you place a wheel on the track, the force of gravity acts on the wheel, overcoming the force of inertia. The wheels with mass located farther from the center of the wheel have more rotational inertia, meaning they experience a greater resistance to their rotational movement. The wheels with mass closer to the center have less rotational inertia and can roll down the ramp more quickly.

## WELL BALANCED

Content Area: **Technology**

***Test & Observe***

- When the arm is in the upright position, what do you notice about the machine's movement?
- Would a broomstick or a pen be easier to balance upright in your hand? Why?
- Try to balance on one foot. What feedback control systems does your body use to keep you upright?

***What's Happening?***

The robot is doing what amounts to balancing an upturned broomstick in the palm of your hand. The machine's controller receives feedback about the arm's position and sends instructions to the motor telling it how to move to keep the arm balanced upright. This is called a feedback control system.

## PAPER AIRPLANES

Content Area: **Engineering**

***Test & Observe***

- What happens if you bend the back of your airplane's wings up? Down?
- Can you find your plane's center of gravity? How could this affect your plane's flight?
- Can you design a plane that will fly through one, two, or all three of the hoops?

***What's Happening?***

Four forces act on an airplane to make it fly: drag, gravity, thrust, and lift. The launcher applies consistent thrust to each launch. Experiment with design features such as an airplane's weight, size, and wing shape to see how forces like gravity, drag and lift influence the distance and accuracy of an airplane's flight.

## BITE A PHONE

Content Area: **Waves**

***Test & Observe***

- How could you make the sound stop, even while you are biting the straw?
- In space, can anyone hear you scream?
- Can you hear the radio if you uncover your ears? Why or why not?

***What's Happening?***

Typically, we hear sound waves when they travel through the air and into our ears. These sound waves strike our eardrums causing tiny vibrations our brain then converts into sensations we interpret as noises, speech, and music. Here, when you bite down on the rod, vibrations produced by the radio move through your skull directly into your inner ear.

## BALANCE BEAMS

Content Area: **Math**

***Test & Observe***

- What patterns do you notice when trying to balance the beams?
- Place one weight on position 4. How many different ways can you make the beam balance by adding weights to the other side?
- Can you represent your observations with a mathematical equation?

***What's Happening?***

A lever is a long beam balanced on a pivot point called a fulcrum. Balance beams are an example of a lever. Here, you can test how the weights' distance from the fulcrum affects the amount of force applied to the beam.

## FLOATING MAGNET

Content Area: **Electricity & Magnetism**

***Test & Observe***

- Use your hand to try and move the magnet up, down, left, and right. What do you observe?
- How would the magnet act if the beams were made of iron? Aluminum? Plastic?
- Can you make the magnet float between the two copper beams?

***What's Happening?***

When the magnetic wand is applied to the copper beam, the magnet slowly moves upward. At times, it appears as if the magnet is suspended in midair. Copper is not magnetic, but it is conductive. When a magnet interacts with a conductive material, it creates an electric current in the shape of an eddy. When the magnet's movement resists a force—such as the push or pull of your hand, gravity, or another magnet—you are observing eddy currents in action.

## HARMONOGRAPH

Content Area: **WAVES**

***Test & Observe***

- How does the movement of the drawing board and pen affect the pattern's shape?
- What happens to the size of the pattern over time? Why?
- Can you make a spiral, square, or figure eight?

***What's Happening?***

The movements of the pen and drawing board are controlled with two separate pendulums. The pen can move back and forth while the drawing board is able to move sideways, lengthwise, or in a circle. The combined movements of the two pendulums allow for endless pattern possibilities.

## BALANCING ACT

Content Area: **Life Sciences**

***Test & Observe***

- Try flexing and relaxing different muscles and joints, such as your core, knees, and shoulders. How does this affect your balance?
- How does your center of gravity affect your balance?
- How long can you balance with your eyes open? With your eyes closed?

***What's Happening?***

Your body relies on information from your eyes, inner ear, muscles, tendons, and joints to stay balanced. Your eyes sense motion and your body's location in relation to the world around you. Your inner ear has organs that can sense when you move your head. Your muscles, tendons, and joints have special sensors sensitive to pressure and stretching. These complex interactions make up your body's balance systems and help you to stay stable and upright.

## AIR BRAKE CHAIR

Content Area: **Forces & Motion**

***Test & Observe***

- When does the bike wheel begin to spin? Stop spinning? Why?
- Does the weight of the rider affect the chair's falling speed?
- If you wanted to fall faster but not freefall, how would you redesign the paddles?

***What's Happening?***

When you let go of the rope, your falling weight causes the bike wheel to spin. The paddles attached to the wheel act as brakes as they push against the air. This air resistance is what slows your fall. This is the same resistance you feel when you stick your hand out the window of a moving car.

# Discovery Center of Idaho Field Work Planning Guide

*From "Field Trip" to "Field Work"; Reimagining the Student Experience*

Just like scientists, students benefit from spending time in the field making observations, inspiring curiosity, and researching a concept. This planning guide can help identify your goals for your students' field work at the Center and help your students meet those goals.

## STEP ONE: IMAGINE THE POSSIBILITIES

In the boxes below, please describe the learning experience you have imagined for your students. What field work will your students do while they are at the Center? What will your students do before and after your field work to connect learning to your classroom?

| Before | During | After |
|---|---|---|
| | | |

## STEP TWO: DEFINE YOUR GOALS

What do you hope students will be curious about when they visit the Center? What do you hope students will take away from this experience?

| Curiosity Factor | Take-Away |
| --- | --- |
| | |

## STEP THREE: COLLABORATION

Please contact Discovery Center education staff at education@dcidaho.org with any remaining questions or concerns you have about your upcoming field work. We're here to help!