NAD TEACHER'S CONVENTION 2012

DISCREPANT EVENTS -- MORE BANG FOR FEWER BUCKS

Dr. Gary Bradley, Lincoln Room A, Monday 9:45 AM

Background Information about me

- Product of SDA Education: Elementary, Secondary, Undergraduate, Post Graduate
- Taught 19 years in the Carolina Conference at the elementary, middle, and secondary level
- Associate Professor of Middle Level / Secondary Math and Science Education at University of South Carolina Upstate.
- I am proud to be an SDA Educator

Background Information About You

- Elementary Level
- Middle School Level
- High School Level
- Multi-grade classroom

… is making teaching more difficult.

MEDIA

- Cable Television, Satellite Television, Internet, Video Games, Smart Phones, Tablets (Many Distractions)
- Screen-Time turns off the frontal lobe of the brain where higher order thinking takes place (Do watch *Little Light Studios* documentaries for more explanation.)
- Watching television puts your mind in a passive mode – which is not conducive to learning.

… is making teaching more difficult.

Parents' Expectations

- "I've paid for my child's education, why aren't they making good grades?"
- "I wasn't very good in science and I don't think my child is either."
- "Your science class is too hard/easy."
- "My child has had a poor background in science."
- "My child is bored in your class"

… is making teaching more difficult.

Society

- Loss of trust for institutions
- Entitlement
- Everyone is above average
- High-stakes Testing
- Unreasonable expectations placed on teachers
  - Budget Restraints
  - Time Expectations

What can we do?

- Pray – Connect ourselves to the Lord
- Use media to combat media
  - Use technology to collect a library of resources and methods that are engaging, affordable, and age-appropriate.
- Involve parents and church members in your classroom
  - Give them specific tasks/projects to work on
  - Do experiments in class that students can take home and demonstrate for their family members
- Replace "entitlement" with a culture of exploration and discovery. Messes and mistakes are a fun part of learning.
- Use cost-effective Discrepant Events in your classroom to actively engage students (engaged students retain more knowledge which will likely improve test scores).

What is a Discrepant Event?

- A discrepant event surprises, puzzles, or astonishes the observer. Often, a discrepant event is one that does not appear to follow basic rules or principles of matter and energy. The outcome of a discrepant event is often unexpected or contrary to what one would have predicted. The explanation for the phenomena observed is not often easily explained without further investigation.
- This makes science more than a demonstration or "magic" show. Students predict the outcome, are involved in the demonstration, and find out the "why."

Why Use Discrepant Events?

- The outcome of a discrepant event creates cognitive dissonance in the students. This is your teaching moment!
- Discrepant events stimulate an observer's natural curiosity. After observing a discrepant event, an observer will want to know "why!" The observer will be strongly motivated to "find out." Discrepant events engage the observer in the learning process. Discrepant events engage learners in inquiry.

How can Discrepant Events be used?

- to engage students in inquiry/discovery/exploration
- as a demonstration followed by discussion to introduce a new topic
- to engage students in scientific process skills
- as a small group lab activity
- as a mind-on warm-up to stimulate critical thinking
- as a take home lab activity
- as a challenge for students to create investigative lab activities to find out more about the event

My favorite 70 Discrepant Events

- Have More Bang
- Cost Fewer Bucks
- Use Accessible Materials
- Described on PDF files with
  - Photos
  - Material Lists
  - Easy-to-Understand Procedures
  - Anticipated Student Responses
  - Scientific Explanation of What Happens
  - Ratings for Wow Factor, Cost, Safety, Set-up
  - Additional Resources…including Videos
  - For complete list visit this link:
- http://nadtc2012bradleyscience.wikispaces.com

Discrepant Event

Bernoulli's Ping Pong Ball

Materials Needed

Hair Dryer
Ping Pong Balls
Sheet of Paper

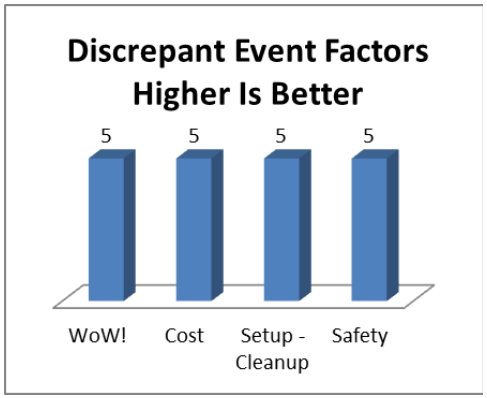
Procedure

1. Place the ping pong ball on the table
2. Turn on the hair dryer and blow the ping pong ball across the table
3. Ask the students what will happen when you turn on the hair dryer, point it straight up, and put a ping pong ball in the hair dryer's air stream. (The ping pong ball will hover in the hair dryer's air stream.)
4. Try slightly tilting the hair dryer. The ball should follow the air stream.
5. Try doing the same thing with a penny in an inflated balloon.

What students think will happen:

The students often think that the ping pong ball will fly away from the blow dryer.

What happens and why



The upward pressure from the hairdryer balances the downward force of gravity, keeping the ball "levitating." The more impressive part of this trick – being able to move the ball along with the hairdryer and angle it and so on – is based on the Bernoulli principle. This states that fast moving fluids (including gases such as air) are at a lower pressure than slow moving fluids. So the airstream from the hairdryer is at a much lower pressure than the air outside. A ball that is smaller than the diameter of the airstream can therefore be balanced within it – if the ball starts "falling" out of the airstream to one side then the higher pressure of the air outside the airstream will push the ball back into the center. This is the process that enables the ball to balance inside the airstream and move around as the hairdryer is moved around.

Discrepant Event

Toilet Paper and Leaf Blower

Materials Needed

Toilet paper
Leaf blower

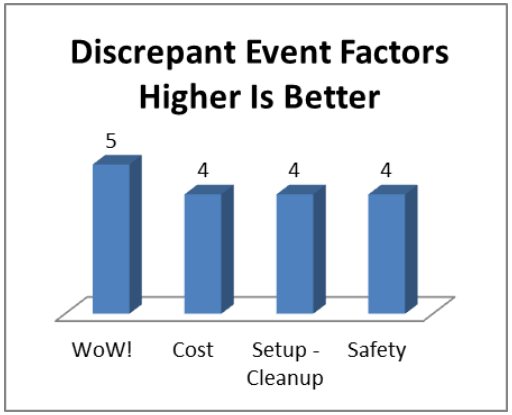
Procedure

1. Have someone hold a leaf blower at a 50 degree angle.
2. Put a roll of toilet paper on a stick and hold the stick.
3. Stretch out a couple feet of toilet paper in over the top of the leaf blower's barrel.
4. Ask the students what they think will happen when you turn on the leaf blower.
5. Turn on the leaf blower and watch the toilet paper fly.

What students think will happen:

The students often think that the toilet paper will just spin around and around.

What happens and why



The toilet paper spins off of the roll and up into the air. The upward pressure from the leaf blower balances the downward force of gravity, keeping the toilet paper "levitating." This action is explained with the Bernoulli principle. This principle states that fast moving fluids (including gases such as air) are at a lower pressure than slow moving fluids. So the airstream from the leaf blower is at a much lower pressure than the air outside. An object that is smaller than the diameter of the airstream can therefore be balanced within it – if the toilet paper starts "falling" out of the airstream to one side, then the higher pressure of the air outside the airstream will push it back into the center.

Sources

Discrepant Event

CD Hover Craft

Materials Needed

Old CD
Pop-top lid from a drink bottle
Craft Glue Gun
Balloon

Procedure

1. Close the pop-top lid and glue the base so that the lid covers the hole in the center of the CD.
2. Blow up a balloon and pinch the neck so that no air can escape.
3. Stretch the neck of the balloon over the pop-top.
4. Place the CD hovercraft on a bench top and push it. How far does it move?
5. Open the pop top lid and push the hovercraft. How far does it move this time?

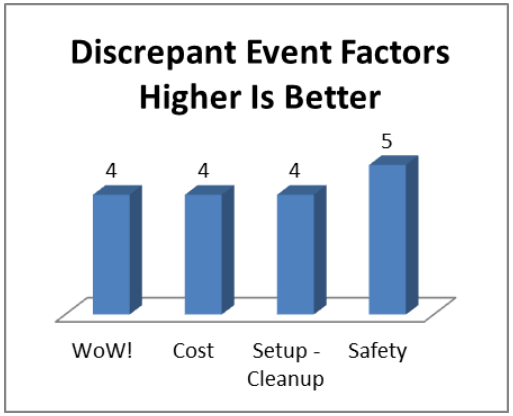
What students think will happen:

The students often think that the balloon will blow the CD up off the table.

What happens and why

When the pop-top lid is opened, air flows out of the balloon, down through the pop-top and under the CD.

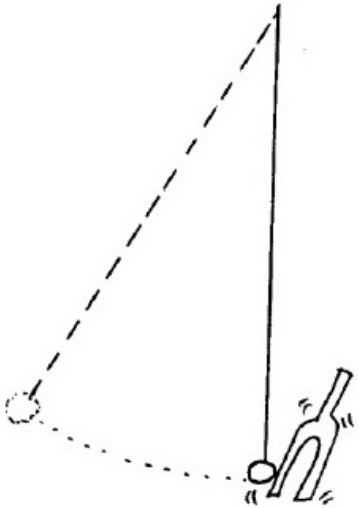
The CD is evenly weighted and has a very flat surface so the air lifts the entire CD off the surface of the table. The layer of air between the bench top and the CD greatly reduces the friction between the two surfaces so the CD hovercraft can glide easily across the bench.



An air hockey board works using the same principles as the CD hovercraft. A fan under the air hockey table pushes air through tiny holes on the table's surface. The flowing air decreases the friction between the hockey puck and the table, allowing the puck to move quickly and freely and allowing you to score!

Discrepant Event

Ping Pong Ball Launch



Materials Needed

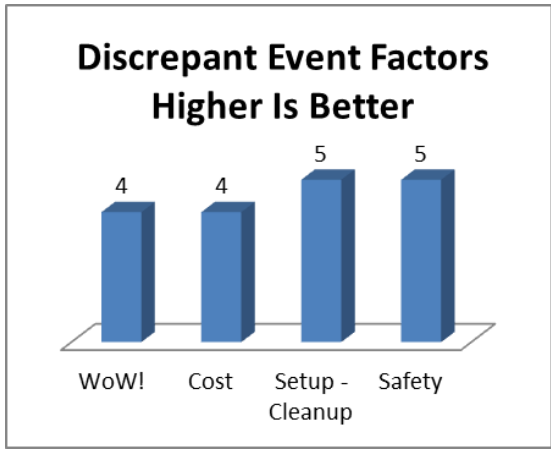
Two feet of string
One ping pong ball
A hot glue gun
A tuning fork

Procedure

1. Glue one end of the string to the ping pong ball.
2. Tap the tuning fork.
3. Ask your students to listen.
4. Ask your students how the tuning fork is making the sound.
5. Hold the string and bring the ping pong ball slowly to the tuning fork until it hits.

What students think will happen

Students often understand that vibrations make sounds but they don't often think of this vibration as having kinetic energy.



What happens and why

The ping pong ball jumps away from the tuning fork--sometimes farther than other times. The tuning fork is vibrating at 256 cycles per second.

Depending on where the tuning fork is in its cycle when the ping pong ball hits, it will be the amount of energy that it takes from the tuning fork. Often the ping pong ball gets a good "kick" from the tuning fork.

Sources

http://www.exploresound.org/home/teachers-parents/good-vibrations/
http://www.youtube.com/watch?v=i-zczJXSxnw&feature=related

Discrepant Event

Dollar Bill and the Paper Clips

Materials Needed

Dollar Bill
2 Paper Clips

Procedure

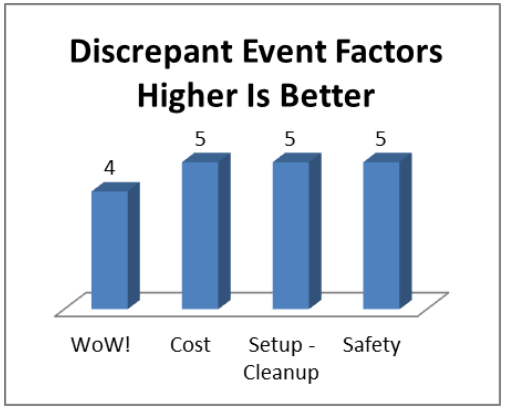
1. Take a dollar bill, fold it in half making sure not to crease the edge, and place a paper clip.
2. Next, take the other half and fold it back in the opposite direction, also making sure not to crease the edge.
3. Pull the dollar out straight

What students think will happen

Students often think that pulling the dollar bill out straight will only knock off the paper clips

What happens and why

The teacher should grab the ends of the dollar bill and begin to pull. As the teacher pulls, the two paper clips will begin to move towards each other. When the paper clips meet, the teacher should snap the dollar bill and the paper clips will fly off. When the teacher picks up the paper clips, they will magically be looped together. This happens because of the way the dollar bill is folded and by the precise placement of the paper clips.



Sources

http://www.allfortheboys.com/home/2011/11/8/the-dollar-bill-paperclip-trick.html
http://www.youtube.com/watch?v=z6NrSVSg6T0

Discrepant Event

Super Tennis Ball

Materials Needed

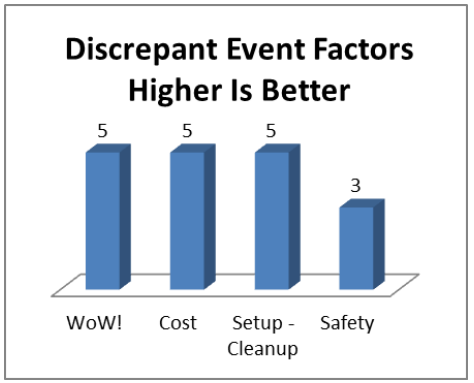
Tennis Ball
Basketball

Procedure

1. Ask students how high they think the tennis ball will bounce when dropped.
2. Drop the ball to show that it bounces, but not higher than the height you dropped it from.
3. Repeat this procedure for the basketball
4. Ask the students how high the basketball and tennis ball will bounce when the tennis ball is placed on top of the basketball.
5. Then place the tennis ball and place it right on top of the basketball and drop the two at the same time (make sure two balls are aligned vertically and there is nothing the tennis ball will hit on your ceiling).

What students think will happen

The students often think that the tennis ball won't bounce higher than the point you dropped it from.



What happens and why

Basic Explanation

It took energy to lift the basketball and tennis ball into the air. As you held the balls, they had potential energy. Potential energy is stored energy. When you let go, the balls now had kinetic energy. Kinetic energy is moving energy.

So which ball had more potential energy? The basketball did because it was heavier and took more energy to lift.

So why did the tennis ball bounce so high? The large kinetic energy from the basketball was transferred to the small tennis ball, causing it to bounce much higher than it would have alone.

Discrepant Event

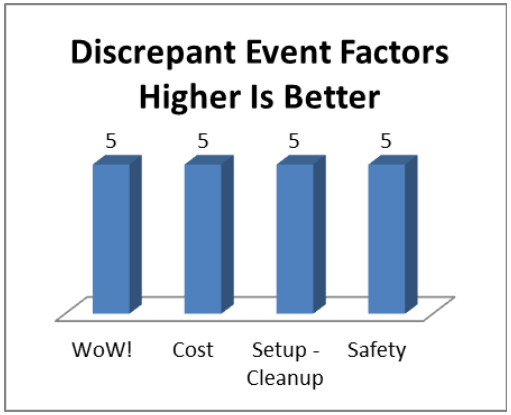
The Magical Pendulum Catch

Materials Needed

11 Washers
3 feet of string

Procedure

1. Tie one washer to the end of a string.
2. Tie the other washers to the other end of the string
3. Put the string over your finger
4. Pull back at a 45 degree angle below the horizontal.
5. Let go of the washer.



What students think will happen:

The students often think that the small washer will simply be pulled over your finger by the other washers.

What happens and why

The one washer spins around your finger preventing the other washers from hitting the table.

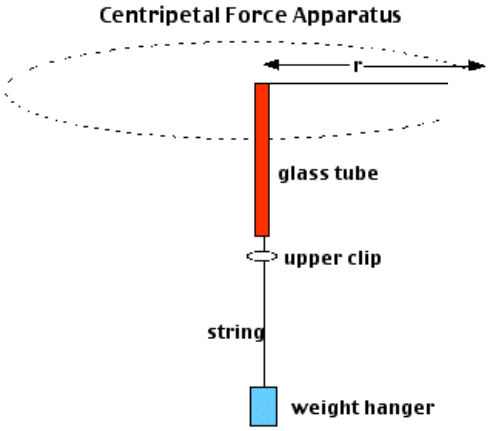
The apparatus that you've constructed out of some string and washer is a pendulum. A pendulum is a weight suspended from a pivot (or fixed point) so that it can swing freely, back and forth. Common examples of pendulums can be found in time pieces such as grandfather clocks.

Pendulums operate using acceleration from gravity. When you release the hex nut, gravity accelerates it towards the ground, giving it velocity. In a normal pendulum, the velocity decreases as the pendulum swings. The amplitude (how high the pendulum swings) also decreases the more the pendulum swings. This happens because of friction.

In our pendulum, the distance between the pivot (your finger) and the bob (the single hex nut) is decreased very rapidly when you release the string. As the distance between the bob and pivot decreases, the velocity of the pendulum increases. With the velocity increasing so rapidly, its

Discrepant Event

The Power Button

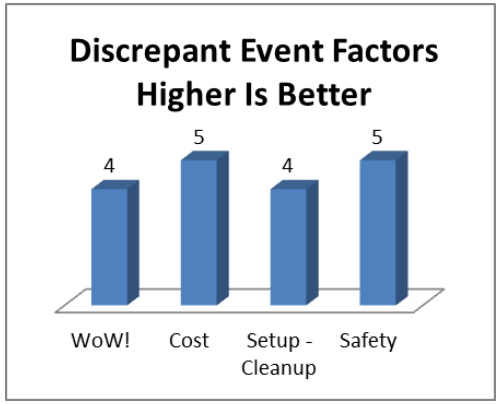


Materials Needed
21 buttons
String
A tube

Procedure
1. Ask the students how to make the one button lift up and hold the twenty buttons in mid-air without you touching any of the buttons.
2. Give the one button a light toss up and start swinging it in a circle.
3. The faster you swing the more the one button will pull up the other buttons

What students think will happen
The students will think that this is impossible.

What happens and why
Toss the one button up in the air and start swinging it around. The one button will hold the other twenty buttons up in the air while it is swinging around.



A force which pulls an object toward the center of a circle is called a centripetal force. This experiment and your experience will tell you that the amount of centripetal force that you need to lift the 20 buttons depends on the mass of the object you are whirling - heavier objects require more force, how fast you are whirling it - going faster requires more force and, the radius of the circle.

This can be summarized: the centripetal force made by the Power Button is equal to its mass times its velocity squared divided by the distance between the tube and the Power Button.

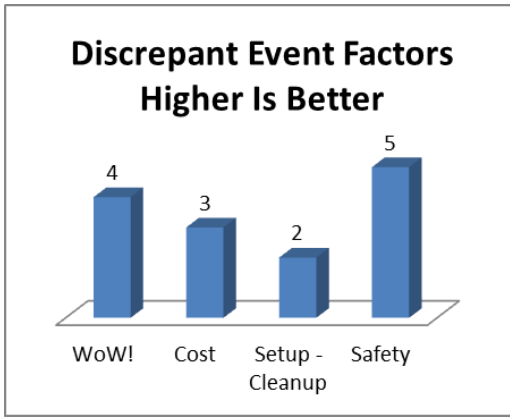
Discrepant Event

Blubber Glove

Materials Needed
Water
Ice
Container for the ice water
Plastic Bags
Canister of Shortening
Paper towels

Procedure
1. Scoop approximately two cups of shortening into the plastic bag.
2. Put the second plastic bag inside the first
3. Work the shortening into a thin layer in between the two bags.
4. Fold the top edge of the inner bag over the out bag.
5. Use a piece of duct tape to create a seal between the two bags.
6. Have the students put their hands in the cold water.
7. Have the students dry their hands and put on the blubber glove.
8. Tell them to put their hand in the ice water wearing the blubber glove.

What students think will happen:
Students often think that the blubber glove won't keep their hands warm in the ice water.



What happens and why
The blubber glove does an amazing job at keeping the cold away from skin. Blubber is a thick layer of fat (adipose) tissue. Animals store extra digested food in the form of adipose tissue, which contains molecules called lipids. Adipose tissue has a relatively low thermal conductivity, which means that it does not transfer heat as well as other tissues and materials—such as muscle or skin. That way, it helps to insulate an animal's body.

Discrepant Event

Magic Ketchup Packet

Materials Needed

2 liter soda pop bottle
Ketchup packet
Water
Salt

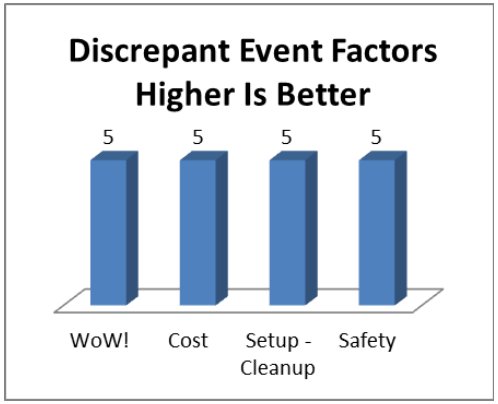
Procedure

Fill a 2 liter soda bottle to the top with water.
Make sure there is no air in the top of the bottle.
Add a ketchup packet.
If it floats you are ready to go. If it does not, add salt and dissolve until the ketchup packet floats at the top of the bottle.
After putting the lid on the bottle, squeeze the bottle hard. The packet will sink.

What students think will happen

The students will think it is impossible to make the ketchup packet sink since it is floating.

What happens and why

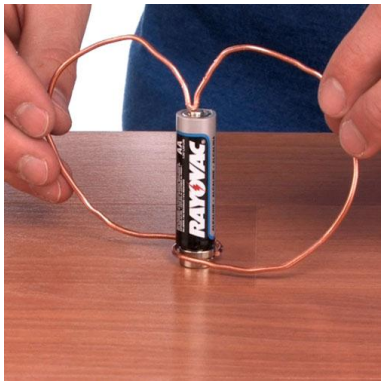


This experiment is all about buoyancy and density. Buoyancy describes whether objects float or sink. This usually describes how things float in liquids, but it can also explain how things float or sink in and various gasses.

Density deals with the amount of mass an object has. Adding salt to the water adjusted the water's density to get the ketchup to float. There is a little bubble inside of the ketchup packet. As we know, bubbles float, and the bubble in the ketchup sometimes keeps the heavy packet from sinking. When you squeeze the bottle hard enough, you put pressure on the packet. That causes the bubble to get smaller and the entire packet to become MORE DENSE than the water around it and the packet sinks. When you release the pressure, the bubble expands, making the

Discrepant Event

Homemade Electric Motor

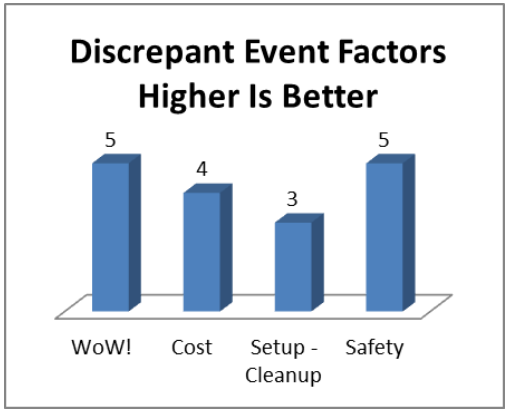


Materials

AA, C, or D size battery
Copper wire
Neodymium Magnets (a small, strong magnet available at hardware stores)
Pliers

Procedure

1. Place the neodymium magnet on the negative terminal of the battery
2. Bend the wire into any shape you want, but be sure it makes good contact with the positive terminal of the battery as well as with the circumference of the magnet.
3. Bending the wire takes patience.
4. Balance the copper wire on top of the battery and make small adjustments in the shape until it spins quickly and easily. The battery will only last a few minutes with the wire on it.



What the students think will happen

Students think that the wire will just sit on top of the batter or jump off.

What actually happens and why

The wire spins quickly and easily on top of the battery. What you have created is called an electromagnetic (scientifically, homopolar) motor. An electromagnetic motor works through a magnetic field along the axis of rotation and an electric current that, at some point, is not parallel to the magnetic field. Sound complicated? It is! So let's try to make it a bit simpler.

In Electromagnetic Motor Design 1, you have an electric current flowing throughout the circuit. The current, at some point while traveling through the system, is not parallel to the magnetic field of the neodymium magnet. At the point where the forces of the current and magnetic field

Discrepant Event

Newspaper Tree

Materials Needed

6 sheets of newspaper
Scissors
Tape
Cardboard tube (paper towel roll works great)

Procedure

1. Unfold a section of the newspaper and tape the sheets of newspaper together, making one long column of pages.
2. Use the cardboard tube as a guide to roll the newspaper into the shape of a tube.
3. Remove the tube from the center of the newspaper roll.
4. Starting at the top end of the newspaper roll, cut the edge of the newspaper down to the middle of the cylinder. Turn the roll a quarter turn and make another cut from the top down to the middle. Do this two more times so you have four equal strips.
5. Bend back each of the strips so that you can see the inside of the roll.
6. Hold onto the base of the tube with one hand while reaching into the center of the newspaper roll with the fingers of the other hand. Pull up on the newspaper inside the tube to start the tree growing. Keep pulling to make the tree grow taller and taller.
7. When you are finished with your newspaper trees, always put them in the recycling bin so you can help save more real trees!

What students think will happen

Students often think that this will be just one more boring thing they have to do for art class.

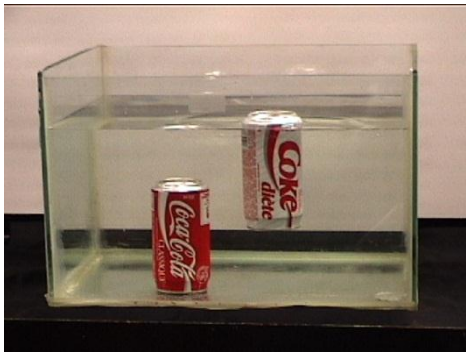
What happens and why

Maybe this is more of a paper trick than a science activity, but it does make you think about where paper comes from and the importance of recycling. Growing your own newspaper tree is a visual reminder that paper is made out of trees so we'd better recycle!

If you are a teacher, while casually rolling up the newspaper and tearing it into four equal sections, ask the

Discrepant Event

Sinking Soda and Floating Soda



Materials Needed

1 can of regular soda,
1 can of diet soda,
Container of water big enough for the can to sink down into

Procedure

1. Fill the container with water
2. Put the can of regular soda in container
3. Observe what happens
4. Ask students to predict what will happen when the can of Diet Coke is placed in the water
5. Put diet soda in water
6. Observe what happens
7. Ask students why they think the diet soda floats and regular coke sinks
8. Tell students to try other soft drinks

What students think will happen

Students often think both cans will sink because the regular coke sinks.

What happens and why

The cans of soda have exactly the same volume, or size. But their density differs due to what is dissolved in the soda. Regular soda contains sugar as a sweetener. If you look at the nutrition facts on a can of regular soda, you will notice that it contains sugar...a lot of sugar. In some cases a 12 ounce can of regular soda will contain over 40 grams of sugar. Diet sodas, on the other hand, use artificial sweeteners such as aspartame. These artificial sweeteners may be hundreds of times sweeter than sugar, which means that less than a few grams of artificial sweetener is

Discrepant Event

Amazing Water Suspension

Materials Needed

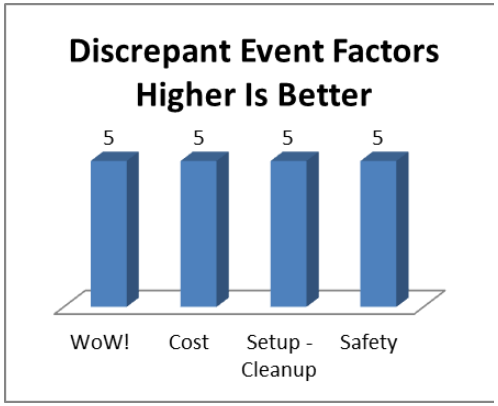
A canning jar with a lid
Water to put in the jar
A note card large enough to cover the mouth of jar
A piece of screen large enough to cover the mouth of the jar

Procedure

1. Ask the students to check the note card to make sure that it isn't sticky.
2. Fill the jar with water all the way to the rim.
3. Put the note card on top of the jar.
4. Place your hand over the note card and turn over the jar.
5. Place the screen wire over the canning jar and tighten the lid over it.
6. Repeat steps 2 through 4 except this time remove the card.

What students think will happen

The students think that the water will pour out each time.



What happens and why

The water will stay in the jar until the note card gets saturated with the water.

The Note Card Holding Up the Water

We live at the bottom of an ocean of air. Just like an ocean of water there is lots of pressure at the bottom of our ocean of air – 14.5 pounds per square inch. When the water goes into the jar the air is removed. The 14.5 pounds of pressure is pushing all around the jar including on the card. The jar doesn't collapse because the pressure is balanced all around it. The note card has 14.5 lbs. per sq. inch acting on it allowing it to "hold" up a lot of water. The

Discrepant Event

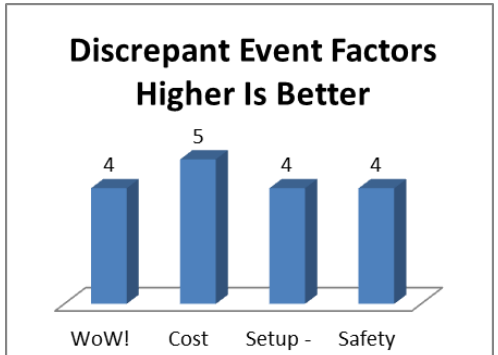
Raising Water in a Cup

Materials Needed:
Candle and matches
Pie pan or dish
Juice bottle, jar, or clear vase
Water
Food coloring
Matches

Procedure:
1. Fill a plastic cup up with water. About 9 oz. should do the trick.
2. Add 2 or 3 drops of food coloring to the water. This will make the movement of the water easier to see later on in the experiment.
3. Pour the water into the plate or pan and place the candle in the middle of the water.
4. Light the candle.
5. Cover the candle with the vase and think about what is taking place both inside and outside of the vase.
6. Carefully observe what happens to the water around the vase. It's bubbling! What happens to the candle flame?
7. Repeat the experiment several times until you can write down or draw a picture that explains why the water level rises.

What students think will happen
Students often think that the candle will burn out but they don't expect that the liquid will be drawn into the cup.

What happens and why
The candle flame heats the air in the vase, and this hot air expands. Some of the expanding air escapes out from under the vase — you might see some bubbles.



Discrepant Event

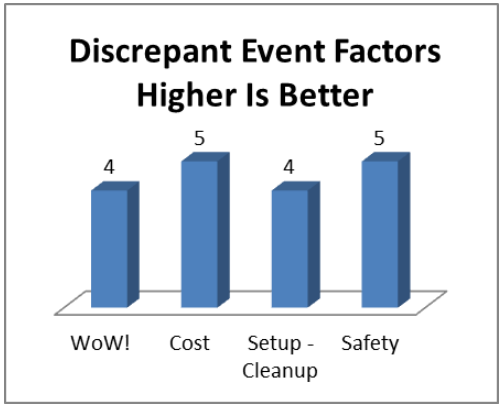
Traveling Water

Materials

Plastic cups
White cloth string
Water
Scissors
Tape

Procedure

1. Using the scissors, cut a length of string roughly two to three feet long.
2. Tape one end of the string to the bottom of one of the cups. Any type of tape will work; just make sure the bottom of the cup is dry when you tape the string down.
3. Fill another cup with water and put the other (not taped) end of the string in the water.
4. Hold the cups with one above the other, but not directly over each other. Hold the cups far enough apart that the string is as close to taut as you can make it. Be careful not to pull the string out of your top cup.
5. Slowly begin pouring the water out of the top cup. Pour the water out of the side of the cup with the string.
6. You'll begin to see the water travel down the string towards the other cup. At first, the water won't make it all the way down, but eventually you'll be able to pour the water straight from your top cup to your bottom cup.



What students think will happen

Students often think that the water will pour straight down even with the string connected to the other cup.

What happens and why

Through a physical property called cohesion, the action of like molecules sticking together, water molecules are able to stick to other water molecules on their way to the lower cup.

But what about the water that poured out at first? It didn't have any water to stick to. Molecules aren't only able to stick to like molecules (water to water). Molecules of water can stick to other

Discrepant Event

Color Changing Milk

Materials Needed

Milk (whole or 2%)
Dinner plate or shallow pie pan
Food coloring (red, yellow, green, blue)
Dish-washing soap (Dawn brand works well)
Cotton swabs

Procedure

1. Pour enough milk in the dinner plate to completely cover the bottom to the depth of about 1/4 inch. Allow the milk to settle.
2. Add one drop of each of the four colors of food coloring - red, yellow, blue, and green - to the milk. Keep the drops close together in the center of the plate of milk.
3. Find a clean cotton swab for the next part of the experiment. It's important not to stir the mix. Just touch it with the tip of the cotton swab. Go ahead and try it. Did anything happen?
4. Now place a drop of liquid dish soap on the other end of the cotton swab. Place the soapy end of the cotton swab back in the middle of the milk and hold it there for 10 to 15 seconds. Look at that burst of color! It's like the 4th of July in a bowl of milk!

What students think will happen

Students might think that the colors will mix when you touch the tip of the dry cotton swab to the center of the milk. When it doesn't students are puzzled. After adding the dish soap and students try again they may think nothing will happen as a repeat of the first attempt. Students are amazed at the results.

What happens and why

When the cotton swab touches the milk the colors burst out and it's like a dazzling display of tie dye colors. This happens because milk is mostly water but it also contains minerals, proteins, vitamins, and tiny droplets of fat suspended in a solution. The secret to the bursting colors is the tiny drop of dish-washing soap which has a special

Discrepant Event Factors
Higher Is Better

Discrepant Event

Vanishing Glass Rod

Materials

3 clear glass beakers (or clear cups)
Wesson oil
Water
Pyrex stirring rods (must be Pyrex glass for this experiment to work)

Procedure

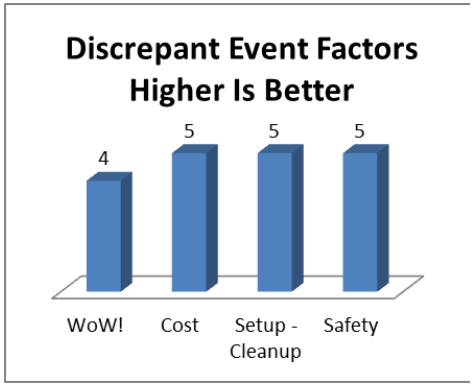
1. Begin with 2 of the glass beakers (or cups).
2. Fill one of the beakers half full with water and fill the other half full with oil.
3. Take one of the Pyrex stirring rods and place it in the beaker that is half-full with water. You can see the stirring rod perfectly clearly.
4. Use another Pyrex stirring rod and place it in the beaker that is half-full with oil. What happens to this stirring rod? It disappears!
5. Take your last beaker and fill it half-full with water.
6. Gently fill the beaker the rest of the way full with oil. If you did it right, you should have a beaker with water on the bottom and oil on the top.
7. Submerge another stirring rod into the beaker with the two liquids in it. What happens to this stirring rod?

What the students think will happen

Students often think that the rod will be visible or completely invisible

What actually happens and why

Students are not surprised to see the stirring rod in the water. Students are surprised to see the stirring rod vanish when it is placed in the oil. The students are further surprised to see half the rod visible and half the rod invisible when it is placed in beaker with the water and oil.



Discrepant Event

Elephant Toothpaste

Materials Needed

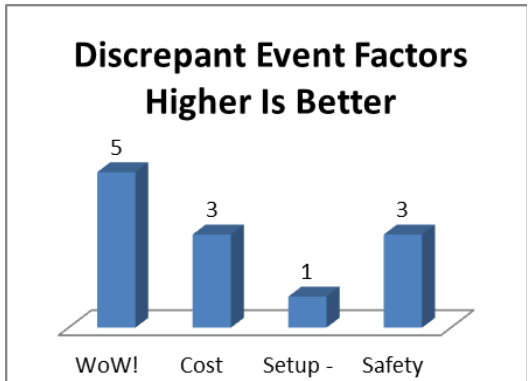
20 Volume Hydrogen Peroxide (found at most beauty supply stores. 20 Volume is a 6% solution)
Dawn Dish Soap
Food coloring
Dried Baker's Yeast
Warm Water

Procedure

1. Fill a graduated cylinder or flower vase (or supported water bottle) with 200 mL of hydrogen peroxide. Students should NOT handle the hydrogen peroxide … let this part be the teacher's contribution.
2. Add 10 drops of food coloring to the hydrogen peroxide (or let drops of food coloring run down the sides of the cylinder – in stripes)
3. Add a squirt of Dawn dish soap to your mixture.
4. Next, add a 1 teaspoon of baker's yeast in a separate small bowl.
5. Add 3 teaspoons of warm water to the yeast and stir.
6. Add the yeast mixture to your hydrogen peroxide solution – and watch it go!

What students think will happen

Mix your hydrogen peroxide solution and ask the students what they think will happen. They will assume that some type of reaction will occur. No reaction will occur without your catalyst, i.e. your baker's yeast. Thus, once the yeast mixture is added to the hydrogen peroxide mixture a crazy fun reaction will occur.



What happens and why

Discrepant Event

Diet Coke and Mentos

Materials Needed
1 2-Liter Diet Coke
1 package of Mentos
Mentos Dropping Unit opened Mentos into the bottle

Procedure

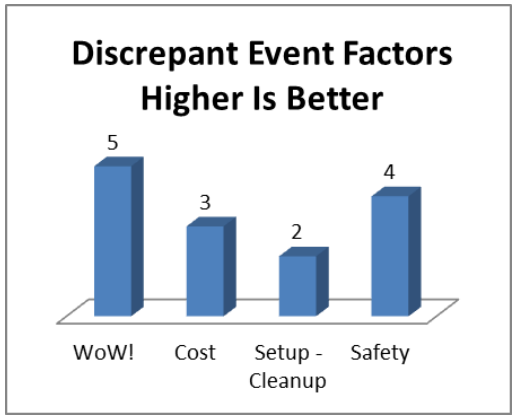
1. You will want to do this experiment outside with your students standing several yards away.
2. Open the 2-liter bottle of Diet Coke.
3. Attach the geyser tube to the Diet Coke bottle. Open your pack of Mentos and pour 7 -10 candies into the top of the utensil.
4. After reminding everyone to step back, pull the tab on the utensil to drop the Mentos in the Diet Coke.
5. Run (don't walk) away! It is comparable to fireworks on the fourth of July with Diet Coke foam exploding straight into the air!

What students think will happen

Students expect to see a little bit of foam but they will not believe what they see. Even if they have seen this discrepant event before they will be excited to watch you demonstrate it again for them.

What happens and why

When you drop the Mentos into the soda, the gelatin and gum arabic from the dissolving candy break the surface tension. This disrupts the water mesh, so that it takes less work to expand and form new bubbles. Each Mentos candy has thousands of tiny pits all over the surface. These tiny pits are called *nucleation sites* -- perfect places for carbon dioxide bubbles to form. As soon as the Mentos hit the soda, bubbles form all over the surface of the candy. Couple this with the fact that the Mentos candies are heavy and sink to the bottom of the bottle and you've got a double-whammy. When all this gas is released, it literally pushes all of the liquid up and out of



Discrepant Event

Steel Wool Fire Starter

Materials Needed

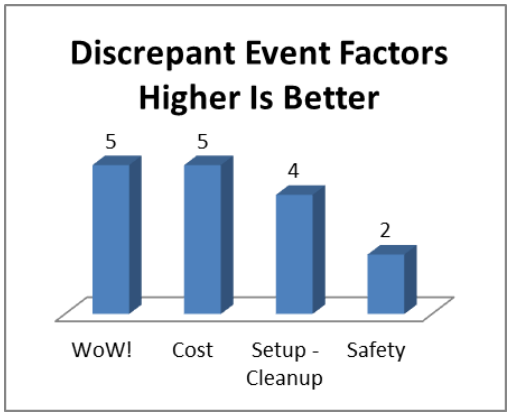
Metal, glass, or ceramic plate
Water
9 volt battery
Fine steel wool - 0000 grade

Procedure

1. Do not hold the steel wool and the battery in the same hand.
2. Set the steel wool on your plate.
3. Touch the 9 volt battery terminals to the steel wool.
4. Blow gently for brighter glow.
5. The steel wool gets hot! Be Careful!
6. Put the remaining steel wool back on the plate.
7. DOUSE STEEL WOOL THROUGLY WITH WATER!

What students think will happen

The students will think nothing will happen when the battery touches the steel wool.



What happens and why

The basic principle involved is that you need enough "electrical current" flowing through the steel wool to get it hot enough to "light." If the steel wool is too "thick" (strands are too large in diameter), then there isn't enough "resistance" in the strands. In that case - you are just discharging the battery - and not ending up getting fire.

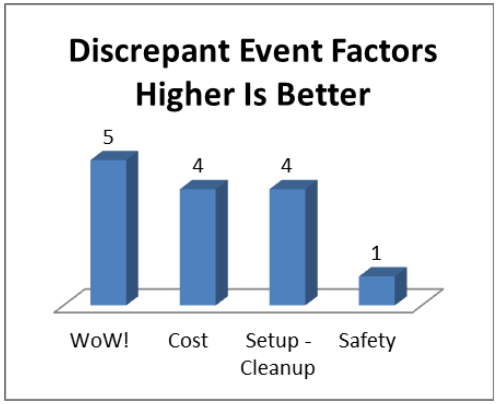
A nine volt battery is great since it has a reasonably high voltage and the terminals are close together.

Discrepant Events

Whoosh Bottle

Materials
Plastic jug, 5-gallon
20 – 30 ml of Isopropyl alcohol
Match

Procedure
Add about 20–30 mL of isopropyl alcohol to the 5-gallon plastic jug.
Do not add more than 30 mL of alcohol.
Recap the bottle of alcohol tightly and move it far from the demonstration area.
Lay the jug sideways on a flat surface allowing the alcohol to flow from base to mouth.
Slowly swirl the jug for about 30 seconds, trying to spread alcohol liquid completely over the entire interior surface. This allows the liquid alcohol to volatilize and makes the vapor concentration uniform throughout the bottle.
Pour out any excess liquid alcohol and shake out the bottle.
Wipe the inside and outside neck of the bottle to remove any remaining liquid.
Stand the jug on the floor. If desired, the demonstration can be performed on a fireproof demonstration table provided that the ceilings are at least 10 feet high.
Dim the lights in the room.
Light a match or wood splint that is taped to a meter stick or other long stick.
Stand back and, at arm's length, bring the burning match or wood splint over or slightly down into the mouth of the bottle.



What the students think will happen
Students often think that they may just see a flame in the bottle.

What actually happens and why
Observe the explosive "whoosh" that results. After the reaction has subsided and all the flames are out, wait for a

Discrepant Event

Propane Bubbles

Materials Needed

Propane torch
Propane bottle
Small bowl of soap bubbles
Lighter

Procedure

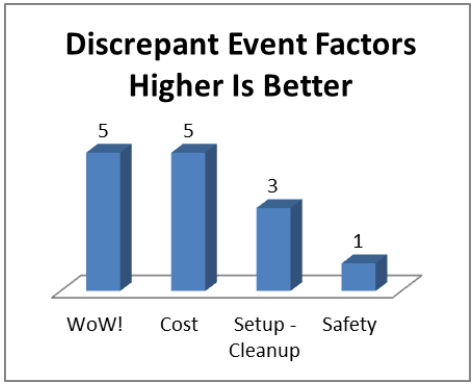
1. Put the propane torch on the propane bottle
2. Open the propane torch allowing the propane to escape
3. Put the end of the propane torch into the bowl of soap bubbles
4. Bubbles should start to form
5. When you have a small handful of bubbles take the propane torch out of the soap bubbles bowl and turn off the propane torch.
6. Dip your hand into the soap bubble bowl making sure to get it completely wet.
7. Put the bubbles in your hand (ensuring you hold the bubbles PALM UP—otherwise they will burn you!!!). Hold your hands out at arm's length (and far away from your bubble bowl) and ignite the bubbles with the lighter.

What students think will happen

Students may think that bubbles can't burn so the bubbles will only pop and disappear.

What happens and why

The soap bubbles ignite with a satisfying large red/orange fireball. Propane is a fuel used for many projects such as soldering that require large amounts of heat. The bubbles catch and hold the propane. Much of the heat of the ignited propane is used to heat the water in the soap bubbles. This is why your hand got warm but didn't burn.



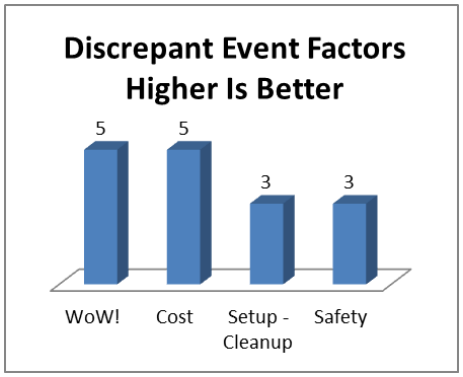
Safety cannot be stressed enough in this discrepant event. Make only a small handful of bubbles. Lots of propane bubbles mean lots of heat with increased potential for burns.

Discrepant Event

Baking Soda Rocket

Materials

16 oz. bottle
Rubber stopper (needs to fit in opening of bottle)
Tablespoon
Baking soda
Duct tape
Scissors
Three unused pencils
Funnel
Vinegar
Paper towel



Procedure (Make sure your blast-off happens outside!)

1. Cut a 12" piece of duct tape.
2. Use the tape that you just cut to fix the three pencils to the outside of a 16 oz bottle. Try to keep the pencils as equidistant (an equal distance) from each other as possible.
3. Use a funnel to fill the 16 oz. bottle half full with vinegar.
4. Take a single paper towel from a roll.
5. Tear off about 1/4 of the paper towel and put one tablespoon of baking soda on the piece of paper towel.
6. Wrap the baking soda in the piece of paper towel. Make sure that the paper towel can fit into the opening of the 16 oz bottle.
7. Take this experiment outside for the rest of the steps. The rocket will get things messy.
8. This step has to happen quickly - put the paper towel-wrapped baking soda inside the bottle and immediately put the rubber stopper into the opening of the bottle.
9. Give the rocket a quick, hard shake and set it upright on the pencils.
10. Stand back!

Discrepant Event

Cloud Bubbles

Materials Needed:
Dry Ice
Thick gloves
Water
Liquid soap
Large plastic container
3 ft. of vinyl hose
Bath towel

Making the Dry Ice Cloud Generator
You will need a large plastic jar (ours is a little over a gallon – a large, clean, pretzel jar), a 3 foot long piece of rubber or vinyl tubing, and a hot glue gun. Make a hole in the top half of the plastic container large enough for the tube to fit into. You can use a knife or a hot nail to melt the plastic. Insert one end of the tube half way into the plastic container. Take the hot glue gun and apply a generous amount of glue all around where the tube goes into the jug. Cut a smooth edge to the free end of your hose.

Procedure
1. Fill the jar half full with very warm water. Dry ice produces the best fog when you use warm water. DO NOT use hot or boiling water as this can cause your jar to melt or crack. Drop a few good sized pieces of dry ice into the jar. Immediately the fog will roll out of the jar. Practice covering the top of the jar with the lid to control the flow of fog out of the tube. You don't have to screw the lid onto the jar. Just hold it on top of the jar to force more or less fog through the rubber tubing.
2. Make a soapy solution by mixing a squirt of liquid soap with about 4 ounces of water in the small plastic container.
3. Dip the free end of the rubber tubing into the bubble solution to wet the end of the tube. Remove the tube from the bubble solution with one hand while covering the jar with the lid in the other hand. Blow a bubble filled with fog.
4. When the bubble reaches the perfect size, gently shake it off of the tubing and it will quickly fall to the ground (it's heavier than a normal bubble

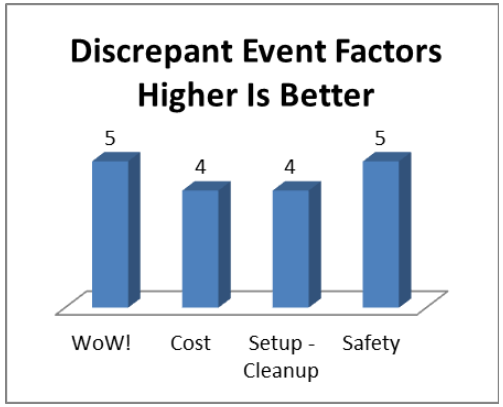
Discrepant Event Factors
Higher Is Better

Discrepant Event

Smoke Ring Launcher

Materials

16 oz. plastic cup(s)
Scissors or knife (ask an adult for help)
Plastic wrap or a freezer bag
Dry ice
Water
Quarter
Pen
Rubber bands



Procedure

1. Flip the cup upside down and trace the quarter onto the bottom of the plastic cup using the pen. Try to make the circle as close to the center of the cup as you can.
2. Using the scissors or knife, cut out the circle you traced onto the bottom of the cup.
3. Place a sheet of plastic wrap or a freezer bag on a flat surface. Trace the top of the plastic cup onto the plastic wrap or freezer bag. Use the circle you traced as a guide, but cut out a circle that is 1" to 2" wider than the circle you traced. This extra space will come in handy. (If you are using plastic wrap, you will need to do this twice to ensure that it is strong enough.)
4. Stretch the piece of plastic you just cut out over the top of the cup. Keep the plastic in its place over the top of the cup using the rubberband.
5. Pour 1 - 2 oz. of warm (not boiling) water into the cup. Pour the water into the quarter sized hole you cut in the bottom of the cup.
6. Drop 1 or 2 pieces of dry ice (small enough to fit in the quarter sized hole) into the cup. Now your cup is smoking!
7. Hold the cup with one hand and tilt it so that the plastic wrap is facing you. With your other hand, lightly tap the plastic wrap.

Discrepant Event

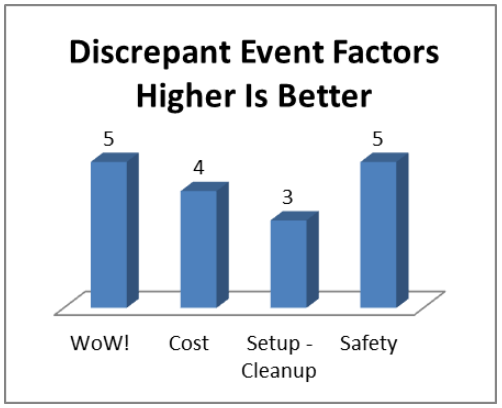
The True Focus

Materials
Large gel beads
Clear serving dish
Water
Photo or poster

Procedure
1. Tape a picture or poster under the serving dish facing upward.
2. Hydrate enough gel beads to cover the bottom of your serving dish.
3. Pick up a gel-ball and explain how each gel bead acts like a lens that reduces and inverts the image behind it (What happens and why)
4. Tell your students that when we add water we can have the "True Focus" of the picture behind the gel-balls.
5. Add enough water to cover the gel beads entirely.

What students think will happen
Students see that there are some colors behind the gel-balls but they don't see the picture under the serving dish.

What actually happens and why
Students will be surprised to see the picture that is behind the gel beads.



The gel beads act as a spherical lens because they are mostly water. Spherical lenses reduce and invert the images behind them. Each gel bead does the same thing to the image behind it. This distorts the image behind the gel balls so that only the colors of the image are visible. This effect is increased if more than one layer of gel beads is used.

When water is added to the gel beads the gel beads seem to disappear. This is because the index of refraction of water and the gel beads are nearly the same. As the gel bead "disappear" the

My favorite 70 Discrepant Events

- Have More Bang
- Cost Fewer Bucks
- Described on PDF files with Photos, materials, procedures, what the students think will happen, what happens and why, ratings, and sources
- http://nadtc2012bradleyscience.wikispaces.com
- Check out the “Moss Graffiti” discrepant event

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