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Putting the I in Science

Naomi Kirkvold

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NEBRASKA HONORS PROGRAM
CLC EXPANDED LEARNING OPPORTUNITY CLUBS
INFORMATION SHEET

Name of Club: Putting the I in Science

Age/Grade Level: 2nd-5th Grade

Number of Attendees: (ideal number) 10 or less

Goal of the Club: (learning objectives/outcomes)

Become interested in science by doing hands on experiments

Resources: (Information for club provided by)

Pinterest

Content Areas: (check all that apply)

- Arts (Visual, Music, Theater & Performance)
- Literacy
- STEM (Science, Technology, Engineering & Math)
- Social Studies
- Wellness (Physical Education, Health, Nutrition & Character Education)

Outputs or final products: (Does the club have a final product/project to showcase to community?)

N/A

Introducing your Club/Activities:

This club gets kids interested in science in ways that they may not have experienced in a classroom.

General Directions:

Perform a science experiment every week with assistance from the students and teach them about how it works.

Tips/Tricks:

Keep track of which students have helped in the experiment so that everyone gets a chance to help.

End each activity with an explanation of why the experiment worked.

Always try to include a more relaxed activity for when the kids are too excitable.

LESSON PLAN WORKSHEET

Lesson Activity Introduction and Density

Name:

Length of Activity: 45 minutes

Supplies: 30 mL water, 30 mL vegetable oil, 30 mL dish soap, 30 mL syrup, 500 mL Graduated cylinder or clear thin bottle, Pasta noodle, Bolt, Small piece of wood, and Other small objects

Directions:

Begin with rules about safety such as always following instructions, using personal protective equipment, doing experiments with adults, and no eating or drinking the chemicals.

Perform density experiment.

1. Add 30 mL syrup into bottom of graduated cylinder
 2. Add 30 mL water into graduated cylinder
 3. Add 30 mL dish soap into graduated cylinder
 4. Add 30 mL vegetable oil into graduated cylinder
 5. Observe how the liquids have divided
 6. Now add the different objects in one at a time starting with the marble
 7. Observe which liquid the objects rest in
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Conclusion of the activity:

When we added the various liquids into the graduated cylinder, some of them sank further down than others. This is because of their density. Density is a measurement of how heavy an object is compared to how much space it takes up. Think about if you had a pillow case that had a pillow inside versus a pillow case that was filled with bricks. Both of these take up the same amount of space, but the pillow case filled with bricks weighs a lot more. This means that the bricks are denser than the pillow. In the case of the liquids in our graduated cylinder, the denser that a liquid is, the lower down it will sink. So, our syrup that was on the bottom of the graduated cylinder was denser than all of the rest of the liquids.

When we added the objects into the graduated cylinder, they sank to different levels. Where they sank to depended on which liquid they were closest to in density.

Parts of activity that worked:

The students really enjoyed dropping the objects into the mixture to see what would happen

Parts of activity that did not work:

Understanding the difference between mass and density

LESSON PLAN WORKSHEET

Lesson Activity Name:	Shell-less Egg *Done with Elephant Toothpaste*
Length of Activity:	10 minutes to set up and 1 week for experiment to complete
Supplies:	Raw egg, Vinegar, and Glass jar

Directions:

1. Predict what will happen to the egg
2. Gently place egg in glass jar
3. Pour vinegar over egg until completely covered
4. Notice bubbles forming
5. Put on lid and wait 1 week
6. Remove egg from vinegar and wash off leftover shell
7. Feel the new texture of the egg

Conclusion of the activity:

In this experiment the chemical acetic acid which is found in vinegar was able to break down the egg shell by reacting with its main component which is calcium carbonate. When these two compounds react, they form calcium acetate which dissolves in the solution as well as the gas carbon dioxide which enters the air inside the glass. The acetic acid is not able to break down the rest of the egg though, so the membrane on the outside stays intact and can hold the egg together still.

Parts of activity that worked:

The shell dissolved, and the kids thought it was cool

Parts of activity that did not work:

In transporting the shell-less egg it broke, so it would be best if the egg could be left in one place for the week, so it will not break.

LESSON PLAN WORKSHEET

Lesson Activity Name:	Elephant toothpaste *Done with Shell-less Egg*
Length of Activity:	20 minutes
Supplies:	Graduated cylinder, empty soda bottle, or another tall clear container, Tray (for easier cleanup), ½ cup 6% Hydrogen peroxide solution, 1 Tablespoon dry yeast, 3 Tablespoons warm water, Dish soap, Food coloring, and Small cup

Directions:

1. Pour Hydrogen Peroxide into empty soda bottle
2. Add whichever food coloring you would like!
3. Add 1 tablespoon of dish soap
4. In the small cup, mix yeast and water for around 30 seconds
5. Pour yeast and water into soda bottle and enjoy!

Conclusion of the activity:

There is some really interesting stuff happening in this reaction. The yeast that we mixed with the water contains an enzyme that causes a reaction with the hydrogen peroxide. The hydrogen peroxide breaks down into water and oxygen. Oxygen as you might know is a gas, so when this gas is formed it enters the soap and forms little bubbles.

Parts of activity that worked:

The kids really enjoyed watching the experiment

Parts of activity that did not work:

The kids were a little too excited and screamed loudly when the bubbling began

LESSON PLAN WORKSHEET

Lesson Activity Name:	Make your own Lava Lamp *Done with Baking Soda and Vinegar Reaction*
Length of Activity:	30 minutes
Supplies:	Bottle with lid, Vegetable oil, Water, Food coloring, and Alka-seltzer

Directions:

Balloon activity

- Explain that this will connect to experiment, but do not tell them how until after the experiment to see if they can make the connection
- Have the kids blow up a few balloons each then pretend that they are fish in a pool. Have them pretend that the balloons are bubbles of air that are big enough to pull them up to the surface of the water before the balloons float away and then they sink back down.

Make lava lamp

1. Fill the bottle about 2/3 full of vegetable oil
2. Fill the rest of the bottle with water
3. Add a few drops of food coloring
4. Break Alka-Seltzer tablet and drop into flask
5. Watch lava lamp erupt!
6. If reaction dies down, add more Alka-Seltzer

Conclusion of the activity:

Water and oil are similar in a few ways, but they have one really important difference which is their density. If an object is really dense, that means that it weighs a lot compared to how much space it takes up. When I think of a really dense object I think of a brick. But an object that is not as dense does not weigh very much compared to the space it takes up, so I think of a pillow. In the case of oil and water, water is actually denser like the brick and oil is less dense like the pillow. So, when the two are mixed together, the water sinks down to the bottom of the bottle. Then, the food coloring dissolves in the water and not the oil. When we added the Alka-Seltzer tablet, it made a gas called carbon dioxide which is even less dense than the oil, that pulls the colored water to the top of the bottle. When it gets to the top of the bottle, the carbon dioxide enters the air, so the water does not have anything making it less dense than oil, so it sinks back to the bottom. The water droplets are pulled up by the gas let off by the Alka-seltzer tablets just like the fish were pulled up by the balloons in the first activity. Once the water and gas reached the top of the oil, the gas entered the air and the water sank back down to the bottom until it was picked up by another particle of gas, just like the fish sinking back to the bottom of the pool.

Parts of activity that worked:

The kids enjoyed getting to take home the lava lamps

Parts of activity that did not work:

During the balloon activity, it was difficult to get the kids to actually do the activity because they just wanted to play with the balloons.

Some of the kids shook up their water and oil mixture before adding in the Alka-seltzer tablets so the tablets didn't react as well.

LESSON PLAN WORKSHEET

Lesson Activity Name:	Baking Soda and Vinegar Reaction *Done with Make your own Lava Lamp*
Length of Activity:	10 minutes
Supplies:	1 cup baking soda, 3 Food coloring, Straws, 9x13" baking pan, and Vinegar

Directions:

1. Separate baking soda into 3 bowls
2. Add a few drops of food coloring into the baking soda and mix together
3. Put baking soda into pan
4. Place straw into vinegar and place finger on the tip to hold vinegar in straw
5. Place straw over baking soda then release your finger and watch the reaction!

Conclusion of the activity:

The vinegar and the baking soda are reacting in what is called an acid-base reaction. The vinegar contains an acid called acetic acid and the baking soda contains a base called sodium bicarbonate. When these react, it produces a gas called carbon dioxide (which you might have heard of) and water.

Parts of activity that worked:

The kids enjoyed the bubbling

Parts of activity that did not work:

The reaction produces some water which spreads out over the baking soda and prevents it from doing as interesting of a reaction. Make sure to keep the water as isolated as possible.

LESSON PLAN WORKSHEET

Lesson Activity Acids and Bases

Name:

Length of Activity: 45 minutes

Supplies: ½ Lemon, ½ Grapefruit, ½ Lime, ½ Apple, Baking Soda, Dish soap, Plate, and Craft sticks or spoon

Directions:

Erupting Fruit

1. Put lemon on a plate or bowl
2. Poke extra holes in the lemon so that the baking soda can get in really well
3. Add some colors!
4. Pour a little bit of dish soap over the top
5. Sprinkle a thick layer baking soda over the top
6. If the reaction doesn't start, add more baking soda and press it into the lemon with the stick
7. Sit back and enjoy!
8. Repeat experiment with grapefruit, lime, and apple

pH scale activity

- Have a printed-out paper with 1-14 and printed pictures of materials used for each student
- Low pH = acid
- High pH = base
- What do they think are the relative pH's of the fruits and baking soda?

pH coloring sheet

Conclusion of the activity:

In this experiment there was a really interesting reaction happening between the lemon and the baking soda. Baking soda is also known as sodium bicarbonate, and this sodium bicarbonate reacts with a chemical in the lemon called citric acid. When this reaction happens, a gas called carbon dioxide is released. In order to see this gas, we added soap which traps the carbon dioxide in the bubbles and makes the lemon look like it is erupting!

This reaction is what we call an Acid-Base reaction. An acid has a low pH while a base has a high pH which makes them want to react.

Parts of activity that worked:

The students enjoyed seeing the fruits bubbling

Parts of activity that did not work:

I included colors on the pH scale and the students thought that the colors corresponded to the colors of the fruits so perhaps using a non-colored scale would be better.

The apple did not react very well even though it is acidic.

LESSON PLAN WORKSHEET

Lesson Activity Name:	Water Droplets *Done with Tie Dye Milk*
Length of Activity:	30 minutes
Supplies:	Small pipettes, A penny or other change, Cup of water, and Tray

Directions:

1. Place the penny on the tray
2. Using your pipette, press down on the bulb and suck some water into the bulb
3. Carefully squeeze water out of the pipette onto the penny
4. Try to put as many drops as possible onto the penny without the water falling off

Conclusion of the activity:

In one drop of water, there are 16700000000000000000 molecules of water. These molecules of water like to stick together, so they are able to form a sort of bubble on top of the penny. This sticking together of molecules is called surface tension. The water molecules stick together even though they would normally fall down onto the table and spread out.

Parts of activity that worked:

They enjoyed using the pipettes. I feared that they would squirt each other with water but the activity was interesting enough that they did not need to distract themselves with attacking each other.

Parts of activity that did not work:

Students lying about how many drops of water they had on their penny. Doing the activity in pairs where one person counted the number of drops would mitigate this.

Sometimes someone would accidentally shake the table so enforcing a rule of no elbows on the table would reduce this

LESSON PLAN WORKSHEET

Lesson Activity Name:	Tie Dye Milk *Done with Water Droplets*
Length of Activity:	15 minutes
Supplies:	Food Coloring, Dish Soap, Q-Tips, Milk, and Pie Plate or bowl

Directions:

1. Pour a thin layer of milk into the pie plate
2. Add several different colors of food coloring to the milk
3. Dip Q-Tip into dish soap
4. Touch the milk with the dish soap and watch the colors separate

Following the experiment, discuss some animals that can walk on water because of surface tension.

Conclusion of the activity:

Before we added the soap to the milk and food coloring mixture, the food coloring was stuck on top of the milk due to the milk's surface tension. However, when we added the soap, it broke the surface tension of the milk because it is a surfactant. When this surface tension was broken, the dye was no longer stuck in one place on the milk but instead it spread out to cover the whole plate.

Parts of activity that worked:

Even though some of the students shook the dish of milk and the colors mixed before the soap was added the experiment still worked.

Parts of activity that did not work:

Food coloring is always risky to use around kids and there were some drops that got onto the table

LESSON PLAN WORKSHEET

Lesson Activity

Food Coloring Solubility

Name:

Done with Color changing Slime

Length of Activity:

10 minutes

Supplies:

3 clear cups or jars, Water of 3 different temperatures, and Food coloring

Directions:

1. Put cold water into one jar, room temperature water into another, and hot water into the final jar
 2. Add 1 drop of food coloring into each container
 3. Observe how quickly the food coloring dissolves
-

Conclusion of the activity:

When a liquid is hotter, the little molecules in it are moving a lot faster than when it is cold. This fast-moving water is able to move the food coloring quickly around the jar and causes it to dissolve faster.

Parts of activity that worked:

The kids always enjoy activities that have color

Parts of activity that did not work:

Since we used different food colorings it was hard to tell that the dye in the hot water actually dissolved faster.

LESSON PLAN WORKSHEET

Lesson Activity	Color changing Slime
Name:	*Done with Food Coloring Solubility*
Length of Activity:	45 minutes
Supplies:	¼ cup school glue, 1 Tablespoon water, 3 teaspoons thermochromic, pigment, ¼ cup liquid starch, Food coloring, Hot pack, Cold pack, and plastic bowl

Directions:

Go over the rules of slime

- Do not touch other people with slime
- Only touch slime to allowed objects
- Do not throw slime
- Keep slime in bag when you are not using it

Make slime

1. Decide on color scheme (color will be a mixture of the colors of the pigment and food coloring when cold and just the color of food coloring will be the color of slime when warm)
2. Pour ¼ cup of glue into a bowl
3. Add 1 tablespoon of water and stir
4. Add 3 teaspoons of thermochromic pigment and mix
5. Add the starch a little bit at a time until it is no longer sticky but instead is very slimy
6. Test the slime by holding it against objects of different temperatures such as a hot pack or cold pack
7. Store in a plastic container

Conclusion of the activity:

Into the slime we added something called a thermochromic pigment. If we break that word down a little bit, it has “thermo” which refers to heat and “chromic” which refers to color. When this thermochromic pigment is at room temperature or colder, it has its nice green color. But when the temperature became high enough, the pigment becomes white. This leads to only seeing only the color of the food coloring when the slime touches something warm.

Parts of activity that worked:

The students who had slime to take home were really happy to have a souvenir

Parts of activity that did not work:

Some of the students did not want to touch the slime so bringing a few spoons for more squeamish students to use to stir the slime would help.

Not all of the student’s slimes turned out well because I had them measure their own materials and put it in the bowl.

I also used paper bowls and the slime got stuck to the bowls so using plastic would be better.

Clean up took far longer than I thought it would so leave at least 15 minutes for the kids to wash their hands.

LESSON PLAN WORKSHEET

Lesson Activity Pea Plants

Name:

Length of Activity: 45 minutes the first day and 15 minutes for the next week

Supplies: 5 empty glass jars, At least 25 peas, Paper towels, Water, Salt water, Milk, Apple Juice, and Vinegar

Directions:

Talk about growing plants/gardening/eating plants

Fill out a prediction worksheet about which seeds will grow best

Preparing plants for growth

1. Place 3 paper towels into each jar
2. Pour $\frac{1}{2}$ cup of water into one jar, $\frac{1}{2}$ cup salt water into another and so on
3. Push at least 5 seeds into the paper towels close to the edge of the container so that they can be seen
4. Watch for growth over a few days

End with a coloring page with parts of a plant.

Conclusion of the activity:

Most plants start from a seed which another plant made. This seed contains food for the plant to use when it is just starting to grow. The seed also needs water and carbon dioxide in the air in order to grow though. The food, water, and carbon dioxide all work together to cause the seed to germinate and start turning into a plant. Once the seed has germinated, it also needs sunlight to provide it with energy.

Parts of activity that worked:

The kids were really good about filling out the prediction worksheet. I think this is something that would work well for other activities too

Parts of activity that did not work:

The students had gotten used to more flashy experiments and they did not think the peas were as interesting

LESSON PLAN WORKSHEET

Lesson Activity Name: Skittles Rainbow

Length of Activity: 30 minutes

Supplies: Skittles, Hot water, and Plate

Directions:

1. Line up the Skittles on the plate in rainbow order
 2. Pour in the hot water at the center of the plate
 3. Watch what happens!
 4. Repeat with water of different temperatures
-

Conclusion of the activity:

As we saw two weeks ago with the food coloring and hot water, color will dissolve faster in hot water than cold water. So, when we put the hot water in the on the plate with the skittles, it dissolves them into the water. However, we can also see that the colors do not mix together. This is because the skittle coatings have different densities which will not mix together.

Parts of activity that worked:

The kids really liked getting skittles at the end and they behaved better knowing that they would be rewarded

Parts of activity that did not work:

If the table is shaken at all the colors will mix and turn brown which happened the first time we did it.

LESSON PLAN WORKSHEET

Lesson Activity Name:	Oobleck *Done with DNA*
Length of Activity:	25 Minutes
Supplies:	½ cup corn starch, ¼ cup water, Spoon, and Bowl

Directions:

1. Add ½ cup of corn starch to the bowl
2. Add ¼ cup of water on top of the corn starch (add more if needed)
3. Mix together slowly to avoid it solidifying
4. Take the mixture out of the bowl and roll in hands to feel the texture

Add in more water or cornstarch if the texture is not correct

Conclusion of the activity:

Most of the time, chemicals do not change whether they are a solid or a liquid if the amount of pressure applied changes. However, with oobleck, it is a type of non-Newtonian fluid which does not obey this rule. Oobleck is a solid when there is a large amount of pressure on it, but it is a liquid when there is not a lot of pressure.

Parts of activity that worked:

The kids really enjoyed making the oobleck and were actually interested to learn about how it works since it is something they have never seen before.

Parts of activity that did not work:

It wound up being far messier than I thought it would be. The biggest issue was getting the corn starch on the floor before the water was even added.

LESSON PLAN WORKSHEET

Lesson Activity	DNA
Name:	*Done with Oobleck*
Length of Activity:	20 minutes
Supplies:	2 Twizzlers, 3 orange jellybeans, 3 purple jellybeans, 3 yellow jellybeans, 3 pink jellybeans, and 6 toothpicks per kid

Directions:

Note:

Orange pairs with yellow

Purple pairs with pink

1. Insert one toothpick into a jellybean
2. On the same toothpick, put the color of jellybean that pairs with the first jellybean
3. Now line up the two Twizzlers next to each other
4. Insert one end of the toothpick with the jellybeans into one Twizzler and the other end into the other Twizzler
5. Repeat for all of the jellybeans and toothpicks
6. Once finished, pick up the Twizzlers and twist so that they spiral. This forms the double helix shape that DNA has

Conclusion of the activity:

You can find DNA all over your body in every tiny cell. You cannot see DNA with your eyes, but we know that it is there by really advanced scientific techniques. DNA is what makes you who you are. It decides what color your eyes are, whether or not you have freckles, the texture of your hair and many more things. You get your DNA from your parents, so that is why some of the traits you see in your parents you may also see in yourself.

Parts of activity that worked:

The kids were able to follow the directions relatively well and were able to make their individual DNAs with a little assistance.

Parts of activity that did not work:

When I brought up that DNA comes from your parents this inadvertently caused many of the kids to become upset because of their relationships with their parents.