COACH ART | starlight children's foundation

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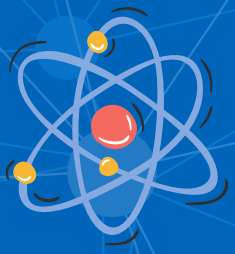
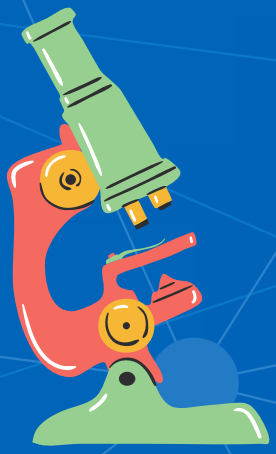
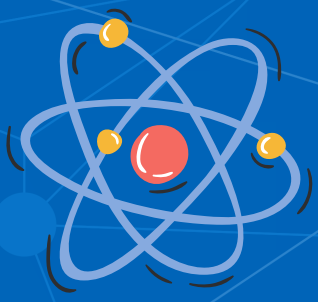






SCIENCE Part 1 of 2

ages 5-10

Captain Starlight, here!

I just landed on Earth with some exciting news:

Starlight Children's Foundation has partnered with the organization **CoachArt** to work together to add fun STEAM (Science, Technology, Engineering, Art, Math) lessons into all the activities! How cool is that?!

Over the next few weeks, I will lead you and your student through four action-packed lessons using these nifty curriculum guides!

Did you know kids learn best when they are having fun? That's why I have thoughtfully sprinkled in a **STEAM** learning moment into each exciting lesson. Make sure you highlight those as you work your way through this curriculum guide.

If you have any questions throughout your mission, check out the Coach Corner website or email ***match@coachart.org.***

Now, buckle up and get ready to blast off in *3...2...1!*

SCIENCE Week 1

INVISIBLE INK

Did you know that communicating with secret messages has been around for years? Have you ever wanted to write and send a secret message? Today let's give it a try!

- **Age Group:** 5-10
- **Skill Level:** Beginner
- **STEAM:** Science
- **Adult Helper:** As needed
- **Learning Objective:** Students will learn how to create a formula to write a secret message.

Activity One 30 minutes **Lesson** 10 minutes **Coaches Notes** 10 minutes

Here is what you need:

- Baking soda
- Water
- Small cup
- Paper
- Paintbrush or cotton swab
- Grape juice

At the end of this module, students will be able to:

- ✓ Write a secret message.
- ✓ Describe a hydrogen ion.

SCIENCE Week 1

Activity: Let's Make Invisible Ink

Here are the basic guidelines:

To Write It:

- Mix 2 tablespoons of baking soda with 2 tablespoons of water.
- Use a cotton swab, paintbrush or toothpick dipped in the mixture to write your message.
- Let the paper dry completely.

History of Secret Codes

Giambattista della Porta was an Italian playwriter from the 1500's who spent most of his life working on different scientific findings. He studied cryptography, which is the art of writing or solving codes. He invented a method which allowed him to write secret messages on the inside of eggs.

He used a mixture of alum (found in baking powder) and plant pigments, then wrote messages on the shell of a boiled egg. The message seeped through the shell and can only be read by peeling the egg.

To Read It:

- Use a cotton swab or paint brush dipped in grape juice to paint over the message.

How it Works:

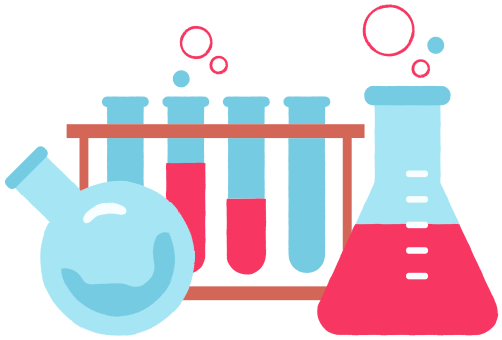
- The baking soda, a base, reacts with the grape juice, an acid, to produce a different color on the paper.

COACHES NOTES

- STEAM Question of the Week:
  - What is an "acid" and "base"? An acid is any hydrogen-containing substance that can donate a proton (hydrogen ion) to another substance. A base is a molecule or ion able to accept a hydrogen ion from an acid. An acid is what makes Sour Patch Kids candy taste sour.
- STEAM Learning Term of the Week:
  - Hydrogen Ion: Created when a hydrogen atom loses or gains an electron.

SCIENCE Week 2

CHROMATOGRAPHY



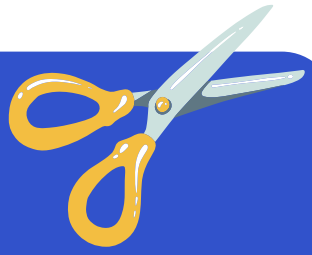
- **Age Group:** 5-10
- **Skill Level:** Beginner
- **STEAM:** Science
- **Adult Helper:** As needed
- **Learning Objective:** Students will learn how to separate a solution.

Let's continue the mysteries of science. Did you know that you can separate a "solution" (which is similar to a mixture)? Today we will be mad scientists and learn how to separate a solution.

Activity One 40 minutes **Lesson** 10 minutes **Coaches Notes** 10 minutes

Here is what you need:

- Chromatography paper strips (order from Amazon)
- Small binder clips
- Plastic cups
- Water
- Markers (we recommend Mr. Sketch markers)
- Newspaper or paper grocery bag



- Scissors
- Stapler
- Cardstock or construction paper

At the end of this module, students will be able to:

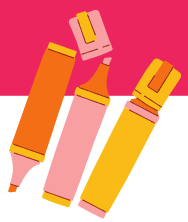
- Define and separate a solution.

EXPERIMENT

Here's how to use chromatography to see what colors are mixed together to make marker ink!

What is chromatography?

Chromatography is the separation of a solution by passing it through a "medium" (a substance). In this case, we'll be separating the colored ink in markers with water using chromatography strips.

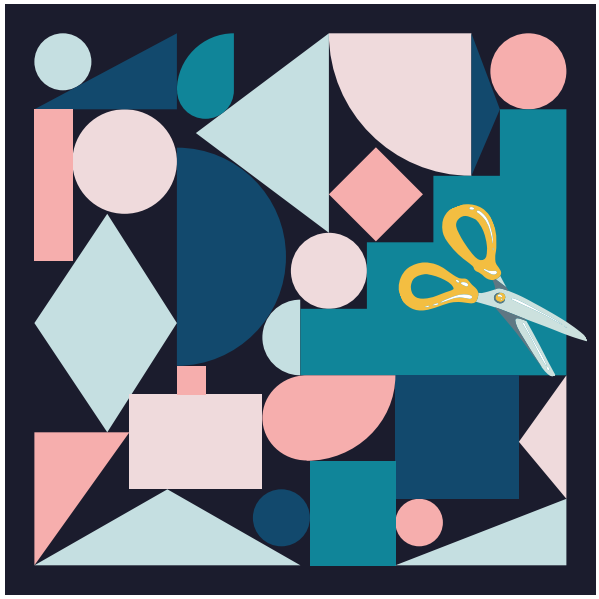


1. Take a chromatography strip and draw a thick marker line across the strip about a 3/4 inch from the bottom. You can use your finger to measure the space.
2. Do this with each color marker you'd like to try out. (You can also use a pencil to write the name of the color marker you used on the strip, so when you're finished, you'll know which strip started out with which color.)
3. Fill a cup about a 1/2 inch high with water. Clear cups are the best, because you can see what's happening.
4. Carefully place the bottom of your chromatography strip along the inside of the cup until it just goes into the water. (You do not want the marker line to touch the water.)
5. Clip it into place with your binder clip. Do this with each of your strips.
6. Observe the water slowly work its way up the chromatography strip, separating the colors of ink used in the marker.
7. This process can take about 30 minutes, so plan out an activity for this time. Color wheel printables or coffee filter butterflies are great "on theme" options.
8. Once the water has reached the top of the strip, remove the strip from the cup and place it on a newspaper or a brown grocery bag to dry.
9. Look closely at each strip. Which colors of ink made up each marker color?

SCIENCE Week 2

Directions for Collage Artwork

- Have students cut their strips into smaller pieces. This is great scissor skill practice.
- Cut a 5-inch by 5-inch piece of black or dark colored construction paper or cardstock.
- Have students glue their cut pieces onto the black square of paper.
- Display your artwork!

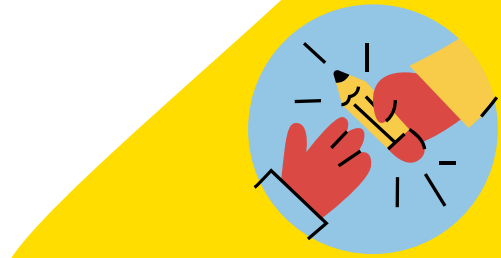


COACHES NOTES

- STEAM Question of the Week:
  - What is the difference between a mixture and a solution? A mixture is a substance that just mixed, but the ingredients are not completely dissolved -- such as pancake batter. In a solution, the ingredients are dissolved completely, and they cannot be filtered out. For example, water mixed with lemonade powder. Mixtures are made up of two or three compounds that aren't fused chemically.

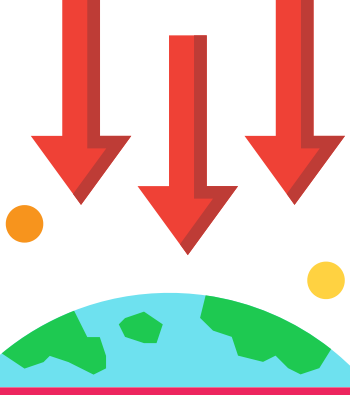
- STEAM Learning Term of the Week:
  - Fused: Joined or blended into one.

SHARE YOUR EXPERIENCE
Enjoy your time together, and email your photos & stories to photos@coachart.org at "original" (maximum) size.



SCIENCE Week 3

EGG DROP



- **Age Group:** 5-10
- **Skill Level:** Beginner
- **STEAM:** Science
- **Adult Helper:** As needed
- **Learning Objective:** Students will learn how force and momentum work.

Have you ever wondered why an egg doesn't break if you drop it on a pillow? Today we are combining science and engineering to test Newton's Laws of Motion.

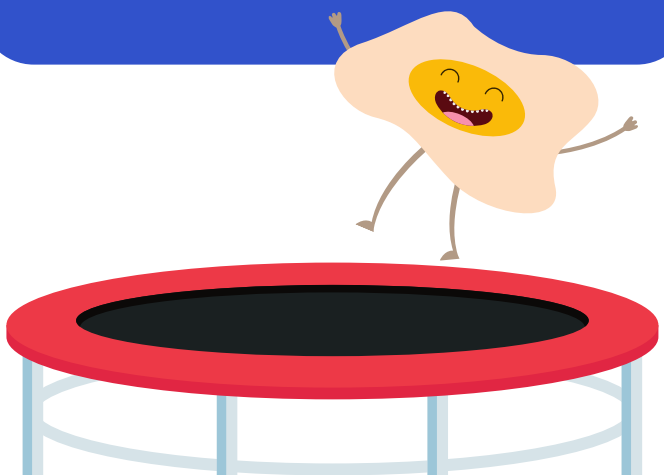
Activity One 30 minutes **Lesson** 15 minutes **Coaches Corner** 10 minutes

Here is what you need:

- 6-12 Raw eggs
- Various containers
- Padding such as bubble wrap, cotton balls, trash bags, etc.
- Measuring tool (tape measure, ruler, or yardstick)

At the end of this module, students will be able to:

- Create a structure to support an egg when it's dropped from a high area.



SCIENCE Week 3

Activity: Welcome to the Egg Drop Challenge!

The objective of the egg drop experiment is to keep the egg from breaking as it decelerates (slows to a stop).

Bonus Challenge

Try this experiment with different kinds of padding. Which works best?

Here are the basic guidelines:

- The container must be under 10 inches tall.
- Place padding in the container.
- Hold an egg 10 inches above the container (use a measuring tool).
- Drop the egg.
- If the egg didn't break, hold the egg 2 inches higher than last time and repeat the experiment.
- Make notes about your results.

COACHES NOTES

- STEAM Question of the Week:
  - What are Force and Momentum?
    - A force is a push or pull acting upon an object as a result of its interaction with another object. When there is an interaction between two objects, there is a force upon each of the objects. Forces only exist because of an interaction.
    - Momentum is "mass in motion." All objects have mass, so if an object is moving, it has momentum -- it has mass in motion. The amount of momentum that an object has depends on two variables: how much stuff is moving, and how fast the stuff is moving.

- STEAM Learning Term of the Week:
  - Newton's Second Law of Motion: Force equals mass times acceleration. In the egg drop experiment, in order to minimize the force experienced by the egg at the time of impact, you are designing a container that must maximize the time during which the egg decelerates (slows) at the time of impact.

SCIENCE Week 4

SLIME

- **Age Group:** 5-10
- **Skill Level:** Beginner
- **STEAM:** Science
- **Adult Helper:** As needed
- **Learning Objective:** Students will learn how salt can cause physical change.

Here is a riddle: What oozes between your fingers when you pick it up, yet doesn't stick to your skin?

Activity One 30 minutes **Lesson** 10 minutes **Coaches Notes** 10 minutes

Here is what you need:

- 5 ounces of glue (Elmer's Color Glue works great!)
- ½ tablespoon of baking soda
- 1 tablespoon of contact lens solution (adult supervision)
- Bowl
- Mixing utensils
- Measuring spoons
- Cornstarch
- Cotton balls
- Food coloring (optional)

At the end of this module, students will be able to:

- Understand how a chemical reaction can form something new.

SCIENCE Week 4

Activity: Slime

Here is what you do:

1. Pour out entire contents of the 5 ounces of glue into a bowl.
2. Add ½ tablespoon of baking soda and mix thoroughly.
3. Add 1 tablespoon of contact lens solution. Mix until mixture gets harder to mix and slime begins to form.
4. Take the slime out and begin kneading with both of your hands.
5. If it's too sticky, add ¼ tablespoon contact lens solution and knead. Keep adding ¼ tablespoon contact lens solution until desired consistency.
6. Have students divide the slime into two separate bowls.

The Experiment:

Ask: What will happen to the slime if you add cornstarch or cotton balls to it?

Have students write out a hypothesis (an assumption)

- Add cotton balls to one bowl
- Add cornstarch to the other

The Results:
Ask: Were the hypotheses correct? Why or why not?

COACHES NOTES

- STEAM Question of the Week:
  - What is the science behind slime? A chemical reaction occurs when the glue and the borate ions are mixed. The molecules become tangled, and slime is the new substance that is formed.
- STEAM Learning Term of the Week:
  - Molecule: A group of atoms that have bonded together.

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