

**Project FOCUS
Best Lessons
FIFTH GRADE**

Title of Lesson: Liquid Chromatography to Demonstrate a Physical Change

Theme: Physical Science

Unit Number: Unit Title: Matter/ Chemical and Physical Changes

Performance Standard(s) Covered (enter codes):

S5P2

S5CS8

S5CS1

Enduring Standards (objectives of activity):

Habits of Mind

- Asks questions
- Uses numbers to quantify
- Works in a group
- Uses tools to measure and view
- Looks at how parts of things are needed
- Describes and compares using physical attributes
- Observes using senses
- Draws and describes observations

Content (key terms and topics covered):

Liquid Chromatography, Physical Change, Chemical Change, Density

Learning Activity (Description in Steps)

Abstract (limit 100 characters): Use liquid chromatography to demonstrate that not all color changes are due to chemical changes.

Details: Mix about 3 or more different colors of food coloring onto a small plate. Then using the tip of a mechanical pencil or a pipette put a drop of the food coloring mixture close to the bottom of a three inch long by one inch wide piece of paper towel. Place this paper towel into a cup that has the bottom filled with water (about 1-2cm). When placing the paper towel into the cup be sure not to let the dot of color touch the water. As the paper towel soaks up the water it should separate the dot into the different colors you used to make the color mixture. Leave it in the cup for about five minutes or more to allow colors to separate. After observing that the colors separate you can explain to the students that mixing colors is a physical change because you were able to separate the components of the mixture back into its individual components. I had each student prepare their own chromatography paper by placing a dot of the color mixture on there, I also let each student place the paper towel into the water. I had students share the color mixtures though. I only had about 6 different color mixtures available to conserve the food coloring. It is important that you ask for predictions before the start of the experiment and it is important that the students make observations as you go along. I began the lesson by asking, "Is color change a property of a physical change or a chemical change?" The students responded by saying it is a property of a chemical change and so the experiment helped show them how not all color change is due to chemical changes.

Materials Needed (Type and Quantity):

3+ different colors of food coloring, Aluminum foil (served as a small plate), pipette (or mechanical pencil), piece of paper towel (3"x1"), little cup with about an inch or so of water.

Notes and Tips (suggested changes, alternative methods, cautions):

I suggest that you start off with a demonstration that shows the students every step. Show them how your dot looks and show them how to gently place it into the water. It'd be nice to show them the final result just so that they have something to compare it to. It is completely up to you to determine if you want the students working in groups or individually. Be prepared with extra paper towels (chromatography paper) because the students will mess up once or twice. Make sure you test this out at home before going to the classroom because the dot of food coloring absorbs differently in different paper towels, you do not want the dot to extend to the edge of the paper towel or to be too wide. I tried using a Kleenex but the paper was too thin and it easily broke. Another thing to keep in mind is that some colors take longer times to separate so five minutes may not be enough to see the color change, or three inches may not be long enough to let the colors separate. You can also throw in why the colors separate the way they do because it helps tie in with previous lessons of density and composition of each color. I used a mechanical pencil to place the dot because the pipette's drop was too big and it covered the entire end of the paper towel. Be prepared to do a lot of clean up because the kids are normally messy when it comes to placing the dot and mixing the color mixture. Not only that but the aluminum foil, if not shaped into a dish, will easily let the color mixture slide off onto their desks. There are no real safety concerns other than the food coloring may stain their little fingers. If I were to do this lesson again, I would use a longer piece of paper so that we see the complete color separation. I would also use clear cups as opposed to the white medicine cups that I used. If the cups were clear I feel as if there would have been less accidents that involved wetting the entire dot. I did the experiment and then let each student do the experiment individually. This worked out well because there were less paper towels crowding one cup and each student had something to do.

Sources/References:

- 1)**
- 2)**
- 3)**