MIND TREKKERS
Marker Chromatography Lesson Plan

Amount of time Demo takes: 4-6 min
# times per hr: 25

Materials:
1. Scissors (1 pair)
2. White paper coffee filter (1 per demo, could cut into fourths)
3. Washable black, blue, green, purple markers (not permanent) (2 packs markers/day, Sharpie FlipChart markers work best (black/green/brown/orange))
4. Water
5. Small clear plastic cups
6. Bucket for water

Set up instructions:
1. Fill tins with water and place them on the table
2. Set out markers. Darker colors work best - purple, green and black work well

SAFETY!
1. Take care to clean up water spills.

Lesson’s big idea
● Light Reflection: Ink and paint get their colors by absorbing some of the colors in white light and reflecting others.
● Capillary Action: The combination of surface tension in the water and adhesion between water molecules and the tube’s sides “pull” liquid up the capillaries. This is why the water moves up the filter, and through the ink.

Background Information
● Light Reflection: Green ink looks green because it reflects the green part of white light and absorbs all the other colors. Red ink looks red because it reflects only the red component of light. When you mix green, red, blue, and yellow ink, each ink that you add absorbs more light. That leaves less light to reflect to your eye. Since the mixture absorbs light of many colors and reflects very little, you end up with black.
● Capillary Action: This demonstration also illustrates capillary action well. Ordinarily, liquids flow downward (obeying gravity). When a tube -- a capillary -- has a narrow enough diameter, however, the combination of surface tension in the water and adhesion between water molecules and the tube’s sides “pull” liquid up the capillaries. This is why the water moves up the filter, and through the ink, without you having to pour anything. For example: plants use capillary action to get water up from their roots to the rest of the plant.
**Instructional Procedure**

1. Cut filters in half, so we use fewer per trip.
   With the black marker or other dark color have a volunteer draw stick figures. You can have them use multiple colors to see the difference in inks. Use scrap paper or newspaper underneath filter so marker does not bleed through onto table.

3. Cover the bottom of the pie tins with water.

4. Place the bottom of the paper in the water, so the water is getting absorbed up the filter (capillary action!).

5. Watch as the water flows up the paper. When it touches the black line, you'll start to see some different colors flowing “out” of the marker lines.

6. Leave the paper in the water until the colors go all the way to the top edge. How many colors can you see?

7. The left was a blue marker, the right was a black marker.

**Clean Up**

Clean up between demonstrations if needed. When completely finished gather all materials listed for this demonstration and make sure everything is accounted for. If something was used up, broken or damaged, let someone know so it can get replaced or fixed.

**References**

http://www.exploratorium.edu/science_explorer/black_magic.html

**National Standards:**

K-4 Content Standard B: Physical Science, Light, heat, electricity and magnetism