Adapted to STEMAZing ECE Format by
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Skittles Science (and M&Ms too)

NOTE: Children should always be given ample time to experiment, notice, and wonder before they are provided an explanation.

Always engage children with our two favorite questions:

What do you notice?

What do you wonder?

Resist the urge to answer any questions children have while exploring. Instead, respond back with questions to children and let them make sense of the world. Sample questions you might use: What do you think? Do you notice any patterns? What could we change? Can we test something else? What can we try next? If children ask a testable question, which they could answer by doing an experiment, talk through with them how they might design a test to help answer their question. As much as possible and within reason, let them actually test their questions by trying the experiments they propose.

Learning Objectives

Children will…

- identify and create patterns.
- change different independent variables of the experiment to see what effect it has.

Vocabulary (See **What the heck? Explanation of Science** at the end for definitions.)

Dissolve	Dye	Sink
Density	Float	~~Diffusion~~

Materials

Skittles	Water	Optional: Salt and Sugar
M&Ms	3 white plastic bowls	

Key Question

How can we create patterns using the dye (coloring) off Skittles and M&Ms?

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Notice and Wonder Developmentally Appropriate Practice

1. Empty the Skittles out onto a table and let children discover the colors.
    - What do you notice?
    - How many different colors are there?
2. Put a white plastic bowl on a table or countertop where it will not be disturbed, but where children can still see into it.
3. Make patterns! Put the Skittles (S side up) in a ring around the bottom of the bowl. Let children decide on the pattern. It can be ABAB, AAB, ABCABC, or whatever pattern interests them.
    - Ask children to make predictions about what will happen when you pour water into the bowl.
4. Gently begin pouring water in the middle of the bowl until it reaches all the Skittles and just barely covers them. Quickly reposition any Skittles that may have shifted around.
    - What do you notice?
    - What do you wonder?
5. Repeat Steps 1-5 but this time using M&Ms.
    - If possible, let the Skittles stay in the water while you experiment with the M&Ms and keep making observations.

Taking It Further

Another fun experiment to try is testing what is the same and what is different when you use sugar water or salt water instead of tap water. Put a generous amount (about 1/8 cup) of salt and sugar into two separate glasses of water. Mix them until the salt and sugar has completely dissolved. The setup for the experiment is the same as above. You can use Skittles or M&Ms to create rings of patterns around the bottom of the bowl. Before starting the experiment, have children make predictions about what will happen and record them.

Ideally you would have three people who can gently pour the liquids into the each bowl simultaneously. If that is not the case, then you can pour them in yourself gently but quickly. Just be certain to pour the tap water in last. You will see why!

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Children should notice…

- there are five different colors of Skittles and six different colors of M&Ms.
- the colors do not mix while they dissolve.
- if bump the bowl the colors will mix up and turn a gross brown color.
- the dye on the blue M&Ms don't dissolve as quickly as the rest of them.
- the Ms from the M&Ms will float to the surface after a long while and sometimes you can pick them up! (It also happens with the Ss on the Skittles but works better with the M&Ms.
- there is a difference when you use salt or sugar water in the experiment – the dyes don't dissolve as fast.

Differentiating Developmentally Appropriate Practice

Younger children can use a plastic bowl.

Extensions for Additional Learning

As always, ask the children throughout the experiment what they notice and what they wonder. If their wonder questions are testable, as much as possible and within reason, let them test their questions by trying new experiments.

See below for examples of what they might wonder and experiments they might do to test their wonderings.

- I wonder what would happen if you put {insert candy of choice} into water?
- I wonder what would happen if you use {insert another liquid} instead of water for the experiment?
- I wonder what would happen if you use really hot or really cold water instead of lukewarm water?
- I wonder what would happen if we put more salt or sugar into the water?
- I wonder what the candies taste like after they have been in the water?
    - Let them try it!

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#STEMAZingPictureBook Recommendations:

Mix It Up! by Herve Tullet (NOTE: These are not the REAL primary colors.)

What Are The Primary Colors? NOT Red, Blue, and Yellow! The Real Physics of Color by DaNel Hogan and Fabiana Estrella

Connections to the activity:

Dissolving dye from candies makes for great homemade paint.

Children can then do some color mixing activities.

SAFETY CONCERNS

Be careful with the glass plate and with any liquids you might be using that are hot.

AZ Early Learning Standards

Science Standard - Strand 1: Inquiry & Application - Concept 1: Exploration, Observation & Hypotheses
The child observes, explore, and interacts with materials, others, and the environment.

Science Standard - Strand 1: Inquiry & Application - Concept 2: Investigation
The child researches their own predictions and the ideas of others through active exploration and experimentation.

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Skittle Science (and M&Ms too)

What the heck? Explanation of the Science (Vocabulary in bold.)

The most common question when doing this experiment is: I wonder why the colors don't mix?

Skittles and M&Ms have hard candy shells made mostly of sugar with different colored dyes added to them. When placed in a liquid, like water, the outside shells will dissolve – be broken apart by the water.

The solution of sugar and dye from the candy shell dissolving is more dense than the water. It therefore creeps out toward the center to fill up the bottom of the bowl. The colors don't mix because they are all about the same density so when they reach each other they push into the lower density areas still not covered in the middle of the bowl. This creates the awesome, colorful pinwheel you see.

No matter how you explain this phenomenon, one this is for sure – this is not diffusion! Diffusion is an exceptionally SLOW process and is not the reason the dyes spread out in the bottom of the bowl. In fact, diffusion being slow might be the explanation behind why the colors don't mix until you agitate the water.

No word yet and why the blue dye on the M&Ms takes so much longer to dissolve than the other colors. Likely explained by differences in the molecule size of the blue dye.

After some time, you will see the Ms on the M&Ms (and sometimes the Ss on the Skittles) start to float. (If they don't, give the bowl a gently swish back and forth to nudge them loose after all of the candy shells have dissolved.) The Ms float because the vegetable dye used to print them is less dense than the water. If something is less dense than the fluid it is in, it will float. If something is more dense than the fluid it is in, it will sink.

The final experiment with the salt water, sugar water, and tap water was exciting. You should have seen the rates of color spread vary dramatically. In the picture below, sugar water was poured in to the green and yellow bowl first. Then, salt water was poured into the red and orange bowl. Finally, regular tap water was poured into the bowl on the left. A few minutes passed and this is what was observed.

The water with the sugar and salt dissolved in it will have a harder time dissolving more sugar and dye from the candies. This partially explains why the rate of color spread is different. The salt and sugar waters are also more dense than regular tap water and this likely affects how quickly the colors spread too.