

# Slime Time: Fun w/ Heat Transfer (For Volunteers)

**AGE GROUP:** K-2

**IDEAL DURATION:** 30 MIN

**SUPPORT NEEDS:** 1 VOLUNTEER PER 5 CHILDREN

**TOTAL COST:** \$1 - \$3 PER CHILD (DEPENDENT ON GROUP VS INDIVIDUAL ACTIVITY)

## **EMERSON RELEVANCY:**

**COLOR CHANGING SLIME WORKS BASED OFF THE RULES OF HEAT TRANSFER. FOR EXAMPLE, IF YOU ARE HOLDING THE SLIME, YOU ARE TRANSFERRING HEAT TO THE SLIME, MAKING IT WARMER, AND CAUSING IT TO CHANGE COLORS. HEAT CAN ALSO FLOW FROM THE SLIME TO COLD WATER, REMOVING HEAT FROM THE SLIME WHICH MAKES IT SEEM COLDER. THIS IS THE SAME IDEA BEHIND THE COLD CHAIN PRODUCTS FROM EMERSON! EMERSON MAKES PARTS FOR AIR CONDITIONING UNITS AND REFRIGERATION. AIR CONDITIONERS KEEP HOUSES COOL DURING THE SUMMER BY TRANSFERRING THE HEAT FROM INSIDE TO OUTSIDE. REFRIGERATORS WORK BY MOVING HEAT FROM FOOD PRODUCTS TO THE SURROUNDING AIR. THIS IS WHAT KEEPS YOUR FOOD COLD AND SAFE TO EAT. NOW YOU KNOW MORE ABOUT EMERSON AND HOW WE KEEP YOUR FOOD SAFE AND YOUR HOMES COMFORTABLE!**

## **DESCRIPTION:**

**FOR THIS EXPERIMENT, WE WILL USE THERMOCHROMIC PIGMENT TO MAKE SLIME CHANGE COLORS WHEN IT TOUCHES HOT OR COLD SURFACES. THERMOCHROMIC PIGMENT CHANGES COLORS BASED ON A CHANGE IN TEMPERATURE – THIS IS WHAT MAKES MOOD RINGS WORK! WHEN THE TEMPERATURE INCREASES, THE CRYSTALS IN LIQUID CRYSTAL THERMOCHROMIC MATERIAL MOVE CLOSER TOGETHER, CHANGING THE LIGHT REFRACTION WAVELENGTHS – OR CHANGING THE COLOR OF THE MATERIAL! WHEN IT GETS COLDER, THE CRYSTALS MOVE FURTHER APART, ALSO CHANGING THE COLOR OF MATERIAL.**



## OBJECTIVE:

THE GOAL OF THIS ACTIVITY IS FOR PARTICIPANTS TO IDENTIFY THE OCCURRENCE OF HEAT TRANSFER. YOU CAN SEE THIS PHENOMENON AFTER CREATING YOUR OWN COLOR CHANGING SLIME! WITH THE SLIME, TRY PUTTING ICE ON IT, BREATHING ON IT, HOLDING THE SLIME BETWEEN YOUR HANDS, OR EVEN DROPPING THE SLIME IN WARM WATER! WHAT DO YOU THINK WILL HAPPEN TO THE COLOR DURING EACH OF THESE ACTIVITIES? WRITE DOWN WHAT YOU THINK AND COMPARE YOUR IDEAS WITH THE RESULTS!

## SUPPLIES:

MATERIAL	AMOUNT	PRICE PER	TOTAL PRICE	# EXPERIMENTS
WHITE SCHOOL GLUE	¼ CUP	\$10.99 PER 16 CUPS	\$10.99	64
WATER	1 TBSP	\$0.00	\$0.00	-
THERMOCHROMIC PIGMENT	3 TSP	\$12.10 PER 100 TSP	\$12.10	33
LIQUID STARCH	¼ CUP	\$15.96 PER 4 CUPS	\$15.96	16
FOOD COLORING	10-20 DROPS	\$10.96 PER 20 ML	\$10.96	20
		TOTAL:	\$50.01	16 TIMES

## STEP-BY-STEP INSTRUCTIONS (FOR ACTIVITY LEADER):

1. PICK YOUR COLORS! THE PIGMENT COLOR WILL BE THE SLIME COLOR WHEN IT IS COLD. THE FOOD COLORING WILL BE THE COLOR OF THE SLIME WHEN IT IS WARM
2. POUR ¼ CUP GLUE INTO A BOWL
3. ADD 1 TABLESPOON OF WATER AND STIR UNTIL COMBINED
4. ADD 5 DROPS OF FOOD COLORING AND MIX WELL
5. ADD 3 TEASPOONS OF THERMOCHROMIC PIGMENT AND MIX WELL

6. **ADD  $\frac{1}{8}$  CUP LIQUID STARCH AND MIX UNTIL SLIMY**
7. **SQUISH THE SLIME WITH YOUR HANDS THEN RETURN TO THE BOWL WITH REMAINING STARCH**
8. **IF THE SLIME IS STILL VERY STICKY, ADD ADDITIONAL STARCH AND SQUISH WITH HANDS AGAIN. REPEAT UNTIL THE SLIME IS NOT STICKY. (NOTE: YOU WILL MOST LIKELY USE  $\frac{1}{4}$  CUP OF STARCH IN TOTAL)**
9. **YOU ARE READY TO PLAY WITH YOUR SLIME AND SEE THE COLORS CHANGE!**

## **ENGINEERING CONSTRAINTS:**

- **10 MINUTES TO EXPLAIN/DEMO, 10 MINUTES TO BUILD, 10 MINUTES TO TEST/REDESIGN/RE-TEST**
- **THIS ACTIVITY CAN BE PERFORMED INDIVIDUALLY OR AS A GROUP EXERCISE BASED ON HOW MUCH MATERIAL IS AVAILABLE AND HOW MUCH ADULT SUPERVISION IS PRESENT**

## **QUESTIONS FOR DESIGN THINKING:**

1. **WHAT WAS THE MOST IMPORTANT PART OF YOUR DESIGN?**
2. **WHAT MATERIAL WAS LEAST EFFECTIVE FOR YOUR DESIGN?**
3. **WHAT MATERIAL COULD HAVE BEEN USED TO MAKE YOUR DESIGN BETTER? (THIS COULD BE A MATERIAL THAT WASN'T OFFERED)**
4. **WHAT WOULD YOU DO DIFFERENTLY NEXT TIME?**

## **OTHER RESOURCES:**

<https://leftbraincraftbrain.com/heat-sensitive-color-changing-slime/>

# Slime Time: Fun w/ Heat Transfer (for participants)

## OBJECTIVE:

THE GOAL OF THIS ACTIVITY IS TO CREATE YOUR OWN SLIME AND EXPERIMENT WITH DIFFERENT FORMS OF HEAT TRANSFER. YOU WILL KNOW THAT HEAT TRANSFER IS TAKING PLACE ONCE THE SLIME CHANGES COLORS!

## ENGINEERING CONSTRAINTS:

- **TIME AVAILABLE – 30 MINUTES**
- **MATERIALS AVAILABLE**
  - **WHITE SCHOOL GLUE**
  - **WATER**
  - **THERMOCHROMIC PIGMENT**
  - **LIQUID STARCH**
  - **FOOD COLORING**



## QUESTIONS FOR DESIGN THINKING:

- **IDENTIFY DIFFERENT INSTANCES OF HEAT TRANSFER. SPECIFICALLY, NOTE WHEN HEAT IS BEING TRANSFERRED INTO THE SLIME AS WELL AS OUT OF THE SLIME BASED ON THE COLOR CHANGES BEING WITNESSED. PLACE THE SLIME ON VARIOUS FOOD ITEMS AS WELL TO MIMIC THE HEAT TRANSFER PROCESS WHICH OCCURS VIA REFRIGERATION.**