

# ALIEN Incubation

Leader Guide



*Fashion*  
through science

## WITH THIS ACTIVITY

- Handout
- Challenge Question
- Regulating Body Heat PDF
- Make Your Own Alien Babies



We are  
Engineers!



Movement  
Improvement



Marvelous  
Materials



Smart  
Clothing



Patternmaking  
Tools n' Tech

## MODULE

## Big Picture

Clothing helps keep our bodies at a comfortable temperature. In environments cooler than body temperature, clothing provides insulation to help prevent conductive heat loss and keep us warm.

## What's the goal?

Young designers will understand that material characteristics affect clothing function, in this case the ability to insulate to provide warmth.

### *Tips*

- If you do not have a microwave nearby, heat the Alien Babies in the nearest microwave, and then store them in an insulated bag. Spread in a single layer and heat for 30 seconds to warm them to about 100°F.
- Have enough cooler space to place all Alien Babies in contact with the ice – they should not be piled up.
- Young designers will have to work very quickly to take temperatures, wrap babies, and place them in coolers. Good organization and clear instructions are important.

## Materials

### What they need: (per group)

- 6 Alien Baby corn bags per group
- A set of 9" x 9" fabric squares: wool fabric or sweater swatch, cotton jersey t-shirt knit, jeans weight denim, polyester fleece, ripstop nylon.
- Masking Tape
- Thermometers (minimum of one per group but more is better) – mercury thermometers, digital oral thermometers, and digital food thermometers all work well!
- Access to microwave oven
- Insulated bag (If heating Alien babies in advance or at some distance)
- Access to Cooler filled with ice (5 lb. bag)
- Handout
- Calculator
- Pencil

**Preparation Time: 1 hour**

**Activity Time: 75 Minutes**

**Difficulty: Level 2**



## Grouping

Young designers work in groups of 3 to 6, with each designer in charge of 1 or 2 babies.

## Let's get started!

1. Introduce the activity with an explanation of **conductive heat loss** and **insulation**.

### VOCABULARY

**Conductive heat loss:** Movement of heat from a warm surface to a cold surface when those surfaces

**Insulation:** A material that prevents or reduces heat loss due to conduction

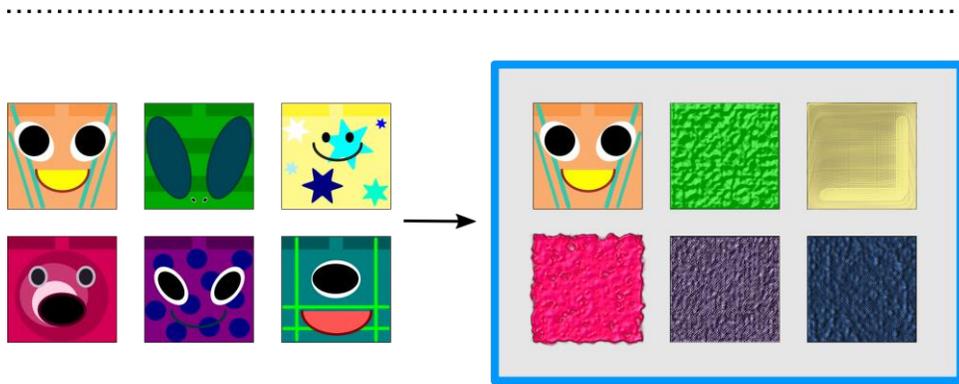
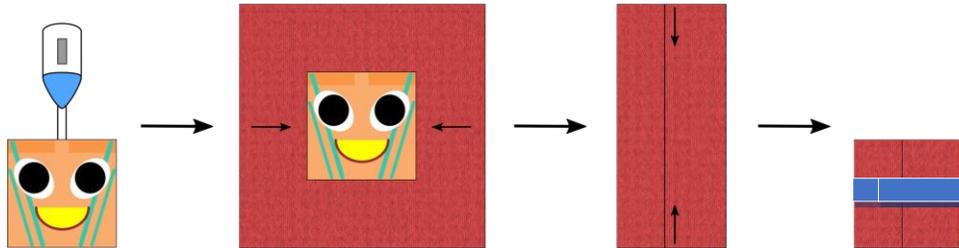
2. Hand out pre-cut fabric squares. Have each team examine the fabrics and rank them from 1-5; a rank of one is the fabric they think will keep an Alien baby warmest and five is the one that is least likely to do so. Explain that they are forming a **hypothesis** based on how they think the fabrics will perform, that they will now test. Record the rankings in the first column on the handout.

### VOCABULARY

**Hypothesis:** An (educated) guess about how things will work, based on what is known or thought to be known.

3. Supply each team with six warm Alien babies (warm them now or in advance).
4. Lay five babies on fabric squares. Leave one poor Alien Baby with no blanket. Before wrapping, stick a thermometer deep inside each Baby through the small opening at the top to obtain a reading. Record on the handout as BEFORE temperatures.

- Wrap five Alien babies quickly in blankets according to the diagram below. Close wrapping with a strip of tape (it is important that they all tape the baby the same way to reduce variation in heat loss).



Top: Take temperatures and wrap in fabrics; Bottom: Wrap five of the six alien babies in fabric and place in cooler.



Wrap the babies with tape like this!

6. Place all 6 Alien babies in the cooler directly on the ice. Leave for 10 minutes.
7. Take the Alien babies out of the cooler and measure their temperatures again. Record the readings in the AFTER column of the handout.
8. Subtract the cold temperature from the original temperature for each fabric or layering of fabric. Write it on the handout in the right-hand column.
9. Rank the fabrics from the one that insulated the most to the one that insulated the least.
  - The one that insulated the best showed the smallest change in temperature.

## Wrap it Up

1. Did your results match your hypothesized rankings?
2. What do you observe about the fabrics that insulate the most?
  - A. *Materials that are able to trap still air within fibers or the fabric structure are good insulators because air is a very poor thermal conductor. Think about how the clothing and bedding materials we use in the winter differ from those we use in the summer; they may be fluffy, bulky, contain fibers or feathers in layers.*
3. What might you do to keep your Alien babies even warmer? Think about how you dress to go outside in the winter.
  - A. *Layering clothing traps still air between layers, adding warmth for each layer plus the air between, as long as the wind does not penetrate the layers to displace the air.*
4. Would the most fabrics that protected best against conductive heat loss be as effective in a windy situation?

A. *Wind will permeate open spaces in fabrics and garment openings, causing heat loss due to **convection**.*

## Take this Further

1. Try other fabrics.
2. Test the effectiveness of layering: Do this activity again, wrapping one baby in a single layer of fabric and another in a double layer of fabric.
  - Does a second layer of the same fabric make a difference?
  - What happens if you layer different fabrics together, for example fleece over jersey knit?
  - Does the order in which the fabrics are layered matter?

### VOCABULARY

**Convective heat loss:** Air flow from warm to cold areas

3. If you have a large group, average the data from multiple groups tests of the same fabrics. This is good research procedure, followed to insure greater reliability, e.g. to reduce variance due to factors such as individual researcher procedure, thermometer variations, and more.

Have the young designers complete the Challenge Question individually.

## Challenge Question Answer Key

Which material would keep your alien baby warmest?

Circle your answer below.



Vinyl raincoat fabric



Terrycloth (towel)



Down-filled Comforter



Corduroy fabric



a sheet of cardboard



Wool fabric