**🧪 STATION 1: “Rescue Wraps” – Testing Cooling Efficiency of First Aid Materials**

**NGSS Standard: HS-PS3-4**
**Concept:** Investigating how different materials transfer thermal energy and protect injured skin.

**Materials:**

 Resealable plastic bag (filled with warm water — this is your “burned skin”)

 Warm water (40–45°C)

 Ice cubes (1 per trial)

 **Test materials:**
• Wet paper towel
• Aloe gel
• Gauze
• Foil
• Cloth

 Digital thermometer

 Stopwatch or timer

 Ruler (optional: measure material thickness)

**Student directions:**

**Step-by-Step Instructions:**

**Step 1: Prepare Your Simulated Burn:**

* + Fill a resealable bag with warm water (~40–45°C).
	+ Seal the bag tightly — no leaks!
	+ This simulates burned skin.

**Step 2: Apply the Cooling Material:**

* + Wrap one test material completely around the bag.
	+ If using aloe gel, spread a layer over the bag before wrapping.
	+ Optional: measure and record thickness of the material with a ruler.

**Step 3: Add the Ice Cube:**

* + Place a single ice cube on top of the wrapped “burn.”
	+ Start the stopwatch as soon as the ice is placed.

**Step 4: Measure Temperature Over Time:**

* + Use the thermometer to measure the temperature **inside the bag** every **minute** for **5 minutes**.
	+ Record your data in the table below. (Slide the thermometer in carefully without opening the bag too much.)

**Step 5: Repeat with Other Materials:**

* + Empty and refill the bag with warm water each time.
	+ Test all materials using the exact same process.

**📊 Data Table:**

| **Material Tested** |  **Start Temp (°C)** |  **Temp @ 1 min** |  **2 min** |  **3 min** |  **4 min** |  **5 min** |
| --- | --- | --- | --- | --- | --- | --- |
| Wet Paper Towel |  |  |  |  |  |  |
| Aloe Gel |  |  |  |  |  |  |
| Gauze |  |  |  |  |  |  |
| Foil |  |  |  |  |  |  |
| Cloth |  |  |  |  |  |  |

**💬 Analysis & Reflection:**

1. **Which material cooled the “burn” the fastest (largest temp drop in 1–2 minutes)?**
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. **Which material kept the temperature more stable over time (slower changes)?**
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. **What physical properties made a material better at transferring or insulating heat? (e.g., thickness, texture, moisture)**
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. **If you were designing a real burn treatment, which material would you recommend and why?**
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**🧪 STATION 1: “Rescue Wraps”**

**Focus:** Testing Cooling Efficiency of First Aid Materials
**NGSS Standard:** **HS-PS3-4** – Plan and conduct an investigation to provide evidence that the transfer of thermal energy depends on the nature of the matter, the mass, and the environment.

**✅ ITEEA STEL Standards – High School Level**

**STEL 1H** – *Technological systems include input, processes, output, and feedback.*
→ Students design and test a system for cooling, evaluating inputs (materials), process (energy transfer), and feedback (temperature readings over time).

**STEL 4H** – *The properties of materials influence their applications.*
→ Learners compare material characteristics (moisture, density, thickness) and how those impact heat transfer.

**STEL 7J** – *Energy cannot be created or destroyed but can be converted from one form to another.*
→ Students observe how thermal energy moves from the simulated burn to the ice, depending on the material used.

**STEL 8H** – *Design is a creative process that leads to new and useful ideas and innovations.*
→ Learners experiment and reflect on which material could be used in real-world applications, like first aid wraps.

**STEL 11H** – *Testing, evaluating, and refining are used to improve technological designs.*
→ Students iteratively test and compare the performance of different materials and evaluate their cooling effectiveness.

**✅ Common Core Math Standards – High School**

**CCSS.MATH.CONTENT.HSS.ID.A.1** – *Represent data with plots on the real number line (e.g., dot plots, histograms, and box plots).*
→ Students can graph temperature change over time for each material to visualize and compare performance.

**CCSS.MATH.CONTENT.HSS.ID.B.6** – *Summarize, represent, and interpret data on two categorical and quantitative variables.*
→ Comparing different materials (categorical) with temperature drop rates (quantitative) over time.

**CCSS.MATH.CONTENT.HSA.CED.A.2** – *Create equations in two or more variables to represent relationships between quantities.*
→ Optional extension: Students can model temperature as a function of time or analyze rates of change.

**CCSS.MATH.PRACTICE.MP4** – *Model with mathematics.*
→ Students model thermal energy transfer mathematically using data from their experiment.

**CCSS.MATH.PRACTICE.MP2** – *Reason abstractly and quantitatively.*
→ Learners interpret the meaning of numerical temperature changes in the context of heat transfer.

**✅ Summary**

This station integrates **engineering design, material science, and thermal physics**. It aligns with **NGSS HS-PS3-4** and connects strongly with **ITEEA STEL standards** related to systems thinking, material properties, and energy transfer. The experiment also supports **Common Core Math** by promoting data collection, graphing, quantitative analysis, and real-world modeling.