**🎯 Bonus Challenge:**

**“First Aid Far From Home” – Design a Survival Wrap Kit**

**Scenario:** You’re designing a **First Aid Cooling Kit** for either astronauts in space or explorers stranded in the wilderness. There's **no hospital nearby**—so your materials need to work fast, be safe, and last.

**🌟 Challenge Goal:**

Design and present a **burn-care first aid kit** that works in **extreme or isolated environments**, such as:

* 🚀 Aboard a spacecraft or lunar base
* 🏕️ Deep wilderness without medical support

You will work in small teams to research, plan, and **present your design**.

**Science Connections**

**NGSS Standard:** HS-PS3-4

* Investigate how energy (thermal) is transferred and controlled  
  **NGSS Standard:** HS-ETS1-2
* Evaluate competing solutions based on criteria and constraints

**Student Directions**

**Step 1: Choose Your Environment**

As a team, pick one:

* Space (zero gravity, very cold/hot extremes, limited water, no gravity)
* Wilderness (variable temperatures, lots of movement, no electricity)

🔍 Think about what survival would look like in this setting.

**Step 2: Identify Needs**

List the challenges you must solve:

* How will your wrap cool a burn quickly?
* Will it **stay in place** during movement?
* Can it be **reused**?
* What if there’s **no freezer or cold water** available?

Record your key design needs:  
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Step 3: Select Materials**

Brainstorm materials you could **realistically pack or find**:

* Lightweight cloth
* Aluminum foil
* Gel packs
* Natural sponges
* Self-heating or self-cooling compounds
* Water-absorbing polymers
* Sterile wipes or single-use wraps

What properties are important in your material choices?

| **Property** | **Why It’s Important for First Aid** |
| --- | --- |
| Thermal Conductivity | Helps draw heat away from the skin |
| Reusability | Saves space and weight in survival gear |
| Safety & Comfort | Safe to use on human skin; no extra damage |
| Ease of Use | Simple, fast to apply under pressure |

**Step 4: Draw and Describe Your Kit**

Use a half-page to:

* Sketch your survival wrap and label the materials
* Explain how it cools burns
* Describe how it’s stored and applied
* Include how long it lasts or how it’s reused

Sketch Space (or use notebook):  
→ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Step 5: Justify Your Choices**

Answer the following as a team:

1. **Why are your materials effective for this environment?**  
   → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. **What trade-offs did you make (e.g., comfort vs. reusability)?**  
   → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. **How does your design support patient comfort and healing?**  
   → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. **If you could only carry 3 items, which would they be and why?**  
   → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Group Presentations:**

Present your First Aid Kit concept to the class. Focus on:

* Science behind your design
* Why it works in your chosen setting
* How you balanced effectiveness, simplicity, and safety

**🌟 Bonus Challenge: First Aid Far From Home**

**NGSS Standards:**

* **HS-PS3-4** – Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperatures are combined results in a more uniform energy distribution.
* **HS-ETS1-2** – Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

**✅ ITEEA STEL Standards – High School**

**STEL 1H** – *Technological systems include input, processes, output, and feedback.*  
→ Students design a system (first aid wrap kit) with performance feedback based on environmental needs and thermal response.

**STEL 2H** – *Core concepts of technology include energy and matter.*  
→ The activity challenges students to apply their understanding of thermal energy transfer in real-world survival scenarios.

**STEL 4H** – *The properties of materials influence their applications.*  
→ Students must choose and justify materials for burn treatment based on insulation, conductivity, and reusability.

**STEL 8H** – *Design is a creative process that leads to useful ideas and solutions.*  
→ Students follow the engineering design process to develop, iterate, and present a first-aid kit.

**STEL 9J** – *Research, development, and experimentation are used to problem-solve and invent.*  
→ Students research environmental constraints (space/wilderness), develop a solution, and present evidence-based designs.

**STEL 11H** – *Apply design and problem-solving skills to address real-world medical, health, and safety challenges.*  
→ This project simulates a real-world first aid innovation challenge under extreme constraints.

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

**CCSS.MATH.CONTENT.HSM.1F.C.7** – *Interpret functions that arise in applications in terms of context.*  
→ Students analyze thermal energy change, duration, and function in their kit designs.

**CCSS.MATH.CONTENT.HSG.MG.A.3** – *Apply geometric concepts in modeling situations.*  
→ Teams sketch and label designs with measurements and spatial reasoning (e.g., surface area of wraps, layer thickness).

**CCSS.MATH.PRACTICE.MP2** – *Reason abstractly and quantitatively.*  
→ Teams consider quantitative design constraints (weight, time to cool, temp reduction).

**CCSS.MATH.PRACTICE.MP4** – *Model with mathematics.*  
→ Students model trade-offs and effectiveness based on heat transfer and time estimations.

**CCSS.MATH.PRACTICE.MP5** – *Use appropriate tools strategically.*  
→ Learners select and propose tools/materials that balance safety, energy transfer, portability, and reusability.

**✅ Summary**

This engineering design challenge aligns with **NGSS HS-PS3-4** and **HS-ETS1-2**, combining science and systems thinking in the context of **extreme environment medicine**. It is deeply tied to **ITEEA STEL standards on energy, materials, systems, and design** and supports **Common Core Math Standards** through modeling, measurement, and data-based decision-making.