**NGSS Middle School Standards for "Practice First Aid" Unit**

This unit aligns with **Next Generation Science Standards (NGSS) for Middle School (Grades 6-8)** by integrating concepts from **Life Science (LS), Physical Science (PS), and Engineering Design (ETS).**

**NGSS Middle School Standards Covered**

**Life Science (LS) – Human Body, Health, and Response to Injury**

* **MS-LS1-3:** Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
	+ **Connection:** Students **explore how the circulatory, immune, and integumentary systems interact during wound healing and infection prevention.**
* **MS-LS1-8:** Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
	+ **Connection:** Students **learn how the body responds to injuries and pain, including reflex responses and the role of the nervous system in emergency situations.**
* **MS-LS1-5:** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
	+ **Connection:** Students **investigate how environmental factors (e.g., bacteria, burns, wounds) affect healing and infection risks.**

**Physical Science (PS) – Forces, Energy Transfer, and Chemical Reactions in First Aid**

* **MS-PS1-2:** Analyze and interpret data on the properties of substances before and after they interact to determine if a chemical reaction has occurred.
	+ **Connection:** Students **examine how antiseptics, disinfectants, and medications interact with wounds and infections.**
* **MS-PS1-3:** Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
	+ **Connection:** Students **learn about the materials used in medical bandages, antiseptics, and wound dressings.**
* **MS-PS3-3:** Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
	+ **Connection:** Students **explore how burn treatments manage heat transfer and how cooling methods reduce tissue damage.**

**Engineering, Technology, and Applications of Science (ETS) – First Aid Tools & Emergency Response**

* **MS-ETS1-1:** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution.
	+ **Connection:** Students **explore the design of first aid kits, considering the essential tools and materials needed for emergency response.**
* **MS-ETS1-2:** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
	+ **Connection:** Students **compare different types of bandages, antiseptics, and wound treatments for effectiveness in different situations.**
* **MS-ETS1-3:** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics.
	+ **Connection:** Students **evaluate different wound care materials (e.g., gauze, liquid bandages, antibacterial ointments) based on their effectiveness.**

**Key Concepts Covered in Middle School**

✔ **Human Body & Health:** **Understanding how the body responds to injuries and how to properly treat wounds.**
✔ **Infection Prevention & Healing:** **Learning how antiseptics, sterilization, and wound care reduce infection risks.**
✔ **Medical Technology & Engineering:** **Exploring first aid tools, bandaging techniques, and emergency response technologies.**
✔ **Physical & Chemical Science in First Aid:** **Understanding heat transfer in burns, antiseptic chemical reactions, and material properties in wound care.**

**NGSS High School Standards for "Practice First Aid" Unit**

This unit aligns with **Next Generation Science Standards (NGSS) for High School (Grades 9-12)** by incorporating concepts from **Life Science (LS), Physical Science (PS), and Engineering Design (ETS).**

**NGSS High School Standards Covered**

**Life Science (LS) – Human Body Systems, Health, and Disease Prevention**

* **HS-LS1-2:** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
	+ **Connection:** Students **explore how the circulatory, nervous, and immune systems work together in wound healing and emergency response.**
* **HS-LS1-3:** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
	+ **Connection:** Students **study how the body regulates temperature, blood clotting, and immune responses during injuries.**
* **HS-LS1-7:** Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen are broken, and new compounds are formed that can transport energy.
	+ **Connection:** Students **learn how oxygen supply is critical to healing and emergency medical care.**
* **HS-LS2-8:** Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
	+ **Connection:** Students **explore how first aid and emergency response affect survival rates in life-threatening situations.**

**Physical Science (PS) – Chemistry & Physics in First Aid Applications**

* **HS-PS1-3:** Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
	+ **Connection:** Students **examine the chemical properties of antiseptics, wound dressings, and clotting agents.**
* **HS-PS1-5:** Apply scientific principles and evidence to explain how temperature, concentration, and the presence of catalysts affect reaction rates.
	+ **Connection:** Students **explore how body temperature affects healing and infection rates.**
* **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 varies with the properties of the substances involved.
	+ **Connection:** Students **study burn treatments and heat transfer in injury management (e.g., cooling burns to reduce tissue damage).**

**Engineering, Technology, and Applications of Science (ETS) – Medical Tools & Emergency Response**

* **HS-ETS1-1:** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
	+ **Connection:** Students **examine how first aid practices, emergency medical response, and medical innovations help address global health challenges.**
* **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.
	+ **Connection:** Students **analyze and improve first aid techniques, tools, and wound care practices.**
* **HS-ETS1-3:** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints.
	+ **Connection:** Students **compare different wound care materials and techniques to determine the most effective treatments.**

**Key Concepts Covered in High School**

✔ **Human Body & Homeostasis:** **How the circulatory, nervous, and immune systems respond to injuries and medical emergencies.**
✔ **First Aid & Infection Prevention:** **The role of antiseptics, sterilization, and wound care in reducing infection risks.**
✔ **Medical Engineering & Innovation:** **How medical tools, bandaging techniques, and emergency response technologies are designed and improved.**
✔ **Physical & Chemical Science in First Aid:** **Understanding heat transfer in burns, antiseptic chemical reactions, and material properties in wound care.**

**NGSS Elementary Standards for "Practice First Aid" Unit**

This unit aligns with **Next Generation Science Standards (NGSS) for Elementary Grades (K-5)** by incorporating concepts from **Life Science (LS), Physical Science (PS), and Engineering Design (ETS).**

**NGSS Elementary Standards Covered**

**Life Science (LS) – Human Body Systems & Health**

* **1-LS1-1:** Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
	+ **Connection:** Students **explore how the human body has built-in protection (skin, clotting, immune system) to heal wounds and prevent infections.**
* **4-LS1-1:** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
	+ **Connection:** Students **learn how the circulatory and immune systems work together to heal wounds and fight infections.**
* **4-LS1-2:** Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to it in different ways.
	+ **Connection:** Students **examine how the body reacts to pain, injuries, and healing, including reflexes and sensory responses.**

**Physical Science (PS) – Properties of Materials & Heat Transfer**

* **2-PS1-2:** Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
	+ **Connection:** Students **test and compare different types of bandages, dressings, and antiseptics to see which work best for treating wounds.**
* **2-PS1-4:** Construct an argument with evidence that some changes caused by heating or cooling can be reversed, and some cannot.
	+ **Connection:** Students **explore burn treatment and discuss how cooling a burn can reduce tissue damage.**
* **5-PS1-3:** Make observations and measurements to identify materials based on their properties.
	+ **Connection:** Students **investigate different first aid materials (gauze, bandages, antiseptics) and determine their best uses based on their properties.**

**Engineering, Technology, and Applications of Science (ETS) – Medical Tools & First Aid**

* **K-2-ETS1-1:** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
	+ **Connection:** Students **identify common injuries and explore how different first aid tools help solve medical problems.**
* **K-2-ETS1-2:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
	+ **Connection:** Students **create models of first aid tools (like a bandage or a sling) and explore their functions.**
* **3-5-ETS1-1:** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
	+ **Connection:** Students **explore the design of first aid kits and discuss how medical tools are made to be safe and effective.**
* **3-5-ETS1-3:** Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
	+ **Connection:** Students **test different wound care techniques and improve their approach based on effectiveness.**

**Key Concepts Covered in Elementary**

✔ **Human Body & Health:** **Basic understanding of the circulatory and immune systems and how the body heals.**
✔ **First Aid & Safety:** **Learning how to clean and bandage wounds, recognize injuries, and apply simple first aid.**
✔ **Material Properties in Medicine:** **Exploring which materials work best for wound care (e.g., gauze vs. cotton, antiseptics vs. water).**
✔ **Engineering & Medical Design:** **Understanding how medical tools are created and optimized for safety and effectiveness.**