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| M. Angileri | **6th grade science** | | **Lesson Plans 1-28 19 Energy Transfer and Temperature #1** | | | | |
| NGSS Standards | **MS-PS 3-4**  DCI : PS3.B  S & E practices  CCC | | **Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.**  **Conservation of Energy and Energy Transfer:** The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample and the environment.  **Planning and Carrying out Investigations:** Plan an investigation and work collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.  **Scale Proportion and Quantity:** Proportional relationships among different types of quantities provide information about the magnitude of properties and processes. | | | | |
| Essential Question | | Why is the shallow water of the lake warmer than the deeper water below it? | | | | | |
| Vocabulary: | | **Energy:** The ability of a system to do work. Energy is required for changes to happen within a system.  **Kinetic Energy:** Energy of motion.  **Mass:** A measure of how much matter is present in a substance.  **Matter:** Anything that has mass and takes up space.  **Temperature:** Average kinetic energy of all the particles in a material; measured by a thermometer in degrees.  **Conductor:** A substance that allows the flow of electric charge or transfers thermal energy through matter.  **Conduction**: Transfer of thermal energy that occurs in solids, liquids, and gasses when two substances of different temperatures touch.  **Convection:** Heat transfer caused by the rising of hotter, less dense fluids and the falling of cooler more dense fluids.  **Heat Transfer:** The thermal energy exchanged between two objects of different temperatures; energy will continue to move in a predictable pattern from warmer site to a cooler site; until all sites have reached the same temperature.  **States:** Distinct forms of matter known in everyday experience; states include solid, liquid, and gas; also referred to as phases.  **System:** A group of interacting or interdependent elements forming a complex whole as in all the factors or variables in a environment or all the variables that might affect a science experiment.  **Thermal Energy:** Thermal Energy is the total kinetic energy of the tiny particles that make up matter. The faster the particles move, the warmer the matter becomes.  **Solid:** A state of matter that has a definite shape and a definite volume.  **Liquid:** A state of matter that has no definite shape but has a definite volume.  **Gas:** A state of matter with no definite shape or volume.  **Particle:** Used as a general term for the atoms and molecules that make up all matter. | | | | | |
|  | | **MONDAY** | | **TUESDAY** | **WEDNESDAY** | **THURSDAY** | **FRIDAY** |
| Content Objective: | | SW demonstrate Application of how the transfer of energy can be tracked as energy flows through a designed or natural system by explaining Heat Transport. | | SW demonstrate evaluation of the relationship between the temperature and the total energy of a system by testing. | SW demonstrate analysis of the relationship between the temperature and the total energy of a system by finding connections between unit lessons. | SW demonstrate knowledge of amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter by recalling past experiences. | SW demonstrate application of the amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter by carrying out an investigation. |
| Language objective | | SW write to describe the relationship between the transfer of energy can be tracked as energy flows through a designed or natural system by using sentence stems. | | SW read to synthesize information about the relationship between the temperature and the total energy of a system using complete sentences. | SW write to describe the relationship between the temperature and the total energy of a system using sentence starters. | SW write to give examples of the amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter using sentence frames. | SW write to interpret how the amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter using content specific vocabulary |
| In class today | | Discuss Explore 1 answers  CCV: Heat Transport  Read Science A: Thermal Transformations | | Discuss Scopepedia p. 5-7  Science A: Thermal Transformations and Quiz  Complete | Heat Travel experiment  Open Note quiz: New Graphic organizer | KWL and APK Energy Transfer and Temperature  Hook: Heat it up | ETT Explore 1: Materials Matter experiment |
| Unit Guiding Questions | | What is the relationship between temperature and thermal energy? | | Does energy transfer from hot to cold or cold to hot? | What is the difference between conduction, convection, and radiation. | What factors affect the amount of energy transfer needed to change the temperature of matter? |  |

Preconception:

Students may think that when a cold object and a warm object are placed in contact with each other, the warm object gets colder and the cold object gets warmer because coldness is transferred from one object to another.

**The thermal energy transferred by conduction goes from the warmer object to the cooler one. The heat transfer will continue as long as there is a difference in temperature between the two objects.**

Students may not understand that every environment does not have the same amount of energy.

**Temperature is the numerical measure of hot and cold. It tells us about the average kinetic energy of the molecules in an object or system. Environments with lower kinetic energies have lower temperatures. Melting ice on the windshield of a car will take longer in freezing temperatures than in warmer temperatures.**

Students may think that different materials will heat at the same rate.

**Conductivity affects the rate of heat transfer through a material. For example, a styrofoam cup used to hold hot coffee has less conductivity and prevents less heat from escaping the cup.**

Students may not understand that different quantities of materials will not heat up at the same rate.

**The amount of matter in a system affects the heating rate of the system. The greater the amount of matter, the slower heat can be transferred through it. For example, it takes longer to heat more water in a pan than less water.**