HIGHLIGHTS OF THE NEW 6TH GRADE SCIENCE SEED CORE

WHAT TO LOOK FOR WHEN TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE

TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE USING THREE DIMENSIONS OF SCIENCE

- Scientific and Engineering Practices (SEP)
- Crosscutting Concepts (CCC)
- Disciplinary Core Ideas (DCI)

Science teaching should engage students in performances of science at the intersection of these three dimensions.

TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE USING THREE DIMENSIONS OF SCIENCE

Scientific and Engineering Practices (SEP)

- A ways and means for conducting or “doing” science.
- These practices are a guide for scaffolding the elements of science inquiry into useful description of what students do when they engage in using science as a process:
  - To gather information
  - Reason with that information
  - Communication that information to others

TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE USING THREE DIMENSIONS OF SCIENCE

Scientific and Engineering Practices are:

1. Asking questions and defining problems
2. Developing models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (science) and designing solutions (engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

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Crosscutting Concepts (CCC)

- These provide a scaffold upon which students can organize the cognitive structures for unifying the science disciplines.
- They are useful tools for students to define the systems of:
  - Phenomena
  - Seek cause and effect relationships
  - Determine patterns that contribute to evidence-supporting practices

TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE USING THREE DIMENSIONS OF SCIENCE

Crosscutting Concepts are:

1. Patterns
2. Cause and Effect
3. Scale, proportion, and quantity
4. Systems and system models
5. Matter and energy
6. Structure and Function
7. Stability and change

TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE USING THREE DIMENSIONS OF SCIENCE

Disciplinary Core Ideas (DCI)

- Core ideas are those concepts, laws, and theories in science that provide a significant and meaningful understanding and/or have a high explanatory value for making sense of phenomena.
- Core ideas are generally written with sufficient detail to tie a core idea to one of the four science disciplines--life, physical, engineering, earth and space sciences.
- The ideas learned are used as evidence in scientific arguments and to support explanations.
- In the past, standards focused on students knowing core ideas; the new vision is for students to use core ideas to support science performances.
- Moving from students knowing “what" and “that” to understanding “how” and “why” is central to the new vision.

TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE USING THREE DIMENSIONS OF SCIENCE

Disciplinary Core Ideas are:

1. Earth and Space Science
2. Life Science
3. Physical Science
4. Engineering

TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE USING THREE DIMENSIONS OF SCIENCE

Every standard includes at least one of each of the three dimensions:

1. **Science and Engineering Practices are bolded.**
2. <u>Crosscutting Concepts are underlined.</u>
3. Disciplinary Core Ideas are in normal font.
4. Standards with *specific engineering expectations* are italicized.

THE NEW 6TH GRADE SCIENCE SEED CORE STRAND 1

STRAND 6.1: Structure And Motion Within The Solar System

The solar system consists of the sun, planets, and other objects within sun's gravitational influence. Gravity is the force of attraction between masses. The sun-earth-moon system provides an opportunity to study interactions between objects in the solar system that influence phenomena observed from earth. Scientists use data from many sources to determine the scale and properties of objects in our solar system.

THE NEW 6TH GRADE SCIENCE SEED CORE STRAND 1, STANDARDS 1, 2, 3

☐ **STANDARD 6.1.1 Develop and use a model** of the sun-earth-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. examples of models could be physical, graphical, or conceptual.

☐ **STANDARD 6.1.2 Develop and use a model** to describe the role of gravity and inertia in orbital motions of objects in our solar system.

☐ **STANDARD 6.1.3 Use computational thinking to analyze data** and determine the scale and properties of objects in the solar system. Examples of scale could include size and distance. Examples of properties could include layers, temperature, surface features, and orbital radius. Data sources could include earth and space-based instruments such as telescopes and satellites. Types of data could include graphs, data tables, drawings, photographs, and models.

THE NEW 6TH GRADE SCIENCE SEED CORE STRAND 2

STRAND 6.2: Energy Affects Matter

Matter and energy are fundamental components of the universe. Matter is anything that has mass and takes up space. Transfer of energy creates change in matter. Changes between general states of matter can occur through the transfer of energy. Density describes how closely matter is packed together. Substances with a higher density have more matter in a given space than substances with a lower density. Changes in heat energy can alter the density of a material. Insulators resist the transfer of heat energy, while conductors easily transfer heat energy. These differences in energy flow can be used to design products to meet the needs of society.

THE NEW 6TH GRADE SCIENCE SEED CORE STRAND 2, STANDARDS 1, 2, 3, AND 4

☐ **Standard 6.2.1 Develop models** to show that molecules are made of different kinds, proportions, and quantities of atoms. Emphasize understanding that there are differences between atoms and molecules, and that certain combinations of atoms form specific molecules. examples of simple molecules could include water (H_2O), atmospheric oxygen (O_2), and carbon dioxide (CO_2).

☐ **Standard 6.2.2 Develop a model** to predict the effect of heat energy on states of matter and density. Emphasize the arrangement of particles in states of matter (solid, liquid, or gas) and during phase changes (melting, freezing, condensing, and evaporating).

THE NEW 6TH GRADE SCIENCE SEED CORE STRAND 2, STANDARDS 1, 2, 3, 4

☐ **Standard 6.2.3 Plan and carry out an investigation** to determine the relationship between temperature, the amount of heat transferred, and the change of average particle motion in various types or amounts of matter. Emphasize recording and evaluating data, and communicating the results of the investigation.

☐ **Standard 6.2.4 *Design*** *an object, tool, or process* that minimizes or maximizes heat energy transfer. *Identify criteria and constraints, develop a prototype for iterative testing, analyze data from testing, and propose modifications for optimizing the* ***design solution***. Emphasize demonstrating how the structure of differing materials allows them to function as either conductors or insulators.

THE NEW 6TH GRADE SCIENCE SEED CORE STRAND 3

STRAND 6.3: EARTH'S WEATHER PATTERNS AND CLIMATE

All earth processes are the result of energy flowing and matter cycling within and among the planet's systems. Heat energy from the sun, transmitted by radiation, is the primary source of energy that affects earth's weather and drives the water cycle. Uneven heating across earth's surface causes changes in density, which result in convection currents in water and air, creating patterns of atmospheric and oceanic circulation that determine regional and global climates.

THE NEW 6TH GRADE SCIENCE SEED CORE STRAND 3, STANDARDS 1, 2, 3, 4

☐ **STANDARD 6.3.1 Develop a model** to describe how the cycling of water through earth's systems is driven by energy from the sun, gravitational forces, and density.

☐ **Standard 6.3.2 Investigate** the interactions between air masses that cause changes in weather conditions. collect and analyze weather data to provide evidence for how air masses flow from regions of high pressure to low pressure causing a change in weather. Examples of data collection could include field observations, laboratory experiments, weather maps, or diagrams.

THE NEW 6TH GRADE SCIENCE SEED CORE STRAND 3, STANDARDS 1, 2, 3, 4

☐ **Standard 6.3.3 Develop and use a model** to show how unequal heating of the Earth's systems causes patterns of atmospheric and oceanic circulation that determine regional climates. Emphasize how warm water and air move from the equator toward the poles. Examples of models could include Utah regional weather patterns such as lake-effect snow and wintertime temperature inversions.

☐ **Standard 6.3.4 Construct an explanation supported by evidence** for the role of the natural greenhouse effect in Earth's energy balance, and how it enables life to exist on earth. Examples could include comparisons between earth and other planets such as Venus and Mars.

THE NEW 6TH GRADE SCIENCE SEED CORE STRAND 4

Strand 6.4: Stability and Change in Ecosystems

The study of ecosystems includes the interaction of organisms with each other and with the physical environment. Consistent interactions occur within and between species in various ecosystems as organisms obtain resources, change the environment, and are affected by the environment. This influences the flow of energy through an ecosystem, resulting in system variations. Additionally, ecosystems benefit humans through processes and resources, such as the production of food, water and air purification, and recreation opportunities. scientists and engineers investigate interactions among organisms and evaluate design solutions to preserve biodiversity and ecosystem resources.

THE NEW 6TH GRADE SCIENCE SEED CORE STRAND 4, STANDARDS 1, 2, 3, 4, 5

☐ **Standard 6.4.1 Analyze data** to provide evidence for the effects of resource availability on organisms and populations in an ecosystem. **Ask questions** to predict how changes in resource availability affects organisms in those ecosystems. Examples could include water, food, and living space in Utah environments.

☐ **Standard 6.4.2 Construct an explanation** that predicts patterns of interactions among organisms across multiple ecosystems. emphasize consistent interactions in different environments, such as competition, predation, and mutualism.

☐ **Standard 6.4.3 Develop a model** to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. Emphasize food webs and the role of producers, consumers, and decomposers in various ecosystems. Examples could include Utah ecosystems such as mountains, great salt lake, wetlands, and deserts.

THE NEW 6TH GRADE SCIENCE SEED CORE STRAND 4, STANDARDS 1, 2, 3, 4, 5

☐ **Standard 6.4.4 Construct an argument supported by evidence** that the stability of populations is affected by changes to an ecosystem. Emphasize how changes to living and nonliving components in an ecosystem affect populations in that ecosystem. Examples could include Utah ecosystems such as mountains, Great Salt Lake, wetlands, and deserts.

☐ **Standard 6.4.5** *Evaluate competing design solutions* for preserving ecosystem services that protect resources and biodiversity based on how well the solutions maintain stability within the ecosystem. Emphasize **obtaining, evaluating, and communicating** information of differing design solutions. Examples could include policies affecting ecosystems, responding to invasive species or solutions for the preservation of ecosystem resources specific to Utah, such as air and water quality and prevention of soil erosion.

TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE USING THE CURIOSITY OF PHENOMENA

- Humans are born with innate curiosity. They explore their environment and seek to know more without any help from anyone.
- Curiosity is an emotion that fuels science learning.
- Curiosity is related to inquisitive thinking, exploration, investigation, and learning.
- Curiosity is one of the significant human motivations for scientific investigations as well as for inquiries to discover knowledge.
- Since the early times humans have sought explanations for natural phenomena.
- Fortunately, our world (and universe) is full of intriguing things to wonder about.

TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE USING THE CURIOSITY OF PHENOMENA

- Curiosity is the aspect of learning which is going to lead to student investigation and wonder.
- Students will learn best by investigating phenomena to make sense of their world.
- When student learn science in this fashion, it will last a lifetime because they own what they have discovered themselves.
- There is much joy from investigating science phenomena.

TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE USING THE CURIOSITY OF PHENOMENA

1. Curiosity of a Phenomenon
    - Observe
    - Ask Questions
    - Wonder
2. Interest
    - Seek information and data
3. Reasoning
    - Use reasoning to construct explanations based on evidence

TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE JSD NEW LESSON PLAN TEMPLATE

- STANDARD FOCUS
- KEY CROSSCUTTING CONCEPT
- KEY SCIENCE AND ENGINEERING PRACTICE
- MATERIALS
- TIME
- TEACHER BACKGROUND KNOWLEDGE
- PRIOR KNOWLEDGE STUDENTS NEED
- STUDENT LEARNING ACTIVITY
  - GATHERING—REASONING—COMMUNICATION
- PHENOMENON
- LEARNING ACTIVITY
- ASSESSMENT
- STUDENT ACTIVITY SHEET

JSD 3D Learning Activity Template

Grade:	**Title:**

Utah Science with Engineering Education Standard (SEEd):

Key crosscutting concept(s) (CCC):
Key science and engineering practice(s) (SEP):

Materials:

Time:

Teacher background, key content information and hints:

Prior knowledge that students need:

Learning Activity Plan

These three aspects of a lesson should be identified in your learning activity.

Gathering: *(Obtain Information, Ask Questions/Define Problems, Plan & Carry Out Investigations, Use Models to Gather Data and Information, Use Mathematics/Computational Thinking.)*	***Reasoning:*** *(Evaluate Information, Analyze Data, Use Mathematics/Computational Thinking, Construct Explanations/Solve Problems, Develop Arguments from Evidence, Use Models to Predict & Develop Evidence.)*	***Communicating:*** *(Communicate Information, Argue from Evidence (written & oral), Use Models to Communicate).*

Phenomenon:

Learning Activity:

Assessment of student learning
Short description of the evidence the teacher is willing to accept that a student is proficient with the performance expectations.
This may be a rubric, narrative, or other set of descriptors that are useful for distinguishing proficient from non-proficient performances.

STUDENT SHEET

- **TITLE**
- **INTRODUCTION** (SHORT BACKGROUND INFO OR QUESTION STATEMENT)
- **MATERIALS** (IF NEEDED)
- **PROCEDURES:** (WHAT DO STUDENTS DO?)
- **DATA TABLES OR GRAPHS** (STUDENTS CAN LABEL AXIS OR COLUMNS OF DATA TO ADD RIGOR)
- **ANALYSIS:** TIE A FEW QUESTIONS TO THE OUTCOMES, CCC OR SEF
- **CONCLUSION:** STUDENTS SHOULD REPORT THEIR LEARNING IN SOME WAY.

TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE SAGE Resources

- **HERE ARE UP-TO-DATE RESOURCES THAT ARE AVAILABLE BY THE STATE OF UTAH TO TEACH THE NEW 6TH GRADE SCIENCE CORE.**
- 6TH GRADE SEED STANDARD BOOKLET (ATTACHED).
- THE OFFICIAL 2017 6TH GRADE TEXTBOOK (OER BOOK) AVAILABLE TO DOWNLOAD, PRINT OUT YOURSELF, OR PURCHASE FROM THE STATE FOR $2.95.
  - HTTP://WWW.SCHOOLS.UTAH.GOV/CURR/SCIENCE/OER.ASPX
- A WEBPAGE WITH DEVELOPED LESSON PLANS WRITTEN BY THE STATE OF UTAH
  - HTTPS://WWW.SEEDSTORYLINES.ORG/
- SELF-PACED STATE OF UTAH CANVAS COURSE YOU CAN SIGN UP FOR
  - HTTP://WWW.UEN.ORG/PLS/SCIENCE/

TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE SAGE TESTING QUESTIONS

- Students will observe an animated phenomenon.
- The phenomenon will apply strictly to a particular standard that has that particular Science & Engineering Practice, Crosscutting Concept, and Disciplinary Core Idea.
- During the animation there will most likely will be quantity and time measurements shown.
- There will be a cluster of 3 or 4 questions that will pertain to that particular phenomenon that has to do with the quantity and time measurements.
- They may need to draw a graph or infer answers by the data.
- By each question, the animated phenomenon will always be present.
- The testing will not cover each standard as it has in the past.
- Examples of test questions will be out shortly to view.

TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE PROFESSIONAL DEVELOPOMENT

- July 31, august 1, 2, and 3
- During the 2017-18 school year
  - Classes will teach the new core and the 3d science implementation
  - 8:30-4:00 each day
  - JATC Building
  - 4 days of training
  - Pay for your substitute
  - If off track or not teaching yet—be paid a stipend
  - No homework
  - Receive 28 relicensure points

TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE MODEL TEACHING DEMONSTRATIONS AND HELP

- Paul Nance has the opportunity to come out to your classroom and model teach a lesson using the new lesson plan format.
- It will be a one time for two consecutive days.
- He will have a lesson plan for each standard to teach.
- Choose the standard you want him to model teach.
- He also can consult with you and coach you.
- New lesson plans will be on the jsd elmentary webpage.

TEACHING THE NEW 6TH GRADE SCIENCE SEED CORE

QUESTIONS??