**wNACA Yearlong UbD for 8th Grade Science 2015-2016**

**UbD Curriculum Template 2.0
Designer: Tylar Rodriguez
Date: 6/26/2015**

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|  **Stage 1 Desired Results**  |
| **Directions:** Choose multiple CCSS (or other standards), copy and paste them here, and unpack them for big ideas and assessment verbs by highlighting. **Common Core State Standards (**[**www.corestandards.org**](http://www.corestandards.org)**), Next Generation Science Standards (**[**http://www.nextgenscience.org**](http://www.nextgenscience.org)**), Indigenous Standards (found in Course Sites).** ***Students who demonstrate understanding can:******NexGen Standards***

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| MS-PS1-1. | Develop models to describe the atomic composition of simple molecules and extended structures.  |
| MS-PS1-2. | Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred[PS1.A: Structure and Properties of Matter](http://www.nap.edu/openbook.php?record_id=13165&page=106)* [Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.](http://www.nap.edu/openbook.php?record_id=13165&page=106)

[PS1.B: Chemical Reactions](http://www.nap.edu/openbook.php?record_id=13165&page=109)* [Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.](http://www.nap.edu/openbook.php?record_id=13165&page=109)
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| MS-PS1-3. | Gather and interpret information to describe that synthetic materials come from natural resources and impact society[PS1.A: Structure and Properties of Matter](http://www.nap.edu/openbook.php?record_id=13165&page=106)* [Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.](http://www.nap.edu/openbook.php?record_id=13165&page=106)

[PS1.B: Chemical Reactions](http://www.nap.edu/openbook.php?record_id=13165&page=109)* [Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.](http://www.nap.edu/openbook.php?record_id=13165&page=109)
 |
| MS-PS1-4. | Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed |
| MS-PS1-5. | Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.  |
| MS-PS1-6. | Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processesPS1.B: Chemical Reactions* Some chemical reactions release energy, others store energy.

ETS1.B: Developing Possible Solutions* A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. *(secondary)*

ETS1.C: Optimizing the Design Solution* Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process - that is, some of the characteristics may be incorporated into the new design. *(secondary)*
* The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. *(secondary)*
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| MS-PS2-1. | Apply Newton’s Third Law to design a solution to a problem involving the motion of two colliding objects[PS2.A: Forces and Motion](http://www.nap.edu/openbook.php?record_id=13165&page=114)* [For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton’s third law).](http://www.nap.edu/openbook.php?record_id=13165&page=114)
 |
| MS-PS2-2. | Plan an investigation to provide evidence that the change in an object’s motion depends on the sum of the forces on the object and the mass of the object. [PS2.A: Forces and Motion](http://www.nap.edu/openbook.php?record_id=13165&page=114)* [The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion.](http://www.nap.edu/openbook.php?record_id=13165&page=114)
* [All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared.](http://www.nap.edu/openbook.php?record_id=13165&page=114)
 |
| MS-PS2-3. | Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. [PS2.B: Types of Interactions](http://www.nap.edu/openbook.php?record_id=13165&page=116)* [Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.](http://www.nap.edu/openbook.php?record_id=13165&page=116)
 |
| MS-PS2-4. | Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects[PS2.B: Types of Interactions](http://www.nap.edu/openbook.php?record_id=13165&page=116)* [Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun.](http://www.nap.edu/openbook.php?record_id=13165&page=116)
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| MS-PS2-5. | Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. [PS2.B: Types of Interactions](http://www.nap.edu/openbook.php?record_id=13165&page=116)* [Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively).](http://www.nap.edu/openbook.php?record_id=13165&page=116)
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| MS-PS3-1. | Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. [PS3.A: Definitions of Energy](http://www.nap.edu/openbook.php?record_id=13165&page=120)* [Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.](http://www.nap.edu/openbook.php?record_id=13165&page=120)
 |
| MS-PS3-2. | Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.  |
| MS-PS3-3. | Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer PS3.A: Definitions of Energy* Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.

PS3.B: Conservation of Energy and Energy Transfer* Energy is spontaneously transferred out of hotter regions or objects and into colder ones.

ETS1.A: Defining and Delimiting an Engineering Problem* The more precisely a design task’s criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. *(secondary)*

ETS1.B: Developing Possible Solutions* A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. *(secondary*
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| MS-PS3-4. | 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. [PS3.A: Definitions of Energy](http://www.nap.edu/openbook.php?record_id=13165&page=120)* [Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.](http://www.nap.edu/openbook.php?record_id=13165&page=120)

[PS3.B: Conservation of Energy and Energy Transfer](http://www.nap.edu/openbook.php?record_id=13165&page=124)* [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.](http://www.nap.edu/openbook.php?record_id=13165&page=124)
 |
| MS-PS3-5. | Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object[PS3.B: Conservation of Energy and Energy Transfer](http://www.nap.edu/openbook.php?record_id=13165&page=124)* [When the motion energy of an object changes, there is inevitably some other change in energy at the same time.](http://www.nap.edu/openbook.php?record_id=13165&page=124)
 |
| MS-PS4-1. | Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.  |
| MS-PS4-2. | Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials |
| MS-PS4-3. | Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. [PS4.C: Information Technologies and Instrumentation](http://www.nap.edu/openbook.php?record_id=13165&page=136)* [Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.](http://www.nap.edu/openbook.php?record_id=13165&page=136)
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| MS-LS1-1. | Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. [LS1.A: Structure and Function](http://www.nap.edu/openbook.php?record_id=13165&page=143)* [All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).](http://www.nap.edu/openbook.php?record_id=13165&page=143)
 |
| MS-LS1-2. | Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function |
| MS-LS1-3. | Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells[LS1.A: Structure and Function](http://www.nap.edu/openbook.php?record_id=13165&page=143)* [In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.](http://www.nap.edu/openbook.php?record_id=13165&page=143)
 |
| MS-LS1-4. | Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. [LS1.B: Growth and Development of Organisms](http://www.nap.edu/openbook.php?record_id=13165&page=145)* [Animals engage in characteristic behaviors that increase the odds of reproduction.](http://www.nap.edu/openbook.php?record_id=13165&page=145)
* [Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.](http://www.nap.edu/openbook.php?record_id=13165&page=145)
 |
| MS-LS1-5. | Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms[LS1.B: Growth and Development of Organisms](http://www.nap.edu/openbook.php?record_id=13165&page=145)* [Genetic factors as well as local conditions affect the growth of the adult plant.](http://www.nap.edu/openbook.php?record_id=13165&page=145)
 |
| MS-LS1-6. | Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms[LS1.C: Organization for Matter and Energy Flow in Organisms](http://www.nap.edu/openbook.php?record_id=13165&page=147)* [Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use.](http://www.nap.edu/openbook.php?record_id=13165&page=147)

[PS3.D: Energy in Chemical Processes and Everyday Life](http://www.nap.edu/openbook.php?record_id=13165&page=128)* [The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. *(secondary)*](http://www.nap.edu/openbook.php?record_id=13165&page=128)
 |
| MS-LS1-7. | Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism |
| 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.  |

NexGen Performance Standards - 8th Grade Science  |
| Other than the big ideas explicitly in the standards you chose, what big ideas might frame this yearlong curriculum?1. Scientific skills
2. Inquiry
3. Matter
 |
| CHOSEN BIG IDEAS(S):Scientific Skills as a means to explore matter (stuff of the universe)  | ***Transfer*** |
| In order to...my students will use...so that they may..* EU1 - explore and engage in the physical world around them...scientific skills like observing and experimental designing….make sense of the natural phenomenon they experience in their lives and take ownership of their experiences with nature (i.e. owning their own knowledge)
* EU2 - understand the interconnectedness between Nature’s forces ...investigate principles of Native and Western science….better understand their relationship with nature through an indigenous lense
* EU3 - become active participants in their communities...actively engage in STEM activities and Inquiry-based case studies….equip themselves with real-world application of the scientific process
 |
| ***Meaning*** |
|
| **ESSENTIAL UNDERSTANDINGS*** The foundational skills of science (observations, inference, experimental design, communication results) are used in our everyday life and are a means to explore the “stuff” that makes up our world (NACA Core Value(s): Reflection)

 * Scientific skills are inherent to Indigenous cultures and can be used to create an understanding of the interconnectedness between different natural forces and their connection to our daily lives (NACA Core Value(s): Respect, Responsibility, Community)

 * STEM careers provide opportunities to advocate for the wellness of myself and my community (NACA Core Value(s): Community/Service, Culture, Perseverance)
 | **ESSENTIAL QUESTIONS** * What tools can be used to understand and explore the physical world around me?
* How do Native and Western interpretations of matter differ? How are they the same?
* How will STEM shape the future for my community and its future?
 |
| ***Acquisition*** |
| *Students will know*Unit 1: Scientific Inquiry and Measurement * Native approach to Science
* Introduction to scientific skills
* Scientific Inquiry structure
* Accuracy vs. Precision
* What is STEM?
* Scientific Instruments

Unit 2: Classifying Matter * Distinguish between observations and inferences
* classifying matter as elements, compounds, or mixtures
* describe physical and chemical properties of matter
* states and properties of matter (solid, liquid, and gas)
* Man-made vs. naturally occurring matter

Unit 3: Elements * atomic structure (protons, neutrons and electrons and making models )
* classifying elements (metals, non-metals, and metalloids)
* properties of elements and implications (i.e. heavy metals and contamination, impact of metals on indigenous cultures)

Unit 4: Changing Matter * valence electrons and predicting bonds
* differences between ionic and covalent bonds
* chemical changes (burning, spoiling milk) vs. physical changes (tearing, bending)
* Simple chemical reactions (baking soda and vinegar, oxygen and iron) and conservation of matter
* change in particle motion when phase changes occur (i.e. higher temper = greater kinetic energy)

Unit 5: Biochemistry * Transfer of Energy
	+ carbon cycle
	+ nitrogen cycle
	+ 10% rule in food consumption
	+ brain receptors and stimuli
	+ enzyme and role in breaking down food (human examples)

Unit 6: Living Organisms structure and function * cell as the base unit
* organism of living things (cell - tissue - organ - organ system)
* organ system functions and interconnectedness
* species specialization for survival (physical and behavioral adaptations)

Unit 7: Chemistry in Energy * Exothermic and endothermic energy
* thermal energy transfer
* Sustainable and non-sustainable energy
* temperature and its meaning
* particle movement during temperature changes

Unit 8: Motion and Newton’s Laws* distance and speed/velocity
* kinetic and potential energy
* Newton’s Three Laws and real world application of those laws
	+ objects in motion remain in motion
	+ greater force = greater acceleration
	+ more mass = greater force

Unit 9: Force and Newton’s Laws * Western and Indigenous ideas of force
* distinguish forces acting on an object (gravity, friction, elastic, etc.)
* Electromagnetic forces
* Earth’s magnetic field

Unit 10: Electricity and Magnetism * Electricity and magnetism
* role of magnetism in producing electricity
* strengths of magnetic forces
* neurological electrical signals

Unit 11: Wave Motion * characteristics of waves (amplitude, wavelength, frequency, etc.)
* wave motion (s and p waves)
* EM waves
* Waves produces from music/sound
* Wave interference (reflection, absorption, transmission, etc.)
* analog systems
* digital systems
* electrical circuitry

\*Based on NMPed and NexGen Science Standards\*  | Unit 1: Scientific Inquiry and Measurements [FOUNDATIONAL SKILLS - introduced in first unit but we be spiraled back into multiple units]* 6 Scientific Inquiry Skills (outlined in scientific skills rubric)
* Observations
* Active questioning
* Investigation
* Experimental Design
* Drawing Inferences
* Scientific Writing/Communication Results
* identify and describe the use of different scientific instruments
* identify accurate and precise measurements
* explain the reliability of a study based on the accuracy and precision of data
* Making observations using a variety of resources including both qualitative and quantitative observations
* Determining what type of observation is best suited for a particular type of investigation
* Critiquing their own observations as well as other for reliable, factual information
* Questioning the ethics and bias of scientific and environmental policy when it comes to sustainable energies
* Seeking diverse sources of information including books, stories (oral or written), scientific journals, internet resources, and elders
* Designing objective investigations/experiments to find solutions to scientific questions
* Critiquing experimental designs and procedures for bias and objectivity
* Explaining the impact of scientific experiments and discoveries for Western society and rural and urban Indigenous communities
* Conducting scientific investigations of meaningful questions in order to better their own communities
* Determining the difference between pseudo and real science
* Expressing the impact of Indigenous teachings and stories on Western scientific ideologies
* Exploring a diverse range of STEM based careers
* Explaining the impact of STEM careers for advocating for Indigenous communities
* Designing and explaining scientific investigations to diverse communities
* Drawing inferences based on the best available information including scientific, first-hand accounts, and stories
* Identifying relationship between Indigenous stories and natural phenomenon

Unit 2: Classifying Matter * Make detailed and organized observations about various types of matter
* Create classification systems to sort/organize different types of matter
* Differentiate between physical and chemical properties
* Identify the phase of different types of matter
* Design an investigation to identify different types of unique matter
* Identify distinguishing properties of matter that would allow others to identify them as well

*Foundational Skills** *Determining what type of observation is best suited for a particular type of investigation*
* *Critiquing their own observations as well as other for reliable, factual information*
* *Drawing inferences based on the best available information including scientific, first-hand accounts, and stories*
* *Designing objective investigations/experiments to find solutions to scientific questions*

Unit 3: Elements * Design, build a critique different models
* Identify a type of model best suited for a specific purpose
* Classify and organize types of matter based on specific characteristics
* Design a research plan to investigation a phenomenon
* Interpret impacts of scientific discoveries on communities
* Distinguish between different elements based on the numbers of protons, neutrons and electrons

Unit 4: Changing Matter* Identify the number of valence electron for a given element
* Predict bonding patterns between different elements
* Predict the type of bond likely to form between given elements
* Identify physical and chemical changes in matter and distinguish between both
* Design and carry-out an investigation to determine if a physical or chemical change has occurred
* Use the principle of Conservation of Mass to describe different chemical changes
* Predict the products of chemical reactions
* Design a model to demonstrate a phenomenon
* Develop a testable hypothesis to predict changes in matter

Unit : Biochemistry * Design a scientific research explanation
* Apply the Law of Conservation of Mass to explain who energy from food is transferred
* Create a visual representation of the cyclical nature of energy transfer in nature
* Develop testable hypothesis about the impact of changes in energy in nature

Unit 6: Living Organisms: Structure and Function * Design an investigation to test for cells
* Design and critique a model of the structure of a cells
* Use observations to create plausible inferences
* Construct an argument using evidence about how specific adaptations have helped different species survive

Unit 7: Chemistry in Energy * Identify properties of exothermic and endothermic reactions
* Distinguish between exothermic and endothermic reactions
* Identify types of renewable and renewable energies
* Evaluate the effectiveness of specific sustainable energies in certain communities
* Design a sustainable energy plan for a community based on a scientific study
* Summarize and interpret scientific data
* Summarize a scientific report

Unit 8: Motion * Design and present a scientific demonstration based on one of Newton’s Laws
* Identify examples of Newton’s three laws
* Critique a model of a specific phenomenon
* Construct visual representations of quantitative and qualitative data
* Interpret graphical data and create scientific conclusions based on the data
* Identify the best type of visual representation to for a specific set of data
* Design, build and evaluate models used for safety protection

Unit 9: Force * Create an original story to describe phenomenon in nature
* Describe the relationship between different natural forces
* Draw inferences from Indigenous stories
* Investigate natural phenomenon using multiple resources
* Manipulate simple algebraic expression to describe force
* Design an algebraic expression to qualify net force

Unit 10: Electricity and Magnetism * Develop simple and complex circuits
* Create a model to show the relationship between electricity and brain signals
* Identify and improve flaws/errors in electrical circuits
* Examine a model/system and identify areas of improvement
* Investigate and design and action plan for a community to use sustainable energy

Unit 11: Wave Motion * identify the characteristics of waves
* Develop a procedure to manipulate one variable at a time
* Use mathematical data to identify Earthquake prone zones
* Create a demonstration to show different types of wave interference
* Create a public awareness campaign of the dangers of exposure to certain types of radiation
 |
| **Stage 2 - Evidence** |
| **Evaluative Criteria** | **Assessment Evidence** |
| Standards-based A+ Rubric in Student-friendly Language

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| Performance Assessment Criteria and Standard Alignment | Complete | Needs Revision |
| **OBSERVATIONS (based on community to identify problem)** -observations are usually detailed and descriptive (3-4 senses)-student attempts to use both quantitative and qualitative observations -student attempts to use academic vocabulary always-demonstration contain observations and most diagram are detailed |  |  |
| **QUESTIONING** -student asks questions based on observations -student question targeted to identified need of community -student questions are testable-student question lead to deep thought by themselves and others  |  |  |
| **INVESTIGATION DESIGN** -student plans out research before starting -student makes a detailed plan for research -student takes detailed notes during research-student research is directly related to investigative question -student identifies forces/technology for possible solution -student perseveres even when struggling with research  |  |  |
| **EXPERIMENT/DEMONSTRATION DESIGN** -student experiments/demonstrations are well planned -student creates experiment/demonstration that can be replicated -student procedures are always detailed -students demonstration presents solution to problem/question |  |  |
| **DRAWING INFERENCES/IDENTIFYING SOLUTIONS** -student can make hypotheses, inferences, and conclusions with only some teacher guidance -student conclusions are based on data -student connect observations to specific, reasonable predictions -students identifies problem/need based on observations and research  |  |  |
| **DEMONSTRATION PERFORMANCE AND PRESENTATION** -student uses scientific writing style when necessary -student includes all important details when writing -student is on topic and does not repeat ideas -student uses visual media to communicate results -student’s solution is well thought out and easily understandable  |  |  |

 | PERFORMANCE TASK(S): 8th Grade Science Demonstrations  What (cognitive verb + big idea):*Students apply their knowledge of use of scientific skills to create a demonstration of a force or technology that could benefit their community* Why (copied and pasted EUs from Stage 1):*The foundational skills of science (observations, inference, experimental design, communication results) are used in our everyday life and are a means to explore the “stuff” that makes up our world (NACA Core Value(s): Reflection)**Scientific skills are inherent to Indigenous cultures and can be used to create an understanding of the interconnectedness between different natural forces and their connection to our daily lives (NACA Core Value(s): Respect, Responsibility, Community)**STEM careers provide opportunities to advocate for the wellness of myself and my community (NACA Core Value(s): Community/Service, Culture, Perseverance)* How (GRASPS, written to and for students):**Goal:** *Identify a need in their community and use their scientific skills to investigate a force/technology that could benefit their community* **Role:** *Community Advocate/Researcher? (need to improve role)* **Audience:** *Chapter officials or community officials* **Situation:** *Every community has specific needs that can be solved using the inquiry process. Students must identify a problem in their community, research, and create a solution to solve the problem. They then must construct/present a demonstration how the problem can be solved utilizing technology and their understanding of the natural world* **Product, Performance, and Purpose:**Product: *scientific demonstration and research paper* Performance: *demonstration utilizing multimedia (variable) to display the problem and your solution* Purpose: *to advocate using the scientific process for improvement in each student’s community* **Standards and Criteria for Success:**Proficient standards in Scientific Inquiry Rubric  |
| <type here> | OTHER EVIDENCE:  |
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| **Stage 3 – Learning Plan** *What units will you teach, and what skills will students master, as a result of this yearlong curriculum?* |

2015 -2016 Academic Year Curriculum Map Template

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| Unit Big Idea (Title) | Unit Essential Question(s) | Unit Standard(s) | Assessment(s) | Time Frame |
| What big idea anchors this unit? | What EQ will anchor conceptual, critical thinking related to the big idea? | What core standard(s) anchors this unit, and therefore what observable skills will you evaluate ? | What summative assessment will provide you evidence of skills and understanding? | What is the approximate time frame for the teaching and learning in this unit? |
| Foundations of Science | *What skills can I use to explore the physical world around me?* *What is science and how can it be used?*  | 5-8 Benchmark I: Use scientific methods to develop questions, design and conduct experiments using appropriate technologies, analyze and evaluate results, make predictions, and communicate findings.1. 2. 3.Evaluate the accuracy and reproducibility of data and observations. Use a variety of technologies to gather, analyze and interpret scientific data. Know how to recognize and explain anomalous data.5-8 Benchmark II: Understand the processes of scientific investigation and how scientific inquiry results in scientific knowledge.1. Examine alternative explanations for observations. 2. Describe ways in which science differs from other ways of knowing and from other bodies of knowledge (e.g., experimentation, logicalarguments, skepticism). 3. Know that scientific knowledge is built on questions posed as testable hypotheses, which are tested until the results are accepted bypeers.5-8 Benchmark III: Use mathematical ideas, tools, and techniques to understand scientific knowledge.1. Use mathematical expressions and techniques to explain data and observations and to communicate findings (e.g., formulas and equations, significant figures, graphing, sampling, estimation, mean).2. Create models to describe phenomena. | Formative Assessments: Exit Tickets to evaluate daily objectives Weekly Quizzes/Review to assess weekly objectives (may take multiple forms - not traditional m/c questions) Case Studies Unit Assessment - mixture of m/c, short answer, and essay questions Summative Assessment - Science Myths Scientific Inquiry Design Project Students created detailed lab investigation of a science myth going to through the design process of designing and experiment (i.e. toast lands butter side down)  | 3-4 weeks |
| Our World MATters! | *How can we describe matter we see our everyday?* *When we discover something new, what things do we need to know in order to make sense of it?* *How is matter in the universe organized?*  *As we discover new elements, how have elements shaped the futures of different indigenous cultures?*  |  PS.1A - Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-2),(MS-PS1-3)In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4)Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1) **PS1.B** - Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2),(MS-PS1-3),(MS-PS1-5PS1.A: Structure and Properties of MatterSubstances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1) Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-2),(MS-PS1-3) | Formative Assessments: Exit Tickets to evaluate daily objectives Weekly Quizzes/Review to assess weekly objectives (may take multiple forms - not traditional m/c questions) Case Studies Unit Assessment - mixture of m/c, short answer, and essay questions Summative Assessment: Lab Practical - Students an independent lab write-up identifying properties of different materials and classifying them Students will utilize knowledge of chemical and physical properties as well as well as developing systematic way to investigate new materials Summative AssessmentElement Research and Model Design - Students will design a model a selected element.Students may use a variety of materials to create an abstract piece of art to represent their model of their atom. Students will also conduct a research presentation of the implication of the element on an Indigenous community  | 9-10 weeks  |
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| Changing Matter  | *Why does matter change?* *By observing natural changes in nature, can we learn to predict how matter will change?* *How does nature preserve and recycle matter?* *What ways do human influence the natural recycling of matter?*  | PS1.A - - Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4)-In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4)-The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (MS-PS1-4)**PS1.B** -Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2),(MS-PS1-3),(MS-PS1-5)· The total number of each type of atom is conserved, and thus the mass does not change. (MS-PS1-5)LS2.B: Cycle of Matter and Energy Transfer in Ecosystems-Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3)LS1.C: Organization for Matter and Energy Flow in Organisms-Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6)-Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organismsMS-LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organismPS3.D: Energy in Chemical Processes and Everyday Life-The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary to MS-LS1-6)-Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials.(secondary to MS-LS1-7) | Formative Assessments: Exit Tickets to evaluate daily objectives Weekly Quizzes/Review to assess weekly objectives (may take multiple forms - not traditional m/c questions) Unit Assessment - mixture of m/c, short answer, and essay questions Case Study - student work in groups to solve fictitious chemical spill. Student must use knowledge of chemical chemical reactions to solve what type of chemical spills is occurring, predict the damage, and create a clean-up strategy  Summative Assessment Research Essay - students will research an environmental disaster. Students will discuss how the flow of energy was effected and what impacts it had on the environment and the surrounding communities. Students may also create an awareness poster utilizing artistic skills.  | 7-9 weeks  |
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| Turning Matter into Organisms  | How is matter assembled to build complex organisms?  | LS1.A: Structure and Function-All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1)-In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3)LS1.B: Growth and Development-Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5) | Formative Assessments: Exit Tickets to evaluate daily objectives Weekly Quizzes/Review to assess weekly objectives (may take multiple forms - not traditional m/c questions) Case Studies Unit Assessment - mixture of m/c, short answer, and essay questions Summative Assessment: Unit Assessment  | 2-3 weeks  |
| Energy in Matter  | *What are the different types of energy and where does it come from?* *How can indigenous tribe utilize sustainable energy technology?* *What happens to energy when matter is changed?*  | PS1.B: Chemical Reactions-Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2),(MS-PS1-3),(MS-PS1-5)-The total number of each type of atom is conserved, and thus the mass does not change. (MS-PS1-5)-Some chemical reactions release energy, others store energy. (MS-PS1-6)PS3.A: Definitions of Energy-The term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary to MS-PS1-4)-The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system’s material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. (secondary to MS-PS1-4) | Formative Assessments: Exit Tickets to evaluate daily objectives Weekly Quizzes/Review to assess weekly objectives (may take multiple forms - not traditional m/c questions) Case Studies Unit Assessment - mixture of m/c, short answer, and essay questions Summative Assessment Thermal Energy Trap - students work collaboratively in groups to design and build a model to trap and conserve thermal energy along with a report on how they could apply their design to Indigenous housing  | 3-4 weeks  |
| Energy in Motion  | *How is energy changed when the motion of matter is changed?* *How do we use information about energy to design safety procedures?*  | PS2.A: Forces and Motion-For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton’s third law). (MS-PS2-1)-The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (MS-PS2-2)-All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. (MS-PS2-2)PS3.A: Definitions of Energy-Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1)-A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2) | Formative Assessments: Exit Tickets to evaluate daily objectives Weekly Quizzes/Review to assess weekly objectives (may take multiple forms - not traditional m/c questions) Case studies Unit Assessment - mixture of m/c, short answer, and essay questionsSummative Assessment  Newton’s Law Demonstration - students design and present a demonstration of Newton’s Law in the real word. They may choose to use any number of multimedia representations to show Newton’s Law in affect  | 4-5 weeks  |
| Forces in Nature  | *How do Indigenous and Western theories about force differ?* *How do we interact with natural forces in our daily lives?* *How are Newton’s laws observed in our daily lives?*  | PS2.B: Types of Interactions-Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3)-Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (MS-PS2-4)-Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively). (MS-PS2-5) | Formative Assessments: Exit Tickets to evaluate daily objectives Weekly Quizzes/Review to assess weekly objectives (may take multiple forms - not traditional m/c questions) Case Studies Unit Assessment - mixture of m/c, short answer, and essay questions Summative Assessment Solar Cooker Design - design and build an efficient solar cooker using sustainable materials with report on how an Indigenous community could benefit from this technology  | 3-4 weeks  |
| Using Energy and Force  | *How can electricity and magnetism to be harnessed to produce sustainable energy?* *If modern technology is more efficient, why don’t more Indigenous peoples use modern tech?*  | PS2.B: Types of Interactions-Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3) | Formative Assessments: Exit Tickets to evaluate daily objectives Weekly Quizzes/Review to assess weekly objectives (may take multiple forms - not traditional m/c questions) Case Studies Unit Assessment - mixture of m/c, short answer, and essay questions Summative Assessment Persuasive Essay - students receive case study and write essay of whether an Indigenous community should invest in sustainable energy technologyStudents may choose to create a poster creating awareness over the use of a sustainable technology.  | 2-3 weeks  |
| Motion of Energy (Waves)  | *How can we describe the motion of different types of energy?* *Which types of energy are harmful and which types of energy are beneficial?*  | *PS4.A: Wave Properties**-A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1)**-A sound wave needs a medium through which it is transmitted. (MS-PS4-2)**PS4.A: Wave Properties**-A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1)**-A sound wave needs a medium through which it is transmitted. (MS-PS4-2)**PS4.B: Electromagnetic Radiation**-When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object’s material and the frequency (color) of the light. (MS-PS4-2)**-The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. (MS-PS4-2)**-A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (MS-PS4-2)**-However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS4-2)**PS4.C: Information Technologies and Instrumentation**-Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. (MS-PS4-3)* | Formative Assessments: Exit Tickets to evaluate daily objectives Weekly Quizzes/Review to assess weekly objectives (may take multiple forms - not traditional m/c questions)Case Study Unit Assessment - mixture of m/c, short answer, and essay questions Summative Assessment Unit Assessment  | 3-4 weeks  |

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