**Accelerating Learning—A 7th Grade Science Example**

**Can we use the data from pre-assessments, critical junctures, post assessments, and On-The-Fly formative assessments from previous units to guide out pre-unit planning? Focus on the progressions of the Science and Engineering Practices and Crosscutting Concepts as specific Disciplinary Core Ideas are taught within the upcoming unit and pre-assessment data can be used to ascertain that information.**

**Example of Acceleration**: **7th Grade, Unit 5 - Thermal Energy**

There are 6 “power” standards bundled together in Unit 3:

06-PS1-1 06-PS1-4 06-PS2-1 07-PS3-3 07-PS3-4 07-PS3-5

which include the following:

* **Crosscutting Concepts:**
  + Scale, Proportion, and Quantity
    - Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.
    - Proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes.
  + Cause and Effect
    - Cause and effect relationships may be used to predict phenomena in natural or designed systems.
  + Systems and System Models
    - Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems.
  + Energy and Matter
    - The transfer of energy can be tracked as energy flows through a designed or natural system.
    - Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion).
* **Science & Engineering Practices:**
  + Developing and Using Models
    - Develop and use a model to predict and/or describe phenomena.
  + Constructing Explanations and Designing Solutions
    - Apply scientific ideas or principles to design an object, tool, process or system.
  + Planning and Carrying Out Investigations
    - Plan an investigation individually and 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.
  + Engaging in Argument from Evidence
    - Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon.
* **Disciplinary Core Ideas:**
  + PS1.A: Structures and Properties of Matter
    - Substances 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.
    - Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).
    - Gases and liquids are made of molecules or inert atoms that are moving about relative to each other.
    - 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.
    - The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.
  + 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)
    - 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)
    - 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.
  + 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).
  + PS3.B: Conservation of Energy and Energy Transfer
    - Energy is spontaneously transferred out of hotter regions or objects and into colder ones.
    - 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.
    - When the motion energy of an object changes, there is inevitably some other change in energy at the same time.

**Before** beginning the unit, compare the 7th grade expectations to the 6th grade expectations. Look for specific alignments in each of the dimension progressions. The variation between the two grade levels identifies your targeted learning. Use data from the pre-assessment to determine which students need extra support in each dimension.

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| **3 Dimensional Progressions for Each Dimension in the Bundled Standards** | | |
|  | 6th Grade | 7th Grade |
| Scale, Proportion, and Quantity | * recognize natural objects and observable phenomena exist from the very small to the immensely large. * use standard units to measure and describe physical quantities such as weight, time, temperature, and volume. | * observe time, space, and energy phenomena at various scales using models to study systems that are too large or too small. * understand phenomena observed at one scale may not be observable at another scale. * use proportional relationships (e.g., speed as the ratio of distance traveled to time taken) to gather information about the magnitude of properties and processes. |
| Cause and Effect | * routinely identify and test causal relationships and use these relationships to explain change. * understand events that occur together with regularity might or might not signify a cause and effect relationship. | * classify relationships as causal or correlational, and recognize that correlation does not necessarily imply causation. * use cause and effect relationships to predict phenomena in natural or designed systems. |
| Systems and System Models | * understand that a system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. * describe a system in terms of its components and their interactions. | * understand that systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. * use models to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. * models are limited in that they only represent certain aspects of the system under study. |
| Energy and Matter | * matter is made of particles and energy can be transferred in various ways and between objects. * observe the conservation of matter by tracking matter flows and cycles before and after processes and recognizing the total weight of substances does not change. | * matter is conserved because atoms are conserved in physical and chemical processes. * within a natural or designed system, the transfer of energy drives the motion or cycling of matter. * energy may take different forms (e.g. energy in fields, thermal energy, energy of motion). * the transfer of energy can be tracked as energy flows through a designed or natural system. |
| Developing and Using Models | * identify limitations of models. * develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events. * develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution. * develop and/or use models to describe and/or predict phenomena. * develop a diagram or simple physical prototype to convey a proposed object, tool, or process. Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system. | * evaluate limitations of a model for a proposed object or tool. * modify a model— based on evidence – to match what happens if a variable or component of a system is changed. * use a model of simple systems with uncertain and less predictable factors. * revise a model to show the relationships among variables, including those that are not observable but predict observable phenomena. * use a model to predict or describe phenomena. * use a model to generate data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs, and those at unobservable scales. |
| Constructing Explanations and Designing Solutions | * construct an explanation of observed relationships (e.g., the distribution of plants in the backyard). * use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem. * identify the evidence that supports particular points in an explanation. * apply scientific ideas to solve design problems. * generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. | * construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) or describe(s) phenomena. * construct an explanation using models or representations. * construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students’ own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. * apply scientific ideas, principles, or evidence to revise or use an explanation for real world phenomena, examples, or events. * apply scientific reasoning to show why the data or evidence is adequate for the explanation or conclusion. * apply scientific ideas or principles to design, construct, or test a design of an object, tool, process or system. |
| Planning and Carrying Out Investigations | * plan an investigation individually and 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. * evaluate the accuracy of various methods for collecting data. * make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. * make predictions about what would happen if a variable changes. * test two different models of the same proposed object, tool, or process to determine which better meets criteria for success. | * plan an investigation individually and 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. * conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation. * evaluate the accuracy of various methods for collecting data. * collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions. * collect data about the performance of a proposed object, tool, process or system under a range of conditions. |
| Engaging in Argument from Evidence | * compare and refine arguments based on an evaluation of the evidence presented. * distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation. * respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions. * construct and support an argument with evidence, data, and/or a model. * use data to evaluate claims about cause and effect. * make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. | * compare two arguments on the same topic and analyze whether they emphasize similar or different evidence or interpretations of facts. * respectfully provide and receive critiques about one’s explanations, procedures, models, and questions by citing relevant evidence. * construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. * evaluate competing design solutions. |
| PS1.A: Structures and Properties of Matter | * Matter exists as particles that are too small to see, and so matter is always conserved even if it seems to disappear. * Measurements of a variety of observable properties can be used to identify particular materials. | The fact that matter is composed of atoms and molecules can be used to explain the properties of substances, diversity of materials, states of matter, phase changes, and conservation of matter. |
| PS2.A: Forces and Motion | * The effect of unbalanced forces on an object results in a change of motion. * Patterns of motion can be used to predict future motion. * Some forces act through contact, some forces act even when the objects are not in contact. * The gravitational force of Earth acting on an object near Earth’s surface pulls that object toward the planet’s center. | The role of the mass of an object must be qualitatively accounted for in any change of motion due to the application of a force. |
| PS3.A: Definitions of Energy | * Moving objects contain energy. The faster the object moves, the more energy it has. * Energy can be moved from place to place by moving objects, or through sound, light, or electrical currents. * Energy can be converted from one form to another form. | * Kinetic energy can be distinguished from the various forms of potential energy. * Energy changes to and from each type can be tracked through physical or chemical interactions. * The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter |
| PS3.B: Conservation of Energy and Energy Transfer |

**Accelerated Instruction:**

Begin by teaching a whole group lesson on the **grade level standard** with a defined learning intention and success criteria.

Depending on where you are in your instructional pace for the year, you work with your PLC to determine whether you move forward with the full curriculum, use the Amplify @Home condensed units or a combination thereof focusing on the deficiencies identified in the initial assessing.

Based on the formative assessments and initial data collection you may add or emphasize specific dimensions as needed for your class. Do plan on using Progress Build progressions to measure acquisition of proficiency. Active planning and preparedness are of the utmost importance. For those students who struggle, additional guided instruction may be required.

Make the greatest use you can of the resources you have been provided. Don’t be hesitant to use the pre-recorded activities for additional guidance at home or in a virtual at home setting in order to provide ongoing instruction.

Use your pre, critical juncture, post assessments to determine growth areas as well as areas which still need to be addressed in additional instructional settings. Remember that the dimensions spiral across the year as well as year to year. Be cognizant of the fact that proficiency in the early part of the year will look different from proficiency at the end of the year as students continue their growth and progress. Decide with your PLC what level of mastery is expected for the point of the year you are in and assess to that level and above.

**We also strongly believe that teachers need to include independent reading in their units. Students get better at reading by reading.**