Title: STEAM Curriculum
Grade: 4

Length: ½ Year, Sept-Jan, Feb-June

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Enduring Understandings:	**Standards to be addressed: NGSS, CCSS ELA, CCSS Math**
STEAM is an educational approach to learning that uses Science, Technology, Engineering, the Arts and Mathematics as access points for guiding student inquiry, dialogue, and critical thinking. http://educationcloset.com/steam/what-is-steam/ https://www.nap.edu/read/13165/chapter/4#10 Collaboration is important to facilitate scientific investigation. https://www.teambuildingportal.com/games/sneek-peek In mathematics, topology is the study of properties of space that are preserved under continuous deformations (e.g., Mobius strip). Any time two atoms join together, they make a molecule. All the stuff around you is made up of molecules. (Unpoppable balloon) Objects in the universe are composed of matter which is anything that takes up space and has mass. (Unpoppable balloon) Friction is the resistance to motion of one object moving against another. (Hovercraft) Scientists analyze and interpret evidence to	The foundational report produced by the National Research Council (NRC) that forms the basis for the NGSS. It calls for a new approach to science education based in scientific and educational research. The NGSS draws its content across the three dimensions, as well as the three-dimensional approach to learning, from The Framework. NJCCS 8.2.5.A.3 Investigate and present factors that influence the development and function of products and systems e.g. resources criteria and constraints. (What is STEAM?) NJCCS 8.2.5.C.4 Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models. (What is collaboration?) NJSLS 4.G Draw and identify lines and angles, and classify shapes by properties of their lines and angles. (Mobius)

solve problems and make decisions. Scientists don't follow the traditional "scientific method," instead they hypothesize, try out their ideas, and constantly revise their thinking to deepen their understanding of how the universe works. (Marshmallow Challenge) Buoyancy is the phenomenon (discovered by Archimedes) that an object less dense than a fluid will float in the fluid. More generally, Archimedes' principle states that a fluid will exert an upward force on an object immersed in it equal to the weight of the fluid displaced by the object. (Buoyancy and Prediction) The engineering design process is a series of steps that engineers follow to come up with a solution to a problem. Many times the solution involves designing a product (like a machine or computer code) that meets certain criteria and/or accomplishes a certain task. (Marshmallow Challenge, Coffee Shop Construction and Shape Construction) The steps of the engineering design process are to: ● Define the Problem ● Do Background Research ● Specify Requirements ● Brainstorm Solutions ● Choose the Best Solution ● Do Development Work ● Build a Prototype ● Test and Redesign Catapult physics is basically the use of stored energy to hurl a projectile (the payload). The three primary energy storage mechanisms are tension, torsion, and gravity. (Pop Fly--lever, motion, force) Collaboration is such an important part of research—and research careers—it is never too early to start learning how to collaborate	**MP.4** Model with mathematics. (MS - PS1 - 1) (Mobius) NGSS 4-LS1 Use a Model to test interactions concerning the functioning of a natural system. (Unpoppable balloon) NGSS 5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen. (Unpoppable balloon) **MS-PS1-1** Develop models to describe the atomic composition of simple molecules and extended structures. (Unpoppable balloon) 3-PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. (Hovercraft) (MS-LS1-3) Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. (Marshmallow Challenge and Coffee Shop Construction) (MS-PS1-4) Cause and effect relationships may be used to predict phenomena in natural or designed systems. (Buoyancy and Prediction) (4-PS4-3) Similarities and differences in patterns can be used to sort and classify designed products. (Coffee Shop Construction)

and avoid the many pitfalls that can turn a dream relationship into a nightmare. (Cup and String activity) http://www.sciencemag.org/careers/2012/07/how-collaborate Nanotechnology is a multidisciplinary science that looks at how we can manipulate matter at the molecular and atomic level. To do this, we must work on the nanoscale -- a scale so small that we can't see it with a light microscope. (Introduction to Nanotechnology) http://science.howstuffworks.com/what-is-nanotechnology.htm The faster a given object is moving, the more energy it possesses. 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. A system of objects may also contain stored (potential) energy, depending on their relative positions. (Speedometry) A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (Earthquake simulator)	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. (Shape Construction) 3-PS2-2 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. (Pop Fly--lever, motion, force) (4-PS3-4) Most scientists and engineers work in teams. (Cup and String Activity) (MS-LS4-S) Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems. (Nanotechnology) 4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object. (Speedometry) 4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide. (Speedometry) 4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. (Earthquake Simulator)

Essential Questions:

STEAM Intro Lesson
What is STEAM?
Why are we doing STEAM classes? (According to the U.S. Department of Education, all STEAM jobs in the U.S. will increase 14 percent from 2010-2020, accounting for millions of positions. Yet, data shows that 3 million of those jobs will go unfilled by 2018. One reason for that is not enough students seriously consider a career in STEAM. STEAM education is active and focuses on a student-centered learning environment. Students engage in questioning, problem solving, collaboration, and hands-on activities while they address real life issues. In STEAM education, teachers function as classroom facilitators. They guide students through the problem-solving process and plan projects that lead to mastery of content and STEAM proficiency. STEAM proficient students are able to answer complex questions, investigate global issues, and develop solutions for challenges and real world problems while applying the rigor of science, technology, engineering, and mathematics content in a seamless fashion. STEAM proficient students are logical thinkers, effective communicators and are technologically, scientifically, and mathematically literate).
What is collaboration?

Mobius Lesson
What is topology?
How do you construct a Mobius Strip?
How can experimenting with Mobius Strips help you make predictions?

Atoms and Molecules- Unpoppable Balloon
How are atoms and molecules related?
What are the parts of an atom?
What happens to molecules in a balloon when it is inflated?

Friction- Hovercraft
What is friction and in what ways is it useful and in what ways is it problematic?
Explain how factors such as gravity, friction and change in mass affect the motion of objects. (Greater the mass of an object, the greater the inertia. An object in motion will stay in motion unless another force is applied to it, like gravity). The more friction, the more force is needed.

Marshmallow Challenge
How does a team work together to build a structure in a limited number of time?

Buoyancy
What is density?
How does density of an object affect floating and sinking in water?

Coffee Shop Construction
What is geometry?
What is the difference between a 2-D and 3-D shapes?

Shape Construction- paper bridge
How does geometry help engineers build bridges?
How do shapes affect the stability of structures?

Pop Fly- Lever, Motion, Force-
How do simple machines use force and motion to make work easier?

Cup and String Challenge
Why is communication important when working in a group to complete a task?

Nanotechnology
What is Nanotechnology?
How small is a nanometer, compared with a hair or an atom?
Why are properties of nanoscale objects sometimes different than those of the same materials at a bigger scale?
What are some of the ways that the discovery of a new technology can impact our lives?

Speedometry
As an engineer, how would you build a ramp to get your Hot Wheels car to go as far as it can?
What happens to the distance your car travels as you increase the height of the ramp?
How can you change your design to give your cars more energy to go farther?
How can you design a racecourse that keeps building kinetic and potential energy so your car will keep moving as long as possible?
What happens when two cars collide when you change the potential energy?

Earthquake Simulator
Why do engineers test soil samples before building a structure?
What strategies should engineers consider as they plan for maximum building safety?

Scientific & Engineering Practices: On FOSS website- framework and NGSS- Taken from FOSS website, Module Details, **<u>Experiments:</u>** <u>Mobius Strip</u> Create a Mobius Strip and make predictions on variations of this strip, e.g., cutting in different segments. Compare and contrast mobius strips with circular strips. <u>Unpoppable Balloon</u> Develop models to describe the atomic composition of simple molecules and extended structures. MS-PS1-1 <u>Hovercraft</u> Plan, develop, test and, if necessary, redesign a model of a hovercraft that will hover over a smooth surface with materials provided. <u>Marshmallow Challenge</u> Design a structure that will be free standing, as tall as possible, and bear the weight of a marshmallow at the top with materials given in a limited amount of time. <u>Buoyancy</u> Predict, by actual observation and touch, what objects are buoyant. Test those objects to determine if predictions are correct. Matter Has Structure ● Density is mass per unit volume. The greater the concentration of a solution, the greater its density. <u>Coffee Shop Construction</u> Plan and construct a 3D (cube like) model with materials provided. <u>Shape Construction- Paper Bridge</u> Build a bridge (with various materials, and	**Crosscutting Concepts: Patterns and trends (how 1 experiment might relate to one another)there are 7** **Which experim is hitting the cross cutt exp** **<u>Experiments:</u>** <u>Mobius Strip</u> Patterns ● Patterns of change can be used to make predictions ● Patterns can be used as evidence to support an explanation. <u>Unpoppable Balloon</u> Cause and Effect ● Cause and effect relationships are routinely identified, tested, and used to explain change Structure and Function ● Different materials have different substructures, which can sometimes be observed. <u>Hovercraft/Marshmallow Challenge/Coffee Shop Construction</u> **Structure and Function** Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used .(MS-PS1-3) <u>Buoyancy</u> **Scale, Proportion, Quantity** Students recognize natural objects and observable phenomena exist from the very small to the immensely large.

parameter such as span) that will hold the weight of 100 pennies Structure of Earth ● People use earth materials to construct things. Properties of different earth materials make them suitable for specific uses. <u>Pop Fly- Lever, Motion, Force</u> Construct an elementary catapult using a lever, fulcrum, and payload to launch small marshmallow as far as possible. Motion and Stability: Forces and Interactions ● The motion of an object is determined by the sum of the forces (pushes and pulls) acting on it. ● Any change of motion requires a force. Each force has a strength and a direction. <u>Cup and String Challenge</u> As a group (4), collaboratively stack cups in various strategic formations using only rubber bands with 4 strings attached. <u>Nanotechnology</u> Gather, read, and synthesize information to determine appropriate technologies for various global issues. <u>Speedometry</u> 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. MS-PS2-2 Motion and Stability: Forces and Interactions ● Any change of motion requires a force. Each force has a strength and a direction. Energy Transfer and Conservation ● Kinetic energy is energy of motion; potential energy is energy of position. The faster an object is moving, the more kinetic energy it has. Objects at	They use standard units to measure and describe physical quantities such as weight, time, temperature, and volume. <u>Shape Construction- Paper Bridge</u> Structure and Function ● Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. <u>Pop Fly- Lever, Motion, Force</u> Systems ● A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. <u>Cup and String Challenge</u> A system can be described in terms of its components and their interactions. (5-ESS2-1) <u>Nanotechnology</u> Scale, Proportion and Quantity ● Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods. <u>Speedometry</u> Energy ● Energy can be transferred in various ways and between objects. <u>Earthquake Simulator</u> **Cause and Effect** Cause and effect relationships may be

higher heights have more potential energy. ● When objects collide, energy can transfer from one object to another, thereby changing their motion. <u>Earthquake Simulator</u> 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. Structure of Earth ● People use earth materials to construct things. Properties of different earth materials make them suitable for specific uses. ● Humans can use scientific knowledge and engineering design to reduce the impact of Earth's natural hazards.	used to predict phenomena in natural or designed systems. (MS-PS1-4) Stability and Change ● Change is measured in terms of differences over time and may occur at different rates. ● Some systems appear stable, but over long periods of time will eventually change.

Big Ideas-I want students to understand:

What scientific explanations and/or models are critical for student understanding of the content?
So what? Who cares?
What is the most important for students to understand about this topic?

<u>Mobius Strip</u>
One of the most famous surfaces in mathematics is the Möbius (MeR-bee-us) strip. In mathematical terms, we say that the Möbius strip is *non-orientable*. That is, when we define a surface normal at a point, it is impossible to extend the definition to the whole surface. (conveyor belts, roller coasters)

<u>Unpoppable Balloon</u>
By using the portion of the balloon where the rubber molecules are under the least amount of stress or strain, the skewer can go through the balloon without it popping. If you could see the rubber that makes up a balloon on a microscopic level, you would see many long strands or chains of molecules. These long strands of molecules are called **polymers**, and the elasticity of these polymer chains causes rubber to stretch.

Blowing up the balloon stretches these strands of polymer chains.

Hovercraft

The air flowing through the straw produces a cushion of air under the hovercraft. This layer of air takes up space and lifts up the hovercraft. Now, the disk can't rub against the table. When objects rub against each other, they produce **friction**, a force that resists motion and slows down moving objects. Thanks to the layer of air, there is hardly any friction, and your hovercraft glides along without being slowed down.

Marshmallow Challenge

The Marshmallow Challenge teaches us that prototyping and iterating can help achieve success. It also shows that success is dependent upon close collaboration between team members. This exercise is used to teach and develop individuals in the attributes of ***collaboration, innovation and creativity***.

Buoyancy

Buoyancy is the ability or tendency to float in water, air or another fluid. Density is how tightly packed the mass is in an object -for an object to float, the buoyant force, the force pointing upwards, has to be equal to or greater than the force of gravity on an object. Otherwise, the object will accelerate downwards and sink. According to Archimedes' principle, the buoyant force on an object is equal to the force of gravity that would act on the displaced water. Archimedes Principle

Coffee Shop Construction

This activity is great for comparing, problem solving, and engineering principles. Students observe 2-D and 3-D structures and attempt to duplicate the shapes/structures.

Shape Construction- Paper Bridge

What helps make a bridge strong? A bridge must support its own weight (the dead load) as well as the weight of anything placed on it. In this activity, students explore bridge engineering by making paper bridges that stretch between stacks of books. *How does changing the shape of the materials (the paper) change the strength of the bridge?* This activity brings civil engineering and materials science to life. By designing and redesigning —and application of science—students can build paper bridges that have some weight-bearing capacity!

Pop Fly- Lever, Motion, Force

A catapult is an awesome science activity but also incorporates math, engineering, and technology. We use technology to assist us in building our simple catapults. We use math to determine the supplies needed to build the catapults. We use our engineering skills to actually build the popsicle stick catapult and we use science to test how far the catapults flung the items we chose.

Cup and String Challenge

This activity promotes and enforces : Communication, Cooperation, Coordination, Paying attention, Patience, Problem solving, Self-control. Students will collaborate, problem solve, and persevere to accomplish each challenge

Nanotechnology

Nano Around the World is a card game designed to get students to reflect on the potential uses of nanotechnology across the globe.
Nanoscience, nanotechnology, and nanoengineering lead to new knowledge and innovations that weren't possible before.
Nanotechnologies—and their costs, utility, risks, and benefits—are closely interconnected with society and with our valu

Speedometry

Hot Wheels Speedometry encourages inquiry and real-world, problem-based learning through play, hands-on activities and in-depth lesson plans that is mapped to state and national standards including Common Core State Standards (CCSS), Next Generation Science Standards (NGSS). These lessons and student activities are designed using the 5E Model (Engage, Explore, Explain, Elaborate and Evaluate) to support students in asking questions and creating experiments to determine the answers. Over the course of the lessons, students will work in collaborative learning groups to deepen their understanding of potential and kinetic energy by observing, predicting, measuring and exploring the effect that the height of a ramp has on the transfer of energy to Hot Wheels cars. The same 5E Model is the basis for the lessons in this unit with the purpose of inspiring students to explore further. Google Sheets will be used to document and track data and to locate patterns and trends.

Earthquake Simulator

Students learn how engineers design and construct buildings to withstand earthquake damage by building their own model structures using toothpicks and marshmallows/clay. They experiment to see how earthquake-proof their buildings are by testing them in an earthquake simulated board. Because earthquakes can cause walls to crack, foundations to move and even entire buildings to crumple, engineers incorporate into their structural designs techniques that withstand damage from earthquake forces, for example, cross bracing, large bases and tapered geometry.

Earthquake-proof buildings are intended to bend and sway with the motion of earthquakes, or are isolated from the movement by sliders. Engineers come up with an idea, test it, and then re-engineer the structure based on its performance.

Do-I want students to be able to:

What scientific practices will we explicitly focus on in this unit?
What key knowledge and skills will students develop as a result of this unit?
(Use verb phrases)

Experiments:

Mobius Strip

- I can define topology and its uses in our everyday world, e.g., conveyor belts, roller coasters. (The study of those properties of geometric forms that remain invariant under certain transformations, as bending or stretching.)
- I can create various types of mobius strips and make predictions on the the outcomes by following oral and presentation instructions.

Unpoppable Balloon

- I understand the basic parts of an atom (nucleus, protons, electrons and neutrons).
- I can participate in the unpoppable balloon experiment and explain why the balloon does not pop based on the previous weeks lesson.

Hovercraft

- I can witness explain how we can alter friction according to our needs and how we take advantage of it.
- I can plan and execute an investigation and experiment 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.

Marshmallow Challenge

- I can define the problem, brainstorm, pick a design, test/redesign, present solution.
- I can work cooperatively with my teammates to construct a spaghetti tower that will withstand the weight of a marshmallow.

Buoyancy

- I can explain how density and shape affects the buoyancy of an object.
- I can make predictions about the buoyancy of various objects by touch and weight (Formulating hypotheses - stating the expected outcome of an experiment.)

Coffee Shop Construction

- I can differentiate the difference between 2-D and 3-D objects.
- I can build a basic triangular element with 3 coffee stirrers and 3 straw pieces, attach more triangular elements together to form a cube and use this construction method to build other kinds of forms.

Shape Construction- paper bridge

- Explain how engineers use history to guide their designs.
- Demonstrate problem-solving techniques such as brainstorming and the engineering design process.
- Explain that different shapes have different strengths.
- Realize that triangles are the strongest shape and recognize that they can be found in most structures.
- I can explore folding techniques to create strength in a piece of paper that can hold the most weight.

Pop Fly- Lever, Motion, Force

- I can explain how simple machines are used in everyday life to move objects and make work easier.
- I can design and build a catapult to launch a load as far as possible.

Cup and String Challenge

- I can practice effective communication and teamwork skills to complete the task given.

Nanotechnology

- I can discuss the applications of nanotechnology and how technologies and society influence each other.
- I can describe some of the current uses and future visions of nanotechnology and recognize the role nanotechnology is playing in the world today.

Speedometry

- I can explain the difference of potential and kinetic energy and how they relate and are found in the real world.
- I can work in collaborative learning groups and understand potential and kinetic energy by observing, predicting, measuring and exploring the effect that the height of a ramp has on the transfer of energy. I will document my data using Google Sheets.

Earthquake Simulator

- I can explain certain characteristics that engineers use to design buildings to withstand earthquake damage.

- I can create a building using toothpicks and clay that can withstand collapse by using an earthquake simulator board. I understand that basic cubes will not work and will have to use diagonal supports in my building.

Know-What are the basics?:

What vocabulary formations or other facts do students need to know in order to understand the big ideas?

Experiments:

Mobius Strip
Topology, mobius
A mobius strip is a continuous one-sided surface that can be formed from a rectangular strip by rotating one end 180° and attaching it to the other end.
Basically, topology is the modern version of geometry, the study of all different sorts of spaces.

Unpoppable Balloon
Atom, molecule, nucleus, proton, neutron, electron, polymer
Atoms are the basic building blocks of ordinary matter. Atoms can join together to form molecules, which in turn form most of the objects around you.

Hovercraft
Friction- Friction is the resistance to motion of one object moving relative to another.
Newton- A measurable force

Marshmallow Challenge
Collaboration
Brainstorming
The engineering design process is a series of steps that engineers follow to come up with a solution to a problem.

Buoyancy
Buoyancy, density, float, sink
Buoyancy is the tendency of a body to float or to rise when submerged in a fluid.

Coffee Shop Construction
2-D, 3-D, geometric
Short for "3 dimensional," 3D refers to the way in which humans view the world.
2-D is an abbreviation for 2-Dimensional. Dimensions are the different planes we experience the world in. The three dimensions we live in are height, width, and depth. When someone refers to something that is 2-D they usually mean it has height and

width like a cartoon on your TV. You can measure how high a character stands and how wide he is but you can't measure how deep the scene is.

Shape Construction
type of bridges: *beam, truss, arch, suspension*
Additional vocabulary: *arch, beam, deck, column, fixed arch, footing, portal, strut*
Triangles are used in construction because they provide sturdy foundations to various infrastructures. Due to their rigid forms, triangles can withstand tremendous pressure.

Pop Fly- Lever, Motion, Force
Catapult, Fulcrum, Load
A simple machine is a simple device for altering the magnitude or direction of a force. The six basic types are the lever, wheel and axle, pulley, screw, wedge,and inclined plane.

Cup and String Challenge
Collaboration
Team Work
Communication
Most scientists and engineers work in teams.

Nanotechnology
Nanotechnology, nanometer
Nanotechnology ("nanotech") is manipulation of matter on an atomic, molecular, and supramolecular scale.

Speedometry
Ramp. mass, slope, height, average, kinetic energy, potential energy

Earthquake Simulator
Earthquake, cross bracing (forms triangles in its design geometry), large "footprints" (base), tapered geometry (decreasing in size as the building gets taller or simply, smaller at the top)

How do I reinforce or build literacy or mathematics skills?

- Science Notebook and various tasks done in those notebooks, e.g., drawings/designs of projects, making predictions, compiling hand-outs, brainstorming ideas.
- Projected E-books viewed as a class ("What Is Matter")
- Projected videos, instructions, documents, game activities, handouts, timer.
- Every activity/experiment/design is available via Google Classroom to all students showing links to videos, instructions, documents/handouts, and on line

games. Some examples:

--http://pbskids.org/designsquad/build/unpoppable-balloon/ (PBS video)
--https://youtu.be/PNXbW22Lat8- Balloon Popping Experiment video
--https://www.youtube.com/watch?v=MAqrWvkBoHk Bill Nye video

- Prediction Sheets: https://docs.google.com/document/d/1ofoUY5tv9PKGdX1wNuz82tN2SIwjCrFmQYP_ZXZt9t0/edit (Mobius Strip/Topology)
- Additional Challenges (activity not done in classroom but accessible to student)

--https://www.youtube.com/watch?v=X-eu1rmzH1E (Mobius Strip)

- Online Games:

--http://www.coolmath-games.com/0-build-the-bridge
--http://www.surfnetkids.com/games/quiz-buoyancy/
--http://studyjams.scholastic.com/studyjams/jams/science/forces-and-motion/force-and-motion.htm (Force and Motion Video)

Assessment: How will I know what students have learned?

Performance Expectations:
Does the formative or summative assessment require students to show their understanding in an observable way?
Does it make students' thinking visible?
Are there criteria and are the criteria relevant to the big ideas for the unit?

Mobius Strip

- I can create various shapes using a mobius strip and explore a mathematical mystery by using strips of paper.

Unpoppable Balloon

- I can explain and demonstrate via the balloon experiment how polymers (long strands of molecules) effect rubber substances by piercing a balloon with a skewer.

Hovercraft

- I can construct a hovercraft that glides along a thin layer of air.

Marshmallow Challenge

- I can work in a group to build a free-standing structure to support the weight of a

marshmallow.

Buoyancy

- I can conduct an experiment, using various volumes of water, and interpret the results of the experiment to determine if my predictions of buoyancy are correct.

Coffee Shop Construction

- I can build a basic triangular element with 3 coffee stirrers and 3 straw pieces.
- I can build and attach more triangular elements together forming a cube.
- I can use this construction method to build other kinds of forms.

Shape Construction

- I can design and build a bridge to support the weight of 100 pennies.

Pop Fly- Lever, Motion, Force

- I can design and build a catapult to launch a load as far as possible.

Cup and String Challenge

- I can be a productive team member to work collaboratively to stack cups with rubber bands without touching the cups.

Nanotechnology

- I can contemplate, after reading about and viewing various nanotechnologies and various real life circumstances, what technologies can be best used for certain populations.

Speedometry

- I can work in collaborative learning groups and understand potential and kinetic energy by observing, predicting, measuring and exploring the effect that the height of a ramp has on the transfer of energy. I will document my data using Google Sheets.

Earthquake Simulator

- I can create a building using toothpicks and clay that can withstand collapse by using an earthquake simulator board. I understand that basic cubes will not work and will have to use diagonal supports in my building.

<u>Other evidence:</u>
Include multiple types of learning to give a more accurate picture of learning.

- Interactive STEAM notebooks
- Classroom discussion
- Self assessment rubrics
- Exit slips
- Kahoot Games
- Google Forms used for pre and post quizzes
- Observation of experiments
- Success of experiments
- Observation of student participation in groups

What some ways we could possibly differentiate instruction to reach all learners?

How shall we teach for understanding?
Incorporate different learning styles as well hands-on and engaging activities?

- Differentiation of assigned articles
- Examples available to students for visual learning
- Modification of experiments that meet the same lesson objective
- Tiered Instruction- Using tiered activities focuses on essential understandings and skills but at different levels of complexity, abstractness, and open-endedness.
- Tiered assignments are designed to instruct students on essential skills that are provided at different levels of complexity, abstractness, and open-endedness. (The curricular content and objective(s) are the same, but the process and/or product are varied according to the student's level of readiness).
- Flexible Grouping- Students work as part of many different groups depending on the task and/or content. Sometimes students are placed in groups based on readiness, other times they are placed based on interest and/or learning profile. Groups can either be assigned by the teacher or chosen by the students. Students can be assigned purposefully to a group or assigned randomly. This strategy allows students to work with a wide variety of peers and keeps them from being labeled as advanced or struggling.