Unit 1: Science Boot Camp **1**

Unit 2: Earth and Space Sciences **6**

Unit 3: Life Sciences **14**

Unit 4: Physical Sciences **22**

Unit 5: Technology and Engineering **30**

Subject	PS7
Unit	Unit 1: Science Boot Camp
Est. Length	8 lessons (Aug-Sept)
Big Idea	Scientists work together, ask questions, and communicate ideas with precision and brevity.
Essential Questions	1. What skills do we need to be successful scientists? 2. How do our brains grow to store new ideas? 3. How do environmental factors influence our ability to process information?
MA State Standards *Power standards in bold	N/A
Common Core State Standards (CCSS)	Reading ● RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. ● RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. ● RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or

performing technical tasks.

- RST.6-8.4: Determine the meaning of key symbols, key terms, and other domain-specific words and phrases as they are used in specific scientific or technical context relevant to grades 6 - 8.
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- RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.

Writing

- WHST.6-8.1: Write arguments focused on *discipline-specific content*.
    - WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
    - WHST.6-8.1.B: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
    - WHST.6-8.1.C: Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
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Science Practices (SP)	**1. Asking scientific questions & defining engineering problems** 2. Developing & using models 3. Planning & carrying out investigations **4. Analyzing & interpreting data** 5. Using mathematics & computational thinking 6. Constructing scientific explanations & designing engineering solutions **7. Engaging in argument from evidence** 8. Obtaining, evaluating, and communicating information
Assessment Alignment	Quiz: Interpreting data & brain vocabulary Performance task: Write a letter to a friend/yourself about how to best take care of your brain
Honors Assignments	None
20 Key Vocabulary Words	Precision, mass, volume, length, claim, evidence, limbic system, prefrontal cortex, neuron, axon, synapse, dopamine

Prior knowledge that students have entering this unit
1. Students have very little knowledge about the brain from previous years; this should put everybody on an equal playing field for the content. 2. Some (though not all) students will be familiar with technical skills like graphing, measuring, and taking notes--norm what this means in PS7, and why it is important. 3. Students know how to ask questions. Asking questions will be made part of daily practice during this unit.

Where this knowledge goes next
Students will learn basic science skills in this unit that will be used for the rest of their middle school careers. We will also continue to refer back to the brain science we learn during this skills focused unit throughout the year to aid metacognition.

Descriptive outline narrative of unit
We will begin the year with an emphasis on routines and skills based in brain science content which isn't in the standards. The goal of this is to familiarize students with science class through untested, engaging content. Each day there will be a new basic skill focus combined with a brain science topic. Every day in this short unit we will emphasize our routines. Skills: ● asking questions & making predictions ● Interpreting data ● Writing claims ● Writing evidence statements to support claims ● Translating between units ● Creating tables and graphs given data

- Study skills (using flashcards, recopying notes, annotating notes with questions to ask yourself)

Routines:

- Silent entry
  - Begin do now, have notebook out and labeled w/ title and date
- Taking notes & other behavior cues on slides
- Writing/asking questions

Engagement:

- gallery walk of pictures of neurons with “I notice...I wonder…”, repeat later with “I think” and “I know”
- Brain mad libs
- Build a model of a neuron
- Neuron puzzle
- In groups, hold out arms; right hand is axon terminal, left hand is dendrite. Pass cotton balls to show neurotransmitters
- scenarios /situations-- which part of the brain does this activate?
-

Day	Lesson #/name	MA	CCSS	Content Objective	Language Objective	Science practice(s)
1	BC1	N/A		SWBAT explain the rationale behind important routines in PS7.	(W): Fill in the blanks in descriptions of routines, and explain the rationale using the sentence frame: *We do this because...*	SP8: OBTAINING, EVALUATING AND COMMUNICATING INFORMATION
2	BC2	N/A		SWBAT match brain structures to their major functions. SWBAT develop a system to organize notes from lectures and data from laboratory investigations. *Engagement: Hook story Phineas Gage, simon says for brain parts*	(W): Use a word bank to match brain structures to their functions.	SP8: OBTAINING, EVALUATING AND COMMUNICATING INFORMATION

3	BC3	N/A		SWBAT practice writing questions and making predictions. SWBAT explain how brain structures change as we learn. *Engagement: story of a neuron, build a neuron, neuron puzzle*	(S): Orally describe neurons to a partner.	SP1: ASKING SCIENTIFIC QUESTIONS
4	BC4	N/A		SWBAT create a dot plot from a table of values. SWBAT use data to show how stress and distractions affect brain performance. *Engagement: gallery walk of neuron pictures with "I notice" and "I wonder"*	(R): Read a scientific table and translate the data to a graph.	SP5: USING MATHEMATICS & COMPUTATIONAL THINKING
5	BC5	N/A		SWBAT write a claim based on a data display. SWBAT explain how sleep and exercise affect brain function. *Engagement: distraction quiz*	(W): Write a one sentence claim that accurately represents the data presented.	SP6: CONSTRUCTING SCIENTIFIC EXPLANATIONS
6	BC6	N/A		SWBAT write an evidence statement to support a claim.	(W): Write an evidence statement to support a claim using the stem: *The table/graph shows...*	SP4: ANALYZING & INTERPRETING DATA
7	BC7	N/A		SWBAT use claims and evidence statements to summarize brain science learnings.	(W): use sentence frames to summarize brain science learnings in writing.	SP8: OBTAINING, EVALUATING AND COMMUNICATING INFORMATION
8	BC8	N/A		SWBAT use study skills to prepare for a quiz.	(S): Work with a partner to study for a quiz.	SP8: OBTAINING, EVALUATING AND COMMUNICATING INFORMATION

Subject	PS7
Unit	Unit 2: Earth and Space Sciences
Est. Length	16 lessons (Sept-Oct)
Big Idea	Studying the Earth's structure helps scientists understand the past and future and predict how humans impact the environment.
Essential Questions	1. How has the Earth's surface changed over billions of years? 2. How does geologic history help us predict the geologic future? 3. How can humans decrease the negative impacts of overpopulation?
MA State Standards *Power standards in bold	**7.MS-ESS2-2: Construct an explanation based on evidence for how Earth's surface has changed over scales that range from microscopic to global in size and operate at times ranging from fractions of a second to billions of years.** • *Examples of processes occurring over large, global spatial scales include plate motion, formation of mountains and ocean basins, and ice ages.* • *Examples of changes occurring over small, local spatial scales include earthquakes and seasonal weathering and erosion.* **7.MS-ESS2-4: Develop a model to explain how the energy of the sun and Earth's gravity drive the cycling of water, including changes of state, as it moves through multiple pathways in Earth's hydrosphere.** • *Examples of models can be conceptual or physical.* • *A quantitative understanding of the latent heats of vaporization and fusion is not expected in state assessment.* 7.MS-ESS3-2: Obtain and communicate information on how data from past geologic events are analyzed for patterns and used to forecast the location and likelihood of future catastrophic events. • *Geologic events include earthquakes, volcanic eruptions, floods, and landslides.* • *Examples of data typically analyzed can include the locations, magnitudes, and frequencies of the natural hazards.* • *Active analysis of data or forecasting is not expected in state assessment.* 7.MS-ESS3-4: Construct an argument supported by evidence that human activities and technologies can be engineered to mitigate the negative impact of increases in human population and per capita consumption of natural resources on the environment. • *Arguments should be based on examining historical data such as population graphs, natural resource distribution maps, and water quality studies over time.*

	• *Examples of negative impacts can include changes to the amount and quality of natural resources such as water, mineral, and energy supplies.*
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Assessment Alignment	<u>Minor Assessments</u> ● Lab ● Quiz 2.1

	● Vocabulary quiz 1 & 2 <u>Major Assessments</u> ● **Project: Children's Story** ● Unit Test
Honors Assignments	● Weather forecasting ● Ice core analysis
20 Key Vocabulary Words	Scale, global, local, geoscience process, weathering, erosion, atmosphere, transpiration, evaporation, condensation, crystallization, precipitation, gravity, natural hazards, forecast, population, per-capita, natural resource, renewable resource, probability

Prior knowledge that students have entering this unit
1. Students should already know about Earth's processes from 6th grade science (earthquakes, volcanos, tectonic plate movement). 2. They would have already learned about the basic steps of the water cycle from grade 3-5.

Where this knowledge goes next
1. The effects of climate change are further studied in the Life Science Unit. 2. Students will cover topics in Earth Science more in depth in 8th grade, with a particular focus on gravity's role.

Descriptive outline narrative of unit
This unit begins with a study of the most visible and concrete topics. Students will look at small scale changes to Earth's surface, like landslides, before moving on to larger, longer-term changes. We will then look at the water cycle through diagrams and texts. They will use this information to create their Roundtable Project. Students will apply mathematical thinking to understand how probability plays into forecasting natural hazards. We will spend several lessons on climate change, with a focus on both how

climate change affects humans and how we contribute to it. At the end of the unit we will preview the engineering unit with design evaluation and systems thinking.

Day	Lesson #/name	MA	CCSS	Content Objective	Language Objective	Science practice(s)
1	ESS1	6.MS-ESS1-5	RST.6-8.1	SWBAT use evidence to justify the claim that the universe is enormous.	(W): Use a KWL chart to describe in writing new learnings about the universe.	SP2: DEVELOPING & USING MODELS
2	ESS2	7.MS-ESS3-4	WHST.6-8.1.B	SWBAT describe the difference between renewable and nonrenewable natural resources.	(W): Describe in writing the difference between renewable and nonrenewable natural resources.	SP8: OBTAINING, EVALUATING AND COMMUNICATING INFORMATION
3	ESS3	7.MS-ESS3-4	WHST.6-8.1.B	SWBAT interpret graphs to explain in writing how natural resource availability and greenhouse gas emissions have changed with the human population.	(W): Cite evidence from a graph to justify the claim that human activities have impacted natural resource availability and greenhouse gas emissions. population, per-capita, natural resource,	SP4: ANALYZING & INTERPRETING DATA
4	ESS4	6.MS-ESS1-5	RST.6-8.1	SWBAT compare and contrast characteristics of Earth and Mars.	(W): Explain using the sentence frame: Water changes state...because...	SP8: OBTAINING, EVALUATING AND COMMUNICATING INFORMATION
5	ESS5					
6	ESS6	7.MS-ESS2-2	WHST.6-8.1.B	SWBAT explain in writing what causes water to change state throughout the water cycle.	(R): Summarize key information from relevant diagrams.	SP7: ENGAGING IN ARGUMENT FROM EVIDENCE
7	ESS7	7.MS-ESS2-4	WHST.6-8.2.B	SWBAT explain why humans recycle water.	(L): Use a short video to describe what happens to wastewater.	SP1: ASKING SCIENTIFIC QUESTIONS

8	ESS8	7.MS-ESS2-4	WHST.6-8.2.B	SWBAT make design choices that reduce water consumption.	(R): Use a water use calculator to determine the number of gallons of water used per day.	SP5: USING MATHEMATICS & COMPUTATIONAL THINKING
9	ESS9	7.MS-ESS2-4	WHST.6-8.2.B	SWBAT describe how Earth's plates move.	(W): Use a cloze reading to describe how Earth's plates move.	SP6: CONSTRUCTING SCIENTIFIC EXPLANATIONS
10	ESS10	7.MS-ESS2-4	WHST.6-8.2.B	SWBAT use time and scale to describe geoscience processes.	(S): Describe geoscience processes using the sentence starters: *This process is caused by… This process takes place over…*	SP8: OBTAINING, EVALUATING AND COMMUNICATING INFORMATION
11	ESS11	7.MS-ESS2-2	RST.6-8.10	SWBAT use evidence to justify claims about how geoscience processes changed a location.	(W): Use paragraph frames to write CERs about geoscience processes.	SP6: CONSTRUCTING SCIENTIFIC EXPLANATIONS
12	ESS12	7.MS-ESS2-2	WHST.6-8.1.B	SWBAT use evidence to justify claims about geoscience processes.	(W): Use sentence starters to write claims and evidence.	SP2: DEVELOPING & USING MODELS
13	ESS13	7.MS-ESS2-2	RST.6-8.10	SWBAT use data to predict the likelihood of future earthquakes and volcanoes.	(R): Use written evidence to determine whether a volcano is likely in a specific area.	SP6: CONSTRUCTING SCIENTIFIC EXPLANATIONS
14	ESS14	7.MS-ESS2-2	WHST.6-8.4	SWBAT use data to predict the likelihood of future hurricanes and tsunami.	(R): Use written evidence to determine whether a volcano is likely in a specific area.	SP4: ANALYZING & INTERPRETING DATA
15	ESS15			SWBAT use data to predict the likelihood of future landslides and tornadoes.	(R): Use evidence from a table or graph to determine whether a tornado is likely in a specific area.	SP4: ANALYZING & INTERPRETING DATA
16	ESS16	7.MS-ESS3-2	WHST.6-8.7	SWBAT determine the best location to build a hotel based on historical hazard data.	(R): Summarize key information	SP6: CONSTRUCTING SCIENTIFIC EXPLANATIONS
17	ESS17	7.MS-ESS3-2	RST.6-8.1	SWBAT use evidence to defend their hotel location decision.	(S & W): Students will defend claim orally and in writing using sentence starter: I chose this	SP6: CONSTRUCTING SCIENTIFIC EXPLANATIONS

					location because… from a data table.	

Subject	PS7
Unit	Unit 3: Life Sciences
Est. Length	28 lessons (Oct-Dec)
Big Idea	High resource availability strengthens individuals and populations, while biodiversity strengthens entire ecosystems.
Essential Questions	1. How does resource availability influence the growth of individuals and populations, including humans? 2. How do interactions between individuals and species affect population growth? 3. In what ways do humans positively and negatively affect other species and ecosystems?
MA State Standards *Power standards in bold	7.MS-LS1-4. Construct an explanation based on evidence for how characteristic animal behaviors and specialized plant structures increase the probability of successful reproduction of animals and plants. • *Examples of animal behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalizations and colorful plumage to attract mates for breeding.* • *Examples of animal behaviors that affect the probability of plant reproduction could include (a) transferring pollen or seeds and (b) creating conditions for seed germination and growth.* • *Examples of plant structures that affect the probability of plant reproduction could include bright flowers attracting butterflies that transfer pollen, flower nectar, and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury* 7.MS-LS2-1: Analyze and interpret data to provide evidence for the effects of periods of abundant and scarce resources on the growth of organisms and the number of organisms (size of populations) in an ecosystem. **7.MS-LS2-2: Describe how relationships among and between organisms in an ecosystem can be competitive, predatory, parasitic, and mutually beneficial and that these interactions are found across multiple ecosystems.** *Emphasis is on describing consistent patterns of interactions in different ecosystems in terms of relationships among and between organisms.* **7.MS-LS2-3**: **Develop a model to describe the cycling of matter among living and nonliving parts of an ecosystem including through the process of photosynthesis and cellular respiration.** *Emphasis is on a general understanding of cycling of matter in an ecosystem.*

	7.MS-LS2-4: Analyze data to provide evidence that disruptions (natural or human-made) to any physical or biological component of an ecosystem can lead to shifts in all its populations. *Focus should be on ecosystems characteristics varying over time, including disruptions such as hurricanes, floods, wildfires, oil spills, and construction.* 7.MS-LS2-5: Evaluate competing design solutions for protecting an ecosystem. Discuss benefits and limitations of each design.* *Examples of design solutions could include water, land, and species protection, and the prevention of soil erosion.* *Examples of design solution constraints could include scientific, economic, and social considerations.* 7.MS-LS2-6 (MA): Explain how changes to the biodiversity of an ecosystem—the variety of species found in the ecosystem—may limit the availability of resources humans use. *Examples of resources can include food, energy, medicine, and clean water.* 7.MS-LS2-7 (MA): Construct a model of a food web to explain that energy is transferred among producers, primary, secondary, and tertiary consumers, and decomposers as they interact within an ecosystem. *Student should be able to predict changes in relative sizes of populations based on food webs.*
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Assessment Alignment	<u>Minor Assessments</u> ● Vocabulary quiz 3 & 4 ● Quiz 3.1 <u>Major Assessments</u> ● Project: Formal Recommendation to City Officials ● Unit 3 Test
Honors Assignments	● Effects of hunger on brain activity ● Parasites and mutualism in humans ● The Sixth Extinction ● Chemistry of photosynthesis
20 Key Vocabulary Words	Biodiversity, producer, consumer, decomposer, food chain, ecosystem, reproductive success, adaptation, trait, population, competition, symbiosis, mutualism, commensalism, abundance, scarcity, disruption, resource, predator, prey, photosynthesis, matter, conservation

Prior knowledge that students have entering this unit
1. From 6th grade, students have an understanding of systems that make up individual life forms. 2. Students should also have a strong working understanding of cells from 6th grade.

3. From the Earth and Space Science unit, students have an understanding of how natural hazards can negatively impact ecosystems.

Where this knowledge goes next

1. Understandings about energy and matter will be carried over into the Physical Sciences Unit.
2. This unit builds foundations for the Life Science unit in 8th grade, as well as the biology classes they will take in high school.

Descriptive outline narrative of unit

Throughout this unit, students will be examining life science through individuals, species, and entire ecosystems. We will begin with the idea of how reproductive success impacts the frequency of common species behaviors and physical traits. We then look into how resource availability affects population size and the traits dominant in a single population. Resource availability is then nuanced by the introduction of different species and the relationships (ex: symbiotic, predatory, competitive) between populations. Students will then study food webs and food chains as a way of organizing these relationships. We will introduce the idea of conservation of matter and energy through food webs, and move to the big idea that most energy that we use is originally coming from the sun. Still working with food webs, students will explain the impacts of removing key species from an ecosystem, as well as the importance of biodiversity within an ecosystem. We will close out the unit by tying these ideas back to human populations: how humans depend on natural resources, how humans negatively impact natural resources, and how we might mitigate our negative impacts.

Day	Lesson #/name	MA	CCSS	Content Objective	Language Objective	Science practice(s)
1	LS1	7.MSLS 1-4	RST.6-8 .1	SWBAT make observations about living things.	(S): Make observations about the world using the stem: “I notice…” “I observe…”	SP1: Asking scientific questions

2	LS2	7.MSLS 1-4	WHST.6 -8.4	SWBAT explain in 2-3 sentences why the traits of an organism increase the probability of survival.	(W): Describe the moth simulation using the paragraph frame: *The dark moths had a higher probability of surviving when...This is because...The light moths had a higher probability of surviving when...This is because...*	SP6: Constructing explanations
3	LS3	7.MSLS 1-4	WHST.6 -8.1.C	SWBAT explain in 2-3 sentences why an animal's trait increases the probability of reproductive success.	(W): Explain using the sentence frame: *This trait _____ the probability of _____ finding a mate. Therefore this trait is _____ by the next generation.*	SP6: Constructing explanations
4	LS4	7.MSLS 1-4	RST.6-8 .2	SWBAT explain in 2-3 sentences why bright flowers are common.	(W): Describe the process of pollination using the paragraph frame: _____ *are attracted to bright flowers. They pick up _____ when they land on a flower and then _____. This process is called _____. This means that bright flowers have a _____ probability of _____.*	SP7: Engaging in argument from evidence
5	LS5	7.MSLS 1-4	WHST.6 -8.7	SWBAT explain how a decline in one population can lead to changes in another population.	(W): Write a Claim-Evidence-Reasoning paragraph using sentence frames.	SP3: Planning investigation
6	LS6	7.MS-L S2-1	WHST.6 -8.8	SWBAT explain in writing how a natural hazard would impact an ecosystem..	(W): Describe impacts on ecosystems using the sentence frame: *If* _____	SP4: Analyzing and interpreting data

					happened to this ecosystem _____ species would be affected. One species affected is _____. This is because _____.	
7	LS7	7.MS-LS2-1	WHST.6-8.1.B	SWBAT identify evidence to support a claim, and explain why it is evidence.	(W): Explain evidence using the sentence frame: *I know this is evidence because...*	SP6: Constructing explanations
8	LS8	7.MS-LS2-1	WHST.6-8.1.B	SWBAT justify the claim that organisms in competitive relationships have interdependent populations.	(W): Justify in writing by citing one piece of evidence from each diagram.	SP7: Engaging in argument from evidence
9	LS9	7.MS-LS2-2	RST.6-8.7	SWBAT compare and contrast symbiotic relationships.	(S): Discuss symbiotic relationships using the vocabulary *parasitism, mutualism, commensalism.*	SP2: Using models
10	LS10	7.MS-LS2-1	WHST.6-8.7	SWBAT use evidence to justify the claim that two species are living in symbiosis.	*(W):* Justify the claim using the frame: _____ *and* _____ *are living in* _____. *Evidence for this is that* _____ *benefits from the relationship, while* _____ _____ *(benefits from/ is not affected by/ is harmed by) the relationship.*	SP4: analyzing & interpreting data
11	LS11	7.MS-LS2-2	WHST.6-8.1.B	SWBAT use understanding of symbiosis relationships to create a fictional ecosystem.	*(W): Explain the relationship between fictional species using the frame: This relationship is* _____. _____ *is a relationship in which* _____. *Evidence that these species are in a* _____ *relationship is*	SP7: Engaging in argument from evidence

					_____.	
12	LS12	7.MS-LS2-2	WHST.6-8.8	SWBAT show mastery of life sciences content.	(W): Use vocabulary from the life sciences unit to describe concepts.	SP8: Obtaining information
13	LS13	7.MS-LS2-3	RST.6-8.7	SWBAT use food chains to identify consumers, producers, and decomposers.	(S): Students will orally identify producers, consumers and decomposers using a food web.	SP2: using models
14	LS14	7.MS-LS2-3	WHST.6-8.1.B	SWBAT use food chains to explain in writing how energy and matter move through a system.	(W): Use a paragraph frame and word bank to explain in writing how energy and matter move through an ecosystem.	SP4: Analyzing data
15	LS15	7.MS-LS2-3	WHST.6-8.4	SWBAT create a food web and use it to describe orally how the energy used comes from the sun.	(S): With a partner, orally describe how the sun's energy travels through a food web.	SP2: Developing models
16	LS16	7.MS-LS2-3	WHST.6-8.1.B	SWBAT use food webs to explain the concepts of conservation of matter and energy.	(W): Using a paragraph frame, justify the claim that matter is conserved.	SP6: Constructing scientific explanations
17	LS17	7.MS-LS2-4	WHST.6-8.1.B	SWBAT use food webs to explain in writing why a disruption in an ecosystem can lead to shifts in all its populations.	(W): Use a food web and a paragraph frame to explain the effect of disruptions on an ecosystem.	SP7: Engaging in argument from evidence
18	LS18	7.MS-LS2-5	WHST.6-8.1.B	SWBAT use evidence to justify the claim that biodiversity is the most important factor in an ecosystem's health.	(S): Use evidence to orally justify the claim that biodiversity is the most important factor in an ecosystem's health.	SP7: Engaging in argument from evidence
19	LS19	7.MS-LS2-5	RST.6-8.1	SWBAT work in groups to predict which ecosystems will best survive in a given scenario.	(L): Work with a partner and use sentence starters to make predictions about ecosystems.	SP1: Asking scientific questions
20	LS20	7.MS-L	RST.6-8	SWBAT evaluate competing design	(S): Orally describe the parts of	SP6: Constructing scientific

		S2-5	.6	solutions for protecting an ecosystem.	a design solution using sentence starters.	explanations
21	LS21	7.MS-LS2-6	RST.6-8.1	SWBAT explain how changes in biodiversity may limit the availability of natural resources humans use.	(R): Find key information about biodiversity and resources in a short description of an ecosystem.	SP6: Constructing scientific explanations
22	LS22	7.MS-LS2-5 & 7.MS-LS2-6	WHST.6-8.1	SWBAT draft a letter to city officials to recommend the best design to combat the effects of climate change on the Cambridge area.	(W): Use paragraph frames and a word bank to draft a letter to city officials.	SP7: Engaging in argument from evidence
23	LS23	LS2-5 & LS2-6	WHST.6-8.1	SWBAT complete a formal letter to city officials to recommend the best design to combat the effects of climate change on the Cambridge area.	(R): Interpret written feedback to improve letter to city officials.	SP8: Communicating information

Subject	PS7
Unit	Unit 4: Physical Sciences
Est. Length	22 lessons (Jan-March)
Big Idea	Energy and matter cannot be created nor destroyed, but can be transformed or exert forces on other objects.
Essential Questions	1. How do distance and magnitude affect the strength of forces? 2. What evidence can we find to support the law of conservation of energy? 3. How can we use material properties to maximize and minimize heat transfer?
MA State Standards *Power standards in bold	7.MS-PS2-3. Analyze data to describe the effect of distance and magnitude of electric charge on the strength of electric forces. • *Includes both attractive and repulsive forces.* • *State assessment will be limited to proportional reasoning.* • *Calculations using Coulomb's law or interactions of subatomic particles are not expected in state assessment.* **7.MS-PS2-5**. **Use scientific evidence to argue that fields exist between objects with mass, between magnetic objects, and between electrically charged objects that exert force on each other even though the objects are not in contact.** • *Emphasis is on evidence that demonstrates the existence of fields, limited to gravitational, electric, and magnetic fields.* • *Calculations of force are not expected in state assessment.* **7.MS-PS3-1**. **Construct and interpret data and graphs to describe the relationships among kinetic energy, mass, and speed of an object.** • *Examples could include riding a bicycle at different speeds and rolling different sized rocks downhill.* • *Consider relationships between kinetic energy vs. mass and kinetic energy vs. speed separate from each other; emphasis is on the difference between the linear and exponential relationships.* • *Calculation or manipulation of the formula for kinetic energy is not expected in state assessment.* 7.MS-PS3-2. Develop a model to describe the relationship between the relative positions of objects interacting at a distance and their relative potential energy in the system. • *Examples of objects within systems interacting at varying distances could include Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a*

	balloon with static electrical charge being brought closer to a stream of water. *• Examples of models could include representations, diagrams, pictures, and written descriptions of systems.* *• State assessment will be limited to electric, magnetic, and gravitational interactions and to interactions of two objects at a time.* *• Calculations of potential energy are not expected in state assessment.* 7.MS-PS3-3. Apply scientific principles of energy and heat transfer to design, construct, and test a device to minimize or maximize thermal energy transfer.* *• Examples of devices could include an insulated box, a solar cooker, and a vacuum flask.* *• Accounting for specific heat or calculations of the total amount of thermal energy transferred is not expected in state assessment.* 7.MS-PS3-4. Conduct an investigation to determine the relationships among the energy transferred, how well the type of matter retains or radiates heat, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. *• Calculations of specific heat or the total amount of thermal energy transferred are not expected in state assessment.* 7.MS-PS3-5. Present evidence to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. *• Examples of empirical evidence could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of an object.* *• Calculations of energy are not expected in state assessment.* 7.MS-PS3-6(MA). Use a model to explain how thermal energy is transferred out of hotter regions or objects and into colder ones by convection, conduction, and radiation. 7.MS-PS3-7(MA). Use informational text to describe the relationship between kinetic and potential energy and illustrate conversions from one form to another. *• Types of kinetic energy include motion, sound, thermal, and light; types of potential energy include gravitational, elastic, and chemical.*
Common Core State Standards (CCSS)	Reading ● RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. ● RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. ● RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. ● RST.6-8.4: Determine the meaning of key symbols, key terms, and other domain-specific words and phrases as

they are used in specific scientific or technical context relevant to grades 6 - 8.

- RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
- RST.6-8.6: Analyze the author's purpose in providing an explanation describing a procedure, or discussing an experiment in text.
- RST.6.8-7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
- RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
- RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.

Writing

- WHST.6-8.1: Write arguments focused on *discipline-specific content*.
    - WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
    - WHST.6-8.1.B: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
    - WHST.6-8.1.C: Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
    - WHST.6-8.1.D: Establish and maintain a formal style.
    - WHST.6-8.1.E: Provide a concluding statement or section that follows from and supports the argument presented.
- WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
    - WHST.6-8.2.A: Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
    - WHST.6-8.2.B: Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
    - WHST.6-8.2.C: Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
    - WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic.
    - WHST.6-8.2.E: Establish and maintain a formal style and objective tone.
    - WHST.6-8.2.F: Provide a concluding statement or section that follows from and supports the information or explanation presented.
- WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate

	to task, purpose, and audience. ● WHST.6-8.5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. ● WHST.6-8.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. ● WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. ● WHST.6-8.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. ● WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. ● WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Science Practices (SP)	**1. Asking scientific questions & defining engineering problems** 2. Developing & using models 3. Planning & carrying out investigations **4. Analyzing & interpreting data** 5. Using mathematics & computational thinking 6. Constructing scientific explanations & designing engineering solutions **7. Engaging in argument from evidence** 8. Obtaining, evaluating, and communicating information
Assessment Alignment	<u>Minor Assessments</u> ● Vocabulary quiz 5 & 6 ● Electric force investigation <u>Major Assessments</u> ● Unit 4 Test ● Project: 3D Printing
Honors Assignments	● What makes a motor work? ● Using and manipulating K.E. = 1/2 m v^2 ● Calculating specific heat

20 Key Vocabulary Words	Energy, kinetic, potential, law of conservation of energy, force, mass, gravitational, attract, repel, magnitude, electromagnetism, charge, thermal energy, conduction, convection, radiation

Prior knowledge that students have entering this unit

1. Students have basic experiential understanding of heat and energy transfer (thought have never been asked to articulate it before).
2. Students have limited practice in graph and table reading, and planning investigations at this point in the year.

Where this knowledge goes next

1. Understandings of kinetic and potential energy are the foundation of some physics standards.
2. Conservation of energy and matter knowledge goes into chemistry next.
3. Each of these topics lays a foundation for 8th grade physical sciences.

Descriptive outline narrative of unit

This unit's core focus is energy. There are three parts to the unit: heat energy and transfer, kinetic and potential energy, and the ways that magnetic, electric, and gravitational fields relate to an object's energy. The unit begins with a study on heat energy. We will study the direction of energy transfer, the influence of mass on energy and energy transfer, and the influence of materials on energy transfer. We then move on to the study of kinetic and potential energy. Students will form a basic understanding on kinetic energy through investigations around mass and kinetic energy, and transfer of kinetic energy to light, heat and sound energy. Our study of potential energy will be more theoretical, and focused on relative potential energy rather than calculated potential energy. Finally we will look at fields. We will study magnetic fields, then gravitational fields, and finally electric fields through a series of investigations. The unit will wrap up with a lab report.

Day	Lesson #/name	MA	CCSS	Content Objective	Language Objective	Science practice(s)
1	PS1	7.MS-PS 3-6	RST.6-8 .7	SWBAT match descriptions and examples to energy type.	(W): Label images using the vocabulary bank: *thermal energy, sound energy, light energy, mechanical energy, chemical energy.*	SP1: Asking scientific questions
2	PS2	7.MS-PS 3-6	RST.6-8 .7	SWBAT use evidence to show that thermal energy moves from hotter areas to cooler areas. SWBAT differentiate between examples of conduction, convection and radiation.	(R): Follow a written procedure to identify evidence that shows thermal energy moves from hotter areas to cooler areas. (S): Work with partner to identify heat transfer form using the sentence frame: *This is an example of _____ because...*	SP3: Planning & carrying out investigations
3	PS3	7.MS-PS 3-4	RST.6-8 .3	SWBAT conduct an investigation to determine the relative heat conductivity of different materials.	(W): Summarize the results of a heat conductivity investigation in a complete paragraph.	SP4: Analyzing & interpreting data
4	PS4	7.MS-PS 3-4	WHST.6 -8.8	SWBAT gather evidence to justify the claim that more massive objects require more energy input to change temperature.	(W): Justify the claim in 2-3 sentences using the sentence starter: *Our evidence shows...*	SP5: Mathematical & computational thinking
5	PS5	7.MS-PS 3-3	RST.6-8 .1	SWBAT use a CAD program to design a 3D object.	(R): Follow written directions precisely.	SP2: Developing & using models
6	PS6	7.MS-PS 3-3	RST.6-8 .1	SWBAT apply scientific principles of heat transfer to design a device to minimize thermal energy transfer. +PS Quiz 1	(R): Follow a written procedure to determine the criteria and constraints for a device that minimizes energy transfer	SP3: Planning & carrying out investigations

7	PS7	7.MS-PS 3-3	RST.6-8 .3	SWBAT use device designs to construct a device to minimize thermal energy transfer. +Reteach & Quiz Revisions	(S): Work with a partner to explain why the device design will minimize thermal energy transfer.	SP3: Planning & carrying out investigations
8	PS8	7.MS-PS 3-3	WHST.6 -8.7	SWBAT test the effectiveness of a design to minimize thermal energy.	(W): Use evidence to justify the claim in 2 - 4 sentences that their device was or was not successful.	SP4: Analyzing & interpreting data
9	PS9	7.MS-PS 3-1	RST.6-8 .1	SWBAT use a simulation to investigate kinetic and potential energy. SWBAT predict the relative kinetic and potential energy of objects in a system.	(S): Describe to a partner the relative difference in kinetic and potential energy between two objects using the sentence starter: *This object has more kinetic energy because...This object has more potential energy because...*	SP3: Planning & carrying out investigations
10	PS10	7.MS-PS 3-1	RST.6-8 .3	SWBAT calculate the kinetic and potential energy of an object. +PS Quiz 2	(R): Find important information in	SP3: Planning & carrying out investigations
11	PS11	7.MS-PS 3-1	WHST.6 -8.1.B	SWBAT use graphs, tables, and diagrams to predict which objects have the highest kinetic or potential energy.	(W): Predict the object that has greater kinetic energy using the sentence frame: *The object with greater kinetic energy is _____ because...*	SP5: Mathematical & computational thinking
12	PS12	7.MS_PS 3-5	WHST.6 -8.1.B	SWBAT identify evidence showing that energy is conserved when kinetic energy transforms to light, heat, and sound.	(W): Describe in 4-5 sentences how energy is conserved in a given scenario using the phrase: *Law of conservation of energy.*	SP6: Constructing scientific explanations

13	PS13	7.MS_PS 3-5	WHST.6 -8.1.B	SWBAT use evidence to justify the claim that energy is conserved when kinetic energy transforms to light, heat, and sound. +PS Test 1	(W): Justify the claim in 2-3 sentences that energy is conserved when motion energy is transformed to light, heat, or sound.	SP6: Constructing scientific explanations
14	PS14	7.MS-PS 3-7	WHST.6 -8.2.D	RETEACH SWBAT use the law of conservation of energy to explain the relationship between potential and kinetic energy.	(W): Explain, in 4 - 5 sentences, the relationship between kinetic energy & potential energy	SP8: Obtaining, evaluating, & communicating information
15	PS15	7.MS-PS 2-5	RST.6-8 .3	SWBAT use magnets to justify the claim that like charges repel and opposite charges attract.	(W): In 2-3 sentences justify the claim that like charges repel and opposite charges attract.	SP6: CONSTRUCTING SCIENTIFIC EXPLANATIONS
16	PS16	7.MS-PS 2-5	RST.6-8 .3	SWBAT use magnets to explain how the strength of forces changes as distance increases.	(W): Explain in 4-5 how the strength of forces changes as distance increases, using evidence from an investigation.	SP6: CONSTRUCTING SCIENTIFIC EXPLANATIONS
17	PS17	7.MS-PS 2-3	RST.6-8 .9	SWBAT compare qualities of electric fields to magnetic fields.	(S): Explain with a partner how electric fields are similar to magnetic fields.	SP1: ASKING SCIENTIFIC QUESTIONS
18	PS18	7.MS-PS 2-3	RST.6-8 .1	SWBAT compare qualities of gravitational fields to magnetic fields.	(S): Explain with a partner how gravitational fields are similar to magnetic fields.	SP1: ASKING SCIENTIFIC QUESTIONS
19	PS19	7.MS-PS 2-3	RST.6-8 .3	SWBAT calculate the gravitational pull of different planets on objects.	(R): Determine the gravitational pull on objects by reading a table.	SP5: USING MATHEMATICS & COMPUTATIONAL THINKING
20	PS20	7.MS-PS 2-3	RST.6-8 .9	SWBAT build an electromagnet and describe how it could be strengthened.	(R): Follow a written procedure to build an electromagnet.	SP3: PLANNING & CARRYING OUT INVESTIGATIONS
21	PS21	7.MS-PS	WHST.6	SWBAT build a simple motor and	(S): Work with a partner to	SP3: PLANNING & CARRYING

		2-3	-8.2.D	identify its parts.	identify the parts of a motor.	OUT INVESTIGATIONS
22	PS22	7.MS-PS 2-3	RST.6-8 .3	SWBAT build an electric fan using a motor and a battery.	(W): Use a word bank to identify the parts of the motor. (R): Follow a written procedure to build an electromagnet.	SP1: ASKING SCIENTIFIC QUESTIONS
23	PS23	7.MS-PS 2-3	RST.6-8 .3	SWBAT use a voltmeter to determine how to increase the output of a generator.	(S): Work with a partner to determine the best ways to increase generator output.	SP2: DEVELOPING & USING MODELS
24	PS24	7.MS-PS 2-3	RST.6-8 .9	SWBAT use paper to build three prototype blades for a wind generator.	(S): Work with a partner to design generator blades. (W): Use sentence starters and a word bank to describe the advantages of each type of blade.	SP2: DEVELOPING & USING MODELS
25	PS25	7.MS-PS 2-3	RST.6-8 .1	SWBAT use CAD to design a set of blades for a wind generator.	(R): Follow written instructions to design generator blades in a CAD program.	SP2: DEVELOPING & USING MODELS
26	PS26	7.MS-PS 2-3	RST.6-8 .3	SWBAT test wind generator and explain results.	(W): Use a paragraph frame and word bank to explain the results of generator testing.	SP3: PLANNING & CARRYING OUT INVESTIGATIONS
27	PS27	7.MS-PS 2-3	RST.6-8 .9	SWBAT write a formal lab report on the results of an electric force investigation.	(W): Write a formal lab report using a template and sentence starters.	SP8: Obtaining, evaluating, & communicating information

Subject	PS7
Unit	Unit 5: Technology and Engineering
Est. Length	20 lessons (Mar-May)
Big Idea	Iterative design is a process that requires testing prototypes, collecting data, and using failure to improve a design solution.
Essential Questions	1. How do systems and subsystems work together for a specific function? 2. How do I use the iterative design process to create a useful product?
MA State Standards *Power standards in bold	**7.MS-ETS1-2. Evaluate competing solutions to a given design problem using a decision matrix to determine how well each meets the criteria and constraints of the problem. Use a model of each solution to evaluate how variations in one or more design features, including size, shape, weight, or cost, may affect the function or effectiveness of the solution.*** **7.MS-ETS1-4. Generate and analyze data from iterative testing and modification of a proposed object, tool, or process to optimize the object, tool, or process for its intended purpose.*** 7.MS-ETS1-7(MA). Construct a prototype of a solution to a given design problem.* 7.MS-ETS3-1(MA). Explain the function of a communication system and the role of its components, including a source, encoder, transmitter, receiver, decoder, and storage. 7.MS-ETS3-2(MA). Compare the benefits and drawbacks of different communication systems. • *Examples of communications systems can include radio, television, print, and Internet.* • *Examples of benefits and drawbacks can include speed of communication, distance or range, number of people reached, audio only vs. audio and visual, and one-way vs. two-way communication.* 7.MS-ETS3-3(MA). Research and communicate information about how transportation systems are designed to move people and goods using a variety of vehicles and devices. Identify and describe subsystems of a transportation vehicle, including structural, propulsion, guidance, suspension, and control subsystems. • *Examples of design elements include vehicle shape to maximize cargo or passenger capacity, terminals, travel lanes, and communications/controls.*

	• *Examples of vehicles can include a car, sailboat, and small airplane.* 7.MS-ETS3-4(MA). Show how the components of a structural system work together to serve a structural function. Provide examples of physical structures and relate their design to their intended use. • *Examples of components of a structural system could include foundation, decking, wall, and roofing.* • *Explanations of function should include identification of live vs. dead loads and forces of tension, torsion, compression, and shear.* • *Examples of uses include carrying loads and forces across a span (such as a bridge), providing livable space (such as a house or office building), and providing specific environmental conditions (such as a greenhouse or cold storage).* • *Calculations of magnitude or direction of loads or forces are not expected in state assessment.* 7.MS-ETS3-5(MA). Use the concept of systems engineering to model inputs, processes, outputs, and feedback among components of a transportation, structural, or communication system
Common Core State Standards (CCSS)	Reading ● RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. ● RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. ● RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. ● RST.6-8.4: Determine the meaning of key symbols, key terms, and other domain-specific words and phrases as they are used in specific scientific or technical context relevant to grades 6 - 8. ● RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. ● RST.6-8.6: Analyze the author's purpose in providing an explanation describing a procedure, or discussing an experiment in text. ● RST.6.8-7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). ● RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. ● RST.6-8.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. ● RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently. Writing ● WHST.6-8.1: Write arguments focused on *discipline-specific content*. ○ WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

	○ WHST.6-8.1.B: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. ○ WHST.6-8.1.C: Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. ○ WHST.6-8.1.D: Establish and maintain a formal style. ○ WHST.6-8.1.E: Provide a concluding statement or section that follows from and supports the argument presented. ● WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. ○ WHST.6-8.2.A: Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. ○ WHST.6-8.2.B: Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. ○ WHST.6-8.2.C: Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. ○ WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic. ○ WHST.6-8.2.E: Establish and maintain a formal style and objective tone. ○ WHST.6-8.2.F: Provide a concluding statement or section that follows from and supports the information or explanation presented. ● WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. ● WHST.6-8.5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. ● WHST.6-8.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. ● WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. ● WHST.6-8.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. ● WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. ● WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Science Practices (SP)	1. **Asking scientific questions & defining engineering problems** 2. Developing & using models 3. Planning & carrying out investigations 4. **Analyzing & interpreting data** 5. Using mathematics & computational thinking 6. Constructing scientific explanations & designing engineering solutions 7. **Engaging in argument from evidence** 8. Obtaining, evaluating, and communicating information
Assessment Alignment	Minor Assessments ● Vocabulary Quiz 7 & 8 ● Engineering Design Mini-project Major Assessments ● Engineering Design Project ● Unit 5 Test
Honors Assignments	● How does the internet work? ● Generator extension
20 Key Vocabulary Words	Systems, structural, propulsion, guidance, suspension, foundation, roofing, feedback mechanisms, loads, forces, tension, compression, arch, beam, suspension, cable, input, output

Prior knowledge that students have entering this unit
1. Students learned the Engineering Design Process last year, and practiced using it. 2. Students learned about communications systems last year.

Where this knowledge goes next
1. 7th grade has the largest Engineering unit. In 8th grade they will use the EDP for a few designs, but the bulk of engineering is done in 7th grade.

Descriptive outline narrative of unit
Students begin the unit learning about the Engineering Design Process, then apply this process in a series of subunits. We first work with transportations systems--learning about the function and design of various subsystems, as well as macro-level analysis of citywide transportation systems. We wrap up the transportation subunit with a a major assessment, where students design improvements to a part of the Boston public transportation system. We next move to structural systems, beginning with identification and explanation of the common parts that make up most human-made structures. Students will spend two weeks designing, building, redesigning, and rebuilding a model bridge. This major assessment will include a write-up. The final system we study is communications. We will spend one week identifying and explaining the function of the subsystems of communications (students who were here in 6th grade already learned this). Quizzes will happen weekly, reteaches will take up about half a block every other week.

Day	Lesson #/name	MA	CCSS	Content Objective	Language Objective	Science practice(s)
1	ET1	7.MS-ETS3-5(MA)	WST.6-8.4	SWBAT differentiate between the input, process, output, and feedback of the engineering design process.	(W): Use EDP vocabulary to describe different stages in systems engineering.	SP2: Developing & using models
2	ET2	7.MS-ETS3-5(MA)	WST.6-8.7	SWBAT follow criteria and constraints to create an engineering solutions.	(R): Find important information about an engineering problem to design a fitting solution.	SP2: Developing & using models
3	ET3	7.MS-ETS3-	WST.6-8.7	SWBAT describe the purpose of subsystems of a transportations	(S): Work with partner to describe the functions of	SP8: Obtaining, evaluating, and communicating information

		3		vehicle, including structural, propulsion, guidance, suspension, and control subsystems.	different transportation subsystems.	
4	ET4	7.MS-ETS3-3	WST.6-8.4	SWBAT explain the purpose of different design elements of transportations systems (vehicle shape, cargo or passenger capacity, terminals, travel lanes, and communications/controls).	(W): Describe in writing the function of design elements of different transportation subsystems.	SP8: Obtaining, evaluating, and communicating information
5	ET5	7.MS-ETS3-3	WST.6-8.7	SWBAT evaluate different transportation systems for efficiency.	(W): Use descriptions and data to provide evidence about the efficiencies of different systems.	SP5: Using mathematics & computational thinking
6	ET6	7.MS-ETS3-3	WST.6-8.7	SWBAT design a solution to improve the efficiency of Boston's public transportation system.	(W): Work with a partner to describe improvements that could be made to the Boston public transportation system.	SP8: Obtaining, evaluating, and communicating information
7	ET7			RETEACH TBD		
8	ET8	7.MS-ETS3-4	WST.6-8.1.B	SWBAT identify components of a structural system including foundation, decking, wall, roofing, inputs (heat or AC), and feedback mechanisms.	(S): Work with a partner to identify components of a structural system.	SP2: Developing & using models
9	ET9	7.MS-ETS3-4	WST.6-8.1.B	SWBAT provide examples of physical structures and relate their design to their intended use.	(R): Read about different structures to relate their design to their intended use.	SP1: Asking scientific questions
10	ET10	7.MS-ETS3-4	RST.6-8.9	SWBAT differentiate between arch, beam, and suspension bridges.	(W): Justify in writing why a type of bridge was chosen.	SP8: Obtaining, evaluating, and communicating information
11	ET11	7.MS-ETS3-4	RST.6-8.9	SWBAT explain which forces are applied to the supports of different	(S): Work with a partner to explain the types of forces	SP6: Constructing scientific explanations

				bridges.	applied to the supports of different bridges.	
12	ET12	7.MS-ETS3-4	RST.6-8.4	SWBAT create three bridge sketches and identify which forces are applied to each support.	(W): Create bridge sketches and identify the forces applied to each support.	SP3: Planning & carrying out investigations
13	ET13	7.MS-ETS3-4	RST.6-8.3	SWBAT use sketches to create physical bridge models.	(R): Follow a written procedure and diagram to create physical bridge models.	SP3: Planning & carrying out investigations
14	ET14	7.MS-ETS3-4	WHST.6-8.9	SWBAT test bridges and begin redesigning their prototypes.	(W): Reflect in writing on the successes and failures of a bridge design.	SP3: Planning & carrying out investigations
15	ET15	7.MS-ETS3-4	RST.6-8.3	SWBAT complete a second iteration of a bridge.	(R): Follow a written procedure and diagram to create physical bridge models.	SP3: Planning & carrying out investigations
16	ET16	7.MS-ETS3-4	RST.6-8.3	SWBAT test second bridge and reflect on their work.	(W): Reflect in writing on the successes and failures of a bridge design.	SP3: Planning & carrying out investigations
17	ET17	7.MS-ETS3-4	WHST.6-8.9	SWBAT complete a write-up about the bridge project.	(W): Work with a partner to describe in detail their bridge design and the improvements that should be made to it.	SP8: Obtaining, evaluating, and communicating information
18	ET18	7.MS-ETS3-1	RST.6-8.9	SWBAT explain the function of the six components of a communication system.	(W): Explain in writing the function of the six components of a communication system.	SP2: Developing & using models
19	ET19	7.MS-ETS3-2	RST.6-8.8	SWBAT discuss benefits and drawbacks of the internet as a communication system.	(S): Work with a partner to describe the benefits and drawbacks of the internet as a communication system.	SP8: Obtaining, evaluating, and communicating information
20	ET20	7.MS-	RST.6-8	SWBAT work in groups to	(R): Follow a written procedure	SP3: Planning & carrying out

		ETS3-1	.3	disassemble electronics and identify their components.	precisely to disassemble electronics and identify their components.	investigations